# भूजल सूचना पुस्तिका

## पाकुर जिला, झारखंड

## Ground Water Information Booklet

**Pakur District, Jharkhand State**


**केन्द्रीय भूमिजल बोर्ड**
**जल संसाधन मंत्रालय**
**(भारत सरकार)**
**राज्य एकक कार्यालय, राँची**
**मध्य-पूर्वी क्षेत्र**
**पटना**

**Central Ground water Board**
**Ministry of Water Resources**
**(Govt. of India)**
**State Unit Office,Ranchi**
**Mid-Eastern Region**
**Patna**

**सितंबर 2013**

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**राज्य एकक कार्यालय, राँची**
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# GROUND WATER INFORMATION BOOKLET
# PAKUR DISTRICT, JHARKHAND STATE

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# PAKUR – DISTRICT AT A GLANCE

| Sl No. | ITEMS | Statistics | |
|---|---|---|---|
| 1. | GENERAL INFORMATION | | |
| | i) Geographical Area (Sq km.) | 1805.59 Sq. km. | |
| | (16) Administrative Divisions (As on 2008)<br>Number of Block<br>Number of Panchyat / Villages | <br>6<br>106/1252 | |
| | (ii) Population (As on 2011 Census) | 900422 persons | |
| | (iii) Average Annual Rainfall (mm) | 1399 mm | |
| 2. | GEOMORPHOLOGY | | |
| | Major Physiographic units | Basaltic terrain of Rajmahal hills | |
| | Major Drainages | Damro. Torai, Bansloi and Tripti. | |
| 3. | LAND USE (Sq Km.) | | |
| | a) Forest area: | 207.9 | |
| | b) Net area sown: | 578.4 | |
| | c) Cultivable area: | 630.5 | |
| 4. | MAJOR SOIL TYPES | Alfisols (red sandy soil and red gravelly soil )Light textured<br>Slightly Acidic<br>Poor in N & P<br>Fairly rich in K | |
| 5. | AREA UNDER PRINCIPAL CROPS | Pulses – 50.01<br>Oilseeds – 9.82<br>Paddy – 382.83 | |
| 6. | IRRIGATION BY DIFFERENT SOURCES<br>(Areas and Number of Structures) | Nos. | Area (ha) |
| | Dugwell | 189 | 379 |
| | Tube wells /Bore wells | 1 | 4 |
| | Tanks / Ponds | 86 | 186 |
| | Canals | 31 | 6133 |
| | Other Sources | 1129 | 3046 |
| | Net irrigated area | | |
| | Gross irrigated area | | 9748 |
| 7. | NUMBERS OF GROUND WATER MONITORING WELLS OF CGWB (As on 31-03-12)<br>No of Dugwell<br>No. of Piezometers | <br>7<br>Nil | |
| 10. | PREDOMINANT GEOLOGICAL FORMATIONS | Alluvium, Laterite, Rajmahal Trap | |
| 11 | HYDDROGEOLOGY | | |
| | ➢ Major Water bearing formation<br>➢ (Pre-monsoon Depth to water level during 2012)<br>➢ Post-monsoon Depth to water level during 2012)<br>➢ Long term water level trend in 10 yrs (2002-2011) in m / yr. (Pre – monsoon) | Rajmahal Trap<br>5.44 to 13.10 mbgl<br>1.80 to 7.03 mbgl<br>Rise: 0.017 – 0.125<br>Fall: 0.062 – 0.223 | |

| | | |
|---|---|---|
| 12. | GROUND WATER EXPLORATION BY CGWB (As on 31-03-07) | |
| | No. of wells drilled (EW, OW, PZ, SH, Total | EW – 7, OW – 5, SH -1 |
| | Depth Range (m) | 23.42 – 200 mbgl |
| | Discharge | 1.80 – 30 $m^3$/hr. |
| | Storativity (S) | 1.3 $x10^{-5}$ to 6.6 $x10^{-4}$ |
| | Transmissivity ($m^2$/day) | 2 – 86.29 $m^2$/day |
| 13. | GROUND WATER QUALITY | Good |
| | Presence of Chemical constituents more than permissible limit (e.g. EC, F, As, Fe) | EC 327 to 1014 micro mhos/cm at $25^0$ C. |
| | Type of Water | Potable |
| 14. | DYNAMIC GROUND WATER RESOURCES (2009) in ham.( Net annual ground water availability) | 12654.77 ham |
| | Gross Ground Water Draft for all uses | 1713.56 ham |
| | Projected Demand for Domestic and Industrial uses up to 2035 | 1581.71 ham |
| | Stage of Ground Water Development (average) | 13.91 % |
| 15. | AWARENESSS AND TRAINING ACTIVITY | |
| | Mass Awareness Programmes Organized<br>Date<br>Place<br>No. of Participants | <br>22nd March 2007<br>Town Hall, Pakur<br>More than 130 people |
| 16. | EFFORTS OF ARTIFICIAL RECHARGE & RAINWATER HARVESTING | |
| | Projects completed by CGWB (No & Amount spent) | Nil |
| | Projects under technical guidance of CGWB (Numbers) | Nil |
| 17 | GROUND WATER CONTROL AND REGULATION | |
| | Number Of OE Blocks | Nil |
| | No. of Critical Block | Nil |
| | No. of Blocks notified | Nil |
| 18. | MAJOR GROUND WATER PROBLEMS AND ISSUES | Fluoride concentration found more than permissible limit in some of the villages |

# Ground Water Information Booklet, Pakur District, Jharkhand state

## 1.0 Introduction

### 1.1 Administration

The district Pakur is situated in the north – eastern part of the Jharkhand state. It is bounded in the north by the Sahebganj district, in the east by West Bengal, in the south by Dumka district and part of West Bengal state and in the west by Dumka and Godda districts. The district is situated between $24^0$ 49' 45"and $24^0$ 14' 00'North latitude and $87^0$ 24' 00" and $87^0$ 55' 00" East longitude. The district falls in Survey of India toposheets nos. 72 P/ 5, P/ 6, P/9, P/10, P/ 11, P/ 14 and P/ 15.

The district has one sub division and six blocks namely – Amrapara, Litipara, Hiranpur, Pakur, Maheshpur and Pakuria (Fig. 1). The administrative division and population of the district is given in table – 1.

### 1.2. River System

The river Ganges passes at a little distance away, along the north eastern boundary of the district. The other rivers of the district are Gumani, Torai, Bansloi and Brahmni. All the rivers flow from west to east direction except river Gumani which flows from SW to NE direction. The drainage pattern of the district is dendritic. All the rivers are tributaries of river Ganga and are seasonal in nature.

### 1.3. Irrigation

Undulating topographic features characterize the district. The agricultural activity of the district is solely dependent upon the monsoon rainfall and the kharif crops mainly paddy and maize are grown extensively. Irrigational facilities are not adequate in the district. Dug well is the most common source of irrigation, but this is not very dependable source. The major part of the district

being rocky, it is difficult to dig wells. Where there exists facility for irrigation during Rabi season from the ponds, wheat is the major crop grown in that area.

### 1.4 Studies

Central Ground Water Board has established a network of observation wells under National Hydrograph Network programme to study the behavior of ground water level and quality of ground water in the district. The systematic hydrogeological survey has been carried out during the AAP 1976 – 77 and ground water management study has been carried out during the AAP 2006 - 2007 and field data was collected for the study of ground water conditions in respect of quality and quantity. The board has also carried out exploratory drilling in the district and drilled six bore wells to know the sub surface geology, depth and thickness of water bearing formation with their yield and determine the different aquifer parameters (Table - 2).

## 2.0 Rainfall and Climate

### 2.1 Rainfall

The area receives rainfall by South-West monsoon. Rainy season sets in the middle of June and lasts till September. The normal average rainfall in the district is 1399 mm.

### 2.2 Climate

The district is characterized by humid to sub-humid climate. During summer the hot spell prevails from March to middle of June. Rainy season started from middle of June to end to September. Winter starts from the middle of November and continues till the end of February. The district experiences great heat from March to May, when the maximum temperature reaches upto $40^0$c. December is the coldest month when the minimum temperatures fall down up to $4^0$c.

## 3.0 Geomorphology and soil types

### 3.1Geomorphology

Major part of the district is characterized by undulating topography covered by basaltic flows of Rajmahal Trap. The district is mainly drained by the river Bansloi, Brahmani, Torai and Gumani. All these rivers are seasonal in nature. Major drainages of the district appear to have a west to easterly flow direction. The main geomorphological features of the district are the rolling peneplain in the south with numerals remnants of ancient ridges and resistant lava plateau of Rajmahal. These plateaus rise above the general level and occupy major part of the district. The general elevation of the hills and plateau varies from 70 to 371 m above MSL.

**3.2 Soil**

The major soil type of the district is the Rajmahal type soil which is derived from basaltic lava. These soils black in colour are very fertile and restricted to Rajmahal lava areas. The other soil type of the district are Red soil, eroded scarp soil, foothill soils, Tal soil and alluvial soil. The red soils are light to medium and are red to yellow or light grey in colour. The eroded scarp soil occurs in transverse section of dissected, descending scarp land at various altitude of upland. The yellowish red foothill soils occur in the eastern fringe of the district. The al soil is found in the back water belt of the Ganga araund Pakur when the rain water remains collected in the rainy season.

**4.0 Ground Water Scenerio**

**4.1 Hydrogeology**

Rajmahal Trap is the major rock type in the district. The other geological formations of the district are alluvium, Laterite and Gondwana.

In the eastern part of the district, recent alluvium occurs in patches, which is mainly composed of sand and sub ordinate clay. Laterites are mainly of in situ origin and have been formed by sub-aerial eroson of underlying basalts under favorable climatic conditions. Laterites provide a productive ground water reservoir due to very good porous and permeable nature. The most significant Barakar coal measures of Gondwana formation occurs in western part of the district.

Rajmahal traps having a large thickness of basaltic lava flows occur in the major part of the district. The different units of the lava flows are the main water bearing horizons in basaltic formation. The basic properties such as the ability to receive recharge, holding capacity of water to take into storage and transmit it as ground water by gravity are different for different litho units of the trappean flows. The massive basaltic unit is hard and compact in nature with negligible primary porosity and permeability. But the process of weathering and structural deformations, development of secondary porosity such as joints and fractures make it to act as good ground water reservoir. The vesicular units have abundant vesicles that contribute to high degree of porosity and permeability to serve as potential aquifers. The ground water occurs under water table conditions in near surface weathered, jointed and fractured basaltic zone. The water bearing zone occurring between depths of 15-40 m are either interflow weathered shear zones or directly connected to shallow aquifer in widely spaced major joints and fractures. These forms semi confined aquifer. Below the depth of 40 m, where the fracture porosity is insignificant, the weathered flow contacts are completely cut-off from lower aquifer on account of intervening high impermeable massive basalts and intertrappean beds give rise to confining conditions. The hydrogeolocicalmap is shown in Figure 4.

**4.1.1 Exploratory wells:** To understand the sub surface geology, identify the various water bearing horizons including their depth, thickness, etc. and for computing the hydraulic characteristics such as Transmissivity and Storativity of the aquifers, exploratory drilling programme was carried out under AAP 1982 – 83. There are 05 exploratory wells and 04 observtion wells were drilled in the district. The depth of exploratory wells ranges between 80.0 to 200.00 mbgl. The static water level of these exploratory wells varies from 1.55 to 11.36 mbgl. The Transmissivity value varies from 2.00 to 86.29 $m^2$/ day, while the Storativity values varying from 01.30 X $10^{-5}$ to 06.6 X $10^{-4}$.

***Depth to Water Level: -*** There are 7 numbers of permanent observation well (HNS) of Central Ground Water Board is located in the district for monitoring of

ground water regime. During the year 2012, the pre monsoon depth to water level was monitored between 5.44 to 13.10 mbgl. while the post monsoon water level observed between 1.80 to 7.03 mbgl. The pre monsoon and post monsoon depth to water level maps (2012) of the district prepared and shown in Figure 2 and 3 respectively.

**4.1.3 Seasonal Fluctuation: -** From the pre monsoon and post monsoon depth to water level data collected during May 2012 and November 2012 respectively, water level fluctuations were computed for all HNS located in the district. The water level fluctuation of the district varies from 1.59 to 6.65 m.

**4.1.4 Long term water level trend:** - Water level of an area depends upon various factors like the storage of ground water development and variation in rainfall over a long period. Central Ground Water Board has established seven National Hyrdograph stations (NHS) for the study of water level behavior in the district. The water level data of each station has been analyzed. The pre monsoon and post monsoon long term water level trend has been calculated for the period of 2002 – 2011 (Table 4). The long term water level trend is showing rising trend between 0.017 – 0.125, 0.437 and 0.011 – 0.287 m/ year for pre monsoon, post monsoon and all period respectively. Similarly, the long term water level trend is showing falling trend between 0.062 – 0.223, 0.071 – 0.335 and 0.196 – 0.300 m/ year for pre monsoon, post monsoon and all period respectively. About 42.86% of NHS showing rising trend of ground water while 57.14% of NHS showing falling trend for pre monsoon period. About 14.28 % of NHS showing rising trend of ground water while 85.72% of NHS showing falling trend for post monsoon period. Similarly, about 71.43 % of NHS showing rising trend and rest 28.27% showing declining trend for all seasons.

## 4.2 Ground Water Resources

Based on the recommendation of the Ground Water Estimation Committee – 1997 (GEC – 1997), Block wise the ground water resource

assessment has been evaluated.. The net ground water availability of the district is 12684.77 ham. The gross ground water draft for all uses of the district is 1713.56 ham. All blocks of the district falling under “Safe” category. The stage of ground water development varies from 8.52% to 29.78 %. (Table – 6, Fig. 5). The net ground water availability for future irrigation development for the district is 10520.82 ham. The Stage of Development is shown in Figure 5.

**4.3 Ground Water Quality**

To evaluate the quality of ground water, samples have been collected from NHS during the May – 2011. These samples have been considered to assess the chemical quality of ground water and its suitability for drinking and irrigation purposes. The samples represent the phreatic aquifer or the shallow aquifer. The water samples were analysed for major chemical constituents by using standard methods at chemical laboratory in CGWB, MER, Patna. Analysed results are given in Table 5. The EC value ranges from 434 – 1014 micro Siemens/cm at $25^0$c.

The results of ground water samples were evaluated in accordance with the ISI – 1993 standard for drinking purpose. In general the quality of ground water in the phreatic aquifer is acceptable except few samples, which are showing nitrate concentration more than permissible limit. As per the ground water management study (2006 – 07), the nitrate concentration more than permissible limit has been observed in the villages namely Bannawgram, Kaira Chhatar, Parerkola, Litipara and Tarai. The Fluoride concentration more than permissible limit (bore well samples) has been observed in the villages – Dharampur Morh, Amrapara, Bannawgram, Dhekiduba, Jatang Khakhsa and Rajdaha. The EC value ranges from 280 – 2160 micro Siemens/cm at $25^0$c.

**4.4 Status of Ground Water Development**

There is sufficient scope for development of ground water through shallow as well as deep bore wells. State Govt. department has been

constructed a large number of bore wells to mitigate the drinking water problem in the district. Central Ground Water Board has drilled 7 exploratory wells and 5 observation wells in the district. The depth of bore wells ranges between 80.00 – 200.00 mbgl. The yield of bore wells ranges from 1.08 to 30.00 $m^3$/hr. The Transmissivity and Storativity value ranges from 2 to 86.29 $m^2$/day and 01.30 x $10^{-5}$ to 06.6 x $10^{-4}$ respectively (Table 2).

## 5.0. Ground Water Management Strategy

### 5.1. Ground Water Development

Dug wells and shallow to medium deep (upto 50 m) bore wells are the main ground water extraction structures in the area to meet the increasing demand of domestic water supply and irrigation. The overall stage of ground water development in the district is 13.91% only. Thus, there is sufficient scope for development of ground water through dug wells, shallow and medium deep bore wells.

Construction of dug cum bore well structure is also suitable for enhancing the yield of dug wells which will be vary much coast effective. The ground water development varies in different places depending on the availability of favorable potential zones/ aquifers. For the construction of ground water structures, knowledge of the local as well as regional hydrogeological condition of the area is necessary.

Ground water potential available for the future development, considering the ground water draft has been worked out as per norms of Ground Water Estimation Committee – 1997 (GEC – 1997) and the details of ground water recharge, net annual ground water availability, annual draft, net ground water balance and stage of ground water development has been assessed and presented in table – 6.

### 5.2. Water Conservation and Artificial Recharge

In view of the increasing thrust on development of ground water resources, there is urgent need to augment the depleting ground water resources. This gets

augmented through natural recharge and can be augmented in a increased scale through artificial recharge. From hydrogeological point of view, rain water conservation is needed to arrest decline in ground water levels and to improve ground water quality by dilution. From hydrogeological point of view, rain water conservation is needed for arrest decline in ground water levels and to improve ground water quality by dilution. The construction of water conservation structures, artificial recharge structures, depends on the topographic features, hydrological and hydrogeological conditions of the area. From this point of view, the Pakur district may be divided into two parts – 1) Western part of the district which is having undulating topography with hills is suitable for check dam, gabion structures and contour bunding and trenching 2) Middle and eastern part is suitable for percolation tanks and nala bunds.

## 6.0 Ground Water Related Issue and Problems

The Flouride concentration has been found more than permissible limit in some villages like Dharampur Morh, Amrapara, Bannawgram, Dhekiduba, Jatang Khakhsa and Rajdaha.

## 7.0. Awareness and Training Activity

### 7.1. The Mass Awareness Programme (MAP) by CGWB

Central Ground Water Board organized a mass awareness programme at Pakur on 22$^{nd}$ March 2007, on “Rain Water Harvesting and Artificial Recharge”. About 150 peoples from different organizations participated in the programme including representatives of NGO’S. In the addition to technical lectures a quiz competition on ground water related topic was conducted for college students.

**7.2 Participation in Exhibition, Mela, Fair etc. -** Nil

**7.3 Presentation and Lecture deliver in public forum / Radio / T.V / Institution of repute / Grassroots association / NGO / Academic institution etc. –** Nil

## 8.0 Area Notified by CGWA / CGWA

As per the ground water resource assessment report of Jharkhand state, all blocks of the district fall under the safe category. Thus, the authority has not been notified any of the blocks.

## 9.0 Recommendation

1. Flouride concentration in ground water (bore well ) exceeds the permissible limits in/around villages Dharampur Morh, Amrapara, Bannawgram, Dhekiduba, Jatang Khakhsa and Rajdaha. In fluoride-affected area, the ground water must be used after deflouridation through fluoride removal plants. Alternative source may be identified. The existing fluoride affected sources may be sealed.
2. Nitrate concentration in shallow aquifer (dug well) is found more than permissible limit in/around villages Bannawgram (Pakuria Block), Kairachhatar (Maheshpur Block) and Litipara (Litipara Block). The bore well may be a better alternate option for the drinking water purposes for the above villages.
3. The exploration data indicate that poor success rate of bore wells in the district. Thus geophysical survey may be adopted for selection of suitable sites for ground water exploration and drilling of production bore wells.
4. Rooftop rain water harvesting and artificial recharge practice may be adopted in the Pakur town where the post monsoon water level (NHS) has been found upto 13.10 mbgl.
5. In order to conserve run off water during monsoon, it is suggested to construct the water conservation structures at suitable places to facilitate

the ground water recharge. These recharge structure may be constructed in and around Amrapara, Maheshpur and Pakuria blocks, where the long term (2002 – 2011) water level trend is showing declining trend for the pre-monsoon as well as post-monsoon period.

**TABLE 1: ADMINISTRATIVE DIVISION AND POPULATION OF PAKUR DISTRICT, JHARKHAND (CENSUS 2011)**

| Sr. No. | Block | Area (Sq. km) | Rural population | | | Urban population | | |
|---|---|---|---|---|---|---|---|---|
| | | | Male | Female | Total | Male | Female | Total |
| 1 | Pakur | 221.71 | 130807 | 129596 | 260403 | 34410 | 33102 | 67512 |
| 2 | Litipara | 169.60 | 52850 | 52851 | 105701 | -- | -- | -- |
| 3 | Amrapara | 413.05 | 32923 | 32366 | 65289 | -- | -- | -- |
| 4 | Hiranpur | 273.29 | 42506 | 41573 | 84079 | -- | -- | -- |
| 5 | Maheshpur | 448.93 | 104984 | 103878 | 208862 | -- | -- | -- |
| 6 | Pakuria | 279.01 | 54181 | 54395 | 108576 | -- | -- | -- |
| **Total** | | **1805.59** | **418251** | **414659** | **832910** | **34410** | **33102** | **67512** |

**TABLE 2: DETAILS OF EXLPORATORY WELLS DRILLED IN PAKUR DISTRICT, JHARKHAND**

| Sl. No | Location/ Block | Depth Drilled (mbgl) | Length of casing pipe/ Depth const. (m) | Static Water Level (mbgl) | Discharge ($m^3$/hr) | Draw-down (m) | Specific Capacity ($m^3$/hr/m) | Trans-missivity ($m^2$/day) | Storativity |
|---|---|---|---|---|---|---|---|---|---|
| 1 | Pakur | 100.60 | -- | -- | Abandoned | -- | -- | -- | -- |
| 2 | Litipara | 98.35 | 11.60 | 11.36 | 9.24 | 13.19 | 0.7 | 86.29 | -- |
| | OW | 99.00 | -- | -- | -- | -- | -- | -- | -- |

| | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| 3 | Amrapara | 98.00 | 7.35 | 1.55 (magl) | 1.08 | 19.65 | 0.05 | 26.00 | 01.30 X $10^{-5}$ |
| | OW | 98.00 | -- | -- | -- | -- | -- | -- | -- |
| 4 | Brindawan | 92.5 | -- | 2.17 | 6.12 | 7.05 | 0.86 | 29.00 | 06.10 X $^{10-5}$ |
| | OW | 96.90 | -- | -- | -- | -- | -- | -- | -- |
| 5 | Gaurpara | 80.00 | -- | -- | Abandoned | -- | -- | -- | -- |
| 6 | Maheshpur | 170.24 | 24.50 | 4.66 | 30.00 | 36.00 | -- | -- | -- |
| | SH | 23.42 | -- | -- | -- | -- | -- | -- | |
| | OW | 156.70 | -- | -- | -- | -- | -- | -- | -- |
| 7 | Pakuria | 200.00 | 18.10 | 10.00 | 12.24 | 27.39 | 0.45 | 02.00 | -- |
| | OW | 200.00 | 22.55 | 10.08 | 12.24 | 12.60 | 0.97 | 05.00 | 06.6 X $10^{-4}$ |

**TABLE 3: DEPTH TO WATER LEVEL OF EXISTING HYDROGRAPH NETWORK STATION (HNS) IN PAKUR DISTRICT (2012)**

| Sr. No. | Location | Depth to water level (mbgl) | | | |
|---|---|---|---|---|---|
| | | May 2012 | August 2012 | November 2012 | January 2013 |
| 1 | Litipara | 9.90 | 6.55 | 7.03 | 7.83 |
| 2 | Amrapara | 5.44 | 2.15 | 1.80 | 2.36 |
| 3 | Maheshpur | 8.55 | 4.12 | 6.96 | 7.37 |
| 4 | Pakur | 13.10 | 5.90 | 6.45 | 8.05 |
| 5 | Pakuria | -- | 1.80 | 2.10 | 3.07 |
| 6 | Salgapara | -- | 1.70 | 3.52 | 4.98 |
| 7 | Hiranpur | 8.60 | 6.40 | 5.60 | 6.15 |

**TABLE 4: LONG TERM WATER LEVEL TREND FOR EXISTING HYDROGRAPH NETWORK STATIONS IN PAKUR DISTRICT (2002 – 2011)**

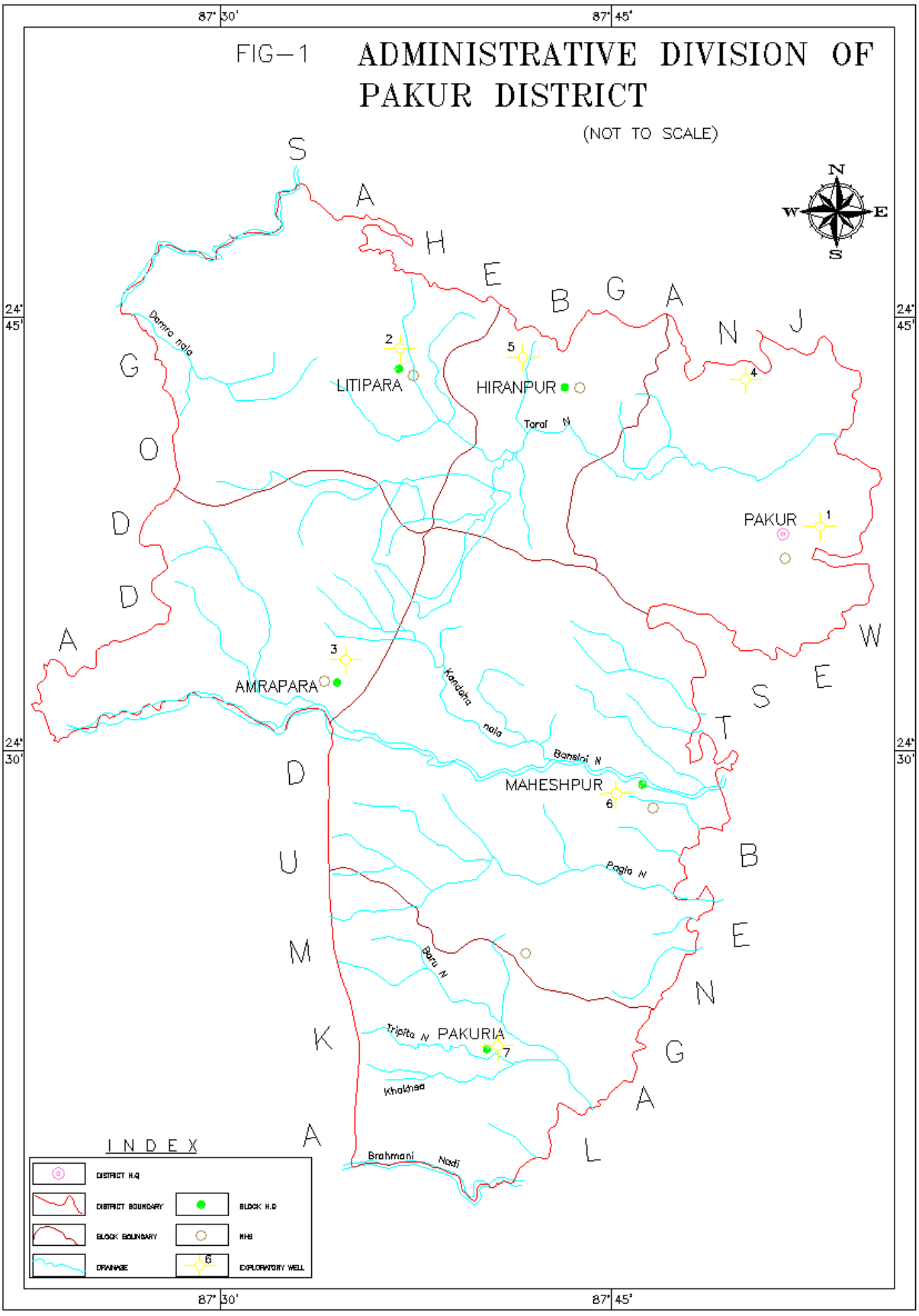
| Sl. No. | Location | Pre monsoon trend (m/year) | | Post monsoon trend (m/year) | | All period (m/year) | |
|---|---|---|---|---|---|---|---|
| | | Rise | Fall | Rise | Fall | Rise | Fall |
| 1 | Amrapara | 0.042 | -- | -- | 0.270 | -- | 0.196 |
| 2 | Hiranpur | 0.125 | -- | 0.437 | -- | 0.287 | -- |
| 3 | Litipara | 0.017 | -- | -- | 0.071 | 0.011 | -- |
| 4 | Maheshpur | -- | 0.223 | -- | 0.261 | -- | 0.300 |
| 5 | Pakur | -- | 0.062 | -- | 0.335 | 0.135 | -- |
| 6 | Pakuria | -- | 0.195 | -- | 0.102 | 0.035 | -- |
| 7 | Salgapara | -- | 0.084 | -- | 0.115 | 0.012 | -- |

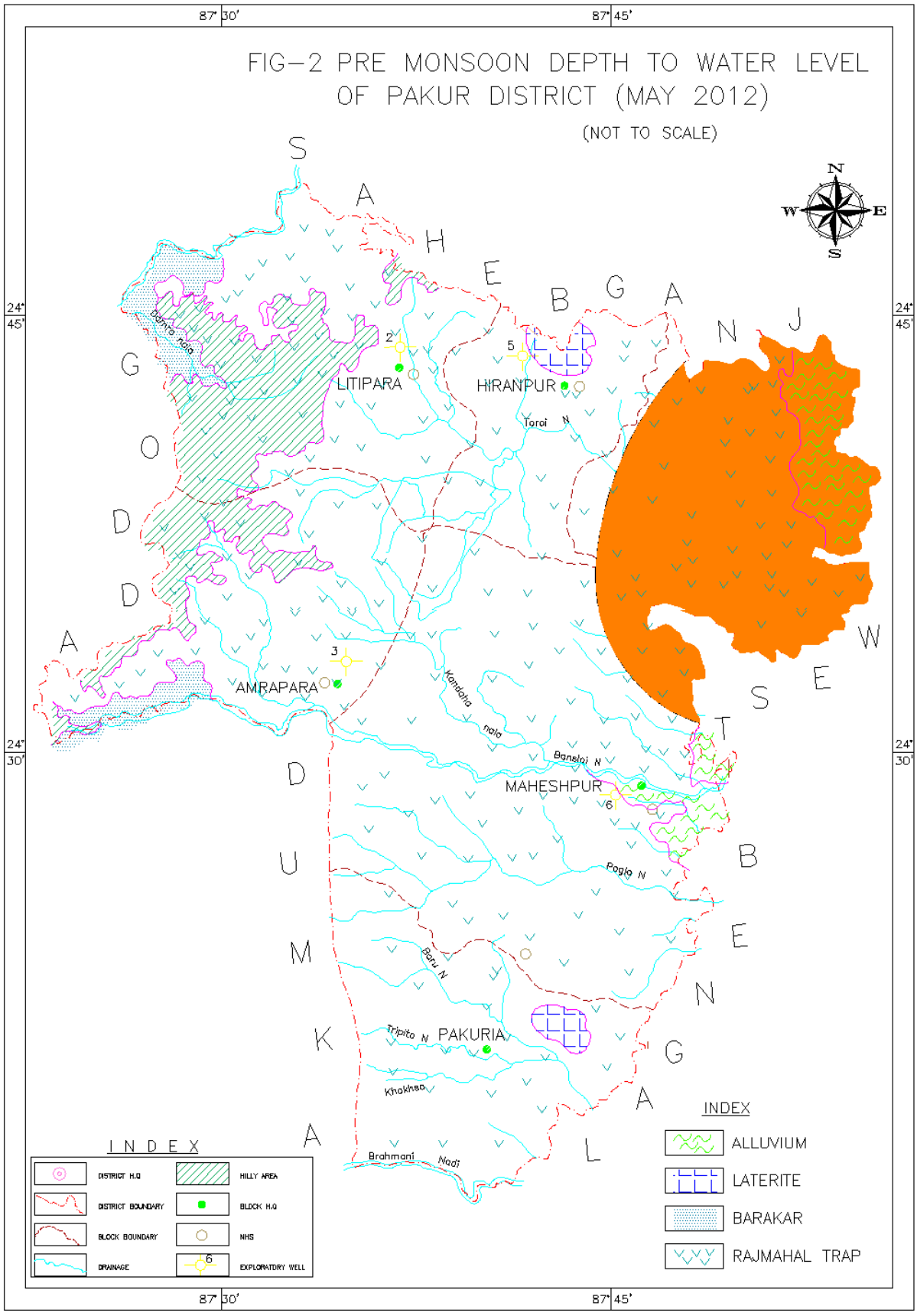
**TABLE 5: CHEMICAL ANALYSIS OF WATER SAMPLES COLLECTED FROM EXISTING HNS OF PAKUR DISTRICT (2011)**

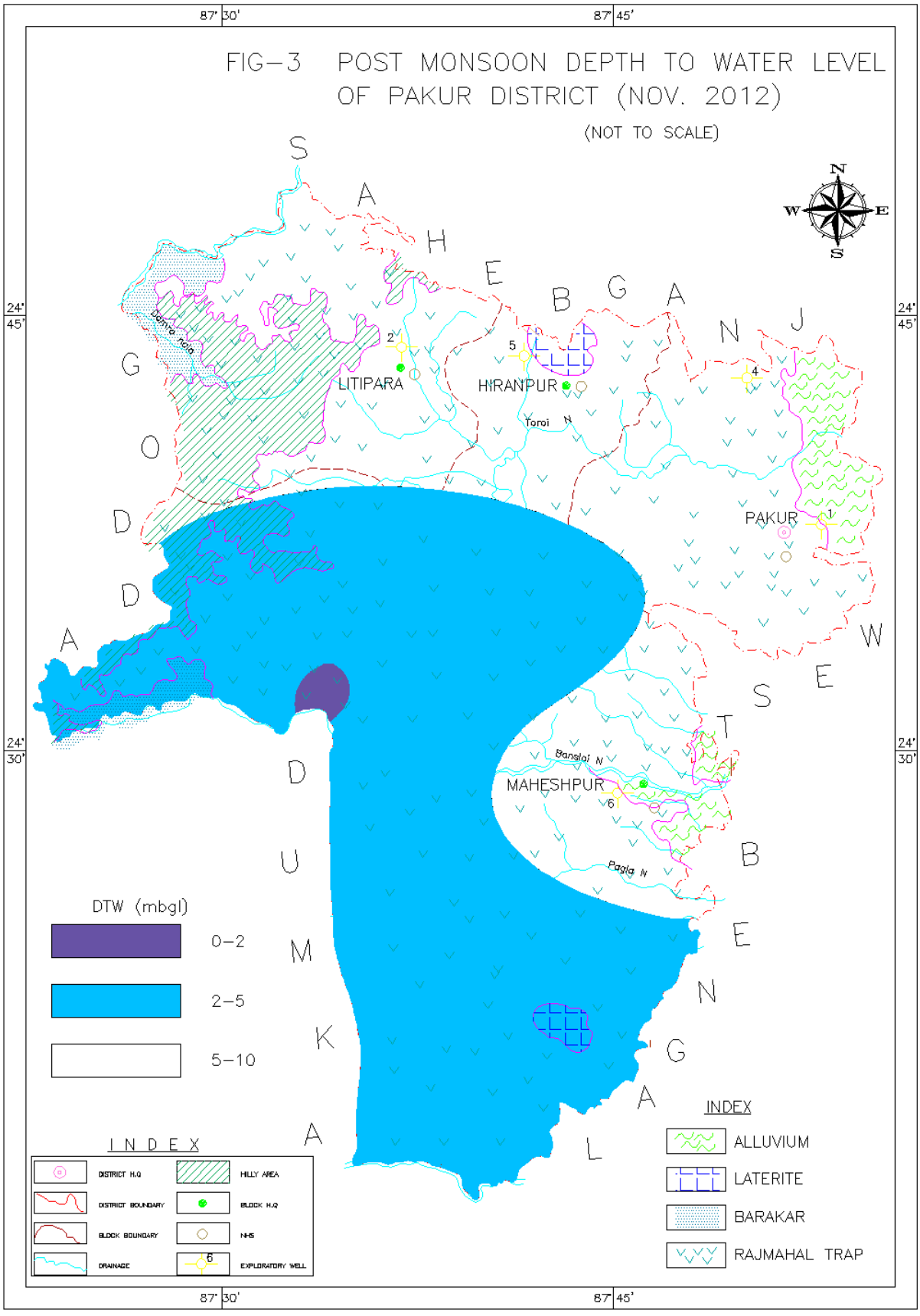
| Sr. No. | Location | Block | EC in micro siemens/ cm at $25^0$c | pH | TH as $CaCO_3$ | Ca | Mg | Na | K | $HCO_3$ | Cl |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | ← mg / l → | | | | | |
| 1 | Pakuria | Pakuria | 434 | 7.29 | 105 | 24 | 10.9 | 44.5 | 1 | 178.35 | 11 |
| 2 | Maheshpur | Maheshpur | 998 | 8.23 | 260 | 44 | 36.5 | 74 | 8 | 190.65 | 53 |
| 3 | Amrapara | Amrapara | 1014 | 8.08 | 235 | 54 | 30.4 | 92 | 7 | 264.45 | 85 |
| 4 | Litipara | Litipara | 790 | 8.24 | 180 | 40 | 19.4 | 82 | 3.8 | 166.05 | 142 |
| 5 | Pakur | Pakur | 327 | 8.12 | 95 | 22 | 9.7 | 21 | 1 | 153.75 | 89 |
| 6 | Salgapara | Maheshpur | 471 | 8.18 | 125 | 28 | 13.4 | 38 | 5 | 196.8 | 64 |
| 7 | Hiranpur | Hiranpur | 338 | 8.31 | 75 | 12 | 10.9 | 33 | 1.6 | 55.35 | 36 |

**TABLE 6:** DETAILS OF GROUND WATER RESOURCES AND STAGE OF GROUND WATER DEVELOPMENT IN PAKUR DISTRICTS AS ON 31st MARCH 2009 (in hectare meters)

| Sr. No. | Assessment Unit/ District | Net Annual Ground Water Availability | Gross Ground Water Draft for Irrigation | Gross Ground Water Draft for Domestic and Industrial water Supply | Gross Ground Water Draft for all Uses (10+11) | Allocation for Domestic and Industrial Requirement supply upto next 25 years | Net Ground Water Availability for future irrigation development (9 – 12 – 13) | Stage of Ground Water Development (12/9)*100 (%) | Categorisation for future ground water development (safe/ critical/ over - exploited) |
|---|---|---|---|---|---|---|---|---|---|
| 1 | 2 | 9 | 10 | 11 | 12 | 13 | 14 | 15 | 16 |
| 1 | Litipara | 2485.62 | 92.34 | 147.43 | 239.77 | 202.25 | 2191.03 | 9.65 | Safe |
| 2 | Amrapara | 1682.11 | 53.36 | 89.90 | 143.26 | 123.33 | 1505.42 | 8.52 | Safe |
| 3 | Hiranpur | 1245.91 | 39.44 | 114.83 | 154.27 | 157.53 | 1048.94 | 12.38 | Safe |
| 4 | Pakur | 1597.82 | 134.78 | 341.09 | 475.87 | 497.61 | 965.43 | 29.78 | Safe |
| 5 | Maheshpur | 3885.37 | 243.28 | 287.60 | 530.88 | 394.54 | 3247.54 | 13.66 | Safe |
| 6 | Pakuria | 1787.94 | 19.02 | 150.49 | 169.51 | 206.45 | 1562.46 | 9.48 | Safe |
| | Total | **12684.77** | **582.22** | **1131.34** | **1713.56** | **1581.71** | **10520.82** | **Avg. 13.91** | **--** |


FIG—1
ADMINISTRATIVE DIVISION OF PAKUR DISTRICT
(NOT TO SCALE)
87° 30'
87° 45'
24° 45'
24° 30'
N
S
E
W
SAHEBGANJ
GODDA
DUMKA
PAKUR
JAMTARA
Damra nala
LITIPARA
HIRANPUR
Toral N
AMRAPARA
Kandana nala
Bansloi N
MAHESHPUR
Pagla N
Paru N
Tripita N
PAKURIA
Khaksad
Brahmani Nadi
INDEX
DISTRICT H.Q
DISTRICT BOUNDARY
BLOCK H.Q
BLOCK BOUNDARY
NHB
DRAINAGE
EXPLORATORY WELL


FIG–2 PRE MONSOON DEPTH TO WATER LEVEL OF PAKUR DISTRICT (MAY 2012)
(NOT TO SCALE)
87° 30'
87° 45'
24° 45'
24° 30'
N
S
E
W
SAHEBGANJ
GODDA
DUMKA
JAMTARA
LITIPARA
HIRANPUR
AMRAPARA
MAHESHPUR
PAKURIA
Banro Nala
Toroi N
Kandaha nala
Bansloi N
Pagla N
Baru N
Tripito N
Khokhsa
Brahmani Nadi
INDEX
DISTRICT H.Q
DISTRICT BOUNDARY
BLOCK BOUNDARY
DRAINAGE
HILLY AREA
BLOCK H.Q
NHS
EXPLORATORY WELL
INDEX
ALLUVIUM
LATERITE
BARAKAR
RAJMAHAL TRAP


FIG–3 POST MONSOON DEPTH TO WATER LEVEL OF PAKUR DISTRICT (NOV. 2012)
(NOT TO SCALE)
87° 30'
87° 45'
24° 45'
24° 30'
N
S
E
W
SAHEBGANJ
GODDA
DUMKA
PAKUR
LITIPARA
HIRANPUR
MAHESHPUR
Dumka Nala
Toroi N
Bansloi N
Pagla N
DTW (mbgl)
0–2
2–5
5–10
INDEX
DISTRICT H.Q
DISTRICT BOUNDARY
BLOCK BOUNDARY
DRAINAGE
HILLY AREA
BLOCK H.Q
NHS
EXPLORATORY WELL
INDEX
ALLUVIUM
LATERITE
BARAKAR
RAJMAHAL TRAP

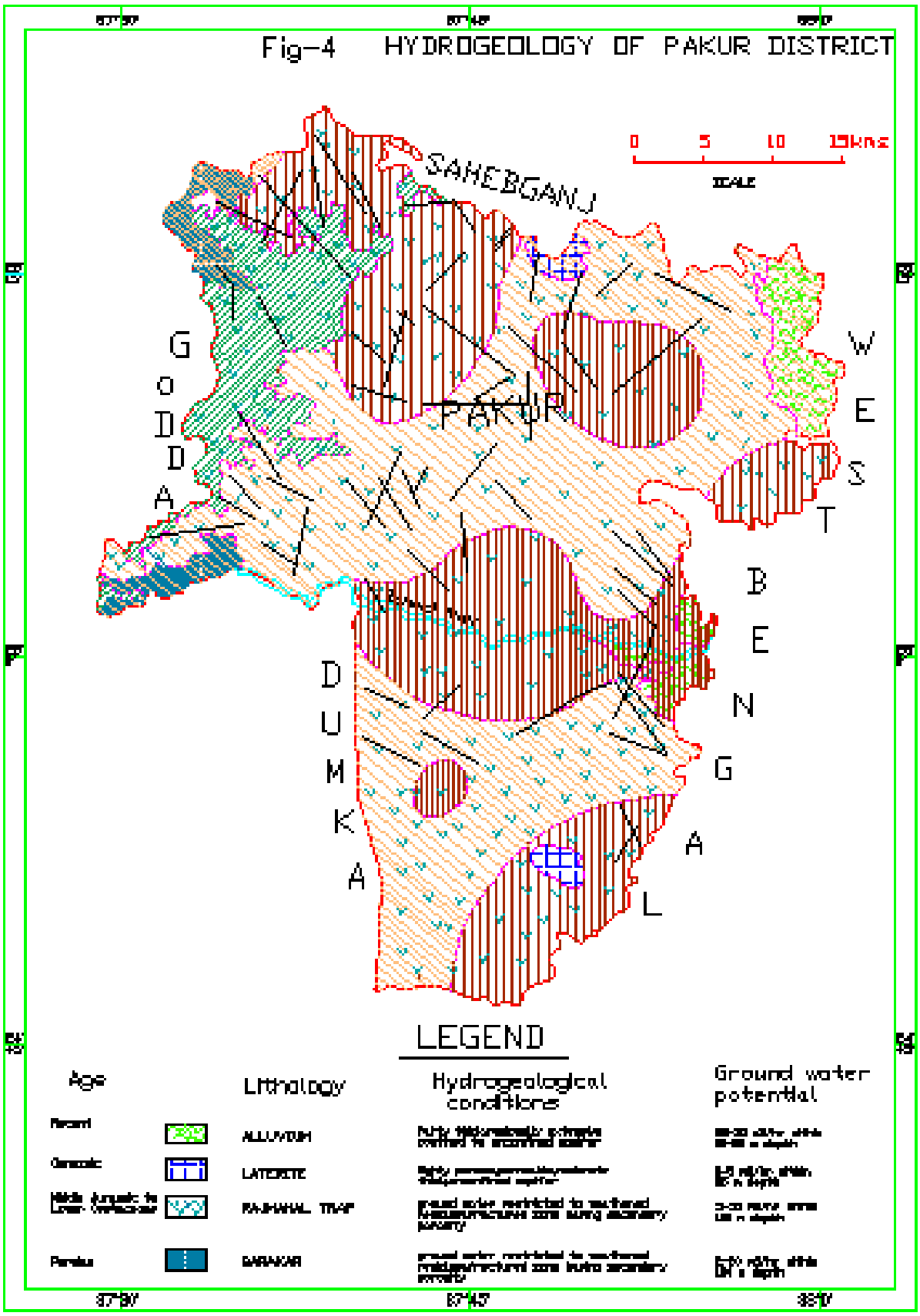
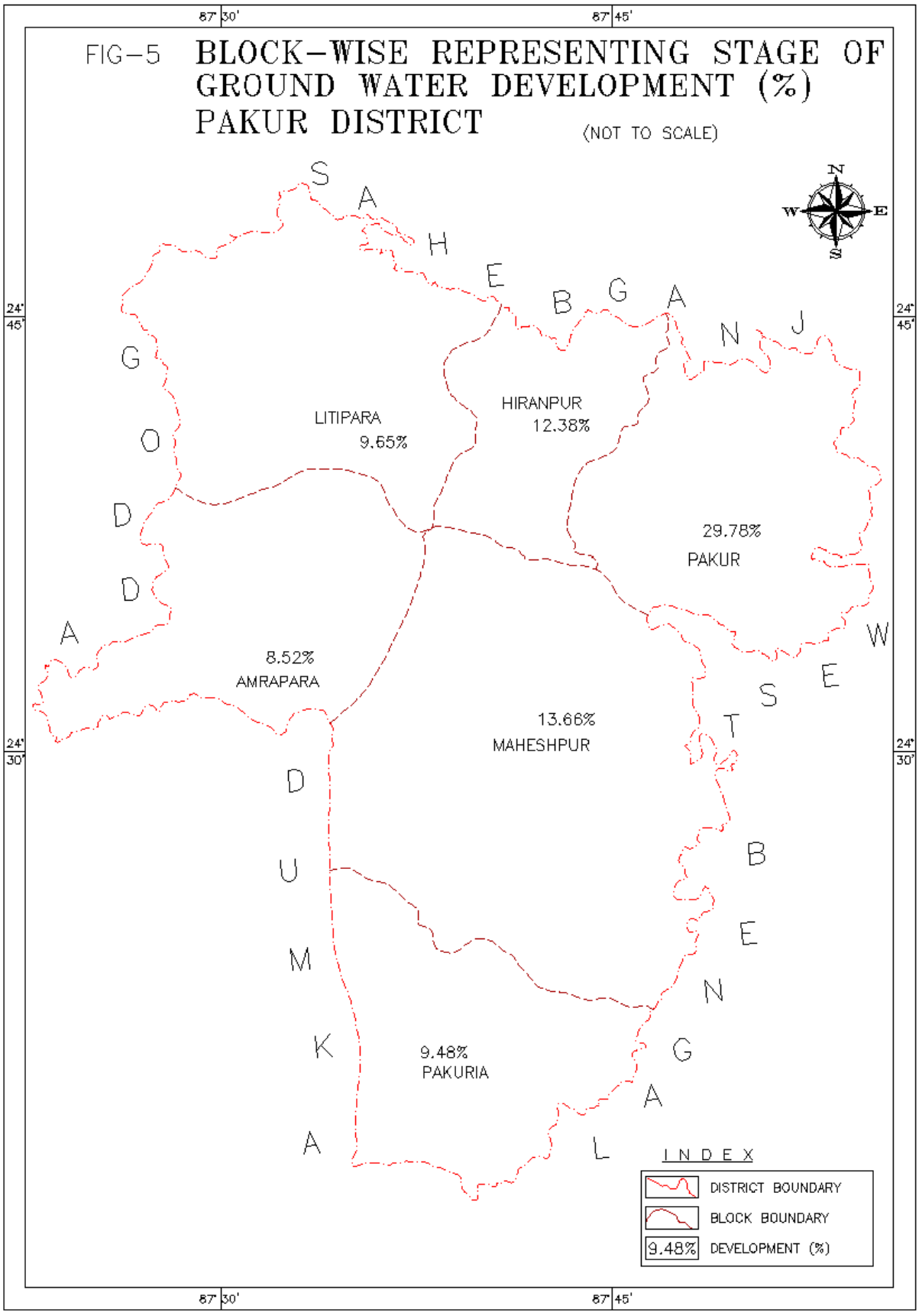


Fig-4 HYDROGEOLOGY OF PAKUR DISTRICT
SAHEBGANJ
PAKUR
GODDA
WEST BENGAL
DUMKA
0 5 10 15kms
SCALE
LEGEND
Age
Lithology
Hydrogeological conditions
Ground water potential
Recent
ALLUVIUM
Quaternic
LATERITE
RAJMAHAL TRAP
Permian
BARAKAR


FIG–5 BLOCK–WISE REPRESENTING STAGE OF GROUND WATER DEVELOPMENT (%) PAKUR DISTRICT
(NOT TO SCALE)
87° 30'
87° 45'
24° 45'
24° 30'
N
S
W
E
SAHEBGANJ
GODDA
DUMKA
LITIPARA
9.65%
HIRANPUR
12.38%
29.78%
PAKUR
8.52%
AMRAPARA
13.66%
MAHESHPUR
9.48%
PAKURIA
INDEX
DISTRICT BOUNDARY
BLOCK BOUNDARY
9.48% DEVELOPMENT (%)