Govt. of India

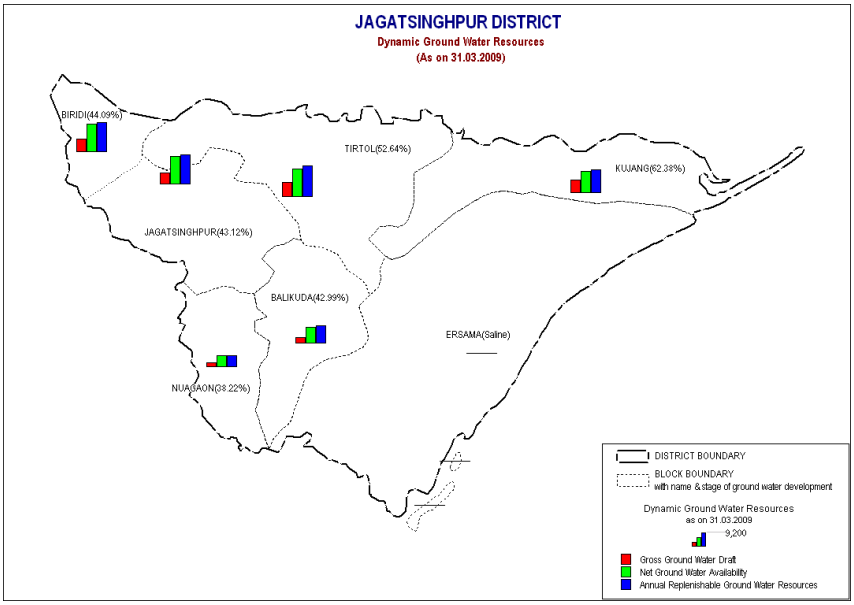
MINISTRY OF WATER RESOURCES

CENTRAL GROUND WATER BOARD

GROUND WATER INFORMATION BOOKLET

OF

JAGATSINGHPUR DISTRICT



South Eastern Region

Bhubaneswar

May , 2013

DISTRICT AT A GLANCE

Sl. No.	Items	Statistics
1	i. Geographical Area in sq km ii. Number of Blocks iii. Number of Panchayat iv. Number of Villages v. Population as on 2011 census vi. Average Annual Rainfall in mm	1668 8 194 1288 1,136,604 1435.9
2	GEOMORPHOLOGY 1. Major Physiographic Units 2. Major Drainages	 i. The saline marshy tract along the coast ii. The gently sloping alluvial plain Mahanadi, Devi
3	LAND USE (Ha) a. Forest Area b. Net Area Sown	 1100 94445
4	MAJOR SOIL TYPE	Alfisols , Aridisols and Entisols
5	AREA UNDER PRINCIPAL CROPS (as on 2009-05)	1. Autmn –4404 Ha 2. Winter – 91715 Ha 3. Summer – 1523 Ha
6	IRRIGATION BY DIFFERENT SOURCES (Areas and nos of structures) 1. Canals 2. Net Irrigated Area in Ha	 i. Major and Medium Irrigation Projects-81906 Ha ii. Minor Irrigation Project (Lift)-9620 (Kharif), 6020 Ha (Rabi) 66529Ha (Kharif) 31017Ha (Rabi)
7	NUMBER OF GROUND WATER MONITORING WELLS OF CGWB (As on 31-3-2007) 1. Nos of Dug Wells	 26 9

	2. Nos of Piezometers	
8	PREDOMINANT GEOLOGICAL FORMATIONS	Recent Alluviums belonging to Quarternary Fomation
9	HYDROGEOLOGY • Major Water Bearing Formations • Pre-Monsoon Depth to Water Level in 2011-07 • Post-Monsoon Depth to Water Level in 2011 - 07 • Long Term water level terend in 10 yrs (1996-2005) in m/yr	Recent Alluvium 0.57mbgl to 5.05mbgl 0.35mbgl to 4.82mbgl pre-monsoon shows rise of 0-2m in 37.5% of wells , and fall of 0-2m in 56.3% and 2-4m in 6.3%of the wells. post-monsoon shows rise of 0-2m in 57.1% of wells , fall of 0-2m in 42.9 % of the wells.
10	GROUND WATER EXPLORATION BY CGWB (AS ON 31-3-2007) No of wells drilled (EW,OW,Pz,SH,Total) Depth Range (m) Discharge (lps) Transmissivity (m^2/day)	 EW-6 PZ-9 +9 (under hydrology project) SL-3 **TOTAL**-27 299 - 612 21 - 70 388-9360
11	GROUND WATER QUALITY Presence of Chemical constituents more than permissible limits (e.g. EC,F,As,Fe) Type of Water	 EC, Iron and Fluoride values are higher in limited patches. Normal(P^H 7.62 to 8.44), except some patches where P^H exceeds 8.44
12	DYNAMIC GROUND WATER RESOURCES (2009 in Ham) 1. Annual Replenishable Ground water Resources	 45029

	2. Net Ground Water Draft 3. Projected Demand for domestic and industrial uses up to 2005 4. Stage of Ground Water Development	21332 2463 14.57%
13	AWARENESS AND TRAINING ACTIVITY 1. Mass Awareness Programmes organized Date Place No of Participants 3. Water Management Training Programmes Organised Date Place No of Participants	 Nil Nil
14	EFFORTS OF ARTIFICIAL RECHARGE AND RAIN WATER HARVESTING Projects compiled by CGWB (No and Amount spent) Projects under Technical guidance of CGWB (nos)	 Nil Nil
15	GROUND WATER CONTROL AND REGULATION No of Blocks No of Critical Blocks No of Blocks Notified	 Nil Nil Nil
16	MAJOR GROUND WATER PROBLEMS AND ISSUES	Ground water Pollution mainly Salinity hazard

1.0 INTRODUCTION

Jagatsinghpur district is one of the thickly populated coastal districts of Orissa in the eastern part underlain by alluvial deposits that resulted fertile agriculturural land. Agriculture is the mainstay of the people and economy of the district is mainly based on agricultural production. Besides the seasonal main occupation is fishing. The district has a total geographical area of 1668 sq km with a total population of 1057629. The density population of the district is 634 persons per sq km as per 2001 census against the state figure of 236 persons per sq km. The rural and urban populations are 953180 and 104449 respectively thereby constituting 90% of the total population in rural areas. The district is having one sub-division, which is divided into 8 community development blocks. The district as well as the subdivisional headquarter is located at Jagatsinghpur town. Jagatsinghpur district lies between East longitudes 86^{o} 03' and 86^{o}45' and North latitudes 19^{o}58' and 20^{o}23' falling in survey of India toposheet no. 73L in 1:2,50,000 scale. It is bounded in north by Kendrapara district, in the north and northwest by Cuttack district and Puri district in the south west and in the east by the Bay of Bengal (Plate-I).

The river Mahanadi flowing from west to east and forming the northern boundary of the district forms the main drainage system in the district. Besides the river Devi, a tributary to Kathajori and flowing north-northwest to south-southeast with a meandering course also forms a drainage system in the district.

The district enjoys irrigation facilities through major, medium, and lift irrigation projects. The major irrigation projects in the district are Taladanda and Machgaon canal irrigation system fed from the Mahanadi river at Jobra point near Cuttack. During kharif total irrigated area from all source is only 66529 hectares against average net sown area of 94445 hectares in 2004-05. During Ravi season total area irrigated is around 31017 hectares.

Systematic geological mapping has been completed by the officers of Geological Survey of India. In the years 1962-63, 1967-68 and 1968-69, Sr. I.V.R.Krishna Rao,

P.Nag, S.Ray Chowdhury, Sr. Geologists, from GSI had covered the area under hydrogeological surveys. This was followed by reappraisal / systematic hydrogeological surveys on 1:50,000 scale by the hydrogeologists of Central Ground Water Board. The district report on "Hydrogeological Frame Work and Ground Water Development Prospects in Jagatsinghpur district, Orissa" was prepared by Dr. K.S.Pandey, Scientist –D in February 1999.

2.0 RAINFALL AND CLIMATE

The south-west monsoon is the principal source of rainfall in the district. The district is characterized by a Topical monsoon climate having three distinct seasons in a year viz. winter, summer and rainy seasons. The Bay of Bengal, which forms the eastern boundary of the district, plays a vital role in controlling the climate of the district. The Normal rainfall of the district is 1501.3 mm. The annual average rainfall in last seven years is 1436 mm. About 75% of the total rainfall occurs during the period from June to September. In the period between April and May 3 to 4 cyclonic rains generally occur in the district that causes a drop in the temperature. The temperature varies from 15 to 37^{o}C. The relative humidity varies from 74 to 86 percent during the year.

3.0 GEOMORPHOLOGY AND SOIL TYPES

Physiographically the district can broadly divided into two distinct units, viz.

i. The saline marshy tract along the coast

ii. The very gently sloping plain

The saline marshy tract forms a long and narrow strip along the coast. The width of this tract varies from 3 to 15 km and is intersected by tidal streams and shrubby vegetation. Sand dunes of varied relief extend continuously for kilometers parallel to the coast. These sand dunes usually forming 5 to 6 chains are gently sloping on the bay side and steeply sloping on the inland side, due to their Aeolian origin. The gently sloping alluvial plain occurs to the west of the saline marshy tract and forms the most fertile part of the district. The general slope of this tract is towards east and southeast and varies from 0.50 to 1.60 m/km.

The distribution of different soil types in the district depends much on its physiographic and lithologic variations. Based on the physical and chemical characteristics, mode of origin and occurrence, soils of the district may be classified into three groups namely Alfisols, Aridisols and Entisols.

i. Alfisols: This includes deltaic alluvial soils and this type of soils occupies nearly 90% of the entire district area. The deltaic alluvial soils are generally deficient in phosphate (P_2O_5) and nitrogen (N). Both the total and available potassium are fairly adequate and P^H varies between 7.38 and 8.16.

ii. Aridisols: These are saline and saline alkali soils and occur in small pockets in the north eastern and south eastern corner of the district near coast. These are rich in calcium, magnesium and also consist of half decomposed organic matter.

iii. Entisols: This includes coastal sandy soils and occurs as narrow elongated ridge along the coast line. The soils are deficient in nitrogen, phosphoric acid and humus, but not in potash and lime.

4.0 GROUND WATER SCENARIO

In Jagatsinghpur district, the ground water occurs in the intergrannular pore spaces. Sand and gravel layers act as repository of ground water. Ground water occurs under unconfined condition in the shallow aquifer zone and perched water table condition within sand dunes underlain by clay beds. The ground water is also found under semi-confined condition in the deeper aquifer zones. The coastal tract held promise for large-scale development for ground water. But the coastal tract is beset quite often with salinity problems both in shallow as well as in deeper aquifers.

4.1 Aquifer System:

Based on the behavior and occurrence of ground water, the regional ground water flow system of the district has been described under two distinct categories viz. i.

Shallow aquifer zone to a depth of 50m and ii. Deeper aquifer zone between 50 and 300 m or more.

Shallow Aquifers: The area is traversed by innumerable nalas, mostly perennial, besides the main stream and presents a favorable ground water condition. The shallow aquifer occurring within a depth of 50m from land surface is consisting of a mixture of sand and clay with little gravel at places. The thickness of the saturated sediments varies from 10 to 35m. Ground water in these sediments usually occurs under water table condition, where as in coastal tract it occurs under perched water table condition underlain by clay beds in sand dunes area. Open wells and shallow tube wells are used to develop ground water from this aquifer mainly for domestic and minor purposes in the alluvial tracts. The open wells receive their recharge mainly from the local precipitation. Cumulatively, two zones are able to supply copious water for irrigation. There are many shallow tube wells for domestic use in the area particularly in the eastern part by tapping 3 to 6 m zone within 30 to 50 m depth.

Deeper Aquifers: The occurrence of fresh water bearing deeper aquifers is identified from available bore hole data down to a maximum depth of 612m. In the major part of the district the depth of the bore holes are restricted to 300m. The available information indicates that there is considerable variation in the granularity and thickness of the aquifers of the area. The aquifers occurring at the depth range of 50 to 300m bgl are grouped in this category. At greater depth, the aquifer zone becomes thicker but alteration of clay bands still continues except some areas where there are no clay bands even upto a depth of 200m bgl. The no of irrigational tube wells constructer by the PHED and RWSS, govt. of Orissa in coastal tract in Ersama block tapped the granular zones 40-60m thick within the depth ranges 135 to 165 m bgl and 210m bgl too. There are few nos of flowing wells with poor discharge.

The distribution of Saline/fresh water Aquifers: It is well informed that adequate thickness of fresh water aquifers occurs in the area at different depths and scope of ground water development by means of shallow and deep tube wells is very high. Saline zones in the east close to the coastline restrict the occurrence of fresh water

aquifer. The coastal saline tract is about 10 km wide in outfall areas of Mahanadi but expands to a maximum width of 45 km in Ersama block. In the coastal saline tract all the aquifers down to about 20 m below ground level contain brackish to saline water. Below 317 to 350 mbgl the aquifers are fresh and suitable for drinking and irrigation uses falling in Kujang and Ersama blocks. Only in parts of Kujang block shallow fresh water aquifers occurs within 20 mbgl on the top of the bore hole. Where as in the block of Tirtol, part of Balikuda, Naugaon blocks, fresh ground water aquifer occur above 80-120 m bgl and saline zones occur below this depth. The fresh water aquifers occur intensively in the remaining part of the area of the district.

The block wise description of fresh and saline water bearing granular zones is described as follows:

Kujang-Ersama Blocks: Saline water bearing granular zones occur at several depths close to the coast line extending right from Paradeepgarh to the extreme south eastern part of Ersama block in the district. In Mahanadi basin of Jagatsinghpur district large area falling in Kuujang and Ersama blocks, top granular zones down to a depth of 18 tom 350 m are saline to brackish in nature and fresh water granular zones occur below this depth. In parts of Kujang block, shallow fresh water granular zones do occur locally i.e. within sand dune area. The salinity of the water in the shallow granular zone in the low lying swampy coastal areas may be attributed to the tidal effects of the meandering nalas due to the poor drainage conditions. The fresh water granular zones in these areas are founds as under:

a) Shallow Aquifer zones: 16 to 28m bgl – average thickness decreases towards northwest

b) Deeper Aquifer Zones: 130 to 138 mbgl | cumulative thickness decreases towards northwest
317 to 350 mbgl

In these areas only deep tube wells are feasible to exploit fresh water below 317 m depth by tapping 30 to 40m of granular zones that may yield 13-50 lps for draw down of 6-12m. Shallow tube well is not suitable to sink in saline tract because after running well for more than 2 to 3 hours well may start yielding saline water in place of fresh water.

Tirtol-Balikuda-Naugaon Blocks: The fresh water granular zones in these blocks are as follows:

c) Shallow Aquifer zones: 10-16 mbgl
17-50 mbgl — average thickness of 35m decreases towards south

d) Deeper Aquifer Zones: 62-80 mbgl
97-106 mbgl
112-127 mbgl — cumulative thickness decreases towards northwest

The saline water zones vary between 80 to 97m and 106 to112m and beyond it extends upto 250m where as in Naugaon area where brackish water encountered in between 75 to 80m. Fresh water zones occur above it. At Bnalikuda fresh water aquifer thickens considerably.

Jagatsinghpur-Biridi-Raghunathpur Blocks: The entire area lying south of Mahanadi, particularly falling in Jagatsinghpur tahasil, Raghunathpur and Biridi blocks is suitable for intensive fresh ground water development by means of shallow and heavy duty tube wells. There is considerably variation in the granularity and thickness of the aquifers in the area. Drilling depths vary from 65 to 260m but the expected alluvial thickness towards south, southeast should be 350m or more.

The fresh water granular zones in these blocks are as follows:

a) Shallow Aquifer zones: 42-52 mbgl — average thickness of 10m decreases towards north

b) Deeper Aquifer Zones: 50-68 mbgl
105-120 mbgl
160-170 mbgl
179-192 mbgl — cumulative thickness 56m

It has to be emphasized that the fresh water granular zones do exist beyond 100m upto 300m below ground level in Jagatsinghpur Tahasil. The fresh water granular zones characterized by sand and gravel varying in sizes from 0.120to 4.0 mm can be developed after the shallower zones within 200m which are feasible to be exploited.

4.2 Hydraulic characteristics of Aquifers:

The alluvial deposit is a good repository of ground water. The thickness of sediments increases towards coast and is high as 600m in southeastern part of the district (Mahanadi delta region). The deep aquifers are confined by extensive clay beds.

The wide range of permeability and Storativity values indicates that the aquifer in the area is heterogeneous laterally. There is a sequence of alternating clayey and sandy layers with occasional presence of thin arenaceous materials. The wells tapping fresh water-bearing zones in coastal alluvial tracts yield copious quantities water with economic drawdown.

A deep tube well constructed in the alluvial sediments of this district by tapping 20 to 60m aquifer zones within a depth of 200m usually sustains yield of the order of 50 to 220 m^3/hr (16.5 to 73 lps) for draw down of the order of 3 to 14m. The tube wells in the shallow zones within a depth of 60 m yield 20 to 60 m^3/hr (6.6 to 19.8 lps) for draw down of the order of 3 to 13m.

The Transmissivity value varies from 1800 to 9360 m^2/day, whereas Storativity varies from 1.918×10^{-4} to 4.68×10^{-4}. The hydraulic conductivity values ranges from 44 to 253 m/day.

4.3 Behavior of Water Level

Depth to Water Level (Pre-monsoon and post-monsoon): The depth to water level measured from the National Hydrograph Stations situated in different blocks. The pre-monsoon 2011 water level data varies from 0.57mbgl at Jaipur to 5.05mbgl at Raghunathpur. The depth to water level map (pre-monsoon, 2011) is displayed in plate-II.

The post-monsoon depth to water level in 2011 varies from 0.35mbgl at Jaipur to 4.82mbgl at Raghunathpur. Plate-III represents depth to water level, post-monsoon 2011.

Seasonal Fluctuation: The seasonal water level fluctuation in 2011 varies from 0.22m to3.94m.

Long Term Water Level Trend in last 10 year in ground water monitoring wells:

The long term trend (10 years) in water level for the pre-monsoon shows rise of 0-2m in 37.5% of wells, and fall of 0-2m in 56.3% and 2-4m in 6.3%of the wells in the district.

The long-term trend (10 years) in water level for the post-monsoon shows rise of 0-2m in 57.1% of wells, fall of 0-2m in 42.9 % wells in the district.

4.4 Ground Water Exploration:

Exploratory drilling has been taken up by the Central Ground Water Board in Kendrapara district with the objective to delineate deeper fresh water bearing zones and their yield potentiality. Till March 2007, 27 nos of bore wells were drilled out of which 6 were exploratory wells, 9 Piezometers, 3 slim holes and 9 additional Piezometers were drilled under hydrology project in the district under normal Ground Water exploration programme. The depth range of these wells varies from 38m to 612.14m below ground level. The yield varies from 21 lps to 70 lps. The Transmissivity varies from 388 m^2/day to 9360 m^2/day.

Based on the above discussions, the Hydrogeological map of Jagatsinghpur district has been prepared and presented in Plate-IV.

4.5 Ground Water Resources:

The Ground Water resources of the district have been assessed adopting the methodology recommended by the ground water Estimation Committee (1997), constituted by Govt. of India. The task was jointly carried out by the central Ground Water Board and Ground Water Survey and Investigation, Department of Water Resources, Govt. of Orissa. The block wise computation of ground water resources in the district has been presented in the table 4.5. The annual replenishable ground water resources in the district are computed as 45029 Ham. The ground water draft for irrigation is through dug wells and shallow tube wells. So far ground water development in the district has been meager and all the blocks fall under the safe category. The stage of ground water development varies from 31.53 % to 67.26 in different blocks. The overall stage of ground water development of the district is 47.37%. The ground water budget of the district is presented in the plate - V.

Table 4.5: STAGE OF GROUND WATER DEVELOPMENT OF KENDRAPARA DISTRICT (BLOCK WISE) AS ON 31ST MARCH 2009

(In ha m)

Sl No	Assessment Unit/Block	Net annual Ground Water Availability	Existing Gross Ground Water Draft for irrigation	Existing Gross Ground Water Draft for domestic and industrial water supply	Existing Gross Ground Water Draft for all uses	Allocation for domestic and industrial requirement supply upto next 25 years	Net Ground Water availability for future irrigation development	Stage of Ground Water Development (%)
1	Balikuda	5052	1890	281.90	2172	360	2802	42.99
2	Biridi	6814	2813	190.28	3004	233	3767	44.09
3	Erasama•	0	0	0.00	0	0	0	0.00
4	Jagatsinghpur	8222	3167	376.97	3545	479	4575	43.12
5	Kujanga	6409	3583	415.16	3998	554	2272	62.38
6	Naugaon	2786	1752	122.27	1874	162	872	67.26
7	Raghunathpur	7340	2106	208.31	2314	239	4995	31.53
8	Tirtol	8406	4086	339.57	4425	436	3884	52.64
9		45029	19397	1935	21332	2463	23167	47.37

- FRESH WATER UNCONFINED AQUIFERS EITHER ABSENT OR AVAILABLE IN POCKETS

4.6 Ground Water Quality

The chemical quality of ground water of the district has been assessed on the basis of ground water samples collected during ground water monitoring in pre-monsoon period and ground water exploration. The range of different chemical constituents in shallow and deeper aquifers is as follows:

Table- 4.6: RANGE OF CHEMICAL CONSTITUENTS IN DIFERRENT AQUIFERS

Sl No	Constituents	Shallow Aquifer Range	Deeper Aquifer Range
1	P^H	7.62-10.20	6.6-8.23
2	Specific Conductance (µs/cm at 25^0 C)	196-5520	420-2166
3	Calcium (mg/litre)	18-74	18-84
4	Magnesium (mg/litre)	30-214	5-52
5	Sodium (mg/litre)	11-184	81-148
6	Chloride (mg/litre)	18-1131	50-640
7	Fluoride (mg/litre)	0.05-1.14	0.05
8	Nitrate (mg/litre)	0.1-86	0.22-1.0
9	Carbonate (mg/litre)	Nil	Nil
10	Iron (mg/litre)	0.1-4.45	0-3.96

The above table infers that the shallow ground water in the district is alkaline in nature with P^H value ranging from 7.62 to 8, though at places where water are more mineralized, the P^H value exceeds 8 . In over all, ground water is suitable for dinking purpose except in some local pockets. The high iron concentration mg/lit has been noted from Gopinathpur and Balikuda. The high nitrate concentration of 86 mg/lit has been found at Raghunathpur, which may be due to increasing population. High fluoride concentration has also been reported in some limited patches (Jaganathpur). It has been found out that the groundwater falls in low to medium sodium hazards and low to high salinity classes i.e. C_1S_1, C_2S_1, C_3S_3 and C_2S_2 class of U.S. salinity classification. In general the formation water is suited for most types of crops in majority of soils.

The deeper ground water is also alkaline in nature and no pollutants like nitrate and fluoride have been found beyond permissible limit, so suitable for domestic purpose except for iron in some patches. So far as U.S. salinity laboratory classification is concerned, the deeper ground water is also suited for most types of crops in majority of soils.

5.0 GROUND WATER MANAGEMENT STRATEGY

5.1 Ground water development:

Ground water development in the district is mainly through dug wells and tube wells, which include filter point, shallow, medium deep and deep tube wells. The ground water is mainly used for drinking and irrigation purposes. The stage of ground water development in the district is low. So far as 14.57% of its resources has been exploited. Hence a strategy for detailed ground water development s required. Based on hydrogeological conditions of the district feasibility of ground water structures and their yield prospects has been indicated in the table4.7: -

Table-4.7: FEASIBILITY OF GROUND WATER STRUCTURES

Type of Structure	Specifications of Structures	Yield prospects
Dug wells fitted with pumps	3-9m deep, dia- 0.7-1.8m	<3 lps
Filter point tube wells	10-40 deep, dia-102-153mm	5-10 lps
Shallow tube wells	Upto 50 m deep, dia-153/204mm	5-10 lps
Medium /Deep tube wells	Upto 200m and 400m deep in non-saline areas, maximum upto 200m deep in saline areas, 204/306mm dia	20-70 lps

The area feasible for different type of ground water structures are stated below:

Dug Wells: The dug wells are feasible only in fresh alluvial tracts, west of coastal saline tact. Centrifugal pumps of 1.5 to 2 H.P. may be installed and can be run 3 to 4 hrs daily. The distance between any two energized dug wells should be kept at least 150m to avoid interference.

Filter Point Wells: These structures are feasible in the Quarternary alluvium west of coastal saline tract (except Kujang and Erasama blocks). The thickness of granular zones tapped in these wells may be 10 to 20 m. Submersible pumps of 2 HP may be fitted and run for 6 to 8 hrs daily. The distance between any two energized dug wells should be kept at least 200m to avoid interference.

Shallow Tube Wells: The shallow tube wells are feasible in the alluvial tracts that may be constructed within 50m depths tapping at least 10 to 20m of granular zones. These tube wells are also feasible in coastal saline tract around Kujang and Paradeep within 26m depths tapping 10m granular zones. Submersible pumps of 5 H.P. may be installed and run for 6 hrs daily. The distance between any two structures should preferably at least 500m.

Medium Deep Tube Wells: The medium deep tube wells are feasible in the entire areas lying west of coastal saline tracts inclusive of patches around Erasama, Kujang-Paradeep and south eastern part around Machagaon with the capacity of 20-70 lps within a depth of 200m and 400m for agricultural development. The depth below 273m and 320 m fresh water bearing aquifers can be tapped in coastal areas whereas in other parts fresh water bearing aquifers may be tapped above 80m and 20m within 200m depths. Submersible or turbine pumps of 20 to 30 HP are suitable in coastal tracts, whereas in west of coastal tract submersible pumps of 10 to 20 HP is suitable. The distance between any two structures should preferably at least 1000m.

Deep Tube Wells: The deep tube wells having the depth range 200 to 400m are feasible in entire district except in few isolated patches to tap deeper fresh water bearing zones. These tube wells can run f or 10 hours in a day. The distance between any two structures should preferably at least 2000m.

5.2 Water Conservation and Artificial Recharge:

As the stage of ground water development is low and there is no report of large-scale depletion of water levels, at present the artificial recharge is not required for the district. However in the salt-water infested areas, which contribute around 50 % of the district, suitable rain water harvesting is necessary. The fresh water can be collected in large ponds, abandoned channels and Ox-Bow lakes and can be used for irrigation of Ravi crop. Creek irrigation is another innovative technique by which the fresh water of the tidal channels can be conserved and used for irrigational purpose during Ravi season. The fresh water of the river is allowed to enter the creek system by means of sluice system in full and/or new moon days and can be used for

irrigation. This is repeated as per the need and hence the creek system can work as a canal system.

6.0 GROUND WATER RELATED ISSUES AND PROBLEMS

Ground Water Problems: The ground water problems include water logged area, polluted area.

Water Logged Area: The water-logging phenomenon occurs in the command areas of the Taladanda and Machagaon canal system (in the northern parts of the district).

Polluted area: The chemical analysis results of water samples from pheratic zones indicate that pollutants like iron, nitrate, chloride, fluoride etc. occurs beyond permissible limit in some isolate local pockets.

7.0 AWARENESS AND TRAINING ACTIVITIES

Mass Awareness Programme and Water Management Training Programme by CGWB:

No such programme has been conducted in the district so far.

8.0 AREAS NOTIFIED BY CGWA

The stage of ground water development is well within safe category and thee is no overexploitation and major threat of Ground water pollution and Depletion. Hence no area has been notified by CGWA.

9.0 RECOMMENDATIONS

1. The development of ground water on large scale requires block as well as Gram panchayat wise large scale detailed hydrogeological maps.

2. Intensive hydrogeological surveys and exploratory drilling aided by remote sensing and geophysical investigation may be taken up jointly by the state and central govt. agencies.
3. As the entire district suffers from salinity problem it is essential to precisely identify the fresh water aquifers through borehole logging to avoid failure of tube wells in saline hazard tract. Cement sealing should also invariably be done precisely to seal off the saline aquifers.
4. Proper care should be taken to avoid overexploitation which may disturb the hydro chemical balance of fresh and saline water leading to contamination of saline water ingress
5. Clustering of tube wells should be avoided particularly near sea coast.
6. The scope of conjunctive use of surface and ground water in the irrigation command area of Taladanda and Machhagaon canal system should be studied and monitored periodically to minimize seasonal water logging problem.
7. Since vast tract of the district is saline infested and beyond the reach of canal network, suitable creek irrigation projects can be taken up to facilitate irrigation for the Ravi crop.
8. Water supply in the rural areas in the district has to be provided from shallow tube wells of 102mm (4") or 153 mm (6") dia located in the high land where ground water is free from water borne diseases.
9. The people participation is essential for large-scale development of ground water. Financial institutions and bankers should extent necessary co-operation to farmers. GRIDCO and rural electrification corporation should also take steps for energisation of wells to ensure optimum utilization of ground water resources.

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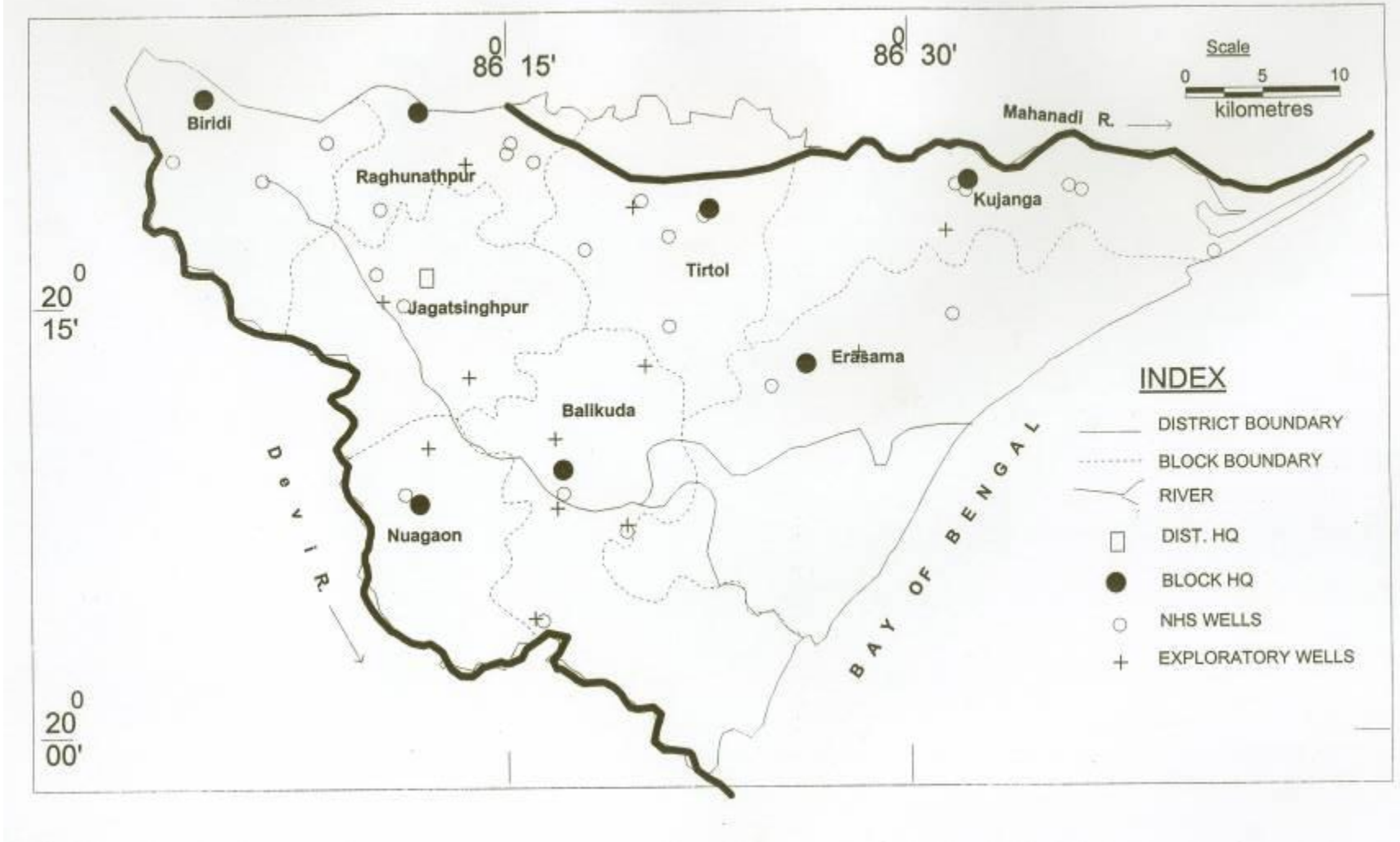
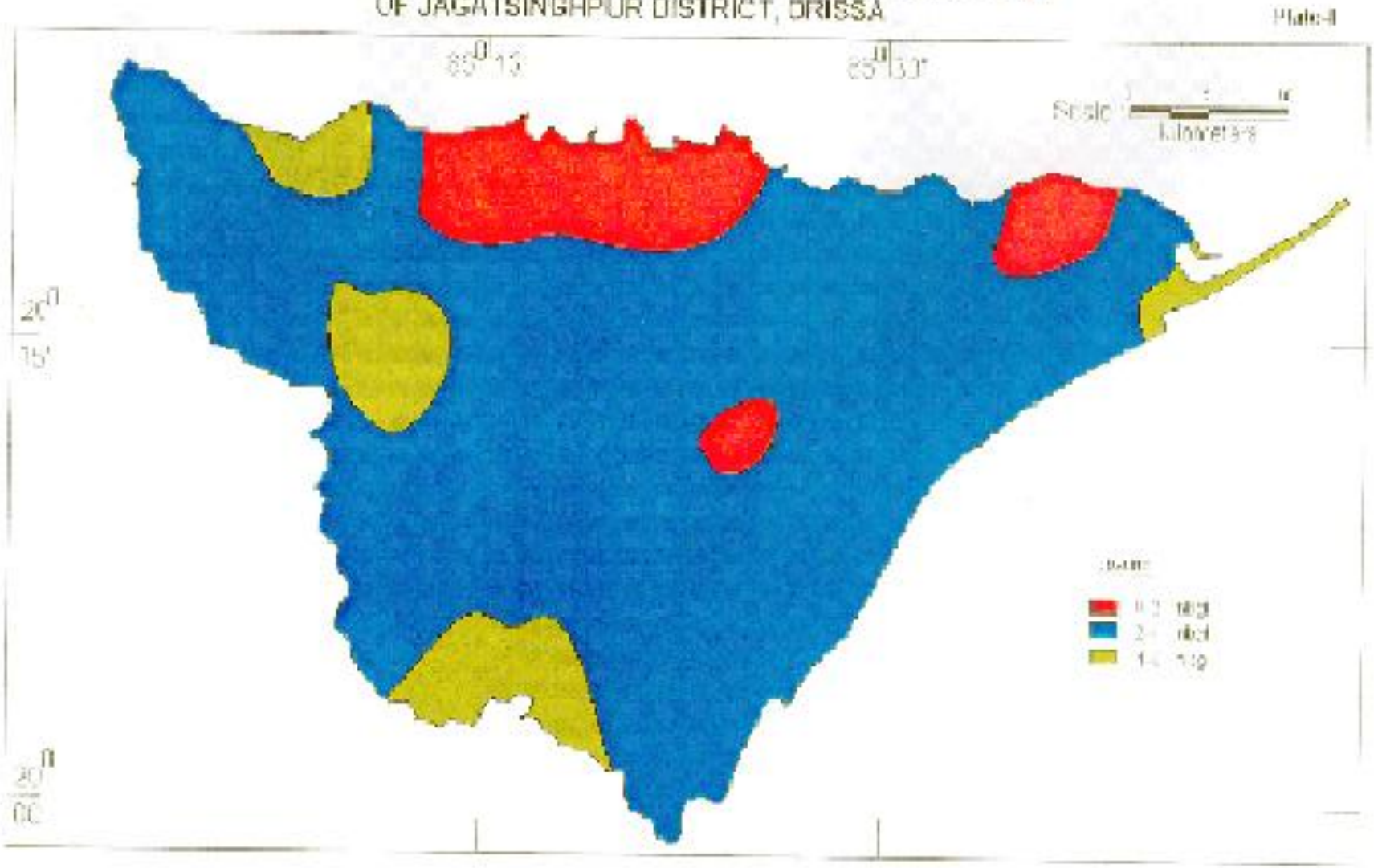
INDEX MAP OF JAGATSINGHPUR DISTRICT, ORISSA

Plate-I



PRE-MONSOON DEPTH TO WATER LEVEL MAP (APRIL **2011**)
OF JAGATSINGHPUR DISTRICT, ORISSA

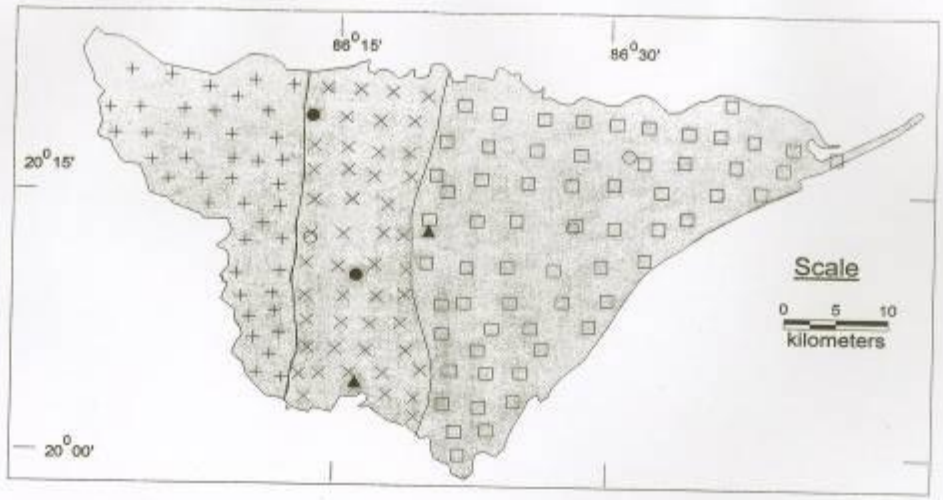


POST-MONSOON DEPTH TO WATER LEVEL MAP(NOVEMBER **2011**) OF JAGATSINGHPUR DISTRICT, ORISSA

Plate- III

HYDROGEOLOGICAL MAP OF JAGATSINGHPUR DISTRICT, ORISSA

Plate-IV

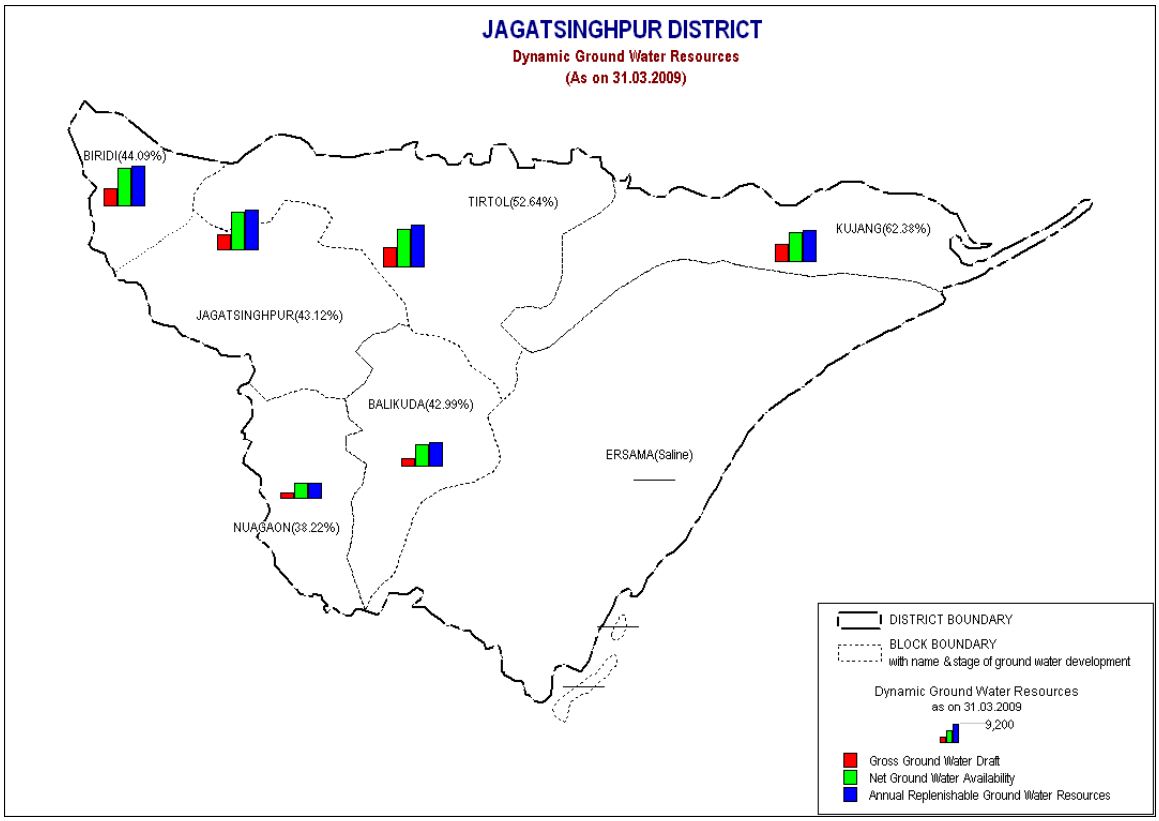


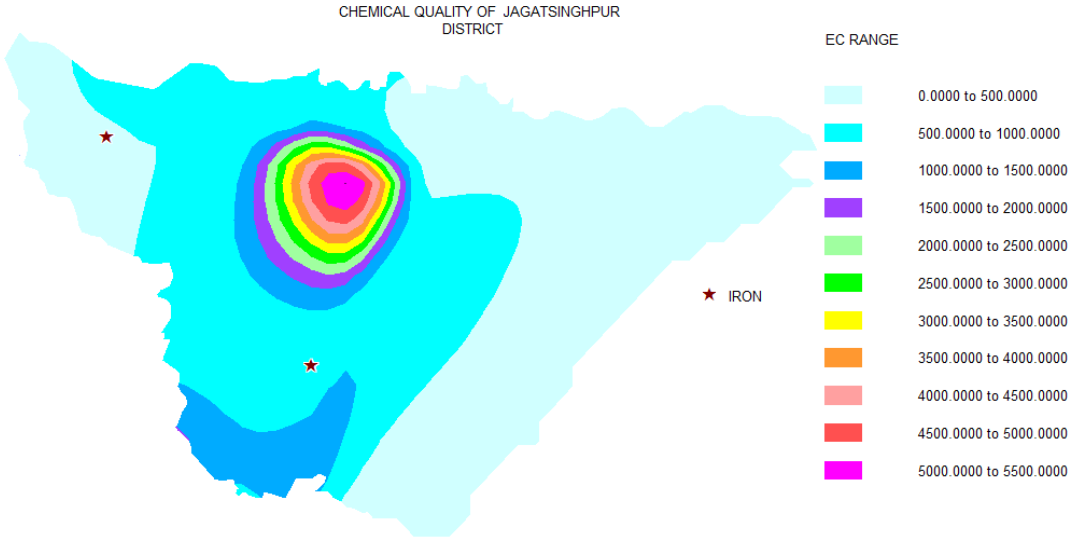
LEGEND

Age	Formation	Lithology	Index	Hydrogeological Conditions	GW Potential
Quarternary to Recent	Alluvial	Sand, silt, clay		Fairly thick and regionally unconfined to confined aquifers down to 300m.	> 40 lps
				Fresh water all through	
				Saline ground water is overlain by Fresh ground water.	
				Fresh ground water overlain by saline ground water.	

Discharge range of Bore Holes

- ● < 40 lps
- ▲ 40 - 60 lps
- ○ > 60 lps


JAGATSINGHPUR DISTRICT
Dynamic Ground Water Resources
(As on 31.03.2009)
BIRIDI(44.09%)
TIRTOL(62.64%)
KUJANG(62.38%)
JAGATSINGHPUR(43.12%)
BALIKUDA(42.99%)
ERSAMA(Saline)
NUAGAON(38.22%)
DISTRICT BOUNDARY
BLOCK BOUNDARY
with name & stage of ground water development
Dynamic Ground Water Resources
as on 31.03.2009
9,200
Gross Ground Water Draft
Net Ground Water Availability
Annual Replenishable Ground Water Resources


CHEMICAL QUALITY OF JAGATSINGHPUR DISTRICT
EC RANGE
0.0000 to 500.0000
500.0000 to 1000.0000
1000.0000 to 1500.0000
1500.0000 to 2000.0000
2000.0000 to 2500.0000
2500.0000 to 3000.0000
3000.0000 to 3500.0000
3500.0000 to 4000.0000
4000.0000 to 4500.0000
4500.0000 to 5000.0000
5000.0000 to 5500.0000
IRON