GOVT. OF INDIA
MINISTRY OF WATER RESOURCES
CENTRAL GROUND WATER BOARD

GROUND WATER BROCHURE
JASHPUR DISTRICT, CHHATTISGARH
2012-13

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GROUND WATER BROCHURE OF JASHPUR DISTRICT

DISTRICT AT A GLANCE

1.	**GENERAL INFORMATION**	
	i) Geographical area	6701 Km^2
	ii) Administrative Divisions (As on 2005)	
	a. Number of Tehsil/ Block	8
	b. Number of gram panchayats	414
	c. Number of villages	764
	iii) Population as per 2011 Census	852043
	iv) Average Annual Rainfall	1487 mm
2.	**GEOMORPHOLOGY**	
	i) Major Physiographic Units	The northern hilly areas can be categorised as structural hills and the relatively plain areas in the southern part can be categorised as pediplains.
	ii) Major Drainages	Mahanadi basin occupies nearly 71% area in the central part, Bramhani basin covers 21% area in the eastern part and Lower Ganges basin spreads over an area of 8% in the northern part of the district.
3.	**LAND USE As on 2005**	
	i) Forest Area	
	a. Reserved forest:	1147 Km^2
	b. Protected forest:	588 Km^2
	ii) Net Area Sown	2520 Km^2
	iii) Double Crop Area	150 Km^2
4.	**MAJOR SOIL TYPES**	Red and yellow soils (Ultisols) and red soils (Alfisols) developed over the granitoids occupy most part of the district Black soils (Inceptisols) have formed over the deccan traps in small patches
5.	**AREA UNDER PRINCIPAL CROPS**	Paddy: 82% of sown area Non Paddy :18% of sown area
6.	**IRRIGATION BY DIFFERENT SOURCES (2010)**	
	i) Dugwells	19.60 Km^2 (no. of dugwells: 12774)
	ii) Tubewells/Borewells	2 Km^2

	(no. of borewells: 203)
iii) Canals	41.54 Km^2
iv) Ponds	1.52 Km^2
	(no. of ponds: 274)
v) Other sources	23.06 Km^2
vii) Gross Irrigated Area	85.33 Km^2

7. NUMBER OF GROUND WATER MONITORING WELLS OF CGWB (As on 31.3.2012)

i) No of Dugwells	34
ii) No of Piezometers	11

8. PREDOMINANT GEOLOGICAL FORMATIONS

Most part of the District is covered by granitiods. A small portion in the northwestern part is occupied by the Deccan Traps and Lametas. Almost the entire area has a thick laterite cover.

9. HYDROGEOLOGY

i) Major Water Bearing Formation	Weathered and fractured granitoids
ii) Pre-monsoon Depth to Water Level During 2012 (mbgl)	Pre-monsoon water levels mostly remain within 5 to 10 m bgl. There are some patches of shallow (less than 3m bgl) water table conditions, which are observed in the inter-montanne valleys.
iii) Post-monsoon Depth to Water Level During 2012 (mbgl)	During post monsoon periods, water levels remain within 0 to 3 m bgl. One case of auto flow condition was encountered in Ghughri near Bagicha.
iv) Long Term Water Level Trend in 10 yrs (2003-2012) in m/yr	In general, decadal water level trends do not show any significant falling trends. Only one well in Pathalgaon urban area shows falling trend in pre monsoon water levels.

10. GROUND WATER EXPLORATION BY CGWB (As on 31.3.2012)

i) No of Wells Drilled (EW, OW, PZ, Total)	EW(Exploratory Wells): 54 OW (Observation Wells): 5 PZ (Piezometers): 5 Total: 64
ii) Depth Range	15-152 m
iii) Discharge	0.5-7.7 litres per second (lps)
v) Transmissivity (m^2/day)	2 to 30 (m^2/day)

11. GROUND WATER QUALITY

i) Presence of chemical constituents more	Nearly 10% of the samples

than permissible limit (e.g. EC, F, As, Fe)	have NO_3 content more than the desirable limit. In one sample (Chharia) F was found to be marginally beyond permissible limit.
ii) Type of Water	Mostly it is Ca-HCO_3 type

12. DYNAMIC GROUND WATER RESOURCES (2009)

i) Annual Available Ground Water Resources	53675.37 ha m
ii) Net Annual Ground Water Draft	17009.71 ha m
iii) Projected Demands for Domestic and Industrial Uses upto 2025	2113.95ha m
iv) Stage of Ground Water Development	33.37%

13. AWARENESS AND TRAINING ACTIVITY

Mass Awareness Programmes Organised

Date: 25th March 2004

Place: Kunkuri

Water Management Training Programmes Organised

Date: 29th March 2004

Place: Jashpur Nagar

14. EFFORTS OF ARTIFICIAL RECHARGE & RAIN WATER HARVESTING

i) Projects Completed by CGWB (No & Amount spent)	Nil
ii) Projects Under Technical Guidance of CGWB (Numbers)	Nil

15. GROUND WATER CONTROL AND REGULATION

i) Number of OE Blocks	Nil
ii) Number of Critical Blocks	Nil
iii) Number of Blocks Notified	Nil

16. MAJOR GROUND WATER PROBLEMS AND ISSUES

Nil

GROUND WATER BROCHURE OF JASHPUR DISTRICT, CHHATTISGARH

BY

Dr. O.N.Tiwari, Scientist 'D

1.0 General

Jashpur district is situated in the northeastern corner of Chhattisgarh **(Fig.1).** On NWW and Southern part it is bordered by Surguja and Raigarh Districts of Chhattisgarh. On the northeastern and southeastern part it has common boundaries with Jharkhand and Orissa respectively. It covers an area of 6710 Km^2.

There are 4 Tehsils, 8 blocks, 414 gram panchayats and 764 villages in the district. Total population in the district is 852043 (census report 2011) of which, more than 95% accounts for rural population. There are only 2 urban centres viz. Jashpurnagar (population 20239) and Pathalgaon (population 13956). People belonging to scheduled castes and scheduled tribes together constitute nearly 70% of the entire population.

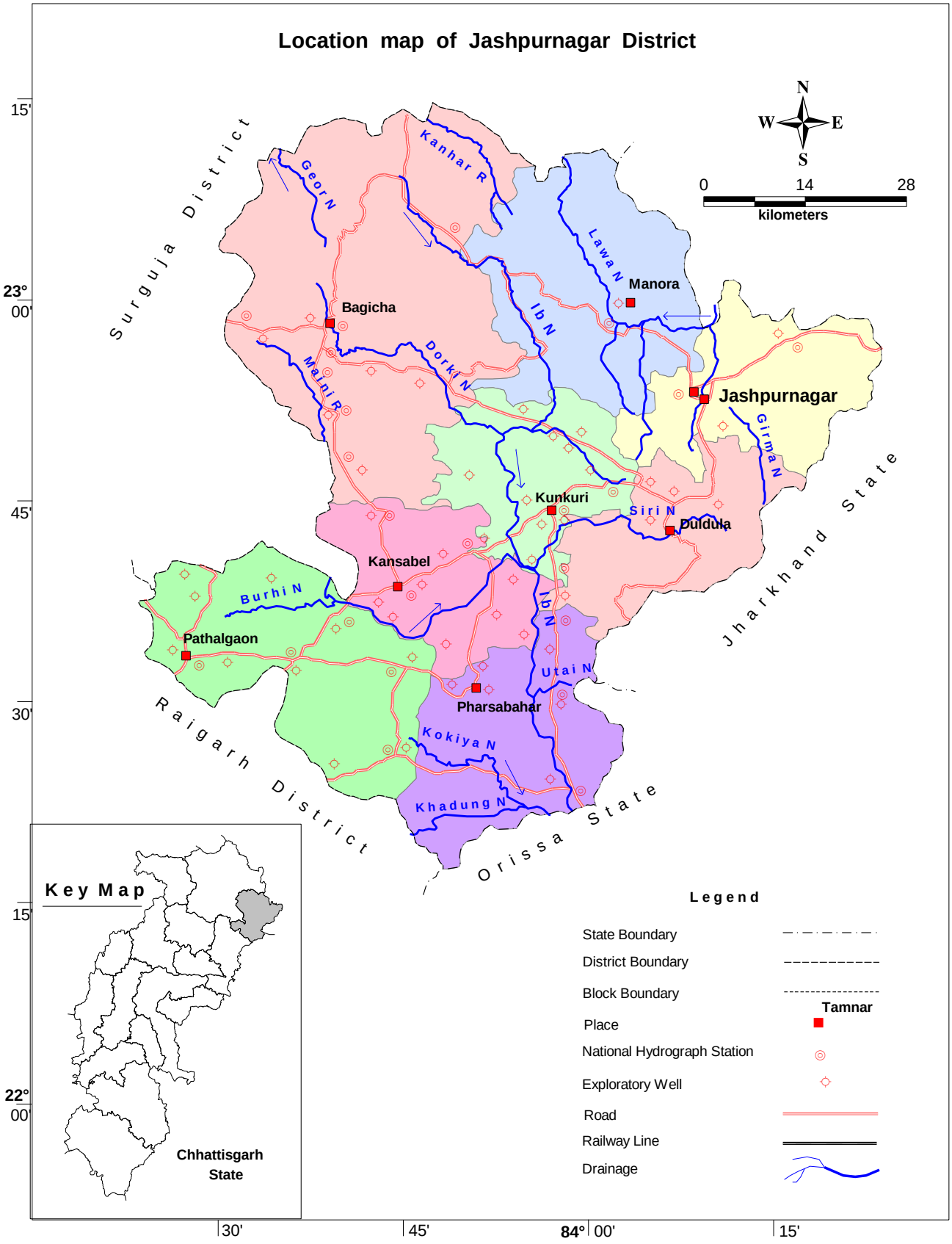
Out of the total geographical area of 6710 Km^2, 898 Km^2 area is covered by reserve forests. Net sown area is only 2520.16 Km^2, Double cropped area is a mere 149.49 Km^2. Agriculture is mostly rainfed. Principal crop taken in the study area is paddy. Rabi crop wherever taken is also mostly paddy. Besides paddy, a few legumes and oilseeds are also cultivated but in negligible area. The most important oil seed taken in the hilly area is 'sarguja'. Red and yellow soils (Ultisols) and red soils (Alfisols) developed over the granitoids occupy most part of the district. Black soils (Inceptisols) are formed over the Deccan traps in small patches

Jashpur district forms a part of the northern hilly region. The district is characterised by a highly undulating hilly terrain. Elevation in the area ranges from 300 to 1100 m amsl. Average slope is towards southeast. The Deccan traps occurring in the northwestern part form a well-defined plateau. The northern hilly areas can be categorised as structural hills and the relatively plain areas in the southern part can be categorised as pediplains.

Entire district can be divided into 3 major river basins: Mahanadi basin occupies nearly 71% area in the central part, Bramhani basin covers 21% area in the eastern part and Lower Ganges basin covers an area of 8% in the northern part of the district.

Major rivers in the Mahanadi basin are Ib and its tributaries such as Dorki, Maini, Kokiya, Utai, Khadung, Burhi etc. In the eastern part, rivers named Girma and Lava Nadi

Fig. - 1


Location map of Jashpurnagar District
N
W
E
S
0
14
28
kilometers
Surguja District
Jharkhand State
Raigarh District
Orissa State
Kanhar R
Geor N
Lawa N
Manora
Ib N
Bagicha
Dorki N
Maini R
Jashpurnagar
Girma N
Kunkuri
Siri N
Duldula
Kansabel
Burhi N
Pathalgaon
Ib N
Utai N
Pharsabahar
Kokiya N
Khadung N
Key Map
Chhattisgarh State
Legend
State Boundary
District Boundary
Block Boundary
Tamnar
Place
National Hydrograph Station
Exploratory Well
Road
Railway Line
Drainage
15'
23° 00'
45'
30'
15'
22° 00'
30'
45'
84° 00'
15'

flow in the Brahmani basin. Lower Ganges part is mainly drained by Geor and Kanhar rivers. Drainage pattern is dendritic and is highly irregular, which is reflective of the topography. Irregular topography results in huge base flow through the streams and less recharge.

2.0 Geology and Hydrogeology

Nearly 90% of the area in the district is covered with granitoids, which include granite gneiss, chlorite-biotite gneiss, muscovite granite, granodiorite etc. Remaining area is occupied by Deccan Traps and Lametas. The entire has a thick carapace of laterite. Thickness of laterite cover varies from a few metres to more than 30m. at several places. Broadly the area can be divided into 4 hydro-stratigraphic units viz. Laterite, Granitoids, Deccan Traps and Lametas.

Laterites make the phreatic aquifer. Dug wells in the area covered by laterites are taped by construction of dug wells. Laterite is *in-situ* in nature and gradually grades to the bedrock. Specific capacities of the dug wells (tapping laterites) tested ranged from 0.005 to 0.1 m^2/min. Granitoids make poor aquifers. Fractures in granite are rare and are highly irregular in nature. Transmissivity of fractured granite varies from 2 to 30 m^2/day.

There is a no. of springs in the district especially in the Jhimki reserve forest area and around the Deccan plateau in the northern part. Discharge of the spring is low and in a lot of cases they are diffused. All the springs encountered have topographic control.

Out of 54 bore wells constructed by CGWB in the granitic terrain, 34 are either dry or has nominal (less than 1 lps) drill time discharge. Potential fractures are rare and wherever present are mostly within 100m bgl. Only 2 fracture zones were encountered beyond 100m. Ground Water Potentials of the Deccan Traps and Lametas have not been explored properly.

Pre-monsoon water levels mostly remain within 5 to 10 m bgl (Fig.2). There are some patches of shallow (less than 3m bgl) water table conditions, which were observed in the inter-montanne valleys. During post monsoon periods, water levels remain within 0 to 3 m bgl (Fig.3). One case of auto flow condition was encountered in Ghughri near Bagicha. Water table fluctuations range from 0 to 15m and lies mostly within 3 to 5m. In general, decadal water level trends do not show significant falling trends. Only one well in Pathalgaon urban area shows falling trend in pre monsoon water levels.

Fig. - 2

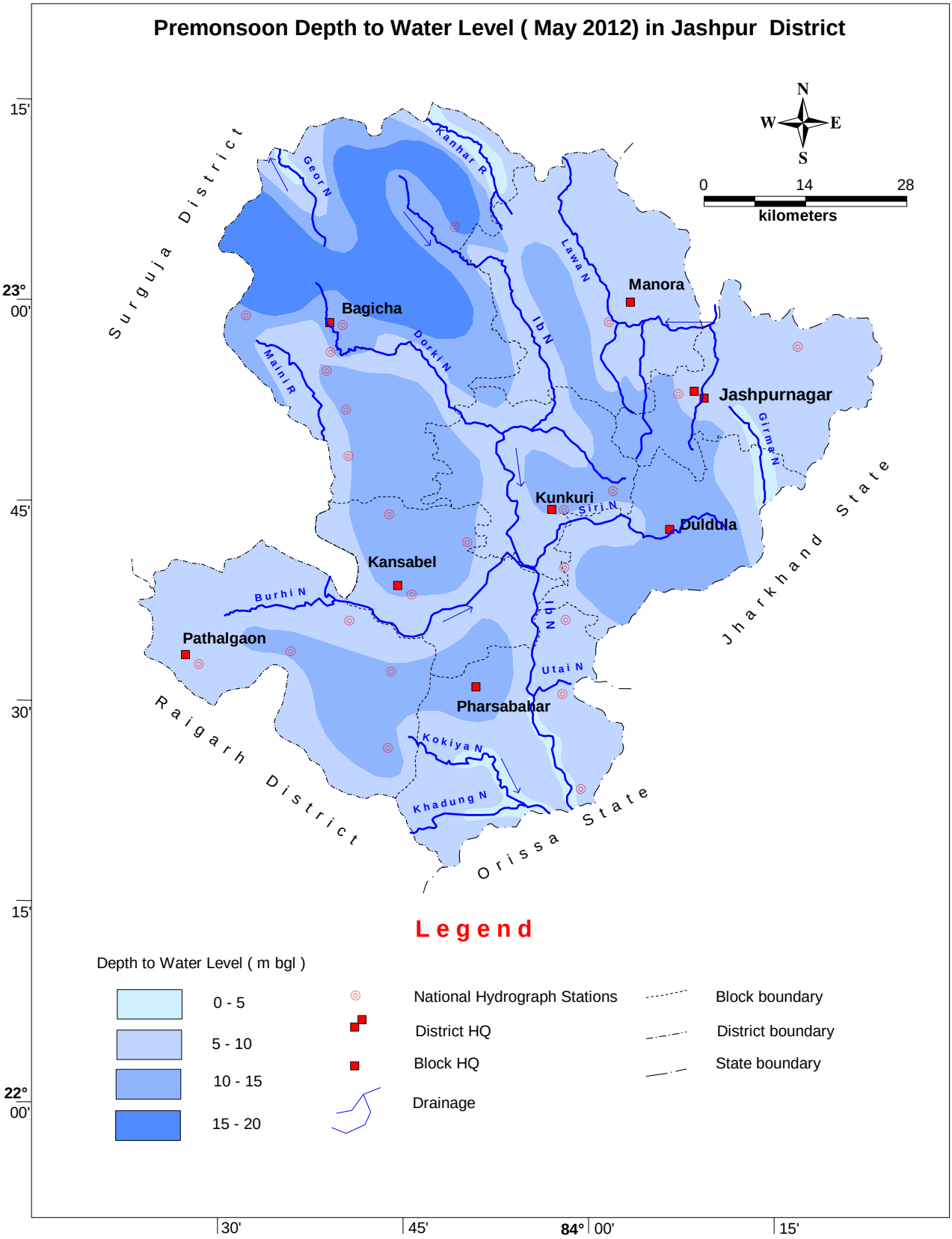
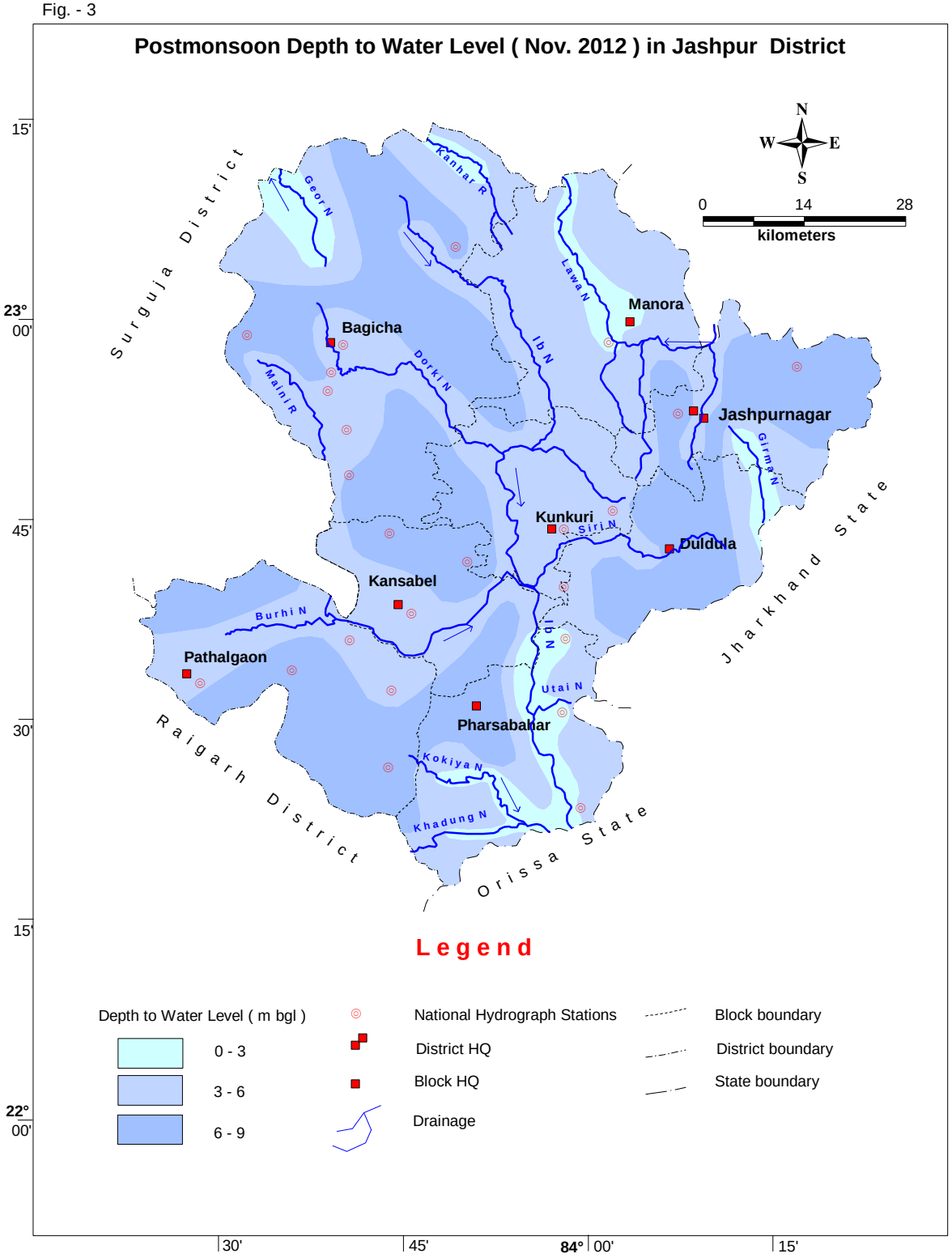

Premonsoon Depth to Water Level (May 2012) in Jashpur District
N
W
E
S
0
14
28
kilometers
Surguja District
Jharkhand State
Raigarh District
Orissa State
Kanhar R
Geor N
Lawa N
Ib N
Dorki N
Maini R
Girma N
Siri N
Burhi N
Utai N
Kokiya N
Khadung N
Bagicha
Manora
Jashpurnagar
Kunkuri
Duldula
Kansabel
Pathalgaon
Pharsabahar
23° 00'
45'
30'
15'
22° 00'
30'
45'
84° 00'
15'
Legend
Depth to Water Level (m bgl)
0 - 5
5 - 10
10 - 15
15 - 20
National Hydrograph Stations
District HQ
Block HQ
Drainage
Block boundary
District boundary
State boundary

Fig. - 3


Postmonsoon Depth to Water Level (Nov. 2012) in Jashpur District
N
W
E
S
0
14
28
kilometers
Surguja District
Jharkhand State
Raigarh District
Orissa State
Bagicha
Manora
Jashpurnagar
Kunkuri
Duldula
Kansabel
Pathalgaon
Pharsabahar
Kanhar R
Geor N
Lawa N
Ib N
Dorki N
Maini R
Girmg N
Siri N
Burhi N
Utai N
Kokiya N
Khadung N
15'
23° 00'
45'
30'
15'
22° 00'
30'
45'
84° 00'
15'
Legend
Depth to Water Level (m bgl)
0 - 3
3 - 6
6 - 9
National Hydrograph Stations
District HQ
Block HQ
Drainage
Block boundary
District boundary
State boundary

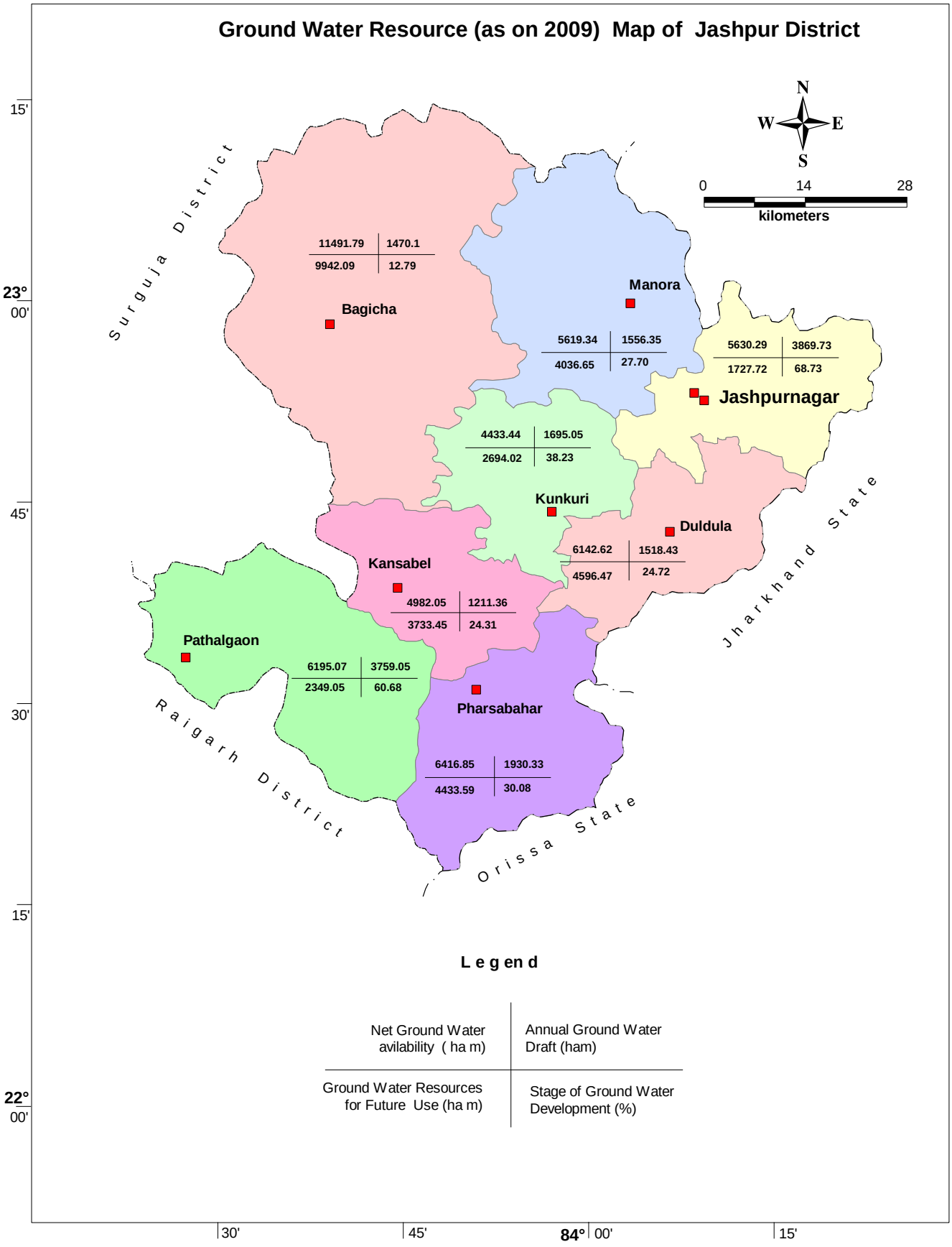
3.0 Ground Water Resources

Ground water resources were estimated by CGWB and State Ground Water Department following the recommendations of GEC'97 in 2009. The categorisation was made based on the stages of development and decadal water level trends. All the blocks in the district are classified as 'safe'. There is no 'semi-critical', 'critical' or 'over-exploited' blocks. A brief account of block wise ground water resources is given below and presented in fig 4.

Ground water resources of Jashpur district (As on 2009)

Assessment Unit / Block	Command / Non Command	Total Annual echarge in Ham	Net Ground Water Availability in Ham	Existing Gross Ground Water Draft for Irrigation in Ham	Existing Gross Ground Water Draft for Domestic & Industrial Water Supply in Ham	Existing Gross Ground Water Draft for All Uses in Ham	Allocation For Domestic & Industrial Water Supply in Ham	Net Ground Water Availability for Future Irrigation Development in Ham	Stage of Ground Water Development in %
Bagicha	Command	538.58	511.65	151.5	9.39	160.89	11.5	348.65	31.45
	Non Command	11558.04	10980.14	964.7	344.51	1309.21	422	9593.44	11.92
	Block Total	12096.62	11491.79	1116.2	353.9	1470.1	433.5	9942.09	12.79
Duldula	Command	98.95	94	35	0.94	35.94	1.18	57.82	38.23
	Non Command	6366.97	6048.62	1373.5	108.99	1482.49	136.47	4538.65	24.51
	Block Total	6465.92	6142.62	1408.5	109.93	1518.43	137.65	4596.47	24.72
Jashpur	Command	90.83	81.75	56.75	0.83	57.58	1.02	23.98	70.43
	Non Command	5840.57	5548.54	3667	145.15	3812.15	177.8	1703.74	68.71
	Block Total	5931.4	5630.29	3723.75	145.98	3869.73	178.82	1727.72	68.73
Kansabel	Command	194.14	174.73	60.5	2.77	63.27	3.39	110.84	36.21
	Non Command	5060.34	4807.32	985.25	162.84	1148.09	199.46	3622.61	23.88
	Block Total	5254.48	4982.05	1045.75	165.61	1211.36	202.85	3733.45	24.31
Kunkuri	Command	485.24	460.98	99.75	10.88	110.63	13.32	347.91	24
	Non Command	4181.54	3972.46	1398	186.42	1584.42	228.35	2346.11	39.89
	Block Total	4666.78	4433.44	1497.75	197.3	1695.05	241.67	2694.02	38.23
Manora	Command	91.81	87.22	12.357143	1.56	13.917143	1.92	72.942857	15.96
	Non Command	5892.65	5598.02	1414.7524	126.99	1541.7424	155.56	4027.7076	27.54
	Block Total	5984.46	5685.24	1427.1095	128.55	1555.6595	157.48	4100.6505	27.36
Pathalgaon	Command	238.93	226.98	115.9	8.16	124.06	9.99	101.09	54.66
	Non Command	6282.2	5968.09	3256.4	378.59	3634.99	463.73	2247.96	60.91
	Block Total	6521.13	6195.07	3372.3	386.75	3759.05	473.72	2349.05	60.68
Tapkara	Command	161.43	153.36	49.7	3.23	52.93	3.96	99.7	34.51
	Non Command	6593.15	6263.49	1645.3	232.1	1877.4	284.3	4333.89	29.97
	Block Total	6754.58	6416.85	1695	235.33	1930.33	288.26	4433.59	30.08
DISTRICT TOTAL		**53675.37**	**50977.35**	**15286.36**	**1723.35**	**17009.71**	**2113.95**	**33577.04**	**33.37**

Fig. No.- 4


Ground Water Resource (as on 2009) Map of Jashpur District
N
W
E
S
0
14
28
kilometers
Surguja District
Jharkhand State
Raigarh District
Orissa State
Bagicha
11491.79
1470.1
9942.09
12.79
Manora
5619.34
1556.35
4036.65
27.70
Jashpurnagar
5630.29
3869.73
1727.72
68.73
Kunkuri
4433.44
1695.05
2694.02
38.23
Duldula
6142.62
1518.43
4596.47
24.72
Kansabel
4982.05
1211.36
3733.45
24.31
Pathalgaon
6195.07
3759.05
2349.05
60.68
Pharsabahar
6416.85
1930.33
4433.59
30.08
23° 00'
45'
30'
15'
22° 00'
30'
45'
84° 00'
15'
L e g en d
Net Ground Water avilability (ha m)
Annual Ground Water Draft (ham)
Ground Water Resources for Future Use (ha m)
Stage of Ground Water Development (%)

4.0 Ground Water Development

Ground water development is mostly through dug wells. Borewells are comparatively less popular. Thick laterite cover results in problems during drilling with DTH rigs. Shallow (mostly less than 5m) dug wells in the intermontane valleys known in the local language as ‘dadhi’ are popular abstraction structures. They are mostly used for small scale irrigation.

Optimum depth of bore wells should be 100m as potential fractures beyond 100m are extremely rare in this area. DTH rigs can be used for construction of wells in most part of the district. However, in the northeastern part (Jashpur Block), weathered thickness is very high, which causes problems during drilling with DTH rigs. Rotary rigs are suitable for these areas (Fig.6). For domestic purposes, large diameter dug wells should be preferred as they support higher storage of water.

Ground water potential of the Deccan Traps in the northwestern part has not been explored properly. Thickness of the trap varies from a few metres to nearly 25m. The infratrappeans (Lametas) are expected to be potential aquifers. However, combination rigs are required for well construction in these areas.

Stage of ground water development in the district is a little more than 33.37%. Bagicha (12.79%) and Kasabel (24.31%) have the lowest stages of development and Jahspur block (68.73%) has the highest stage of development. Stage of ground water development in the district has increased from 9.12% during 1998 to 18.63 % during 2004 & 33.37% in the year 2009. Other factors such as increase in the no. of abstraction structures, diesel pumps and electric pumps over the years also reveal that ground water development in the district is the almost the same as the whole Chhattisgarh state.

5.0 Ground Water Quality

Chemical analyses of ground water samples show that ground water is not much evolved. More than 90% of the samples are either Ca-HCO_3 type or mixed type. Chemical characteristics show that the ground water flow system in the area is characterised by short flow paths and low residence time.

Quality of ground water is suitable for all uses. In almost all the cases the parameters analysed were found to be within permissible limits. Nearly 10% of the

samples have NO_3 content more than the desirable limit, the cause of which can be attributed to the practices of disposing wastewater nearer to the abstraction structures. In one sample (Chharia) F was found to be marginally beyond permissible limit.

6. 0 Ground Water management strategy

Ground water yield potential in the district is limited and it is not possible to plan for irrigation using ground water in large scale.

The Deccan Traps and the Infratrappeans on the northwestern part of the district as mentioned earlier are not explored yet.

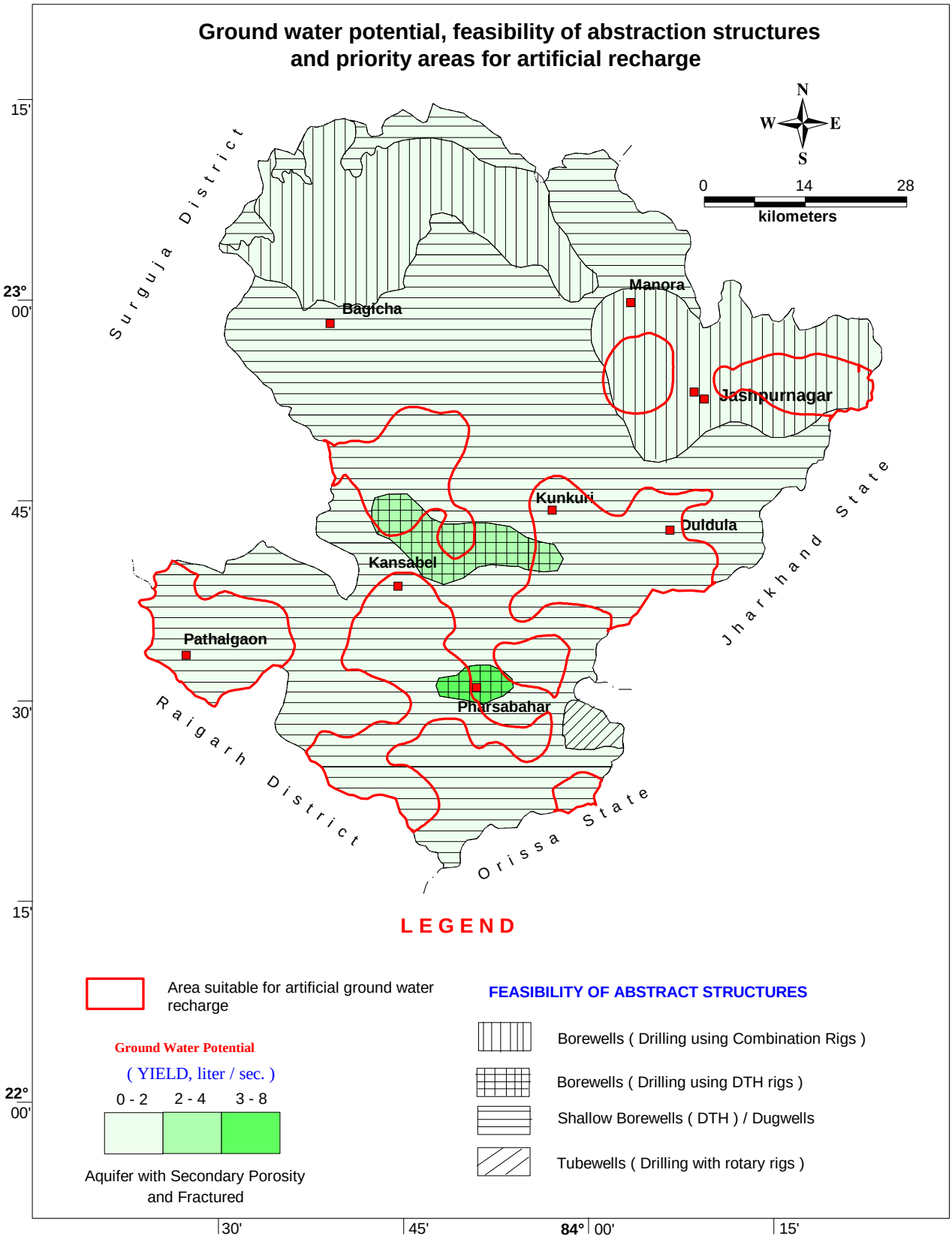
There are a number of springs in the district especially in the hilly areas. Chemical quality of these stream waters is excellent (EC= less than 100 μ mhos per cm). The spring water can be used for providing drinking water in these areas. However, the discharges of the springs are not that high that they can be used for irrigation purposes. There are several villages, where spring waters are being used for drinking purposes locally.

Some urban centres like Pathalgaon face acute shortage of ground water during summer period. Boreholes in this area are mostly unsuccessful. Alternative water sources are necessary to meet the water demands.

7.0 Water Conservation and artificial recharge

Average annual rainfall in the district varies from 1250mm to 1600mm. The district has a highly undulating topography. Drainage is intensely developed, which is indicative of low infiltration and high run off. Construction of Rain Water Harvesting structures such as gully plugs, gabion structures, check dams and stop dams would increase the storage and retention time in the nala, which would directly recharge the ground water around it. Water stored in these structures can be used for irrigation also. Further, the inter montanne valleys can be converted to surface water reservoirs with relatively small investments. They can act as effective rainwater harvesting structures. Areas (Fig.6) where depth to water table is more than three metres during the post monsoon period are the priority areas for artificial recharge.

Fig. - 6


Ground water potential, feasibility of abstraction structures and priority areas for artificial recharge
N
W
E
S
0
14
28
kilometers
Surguja District
Jharkhand State
Raigarh District
Orissa State
Bagicha
Manora
Jashpurnagar
Kunkuri
Duldula
Kansabel
Pathalgaon
Pharsabahar
15'
23° 00'
45'
30'
15'
22° 00'
30'
45'
84° 00'
15'
LEGEND
Area suitable for artificial ground water recharge
Ground Water Potential
(YIELD, liter / sec.)
0 - 2
2 - 4
3 - 8
Aquifer with Secondary Porosity and Fractured
FEASIBILITY OF ABSTRACT STRUCTURES
Borewells (Drilling using Combination Rigs)
Borewells (Drilling using DTH rigs)
Shallow Borewells (DTH) / Dugwells
Tubewells (Drilling with rotary rigs)

8.0 Awareness and training activities

Till date, one training programme on “rainwater harvesting and artificial recharge” and one mass awareness programme on “water conservation” have been conducted in Jashpur District (table2).

Table 2: Summary of Mass Awareness Programmes and Training Programmes organised in Jashpur District.

Sl. No.	Year	Date	Place	Programme
1	2003-04	25th March 2004	Kunkuri	Mass Awareness Programme on ground water conservation
2	2003-04	29th March 2004	Jashpurnagar	Training programme on rainwater harvesting and artificial recharge

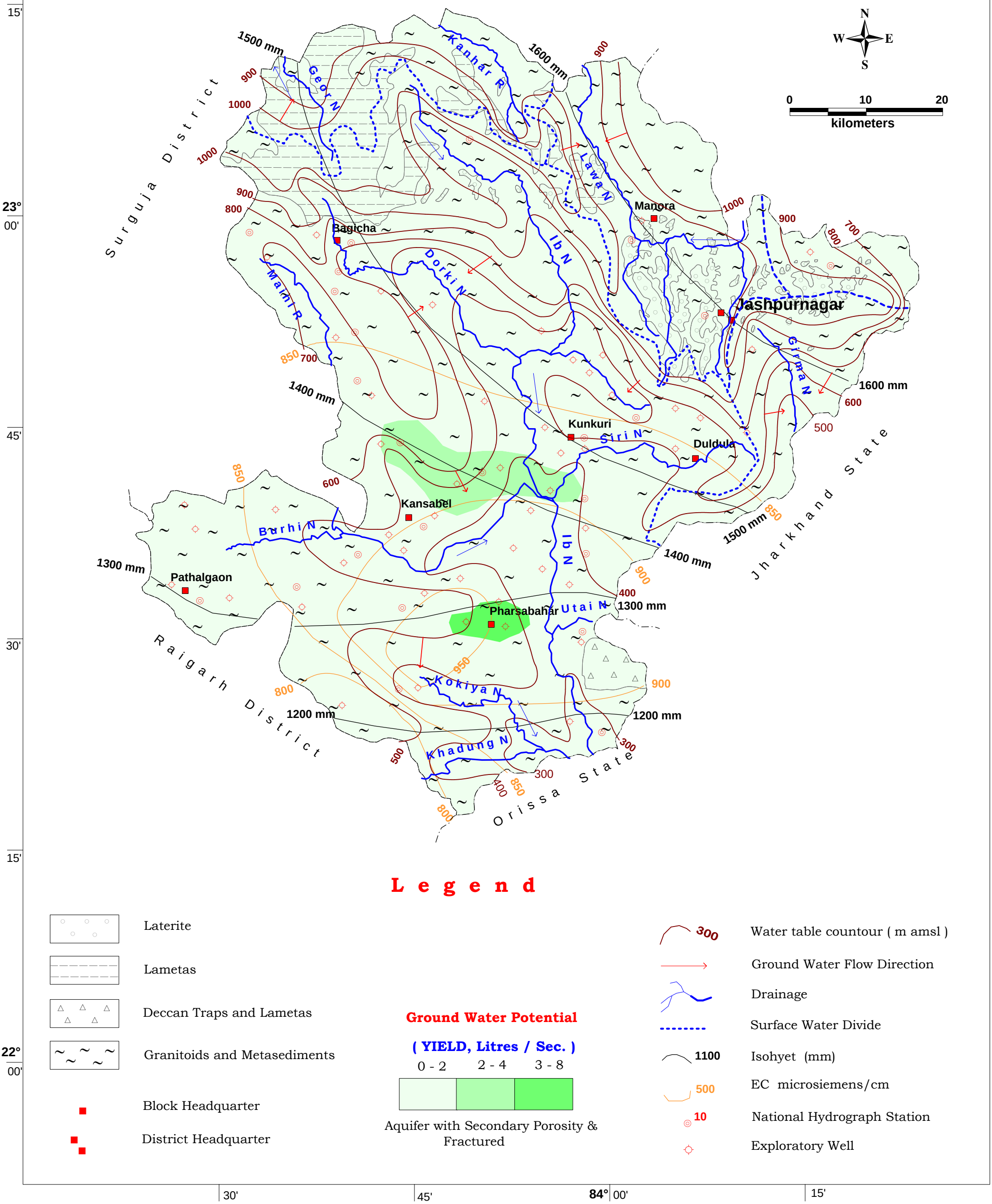
ACKNOWLEDGEMENT

The author is grateful to **Shri Sushil Gupta,** Chairman, Central Ground Water Board for giving this opportunity for preparation of the 'Ground Water Brochure of Dhamtari district, Chhattisgarh’. The author is thankful to **Shri K. C. Naik,** Regional Director, Central Ground Water Board, NCCR, Raipur for his guidance and constant encouragement for the preparation of this brochure. The author is also thankful to **Shri S. K. Verma,** Sr. Hydrogeologist (Scientist 'C') for his valuable comments and guidance. The help rendered by **Shri J.R.Verma** Scientist 'B’ in preparing the brochure is duly acknowledged. The author is also thankful to **Shri T.S.Chauhan,** Drafs man help in preparation of the map.

Dr O.N. Tiwari
Scientist ‘D’

Fig. No. - 5

HYDROGEOLOGICAL MAP OF JASHPURNAGAR DISTRICT



L e g e n d

- Laterite
- Lametas
- Deccan Traps and Lametas
- Granitoids and Metasediments
- Block Headquarter
- District Headquarter

Ground Water Potential

(YIELD, Litres / Sec.)

0 - 2 | 2 - 4 | 3 - 8

Aquifer with Secondary Porosity & Fractured

- Water table countour (m amsl)
- Ground Water Flow Direction
- Drainage
- Surface Water Divide
- Isohyet (mm)
- EC microsiemens/cm
- National Hydrograph Station
- Exploratory Well