Draft Report

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भारत सरकार

Central Ground Water Board

Ministry of Water Resources, River Development and Ganga Rejuvenation

Government of India

Report
on
AQUIFER MAPPING AND MANAGEMENT PLAN

Parts of Bardhaman, Hugli, Nadia and North 24 Parganas Districts, West Bengal

पूर्वी क्षेत्र, कोलकाता

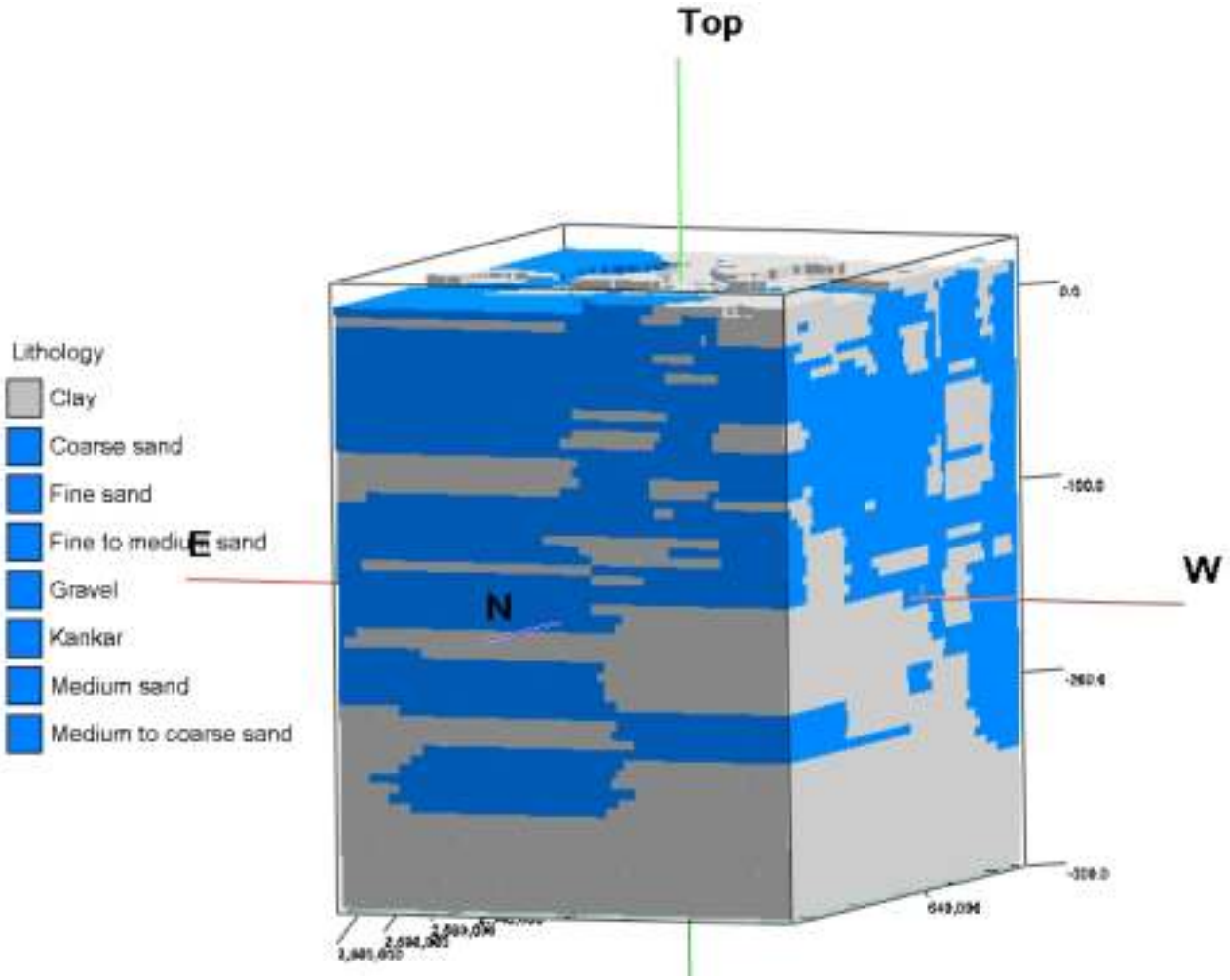
Eastern Region, Kolkata

AQUIFER MAPPING AND MANAGEMENT PLAN

IN

PARTS OF BARDHAMAN, HUGLI, NADIA & NORTH 24 PARGANAS DISTRICTS, WEST BENGAL

(PHASE-II)



By

CENTRAL GROUND WATER BOARD
EASTERN REGION
KOLKATA

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AQUIFER MAPPING AND MANAGEMENT PLAN
IN
PARTS OF BARDHAMAN, HUGLI, NADIA & NORTH 24 PARGANAS DISTRICTS, WEST BENGAL
(PHASE-II)

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PART-I

Technical Report of parts of Bardhaman, Hugli, Nadia & North 24 Parganas Districts, West Bengal

Chapter- 1

1. INTRODUCTION

Groundwater is one of the prime sources of fresh water contributing significantly for the survival of mankind. However, overexploitation, surface runoff, subsurface groundwater discharge have depleted the fresh groundwater availability considerably. Assessing the groundwater potential zone is extremely important for the protection of water quantity & quality, and the management of groundwater system. In this context, the National Aquifer Mapping & Management Programme (NAQUIM) has been taken up by CGWB under XIIth Plan. As per the revised Action Plan in 2nd Phase under NAQUIM, ground water management studies in 26 blocks of four districts (in parts) of West Bengal- Bardhaman, Hugli, Nadia and North 24 Parganas districts, covering an area of approximately 5,031 sq. km. was taken up by CGWB, ER, Kolkata. This report envisages the salient features of aquifer geometry, characteristics; ground water occurrences, availability, resource vis-a-vis quality etc. in present scenario.

1.1 Objective

The broad objective of the study is to establish the geometry of the underlying aquifer systems in horizontal and vertical domain and characterize them, so as to work out the development potential and prepare aquifer-wise management plan using ground water simulation model.

- The objective of this study is to formulate management plan of aquifers of the area with respect to issues concerned.

Major issues of the study area are

- Arsenic contamination in ground water of shallow aquifer
- Declining ground water level in semi-critical blocks in the area.

1.2 Scope of Study

The scope of the present study is broadly within the framework of National Aquifer Mapping & Management Programme (NAQUIM) being implemented by CGWB. There are four major activity components viz.: (i) data collection / compilation (ii) Data gap analysis (iii) Data generation and (vi) Preparation of aquifer maps and management plan to achieve the primary objective. Data compilation included collection, and wherever required procurement, of all maps from concerned Agencies, such as the Survey of India, Geological Survey of India, State Governments etc., computerization and analyses of all acquired data, and preparation of a knowledge base. Identification of Data Gap included ascertaining requirement for further data generation in respect of hydrogeological, geophysical, chemical, hydrological, hydro-meteorological studies, etc. Data generation included those of hydrometeorology,

chemical quality of ground water, litho-logs and aquifer parameters. Generation of ground water chemical quality data was accomplished by collection of water samples and their laboratory analyses for all major parameters, and some of the heavy metals. Additional data pertaining to sub-surface lithology and aquifer parameters were obtained through drilling of additional exploratory wells and slim holes, pumping tests at the drilling sites.

1.3 Approach and Methodology

An approach and methodology adopted to achieve the major objective have been shown below step-wise.

i) Compilation of existing data
ii) Identification of data gaps
iii) Data generation based on data gaps
iv) Preparation of thematic maps on GIS platform
v) Preparation of Rock-Works based 2D/3D maps
vi) Compilation of Block-wise Aquifer Maps and Management Plan

1.4 Location, Extent and Accessibility of the study area

The study area (Plate 1) comprising 26 blocks is located on the east-central part of West Bengal covering parts of Bardhaman, Hugli, Nadia and N 24 Parganas districts. The area extends between North latitudes 22° 38' 41" and 23° 36' 17" and East longitudes 88° 08' 38" and 88° 59' 40". The study area partly falls in the Survey of India Topo-sheet nos.- 79A/2,3,4,6,7,8,10,11,12&16, and 79B/1,2,5,6,9&13. The study area forms part of Lower Ganga Alluvial Plains in the inter-fluvial belt of Ganga basin.

The area is well connected by road with NH-34, some of the State Highways & MDRs; and by rail-network of Eastern Railway mainly with Howrah - Malda Section.

1.5 Administrative divisions and population

The study area comprises of 26 Blocks of four districts (in parts) of West Bengal- Bardhaman, Hugli, Nadia and North 24 Parganas districts, covering an area of approximately 4931 sq. km. District-wise the details of administrative divisions are summarized in Table I.

Table I: **Administrative divisions of the study area**

SI No.	Name of the District	Name of the Block	Geographic area (sq.km.)	Population of CD Block (2011 census)
1.	BARDHAMAN	Kalna- I	178.22	148673
2.		Kalna- II	172.64	133485
3.		Purbasthali- I	151.28	153703
4.		Purbasthali- II	199.61	212355
5.	HUGLI	Balagarh	215.52	200810
6.		Chinsura- Magra	96.35	86792
7.		Pandua	284.03	265863

8.		Polba-Dadpur	287.85	263555
9.		Serampur-Uttarpara	93.07	36389
10.		Singur	206.23	223951
11.		Chanditala- I	93.00	104677
12.	NADIA	Chakdah	346.61	314383
13.		Haringhata	164.28	207459
14.		Krihnanagar- I	275.88	285885
15.		Krihnanagar- II	141.46	134032
16.		Ranaghat- I	160.21	120847
17.		Ranaghat- II	280.37	314519
18.		Nabadwip	103.72	76241
19.		Shantipur	192.16	54256
20.	NORTH 24 PARGANAS	Amdanga	130.61	185014
21.		Bagdah	228.62	242974
22.		Barrackpur- I	145.34	94278
23.		Bangaon	358.55	380903
24.		Gaighata	248.80	265526
25.		Habra- I	146.16	175651
26.		Habra- II	130.79	140675
TOTAL			5031.36	4822896

Source: State Statistical Handbook, 2013 & GIS based maps.

As per 2011 census, the total population of the concerned block-areas (ie. 26 Blocks) is 4822896.

The Administrative Map of the study area is shown in **Plate-1.**

1.6 Landuse, Irrigation and Cropping pattern

Out of the total area concerned, about 73 % area is occupied by cultivable land with single and double crops, about 0.22 % area is occupied by current waste land, about 0.16 % area is occupied by wet land and the negligible area is under forest land.

The Land Use/ Land Cover Map of the study area is shown in **Plate-2**.

Irrigation plays an important role for crop production and intensity of crops. The cultivable land in the study area, about 34 % is rain fed, and in the rest area, crop production is solely dependent of surface water and ground water irrigation systems.

48 % of cultivable area has been irrigated through ground water & surface water. Ground water irrigation is created by deep tube well and shallow' tube wells. Irrigation by surface water is done through River lift irrigation, whereas irrigation by water conservation structures (tanks etc.) is covering an area of about 13% of the total irrigated area.

1.7 Urban areas, Industries and Mining activities

Urban areas in the study area include 1 Municipal Corporation- Chandannagar, and 12 Municipalities, viz., Kalna in Bardhaman district; Hugli-Chinsura & Serampur-Uttarpara in Hugli district; Chakdah, Krishnanagar, Ranaghat, Nabadwip & Shantipur in Nadia district,

and Barrackpur, North Barrackpur, Bangaon & Habra in North 24 Parganas district. Small industries are set up in the study area, registered with the Directorate of Cottage and Small Scale Industries. A number of registered working factories are present in the area. Mining activities are virtually absent in this area.

1.8 Data Gap Analysis

1.8.1 Data Gap Analysis of parts of West Bengal during AAP 2012-13

Report on Data Gap Analysis in West Bengal during AAP 2012-13

To carry out the assignment of Aquifer Mapping in the State of West Bengal, as a part of National Aquifer mapping programme under AAP 2012-13, first the task of data gap analysis has been done up in the Indo-Gangetic alluvial terrain of West Bengal covering Parts of Hugli, Barddhaman and Nadia districts. A sum total of 1399 sq km area falling in 2 nos. of Survey of India toposheets i.e 79 A/7, 79 A/8 (Parts) , incorporated in 15 CD(parts) blocks was allocated for detailed survey under Aquifer Mapping programme. Details of parts of blocks are presented in Table-1. Details of the characteristics of the aquifers as studied from the exploratory tube wells of CGWB are utilised to find out the data gap existing in the area incorporated in the toposheets as mentioned above. Similarly the data gap existing in case of geophysical studies, Hydrochemical and groundwater monitoring studies of CGWB were worked out.

Water Use & Demand: As per ground water estimation on March'11, ground water uses for all purposes for entire study area is 382.1111 MCM, whereas the total demand of ground water for domestic & industrial purposes up to 2035 is in the tune of 43.0549 MCM.

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Table-I : District/ Block wise area incorporated in the aquifer mapping studies in AAP 2012-13

Sl. No	Toposheet No.	District	Block	Total area of the Block (Sq. Km.)	% of block area	Gross Draft for all uses (MCM)	Demand for domestic & industrial use during 2035 (MCM)
1	79 A/8	Bardhaman	Kalna II	149	66	21.3779	3.5796
		Hugli	Balagarh	202	100	55.2274	4.4604
			Chinchura	47	43.5	7.7527	4.3873
			Pandua	129	47	26.3362	2.7742

			Polba-Dadpur	14	5	2.7311	.2487
		Nadia	Chakdah	49	14	11.8318	1.8472
			Ranghat-I & Ranghat-II	26	6	9.9611	.9044
			Shantipur	158	80.6	46.5721	6.4399
2	79A/7	Bardhaman	Purbasthali-I	126	85	34.1814	3.4741
		-do-	Purbasthali-II	66	34	26.1933	1.4276
		-do-	Kalna-I	120	68	29.6888	2.3332
		Nadia	Nabadwip	109	100	32.1749	5.3218
		-do-	Krishnanagar-I	121	42	47.6440	3.9593
		-do-	Krishnanagar-II	84	68	30.4384	1.8972
			Total	**1399**		**382.1111**	**43.0549**

Data Gap Analysis – Existing Data Base:

Toposheet wise details of the characteristics of the aquifers as studied from the existing exploratory tube wells of CGWB **(Table-II)** & the details of wells as collected from State department are utilised to find out the data gap existing in the area incorporated in the toposheets as mentioned above. Similarly the data gap existing in case of geophysical studies, hydrochemical and groundwater monitoring studies of CGWB have been worked out.

Table- II : Toposheet wise Exploratory Data compilation for Aquifer Mapping during AAP 2012-13
Toposheet no. 79A/7

Quadrant No.	Name of site	Agency	Depth of drilling	Aquifers tapped			Aquifer parameter									Aquifer water quality			Any other information
				Aq- I	Aq- II	Aq- III	Aq- I			Aq- II			Aq- III			Aq- I	Aq- II	Aq- III	-
							K	T	S	K	T	S	K	T	S				
1a	Nil												-	-	-	-	-	-	-
1b	Nil												-	-	-	-	-	-	-
1c	Chaugacha	CGWB	325/133		112-130								-	-	-	-	-	-	-
2a	Chandpur	CGWB	225/147		114-123 141-144								-	-	-	-	-	-	-
2b	Bhaluka	CGWB	325/302		154-160 170-176 296-298								-	-	-	-	-	-	-
2c	Krishnagar	CGWB	264/241		161-167 171-177 194-200						337		-	-	-	-	-	-	-

					106-212 215-227 232-238														
2c	Bhatjangla	CGWB	305/149	32-68 84-146				1160											
3a	Simlon	CGWB	226/168		112-118 124-136 161-165								-	-	-	-	-	-	-
3b	nil																		
3c	nil																		

Toposheet no. 79 A/8

Quadrant No.	Name of site	Agency	Depth of drilling	Aquifers tapped			Aquifer parameter									Aquifer water quality			Any other information
				Aq- I	Aq- II	Aq- III	Aq- I			Aq- II			Aq- III			Aq- I	Aq- II	Aq- III	-
							K	T	S	K	T	S	K	T	S				
1a	Nepakuli	CGWB	225/144		120-129 135-141								-	-	-	-	-	-	-
1b	Purbasahapur	CGWB	338/252			219-231							-		-	-	-	-	-
1b	Purbasahapur	CGWB	156/153		126-150						633								
1b	Purbasahapur	CGWB	52/46	28-42				435											
1c	Guptipara	CGWB	232/178		118-130 148-160 166-175								-	-	-	-	-	-	-
1c	Guptipara	CGWB	92/63	48-60															
2a	Baidyapur	CGWB	220		128-140 152-164								-	-	-	-	-	-	-
2b	Bakulia	CGWB	226/132		102-114 123-129								-	-	-	-	-	-	-

2b	Inchura	CGWB	325/105		106-118 186-192														
2c	Natagarh	CGWB	250/200		175-197						388		-	-	-	-	-	-	-
2c	Natagarh	CGWB	101/101	87-99				1160											
3a	Khanan	CGWB	179/174		143-158 165-171								-	-	-	-	-	-	-
3a	Khanan	CGWB	80/75	54-72															
3a	Itachuna	CGWB	192/170		146-167														
3a	Mahanad	CGWB	225/208		140-146 193-205														
3b	nil																		
3c	nil																		

Data Gap analysis & Recommendation for Data Generation for aquifer mapping programme in West Bengal State during AAP 2012-13:

EXPLORATION:

Toposheet No.79 A/7

Quadrant No.	No. of additional EW required			No. of additional VES/TEM required			No. of additional water level monitoring stations required			No. of additional water quality stations required		
	Aq-I	Aq-II	Aq-III	Aq-I	Aq-II	Aq-III	Aq-I	Aq-II	Aq-III	Aq-I	Aq-II	Aq-III
1A	0	0	1	-	-	3	1	1	1	1	1	1
3A	0	0	1	-	-	3	0	1	1	0	1	1
2B	2	2	2	-	-	3	0	1	1	0	1	1
1C	0	0	1	-	-	3	0	1	1	0	1	1
3C	0	0	1	-	-	3	0	1	1	0	1	1
Total	**2 (1 EW, 1OW)**	**2 (1 EW, 1OW)**	**6 (5 EW, 1OW)**	-	-	**15**	**2**	**9**	**9**	**2**	**9**	**9**

Note: No. of additional EW required – 10 (Aq-I: 2, Aq-II: 2, Aq-III: 6)

No. of additional VES/TEM required – 27 (Aq-I: 0, Aq-II: 0, Aq-III: 15)

No. of additional water level monitoring stations required – 20(Aq-I: 2, Aq-II:9, Aq-III: 9)

No. of additional water quality stations required – 20 (Aq-I: 2, Aq-II: 9, Aq-III: 9)

Toposheet No. 79 A/7 Exploratory Data adequacy for <u>Three</u> Aquifer group system in Alluvial areas (quadrant wise)

Aq. Gr..	Depth Range	Aq. parameters	EC
Ist	Nil	Nil	Nil
IInd	Nil	Nil	Nil
IIIrd	Nil	Nil	Nil

Aq. Gr.	Depth Range	Aq. parameters	EC
Ist	Nil	Nil	Nil
IInd	Nil	Nil	Nil
IIIrd	Nil	Nil	Nil

Aq. Gr..	Depth Range	Aq. parameters	EC
Ist	Nil	Nil	Nil
IInd	112-130	Nil	Nil
IIIrd	Nil	Nil	Nil

Aq. Gr.	Depth Range	Aq. parameters	EC
Ist	Nil	Nil	Nil
IInd	114-144	Nil	Nil

Aq. Gr.	Depth Range	Aq. parameters	EC
Ist	Nil	Nil	Nil
IInd	Nil	Nil	Nil

Aq. Gr.	Depth Range	Aq. parameters	EC
Ist	Nil	Nil	Nil
IInd	Nil	Nil	Nil

III[rd]	Nil	Nil	Nil

III[rd]	Nil	Nil	Nil

III[rd]	Nil	Nil	Nil

Aq. Gr.	Depth Range	Aq. parameters	EC
I[st]	Nil	Nil	Nil
II[nd]	112-165	Nil	Nil
III[rd]	Nil	Nil	Nil

Aq. Gr.	Depth Range	Aq. parameters	EC
I[st]	Nil	Nil	Nil
II[nd]	Nil	Nil	Nil
III[rd]	Nil	Nil	Nil

Aq. Gr.	Depth Range	Aq. parameters	EC
I[st]	Nil	Nil	Nil
II[nd]	Nil	Nil	Nil
III[rd]	Nil	Nil	Nil

Toposheet No. 79 A/7 Exploratory Data Gap Analysis for <u>Three</u> Aquifer group system in Alluvial areas (quadrant wise)

Aq. Gr.	EW/OW/SH/PZ		
	Req	Exist	Gap
I[st]	0	0	0
II[nd]	0	0	0
IIIrd	1EW	0	1 EW

Aq. Gr.	EW/OW/SH/PZ		
	Req	Exist	Gap
I[st]	0	0	0
II[nd]	0	0	0
IIIrd	0	0	0

Aq. Gr.	EW/OW/SH/PZ		
	Req	Exist	Gap
I[st]	0	0	0
II[nd]	0	0	0
IIIrd	1EW	0	1 EW

Aq. Gr.	EW/OW/SH/PZ		
	Req	Exist	Gap
I[st]	0	0	0
II[nd]	0	0	0
IIIrd	0	0	0

Aq. Gr.	EW/OW/SH/PZ		
	Req	Exist	Gap
I[st]	2EW	0	2 EW
II[nd]	2EW	0	2 EW
IIIrd	2EW	0	2 EW

Aq. Gr.	EW/OW/SH/PZ		
	Req	Exist	Gap
I[st]	0	0	0
II[nd]	0	0	0
IIIrd	0	0	0

Aq. Gr.	EW/OW/SH/PZ		
	Req	Exist	Gap
I^{st}	0	0	0
II^{nd}	0	0	0
IIIrd	1EW	0	1 EW

Aq. Gr.	EW/OW/SH/PZ		
	Req	Exist	Gap
I^{st}	0	0	0
II^{nd}	0	0	0
IIIrd	0	0	0

Aq. Gr.	EW/OW/SH/PZ		
	Req	Exist	Gap
I^{st}	0	0	0
II^{nd}	0	0	0
IIIrd	1EW	0	1 EW

Toposheet No. 79 A/7 Data adequacy of GW Monitoring data for Three Aquifer group system in Alluvial areas (quadrant wise)

Aq. Gr.	DW/PZ
I^{st}	PZ
II^{nd}	N
III^{rd}	N

Aq. Gr.	DW/PZ
I^{st}	PZ
II^{nd}	N
III^{rd}	N

Aq. Gr.	DW/PZ
I^{st}	PZ
II^{nd}	N
III^{rd}	N

Aq. Gr.	DW/PZ
I^{st}	PZ
II^{nd}	N
III^{rd}	N

Aq. Gr.	DW/PZ
I^{st}	PZ
II^{nd}	N
III^{rd}	N

Aq. Gr.	DW/PZ
I^{st}	PZ
II^{nd}	N
III^{rd}	N

Aq. Gr.	DW/PZ
I^{st}	PZ
II^{nd}	N
III^{rd}	N

Aq. Gr.	DW/PZ
I^{st}	PZ
II^{nd}	N
III^{rd}	N

Aq. Gr.	DW/PZ
I^{st}	PZ
II^{nd}	N
III^{rd}	N

Toposheet No. 79 A/7 Data gap analysis for GW Monitoring data of <u>Three</u> Aquifer group system in Alluvial areas (quadrant wise)

Aq. Gr.	DW/PZ		
	Req	Exist	Gap
Ist	4 PZ	3PZ	1 PZ
IInd	1 PZ	0	1 PZ
IIIrd	1 PZ	0	1 PZ

Aq. Gr.	DW/PZ		
	Req	Exist	Gap
Ist	5 PZ	5PZ	0
IInd	0	0	0
IIIrd	0	0	0

Aq. Gr.	DW/PZ		
	Req	Exist	Gap
Ist	5 PZ	5PZ	0
IInd	1 PZ	0	1 PZ
IIIrd	1 PZ	0	1 PZ

Aq. Gr.	DW/PZ		
	Req	Exist	Gap
Ist	3 PZ	3 PZ	0
IInd	0	0	0
IIIrd	0	0	0

Aq. Gr.	DW/PZ		
	Req	Exist	Gap
Ist	7 PZ	7PZ	0
IInd	1 PZ	0	1 PZ
IIIrd	1 PZ	0	1 PZ

Aq. Gr.	DW/PZ		
	Req	Exist	Gap
Ist	6 PZ	6 PZ	0
IInd	0	0	0
IIIrd	0	0	0

Aq. Gr.	DW/PZ		
	Req	Exist	Gap
Ist	2 PZ	1 PZ	1 PZ
IInd	1 PZ	0	1 PZ
IIIrd	1 PZ	0	1 PZ

Aq. Gr.	DW/PZ		
	Req	Exist	Gap
Ist	3 PZ	2 PZ	1 PZ
IInd	0	0	0
IIIrd	0	0	0

Aq. Gr.	DW/PZ		
	Req	Exist	Gap
Ist	5 PZ	4 PZ	1 PZ
IInd	1 PZ	0	1 PZ
IIIrd	1 PZ	0	1 PZ

Toposheet No. 79 A/7 Data adequacy of GW Quality data for <u>Three</u> Aquifer group system in Alluvial areas (quadrant wise)

Aq. Gr.	Sample Point
Ist	Y
IInd	N
IIIrd	N

Aq. Gr.	Sample Point
Ist	Y
IInd	N
IIIrd	N

Aq. Gr.	Sample Point
Ist	Y
IInd	N
IIIrd	N

Aq. Gr.	Sample Point
Ist	Y
IInd	N
IIIrd	N

Aq. Gr.	Sample Point
Ist	Y
IInd	N
IIIrd	N

Aq. Gr.	Sample Point
Ist	Y
IInd	N
IIIrd	N

Aq. Gr.	Sample Point
Ist	Y
IInd	N
IIIrd	N

Aq. Gr.	Sample Point
Ist	Y
IInd	N
IIIrd	N

Aq. Gr.	Sample Point
Ist	Y
IInd	N
IIIrd	N

Toposheet No. 79 A/7 Data gap analysis for GW Quality data of <u>Three</u> Aquifer group system in Alluvial areas (quadrant wise)

Aq. Gr.	DW/PZ		
	Req	Exist	Gap
Ist	4 PZ	3PZ	1 PZ
IInd	1 PZ	0	1 PZ
IIIrd	1 PZ	0	1 PZ

Aq. Gr.	DW/PZ		
	Req	Exist	Gap
Ist	5 PZ	5PZ	0
IInd	0	0	0
IIIrd	0	0	0

Aq. Gr.	DW/PZ		
	Req	Exist	Gap
Ist	5 PZ	5PZ	0
IInd	1 PZ	0	1 PZ
IIIrd	1 PZ	0	1 PZ

Aq. Gr.	DW/PZ		
	Req	Exist	Gap
Ist	3 PZ	3 PZ	0
IInd	0	0	0
IIIrd	0	0	0

Aq. Gr.	DW/PZ		
	Req	Exist	Gap
Ist	7 PZ	7PZ	0
IInd	1 PZ	0	1 PZ
IIIrd	1 PZ	0	1 PZ

Aq. Gr.	DW/PZ		
	Req	Exist	Gap
Ist	6 PZ	6 PZ	0
IInd	0	0	0
IIIrd	0	0	0

Aq. Gr.	DW/PZ		
	Req	Exist	Gap
Ist	2 PZ	1 PZ	1 PZ
IInd	1 PZ	0	1 PZ
IIIrd	1 PZ	0	1 PZ

Aq. Gr.	DW/PZ		
	Req	Exist	Gap
Ist	3 PZ	2 PZ	1 PZ
IInd	0	0	0
IIIrd	0	0	0

Aq. Gr.	DW/PZ		
	Req	Exist	Gap
Ist	5 PZ	4 PZ	1 PZ
IInd	1 PZ	0	1 PZ
IIIrd	1 PZ	0	1 PZ

Toposheet No.79 A/8

Quadrant No.	**No. of additional EW required**			**No. of additional VES/TEM required**			**No. of additional water level monitoring stations required**			**No. of additional water quality stations required**		
	Aq-I	**Aq-II**	**Aq-III**	**Aq-I**	**Aq-II**	**Aq-III**	**Aq-I**	**Aq-II**	**Aq-III**	**Aq-I**	**Aq-II**	**Aq-III**
1A	0	0	1	-	-	3	0	1	1	0	1	1
3A	0	0	1	-	-	3	0	0	1	0	0	1
2B	2	2	2	-	-	3	0	1	1	0	1	1
1C	0	0	1	-	-	3	0	1	1	0	1	1
3C	0	0	1	-	-	3	1	1	1	1	1	1
Total	**2 (1 EW, 1OW)**	**2 (1 EW, 1OW)**	**6 (5 EW, 1OW)**	-	-	**15**	**1**	**4**	**5**	**1**	**4**	**5**

Note: No. of additional EW required – 10 (Aq-I: 3, Aq-II: 2, Aq-III: 5)

No. of additional VES/TEM required – 15 (Aq-I: -, Aq-II: -, Aq-III: 15)

No. of additional water level monitoring stations required – 10 (Aq-I: 1, Aq-II: 4, Aq-III: 5)

No. of additional water quality stations required – 10 (Aq-I: 1, Aq-II: 4, Aq-III: 5)

Toposheet No. 79 A/8 Exploratory Data adequacy for <u>Three</u> Aquifer group system in Alluvial areas (quadrant wise)

Aq. Gr.	Depth Range	Aq. parameters	EC
Ist	120-141	Nil	Nil
IInd	Nil	Nil	Nil
IIIrd	Nil	Nil	Nil

Aq. Gr.	Depth Range	Aq. parameters	EC
Ist	28-42	435 m^2/d	Nil
IInd	126-150	633 m^2/d	Nil
IIIrd	219-231	Nil	Nil

Aq. Gr.	Depth Range	Aq. parameters	EC
Ist	48-60	Nil	Nil
IInd	118-175	Nil	Nil
IIIrd	Nil	Nil	Nil

Aq. Gr.	Depth Range	Aq. parameters	EC
Ist	Nil	Nil	Nil
IInd	128-164	Nil	Nil
IIIrd	Nil	Nil	Nil

Aq. Gr.	Depth Range	Aq. parameters	EC
Ist	Nil	Nil	Nil
IInd	102-192	Nil	Nil
IIIrd	Nil	Nil	Nil

Aq. Gr.	Depth Range	Aq. parameters	EC
Ist	87-99	1160 m^2/d	Nil
IInd	175-197	388 m^2/d	Nil
IIIrd	Nil	Nil	Nil

Aq. Gr.	Depth Range	Aq. parameters	EC
Ist	54-72	Nil	Nil
IInd	143-171	Nil	Nil
IIIrd	Nil	Nil	Nil

Aq. Gr.	Depth Range	Aq. parameters	EC
Ist	Nil	Nil	Nil
IInd	Nil	Nil	Nil
IIIrd	Nil	Nil	Nil

Aq. Gr.	Depth Range	Aq. parameters	EC
Ist	Nil	Nil	Nil
IInd	Nil	Nil	Nil
IIIrd	Nil	Nil	Nil

Toposheet No. 79 A/8 Exploratory Data Gap Analysis for <u>Three</u> Aquifer group system in Alluvial areas (quadrant wise)

Aq. Gr.	EW/OW/SH/PZ		
	Req	Exist	Gap
Ist	0	0	0
IInd	0	0	0
IIIrd	1EW	0	1 EW

Aq. Gr.	EW/OW/SH/PZ		
	Req	Exist	Gap
Ist	0	0	0
IInd	0	0	0
IIIrd	0	0	0

Aq. Gr.	EW/OW/SH/PZ		
	Req	Exist	Gap
Ist	0	0	0
IInd	0	0	0
IIIrd	1EW	0	1 EW

Aq. Gr.	EW/OW/SH/PZ		
	Req	Exist	Gap
Ist	0	0	0
IInd	0	0	0
IIIrd	0	0	0

Aq. Gr.	EW/OW/SH/PZ		
	Req	Exist	Gap
Ist	2EW	0	2 EW
IInd	2EW	0	2 EW
IIIrd	2EW	0	2 EW

Aq. Gr.	EW/OW/SH/PZ		
	Req	Exist	Gap
Ist	0	0	0
IInd	0	0	0
IIIrd	0	0	0

Aq. Gr.	EW/OW/SH/PZ		
	Req	Exist	Gap
Ist	0	0	0
IInd	0	0	0
IIIrd	1EW	0	1 EW

Aq. Gr.	EW/OW/SH/PZ		
	Req	Exist	Gap
Ist	0	0	0
IInd	0	0	0
IIIrd	0	0	0

Aq. Gr.	EW/OW/SH/PZ		
	Req	Exist	Gap
Ist	0	0	0
IInd	0	0	0
IIIrd	1EW	0	1 EW

Toposheet No. 79 A/8 Data adequacy of GW Monitoring data for <u>Three</u> Aquifer group system in Alluvial areas (quadrant wise)

Aq. Gr.	DW/PZ
I st	PZ
II nd	N
III rd	N

Aq. Gr.	DW/PZ
I st	PZ
II nd	N
III rd	N

Aq. Gr.	DW/PZ
I st	PZ
II nd	N
III rd	N

Aq. Gr.	DW/PZ
I st	PZ
II nd	N
III rd	N

Aq. Gr.	DW/PZ
I st	PZ
II nd	N
III rd	N

Aq. Gr.	DW/PZ
I st	PZ
II nd	N
III rd	N

Aq. Gr.	DW/PZ
I st	PZ
II nd	N
III rd	N

Aq. Gr.	DW/PZ
I st	PZ
II nd	N
III rd	N

Aq. Gr.	DW/PZ
I st	PZ
II nd	N
III rd	N

Toposheet No. 79 A/8 Data gap analysis for GW Monitoring data of <u>Three</u> Aquifer group system in Alluvial areas (quadrant wise)

Aq. Gr.	DW/PZ		
	Req	Exist	Gap
I st	4 PZ	1PZ	1 PZ
II nd	1 PZ	0	1 PZ
III rd	1 PZ	0	1 PZ

Aq. Gr.	DW/PZ		
	Req	Exist	Gap
I st	2 PZ	2PZ	0
II nd	0	0	0
III rd	0	0	0

Aq. Gr.	DW/PZ		
	Req	Exist	Gap
I st	6 PZ	6PZ	0
II nd	1 PZ	0	1 PZ
III rd	1 PZ	0	1 PZ

Aq. Gr.	DW/PZ		
	Req	Exist	Gap
I st	4 PZ	4 PZ	0
II nd	0	0	0
III rd	0	0	0

Aq. Gr.	DW/PZ		
	Req	Exist	Gap
I st	8 PZ	8PZ	0
II nd	1 PZ	0	1 PZ
III rd	1 PZ	0	1 PZ

Aq. Gr.	DW/PZ		
	Req	Exist	Gap
I st	6 PZ	6 PZ	0
II nd	0	0	0
III rd	0	0	0

Aq. Gr.	DW/PZ		
	Req	Exist	Gap
I st	4 PZ	4 PZ	0
II nd	1 PZ	0	1 PZ
III rd	1 PZ	0	1 PZ

Aq. Gr.	DW/PZ		
	Req	Exist	Gap
I st	5 PZ	5 PZ	0
II nd	0	0	0
III rd	0	0	0

Aq. Gr.	DW/PZ		
	Req	Exist	Gap
I st	1 PZ	1 PZ	0
II nd	1 PZ	0	1 PZ
III rd	1 PZ	0	1 PZ

Toposheet No. 79 A/8 Data adequacy of GW Quality data for Three Aquifer group system in Alluvial areas (quadrant wise)

Aq. Gr.	Sample Point
I st	Y
II nd	N
III rd	N

Aq. Gr.	Sample Point
I st	Y
II nd	N
III rd	N

Aq. Gr.	Sample Point
I st	Y
II nd	N
III rd	N

Aq. Gr.	Sample Point
I st	Y
II nd	N
III rd	N

Aq. Gr.	Sample Point
I st	Y
II nd	N
III rd	N

Aq. Gr.	Sample Point
I st	Y
II nd	N
III rd	N

Aq. Gr.	Sample Point
I[st]	Y
II[nd]	N
III[rd]	N

Aq. Gr.	Sample Point
I[st]	Y
II[nd]	N
III[rd]	N

Aq. Gr.	Sample Point
I[st]	Y
II[nd]	N
III[rd]	N

Toposheet No. 79 A/8 Data gap analysis for GW Quality data of <u>Three</u> Aquifer group system in Alluvial areas (quadrant wise)

Aq. Gr.	DW/PZ		
	Req	Exist	Gap
I[st]	4 PZ	1PZ	1 PZ
II[nd]	1 PZ	0	1 PZ
III[rd]	1 PZ	0	1 PZ

Aq. Gp.	DW/PZ		
	Req	Exist	Gap
I[st]	2 PZ	2PZ	0
II[nd]	0	0	0
III[rd]	0	0	0

Aq. Gp.	DW/PZ		
	Req	Exist	Gap
I[st]	6 PZ	6PZ	0
II[nd]	1 PZ	0	1 PZ
III[rd]	1 PZ	0	1 PZ

Aq. Gr.	DW/PZ		
	Req	Exist	Gap
I[st]	4 PZ	4 PZ	0
II[nd]	0	0	0
III[rd]	0	0	0

Aq. Gr.	DW/PZ		
	Req	Exist	Gap
I[st]	8 PZ	8PZ	0
II[nd]	1 PZ	0	1 PZ
III[rd]	1 PZ	0	1 PZ

Aq. Gr.	DW/PZ		
	Req	Exist	Gap
I[st]	6 PZ	6 PZ	0
II[nd]	0	0	0
III[rd]	0	0	0

Aq. Gr.	DW/PZ		
	Req	Exist	Gap
I[st]	4 PZ	4 PZ	0
II[nd]	1 PZ	0	1 PZ
III[rd]	1 PZ	0	1 PZ

Aq. Gr.	DW/PZ		
	Req	Exist	Gap
I[st]	5 PZ	5 PZ	0
II[nd]	0	0	0
III[rd]	0	0	0

Aq. Gr.	DW/PZ		
	Req	Exist	Gap
I[st]	1 PZ	1 PZ	0
II[nd]	1 PZ	0	1 PZ
III[rd]	1 PZ	0	1 PZ

1.8.2 Data Gap Analysis of parts of West Bengal during AAP 2013-14

Data Gap Analysis in parts of West Bengal (AAP 2013-14)

To carry out the assignment of Aquifer Mapping in the State of West Bengal, as a part of National Aquifer mapping programme under AAP 2013-14, first the task of data gap analysis has been carried out in the Indo-Gangetic alluvial terrain covering the parts of three districts like Hugli, Nadia and North 24 Parganas districts. A total of 2551 sq km area falling in 4 nos. of Survey of India Toposheets i.e,79A/12,79 A/16 (part),79B/5 and 79B/9, incorporated in 22 CD blocks (parts) was allocated for detailed survey under Aquifer Mapping programme in AAP 2013-14. Details of parts of blocks coming in the study area are presented in Table-1.

Details of the characteristics of the aquifers as studied from the exploratory tube wells of CGWB are utilised to find out the data gap existing in the area incorporated in the toposheets as mentioned above. Similarly the data gap existing in case of geophysical studies, Hydrochemical and ground water monitoring studies of CGWB have been worked out.

Data gap analysis has been done for ground water exploration, geophysical studies, water level monitoring and water quality components based on the data available in CGWB.

Table-III : District wise/ Block wise area incorporated in the aquifer mapping studies in AAP 2013-14

Block/District	Total area of the Block (Km^2)	Total area falling inside the specific Toposheet (Km^2)
Toposheet No. 79 A/16		
BAGDAH/North 24 Parganas	233.47	197.77
BONGAON/North 24 Parganas	361.4	218.93
GAIGHATA/North 24 Parganas	243.3	7.27
Area in toposheet *79 A/16:*		**423.97**
Toposheet No. 79 B/5		
CHANDITALA-I/Hugli	93.45	4.55
CHINSURAH-MOGRA/Hugli	108.2	72.36
POLBA -DADPUR/Hugli	285.69	156.14
SERAMPUR-UTTARPARA/Hugli	94.43	42.66
SINGUR/Hugli	199.83	108.61
CHAKDAHA/Nadia	356.25	55.46
AMDANGA/North 24 Parganas	139.27	73.93
BARRACKPORE-I/North 24 Parganas	217.3	152.96
BARRACKPORE-II/North 24 Parganas	117.21	29.64
BARASAT-I/North 24 Parganas	157.7	11.69
Area in toposheet *79 B/5:*		**708.00**
Toposheet No. 79 B/9		
CHAKDAHA/Nadia	356.25	26.76
AMDANGA/North 24 Parganas	139.27	65.32
BARRACKPORE-I/North 24 Parganas	217.3	7.18
BARASAT-I/North 24 Parganas	157.7	33.34
BONGAON/North 24 Parganas	361.4	35.65
BADURIA/North 24 Parganas	202.15	6.88
HARINGHATA/Nadia	170.32	143.97

GAIGHATA/North 24 Parganas	243.3	77.92
DEGANGA/North 24 Parganas	202.09	51.71
HABRA-I/North 24 Parganas	168.84	127.24
HABRA-II/North 24 Parganas	112.67	136.01
Area in toposheet *79 B/9:*		**711.98**
Toposheet No. 79 A/12		
CHAKDAHA/Nadia	356.25	213.77
HARINGHATA/Nadia	170.32	5.96
BAGDAH/North 24 Parganas	233.47	36.9
BONGAON/North 24 Parganas	361.4	103.17
SHANTIPUR/Nadia	196.01	20.92
RANAGHAT-I & II/Nadia	451.28	326.34
Area in toposheet *79 A/12:*		**707.06**
Total geographical area covered during AAP 2013-14:		**2551.01 sq km**

Previous work & Present Status of Data

In the study area, a total 143 no VES have been carried out to know the subsurface potential zones layer wise. To know the sub surface hydrogeology a total 30 nos of exploratory bore wells have been drilled and pumping test have been conducted to determine the hydrological parameters

Water use and demand

Ground water uses for all purposes for entire study area is 75692.43 ham, whereas the total demand of ground water for all purposes up to 2025 is in the tune of 12258.27 ham.

Data Gap Analysis – existing data base

Exploration

Previously, total 30 tube wells have been constructed by CGWB in the present study area. These tube wells have tapped the combined zones belonging to various aquifer groups. Aquifer group-I tapped zones from 22-113 m bgl, Aquifer group-II tapped zones from 60-240 m bgl.

For aquifer group-I, Transmissivity (T) value range from 1473 to 1925 m^2/day and Storativity (S) ranges from 0.028 to $7.66x10^{-4}$.

VES and profiling

An overall analysis was carried out with the existing surface geophysical survey (VES) data available in the Regional Office, Kolkata with an objective of aquifer mapping study. The individual toposheet of the aquifer mapping study area was collected and existing VES data were calculated quadrant-wise. On that basis, required number of required VES was estimated within each quadrant of a toposheet to get a clear idea of the disposition of the aquifer system of the area.

From the electrical logging chart most of study area fall within the gangetic alluvium regime. Alternate clay and sand sequence exhibits 2 to 3 prominent aquifer systems which are separated by clay layers. To get the resistivity signatures of these three aquifers at different depth, the required numbers of VES were classified in three different columns in the tabular sheet.

In the study area, total 143 nos. VES have been carried out during the previous studies. Geophysical data compilation has given in Table-IV.

Table-IV : Geophysical Data Gap Analysis

(Number of Additional VES Required)

Toposheet No.	Quadrant No	VES Conducted till 31.03.2013	No. of Additional VES/ TEM Required		
			VES With AB/2= 150.0 m	VES With AB/2= 250.0 m	VES With AB/2= 350.0 m
79B/5	1A	Work is in progress in F.S.P. 2013-14	1	2	3
	1B		1	2	3
	1C		1	2	3
	2A		1	2	3
	2B		2	3	3
	2C		1	2	3
	3A		1	2	3
	3B		1	2	3
	3C		2	3	3
79B/9	1A	Work is in progress in F.S.P. 2013-14	2	3	3
	1B		1	2	3
	1C		2	2	3
	2A		1	2	3
	2B		2	3	3
	2C		1	2	3
	3A		1	2	3
	3B		1	2	3
	3C		2	3	3
79A/12	1A	Work is in progress in F.S.P. 2013-14	2	3	3
	1B		1	2	3
	1C		1	2	3
	2A		1	2	3
	2B		1	2	3
	2C		1	2	3
	3A		1	2	3
	3B		2	3	3
	3C		1	2	3
79A/16	1A	Work is in progress in F.S.P. 2013-14	2	2	3
	1B		2	3	3
	1C		2	2	3
	2A		1	2	3
	2B		1	2	3
	2C		*NOT INCLUDED IN THE STUDY AREA*		
	3A		2	3	3
	3B		1	2	3
	3C		*NOT INCLUDED IN THE STUDY AREA*		

Recommendation for Data generation

Exploration

In Toposheet 79B/5, total No. of additional EW required- 9 of which aquifer wise break up are as Aq-I: 2no., Aq-II: 2 no., Aq-III:5 nos.

In Toposheet 79B/9, total No. of additional EW required- 8 of which aquifer wise break up are as Aq-I:2no., Aq-II:2 no., Aq-III:4 nos.

In Toposheet 79A/12, total No. of additional EW required- 10 of which aquifer wise break up are as Aq-I: 2no., Aq-II: 2 no., Aq-III: 6 nos.

In Toposheet 79A/16 (part), total No. of additional EW required- 9 of which aquifer wise break up are as Aq-I:2no., Aq-II:2 no., Aq-III:5 nos.

VES and profiling

In Toposheet 79B/5, total no. of additional VES/TEM required-34 of which aquifer wise break up are as Aq-I:7no., Aq-II:12 no., Aq-III:15 nos.

In Toposheet 79B/9, total no. of additional VES/TEM required-34 of which aquifer wise break up are as Aq-I: 7no., Aq-II: 12 no., Aq-III: 15 nos.

In Toposheet 79 A/12, total no. of additional VES/TEM required-32 of which aquifer wise break up are as Aq-I: 6 no., Aq-II: 11 no., Aq-III: 15 nos.

In Toposheet 79 A/16 (part), total no. of additional VES/TEM required-28 of which aquifer wise break up are as Aq-I:7 no., Aq-II: 9 no., Aq-III:12 nos.

Water level monitoring

In Toposheet 79B/5, total no. of additional water level monitoring stations required-11 of which aquifer wise break up are as Aq-I:3 no., Aq-II:3 no., Aq-III:5 nos.

In Toposheet 79B/9, total no. of additional water level monitoring stations required-11 of which aquifer wise break up are as Aq-I:3 no., Aq-II:3 no., Aq-III:5 nos.

In Toposheet 79 A/12, total no. of additional water level monitoring stations required-10 of which aquifer wise break up are as Aq-I:1 no., Aq-II:4 no., Aq-III:5 nos.

In Toposheet 79 A/16 (part), total no. of additional water level monitoring stations required- 8 of which aquifer wise break up are as Aq-I:3 no., Aq-II:1 no., Aq-III:4 nos.

Water Quality Monitoring

In Toposheet 79B/5, total no. of additional water level quality stations required- 11 of which aquifer wise break up are as Aq-I:3 no., Aq-II: 3 no., Aq-III: 5 nos.

In Toposheet 79B/9, total no. of additional water quality stations required- 11 of which aquifer wise break up are as Aq-I:4 no., Aq-II:2 no., Aq-III:5 nos.

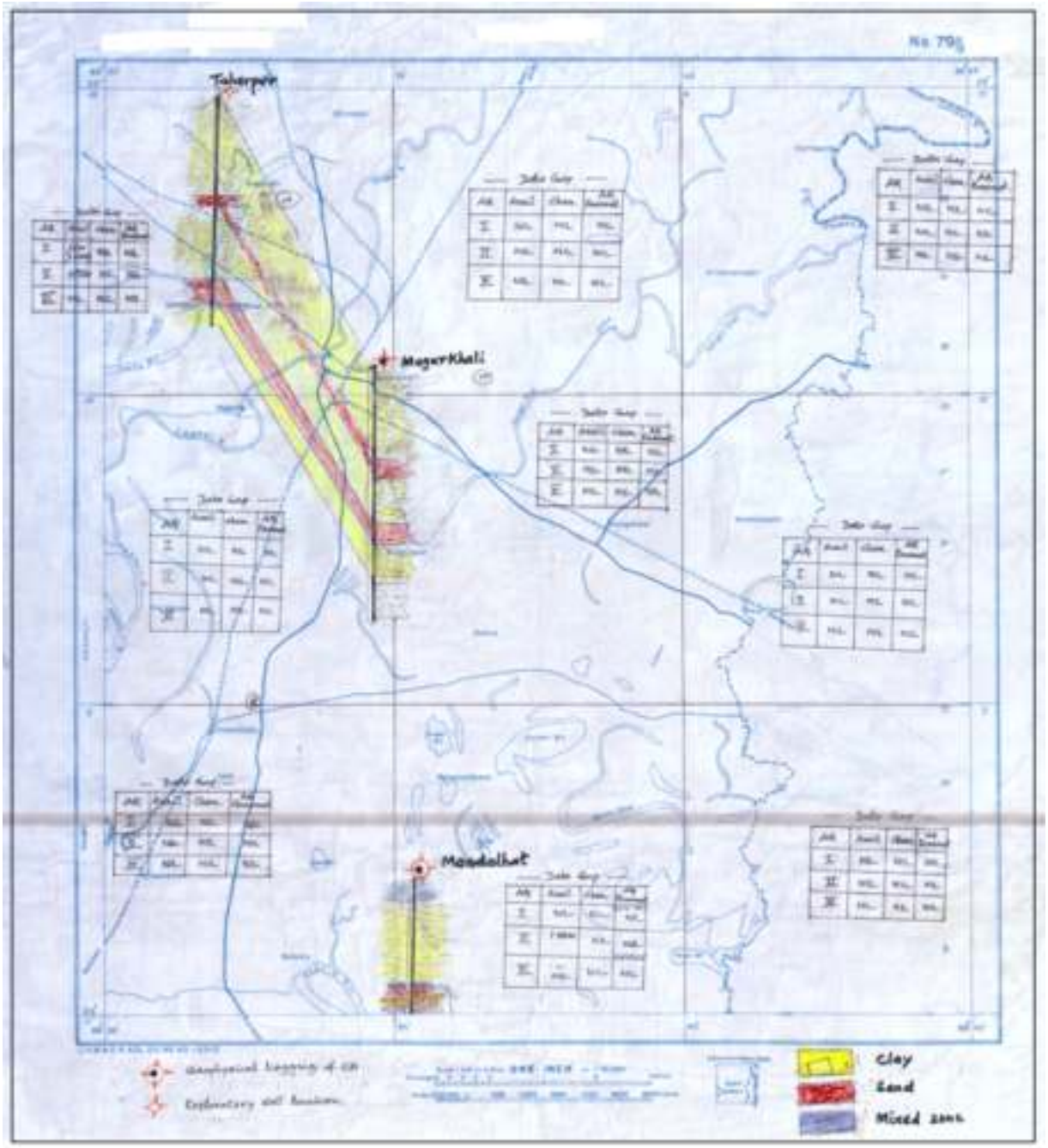
In Toposheet 79 A/12, total no. of additional water quality stations required- 10 of which aquifer wise break up are as Aq-I:1 no., Aq-II: 4 no., Aq-III: 5 nos.

In Toposheet 79 A/16 (part), total no. of additional water quality stations required- 8 of which aquifer wise break up are as Aq-I:3 no., Aq-II:1 no., Aq-III:4 nos.

Figures

Base Maps & Data Gap Analysis Maps for exploration and VES

Map-1A



Map-1B

Map-1C

Map-1D

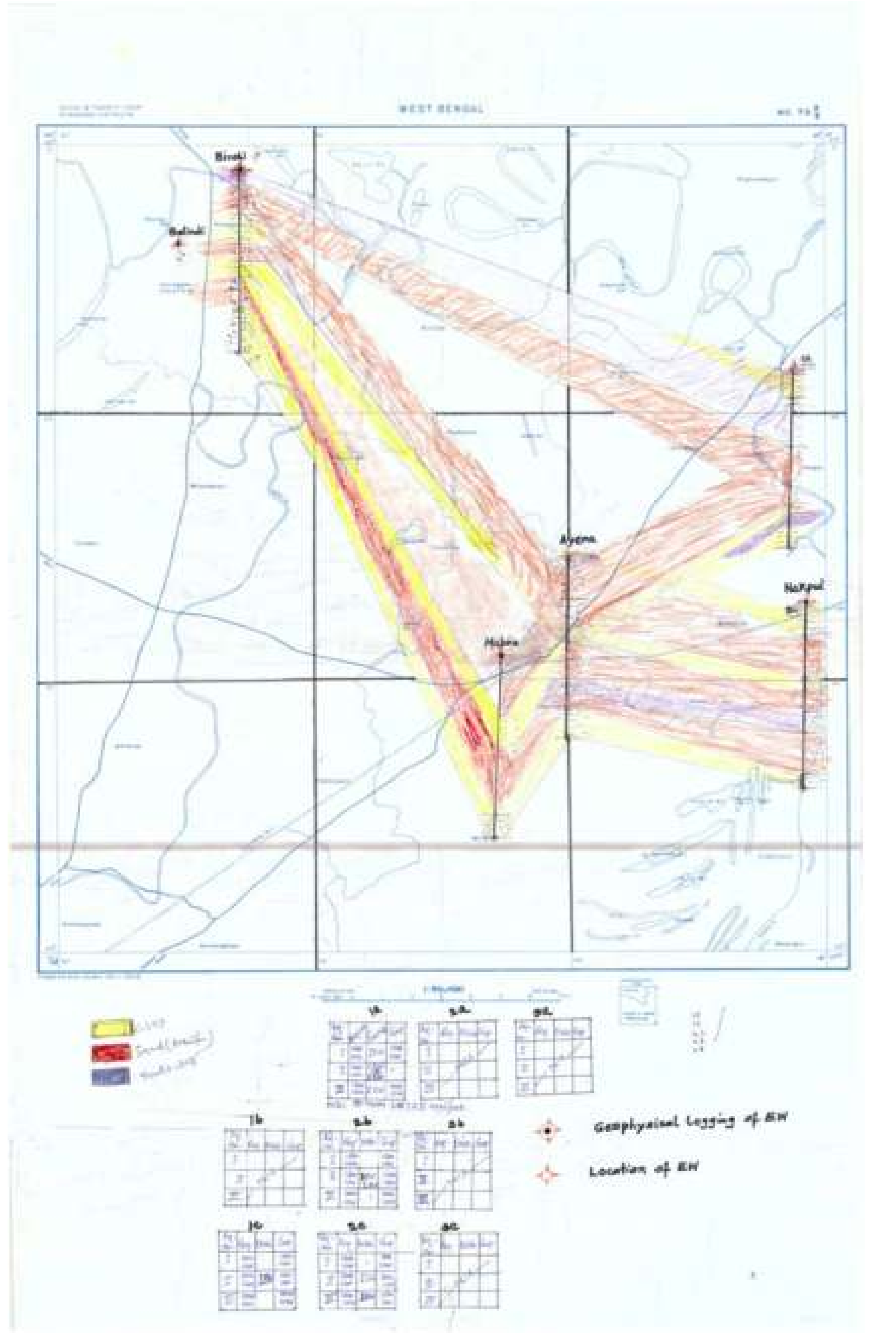

WEST BENGAL
Birohi
Balindi
Aysma
Haripur
Mohna
Geophysical Logging of EW
Location of EW

Table-V : EXPLORATORY DATA COMPILATION FOR AQUIFER MAPPING (AAP 2013-14)

Toposheet No. 79B/9

Quadrant No.	Name of site	Agency	Depth of drilling	Aquifers tapped			Aquifer parameter									Aquifer water quality			Any other information
				Aq- I	Aq- II	Aq- III	Aq- I			Aq- II			Aq- III			Aq- I	Aq- II	Aq- III	-
							K	T	S	K	T (m^2 /day)	S	K	T	S				
1a	Balindi	CGWB	250/232	-	110-126	-	-	-	-	-	-	-	-	-	-	-	-	-	-
1a	Birohi	CGWB	252/250	-	-	205-210 213-222 233-238 242-248	-	-	-	-	-	-	-	-	-	-	-	-	-
1a	Birohi	CGWB	195/165		60-66 159-162		-	-	-	-	-	-	-	-	-	-	-	-	-
1a	Birohi	CGWB	60-46	22-25	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2a	nil				-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
3a	nil				-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
1b	nil				-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2b	Ayera	CGWB	250/212	-	191-209	-	-	-	-	-	-	-	-	-	-	-	-	-	-

2b	Chaitanya College, Habra	CGWB	250/208	-	187-205 195-204	-	-	-	-	-	4119	$1.5*10^{-4}$	-	-	-	-	-	-	-
3b	nil	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
1c	Gaighata	CGWB	245/216	-	197-215	-					4662	$2.32*10^{-5}$							
2c	Nakpul	CGWB	257/235	-	-	208-232	-	-	-	-	-	-	-	-	-	-	-	-	-
2c	Nakpul	CGWB	160/150	-	123-147	-	-		-	-	-	-	-	-	-	-	-	-	-

Toposheet No : 79A/16

Quad Rant No.	Name of site	Agency	Depth of drilling	Aquifers tapped			Aquifer parameter									Aquifer water quality			Any other information
							Aq- I			Aq- II			Aq -III			Aq- I	Aq- II	Aq- III	
				Aq- I	Aq- II	Aq- III	K	T	S	K	T (m^2 /day)	S	K	T	S				
1A	Nil	--	--	--	--	--	--	--	--	--	--	--	--	--	--				
2A	Nil	--	--	--	--	--	--	--	--	--	--	--	--	--	--				
3A	Bongaon	CGWB	251.75	--	201-233	---	--	--	--	--	--	--	--	--	--				AG I-10-123 mbgl AG II-193-236 mbgl AG III- >245 mbgl
1B	Bagdah	CGWB	248	---	190-196 215-227 234-240	----	--	--	--		970	4×10^{-4}	---	--	---		Ec=703		AG I-10-123 mbgl AG II-130-214 mbgl AG III- >225 mbgl
2B	Nil	--	--	--	--	--	--	--	--	--	--	--	--	--	--				
3B	Nil	--	--	--	--	--	--	--	--	--	--	--	--	--	--				
1C	Nil	--	--	--	--	--	--	--	--	--	--	--	--	--	--				
2C	Bangladesh																		
3C	Bangladesh																		

Toposheet No. 79 B/5

Quadrant No.	Name of site	Agency	Depth of drilling	Aquifers tapped			Aquifer Parameter									Aquifer water quality		
				Aq -I	Aq -II	Aq-III	Aq-I			Aq-II			Aq-III			Aq -I	Aq-II	Aq-III
							K	T (m^2 /day)	S	K	T (m^2 /day)	S	K	T	S			
1A	-	-	-	NA	NA	NA	-	-	-	-	-	-	-	-	-	-	-	-
2A	-	-	-	NA	NA	NA	-	-	-	-	-	-	-	-	-	-	-	-
3A	-	-	-	NA	NA	NA	-	-	-	-	-	-	-	-	-	-	-	-
2A	Sahaganj	CGWB	179/151	-	131-141	-	-	-	-	-	-	-	-	-	-	-	-	-
2B	Bhatpara	CGWB	122/120	-	100-118	-	-	-	-	-	-	-	-	-	-	-	-	-
2B	Bhatpara	CGWB	250/183	-	162-180		-	-	-	-	-	-		774	-	-	-	-
2B	Bhatpara	CGWB	190/186	-	174-184		-	-	-	-	-	-	-	-	-	-	-	-
3B	Doda Complex	CGWB	90/89	70-76 80-86	-	-	-	1914	$7.66*10^{-4}$	-	-	-	-	-	-	-	-	-
3B	Doda Complex	CGWB	90/85	67-73.5 76-83	-	-	-	-	-	-	-	-	-	-	-	-	-	-
3B	Doda Complex	CGWB	350/202	-	175-199	-	-	-	-	-	-	-	-	-	-	-	-	-
3B	Doda Complex	CGWB	200/198	-	180-186 190-196	-	-	-	-	-	699	$1.25*10^{-4}$	-	-	-	-	-	-
1C	Kachrapara	CGWB	111/110	-	96-108	-	-	-	-	-	-	-	-	-	-	-	-	-
1C	Kachrapara	CGWB	233/153	-	132-150		-	-	-	-	-	-	-	-	-	-	-	-
1C	Kachrapara	CGWB	153/151	-	133-139 146-149		-	-	-	-	-	-	-	530	$8.38*10^{-4}$	-	-	-
2C	Nil	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
3C	Mirhati	CGWB	90/89	70-76 80-86	-	-		1473	0.028	-	-	-	-	-	-	-	-	-
3C	Mirhati	CGWB	350/202	-	-	175-199	-	-	-	-	-	-	-	1956	0.0004	-	-	162-180
																		174-184

Toposheet No. 79 A/12

Quadrant No.	Name of site	Agency	Depth of drilling	Aquifers tapped			Aquifer Parameter									Aquifer water quality		
				Aq -I	Aq -II	Aq-III	Aq-I			Aq-II			Aq-III			Aq-I	Aq-II	Aq-III
							K	T	S	K	T	S	K	T	S			
1A	Taherpur	CGWB	351/202	-	175-199	-	-	-	-	-	-	-	-	-	-	-	-	-
1A	Taherpur	CGWB	121/115	95-113	-	-	-	-	-	-	-	-	-	-	-	-	-	-
1B	Magurkhali	CGWB	250/243	-	-	228-240	-	-	-	-	-	-	-	-	-	-	-	-
1B	Magurkhali	CGWB	110/108	88-106	-	-	-	-	-	-	-	-	-	-	-	-	-	-
1B	Magurkhali	CGWB	180/173	-	150-170	-	-	-	-	-	-	-	-	-	-	-	-	-
1C	Nil	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2A	Nil	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2B	Nil	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2C	Nil	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
3A	Nil	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
3B	Mondalhat	CGWB	243/129	-	104-110 112-126	-	-	-	-	-	-	-	-	-	-	-	-	-
3C	Nil	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-

Table- VI : GEOPHYSICAL DATA COMPILATION (2013-14)

Toposheet No.	Quadrant No.	Name of Site	Agency	VES/ TEM	Depth of Investigation	Depth Logged	Layers	Aquifer Identified			Remarks
								Aq-I	Aq-II	Aq-III	
79B/5	**1A**			Nil							
	1B			Nil							
	1C			Nil							
	2A			Nil							
	2B	Bhatpara, N.24 Pgs	CGWB	Nil		250.0 m bgl		30.00 – 42.00 mbgl	61.00 – 150.00 mbgl	160.00 – 181.00 mbgl	
	2C			Nil							
	3A			Nil							
	3B			Nil							
	3C	Mirhati, N.24 Pgs	CGWB	Nil		232.0 m bgl		25.00 - 60.00 mbgl	87.00 – 180.00 mbgl		
79B/9	**1A**	Balindi, Nadia Birohi, Nadia	CGWB CGWB	Nil		252.00 mbgl 248.00 mbgl		21.00- 52.00 mbgl 42.00 - 75.00 mbgl	61.00 - 90.00 mbgl 115.00 - 145.00 mbgl	105.00 - 126.00 mbgl 170.00 - 240.00 mbgl	
	1B			Nil							
	1C	Beri - Gopalpur Gaihata, N. 24 Pgs	CGWB	Nil		160.00 mbgl		17.00 – 102.00 mbgl			
	2A			Nil							
	2B	Chaitanya College, Habra, N.24pgs.	CGWB	Nil		248.00 mbgl		20.00 – 154.00 mbgl	177.00 – 219.00 mbgl	227.00 - 248.00 mbgl	
	2C	Nakpul, Gobar Danga, N. 24 Pgs	CGWB	Nil		158.00 mbgl		31.00 – 158.00 mbgl			
	3A			Nil							
	3B	Ashok nagar,	CGWB	Nil		248.00 mbgl		18.00 -	168.00 –	210.00 –	

		N. 24 Pgs						150.00 mbgl	203.00 mbgl	222.00 mbgl	
	3C			Nil							
79A/12	**1A**	Ranaghat, Nadia	CGWB	Nil		239.0 mbgl		16.00 – 91.00 mbgl	98.00 - 128.00 mbgl	160.00 – 176.00 mbgl	
	1B			Nil							
	1C			Nil							
	2A			Nil							
	2B			Nil							
	2C			Nil							
	3A			Nil							
	3B	Madalhata, Nadia	CGWB	Nil		233.0 mbgl		28.00 – 69.00 mbgl	96.00 – 128.00 mbgl		
	3C			Nil							
79A/16	**1A**			Nil							
	1B	Bagdah, N 24 pgs.	CGWB	Nil		248.0 mbgl		30.00 – 137.00 mgl	140.00 – 206.00 mbgl	212.00 – 238.00 mbgl	
	1C			Nil							
	2A			Nil							
	2B			Nil							
	2C	***NOT INCLUDED IN THE STUDY AREA***									
	3A	Bangaon, N 24 Pgs	CGWB	Nil		238.0 mbgl		12.00 – 100.00 mbgl	176.00 – 207.00 mbgl	221.00-238.00 mbgl	
	3B			Nil							
	3C	***NOT INCLUDED IN THE STUDY AREA***									

Data Gap analysis & Recommendation for Data Generation for aquifer mapping programme in West Bengal State during AAP 2013-14:

Toposheet No.: 79 B/5

Quadrant No.	No. of additional EW required			No. of additional VES/TEM required			No. of additional water level monitoring stations required			No. of additional water quality stations required			Remarks
	Aq-I	Aq-II	Aq-III	Aq-I	Aq-II	Aq-III	Aq-I	Aq-II	Aq-III	Aq-I	Aq-II	Aq-III	
1A	0	0	1	1	2	3	1	0	1	1	0	1	
3A	0	0	1	1	2	3	1	1	1	1	1	1	
2B	2	2	2	2	3	3	1	1	1	1	1	1	
1C	0	0	1	1	2	3	0	1	1	0	1	1	
3C	0	0	0	2	3	3	0	0	1	0	0	1	
Total	**2 (1 EW, 1OW)**	**2 (1 EW, 1OW)**	**5 (4 EW, 1 OW)**	**7**	**12**	**15**	**3**	**3**	**5**	**3**	**3**	**5**	

Note: No. of additional EW required- 9 (Aq-I: 2, Aq-II: 2, Aq-III: 5)

No. of additional VES/TEM required- 34 (Aq-I: 7, Aq-II: I2, Aq-III: 15)

No. of additional water level monitoring stations required -11 (Aq-I: 3, Aq-II: 3, Aq-III: 5)

No. of additional water quality stations required-11 (Aq-I: 3, Aq-II: 3, Aq-III: 5)

Toposheet No. 79 B/5 Exploratory Data adequacy for <u>Three</u> Aquifer group system in Alluvial areas (quadrant wise)

Aq. Gr.	Depth Range	Aq. parameters	EC
Ist	Nil	Nil	Nil
IInd	Nil	Nil	Nil
IIIrd	Nil	Nil	Nil

Aq. Gr.	Depth Range	Aq. parameters	EC
Ist	Nil	Nil	Nil
IInd	Nil	Nil	Nil
IIIrd	Nil	Nil	Nil

Aq. Gr.	Depth Range	Aq. parameters	EC
Ist	Nil	Nil	Nil
IInd	132-150	530m^2/d, 8.3X 10^{-4}	Nil
IIIrd	Nil	Nil	Nil

Aq. Gr.	Depth Range	Aq. parameters	EC
Ist	Nil	Nil	Nil
IInd	131-141	Nil	Nil
IIIrd	Nil	Nil	Nil

Aq. Gr.	Depth Range	Aq. parameters	EC
Ist	Nil	Nil	Nil
IInd	162-184	774 m^2/d	Nil
IIIrd	Nil	Nil	Nil

Aq. Gr.	Depth Range	Aq. parameters	EC
Ist	Nil	Nil	Nil
IInd	Nil	Nil	Nil
IIIrd	Nil	Nil	Nil

Aq. Gr.	Depth Rnge	Aq. parameters	EC
Ist	Nil	Nil	Nil
IInd		Nil	Nil
IIIrd	Nil	Nil	Nil

Aq. Gr.	Depth Range	Aq. parameters	EC
Ist	67-86	1914 m^2/d, 0.0007	Nil
IInd	175-	699m	Nil

Aq. Gr.	Depth Range	Aq. parameters	EC
Ist	70-86	1473 m^2/d, 0.028	Nil
IInd	175-199	1956 m^2/d,	Nil

			199	^{2}/d, 1.25 X 10^{-4}				0.0004		
		IIIrd	Nil	Nil	Nil		IIIrd	Nil	Nil	Nil

Toposheet No. 79 B/5 Exploratory Data Gap Analysis for <u>Three</u> Aquifer group system in Alluvial areas (quadrant wise)

Aq. Gr.	EW/OW/SH/PZ		
	Req	Exist	Gap
Ist	0	0	0
IInd	0	0	0
IIIrd	1EW	0	1 EW

Aq. Gr.	EW/OW/SH/PZ		
	Req	Exist	Gap
Ist	0	0	0
IInd	0	0	0
IIIrd	0	0	0

Aq. Gr.	EW/OW/SH/PZ		
	Req	Exist	Gap
Ist	0	0	0
IInd	1 EW,1 OW	1 EW, 1OW	0
IIIrd	1EW	0	1 EW

Aq. Gr.	EW/OW/SH/PZ		
	Req	Exist	Gap
Ist	0	0	0
IInd	1 EW	1 EW	0
IIIrd	0	0	0

Aq. Gr.	EW/OW/SH/PZ		
	Req	Exist	Gap
Ist	2EW	0	2 EW
IInd	3EW, 1OW	1 EW, 1 OW	2 EW
IIIrd	2EW	0	2 EW

Aq. Gp.	EW/OW/SH/PZ		
	Req	Exist	Gap
Ist	0	0	0
IInd	0	0	0
IIIrd	0	0	0

Aq. Gr.	EW/OW/SH/PZ		
	Req	Exist	Gap
Ist	0	0	0
IInd	0	0	0
IIIrd	1EW	0	1 EW

Aq. Gr.	EW/OW/SH/PZ		
	Req	Exist	Gap
Ist	1 EW 1 OW	1EW 1OW	0
IInd	1 EW 1OW	1EW 1OW	0
IIIrd	0	0	0

Aq. Gr.	EW/OW/SH/PZ		
	Req	Exist	Gap
Ist	1 EW	1 EW	0
IInd	1 EW	1 EW	
IIIrd	0	0	0

Toposheet No. 79 B/5 Data adequacy of GW Monitoring data for <u>Three</u> Aquifer group system in Alluvial areas (quadrant wise)

Aq. Gr.	DW/PZ
Ist	PZ
IInd	N
IIIrd	N

Aq. Gr.	DW/PZ
Ist	PZ
IInd	N
IIIrd	N

Aq. Gr.	DW/PZ
Ist	PZ
IInd	N
IIIrd	N

Aq. Gr.	DW/PZ
Ist	N
IInd	N
IIIrd	N

Aq. Gr.	DW/PZ
Ist	PZ
IInd	N
IIIrd	N

Aq. Gr.	DW/PZ
Ist	PZ
IInd	N
IIIrd	N

Aq. Gr.	DW/PZ
Ist	N
IInd	N
IIIrd	N

Aq. Gr.	DW/PZ
Ist	PZ
IInd	N
IIIrd	N

Aq. Gr.	DW/PZ
Ist	PZ
IInd	N
IIIrd	N

Toposheet No. 79 B/5 Data gap analysis for GW Monitoring data of <u>Three</u> Aquifer group system in Alluvial areas (quadrant wise)

Aq. Gr.	DW/PZ		
	Req	Exist	Gap
Ist	2PZ	1PZ	1 PZ
IInd	0	0	0
IIIrd	1 PZ	0	1 PZ

Aq. Gr.	DW/PZ		
	Req	Exist	Gap
Ist	4PZ	4PZ	0
IInd	0	0	0
IIIrd	0	0	0

Aq. Gr.	DW/PZ		
	Req	Exist	Gap
Ist	5PZ	5PZ	0
IInd	1 PZ	0	1 PZ
IIIrd	1 PZ	0	1 PZ

Aq. Gr.	DW/PZ		
	Req	Exist	Gap
Ist	0	0	0
IInd	0	0	0
IIIrd	0	0	0

Aq. Gr.	DW/PZ		
	Req	Exist	Gap
Ist	2PZ	1PZ	1 PZ
IInd	1 PZ	0	1 PZ
IIIrd	1 PZ	0	1 PZ

Aq. Gr.	DW/PZ		
	Req	Exist	Gap
Ist	0	3PZ	0
IInd	0	0	0
IIIrd	0	0	0

Aq. Gr.	DW/PZ		
	Req	Exist	Gap
Ist	1 PZ	0	1 PZ
IInd	1 PZ	0	1 PZ
IIIrd	1 PZ	0	1 PZ

Aq. Gr.	DW/PZ		
	Req	Exist	Gap
Ist	4 PZ	4PZ	0
IInd	0	0	0
IIIrd	0	0	0

Aq. Gr.	DW/PZ		
	Req	Exist	Gap
Ist	2PZ	2PZ	0
IInd	0	0	0
IIIrd	1 PZ	0	1 PZ

Toposheet No. 79 B/5 (parts) Data adequacy of GW Quality data for <u>Three</u> Aquifer group system in Alluvial areas (quadrant wise)

Aq. Gr.	Sample Point
Ist	Y
IInd	N
IIIrd	N

Aq. Gr.	Sample Point
Ist	Y
IInd	N
IIIrd	N

Aq. Gr.	Sample Point
Ist	Y
IInd	N
IIIrd	N

Aq. Gr.	Sample Point
Ist	N
IInd	N
IIIrd	N

Aq. Gr.	Sample Point
Ist	Y
IInd	N
IIIrd	N

Aq. Gr.	Sample Point
Ist	Y
IInd	N
IIIrd	N

Aq. Gr.	Sample Point
Ist	N
IInd	N
IIIrd	N

Aq. Gr.	Sample Point
Ist	Y
IInd	N
IIIrd	N

Aq. Gr.	Sample Point
Ist	Y
IInd	N
IIIrd	N

Toposheet No. 79 B/5 Data gap analysis for GW Quality data of <u>Three</u> Aquifer group system in Alluvial areas (quadrant wise)

Aq. Gr.	DW/PZ		
	Req	Exist	Gap
Ist	2PZ	1PZ	1 PZ
IInd	0	0	0
IIIrd	1 PZ	0	1 PZ

Aq. Gr.	DW/PZ		
	Req	Exist	Gap
Ist	4PZ	4PZ	0
IInd	0	0	0
IIIrd	0	0	0

Aq. Gr.	DW/PZ		
	Req	Exist	Gap
Ist	5PZ	5PZ	0
IInd	1 PZ	0	1 PZ
IIIrd	1 PZ	0	1 PZ

Aq. Gr.	DW/PZ		
	Req	Exist	Gap
Ist	0	0	0
IInd	0	0	0
IIIrd	0	0	0

Aq. Gr.	DW/PZ		
	Req	Exist	Gap
Ist	2PZ	1PZ	1 PZ
IInd	1 PZ	0	1 PZ
IIIrd	1 PZ	0	1 PZ

Aq. Gr.	DW/PZ		
	Req	Exist	Gap
Ist	0	3PZ	0
IInd	0	0	0
IIIrd	0	0	0

Aq. Gr.	DW/PZ		
	Req	Exist	Gap
Ist	1 PZ	0	1 PZ
IInd	1 PZ	0	1 PZ
IIIrd	1 PZ	0	1 PZ

Aq. Gr.	DW/PZ		
	Req	Exist	Gap
Ist	4 PZ	4PZ	0
IInd	0	0	0
IIIrd	0	0	0

Aq. Gr.	DW/PZ		
	Req	Exist	Gap
Ist	2PZ	2PZ	0
IInd	0	0	0
IIIrd	1 PZ	0	1 PZ

Toposheet No.: 79 B/9

Quadrant No.	No. of additional EW required			No. of additional VES/TEM required			No. of additional water level monitoring stations required			No. of additional water quality stations required			Remarks
	Aq-I	Aq-II	Aq-III	Aq-I	Aq-II	Aq-III	Aq-I	Aq-II	Aq-III	Aq-I	Aq-II	Aq-III	
1A	0	0	0	1	2	3	0	0	1	0	0	1	
3A	0	0	1	1	2	3	1	1	1	1	1	1	
2B	2	2	2	2	3	3	1	0	1	1	0	1	
1C	0	0	1	1	2	3	1	1	1	1	1	1	
3C	0	0	0	2	3	3	1	0	1	1	0	1	
Total	**2 (1 EW, 1OW)**	**2 (1 EW, 1OW)**	**4 (3 EW, 1OW)**	**7**	**12**	**15**	**4**	**2**	**5**	**4**	**2**	**5**	

Note: No. of additional EW required- 8 (Aq-I: 2, Aq-II: 2, Aq-III: 4)

No. of additional VES/TEM required -34 (Aq-I: 7, Aq-II: 12, AQ-III: 15)

No. of additional water level monitoring stations required -11(Aq-I: 4, Aq-II: 2, Aq-III: 5)

No. of additional water quality stations required -11 (Aq-I: 4, Aq-II: 2, Aq-III: 5)

Toposheet No. 79 B/9 Exploratory Data adequacy for <u>Three</u> Aquifer group system in Alluvial areas (quadrant wise)

Aq. Gr.	Depth Range	Aq. parameters	EC
Ist	22-25	Nil	Nil
IInd	110-126	Nil	Nil
IIIrd	205-248	Nil	Nil

Aq. Gr.	Depth Range	Aq. Parameters	EC
Ist	Nil	Nil	Nil
IInd	Nil	Nil	Nil
IIIrd	Nil	Nil	Nil

Aq. Gr.	Depth Range	Aq. parameters	EC
Ist	Nil	Nil	Nil
IInd	Nil	Nil	Nil
IIIrd	Nil	Nil	Nil

Aq. Gr.	Depth Rnge	Aq. parameters	EC
Ist	Nil	Nil	Nil
IInd	Nil	Nil	Nil
IIIrd	Nil	Nil	Nil

Aq. Gr.	Depth Range	Aq. Parameters	EC
Ist	Nil	Nil	Nil
IInd	Nil	Nil	Nil
IIIrd	Nil	Nil	Nil

Aq. Gr.	Depth Range	Aq. parameters	EC
Ist	Nil	Nil	Nil
IInd	123-147	Nil	Nil
IIIrd	208-232	Nil	Nil

Aq. Gr.	Depth Rnge	Aq. parameters	EC
Ist	Nil	Nil	Nil
IInd	Nil	Nil	Nil
IIIrd	Nil	Nil	Nil

Aq. Gr.	Depth Range	Aq. Parameters	EC
Ist	Nil	Nil	Nil
IInd	Nil	Nil	Nil
IIIrd	Nil	Nil	Nil

Aq. Gr.	Depth Range	Aq. parameters	EC
Ist	Nil	Nil	Nil
IInd	Nil	Nil	Nil
IIIrd	Nil	Nil	Nil

Toposheet No. 79 B/9 Exploratory Data Gap Analysis for <u>Three</u> Aquifer group system in Alluvial areas (quadrant wise)

Aq. Gr.	EW/OW/SH/PZ		
	Req	Exist	Gap
Ist	1EW	1EW	0
IInd	1EW	1EW	0
IIIrd	1EW	1EW	0

Aq. Gr.	EW/OW/SH/PZ		
	Req	Exist	Gap
Ist	0	0	0
IInd	0	0	0
IIIrd	0	0	0

Aq. Gr.	EW/OW/SH/PZ		
	Req	Exist	Gap
Ist	0	0	0
IInd	0	0	0
IIIrd	1EW	0	1EW

Aq. Gr.	EW/OW/SH/PZ		
	Req	Exist	Gap
Ist	0	0	0
IInd	1 EW	1 EW	0
IIIrd	0	0	0

Aq. Gr.	EW/OW/SH/PZ		
	Req	Exist	Gap
Ist	2EW	0	2 EW
IInd	2 EW	0	2 EW
IIIrd	2EW	0	2 EW

Aq. Gr.	EW/OW/SH/PZ		
	Req	Exist	Gap
Ist	0	0	0
IInd	1EW	0	0
IIIrd	1EW	0	0

Aq. Gr.	EW/OW/SH/PZ		
	Req	Exist	Gap
Ist	0	0	0
IInd	0	0	0
IIIrd	1EW	0	1 EW

Aq. Gr.	EW/OW/SH/PZ		
	Req	Exist	Gap
Ist	0	0	0
IInd	0	0	0
IIIrd	0	0	0

Aq. Gr.	EW/OW/SH/PZ		
	Req	Exist	Gap
Ist	0	0	0
IInd	0	0	0
IIIrd	0	0	0

Toposheet No. 79 B/9 Data adequacy of GW Monitoring data for Three Aquifer group system in Alluvial areas (quadrant wise)

Aq. Gr.	DW/PZ
Ist	PZ
IInd	N
IIIrd	N

Aq. Gr.	DW/PZ
Ist	PZ
IInd	N
IIIrd	N

Aq. Gr.	DW/PZ
Ist	PZ
IInd	N
IIIrd	N

Aq. Gr.	DW/PZ
Ist	PZ
IInd	N
IIIrd	N

Aq. Gr.	DW/PZ
Ist	PZ
IInd	N
IIIrd	N

Aq. Gr.	DW/PZ
Ist	PZ
IInd	N
IIIrd	N

Aq. Gr.	DW/PZ
Ist	PZ
IInd	N
IIIrd	N

Aq. Gr.	DW/PZ
Ist	PZ
IInd	N
IIIrd	N

Aq. Gr.	DW/PZ
Ist	N
IInd	N
IIIrd	N

Toposheet No. 79 B/9 Data gap analysis for GW Monitoring data of <u>Three</u> Aquifer group system in Alluvial areas (quadrant wise)

Aq. Gr.	DW/PZ		
	Req	Exist	Gap
Ist	2PZ	2PZ	0
IInd	0	0	0
IIIrd	1 PZ	0	1 PZ

Aq. Gr.	DW/PZ		
	Req	Exist	Gap
Ist	2PZ	2PZ	0
IInd	0	0	0
IIIrd	0	0	0

Aq. Gr.	DW/PZ		
	Req	Exist	Gap
Ist	6PZ	5PZ	1 PZ
IInd	1 PZ	0	1 PZ
IIIrd	1 PZ	0	1 PZ

Aq. Gr.	DW/PZ		
	Req	Exist	Gap
Ist	8PZ	8PZ	0
IInd	0	0	0
IIIrd	0	0	0

Aq. Gr.	DW/PZ		
	Req	Exist	Gap
Ist	4PZ	4PZ	0
IInd	1 PZ	0	1 PZ
IIIrd	1 PZ	0	1 PZ

Aq. Gr.	DW/PZ		
	Req	Exist	Gap
Ist	4PZ	4PZ	0
IInd	0	0	0
IIIrd	0	0	0

Aq. Gr.	DW/PZ		
	Req	Exist	Gap
Ist	9 PZ	8PZ	1 PZ
IInd	1 PZ	0	1 PZ
IIIrd	1 PZ	0	1 PZ

Aq. Gr.	DW/PZ		
	Req	Exist	Gap
Ist	6 PZ	6PZ	0
IInd	0	0	0
IIIrd	0	0	0

Aq. Gr.	DW/PZ		
	Req	Exist	Gap
Ist	1PZ	0	1 PZ
IInd	0	0	0
IIIrd	1 PZ	0	1 PZ

Toposheet No. 79 B/9 (parts) Data adequacy of GW Quality data for Three Aquifer group system in Alluvial areas (quadrant wise)

Aq. Gr.	Sample Point
I^{st}	Y
II^{nd}	N
III^{rd}	N

Aq. Gr.	Sample Point
I^{st}	Y
II^{nd}	N
III^{rd}	N

Aq. Gr.	Sample Point
I^{st}	Y
II^{nd}	N
III^{rd}	N

Aq. Gr.	Sample Point
I^{st}	Y
II^{nd}	N
III^{rd}	N

Aq. Gr.	Sample Point
I^{st}	Y
II^{nd}	N
III^{rd}	N

Aq. Gr.	Sample Point
I^{st}	Y
II^{nd}	N
III^{rd}	N

Aq. Gr.	Sample Point
I^{st}	Y
II^{nd}	N
III^{rd}	N

Aq. Gr.	Sample Point
I^{st}	Y
II^{nd}	N
III^{rd}	N

Aq. Gr.	Sample Point
I^{st}	N
II^{nd}	N
III^{rd}	N

Toposheet No. 79 B/9 Data gap analysis for GW Quality data of <u>Three</u> Aquifer group system in Alluvial areas (quadrant wise)

Aq. Gr.	DW/PZ		
	Req	Exist	Gap
Ist	2PZ	2PZ	0
IInd	0	0	0
IIIrd	1 PZ	0	1 PZ

Aq. Gr.	DW/PZ		
	Req	Exist	Gap
Ist	2PZ	2PZ	0
IInd	0	0	0
IIIrd	0	0	0

Aq. Gr.	DW/PZ		
	Req	Exist	Gap
Ist	6PZ	5PZ	1 PZ
IInd	1 PZ	0	1 PZ
IIIrd	1 PZ	0	1 PZ

Aq. Gr.	DW/PZ		
	Req	Exist	Gap
Ist	8PZ	8PZ	0
IInd	0	0	0
IIIrd	0	0	0

Aq. Gr.	DW/PZ		
	Req	Exist	Gap
Ist	4PZ	4PZ	0
IInd	1 PZ	0	1 PZ
IIIrd	1 PZ	0	1 PZ

Aq. Gr.	DW/PZ		
	Req	Exist	Gap
Ist	4PZ	4PZ	0
IInd	0	0	0
IIIrd	0	0	0

Aq. Gr.	DW/PZ		
	Req	Exist	Gap
Ist	9 PZ	8PZ	1 PZ
IInd	1 PZ	0	1 PZ
IIIrd	1 PZ	0	1 PZ

Aq. Gr.	DW/PZ		
	Req	Exist	Gap
Ist	6 PZ	6PZ	0
IInd	0	0	0
IIIrd	0	0	0

Aq. Gr.	DW/PZ		
	Req	Exist	Gap
Ist	1PZ	0	1 PZ
IInd	0	0	0
IIIrd	1 PZ	0	1 PZ

Toposheet No.: 79A/12

Quadrant No.	No. of additional EW required			No. of additional VES/TEM required			No. of additional water level monitoring stations required			No. of additional water quality stations required			Remarks
	Aq-I	Aq-II	Aq-III	Aq-I	Aq-II	Aq-III	Aq-I	Aq-II	Aq-III	Aq-I	Aq-II	Aq-III	
1A	0	0	1	2	3	3	1	1	1	1	1	1	
3A	0	0	1	1	2	3	0	0	1	0	0	1	
2B	2	2	2	1	2	3	0	1	1	0	1	1	
1C	0	0	1	1	2	3	0	1	1	0	1	1	
3C	0	0	1	1	2	3	1	1	1	1	1	1	
Total	**2 (1 EW, 1OW)**	**2 (1 EW, 1OW)**	**6 (5 EW, 1OW)**	**6**	**11**	**15**	**1**	**4**	**5**	**1**	**4**	**5**	

Note: No. of additional EW required- 10 (Aq-I: 2, Aq-II: 2, Aq-III: 6)

No. of additional VES/TEM required- 32 (Aq-I: 6, Aq-II: 11, Aq-III: 15)

No. of additional water level monitoring stations required -10(Aq-I: 1, Aq-II: 4, Aq-III: 5)

No. of additional water quality stations required -10 (Aq-I: 1, Aq-II: 4, Aq-III: 5)

Toposheet No. 79 A/12 Exploratory Data adequacy for Three Aquifer group system in Alluvial areas (quadrant wise)

Aq. Gr.	Depth Range	Aq. parameters	EC
I^{st}	Nil	Nil	Nil
II^{nd}	175-199	Nil	Nil
III^{rd}	Nil	Nil	Nil

Aq. Gr.	Depth Range	Aq. parameters	EC
I^{st}	Nil	Nil	Nil
II^{nd}	150-170	Nil	Nil
III^{rd}	228-240	Nil	Nil

Aq. Gr.	Depth Range	Aq. parameters	EC
I^{st}	Nil	Nil	Nil
II^{nd}	Nil	Nil	Nil
III^{rd}	Nil	Nil	Nil

Aq. Gr.	Depth Range	Aq. parameters	EC
I^{st}	Nil	Nil	Nil
II^{nd}	Nil	Nil	Nil
III^{rd}	Nil	Nil	Nil

Aq. Gr.	Depth Range	Aq. parameters	EC
I^{st}	Nil	Nil	Nil
II^{nd}	Nil	Nil	Nil
III^{rd}	Nil	Nil	Nil

Aq. Gr.	Depth Range	Aq. parameters	EC
I^{st}	Nil	Nil	Nil
II^{nd}	Nil	Nil	Nil
III^{rd}	Nil	Nil	Nil

Aq. Gr.	Depth Range	Aq. parameters	EC
I[st]	Nil	Nil	Nil
II[nd]	Nil	Nil	Nil
III[rd]	Nil	Nil	Nil

Aq. Gr.	Depth Range	Aq. parameters	EC
I[st]	Nil	Nil	Nil
II[nd]	104-126	Nil	Nil
III[rd]	Nil	Nil	Nil

Aq. Gr.	Depth Range	Aq. parameters	EC
I[st]	Nil	Nil	Nil
II[nd]	Nil	Nil	Nil
III[rd]	Nil	Nil	Nil

Toposheet No. 79 A/12 Exploratory Data Gap Analysis for <u>Three</u> Aquifer group system in Alluvial areas (quadrant wise)

Aq. Gr.	EW/OW/SH/PZ		
	Req	Exist	Gap
Ist	0	0	0
IInd	1EW	1EW	0
IIIrd	1EW	0	1EW

Aq. Gr.	EW/OW/SH/PZ		
	Req	Exist	Gap
Ist	0	0	0
IInd	0	1EW	0
IIIrd	0	1EW	0

Aq. Gr.	EW/OW/SH/PZ		
	Req	Exist	Gap
Ist	0	0	0
IInd	0	0	0
IIIrd	1EW	0	1EW

Aq. Gr.	EW/OW/SH/PZ		
	Req	Exist	Gap
Ist	0	0	0
IInd	1 EW	1EW	0
IIIrd	0	0	0

Aq. Gr.	EW/OW/SH/PZ		
	Req	Exist	Gap
Ist	2EW	0	2EW
IInd	2 EW	0	2EW
IIIrd	2EW	0	2EW

Aq. Gr.	EW/OW/SH/PZ		
	Req	Exist	Gap
Ist	0	0	0
IInd	0	0	0
IIIrd	0	0	0

Aq. Gr.	EW/OW/SH/PZ		
	Req	Exist	Gap
Ist	0	0	0
IInd	0	0	0
IIIrd	1EW	0	1 EW

Aq. Gr.	EW/OW/SH/PZ		
	Req	Exist	Gap
Ist	0	0	0
IInd	1EW	1E W	0
IIIrd	0	0	0

Aq. Gr.	EW/OW/SH/PZ		
	Req	Exist	Gap
Ist	0	0	0
IInd	0	0	0
IIIrd	1EW	0	1 EW

Toposheet No. 79 A/12 Data adequacy of GW Monitoring data for <u>Three</u> Aquifer group system in Alluvial areas (quadrant wise)

Aq. Gr.	DW/PZ
Ist	PZ
IInd	N
IIIrd	N

Aq. Gr.	DW/PZ
Ist	PZ
IInd	N
IIIrd	N

Aq. Gr.	DW/PZ
Ist	PZ
IInd	N
IIIrd	N

Aq. Gr.	DW/PZ
Ist	PZ
IInd	N
IIIrd	N

Aq. Gr.	DW/PZ
Ist	N
IInd	N
IIIrd	N

Aq. Gr.	DW/PZ
Ist	PZ
IInd	N
IIIrd	N

Aq. Gr.	DW/PZ
Ist	N
IInd	N
IIIrd	N

Aq. Gr.	DW/PZ
Ist	PZ
IInd	N
IIIrd	N

Aq. Gr.	DW/PZ
Ist	PZ
IInd	N
IIIrd	N

Toposheet No. 79 A/12 Data gap analysis for GW Monitoring data of <u>Three</u> Aquifer group system in Alluvial areas (quadrant wise)

Aq. Gr.	DW/PZ		
	Req	Exist	Gap
Ist	5PZ	4PZ	1 PZ
IInd	1 PZ	0	1 PZ
IIIrd	1 PZ	0	1 PZ

Aq. Gr.	DW/PZ		
	Req	Exist	Gap
Ist	2PZ	2PZ	0
IInd	0	0	0
IIIrd	0	0	0

Aq. Gr.	DW/PZ		
	Req	Exist	Gap
Ist	2PZ	2PZ	0
IInd	1 PZ	0	1 PZ
IIIrd	1 PZ	0	1 PZ

Aq. Gr.	DW/PZ		
	Req	Exist	Gap
Ist	4PZ	4PZ	0
IInd	0	0	0
IIIrd	0	0	0

Aq. Gr.	DW/PZ		
	Req	Exist	Gap
Ist	0	0	0
IInd	1 PZ	0	1 PZ
IIIrd	1 PZ	0	1 PZ

Aq. Gr.	DW/PZ		
	Req	Exist	Gap
Ist	1PZ	1PZ	0
IInd	0	0	0
IIIrd	0	0	0

Aq. Gr.	DW/PZ		
	Req	Exist	Gap
I[st]	0	0	0
II[nd]	0	0	0
III[rd]	1 PZ	0	1 PZ

Aq. Gp.	DW/PZ		
	Req	Exist	Gap
I[st]	2 PZ	2PZ	0
II[nd]	0	0	0
III[rd]	0	0	0

Aq. Gr.	DW/PZ		
	Req	Exist	Gap
I[st]	3PZ	2PZ	1 PZ
II[nd]	1 PZ	0	1 PZ
III[rd]	1 PZ	0	1 PZ

Toposheet No. 79 A/12 Data adequacy of GW Quality data for <u>Three</u> Aquifer group system in Alluvial areas (quadrant wise)

Aq. Gr.	Sample Point
Ist	Y
IInd	N
IIIrd	N

Aq. Gr.	Sample Point
Ist	Y
IInd	N
IIIrd	N

Aq. Gr.	Sample Point
Ist	Y
IInd	N
IIIrd	N

Aq. Gr.	Sample Point
Ist	Y
IInd	N
IIIrd	N

Aq. Gr.	Sample Point
Ist	N
IInd	N
IIIrd	N

Aq. Gr.	Sample Point
Ist	Y
IInd	N
IIIrd	N

Aq. Gr.	Sample Point
Ist	N
IInd	N
IIIrd	N

Aq. Gr.	Sample Point
Ist	Y
IInd	N
IIIrd	N

Aq. Gr.	Sample Point
Ist	Y
IInd	N
IIIrd	N

Toposheet No. 79 A/12 Data gap analysis for GW Quality data of <u>Three</u> Aquifer group system in Alluvial areas (quadrant wise)

Aq. Gr.	DW/PZ		
	Req	Exist	Gap
Ist	5PZ	4PZ	1 PZ
IInd	1 PZ	0	1 PZ
IIIrd	1 PZ	0	1 PZ

Aq. Gr.	DW/PZ		
	Req	Exist	Gap
Ist	2PZ	2PZ	0
IInd	0	0	0
IIIrd	0	0	0

Aq. Gr.	DW/PZ		
	Req	Exist	Gap
Ist	2PZ	2PZ	0
IInd	1 PZ	0	1 PZ
IIIrd	1 PZ	0	1 PZ

Aq. Gr.	DW/PZ		
	Req	Exist	Gap
Ist	4PZ	4PZ	0
IInd	0	0	0
IIIrd	0	0	0

Aq. Gr.	DW/PZ		
	Req	Exist	Gap
Ist	0	0	0
IInd	1 PZ	0	1 PZ
IIIrd	1 PZ	0	1 PZ

Aq. Gr.	DW/PZ		
	Req	Exist	Gap
Ist	1PZ	1PZ	0
IInd	0	0	0
IIIrd	0	0	0

Aq. Gr.	DW/PZ		
	Req	Exist	Gap
Ist	0	0	0
IInd	0	0	0
IIIrd	1 PZ	0	1 PZ

Aq. Gr.	DW/PZ		
	Req	Exist	Gap
Ist	2 PZ	2PZ	0
IInd	0	0	0
IIIrd	0	0	0

Aq. Gr.	DW/PZ		
	Req	Exist	Gap
Ist	3PZ	2PZ	1 PZ
IInd	1 PZ	0	1 PZ
IIIrd	1 PZ	0	1 PZ

Toposheet No.: 79A/16 (Part)

Quadrant No.	No. of additional EW required			No. of additional VES/TEM required			No. of additional water level monitoring stations required			No. of additional water quality stations required			Remarks
	Aq-I	Aq-II	Aq-III	Aq-I	Aq-II	Aq-III	Aq-I	Aq-II	Aq-III	Aq-I	Aq-II	Aq-III	
1A	0	0	1	2	2	3	1	0	1	1	0	1	
3A	0	0	1	2	3	3	1	1	1	1	1	1	
2B	2	2	2	1	2	3	0	0	1	0	0	1	
1C	0	0	1	2	2	3	1	0	1	1	0	1	
3C	Bangladesh			Bangladesh			Bangladesh			Bangladesh			
Total	**2 (1 EW, 1OW)**	**2 (1 EW, 1OW)**	**5 (4 EW, 1OW)**	**7**	**9**	**12**	**3**	**1**	**4**	**3**	**1**	**4**	

Note: No. of additional EW required- 09 (Aq-I: 2, AQ-II: 2, AQ-III: 5)

No. of additional VES/TEM required- 28 (AQ-I:7, Aq-II: 9, AQ-III:12)

No. of additional water level monitoring stations required -8 (AQ-I: 3, AQ-II: 1, AQ-III: 4)

No. of additional water quality stations required- 8 (AQ-I: 3, AQ-II: 1, AQ-III: 4)

Toposheet No. 79 A/16 Exploratory Data adequacy for Three Aquifer group system in Alluvial areas (quadrant wise)

Aq. Gr.	Depth Range	Aq. parameters	EC
I^{st}	Nil	Nil	Nil
II^{nd}	Nil	Nil	Nil
III^{rd}	Nil	Nil	Nil

Aq. Gr.	Depth Range	Aq. parameters	EC
I^{st}	Nil	Nil	Nil
II^{nd}	Nil	Nil	Nil
III^{rd}	Nil	Nil	Nil

Aq. Gr.	Depth Range	Aq. parameters	EC
I^{st}	Nil	Nil	Nil
II^{nd}	Nil	Nil	Nil
III^{rd}	Nil	Nil	Nil

Aq. Gr.	Depth Range	Aq. parameters	EC
I^{st}	Nil	Nil	Nil
II^{nd}	Nil	Nil	Nil
III^{rd}	Nil	Nil	Nil

Aq. Gr.	Depth Range	Aq. parameters	EC
I^{st}	Nil	Nil	Nil
II^{nd}	Nil	Nil	Nil
III^{rd}	Nil	Nil	Nil

Aq. Gr.	Depth Range	Aq. parameters	EC
I^{st}	Nil	Nil	Nil
II^{nd}	Nil	Nil	Nil
III^{rd}	Nil	Nil	Nil

Aq. Gr.	Depth Range	Aq. parameters	EC
I^{st}	Nil	Nil	Nil
II^{nd}	Nil	Nil	Nil
III^{rd}	201-233	Nil	Nil

Aq. Gr.	Depth Range	Aq. parameters	EC
I^{st}	Nil	Nil	Nil
II^{nd}	Nil	Nil	Nil
III^{rd}	Nil	Nil	Nil

Toposheet No. 79 A/16 Exploratory Data Gap Analysis for <u>Three</u> Aquifer group system in Alluvial areas (quadrant wise)

Aq. Gr.	EW/OW/SH/PZ		
	Req	Exist	Gap
Ist	0	0	0
IInd	0	0	0
IIIrd	1EW	0	1 EW

Aq. Gr.	EW/OW/SH/PZ		
	Req	Exist	Gap
Ist	0	0	0
IInd	0	0	0
IIIrd	0	0	0

Aq. Gr.	EW/OW/SH/PZ		
	Req	Exist	Gap
Ist	0	0	0
IInd	0	0	0
IIIrd	1EW	0	1 EW

Aq. Gr.	EW/OW/SH/PZ		
	Req	Exist	Gap
Ist	0	0	0
IInd	1 EW	1 EW	0
IIIrd	0	0	0

Aq. Gr.	EW/OW/SH/PZ		
	Req	Exist	Gap
Ist	2EW	0	2 EW
IInd	2 EW	0	2 EW
IIIrd	2EW	0	2 EW

Aq. Gp.	EW/OW/SH/PZ		
	Req	Exist	Gap
Ist	0	0	0
IInd	0	0	0
IIIrd	0	0	0

Aq. Gr.	EW/OW/SH/PZ		
	Req	Exist	Gap
Ist	0	0	0
IInd	0	0	0
IIIrd	2EW	1EW	1EW

Aq. Gr.	EW/OW/SH/PZ		
	Req	Exist	Gap
Ist	0	0	0
IInd	0	0	0
IIIrd	0	0	0

Toposheet No. 79 A/16 Data adequacy of GW Monitoring data for Three Aquifer group system in Alluvial areas (quadrant wise)

Aq. Gr.	DW/PZ
Ist	N
IInd	N
IIIrd	N

Aq. Gr.	DW/PZ
Ist	PZ
IInd	N
IIIrd	N

Aq. Gr.	DW/PZ
Ist	PZ
IInd	N
IIIrd	N

Aq. Gr.	DW/PZ
Ist	PZ
IInd	N
IIIrd	N

Aq. Gr.	DW/PZ
Ist	PZ
IInd	N
IIIrd	N

Aq. Gr.	DW/PZ
Ist	PZ
IInd	N
IIIrd	N

Aq. Gr.	DW/PZ
Ist	PZ
IInd	N
IIIrd	N

Toposheet No. 79 A/16 Data gap analysis for GW Monitoring data of <u>Three</u> Aquifer group system in Alluvial areas (quadrant wise)

Aq. Gr.	DW/PZ		
	Req	Exist	Gap
Ist	1PZ	0	1 PZ
IInd	0	0	0
IIIrd	1 PZ	0	1 PZ

Aq. Gr.	DW/PZ		
	Req	Exist	Gap
Ist	3PZ	3PZ	0
IInd	0	0	0
IIIrd	0	0	0

Aq. Gr.	DW/PZ		
	Req	Exist	Gap
Ist	2PZ	2PZ	0
IInd	0	0	0
IIIrd	1 PZ	0	1 PZ

Aq. Gr.	DW/PZ		
	Req	Exist	Gap
Ist	3PZ	3PZ	0
IInd	0	0	0
IIIrd	0	0	0

Aq. Gr.	DW/PZ		
	Req	Exist	Gap
Ist	3PZ	3PZ	0
IInd	0	0	0
IIIrd	1 PZ	0	1 PZ

Aq. Gr.	DW/PZ		
	Req	Exist	Gap
Ist	3PZ	3PZ	0
IInd	1 PZ	0	1 PZ

Aq. Gr.	DW/PZ		
	Req	Exist	Gap
Ist	2 PZ	2PZ	0
IInd	0	0	0
IIIrd	0	0	0

III[rd]	1 PZ	0	1 PZ		

Toposheet No. 79 A/16 Data adequacy of GW Quality data for Three Aquifer group system in Alluvial areas (quadrant wise)

Aq. Gr.	Sample Point
I st	N
II nd	N
III rd	N

Aq. Gr.	Sample Point
I st	Y
II nd	N
III rd	N

Aq. Gr.	Sample Point
I st	Y
II nd	N
III rd	N

Aq. Gr.	Sample Point
I st	Y
II nd	N
III rd	N

Aq. Gr.	Sample Point
I st	Y
II nd	N
III rd	N

Aq. Gr.	Sample Point
I st	Y
II nd	N
III rd	N

Aq. Gr.	Sample Point
I st	Y
II nd	N
III rd	N

Toposheet No. 79 A/16 Data gap analysis for GW Quality data of <u>Three</u> Aquifer group system in Alluvial areas (quadrant wise)

Aq. Gr.	DW/PZ		
	Req	Exist	Gap
Ist	1PZ	0	1 PZ
IInd	0	0	0
IIIrd	1 PZ	0	1 PZ

Aq. Gr.	DW/PZ		
	Req	Exist	Gap
Ist	3PZ	3PZ	0
IInd	0	0	0
IIIrd	0	0	0

Aq. Gr.	DW/PZ		
	Req	Exist	Gap
Ist	2PZ	2PZ	0
IInd	0	0	0
IIIrd	1 PZ	0	1 PZ

Aq. Gr.	DW/PZ		
	Req	Exist	Gap
Ist	3PZ	3PZ	0
IInd	0	0	0
IIIrd	0	0	0

Aq. Gr.	DW/PZ		
	Req	Exist	Gap
Ist	3PZ	3PZ	0
IInd	0	0	0
IIIrd	1 PZ	0	1 PZ

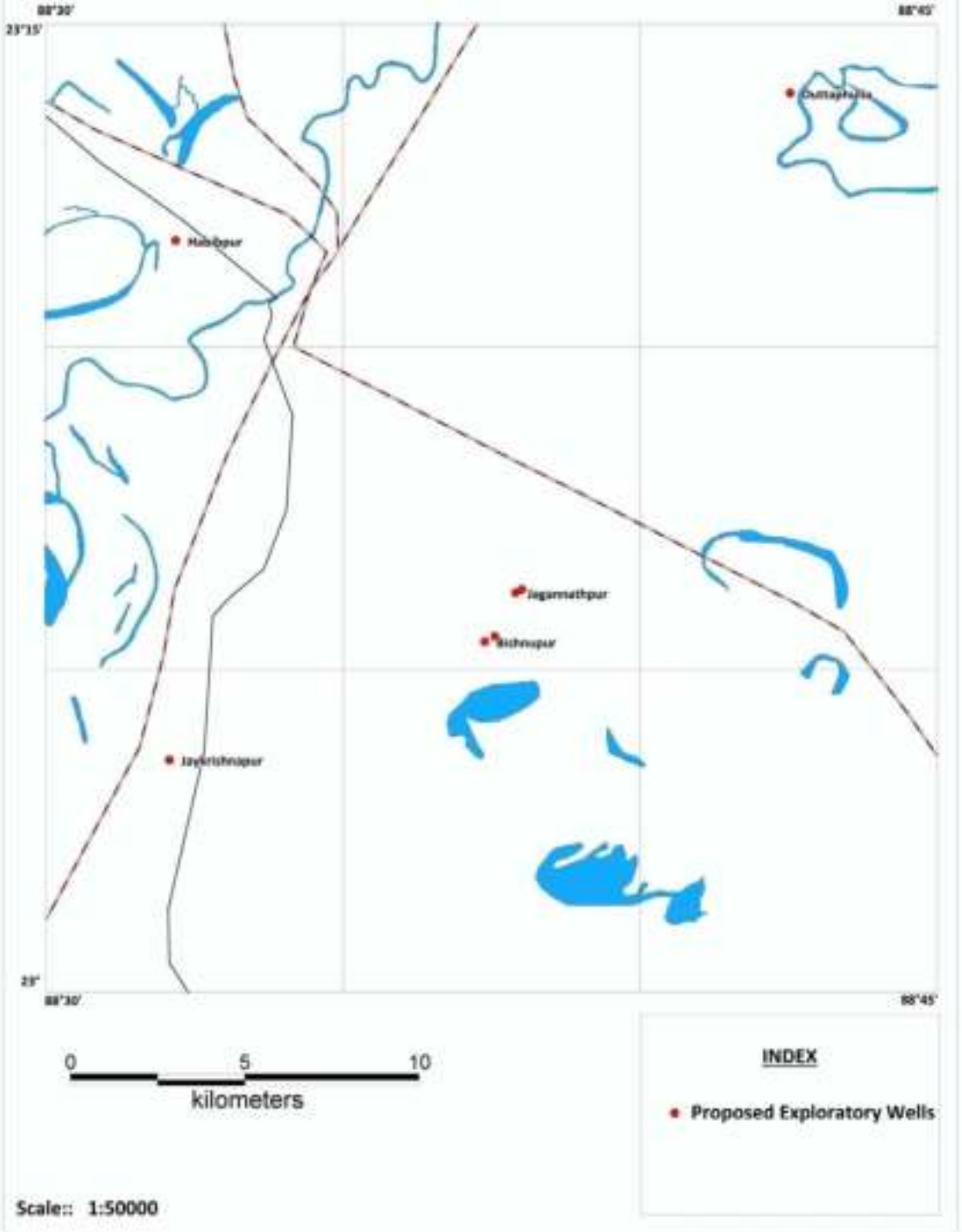
Aq. Gr.	DW/PZ		
	Req	Exist	Gap
Ist	3PZ	3PZ	0
IInd	1 PZ	0	1 PZ

Aq. Gr.	DW/PZ		
	Req	Exist	Gap
Ist	2 PZ	2PZ	0
IInd	0	0	0
IIIrd	0	0	0

III[rd]	1 PZ	0	1 PZ		

T/S NO. 79 A/12

Exploratory Well Location Map



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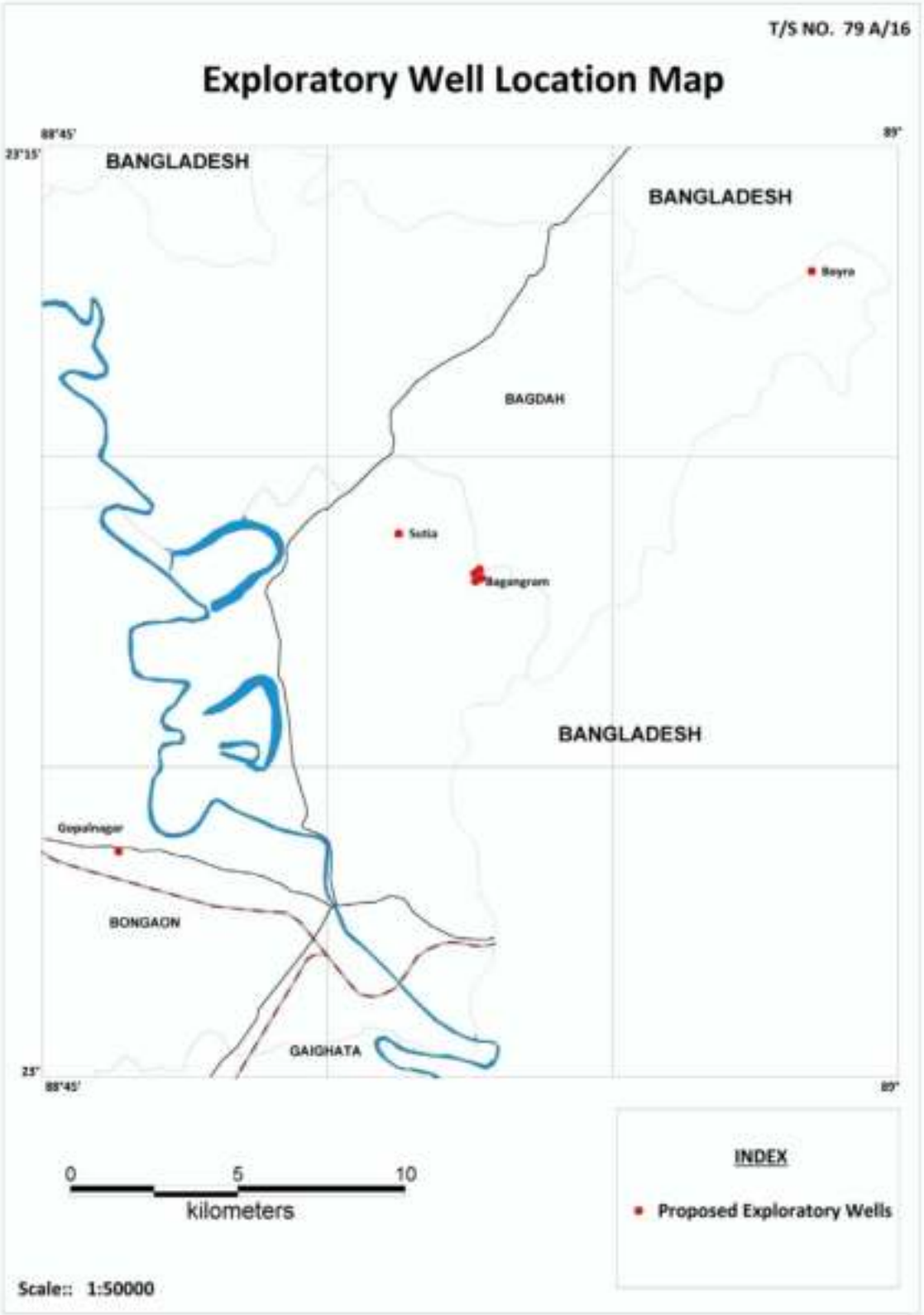
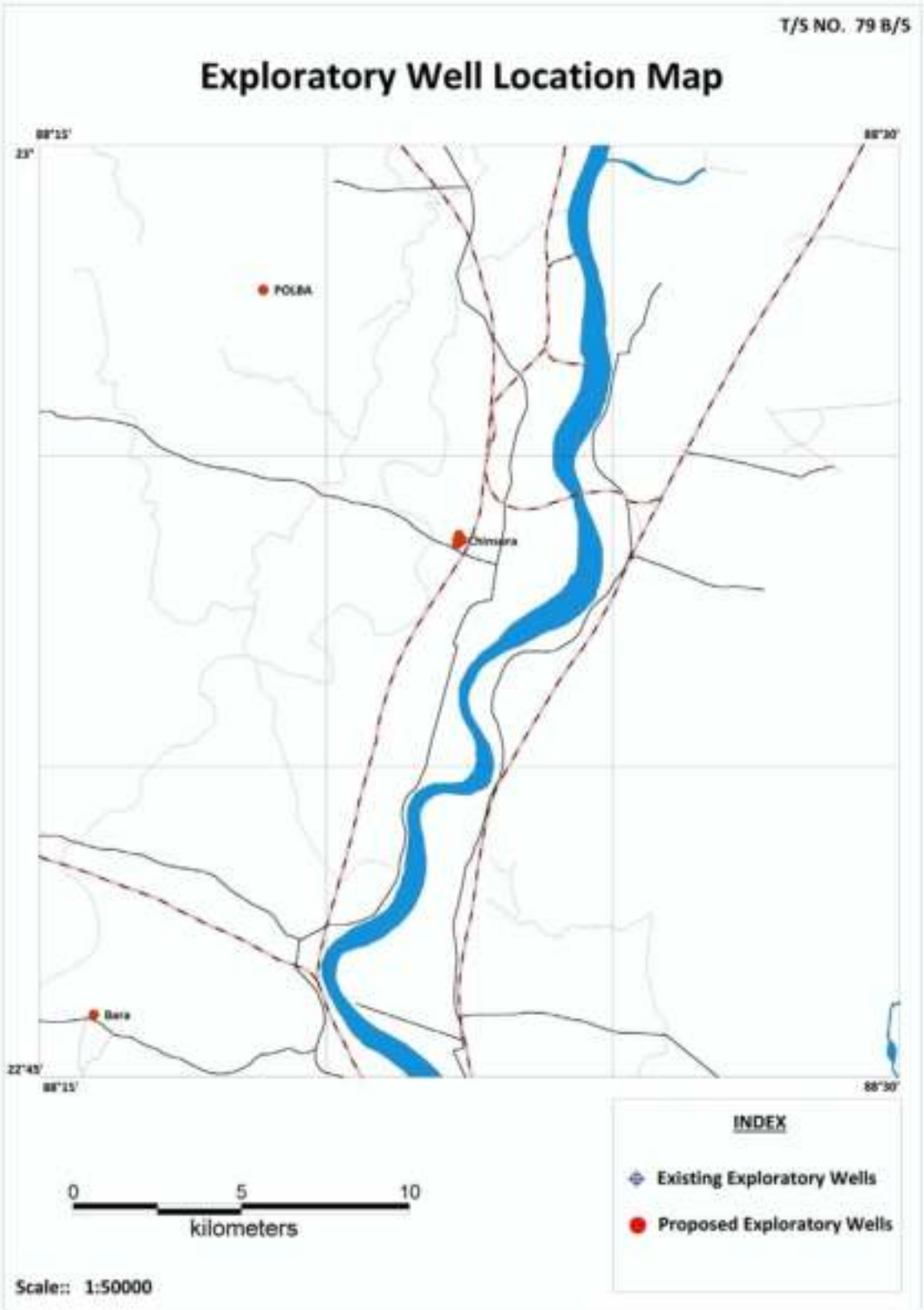
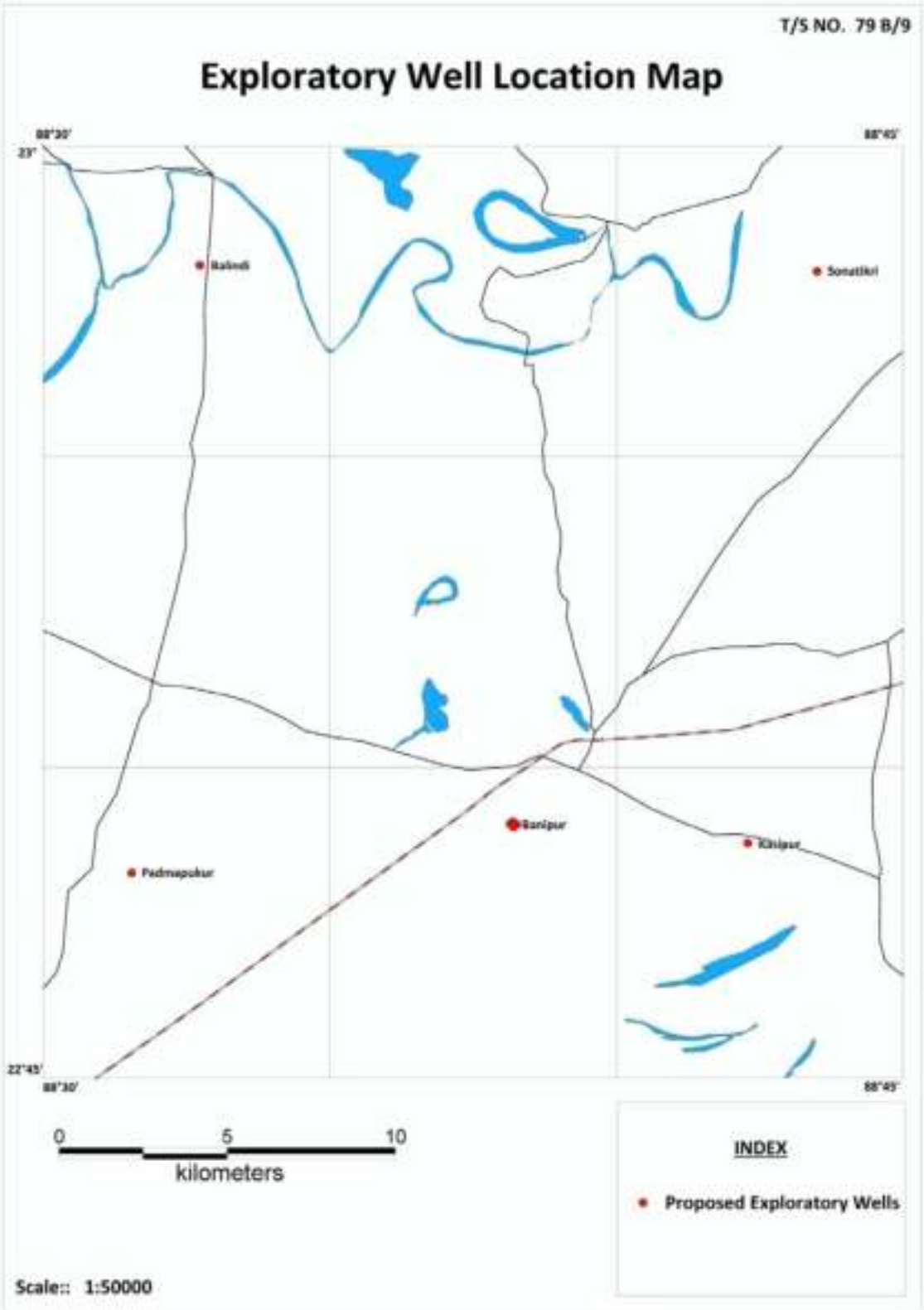

T/S NO. 79 A/16
Exploratory Well Location Map
88°45'
89°
23°15'
BANGLADESH
BANGLADESH
Boyra
BAGDAH
Sutia
Bagangram
BANGLADESH
Gopalnagar
BONGAON
GAIGHATA
23°
88°45'
89°
0
5
10
kilometers
INDEX
Proposed Exploratory Wells
Scale:: 1:50000


T/S NO. 79 B/5
Exploratory Well Location Map
88°15'
88°30'
23°
POLBA
Chinsura
Bara
22°45'
88°15'
88°30'
INDEX
Existing Exploratory Wells
Proposed Exploratory Wells
0
5
10
kilometers
Scale:: 1:50000


T/S NO. 79 B/9
Exploratory Well Location Map
88°30'
88°45'
23°
Sonatikri
Banipur
Padmapukur
22°45'
88°30'
88°45'
0
5
10
kilometers
INDEX
Proposed Exploratory Wells
Scale:: 1:50000

Location List of Proposed Exploratory wells in Toposheet No 79B/5

Sl No	Location	Block_Name	Longitude	Latitude	Type	Depth (m)
1	POLBA	DADPUR-POLBA	88.315	22.9612	SPEW	300
2	Chinsura	CHUNCHURA	88.3715	22.8938	DEW	300
3	Chinsura	CHUNCHURA	88.3729	22.894	IEW	200
4	Chinsura	CHUNCHURA	88.372	22.8947	SEW	100
5	Bara	CHANDITALA-I	88.2657	22.7666	SPEW	300
6	Chinsura	CHUNCHURA	88.3715	22.8931	DOW	300
7	Chinsura	CHUNCHURA	88.372	22.8954	SOW	100

SPEW- Special Purpose Exploratory Wells to be converted to monitoring well.
DEW- Deep Exloratory well
IEW- Intermediate Exploratory well
SEW- Shallow Exploratory well
DOW- Deep Observation well
IOW- Intermediate Observation well
SOW- Shallow Observation well

Location List of Proposed Exploratory wells in Toposheet No 79B/9

Sl No	Location	Longitude	Latitude	Block_Name	District	Type	Depth (m)
1	Banipur	88.6358	22.8181	HABRA-I	N 24 Pargana	SOW	100
2	Banipur	88.6365	22.8188	HABRA-I	N 24 Pargana	SEW	100
3	Banipur	88.6377	22.818	HABRA-I	N 24 Pargana	DOW	300
4	Banipur	88.6367	22.8173	HABRA-I	N 24 Pargana	DEW	300
5	Balindi	88.5455	22.9681	HARINGHATA	Nadia	SPEW	300
6	Sonatikri	88.7251	22.9665	GAIGHATA	N 24 Pargana	SPEW	300
7	Kasipur	88.7049	22.813	HABRA-I	N 24 Pargana	SPEW	300
8	Padmapukur	88.5256	22.805	HABRA-II	N 24 Pargana	SPEW	300

SPEW- Special Purpose Exploratory Wells to be converted to monitoring well.
DEW- Deep Exloratory well
IEW- Intermediate Exploratory well
SEW- Shallow Exploratory well
DOW- Deep Observation well
IOW- Intermediate Observation well
SOW- Shallow Observation well

Location List of Proposed Exploratory wells in Toposheet No 79A/12

Sl no	Location	Longitude	Latitude	Block_Name	District	Type	Depth (m)
1	Bishnupur	88.623	23.0906	CHAKDAH	Nadia	SEW	100
2	Bishnupur	88.6259	23.0919	CHAKDAH	Nadia	IEW	200
3	Jagannathpur	88.6317	23.1031	CHAKDAH	Nadia	DEW	300
4	Jagannathpur	88.6335	23.1039	CHAKDAH	Nadia	DOW	300
5	Habibpur	88.5364	23.1942	RANAGHATI & II	Nadia	SPEW	300
6	Duttaphulia	88.7087	23.2322	RANAGHATI & II	Nadia	SPEW	300
7	Jaykrishnapur	88.5346	23.0599	CHAKDAH	Nadia	SPEW	300

SPEW- Special Purpose Exploratory Wells to be converted to monitoring well.
DEW- Deep Exloratory well
IEW- Intermediate Exploratory well
SEW- Shallow Exploratory well
DOW- Deep Observation well
IOW- Intermediate Observation well
SOW- Shallow Observation well

Location List of Proposed Exploratory wells in Toposheet No 79A/16

Sl No	Location	Longitude	Latitude	Block	District	Type	Depth in m
1	Boyra	88.9747	23.2165	BAGDAH	N 24 Parganas	SPEW	300
2	Gopalnagar	88.7723	23.0606	BONGAON	N 24 Parganas	SPEW	300
3	Bagangram	88.8765	23.1332	BONGAON	N 24 Parganas	SEW	100
5	Bagangram	88.8784	23.134	BONGAON	N 24 Parganas	SOW	100
6	Sutia	88.8541	23.1459	BONGAON	N 24 Parganas	IEW	210
7	Bagangram	88.8762	23.1353	BONGAON	N 24 Parganas	DEW	300
8	Bagangram	88.8777	23.1363	BONGAON	N 24 Parganas	DOW	300

SPEW- Special Purpose Exploratory Wells to be converted to monitoring well.
DEW- Deep Exloratory well
IEW- Intermediate Exploratory well
SEW- Shallow Exploratory well
DOW- Deep Observation well
IOW- Intermediate Observation well
SOW- Shallow Observation well

Chapter – 2

CLIMATE

The climate of the area is characterized by hot and humid climate with adequate rainfall mainly derived from south-west monsoon, which starts from mid-June and continue up to September. Generally, 85 percent of the rainfall is received during the monsoon period. Pre-monsoon showers are occasionally received in the month of March, April and May.

2.1 Rainfall

The average annual rainfall in the four districts of the surveyed area from 2009-2013 is 1260 mm. Rainfall amount is measured in the study area from the Rain gauge stations situated in different blocks. District-wise the average annual rainfall data for a period of 5 years (2009-2013) have been tabulated below (Table-II). Overall the rainfall is lesser in northern part of the area compared to southern part.

The normal annual rainfall (1980-2013) is slightly higher at 1442 mm. It is obvious that there is slight decrease in rainfall during the last 5 years.

Table-II Average annual rainfall in different districts for the period 2009 -13

(in mm)

District	Normal	Actual				
		2009	2010	2011	2012	2013
(1)	(2)	(3)	(4)	(5)	(6)	(7)
Bardhaman	1271	1229	856	1322	1030	1216
Hugli	1516	1263	1044	1556	1152	1494
Nadia	1401	1209	940	1488	1039	1245
N 24 Parganas	1579	1410	1180	1669	1208	1658

Source: State Statistical Handbook, 2013

The Iso-hyet Map of the study area is shown in **Plate-3**

2.2 Temperature

The winter season sets in around middle of November when both maximum and minimum temperature begin to drop steadily and attain their respective lowest values in the month of January. The temperature starts rising in the month of February. May is the hottest month of the year. Maximum and minimum temperature recorded in 2004 to 2007 in Nadia & Hugli districts are 40^0 C and 8^0 C respectively, while the same are 41^0 C & 9^0 C in N 24 Parganas district, and 44^0 C & 9^0 C in Bardhaman district.

Chapter – 3

PHYSIOGRAPHY

3.1 Geomorphology

Overall the study area belongs to alluvial plane topography with meander scar, cut off/ abandoned channel, point bar, natural levee type landforms. The area under study is generally with flat topography with surface elevation ranging from 11 to 15 m above mean sea level (amsl). Geomorphic unit is mostly Younger deltaic plain; Older alluvium occupies a small part in western sector of study area. The Geomorphology Map of the study area is shown in **Plate-4**.

3.2 Drainage

The tributaries of Ganga/ Padma viz., Bhagirathi/ Hugli, Jalangi, Churni, Ichhamati etc form the major drainage-system in the study area. All rivers and tributaries are perennial in nature. The major river Bhagirathi/ Hugli flows along the central portion of the area from almost north to south direction. The other tributaries like- Jalangi, Churni flow from north-east to south-west, and Ichhamati flows from north to south along the south-eastern boundary of the study area. The Drainage & Water Body Map of the study area is shown in **Plate-5**.

3.3 Soil Characteristics

In the study area, the soil is light alluvium type with comparatively light texture. The soil is low in organic carbon content and soil reaction is slightly acidic to neutral. Main types of soil in the study area are fine to coarse loamy soils, fine soils, fine cracking soils etc. The detailed Soil Map of this area is shown in **Plate-6**.

4. GEOLOGY

4.1 General geology

The area under study is covered by a huge thickness of Recent to Sub-Recent Alluvium of the Ganga river system (Quaternary age). Recent fluviatile sediments consists of clay, silt, sand and gravel succession. Sand is grey coloured with fine to coarse grained and highly micaceous in nature. Gravels are mainly composed of quartz, rock fragments

and laterites (**Plate-7).**

4.2 Subsurface Geology

In the area under study, sediment thickness is more than 300 mbgl. Generally fine to very fine sand, sometimes mixed with clay occurs at or near the surface to a depth of 3- 5 mbgl. The presence of 150 to 180 m thick granular zone composed of coarse sand and gravel within 200 mbgl, occur consistently throughout the area. Although local clay lenses have been observed within the medium sand at shallow depth. Exploration in the area reveals that in some blocks, viz. Purbasthali-I, Kalna-I, in Bardhaman district, Polba-Dadpur in Hugli district, Krishnanagar-II in Nadia district, Gaighata, Bangaon, Habra-I in N 24 Parganas district consistent clay layers encounters, in general, in the depth span of 150-250 mbgl, beyond which sand of various grades encounters down to the drilling depth of 400 mbgl.

A total 217 No. lithologs of tube wells (CGWB & State Dept.) have been considered for the study of subsurface geology. The map showing the locations of the Exploratory Wells by CGWB/ State Govt. wells is presented in **Plate-8.** The 2D/3D views of the aquifer system in the study area are shown below as: - (a) Multi-log 3D Plot of the EWs; (b) Lithological Fence 3D Model in **Plate-9**; Aquifer 3D Model **(Plate-10),** Isopach 2D of Aquifer-I in As area (**Plate 11),** Isopach 2D of Aquifer-II in As area (**Plate 12),** Lithological 3D Model in the area (300 m) (**Plate 13),** Lithology Profile along A-A' (N-S) in As area in the study area (**Plate 14),** Aquifer Section in As area (**Plate 15),** Lithology Profile along A-A' (NW-SE) in As area (**Plate 16),** Lithology Profile along A-A' (NE-SW) in As area (**Plate 17).**

5. HYDROGEOLOGY

5.1 Water bearing Formation:

The area under study is underlain by Quaternary alluvium the aquifers are regionally extensive and interconnected forming a single potential aquifer system within about 200 mbgl. However, number of discontinuous clay partings exists within this top aquifer. From the exploration data of CGWB & other organisations, it has been found that this top aquifer is, in general, underlain by the thick clay layer down to the drilled depth of about 400 mbgl.

Depth to Water level Map (Pre Monsoon, 2015) of Aquifer Mapping Area (**Plate 18) &** Depth to Water level Map (Post Monsoon, 2015) of Aquifer Mapping Area (**Plate 19)** have been depicted respectively.

In general, the presence of about 150 to 180 m thick granular zone within 200 mbgl, in which coarse sand and gravel occurs with local discontinuous clay lenses, forms the 1st Aquifer Group. However, in some blocks say, Purbasthali-I, Kalna-I, in Bardhaman district, Polba-Dadpur in Hugli district, Krishnanagar-II in Nadia district, Gaighata, Bangaon, Habra-I in N 24 Parganas district consistent 2nd Aquifer Group exists within the depth span of 250-380 mbgl, as revealed from exploration data**.**

5.2 Occurrence, movement and distribution of ground water:

In the study area, ground water occurs under water table conditions down to a depth of about 180 mbgl . Wherever upper sandy or silty clay is present, aquifer impart a partially confined conditions. In some parts of Purbasthali-I, Kalna-I in Bardhaman district, Polba-Dadpur in Hugli district, Krishnanagar-II in Nadia district, Gaighata, Bangaon, Habra-I in N 24 Parganas district ground water occurs under confined conditions between depth of 200 to 330 mbgl.

From the Hydrogeological Map (**Plate-20**) showing water table contours, it is observed that, ground water table ranges from more than 12m amsl (above mean sea level) to more than 6m bmsl (below mean sea level) during pre-monsoon period and, from more than 15 m amsl (above mean sea level) to more than 3 m bmsl (below mean sea level) during post-monsoon period of 2015. The regional ground water flow is in general, from north-west to south-east direction from Purbasthali-II of Bardhaman district to Habra-I block of 24 Parganas (N) district. In the study area, locally there are a number of ground water troughs and mounds, as observed.

5.3 Aquifer with groundwater regime, depth to water level, hydrograph analysis etc.

During detailed survey 273 numbers of almost uniformly distributed key observation wells have been established in the study area and in addition, 164 NHS falling in this area were considered for water level monitoring and water sample collection **(Plate-18 & 19).** These are mostly tube-wells within 150 mbgl representing I^{st} aquifer system.

5.4 Ground Water Flow through the deeper 2^{nd} Aquifer:

Piezometric Surface of 2^{nd} aquifer (generally occurs below 180m bgl & confined aquifer in nature) during pre-monsoon period has been prepared and presented in **Plate 21.**

In the area Piezometric surface ranges from 16m to -3.5m amsl with local piezometric mounds & troughs and with local variations of ground water flow direction. The highest mounds are observed in Pandua, Chinsurah-Magra, Ranaghat-I & II, Chakdah & Barrackpur-I blocks; and the deepest troughs are observed in Polba-Dadpur, Kalna & Balagarh blocks. The regional ground water flow is mainly towards southeast.

Ground water flow has been calculated by Darcy's law using Q= TIL where Q is quantity of ground water flowing through the area, T is Transmissivity of the Aquifer , I is Hydraulic Gradient and L is maximum length of flow path perpendicular to flow direction.

In general ground water flow is from NW to SE within the area. Maximum length of flow path across the area in NE-SW direction (length L) is 90 km i.e. 90,000m with Hydraulic gradient of 1: 12000 (as 6 m drop for distance of 72 km or 72000m). Average Transmissivity (T) of the 2^{nd} aquifer is considered as $600 m^2$/day. The quantity of Ground Water flow is calculated as 4500 m^3/day (600 x (1/12000) x 90000) or **1.6425 MCM/yr** for the present ground water scenario.

5.4 Pre-monsoon & Post-monsoon long term trend analysis :

The long term trend analysis reveals that there are falling trends in all the Blocks both during Pre-monsoon and Post-monsoon periods except in Kalna-II and Ranaghat-I blocks where slight rising trends are observed during pre-monsoon period (**Plate-22 & 23**). The Pre-monsoon falling trend varies from 0.01 cm/year (in Krihnanagar-I Block) to 43.70 cm/year (in Singur Block). The Post-monsoon falling trend varies from 3.62 cm/year (in Bangaon Block) to 33.96 cm/year (in Polba-Dadpur Block) Details of pre-monsoon and post-monsoon water level trend (from 1995 to 2011) in cm/year for individual Block is given in Table-III.

Table III: Block-wise Pre-monsoon and Post-monsoon long term water level trends (1995 to 2011)

Sl. No.	Block	Pre-monsoon		Post-monsoon	
		Rise (cm/year)	Fall (cm/year)	Rise (cm/year)	Fall (cm/year)
1	2	3	4	5	6
1.	Kalna- I	-	1.32	-	8.53
2.	Kalna- II	2.74	-	-	30.55
3.	Purbasthali- I	-	5.30	-	11.16
4.	Purbasthali- II	-	12.73	-	19.38
5.	Balagarh	-	2.60	-	13.75
6.	Chinsura- Magra	-	18.99	-	26.38
7.	Pandua	-	16.09	-	25.32
8.	Polba-Dadpur	-	35.28	-	33.96
9.	Serampur-Uttarpara	-	14.51	-	16.17
10.	Singur	-	43.70	-	29.14
11.	Chanditala- I	-	33.85	-	18.50
12.	Chakdah	-	6.09	-	11.63
13.	Haringhata	-	8.80	-	10.30
14	Krihnanagar- I	-	0.01	-	7.29
15	Krihnanagar- II	-	1.79	-	8.52
16	Ranaghat- I	0.41	-	-	5.22
17	Ranaghat- II	-	1.88	-	7.69
18	Nabadwip	-	4.58	-	6.70
19	Shantipur	-	3.76	-	8.23
20	Amdanga	-	14.57	-	23.69
21	Bagdah	-	4.08	-	8.06
22	Barrackpur- I	-	13.32	-	18.64
23	Bangaon	-	1.76	-	3.62
24	Gaighata	-	5.63	-	6.02

25	Habra- I	-	2.19	-	9.01
26	Habra- II	-	9.12	-	17.02

Chapter-6

6. GROUND WATER RESOURCES, DRAFT, SOD & CATEGORY

Dynamic Ground water resources of Aquifer –I in the area under study have been calculated on the basis of GEC (1997) methodology by CGWB and State Water Investigation Department (SWID) for the year as on 31.03.2011. The block wise computed data of dynamic ground water resources, as on 31st March 2011 is shown below in Table-IV.

Table-IV. Block wise dynamic ground water resources as on 31st March'11

Sr. No.	District	Name of Block	Net Available GW Resources in MCM	Gross GW Draft in MCM	SOD % in 2011	Pre trend (- rising & + Falling)	Post trend (- rising & + Falling)	Category of Block
1	Barddhaman	Purbasthali I	8217.79	4021.34	48.93	5.30	11.16	Safe
2		Purbasthali II	10255.29	7703.92	75.12	12.73	19.38	Safe
3		Kalna I	11195.83	3239.08	28.52	1.32	8.53	Safe
4		Kalna II	7820.50	4365.92	55.45	-2.74	30.55	Semi Critical
5	Nadia	Chakdah	16057.89	8451.31	52.63	6.09	11.63	Safe
6		Haringhata	8321.47	6276.05	75.42	8.8	10.3	Safe
7		Krishnanagar I	14562.95	11343.81	77.89	0.01	7.29	Safe
8		Krishnanagar II	5588.29	4476.23	80.00	1.79	8.52	Safe
9		Ranaghat I	6474.54	4181.45	64.58	-0.41	5.22	Safe
10		Ranaghat II	14517.25	12420.36	85.56	1.88	7.69	Safe
11		Shantipur	7472.69	5778.18	77.32	3.76	8.23	Safe
12		Nabadwip	4911.40	3217.49	65.51	4.58	6.7	Safe
13	Hughli	Balagarh	11973.63	5522.74	45.79	2.60	13.75	Safe

14		Pandua	11241.31	5603.45	49.38	16.09	25.32	Semi Critical
15		Chinsurah	4628.39	1782.22	38.50	18.99	26.38	Semi Critical
16		Polba-Dadpur	11514.14	5462.19	47.05	35.28	33.96	Semi Critical
17		Singur	7247.79	2648.91	36.54	43.70	29.14	Semi Critical
18		Chanditala I	3781.26	1774.37	46.11	33.85	18.50	Safe
19		Srirampur-Uttarpara	3447.94	1717.38	49.81	14.51	16.17	Safe
20	North 24 Parganas	Amdanga	6540.26	3533.43	54.03	14.57	23.69	Safe
21		Bagdah	12673.84	9713.10	76.64	4.08	8.06	Safe
22		Barrackpore I	9066.31	3417.73	37.70	13.32	18.64	Safe
23		Bongaon	18561.12	12567.17	67.71	1.76	3.62	Safe
24		Gaighata	13062.50	9717.44	74.39	5.63	6.02	Safe
25		Habra I	8257.52	5771.02	69.89	2.19	9.01	Safe
26		Habra II	5272.49	2822.43	53.53	9.12	17.02	Safe

On the basis of ground water resource calculation (2011) and water level trend, 5 blocks viz. Kalna-II block of Bardhaman district and, Pandua, Chinsurah-Magra, Polba-Dadpur & Singur blocks of Hugli district have been categorized as 'Semi-Critical' blocks. Rest of the blocks i.e. 21 blocks have been categorized as 'Safe' blocks.

The Static (In-storage) Ground water resources of **Aquifer –I** in the study area is estimated based on the average Specific Yield (considered as 16% for the blocks of Hugli district and 20% for rest of the blocks of Bardhaman, Nadia & 24 Parganas (N) districts), and the pre-monsoon saturated thickness of the phreatic aquifer. Block-wise the In-storage ground water resources were calculated and tabulated which is shown in Table-V.

Table-V: In-storage Ground Water Resources in Aquifer-I (Phreatic) in the area

Block	Geographic area (sq.km.)	Average Depth of Pre-monsoon Water level (mbgl)	Considerable Specific yield (Approx.)	Average Thickness of Granular Zone in 1st aquifer (m)	Thickness of the Granular Zone/ Productive Zone below Pre- monsoon WL (m)	In-Storage Ground Water Resources (MCM)
Kalna- I	178.22	12.78	0.15	120	107.22	2866.31226
Kalna- II	172.64	13.71	0.15	210	196.29	5083.12584
Purbasthali- I	151.28	13.03	0.15	170	156.97	3561.96324
Purbasthali- II	199.61	8.64	0.15	138	129.36	3873.23244
Balagarh	215.52	10.58	0.11	171	160.42	3803.109024
Chinsura-Magra	96.35	12.96	0.11	140	127.04	1346.43344
Pandua	284.03	16.47	0.11	132	115.53	3609.538449
Polba-Dadpur	287.85	15.44	0.11	140	124.56	3944.00556
Serampur-Uttarpara	93.07	7.81	0.11	181	173.19	1773.067263
Singur	206.23	17.07	0.11	210	192.93	4376.674929
Chanditala- I	93	13.73	0.11	122	108.27	1107.6021
Chakdah	346.61	8.54	0.15	105	96.46	5015.10009
Haringhata	164.28	6.6	0.15	135	128.4	3164.0328
Krihnanagar- I	275.88	5.81	0.15	151	145.19	6008.25258
Krihnanagar- II	141.46	6.16	0.15	113	106.84	2267.03796
Ranaghat- I	160.21	5.43	0.15	150	144.57	3474.233955
Ranaghat- II	280.37	5.48	0.15	145	139.52	5867.58336
Nabadwip	103.72	5.07	0.15	164	158.93	2472.63294
Shantipur	192.16	5.73	0.15	146	140.27	4043.14248
Amdanga	130.61	10.98	0.15	185	174.02	3409.31283
Bagdah	228.62	5.33	0.15	142	136.67	4686.82431

Barrackpur- I	**145.34**	**10.85**	**0.15**	**125**	**114.15**	**2488.58415**
Bangaon	**358.55**	**5.01**	**0.15**	**131**	**125.99**	**6776.057175**
Gaighata	**248.8**	**5.49**	**0.15**	**138**	**132.51**	**4945.2732**
Habra- I	**146.16**	**6.4**	**0.15**	**140**	**133.6**	**2929.0464**
Habra- II	**130.79**	**8.27**	**0.15**	**117**	**108.73**	**2133.119505**
TOTAL	**5031.36**					**95025.29828**

Chapter-7

7. HYDROCHEMISTRY

7.1 Quality of Shallow and Deeper Aquifer Water:

Ground water samples were collected during pre-monsoon period from the National Hydrograph Stations as well as the Key Observation Wells falling in the study area and those have been analysed in the departmental Chemical Laboratory. Chemical quality of ground water occurring in shallow and deeper aquifers does not vary significantly, except arsenic concentration. Using the data of chemical parameters, overall analyses for ground water quality were done separately for arsenic infested and non-arsenic infested areas in the study area. The ground water in both the cases, in general, is Ca-Mg- HCO_3 type and at few places, Ca-Mg-Cl-SO_4, Na-K-Cl-SO_4 and Na- K- HCO_3 types (**Plate-26-29**) .

7.2 General range of chemical parameter in the area:

From the analytical results as available so far from the Laboratory, it is found that, pH of water, in general, varies between 6.5 and 8.8 and, EC between 251 and 4878 (µS/cm (**Plate - 24**). Concentrations of Na and K ranges from 3 to 850 mg/1 and from 0.1 to 139 mg/1, respectively. Fe content is also available sporadically upto 7.8 mg/1 (**Plate-25**). CO3 is upto 33 mg/l. HCO3 present in the range of 31-750 mg/1 and Cl is mostly in the range of 7-1099 mg/1. F ranges from 0.0- 1.0 mg/1. SO4 concentrations are varying from 0 to 199 mg/l. Total hardness as per CaC03 ranges from 13 - 675 mg/1, whereas Ca varies from 4 to 227 mg/1. Nitrate concentration ranges from 0.0-108 mg/1 (in parts of Nadia & N 24 Parganas districts)..

7.3 Ground water pollution:

Generally, all parameters in collected water samples show values within permissible limit. Only 18% samples analysed in the field shows pH values more than permissible limit (i.e.> 8.5). Arsenic in shallow tube wells show concentration more than permissible limit. Out of 26 blocks, 20 blocks in the study area are arsenic infested sporadically. Aquifers upto 160 mbgl depth is more or less arsenic infested (**Plate-25**). Arsenic Contamination (with in 160 m Depth) of Aquifer Mapping Area & Depth wise Arsenic Concentration in Amdanga Block, N 24 Parganas District have been depicted in **Plate 30** & **Plate 31** respectively.

Data collected from PHED showing concentration of arsenic vs. percentage of affected tube-well is given in Table-VI.

Table-VI: Percentage of tube wells having arsenic content in each block

Sl. No.	*Blocks*	*Arsenic (<0.01 mg/l)*	*Arsenic (>0.01-<0.05 mg/l)*	*Arsenic (> 0.05 mg/l)*	*Total Tube wells*
1	KALNA- II	94.01	3.57	2.23	1119
2	PURBASTHALI- I	86.99	5.90	7.11	1407
3	PURBASTHALI- II	63.69	19.29	16.95	1581
4	BALAGARH	63.54	24.25	12.22	2087
5	PANDUA				
6	CHAKDAH	*27.49*	*38.05*	*34.42*	*2263*
7	HARINGHATA	*36.29*	*33.82*	*29.90*	*1174*
8	KRISHNAGAR - I	*38.61*	*39.17*	*22.21*	*2494*
9	KRISHNAGAR - II	*1.52*	*66.63*	*31.85*	*986*
10	NABADWIP	*35.46*	*37.22*	*27.24*	*1303*
11	RANAGHAT - I	*16.92*	*55.39*	*27.69*	*1939*
12	RANAGHAT - II	21.09	54.64	24.23	2674
13	SANTIPUR	23.94	44.41	31.65	1011
14	AMDANGA	62.89	27.78	9.33	1404
15	BAGDA	23.67	54.47	21.86	1711
16	BARRACKPUR - I	40.71	51.71	7.58	963
17	BONGAON	25.72	42.72	31.69	1835
18	GAIGHATA	18.88	28.93	52.19	1483
19	HABRA – I	31.71	23.49	44.79	1277
20	HABRA - II	64.61	11.76	23.53	1054

Chapter-8

AQUIFER MANAGEMENT PLAN

8.1 Desirable Management Interventions

To formulate the proper Aquifer Management Plan, it is required to understand the ground water resources, its quality and proper scientific development. The study area is basically under intensive irrigated agriculture by groundwater and also partly by surface water. Paddy and Rabi vegetables are the important corps cultivated by farmers in the region. In major part of the area farmers depend only on groundwater for cultivation of these crops during all seasons. Any reduction in the yield of the tube wells due to decline in groundwater shall adversely impact the production of the food grain. Though the study area has multilayer aquifer system in which **Aquifer I** (within depth of 200 m bgl) is highly potential in nature, holds fresh water and caters to the need of irrigation in, agriculture and industries. In some places arsenic contamination in ground water occurs (>0.01mg/l) in a sporadic manner in **Aquifer I** and therefore it is not suitable for drinking purposes. **Aquifer II** (within depth of 160 to 390) occurs below the **Aquifer I** separated by thick clay bed and is in general arsenic free (arsenic content BDL to <0.01 mg/l). Aquifer II is not so much potential as Aquifer I. The urban agglomeration depends on aquifer II for their requirement. CGWB has constructed number of arsenic free wells tapping the Aquifer II using cement sealing techniques and handed over to PHED/ State Government departments for supply of arsenic free water. PHED. It is observed that ground water level is declining slowly in most of the area under irrigation and also in some of the wells in the urban areas. Therefore, there is need for efficient management of the aquifer systems for sustenance of the tube wells tapping **Aquifer I** as well as **Aquifer II**. The disposition of aquifer systems in different blocks of the study area is generalized in Table-VII below.

Table-VII Disposition of aquifer system in the study area

Sr. No.	District	Block	Depth range of 1st aquifer	Depth range of 2nd aquifer
1	Barddhaman	Kalna I	6-135	168-254
2	Barddhaman	Kalna II	15-27, 61-225	
3	Barddhaman	Purbasthali I	15-37, 46-117, 123-185	192-195, 206-215, 240-265, 286-330
4	Barddhaman	Purbasthali II	15-58, 61-127, 136-153	193-222
5	Hughli	Balagarh	30-186	193-200
6	Hughli	Chanditala I	3-36, 40-137	146-155
7	Hughli	Chinsurah	9-44, 51-160	168-205
8	Hughli	Pandua	44-131, 138-147	169-172, 193-212
9	Hughli	Polba-Dadpur	21-155	186-224
10	Hughli	Singur	51-225	
11	Hughli	Srirampur-Uttarpara	15-18, 48-196	
12	Nadia	Chakdah	12-120	
13	Nadia	Haringhata	16-150	157-179
14	Nadia	Krishnanagar I	6-132, 147-154, 160-166	173-178, 174-212, 227-264
15	Nadia	Krishnanagar II	7-128	230-249, 252-267, 279-285
16	Nadia	Nabadwip	4-179	
17	Nadia	Ranaghat I	3-165	
18	Nadia	Ranaghat II	4-82, 92-160	166-226
19	Nadia	Shantipur	17-136, 150-161	230-249, 252-269, 279-325
20	North 24 Parganas	Amdanga	50-200	220-245
21	North 24 Parganas	Bagdah	25-157	163-215, 227-253
22	North 24 Parganas	Barrackpore I	50-140	170-200, 220-245
23	North 24 Parganas	Bongaon	12-146	163-167, 193-252, 342-354, 363-394
24	North 24 Parganas	Gaighata	28-153	180-247
25	North 24 Parganas	Habra I	3-155	161-172, 185-219, 223-260
26	North 24 Parganas	Habra II	2-70, 92-104, 110-132	141-160, 185-191, 198-225

Therefore, Aquifer Management plan for the Study area is brought out keeping in view of the field conditions.

8.2 Ground Water Management Plan for Drinking Purposes:

The drinking water in 26 blocks (Rural) under study is being supplied by PHED through surface water & ground water. Since sporadic occurrence of arsenic above permissible limit are reported in 20 blocks out of 26 blocks & a total of 4392159 people (as per 2011 Census)

of the 20 blocks in 9938 habitants are at risk zone. Details of risk population are shown in Table-VIII below:

Table- VIII District wise Risk Population in As affected blocks

District	Block (As affected)	No. of habitations in the risk zone where As concentration >0.05 mg/L	No. of habitations in the risk zone where As concentration 0.01 to 0.05 mg/L	Risk Population (2011) where As concentration >0.05 mg/L
Nadia	CHAKDAH	168	47	314383
	HARINGHATA	124	53	207459
	KRISHNAGAR - I	156	93	285885
	KRISHNAGAR - II	67	6	134032
	NABADWIP	68	11	76241
	RANAGHAT - I	111	36	120847
	RANAGHAT - II	164	117	314519
	SANTIPUR	101	35	154256
	Nadia Study area	**959**	**398**	**1607622**
North 24 Parganas	AMDANGA	56	95	185014
	BAGDA	137	143	242974
	BARRACKPUR - I	35	75	94278
	BONGAON	261	97	380903
	GAIGHATA	178	23	265526
	HABRA – I	161	24	175651
	HABRA - II	107	26	140675
	North 24 Parganas Study area	**1112**	**548**	**1794571**
Hugli	BALAGARH	87	124	200810
	PANDUA	1		265863
	Hughli Study area	**88**	**124**	**466673**
Barddhaman	KALNA- II	6	12	157235
	PURBASTHALI- I	22	21	153703
	PURBASTHALI- II	58	26	212355
	Barddhaman Study area	**86**	**59**	**523293**
Total Study area		**2245**	**1129**	**4392159**

To supply safe Drinking Water to the affected blocks of the State a comprehensive Arsenic Master Plan was taken for implementation through various Short, Medium and Long Term measures by the State Government with assistance of Government of India. District wise the arsenic disposition & scope for supply of drinking water is discussed below:

Nadia District

Sporadic occurrence of arsenic in shallow aquifers has been established in all the blocks of the district. A total of 3728727 of people (as per 2011 Census) in rural area of the district are at risk zone. The maximum concentration of arsenic in ground water has been observed as 1.16 mg/L.

PHED has tested so far 29640 nos. of public hand pump tube wells in Nadia district in their laboratories. From the chemical analysis results of the tube wells, it has been observed that 41.20% tube wells contain arsenic content in ground water in the range of 0.01 to 0.05 mg/L & 25.85% tube wells are having arsenic content >0.05 mg/L.

In the present study area all the blocks (Ckakdah, Haringhata, Krishnanagar I, Krishnanagar II, Ranaghat I, Ranaghat II, Shantipur & Nabadwip) are arsenic infested in which 959 habitations having arsenic in ground water >0.05 mg/l and 398 habitations having arsenic 0.01 to 0.05 mg/l and 1607622 populations are in the zone of arsenic contamination.

In the study area focus has been given only for Nabadwip, Krishnanagar I, Santipur, Ranaghat I & Ranaghat II blocks, as the risk population of the rest of the blocks has been already covered by PHED with arsenic free water supply.

The scope for construction of tube wells in the study area tapping arsenic free aquifers for catering potable water to the population of risk zone, yet to be covered by PHED, Govt. of West Bengal for ground water based water supply scheme, is Presented in Table-IX below.

Table- IX Block wise comments on supply of ground water to the risk population

Sl. No.	Block	Number of Villages to be covered by water supply schemes	Population in risk zone (as per Census 2011) to be covered by water supply schemes.	Comments on providing water supply to the risk population
1	Nabadwip	9	60314	No exploration has been conducted in the block so far. As also no deep drilling data is available with CGWB. Hence, no arsenic free tube well is proposed in the block.
2	Krishnagar I	14	66043	As per CGWB exploration data down to the drilled depth of 325 mbgl, aquifer zone exists between 255 & 325 mbgl intercalated with thin clay layers, separated from upper aquifers by thick clay layer extending from 159-255 mbgl.
3.	Santipur	9	75048	As per CGWB exploration data down to the drilled depth of 322 mbgl, sand zone are encountered within 167 mbgl, beyond which clay layer exist. Hence,

				no arsenic free tube well is proposed in the block. Deep drilling down to about 500 mbgl may provide information about arsenic free aquifers in the area.
4.	Ranaghat I	12	60708	As per CGWB exploration data down to the drilled depth of 351 mbgl, continuous sand zone are encountered within 200 mbgl & 228-240 mbgl (with meagre discharge), beyond which clay layer exists upto the drilled depth. Hence, no arsenic free tube well is proposed in the block. Deep drilling down to about 500 mbgl may provide information about arsenic free aquifers in the area.
5.	Ranaghat II	2	9184	

From the above table, it is observed that arsenic free deeper aquifers in the depth span of 200-325 mbgl, separated from upper aquifers by thick clay bed have been delineated in **Krishnanagar I block only**. . Hence the tube wells, tapping aquifers between 200-350 mbgl with proper cement sealing against thick clay bed above 200 mbgl, can cater arsenic free ground water to the populace of the villages, yet to be covered by water supply scheme of PHED.

As evidenced from the exploration arsenic free deeper aquifers ranging from 200 to 300 mbgl) are potential with a capacity to yield to the tune of 12.5 litre per second with drawdown of 6 m (approx) and can cater to the need of rural water supply. The demand for potable water vis-à-vis availability of arsenic free ground water from the deeper aquifers has been calculated for the Krishnagar I block of Nadia district for drinking and domestic purpose & is given in table below. Considering human drinking and domestic demand of water @70 lpcd & projected population upto 2021 (considering decadal growth rate @ 21.09% following PHED guidelines and District Census 2011), the demand of water for human population as on 2021 has been calculated. Cattle population as on 2021 is estimated considering 0.19 per capita human population (district cattle population/ district human population), village population & 0.36 annual growth rate. Considering the cattle consumption @20 lpcd, water requirement for cattle has been calculated. For Operation & Maintenance after completion of the schemes, the same shall be handed over to PHED of Govt. of West Bengal and concerned Jilla Parisad.

As per the Table-X, the gist of requirement of arsenic free tube wells in the arsenic infested villages in Nadia district, those are yet to be covered is as under:

- Block identified – **Krishnagar- I** of Nadia district
  - Total Number of Villages, affected by As > 0.01 mg/L, to be covered water supply schemes – 14
  - Human Population affected (2021) --- app 74115
  - Total cattle population (2021) - app. 13007
  - Total water requirement (projected) @ 70 lpcd – 5188050 litres per day (Human)

- Total water requirement for cattle @20 lpcd- 260140litres per day
- Total Water Requirement- 5448190 litre per day
- No. of tube wells proposed of 300m depth (250 mm X 150 mm) with av. Yield-12.5 lps running for about 8 hours a day – 21 nos.
- No. of observation well required – 1 nos.
- Total Cost – Rs. 545 lakhs (@ Rs. 20 lakhs per tube-well, as per EFC)

Table-X: PROPOSAL FOR CONSTRUCTION OF TUBE WELLS FOR SUPPLY OF ARSENIC FREE WATER TO THE POPULATION IN RISK ZONE NOT YET COVERED BY POTABLE WATER IN NADIA DISTRICT														
Name of Block	Number of Villages to be covered by water supply schemes	Population in risk zone (as per Census 2011)	Projected population upto 2021 (considering growth 21.09% per decade as per Census 2011	Water required for drinking & domestic purposes @ 70 lpcd (in lpd)	Cattle Population (Considering 0.19 per capita human population) as on 2011	Cattle Population (Considering 0.36 annual growth rate) as on 2021	Water required for drinking & domestic purposes @ 20 lpcd (in lpd)	Total Water Requirement in lpd	Average expected yield of Arsenic free water in lps	Supply of arsenic free water by running 8 hrs/day (lpd)	No of Tube Well required	Cost of the tube well of 300 m depth (approx) & 10"x6" dia @ Rs. 25 lakhs (In lakh) as per EFC	No of Observation Well required	Cost of the Observation well of 300 m depth (approx) 6" dia @ Rs. 20 lakhs (In lakh)as per EFC
Krishnagar I	Chak Dignagar	2178	2444	171080	414	429	8579	179659	12.5	360000	1	25		
Krishnagar I	Joginidaha	899	1009	70630	171	177	3541	74171	12.5	360000	1	25		
Krishnagar I	Bhimpur	8057	9042	632940	1531	1587	31737	664677	12.5	360000	2	50		
Krishnagar I	Jaba	991	1112	77840	188	195	3904	81744	12.5	360000	1	25		
Krishnagar I	Paninala	3189	3579	250530	606	628	12562	263092	12.5	360000	1	25		
Krishnagar I	Chakgokul Nagar	803	901	63070	153	158	3163	66233	12.5	360000	1	25		
Krishnagar I	Paschimbhatjangla	12963	14547	1018290	2463	2553	51062	1069352	12.5	360000	3	75		
Krishnagar I	Baruihuda (CT)	11474	12876	901320	2180	2260	45197	946517	12.5	360000	3	75		
Krishnagar I	Krishnanagar (P)	13640	15307	1071490	2592	2686	53728	1125218	12.5	360000	3	75	1	20
Krishnagar I	Ghurni (P)	1694	1901	133070	322	334	6673	139743	12.5	360000	1	25		
Krishnagar I	Khamarpara	2322	2606	182420	441	457	9146	191566	12.5	360000	1	25		
Krishnagar I	Pansipara	513	576	40320	97	101	2021	42341	12.5	360000	1	25		
Krishnagar I	Purbbabhatjangla	2315	2598	181860	440	456	9119	190979	12.5	360000	1	25		
Krishnagar I	Kulgachhi	5005	5617	393190	951	986	19715	412905	12.5	360000	1	25		
	BLOCK TOTAL	**66043**	**74115**	**5188050**	**12548**	**13007**	**260146**	**5448196**			**21**	**525**		

North 24 Parganas District

Sporadic occurrence of arsenic in shallow ground water is found to occur in most of the blocks of the district (21 blocks). A total of 4113154 of people (as per 2011 Census) in rural area of the district are at risk zone. The maximum concentration of arsenic in ground water has been observed as 3.77 mg/L.

PHED has tested so far 25985 nos. of public hand pump tube wells in North 24 Parganas district in their laboratories. From the chemical analysis results of the tube wells, it has been observed that 31% tube wells contain arsenic content in ground water in the range of 0.01 to 0.05 mg/L & 26% tube wells are having arsenic content >0.05 mg/L.

In the present study area all the blocks (Amdanga, Bagdah, Barackpore I, Bongaon, Gaighata, Habra I & Habra II) are arsenic infested in which 1112 habitations having arsenic in ground water >0.05 mg/l and 548 habitations having arsenic 0.01 to 0.05 mg/l and 1794571 populations are in the zone of arsenic contamination.

In the study area, focus has been given only for Bagdah and Bangaon blocks, as the risk population of the rest of the blocks has been already covered by PHED with arsenic free water supply.

The scope for construction of tube wells tapping arsenic free aquifers for catering potable water to the population of risk zone, yet to be covered by PHED, Govt. of West Bengal for ground water based water supply scheme, is presented in Table-XI below.

Table- XI Block wise comments on supply of ground water to the risk population

Sl. No.	Block	Number of Villages to be covered by water supply schemes	Population in risk zone (as per Census 2011) to be covered by water supply schemes.	Comments on providing water supply to the risk population
1	Bagdah	28	46586	Potential arsenic free aquifers in the depth span of 200-335 mbgl, separated from the upper aquifers system by thick clay layer of 10 to 30 m, are expected to be encountered down to the drilled depth of 350 mbgl.
2	Bongaon	30	66843	
	TOTAL	**58**	**113429**	

From the above table, it is observed that ground water exploration in the blocks of Bongaon & Bagdah could delineate arsenic free deeper aquifers in the depth span of 200-325 mbgl, separated from upper aquifers by thick clay bed. Hence the tube wells, tapping aquifers between 200-350 mbgl with proper cement sealing against thick clay bed above 200 mbgl, can cater arsenic free ground water to the populace of the villages, yet to be covered by water supply scheme of PHED.

As evidenced from the exploration arsenic free deeper aquifers ranging from 200 to 300 mbgl) are potential with a capacity to yield to the tune of 12.5 litre per second with drawdown of 6 m (approx) and can cater to the need of rural water supply. The demand for potable water vis-à-vis availability of arsenic free ground water from the deeper aquifers has been calculated for blocks of Bongaon, & Bagdah of North 24 Parganas district for drinking

and domestic purpose & is given in table below. Considering human drinking and domestic demand of water @70 lpcd & projected population upto 2021 (considering decadal growth rate @ 12.04% following PHED guidelines and District Census 2011), the demand of water for human population as on 2021 has been calculated. Cattle population as on 2021 is estimated considering 0.1 per capita human population (district cattle population/ district human population), village population & 0.36 annual growth rate. Considering the cattle consumption @20 lpcd, water requirement for cattle has been calculated. The tube wells should be constructed by tapping the aquifers which is separated from top arseniferous aquifers by a persistent clay blanket. Provision for sealing the top arseniferous aquifers with proper cement sealing against clay layer should be kept in order to prevent the vertical percolation of arseniferous water from the top contaminated aquifer.

For Operation & Maintenance after completion of the schemes, the same shall be handed over to PHED of Govt. of West Bengal and concerned Jilla Parisad.

The gist of requirement of arsenic free tube wells in the arsenic infested villages in Bagdah & Bongaon of North 24 Parganas district, those are yet to be covered is as under Table-XII:

- Blocks identified – **Bagdah and Bangaon** of **N 24 Parganas** district
  - Total Number of Villages, affected by As > 0.01 mg/L, to be covered water supply schemes – 58 (28 in Bagda & 30 in Bongaon)
  - Human Population affected (2021) --- app 127082
  - Total cattle population (2021) - app. 11758
  - Total water requirement (projected) @ 70 lpcd – **8895740** litres per day (Human)
  - Total water requirement for cattle @20 lpcd- **235158**litres per day
  - Total Water Requirement- **9130898** lakh litre per day
  - No. of tube wells proposed of 300m depth (250 mm X 150 mm) with av. Yield-12.5 lps running for about 8 hours a day – 60 nos.
  - No. of observation well required – 2 nos.
  - Total Cost – Rs. 1540 lakhs (@ Rs. 20 lakhs per tube-well, as per EFC)

TABLE-XII: PROPOSAL FOR CONSTRUCTION OF TUBE WELLS FOR SUPPLY OF ARSENIC FREE WATER TO THE POPULATION IN RISK ZONE NOT YET COVERED BY POTABLE WATER IN NORTH 24 PARGANAS DISTRICT

Name of Block	Name of Villages	Population in risk zone (as per Census 2011)	Projected population upto 2021 (considering growth 12.04% per decade as per Census 2011	Water required for drinking & domestic purposes @ 70 lpcd (in lpd)	Cattle Population (Considering 0.1 per capita human population) as on 2011	Cattle Population (Considering 0.36 annual growth rate) as on 2021	Water required for drinking & domestic purposes @ 20 lpcd (in lpd)	Total Water Requirement in lpd+H165	Average expected yield of Arsenic free water in lps	Supply of arsenic free water by running 8 hrs/day (lpd)	No of Tube Well required	Cost of the tube well of 300 m depth (approx) & 10"x6" dia @ Rs. 25 lakhs (In lakh) as per EFC	No of Observation Well required	Cost of the Observation well of 300 m depth (approx) 6" dia @ Rs. 20 lakhs (In lakh)as per EFC
Bagda	Chandpur	2312	2590	181300	231	240	4793	186093	12.5	360000	1	25		
Bagda	Uttar Jiala	1499	1679	117530	150	155	3108	120638	12.5	360000	1	25		
Bagda	Bagi	1485	1664	116480	149	154	3079	119559	12.5	360000	1	25		
Bagda	Patkelpota	1214	1360	95200	121	126	2517	97717	12.5	360000	1	25		
Bagda	Asaru	3436	3850	269500	344	356	7123	276623	12.5	360000	1	25		
Bagda	Kathalia	673	754	52780	67	70	1395	54175	12.5	360000	1	25		
Bagda	Kulanandapur	3223	3611	252770	322	334	6682	259452	12.5	360000	1	25		
Bagda	Padma Pukuria	706	791	55370	71	73	1464	56834	12.5	360000	1	25		
Bagda	Salak	1936	2169	151830	194	201	4014	155844	12.5	360000	1	25		
Bagda	Kulanandapur Chak	389	436	30520	39	40	806	31326	12.5	360000	1	25		
Bagda	Par Krishnachandrapur	2682	3005	210350	268	278	5560	215910	12.5	360000	1	25		
Bagda	Singi	1322	1481	103670	132	137	2741	106411	12.5	360000	1	25		
Bagda	Uttar Bailadanga	1842	2064	144480	184	191	3819	148299	12.5	360000	1	25	1	20
Bagda	Ranihati	1793	2009	140630	179	186	3717	144347	12.5	360000	1	25		
Bagda	Chuadanga	744	834	58380	74	77	1542	59922	12.5	360000	1	25		

Bagda	Kapashati	942	1055	73850	94	98	1953	75803	12.5	360000	1	25		
Bagda	Paschim Malipota	1785	2000	140000	179	185	3701	143701	12.5	360000	1	25		
Bagda	Paschim Bhabanipur	1257	1408	98560	126	130	2606	101166	12.5	360000	1	25		
Bagda	Andulpota	2090	2342	163940	209	217	4333	168273	12.5	360000	1	25		
Bagda	Santosa	2585	2896	202720	259	268	5359	208079	12.5	360000	1	25		
Bagda	Uttar Panchpota	2242	2512	175840	224	232	4648	180488	12.5	360000	1	25		
Bagda	Jhikra	1142	1279	89530	114	118	2368	91898	12.5	360000	1	25		
Bagda	Rajkol	589	660	46200	59	61	1221	47421	12.5	360000	1	25		
Bagda	Kashipur	2433	2726	190820	243	252	5044	195864	12.5	360000	1	25		
Bagda	Ronghat	2745	3075	215250	275	285	5691	220941	12.5	360000	1	25		
Bagda	Jitpur	764	856	59920	76	79	1584	61504	12.5	360000	1	25		
Bagda	Magurkona	388	435	30450	39	40	804	31254	12.5	360000	1	25		
Bagda	Pustighata	2368	2653	185710	237	245	4909	190619	12.5	360000	1	25		
	28	**46586**	**52194**	**3653580**	**4659**	**4829**	**96581**	**3750161**			**28**	**700**	**1**	**20**
Bongaon	Garibpur	1839	2060	144200	184	191	3813	148013	12.5	360000	1	25		
Bongaon	Monoharpur	1222	1369	95830	122	127	2533	98363	12.5	360000	1	25		
Bongaon	Paschim Huda	3194	3579	250530	319	331	6622	257152	12.5	360000	1	25		
Bongaon	Mendia	1448	1622	113540	145	150	3002	116542	12.5	360000	1	25		
Bongaon	Ganeshpur	1256	1407	98490	126	130	2604	101094	12.5	360000	1	25		
Bongaon	Briddhapalla	1255	1406	98420	126	130	2602	101022	12.5	360000	1	25		
Bongaon	Chithalia	1198	1342	93940	120	124	2484	96424	12.5	360000	1	25		
Bongaon	Hingli	2534	2839	198730	253	263	5253	203983	12.5	360000	1	25		
Bongaon	Gopinathpur	3025	3389	237230	303	314	6271	243501	12.5	360000	1	25		
Bongaon	Chauveria Chak	794	890	62300	79	82	1646	63946	12.5	360000	1	25		
Bongaon	Sehalapara	3859	4324	302680	386	400	8000	310680	12.5	360000	1	25		
Bongaon	Kulpukuria	833	933	65310	83	86	1727	67037	12.5	360000	1	25		
Bongaon	Taranipur	1177	1319	92330	118	122	2440	94770	12.5	360000	1	25		
Bongaon	Icchalampur	6886	7715	540050	689	714	14276	554326	12.5	360000	2	50		
Bongaon	Serpur	3740	4190	293300	374	388	7754	301054	12.5	360000	1	25		

Bongaon	Keutipara	2353	2636	184520	235	244	4878	189398	12.5	360000	1	25	1	20
Bongaon	Kundipur Jalkar	50	56	3920	5	5	104	4024	12.5	360000	1	25		
Bongaon	Kundipur	4760	5333	373310	476	493	9868	383178	12.5	360000	1	25		
Bongaon	Ghatbour	2711	3037	212590	271	281	5620	218210	12.5	360000	1	25		
Bongaon	Dakhin Charuigachi	1715	1921	134470	172	178	3555	138025	12.5	360000	1	25		
Bongaon	Angarpukuria	1034	1158	81060	103	107	2144	83204	12.5	360000	1	25		
Bongaon	Sabhaipur Chak	918	1029	72030	92	95	1903	73933	12.5	360000	1	25		
Bongaon	Janipur	725	812	56840	73	75	1503	58343	12.5	360000	1	25		
Bongaon	Kharua Rajapur	1591	1783	124810	159	165	3298	128108	12.5	360000	1	25		
Bongaon	Hrishpur Chak	1637	1834	128380	164	170	3394	131774	12.5	360000	1	25		
Bongaon	Purana Bongaon	8265	9260	648200	827	857	17135	665335	12.5	360000	2	50		
Bongaon	Unai	1740	1949	136430	174	180	3607	140037	12.5	360000	1	25		
Bongaon	Rachhulpur	2985	3344	234080	299	309	6188	240268	12.5	360000	1	25		
Bongaon	Raghunathpur	963	1079	75530	96	100	1996	77526	12.5	360000	1	25		
Bongaon	Ramshankarpur	1136	1273	89110	114	118	2355	91465	12.5	360000	1	25		
30		**66843**	**74888**	**5242160**	**6684**	**6929**	**138577**	**5380737**			**32**	**800**	**1**	**20**
GRAND TOTAL		**113429**	**127082**	**8895740**	**11343**	**11758**	**235158**	**9130898**	**0**	**0**	**60**	**1500**	**2**	**40**

Barddhaman District

Sporadic occurrence of arsenic in shallow ground water is found to occur in 5 blocks of Purbasthali – I, Purbasthali – II, Katwa-I, Katwa-II, Kalna-II. A total of 826615 of people (as per 2011 Census) in rural area of the district are at risk zone. The maximum concentration of arsenic in ground water has been observed as 0.84 mg/L.

PHED has tested so far 6518 nos. of public hand pump tube wells in Barddhaman district in their laboratories. From the chemical analysis results of the tube wells, it has been observed that 9% tube wells contain arsenic content in ground water in the range of 0.01 to 0.05 mg/L & 6.50% tube wells are having arsenic content >0.05 mg/L.

In the present study area three blocks (Purbasthali I, Purbasthali II & Kalna II) out of four blocks are arsenic infested in which 86 habitations having arsenic in ground water >0.05 mg/l and 59 habitations having arsenic 0.01 to 0.05 mg/l and 523293 populations are in the zone of arsenic contamination.

As per the data of PHED, Govt. of West Bengal, about 91% of the rural risk population has been covered by water supply schemes. Only 9% rural population in Purbasthali-I & a small part of Kalna II blocks is to be covered by arsenic free water supply.

In the study area focus has been given only for Purbasthali I & Kalna II blocks. In Purbasthali-I & Kalna II blocks, arsenic free deeper aquifers in the depth span of 150-300 mbgl, separated from upper aquifers by thick clay bed. Hence the tube wells, tapping aquifers between 150-300 mbgl with proper cement sealing against thick clay bed above 150 mbgl, can cater arsenic free fresh ground water to the populace of the villages, yet to be covered by water supply scheme of PHED.

The scope for construction of tube wells tapping arsenic free aquifers for catering potable water to the population of risk zone, yet to be covered by PHED, Govt. of West Bengal for ground water based water supply scheme, is presented in Table-XIII below.

Table-XIII Block wise comments on supply of ground water to the risk population

Sl. No.	Block	Number of Villages to be covered by water supply schemes	Population in risk zone (as per Census 2011) to be covered by water supply schemes.	Comments on providing water supply to the risk population
1	Purbasthali I	14	74290	Potential aquifers in the depth span of 150-300 mbgl separated from upper aquifers by thick clay bed.
2	Kalna II	2	2199	

In these blocks, potable deeper aquifers in the depth span of 150-300 mbgl, separated from upper aquifers by thick clay bed. Hence the tube wells, tapping aquifers between 150-300 mbgl with proper cement sealing against thick clay bed above 150 mbgl, can cater arsenic free fresh ground water to the populace of the villages, yet to be covered by water supply scheme of PHED.

As evidenced from the exploration arsenic free deeper aquifers ranging from 150 to 300 mbgl are potential with a capacity to yield to the tune of 12.5 litre per second with drawdown of 6 m (approx) and can cater to the need of rural water supply. The demand for potable water vis-à-vis availability of arsenic free ground water from the deeper aquifers has been calculated for Purbasthali-I & Kalna II blocks of Barddhaman district for drinking and domestic purpose & is given in table below. Considering human drinking and domestic demand of water @70 lpcd & projected population upto 2021 (considering decadal growth rate @ 11.92% following PHED guidelines and District Census 2011), the demand of water for human population as on 2021 has been calculated. Cattle population as on 2021 is estimated considering 0.2 per capita human population (district cattle population/ district human population), village population & 0.36 annual growth rate. Considering the cattle consumption @20 lpcd, water requirement for cattle has been calculated.

It has been found that water from total of 25 tube wells (23 tubewells in Purbasthali I & 2 wells in Kalna II blocks) in 16 villages (14 villages of Purbasthali-I & 2 villages of Kalna II blocks) in study areas of Barddhaman district can meet the supply of safe arsenic free water among the population of 68341 living in the risk zone (as per Census 2011). The tube wells should be constructed by tapping the aquifers which is separated from top arseniferous aquifers by a persistent clay blanket. Provision for sealing the top arseniferous aquifers with proper cement sealing against clay layer should be kept in order to prevent the vertical percolation of arseniferous water from the top contaminated aquifer.

For Operation & Maintenance after completion of the schemes, the same shall be handed over to PHED of Govt. of West Bengal and concerned Jilla Parisad.

The gist of requirement of arsenic free tube wells in the arsenic infested villages in Barddhaman district, those are yet to be covered is as under Table-XIV:

- Blocks identified – **Purbasthali-I & Kalna II** blocks of **Bardhaman** district
    - Total Number of Villages, affected by As > 0.01 mg/L, to be covered water supply schemes - 16
    - Human Population affected (2021) --- app 76489
    - Total cattle population (2021) - app. 14168
    - Total water requirement (projected) @ 70 lpcd – 5354230 litres per day (Human)
    - Total water requirement for cattle @20 lpcd- 283360 litres per day
    - Total Water Requirement- 5963374 lakh litre per day
    - No. of tube wells proposed of 300m depth (250 mm X 150 mm) with av. Yield-12.5 lps running for about 8 hours a day – 25 nos.
    - No. of observation well required – 2 no.
    - Total Cost– Rs. 665 lakhs (@ Rs. 20 lakhs per tube-well, as per EFC)

TABLE-XIV: PROPOSAL FOR CONSTRUCTION OF TUBE WELLS FOR SUPPLY OF ARSENIC FREE WATER TO THE POPULATION IN RISK ZONE NOT YET COVERED BY POTABLE WATER IN BARDDHAMAN DISTRICT

Name of Block	Name of Villages	Population in risk zone (as per Census 2011)	Projected population upto 2021 (considering growth 11.92 % per decade as per Census 2011	Water required for drinking & domestic purposes @ 70 lpcd (in lpd)	Cattle Population (Considering 0.2 per capita human population) as on 2011	Cattle Population (Considering 0.36 annual growth rate) as on 2021	Water required for drinking & domestic purposes @ 20 lpcd (in lpd)	Total Water Requirement in lpd	Average expected yield of Arsenic free water in lps	Supply of arsenic free water by running 8 hrs/day (lpd)	No of Tube Well required	Cost of the tube well of 300 m depth (approx) & 10"x6" dia @ Rs. 25 lakhs (In lakh) as per EFC	No of Observation Well required	Cost of the Observation well of 300 m depth (approx) 6" dia @ Rs. 20 lakhs (In lakh)as per EFC
Purbasthalli-I	SAHAPUR	620	694	48580	124	129	2571	51151	12.5	360000	1	25		
Purbasthalli-I	ATKADANGA	1072	1200	84000	214	222	4445	88445	12.5	360000	1	25		
Purbasthalli-I	MUDAFAR FALAHARI	25128	28123	1968610	5026	5209	104190	2072800	12.5	360000	6	150		
Purbasthalli-I	SAIDPUR	325	364	25480	65	67	1348	26828	12.5	360000	1	25	1	20
Purbasthalli-I	BETPUKUR	1188	1330	93100	238	246	4926	98026	12.5	360000	1	25		
Purbasthalli-I	BHATSALA	2599	2909	203630	520	539	10776	214406	12.5	360000	1	25		
Purbasthalli-I	NAMA BHANDARTIKURI	443	496	34720	89	92	1837	36557	12.5	360000	1	25		
Purbasthalli-I	SULANTU	1351	1512	105840	270	280	5602	111442	12.5	360000	1	25		
Purbasthalli-I	BHANDARTIKURI	1088	1218	85260	218	226	4511	89771	12.5	360000	1	25		
Purbasthalli-I	GOLAHAT	2966	3320	232400	593	615	12298	244698	12.5	360000	1	25		
Purbasthalli-I	MANGANPUR	2496	2794	195580	499	517	10349	205929	12.5	360000	1	25		
Purbasthalli-I	DAKSHINBATI	2644	2959	207130	529	548	10963	218093	12.5	360000	1	25		
Purbasthalli-I	JALAHATI	4626	5177	362390	925	959	19181	381571	12.5	360000	1	25		

Purbasthalli-I	SRIRAMPUR	19830	22194	1553580	3966	4111	82222	1635802	12.5	360000	5	125		
		66376	**74290**	**5200300**	**13275**	**13761**	**275218**	**5475518**			**23**	**575**	**1**	**20**
Kalna II	Kanibamni	1,393	1559	109130	279	289	5776	114906	12.5	360000	1	25		
Kalna II	BARASAT	572	640	44800	114	119	2372	47172	12.5	360000	1	25	1	20
		1,965	**2199**	**153930**	**393**	**407**	**8148**	**162078**			**2**	**50**	**1**	**20**
	Total	**68341**	**76489**	**5354230**	**13668**	**14168**	**283366**	**5637596**	**0**	**0**	**25**	**625**	**2**	**40**

Kalna I block of Barddhaman district is not arsenic affected blocks and two aquifer system exists in this block. Upper aquifer occurs 6 to 135 m bgl and deeper potential aquifer exists in the depth range of 168-254 m bgl. Therefore drinking water tube can be constructed in deeper aquifer to meet the drinking supply in the block.

Hugli District

Sporadic occurrence of arsenic in shallow ground water is found to occur in 2 blocks namely Balagarh & Pandua. Pandua block has recently been included in the list. A total of 466673 people (as per 2011 Census) in rural area of the district are at risk zone. However, As informed by Shri. Tanay Das, SE, Circle I, PHED, most of the areas in Balagarh block are covered by PWSS from surface water & the remaining area is under coverage. Hence there is no need for construction of tube well for domestic water supply in the block.

At present all the Mouzas in Balagarh block are either under coverage of PWSS or by spot sources. As part of Arsenic Sub-Mission (ASM), 7 no pipe water supply schemes have been executed in Balagarh block using ground water as source covering 25 no mouzas and 23.87% population with 61 lpcd water supply. Out of the 7, 6 schemes already have been commissioned. Initial test report of the big dia deep tube wells reveals that, the well constructed tapping the deeper aquifers in the area shows As contamination within permissible limit. Iron contamination, however, reported above permissible limit, and thus Iron Elimination plants were installed with these schemes. In addition to above, there exist 6 no of old pipe water supply schemes covering 68 no mouzas and 43.88 % population. In rest of the Mouzas, 43 no, which are not covered by PWSS, are presently served with numbers of spot tube wells. In this present circumstance of water supply scenario in the block, a meeting with all the Hon'ble MLAs of Hugli district proposed for a surface water supply schemes for the entire block to cater safe drinking water requirement of the population. Accordingly, PHED, Govt of West Bengal, has prepared a project profile report for surface water based schemes for Balagarh. The proposed surface water based schemes will serve as additional resources of water supply in the area which are already under coverage of PWSS. The estimated capital cost of the schemes comes to Rs 150.77 crores. Proposal for surface water based schemes also comply with the recommendations of the Arsenic Task Force and Arsenic Master Plan which very clearly recommended for ground water supply as midterm measures and also advocated that, for long term sustainable supply of As free water, surface water based schemes are more justified.

Pandua block is recently added arsenic affected block of Hugli district, West Bengal. It has been found that water from total of 67 tube wells in 14 villages of Pandua block , in study areas of Hugli district can meet the supply of safe arsenic free water among the population of 316197 living in the risk zone (as per Census 2011). The tube wells should be constructed by tapping the aquifers which is separated from top arseniferous aquifers by a persistent clay blanket. Provision for sealing the top arseniferous aquifers with proper cement sealing against clay layer should be kept in order to prevent the vertical percolation of arseniferous water from the top contaminated aquifer.

For Operation & Maintenance after completion of the schemes, the same shall be handed over to PHED of Govt. of West Bengal and concerned Jilla Parisad.

The gist of requirement of arsenic free tube wells in the arsenic infested villages in Pandua block, Hugli district, those are yet to be covered is as under Table-XV:

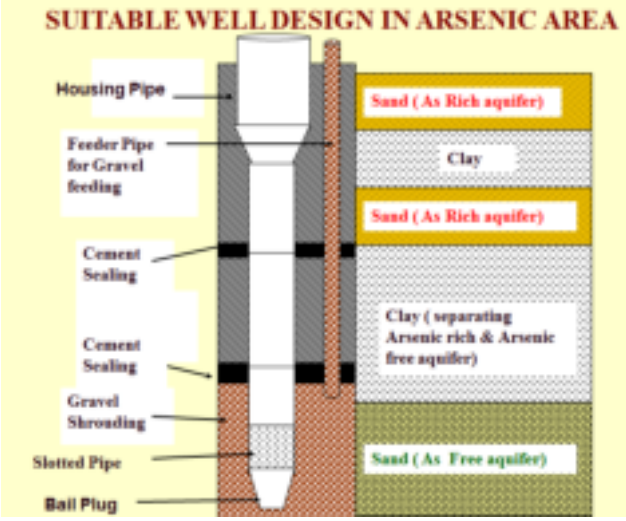
- Block identified – **Pandua** block of **Hugli** district
    - Total Number of Villages, affected by As > 0.01 mg/L, to be covered water supply schemes - 14
    - Human Population affected (2021) --- app 346109
    - Total water requirement (projected) @ 70 lpcd – 24227647 litres per day (Human)
    - No. of tube wells proposed of 300m depth (250 mm X 150 mm) with av. Yield-12.5 lps running for about 8 hours a day – 67 nos.
    - No. of observation well required – 3 no.
    - Total Cost – Rs. 1735 lakhs(@ Rs. 20 lakhs per tube-well, as per EFC)

Table-XV Proposal for Construction of Tube Wells for Supply of Arsenic Free Water to the Population in Risk Zone not yet Covered by Potable Water in Hugli District

Sl.No.	Gram Panchyat	Number of Villages	Population in risk zone (as per Census 2011)	Projected population upto 2021 (considering growth 9.46% per decade as per Census 2011	Water required for drinking & domestic purposes @ 70 lpcd (in lpd)	Average expected yield of Arsenic free water in lps	Supply of arsenic free water by running 8 hrs/day (lpd)	No of Tube Well required	Cost of the tube well of 300 m depth (approx) & 10"x6" dia @ Rs. 25 lakhs (In lakh) as per CGWB, EFC	No of Observation Well required	Cost of the Observation well of 300 m depth (approx) 6" dia @ Rs. 20 lakhs (In lakh)
1	BELUN-DHAMASIN	14	21,765	23824	1667678	12.5	360000	5	125		
2	BERALA KONCHMALI	9	17,197	18824	1317669	12.5	360000	4	100		
3	BONTIKA-BOINCHEE	5	25,128	27505	1925358	12.5	360000	5	125		
4	HARAL-DASPUR	14	20,608	22558	1579026	12.5	360000	4	100	1	20
5	ILSOVA-DASPUR	13	16,075	17596	1231699	12.5	360000	3	75	1	20
6	ITACHUNA-KHANNYAN	11	22,166	24263	1698403	12.5	360000	5	125		
7	JAMGRAM-MONDALAI	11	15,219	16659	1166110	12.5	360000	3	75		
8	JAMNA	9	10,794	11815	827057.9	12.5	360000	2	50	1	20
9	JAYAR-DWARBASINI	11	18,515	20267	1418656	12.5	360000	4	100		
10	KHIRKUNDU NAMAJGRAM NIALA	10	20,300	22220	1555427	12.5	360000	4	100		
11	PANCHGHORA-TOREGRAM	7	12,058	13199	923908.1	12.5	360000	3	75		
12	PANDUA	0	30,700	33604	2352295	12.5	360000	7	175		
13	RAMESWARPUR GOPALNAGAR	10	18,382	20121	1408466	12.5	360000	4	100		
14	SARAITINNA	6	23,681	25921	1814486	12.5	360000	5	125		
15	SIKHIRA-CHAMPTA	12	14,877	16284	1139905	12.5	360000	3	75		
16	SIMLAGARH-VITASIN	14	28,732	31450	2201503	12.5	360000	6	150		
	Total		**316197**	**346109**	**24227647**			**67**	**1675**	**3**	**60**

Proposed Design of Arsenic Free Wells

The specially designed wells with cement seal technique answer the solution to handle such situation. The cement sealing is applied to a suitably thick intervening clay layer separating the arsenic contaminated aquifer from arsenic free aquifer (Fig 15). This cement seal prevents seeping of contaminated water through the annular space which is filled with gravel material.



Schematic Design of Tube well with cement seal for Arsenic affected Area.

Chanditala I, Chinsurah, Polba-Dadpur, Singur & Srirampur-Uttarpara blocks of Hugli district, West Bengal are not reported as arsenic infested blocks. From the sub-surface disposition of the aquifers it is observed that aquifer I (upto depth of 150m bgl) & Aquifer II (150-250mbgl) are present in Chanditala I, Chinsurah & Polba-Dadpur blocks of West Bengal whereas only one aquifer (aquifer I) present in Singur & Srirampur-Uttarpara blocks of Hugli district down to depth of nearly 200m bgl. All the aquifers are quite potential to supply drinking water in all the blocks.

8.3 Ground Water Management Plan for Irrigation Purposes:

The block wise geographical area, cultivable area, irrigation area, ground water resources available; ground water draft etc has been presented in Table –XVI.

Table- XVI : Block wise ground water Resources, Draft, SOD and Category

Sr. No.	District	Name of Block	Net Available GW Resources in MCM	Gross GW Draft in MCM	SOD % in 2011	Pre trend (- rising & + Falling)	Post trend (- rising & + Falling)	Category of Block
1	Barddhaman	Purbasthali I	82.1779	40.2134	48.93	5.30	11.16	Safe
2		Purbasthali II	102.5529	77.0392	75.12	12.73	19.38	Safe
3		Kalna I	111.9583	32.3908	28.52	1.32	8.53	Safe
4		Kalna II	78.2050	43.6592	55.45	-2.74	30.55	Semi Critical
5	Nadia	Chakdah	160.5789	84.5131	52.63	6.09	11.63	Safe
6		Haringhata	83.2147	62.7605	75.42	8.8	10.3	Safe
7		Krishnanagar I	145.6295	113.4381	77.89	0.01	7.29	Safe
8		Krishnanagar II	55.8829	44.7623	80.00	1.79	8.52	Safe
9		Ranaghat I	64.7454	41.8145	64.58	-0.41	5.22	Safe
10		Ranaghat II	145.1725	124.2036	85.56	1.88	7.69	Safe
11		Shantipur	74.7269.	57.7818	77.32	3.76	8.23	Safe
12		Nabadwip	49.1140	32.1749	65.51	4.58	6.7	Safe
13	Hughli	Balagarh	119.7363	55.2274	45.79	2.60	13.75	Safe
14		Pandua	112.4131	56.0345	49.38	16.09	25.32	Semi Critical
15		Chinsurah	46.2839	17.8222	38.50	18.99	26.38	Semi Critical
16		Polba-Dadpur	115.1414	54.6219	47.05	35.28	33.96	Semi Critical
17		Singur	72.4779	26.4891	36.54	43.70	29.14	Semi Critical
18		Chanditala I	37.8126	17.7437	46.11	33.85	18.50	Safe
19		Srirampur-Uttarpara	34.4794	17.1738	49.81	14.51	16.17	Safe
20	North 24 Parganas	Amdanga	65.4026	35.3343	54.03	14.57	23.69	Safe
21		Bagdah	126.7384	97.1310	76.64	4.08	8.06	Safe

22		Barrackpore I	90.6631	34.1773	37.70	13.32	18.64	Safe
23		Bongaon	185.6112	125.6717	67.71	1.76	3.62	Safe
24		Gaighata	130.6250	97.1744	74.39	5.63	6.02	Safe
25		Habra I	82.5752	57.7102	69.89	2.19	9.01	Safe
26		Habra II	52.7249	28.2243	53.53	9.12	17.02	Safe

Out of 26 blocks in the study area, **five blocks have been identified as Semi-Critical** category (Kalna II-Barddhaman district, Pandua, Chinsura, Polba-Dadpur & Singur of Hughli district) and **twenty one blocks have been identified as Safe category.**.

It is observed that SOD of the study area varies from 28.52 to 80%. The long term premonsoon trend of water level shows declining trend of 0.01 to 43 cm/yr and post monsoon trend ranges from 3.6 to 33.96 cm/yr. In most of the blocks, the long term trend of water level is not significantly declining (not more than 20 cm/yr as considered by CGWB and State Government jointly). Only five blocks (Kalna-II, Barddhaman district, Pandua, Chinsura, Polba-Dadpur & Singur of Hughli district) is categorized as Semi-critical where the long term trend of water level is significantly declining (more than 20 cm/yr). Based on the ground water resources estimation, it is recommended to restrict the use of ground water resources for irrigation purposes in the above semi-critical blocks. It is also recommended to implement artificial recharge projects in the above blocks. In safe blocks, ground water development can be done by construction of tube wells tapping the aquifer I. Block wise ground water management plan was presented in Table-XVII below.

Table-XVII Block wise ground water management plan

Sr No.	Name of Block	Cultivable area in ha	Net irrigated area in ha	Area to be irrigated in ha	SOD in %	Category	Remarks for GW Management Plan
1	Kalna I	12818.00	8210.00	4608.00	28.52	Safe	Can be developed for GW based Irrigation
2	Kalna II	13958	8276	5682.00	55.45	Semi Critical	Scheme for artificial recharge and SW based irrigation can be taken up
3	Purbasthali I	11871	7006	4865.00	48.93	Safe	Can be developed for GW based Irrigation
4	Purbasthali II	14810	10718	4092.00	75.12	Safe	Can be developed for GW based Irrigation
5	Balagarh	15693	8195	7498.00	45.79	Safe	Can be developed for GW based Irrigation
6	Chanditala I	6879	4409	2470.00	46.11	Safe	Can be developed for GW based Irrigation

7	Chinsura	3752	2328	1424.00	38.50	Semi Critical	Scheme for artificial recharge and SW based irrigation can be taken up
8	Pandua	23022	10691	12331.00	49.38	Semi Critical	Scheme for artificial recharge and SW based irrigation can be taken up
9	Polba-Dadpur	19468	10573	8895.00	47.05	Semi Critical	Scheme for artificial recharge and SW based irrigation can be taken up
10	Singur	10069	3117	6952.00	36.54	Semi Critical	Scheme for artificial recharge and SW based irrigation can be taken up
11	Srirampur-Uttarpara	1342	419	923.00	49.81	Safe	Can be developed for GW based Irrigation
12	Chakdah	20683	7871	12812.00	52.63	Safe	Can be developed for GW based Irrigation
13	Haringhata	10453	6769	3684.00	75.42	Safe	Can be developed for GW based Irrigation
14	Krishnanagar I	12106	8172	3934.00	77.89	Safe	Can be developed for GW based Irrigation
15	Krishnanagar II	8289	5725	2564.00	80.00	Safe	Can be developed for GW based Irrigation
16	Nabadwip	5225	2960	2265.00	64.58	Safe	Can be developed for GW based Irrigation
17	Ranaghat I	11478	3893	7585.00	85.56	Safe	Can be developed for GW based Irrigation
18	Ranaghat II	22862	12066	10796.00	77.32	Safe	Can be developed for GW based Irrigation
19	Shantipur	9841	4464	5377.00	65.51	Safe	Can be developed for GW based Irrigation
20	Amdanga	8155	4516	3639.00	54.03	Safe	Can be developed for GW based Irrigation
21	Bagdah	17667	8636	9031.00	76.64	Safe	Can be developed for GW based Irrigation
22	Barrackpore I	5485	1844	3641.00	37.70	Safe	Can be developed for GW based Irrigation
23	Bongaon	26109	16940	9169.00	67.71	Safe	Can be developed for GW based Irrigation
24	Gaighata	17676	9332	8344.00	74.39	Safe	Can be developed for GW based Irrigation
25	Habra I	10231	4323	5908.00	69.89	Safe	Can be developed for GW based Irrigation
26	Habra II	8261	5257	3004.00	53.53	Safe	Can be developed for GW based Irrigation

Sr No.	Name of Block	Category	Future GW resources available for irrigation in ham	Unit Draft of LDTW in ham/yr	Unit Draft of HDTW in ham/yr	No of additional LDTW feasible	No. of additional HDTW feasible
1	Kalna I	Safe	7692.46	4	21	1731	37
2	**Kalna II**	**Semi Critical**	3287.38	4	21	0	0
3	Purbasthali I	Safe	4102.07	4	21	923	20
4	Purbasthali II	Safe	2454.41	4	21	552	12
5	Balagarh	Safe	6245.19	2.4	21	2342	30
6	Chanditala I	Safe	1848.07	2.4	21	693	9
7	**Chinsura**	**Semi Critical**	2574.62	2.4	21	0	0
8	**Pandua**	**Semi Critical**	5365.66	2.4	21	0	0
9	**Polba-Dadpur**	**Semi Critical**	5822.59	2.4	21	0	0
10	**Singur**	**Semi Critical**	4188.04	2.4	21	0	0
11	Srirampur-Uttarpara	Safe	1424.61	2.4	21	534	7
12	Chakdah	Safe	7297.43	1.6	21	4105	35

13	Haringhata	Safe	1935.91	1.6	21	1089	9
14	Krishnanagar I	Safe	2998.27	1.6	21	1687	14
15	Krishnanagar II	Safe	1046.69	1.6	21	589	5
16	Nabadwip	Safe	1569.22	1.6	21	883	7
17	Ranaghat I	Safe	2183.89	1.6	21	1228	10
18	Ranaghat II	Safe	1852.9	1.6	21	1042	9
19	Shantipur	Safe	1507.3	1.6	21	848	7
20	Amdanga	Safe	2914.61	1.4	21	1874	14
21	Bagdah	Safe	2838.48	1.4	21	1825	14
22	Barrackpore I	Safe	5005.73	1.4	21	3218	24
23	Bongaon	Safe	5745.76	1.4	21	3694	27
24	Gaighata	Safe	3177.86	1.4	21	2043	15
25	Habra I	Safe	2225.63	1.4	21	1431	11
26	Habra II	Safe	2366.72	1.4	21	1521	11
Total			89672			33850	326

For Semi-critical blocks (Kalna II, Chinsura, Pandua, Polba-Dadpur & Singur blocks), withdrawal of ground water has to be restricted side by side scope of artificial recharge has to be adopted. It is better to adopt policies for full utilization of command areas for existing tube wells. Change in cropping pattern and low crop water requirement crops may be thought over. Side by side irrigation from surface water sources may also be adopted. Apart from these modern techniques for irrigation should be encouraged among the farmers.

Research & Development studies have to be undertaken for inclusion of arsenic in crops irrigated by arsenic water and its impact on human health.

8.4 Scope for Artificial Recharge in Study Area:

Considering the administrative units (blocks or municipalities), average post monsoon water level and long term trend of ground water level, the area suitable for artificial recharge has been identified (**Plate 32**). The area suitable for recharge is arrived considering the following sub area:

a) Water levels more than 9 m bgl with or without the falling trend with first priority.
b) Water levels between 6 and 9 m bgl and with declining trend with second priority.
c) Area showing water levels between 6-9 mbgl with no declining trend with third priority.
d) Areas showing water levels between 3 and 6 mbgl and with declining trend with fourth priority.

However, area with 3-6 m bgl post monsoon water level with no long term falling trend and area with 0-3 mbgl of post monsoon water level has not been considered as feasible area for recharge.

It is observed that in the total area 5031 sq km, about **1,373 sq km** has been identified as feasible area for recharge.

Block-wise net surface water availability for recharge; source-water allocation for suitable types of structures; feasible numbers of various structures and structure-wise cost estimates were worked out for the study area, which is presented in the Table-XVIII below**.**

Table-XVIII Block-wise net surface water availability for recharge; source-water allocation for suitable types of structures

District	Block	Total Surface water available in MCM for recharge	Source Water Allocation (MCM)			Number of Structures feassible			Structure-wise Cost Estimate in lakh Rs.			Total cost in lakh Rs
			Percolation Tanks	REET with RS	Injection Well	Percolation Tanks	REET with RS	Injection Well	Percolation Tanks	REET with RS	Injection Well	
BARDDHAMAN	Kalna-I	104.65	49	28	28	98	278	93	392	834	1116	2342
BARDDHAMAN	Kalna-II	102.68	48	27	27	96	273	91	384	819	1092	2295
BARDDHAMAN	Purbasthali-I	88.53	42	24	24	83	235	78	332	705	936	1973
BARDDHAMAN	Purbasthali-II	114.79	54	30	30	108	305	102	432	915	1224	2571
HUGLI	Balagarh	156.05	73	41	41	146	414	138	2920	3312	552	6784
HUGLI	Chanditala-I	72.14	34	19	19	68	192	64	1360	1536	256	3152
HUGLI	Chunchura	83.52	39	22	22	78	222	74	1560	1776	296	3632
HUGLI	Pandua	213.39	100	57	57	200	567	189	4000	4536	756	9292
HUGLI	Polba-Dadpur	220.54	103	59	59	207	585	195	4140	4680	780	9600
HUGLI	Singur	154.26	72	41	41	145	410	137	2900	3280	548	6728
HUGLI	Shrirampur	28.80	14	8	8	27	76	25	540	608	100	1248
NADIA	Chakdah	16.41	8	4	4	15	44	15	300	352	60	712
NADIA	Haringhata	7.85	4	2	2	7	21	7	140	168	28	336
NADIA	Krishnanagar-I	13.32	6	4	4	12	35	12	240	280	48	568
NADIA	Krishnanagar-II	5.73	3	2	2	5	15	5	100	120	20	240
NADIA	Navadwip	5.02	2	1	1	5	13	4	100	104	16	220
NADIA	Ranaghat-I	7.88	4	2	2	7	21	7	140	168	28	336
NADIA	Ranaghat -II	12.92	6	3	3	12	34	11	240	272	44	556
NADIA	Shantipur	9.03	4	2	2	8	24	8	160	192	32	384
NORTH 24 PARGANAS	Amdanga	18.35	9	5	5	17	49	16	340	392	64	796
NORTH 24 PARGANAS	Bagdah	30.75	14	8	8	29	82	27	580	656	108	1344
NORTH 24 PARGANAS	Barakpur-I	28.62	13	8	8	27	76	25	540	608	100	1248
NORTH 24 PARGANAS	Bongaon	47.61	22	13	13	45	126	42	900	1008	168	2076
NORTH 24 PARGANAS	Gaighata	32.05	15	9	9	30	85	28	600	680	112	1392
NORTH 24 PARGANAS	Habra-I	22.24	10	6	6	21	59	20	420	472	80	972
NORTH 24 PARGANAS	Habra-II	14.84	7	4	4	14	39	13	280	312	52	644
		1611.95	756	428	428	1510	4280	1426	24040	28785	8616	61441

Considering the higher ground water development, long term declining trend of water level, categorization of the block as per the Ground Water Resource Assessment, 2011 and block/municipal level suitable area for recharge, priority may be assessed for implementation of artificial recharge projects in the study area. Percolation Tanks and Re-excavation of Existing Tanks with Recharge Shafts in the rural area, and Injection Wells in the municipal and urban area may be constructed as per the feasibility study. To start with, the semi-critical blocks (Kalna II, Chinsura, Pandua, Polba-Dadpur & Singur blocks) may be targeted first.

Table- XIX Block wise area suitable for recharge in the study area

District	**Block**	Area (in sq. Km)	Total Area suitable for recharge (sq km.)
BARDDHAMAN	Kalna-I	178.22	17.07
BARDDHAMAN	Kalna-II	172.64	0.72
BARDDHAMAN	Purbasthali-I	151.28	15.40
BARDDHAMAN	Purbasthali-II	199.61	37.62
HUGLI	Balagarh	215.52	0
HUGLI	Chanditala-I	93.00	87.46
HUGLI	Chunchura	96.35	43.74
HUGLI	Pandua	284.03	96.81
HUGLI	Polba-Dadpur	287.85	282.28
HUGLI	Singur	206.23	202.76
HUGLI	Shrirampur	93.07	80.36
NADIA	Chakdah	346.61	80.48
NADIA	Haringhata	164.28	16.35
NADIA	Krishnanagar-I	275.88	2.85
NADIA	Krishnanagar-II	141.46	0
NADIA	Navadwip	103.72	23.82
NADIA	Ranaghat-I	160.21	6.33
NADIA	Ranaghat -II	280.37	30.42
NADIA	Shantipur	192.16	48.60
NORTH 24 PARGANAS	Amdanga	130.61	49.02
NORTH 24 PARGANAS	Bagdah	228.62	8.27
NORTH 24 PARGANAS	Barakpur-I	145.34	132.74
NORTH 24 PARGANAS	Bongaon	358.55	59.99
NORTH 24 PARGANAS	Gaighata	248.80	3.65
NORTH 24 PARGANAS	Habra-I	146.16	36.91
NORTH 24 PARGANAS	Habra-II	130.79	9.64
Total		5031.36	1373.29

Considering the higher ground water development, categorization of the block as per the Ground Water Resource Assessment, 2011 and block/municipal level suitable area for recharge, priority may be assessed for implementation of artificial recharge projects in the study area. Percolation Tanks and Re-excavation of Existing Tanks with Recharge Shafts in the rural area, and Injection Wells in the municipal and urban area may be constructed as per

the feasibility study. To start with, the semi-critical blocks and municipal areas may be targeted.

8.5 Computation of Ground Water Storage in 2nd confined aquifer:

The co-efficient of storage or storativity of a confined aquifer is defined as the volume of water it releases or takes into storage per unit surface area of the aquifer per unit change in hydraulic head.

The Quantity of water added or released from an aquifer (Δ**V**) can be calculated as follows:

Δ**V= S.** Δ**h** Where **S** is Storativity and Δ**h** is Change in piezometric head of the aquifer

Therefore for an areal extent of **A** of the aquifer, the total quantity of Water Q that can release from the confined aquifer is as follows:

Q = A. Δ**V = A. S.** Δ**h**

The total quantity of water released in confined aquifer due to change in pressure (i.e to lower the piezometric head upto the bottom of confining layer) can be computed between piezometric head (h_1)at any given time 't' and the bottom of the confining layer (h_0) by using the following equation:

$$\mathbf{Q_P = S\ A\ \Delta h = SA\ (h_0 - h_1)}$$

Where ,

Q_P = Quantity of water released under Pressure (m^3)

S= Storativity

A= Areal extend of confined aquifer (m^2)

Δh = Change in piezometric head

h_0 = Bottom of the confining layer

h_1 = Piezometric head at time 't'

Calculation of Ground Water Draft from Confined Aquifer allowing 2m falls of Pieizometric level:

In general the piezometric head of the 2nd confined aquifer ranges from -3 to 15 m amsl during pre-monsoon period and it fluctuates between 2 to 3m in between Pre & Post monsoon periods. Calculation of volume of water that can be released have been calculated for overall area as well as for the blocks where deeper aquifer exists and can be utilized for drinking purposes (details of blockwise aquifer management as discussed earlier).

For the Whole study area, A = 5031 sq km = 5031×10^6 m^2 .

Q_P = Quantity of water released under Pressure (m^3) for lowering of piezometric head of 2m

$h_1 - h_2 = 2$ m

S= Storativity considering average S value as 9×10^{-4}

$Q_P = A \times S \times (h_1 - h_2) = 5031 \times 10^6 \times 9 \times 10^{-4} \times 2 = 9055800\ m^3 = 90.558$ MCM/yr

It is observed that tube well tapping the deeper aquifer can capable of yielding $25 m^3$/hr. Each deep tube well running for 8hrs of pumping per day with yield of $25 m^3$/hr for 365 days can capable of withdrawing 73000 m^3 of water. Therefore for draft of 90 MCM water it is calculated that additional 123 tube wells can be constructed in 2nd aquifer of the study area. However, as already mentioned that 2nd deeper aquifer (arsenic free) has been

kept only for drinking purposes, based on the requirements of individual blocks, availability of deeper arsenic free aquifer and actual need for drinking purposes (uncovered at present by State PHED) has been calculated and presented in the **Table-XX** below.

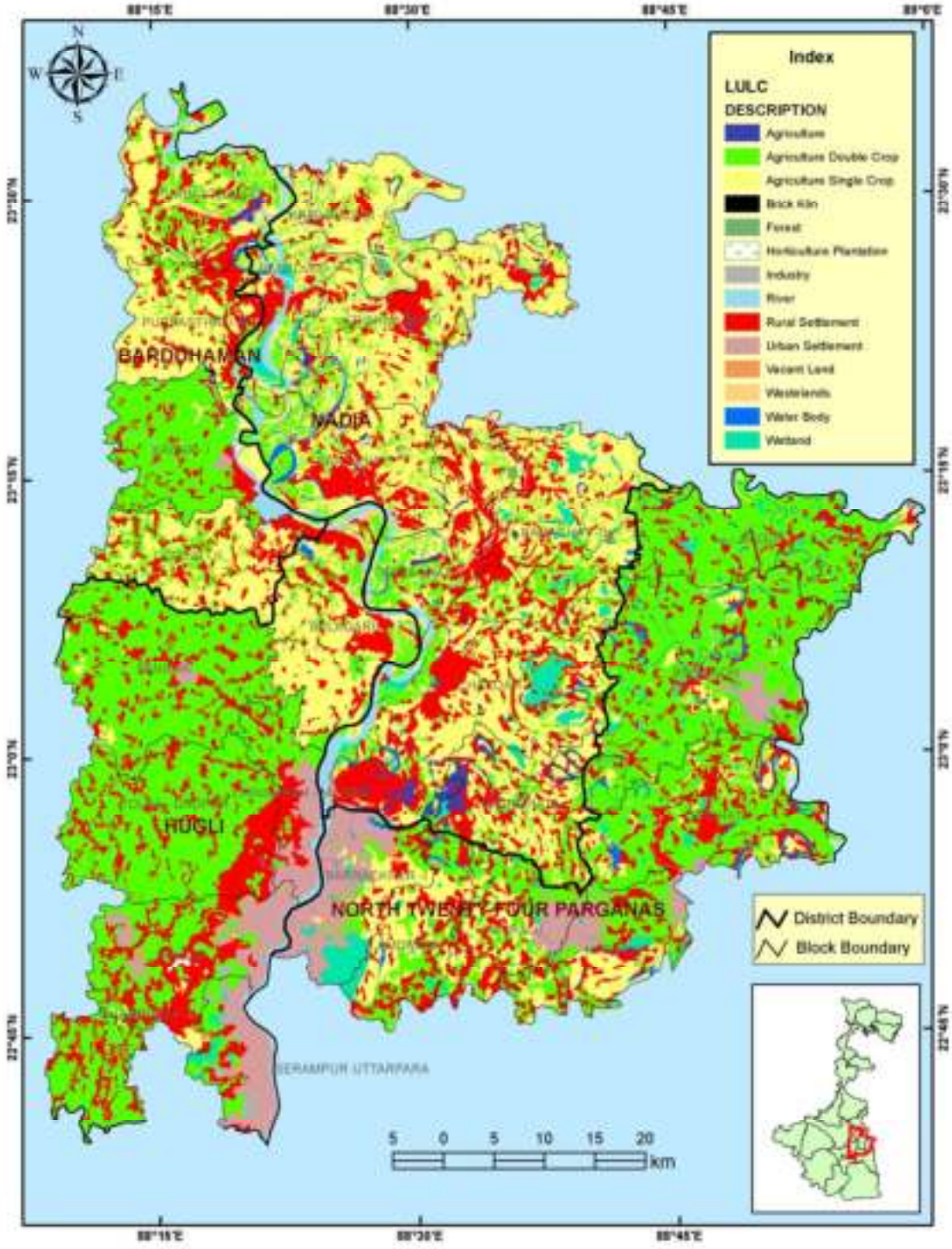
Table-XX deeper arsenic free aquifer and actual need for drinking purposes

District	Name of the block	Geographical area (in Sq.Km.)	Depth of Present Piezometric Surface (mamsl)	Maximum allowable depth of the piezometric surface (mamsl)	Storativity of the aquifer	Resource in MCM	Total annual unit draft in MCM (considering 30 m^3/hr discharge and 8 hrs/day running)	Number of tube well feasible
BARDDHAMAN	Kalna-I	178.22	5	3	0.0009	0.320796	0.073	4
BARDDHAMAN	Kalna-II	172.64	5	3	0.0009	0.310752	0.073	4
BARDDHAMAN	Purbasthali-I	151.28	9	7	0.0009	0.272304	0.073	4
BARDDHAMAN	Purbasthali-II	199.61	9	7	0.0009	0.359298	0.073	5
HUGLI	Balagarh	215.52	4	2	0.0009	0.387936	0.073	5
HUGLI	Chanditala-I	93	5	3	0.0009	0.1674	0.073	2
HUGLI	Chunchura	96.35	12	10	0.0009	0.17343	0.073	2
HUGLI	Pandua	284.03	11	9	0.0009	0.511254	0.073	7
HUGLI	Polba-Dadpur	287.85	3	1	0.0009	0.51813	0.073	7
HUGLI	Singur	206.23	5	3	0.0009	0.371214	0.073	5
HUGLI	Shrirampur	93.07	4	2	0.0009	0.167526	0.073	2
NADIA	Chakdah	346.61	10	8	0.0009	0.623898	0.073	9
NADIA	Haringhata	164.28	7	5	0.0009	0.295704	0.073	4
NADIA	Krishnanagar-I	275.88	9	7	0.0009	0.496584	0.073	7
NADIA	Krishnanagar-II	141.46	9	7	0.0009	0.254628	0.073	3
NADIA	Navadwip	103.72	8	6	0.0009	0.186696	0.073	3
NADIA	Ranaghat-I	160.21	11	9	0.0009	0.288378	0.073	4
NADIA	Ranaghat -II	280.37	11	9	0.0009	0.504666	0.073	7
NADIA	Shantipur	192.16	8	6	0.0009	0.345888	0.073	5
NORTH 24 PARGANAS	Amdanga	130.61	5	3	0.0009	0.235098	0.073	3
NORTH 24 PARGANAS	Bagdah	228.62	9	7	0.0009	0.411516	0.073	6
NORTH 24 PARGANAS	Barakpur-I	145.34	10	8	0.0009	0.261612	0.073	4
NORTH 24 PARGANAS	Bongaon	358.55	9	7	0.0009	0.64539	0.073	9
NORTH 24 PARGANAS	Gaighata	248.8	7	5	0.0009	0.44784	0.073	6
NORTH 24 PARGANAS	Habra-I	146.16	9	7	0.0009	0.263088	0.073	4
NORTH 24 PARGANAS	Habra-II	130.79	9	7	0.0009	0.235422	0.073	3
Total		5031.36						124

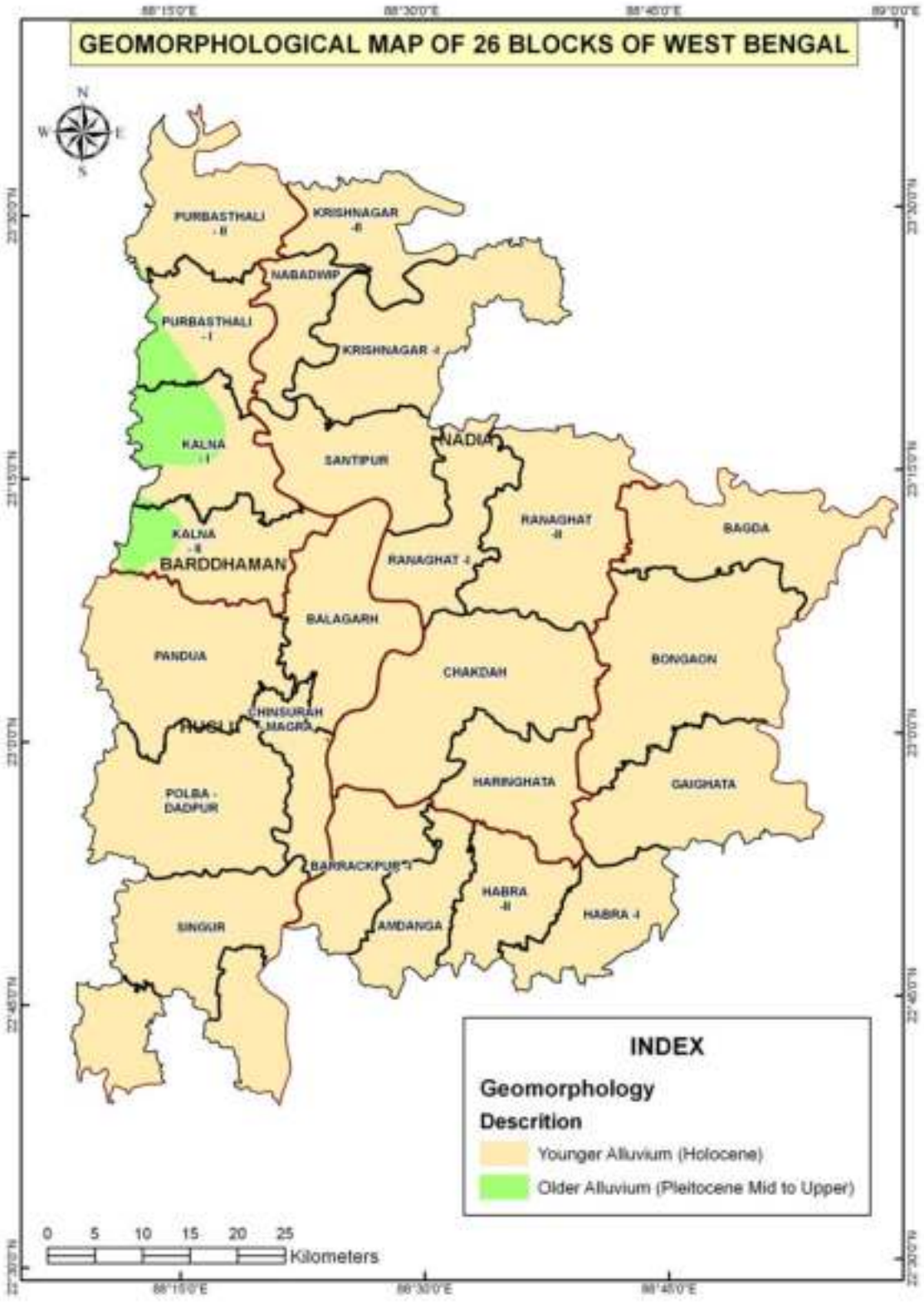
PLATES


ADMINISTRATIVE MAP OF 26 BLOCKS, WEST BENGAL
Index
Block HQ
Rail
Road
BARDDHAMAN
NADIA
HUGLI
NORTH TWENTY FOUR PARGANAS
District Boundary
Block Boundary
5 0 5 10 15 20
km

LANDUSE/LANDCOVER MAP OF 26 BLOCKS, WEST BENGAL



ISOHYTEL MAP OF 26 BLOCKS, WEST BENGAL


GEOMORPHOLOGICAL MAP OF 26 BLOCKS OF WEST BENGAL
88°15'0"E
88°30'0"E
88°45'0"E
89°0'0"E
N
W
E
S
PURBASTHALI - II
KRISHNAGAR - II
NABADWIP
PURBASTHALI - I
KRISHNAGAR - I
KALNA - I
SANTIPUR
NADIA
RANAGHAT - II
BAGDA
KALNA - II
BARDDHAMAN
RANAGHAT - I
BALAGARH
PANDUA
CHAKDAH
BONGAON
CHINSURAH MAGRA
HUGLI
POLBA - DADPUR
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GAIGHATA
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HABRA - II
HABRA - I
SINGUR
AMDANGA
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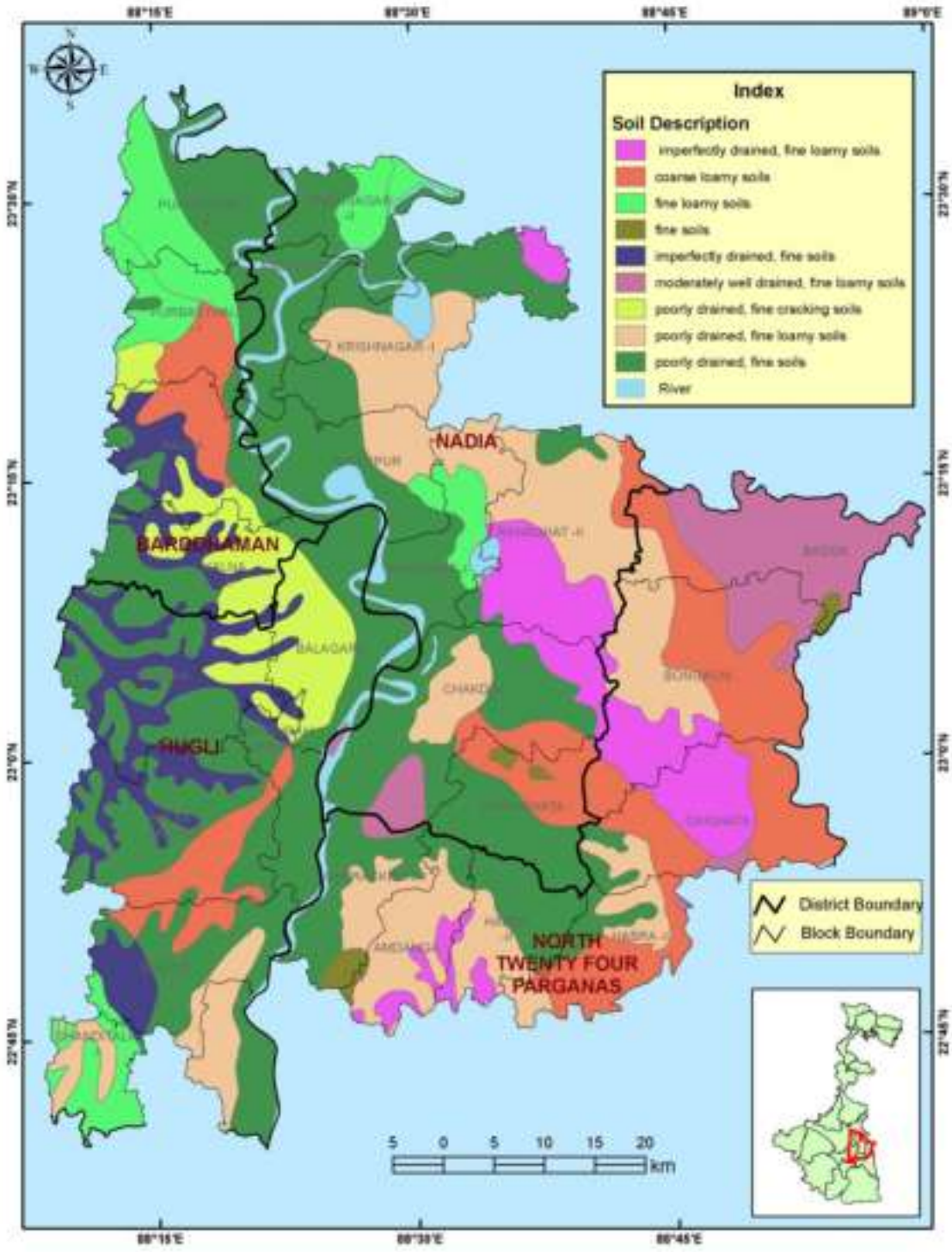
Older Alluvium (Pleitocene Mid to Upper)
0 5 10 15 20 25
Kilometers

DRAINAGE AND WATER BODY MAP IN 26 BLOCKS, WEST BENGAL

SOIL MAP OF 26 BLOCKS, WEST BENGAL




GEOLOGICAL MAP OF 26 BLOCKS OF WEST BENGAL
PURBASTHALI -II
KRISHNAGAR -II
NABADWIP
PURBASTHALI -I
KRISHNAGAR -I
KALNA -I
SANTIPUR
NADIA
KALNA -II
BARDDHAMAN
RANAGHAT -II
RANAGHAT -I
BAGDA
BALAGARH
PANDUA
CHAKDAH
BONGAON
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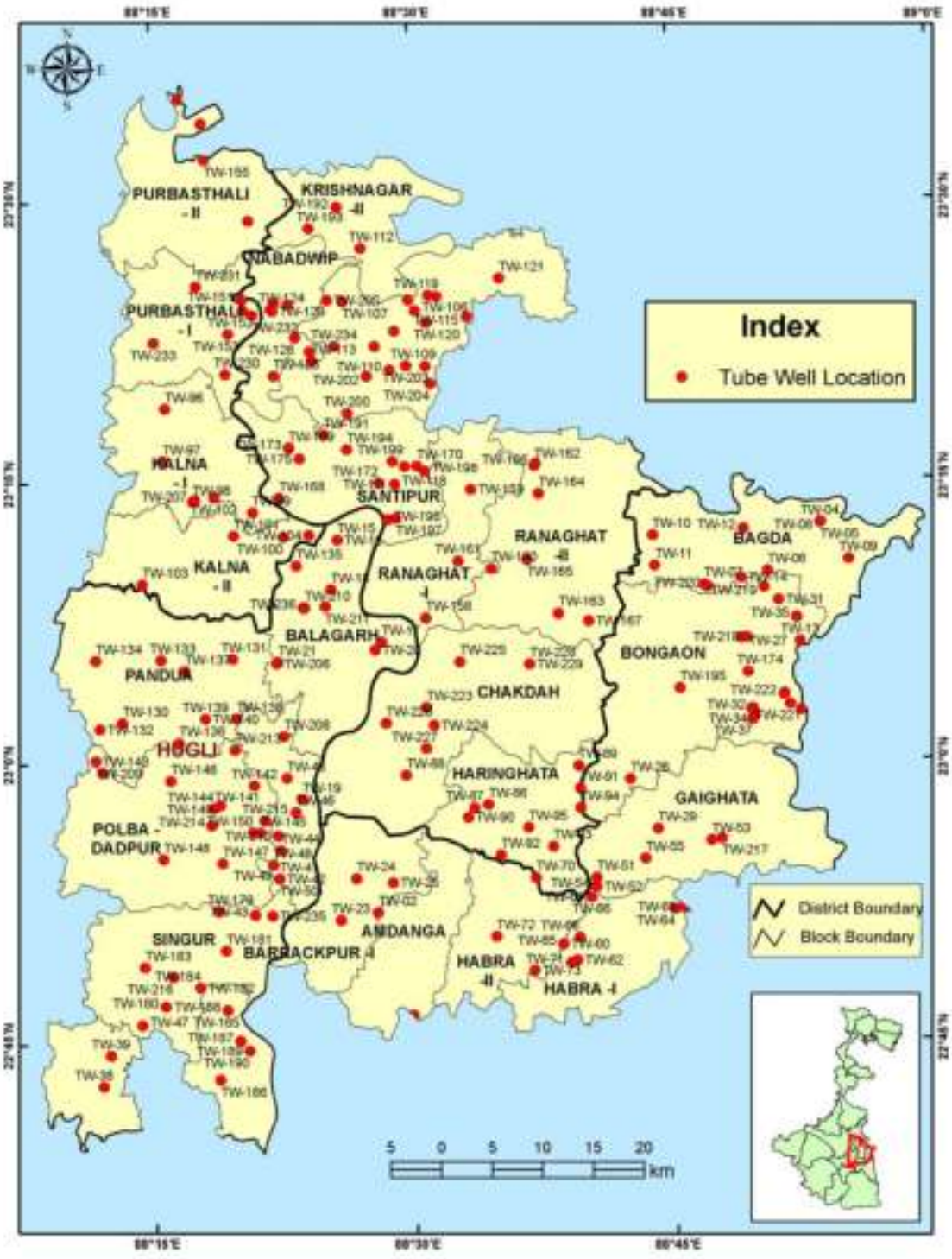
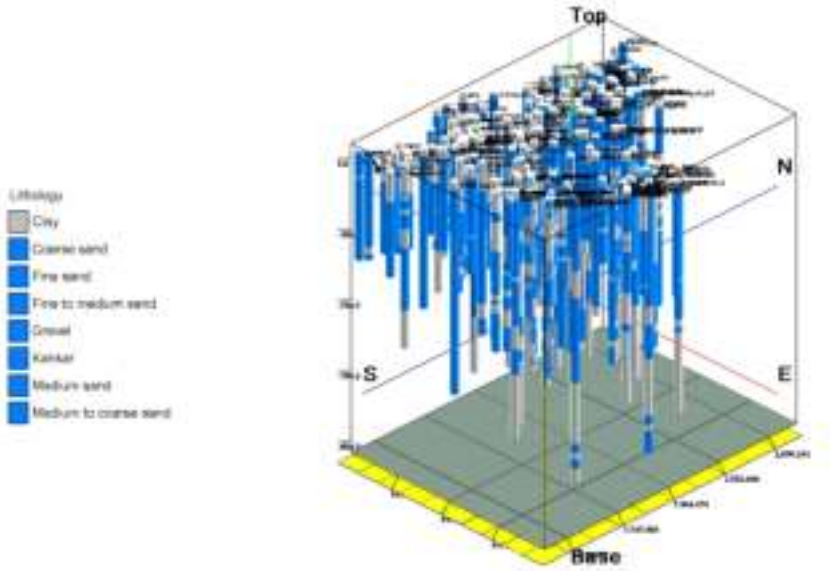
Older Alluvium (Pleitocene Mid to Upper)
0 5 10 15 20 25
Kilometers

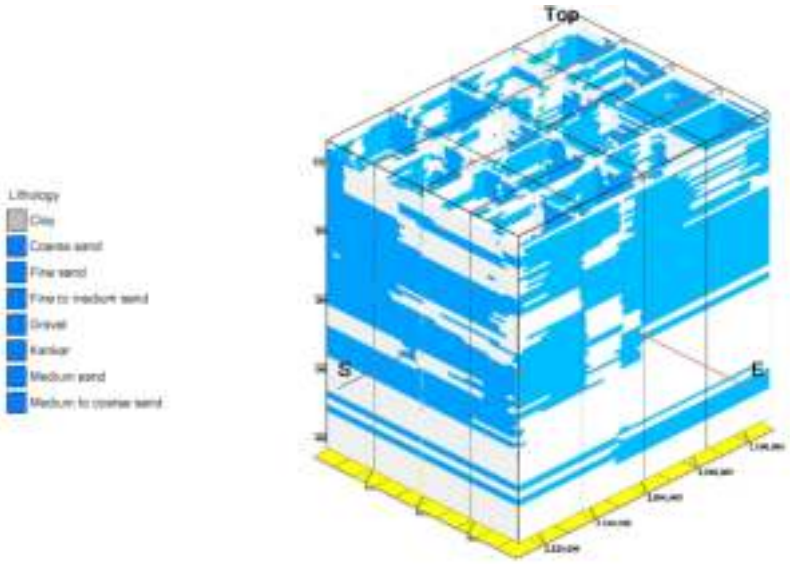
LOCATION OF TUBEWELLS (CGWB & STATE DEPT.) IN 26 BLOCKS, WEST BENGAL



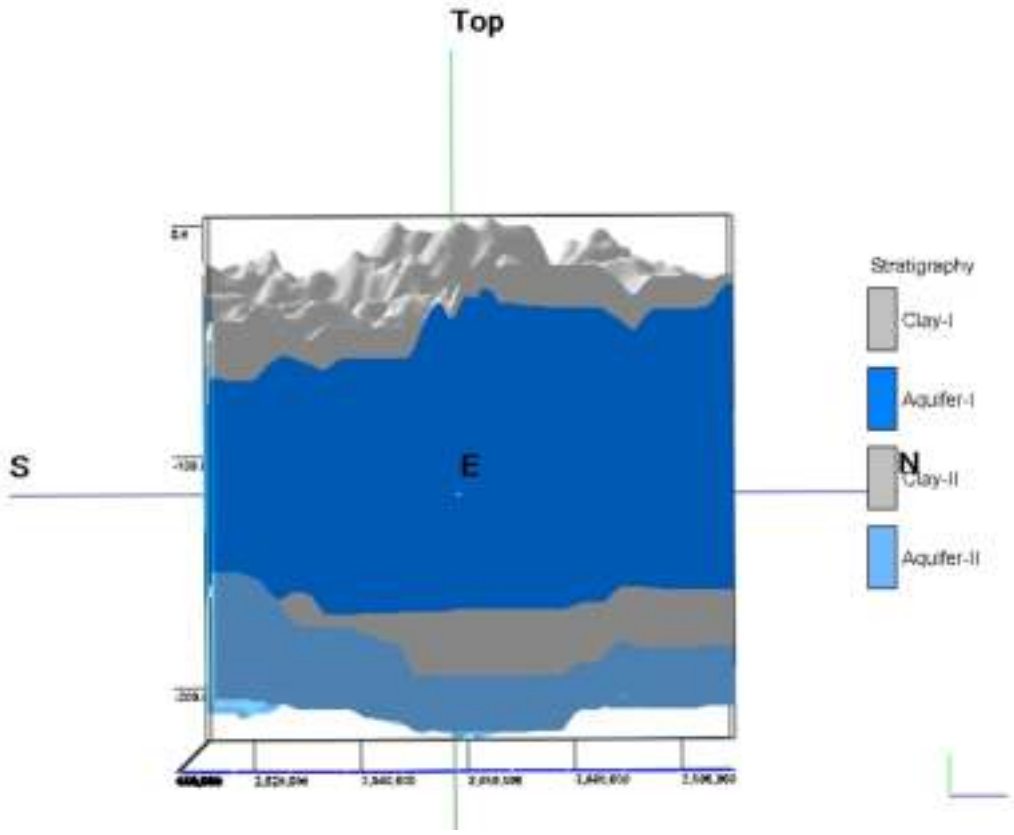
Multilog 3D Plot



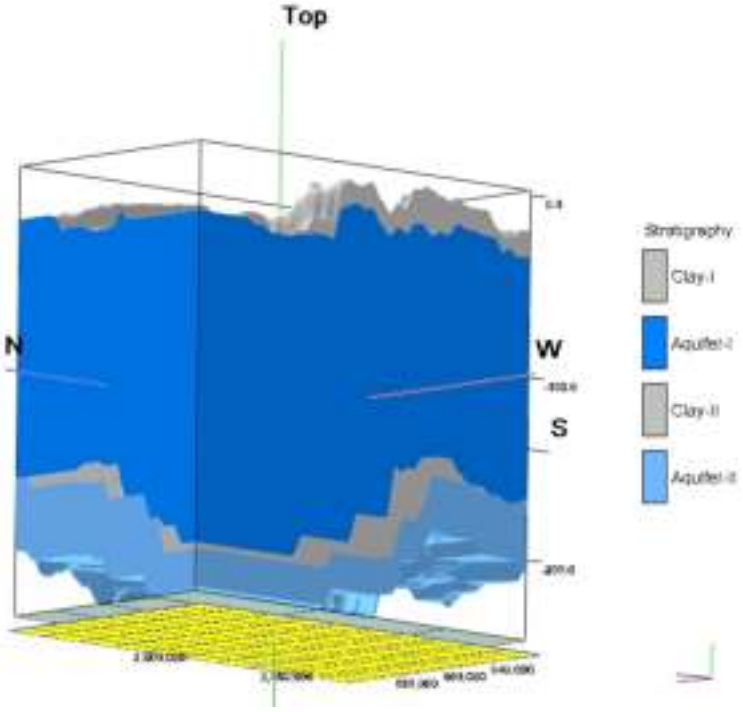
Lithological Fence 3D Diagram



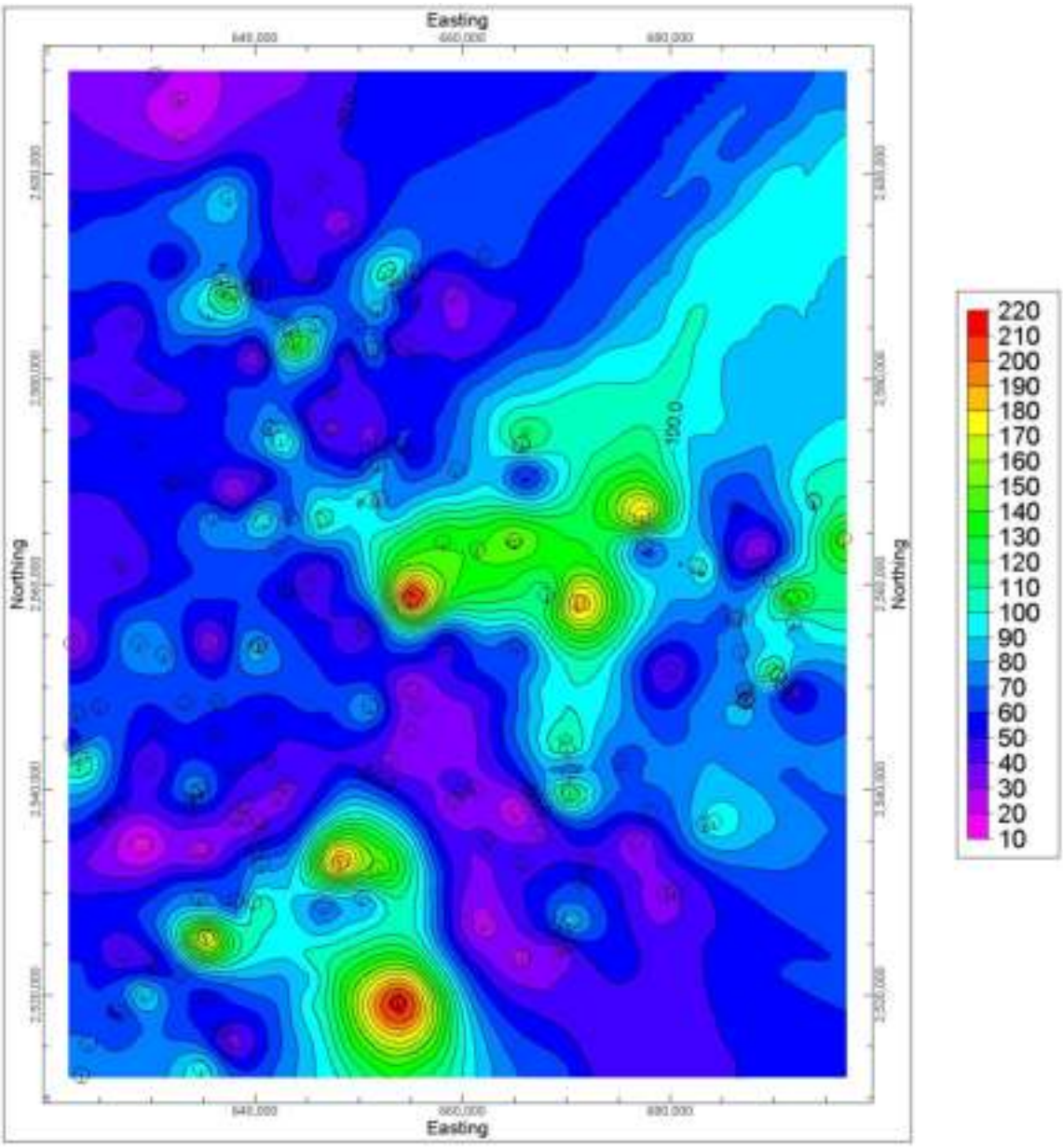
Aquifer 3D Model in the study area



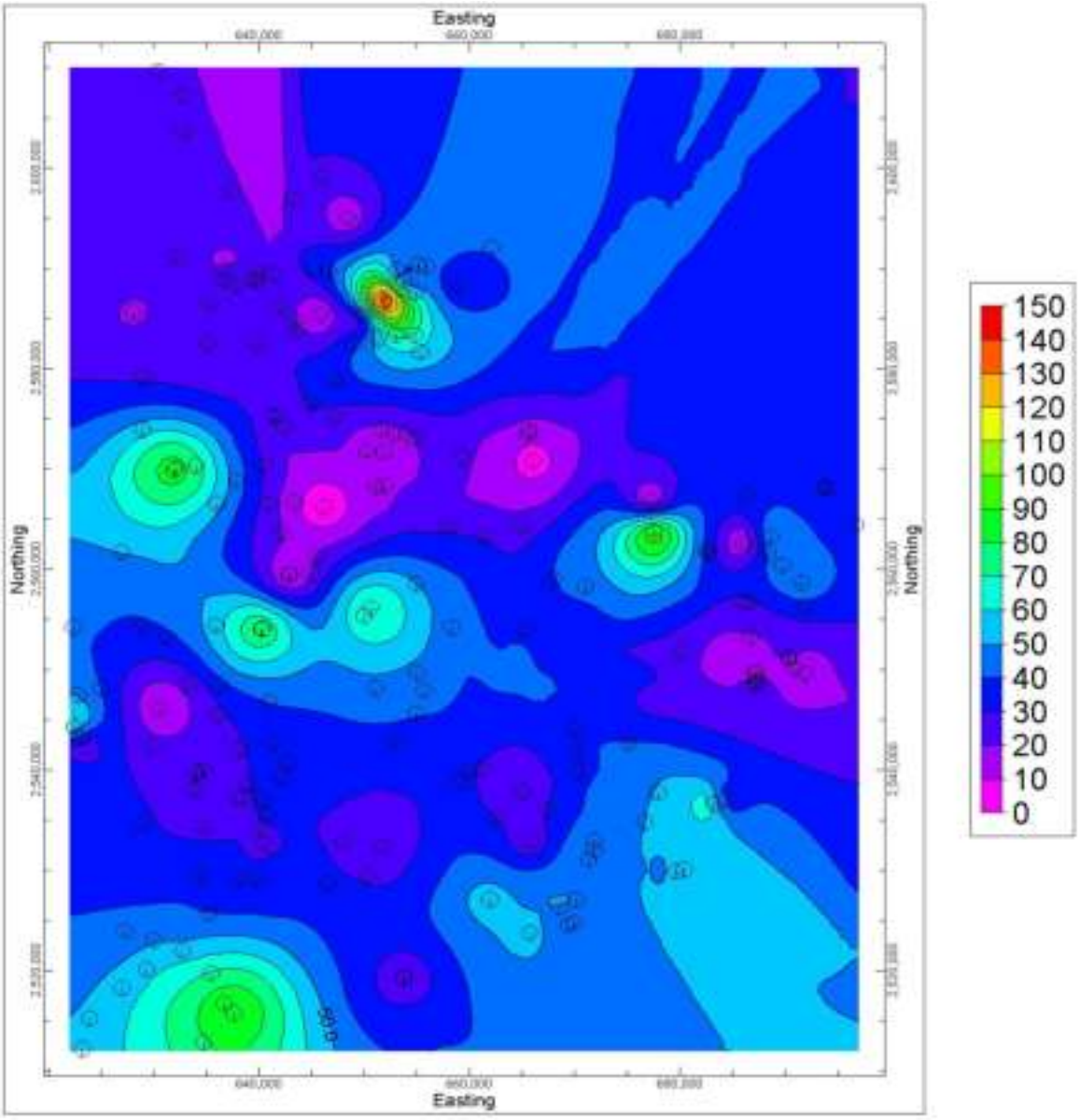
Aquifer 3D Model in As infested study area



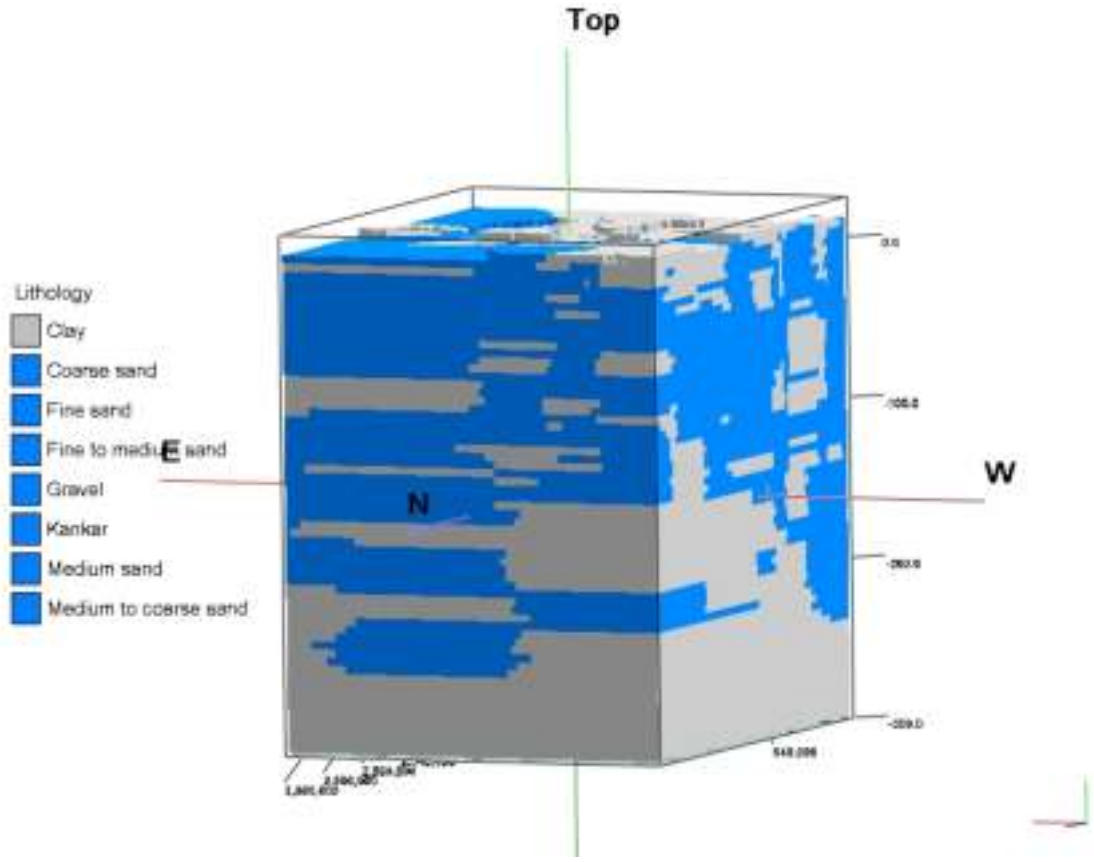
Isopach 2D of Aquifer-I in As area



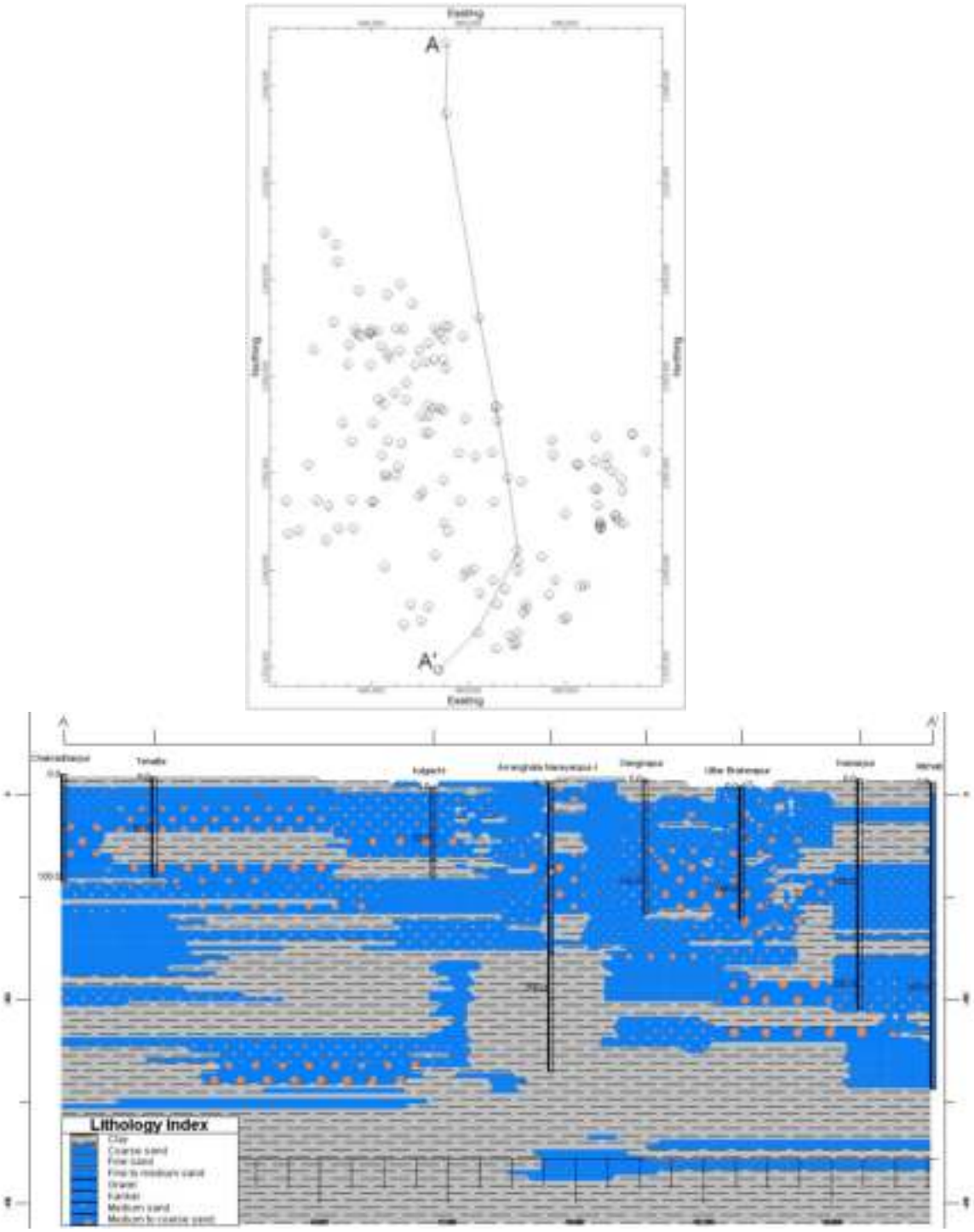
Isopach 2D of Aquifer-II in As area



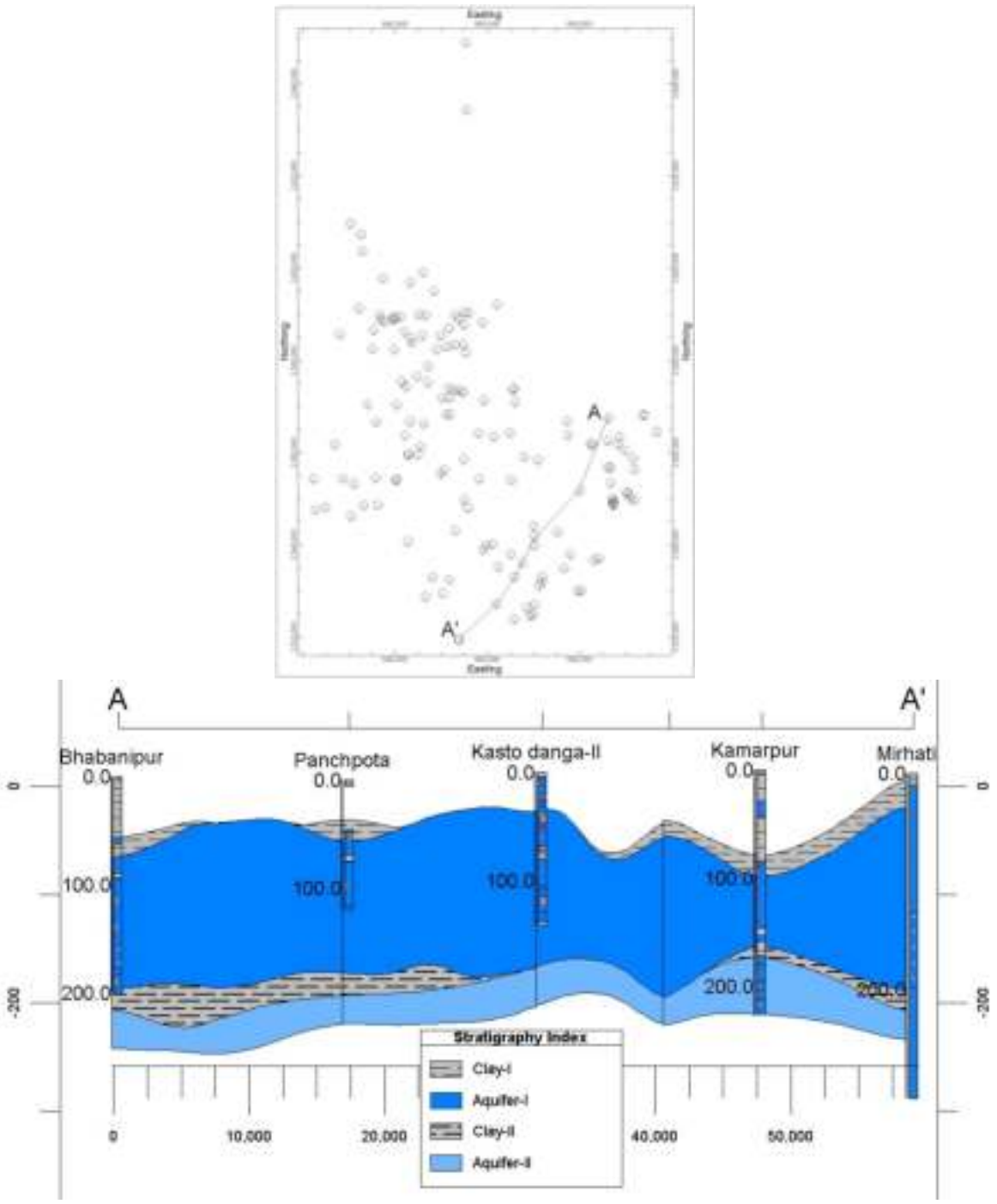
Lithological 3D Model in the area (300 m)



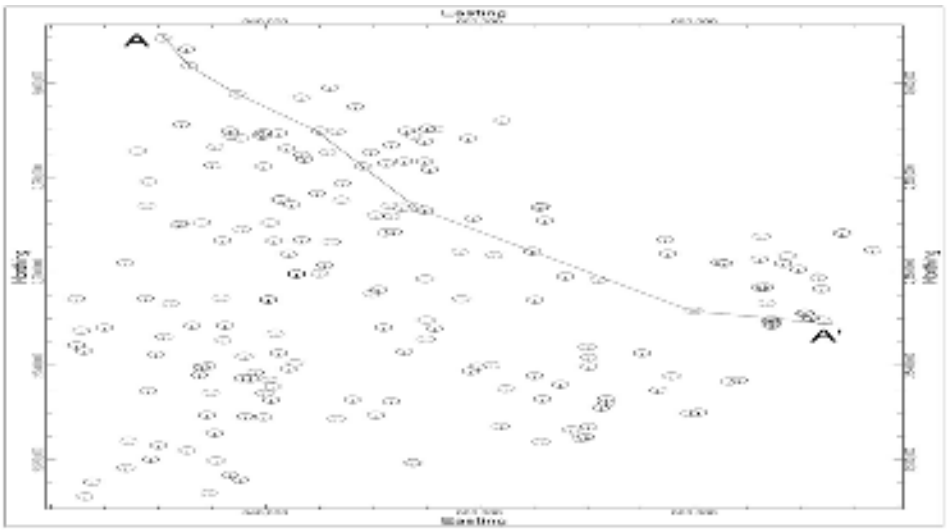
Lithology Profile along A-A’ (N-S) in As area

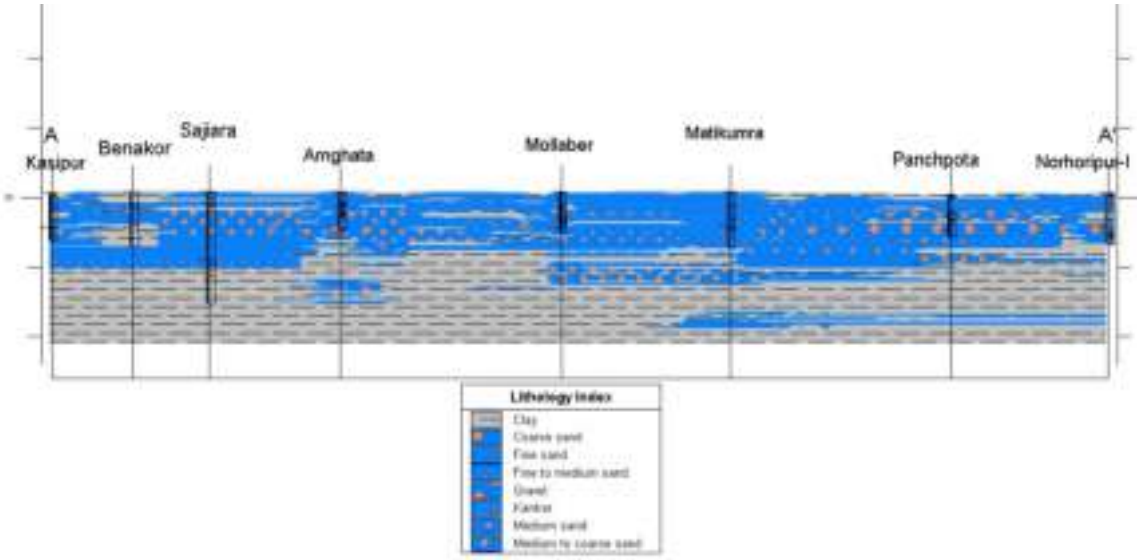


Aquifer Section in As area

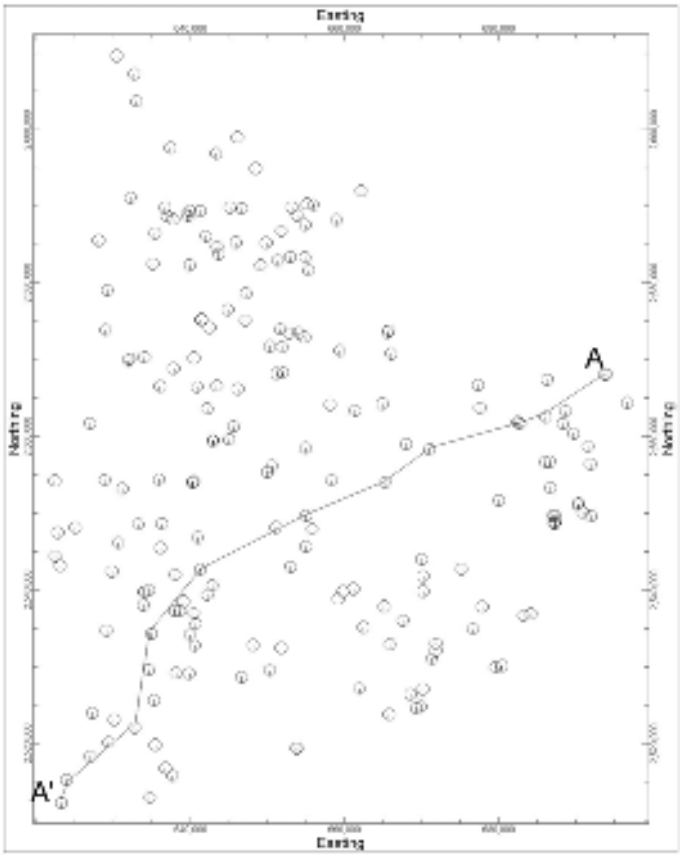


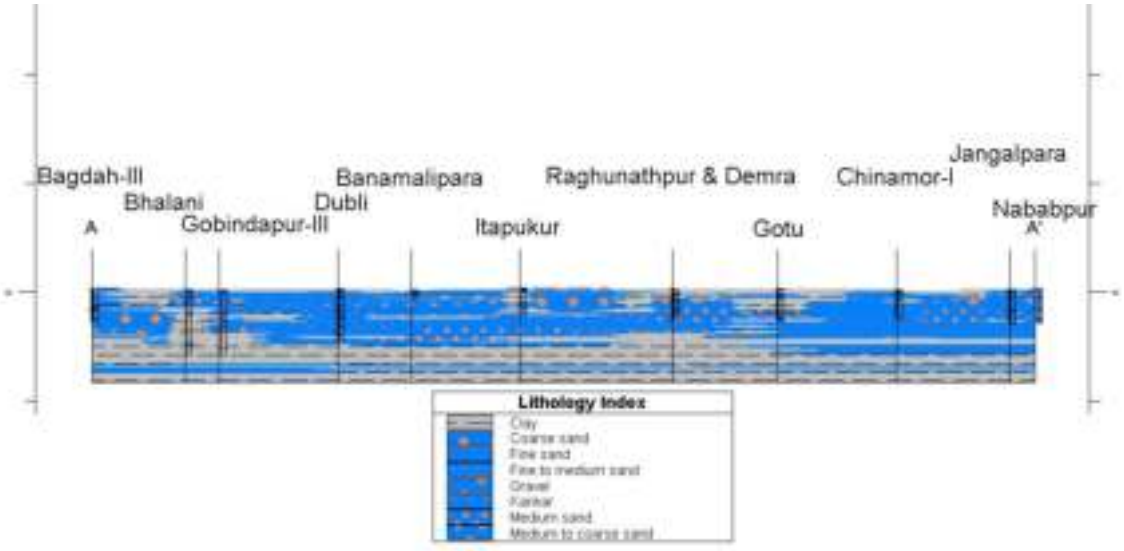
Lithology Profile along A-A’ (NW-SE) in As area



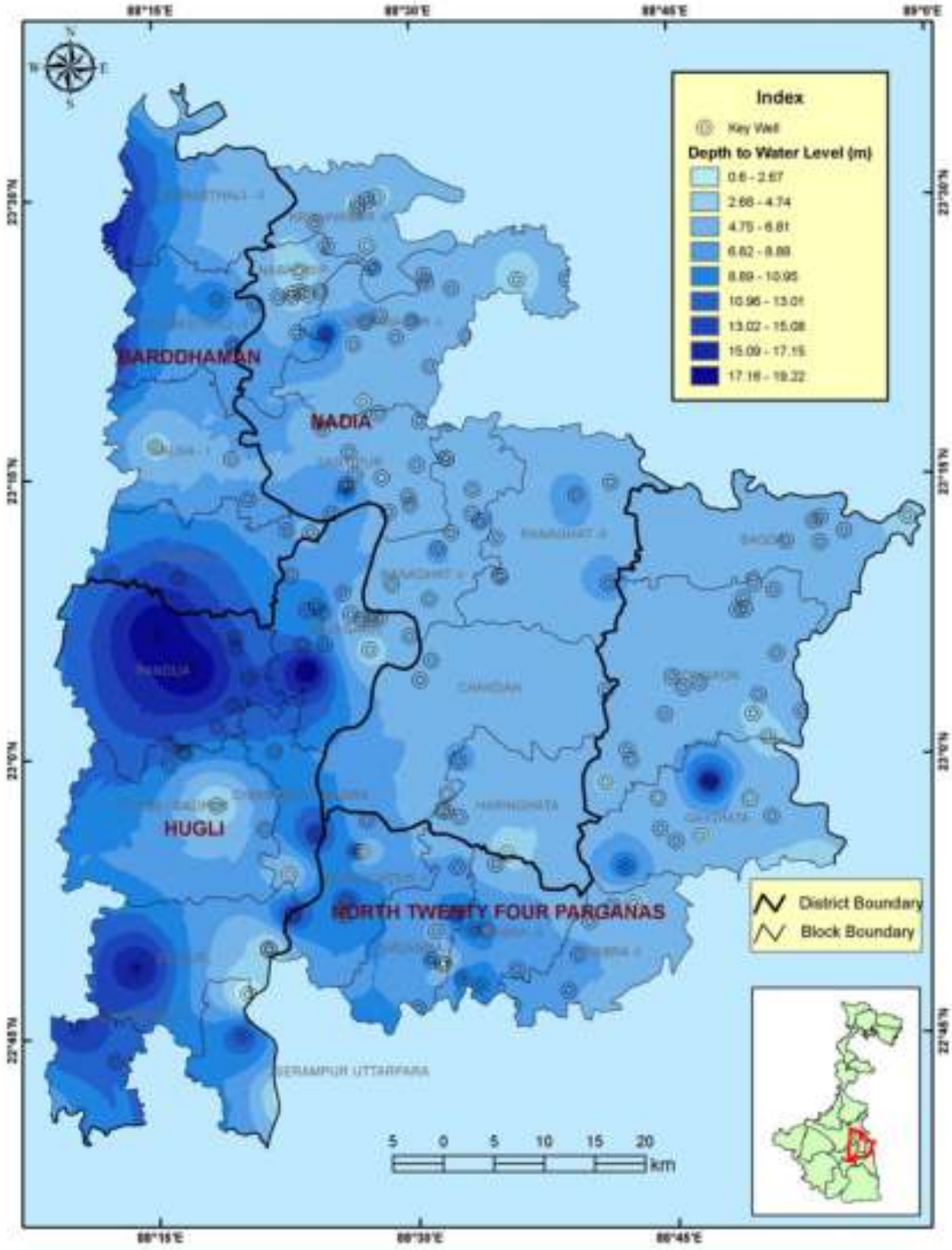


Lithology Profile along A-A’ (NE-SW) in As area

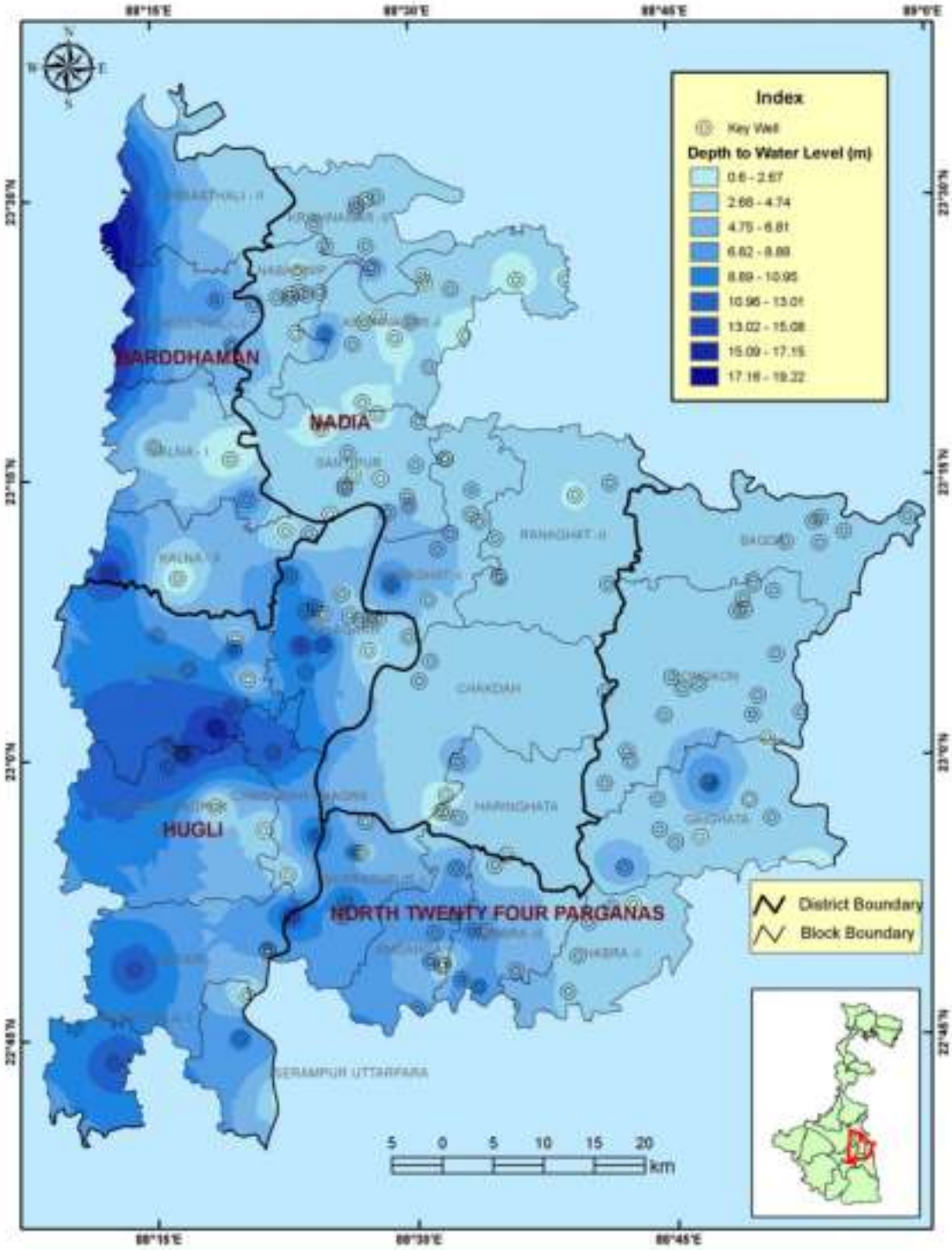




DEPTH TO WATER LEVEL (PRE MONSOON, 2015) MAP OF 26 BLOCKS, WEST BENGAL

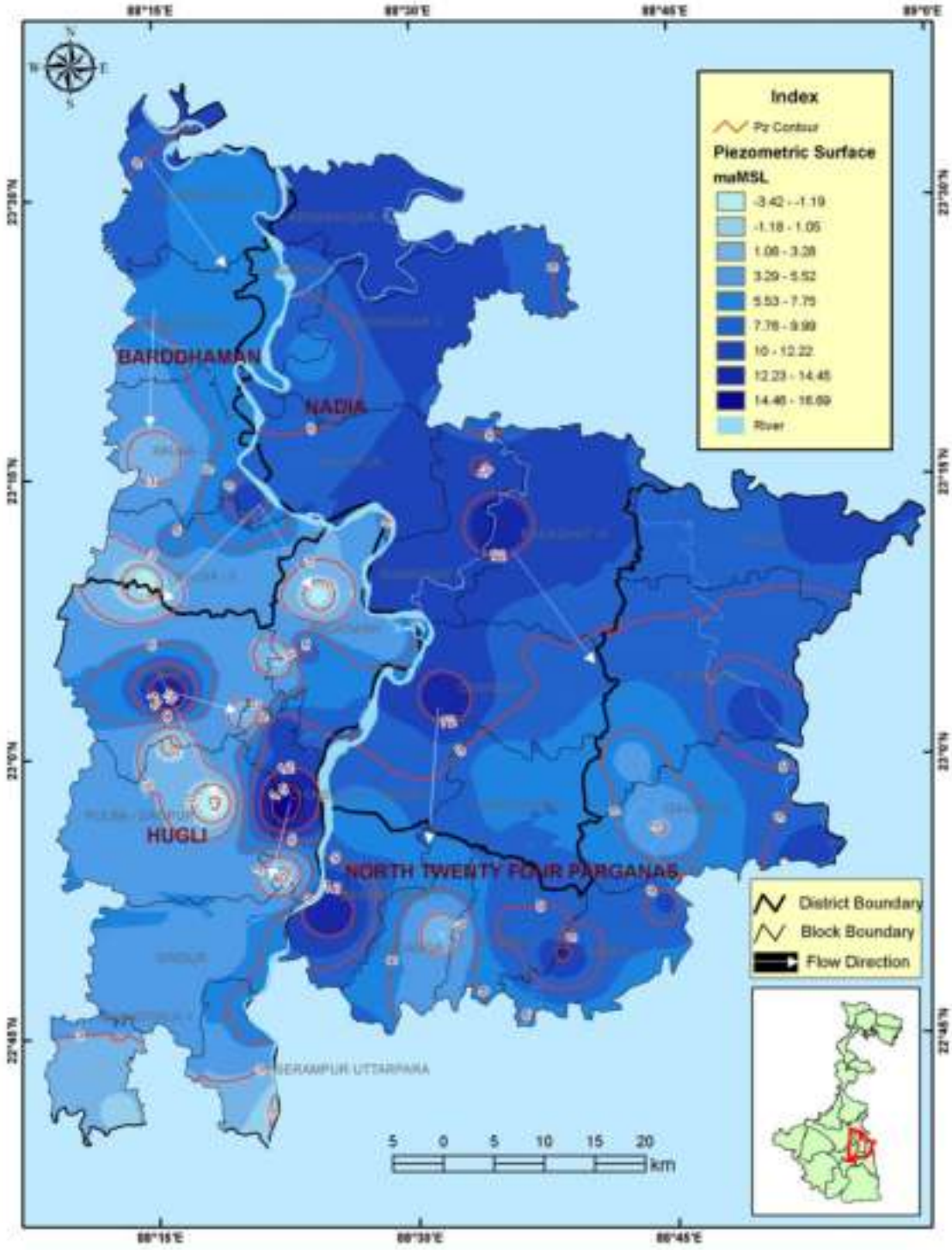


DEPTH TO WATER LEVEL (POST MONSOON, 2015) MAP OF 26 BLOCKS, WEST BENGAL

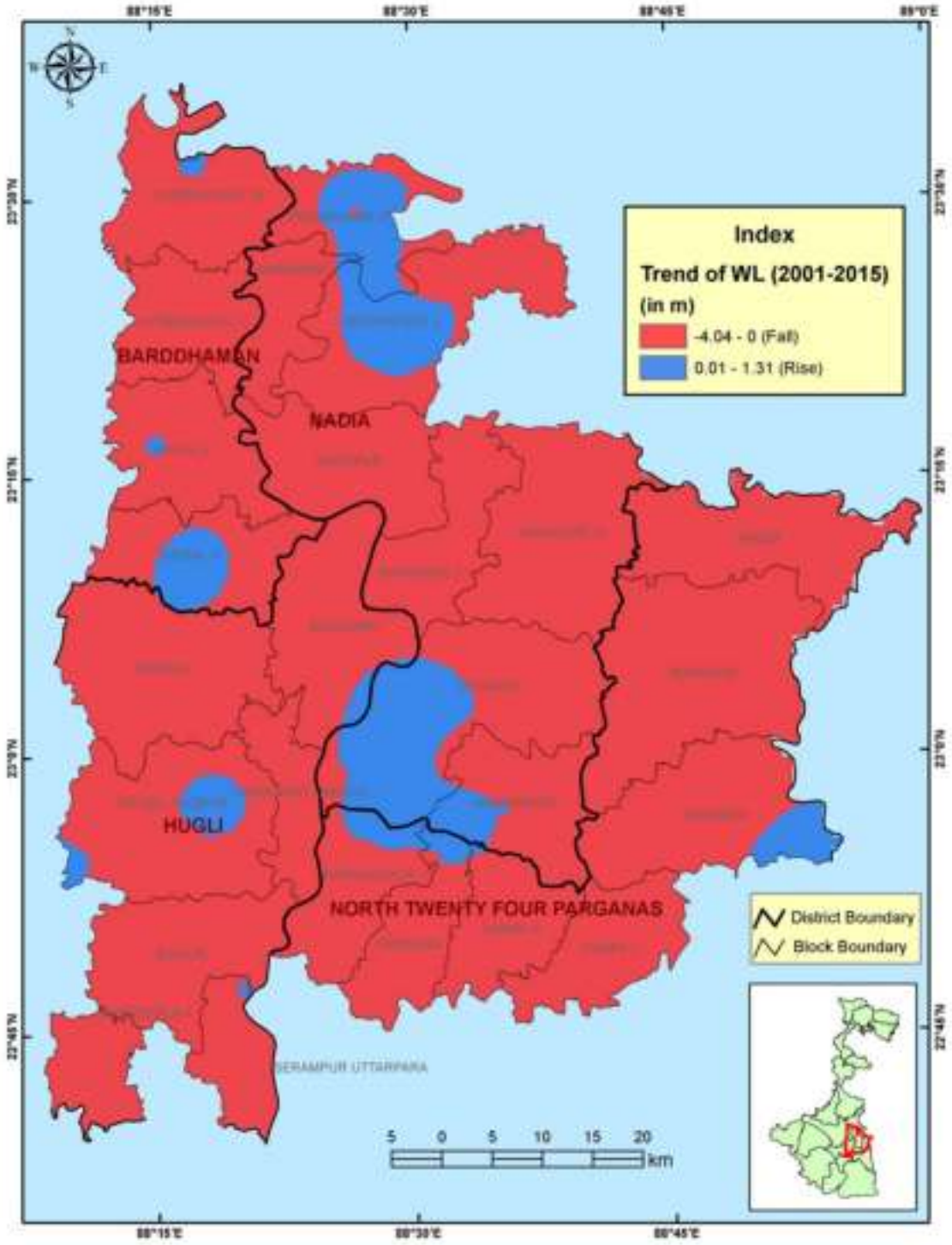


HYDROGEOLOGY MAP OF 26 BLOCKS, WEST BENGAL

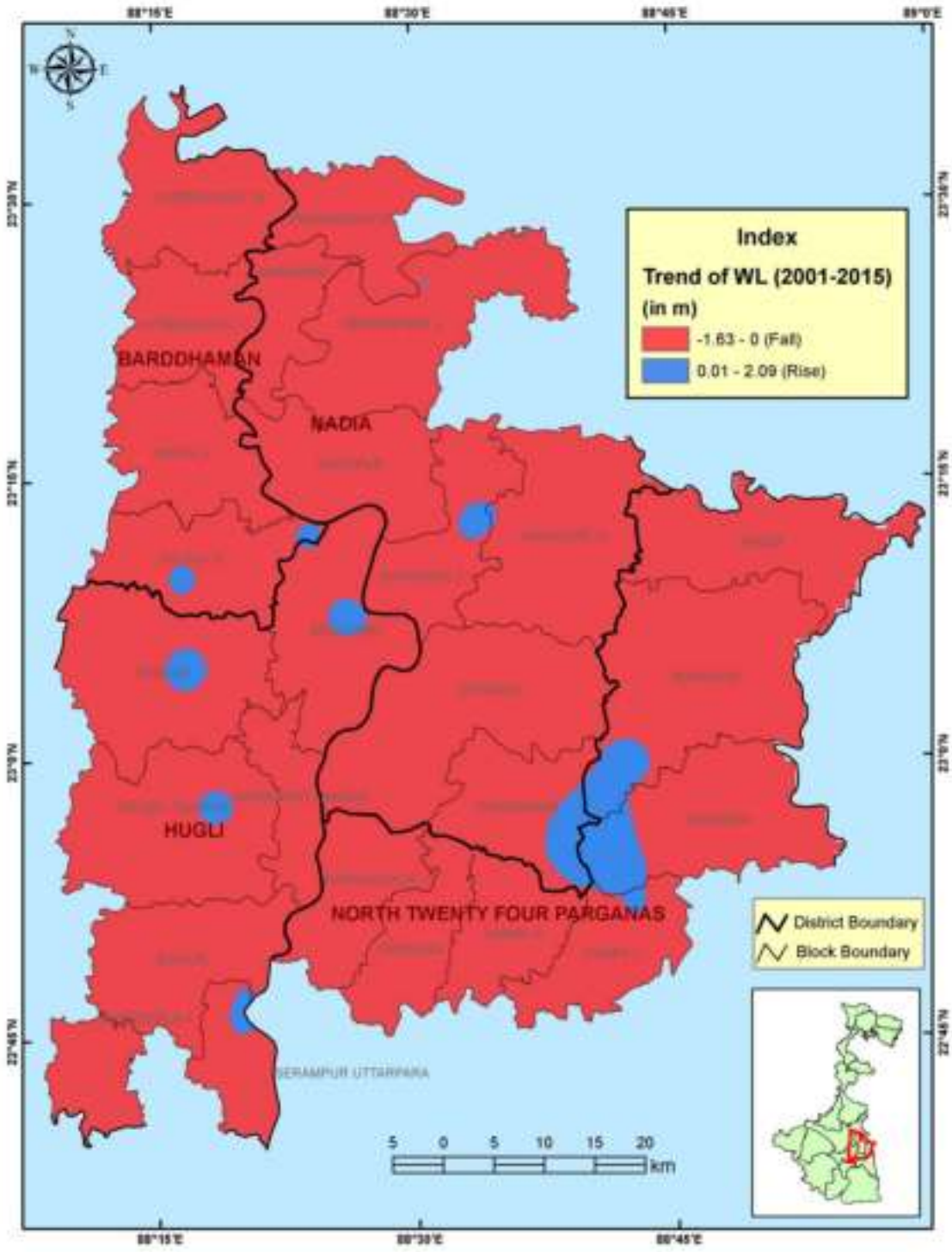
PIEZOMETRIC SURFACE MAP DEEPER AQUIFER OF 26 BLOCKS, WEST BENGAL



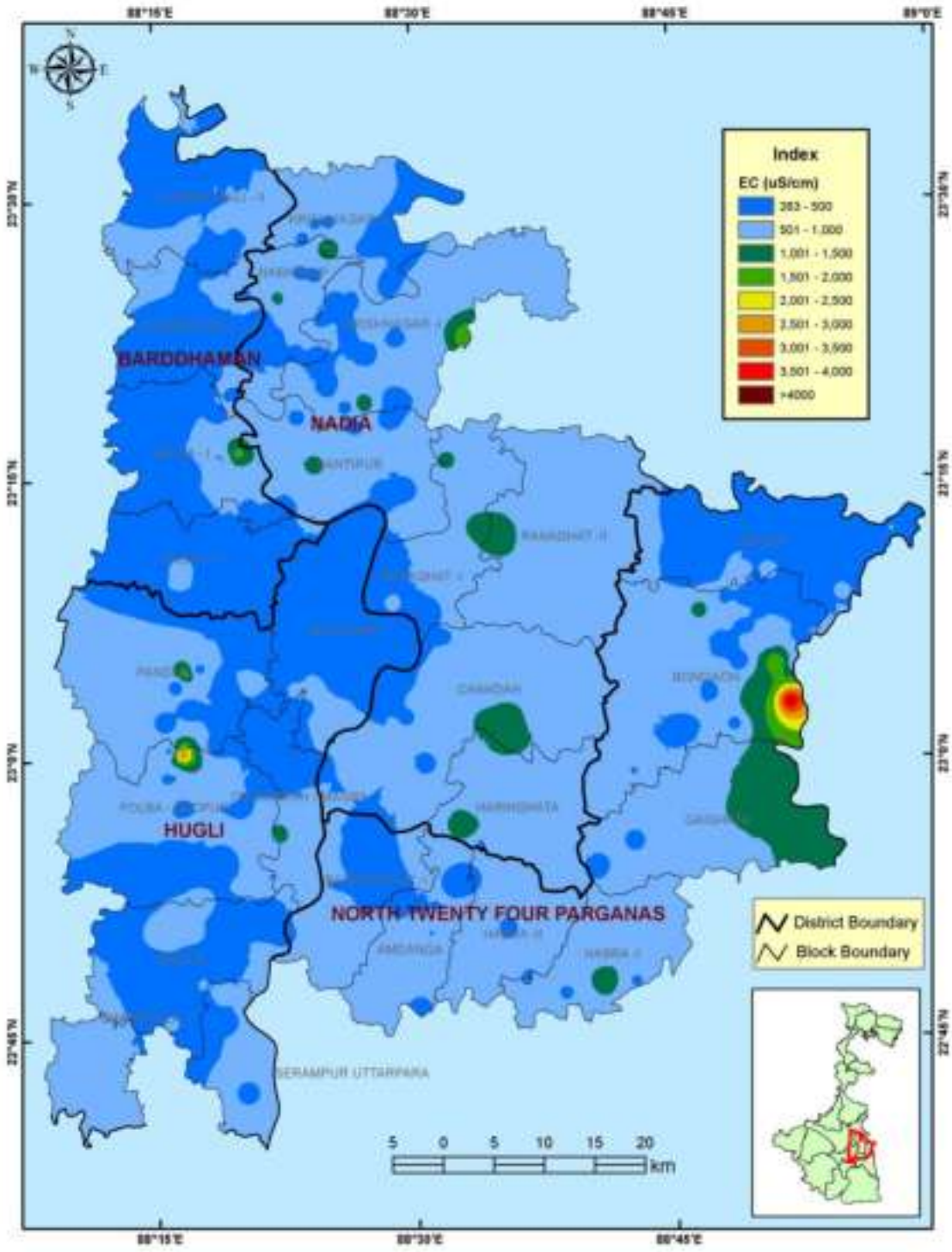
PRE-MONSOON WATER LEVEL TREND (2001-2015) MAP OF 26 BLOCKS, WEST BENGAL



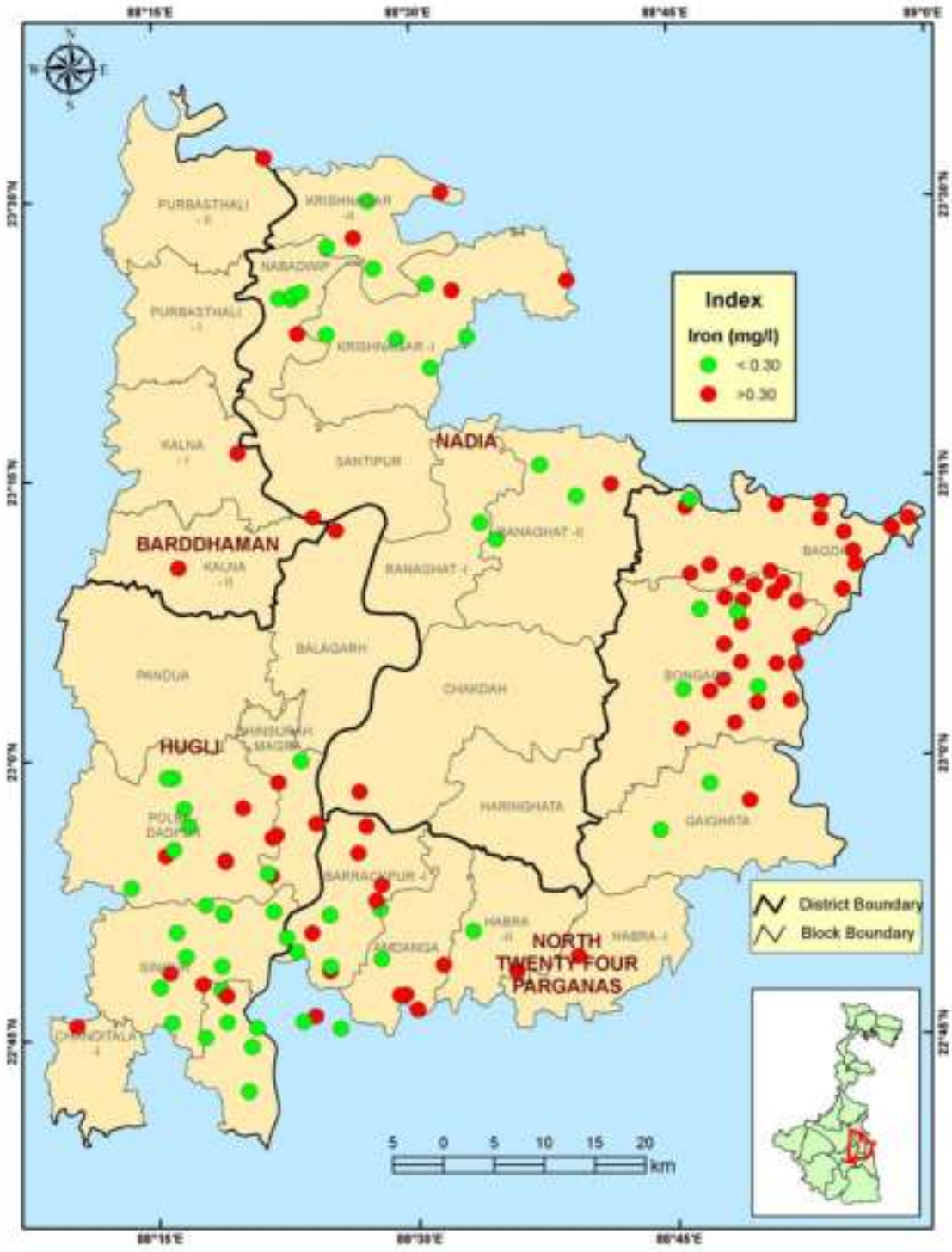
POST MONSOON WATER LEVEL TREND (2001-2015) MAP OF 26 BLOCKS, WEST BENGAL



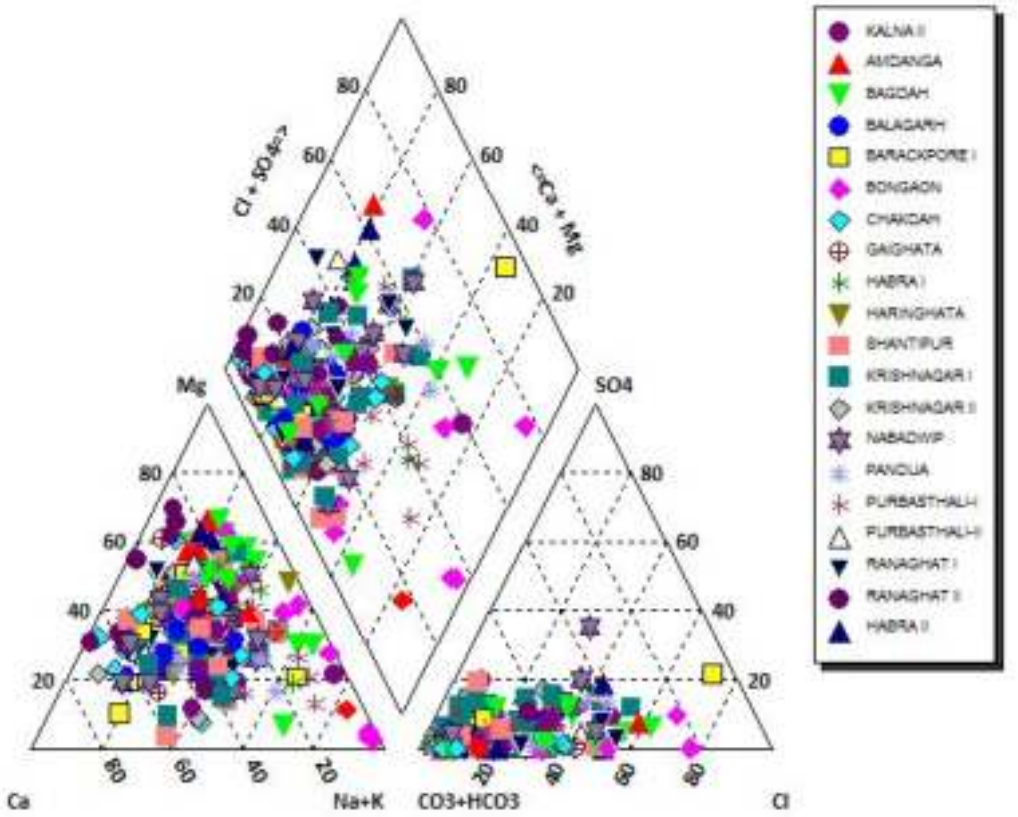
ELECTRICAL CONDUCTIVITY MAP OF 26 BLOCKS, WEST BENGAL



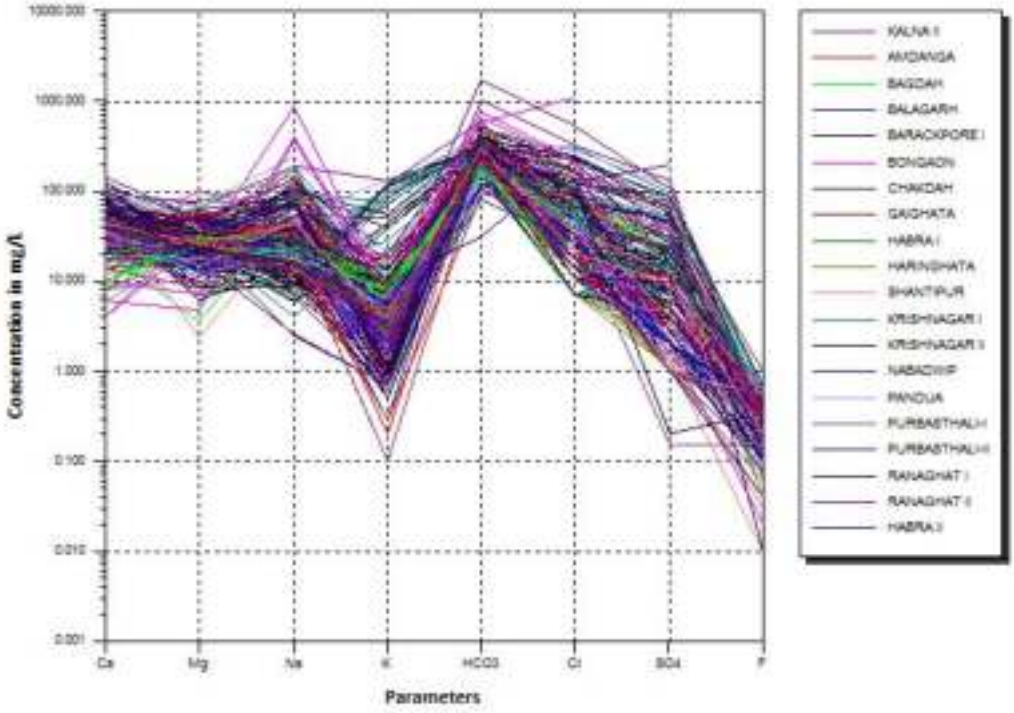
IRON CONCENTRATION MAP OF 26 BLOCKS, WEST BENGAL

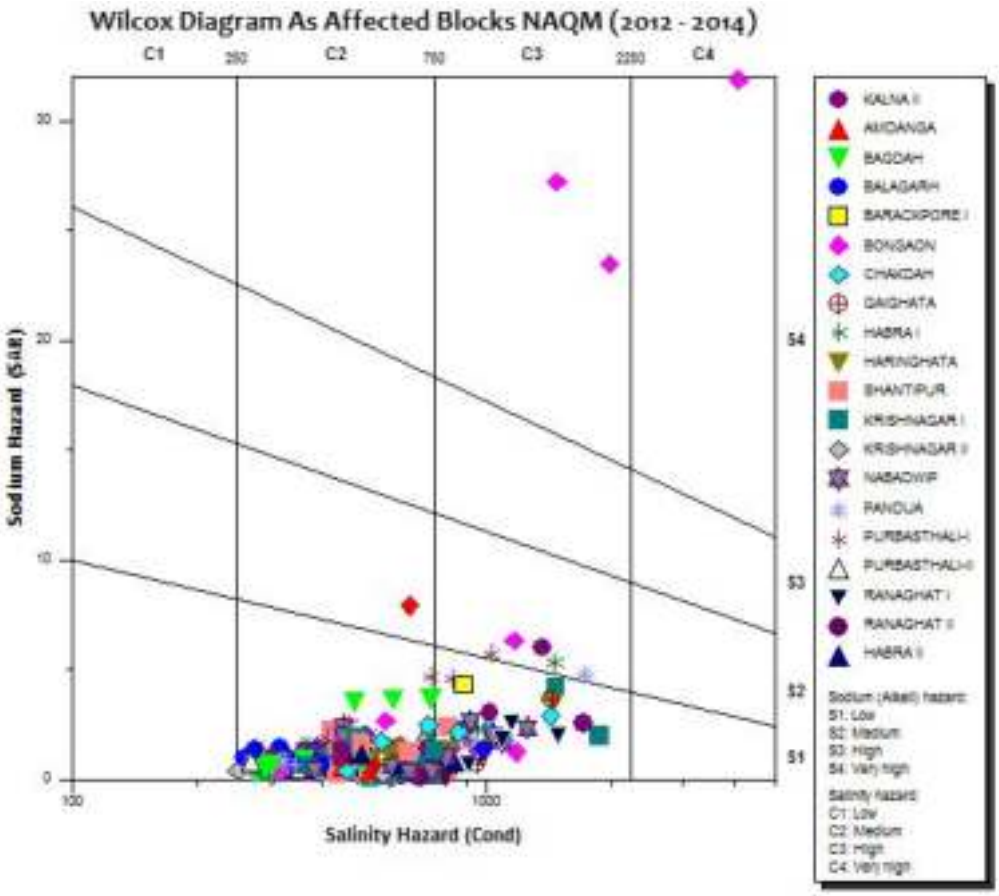


Piper Plot Arsenic Affected Blocks - NAQM (2012-2014)

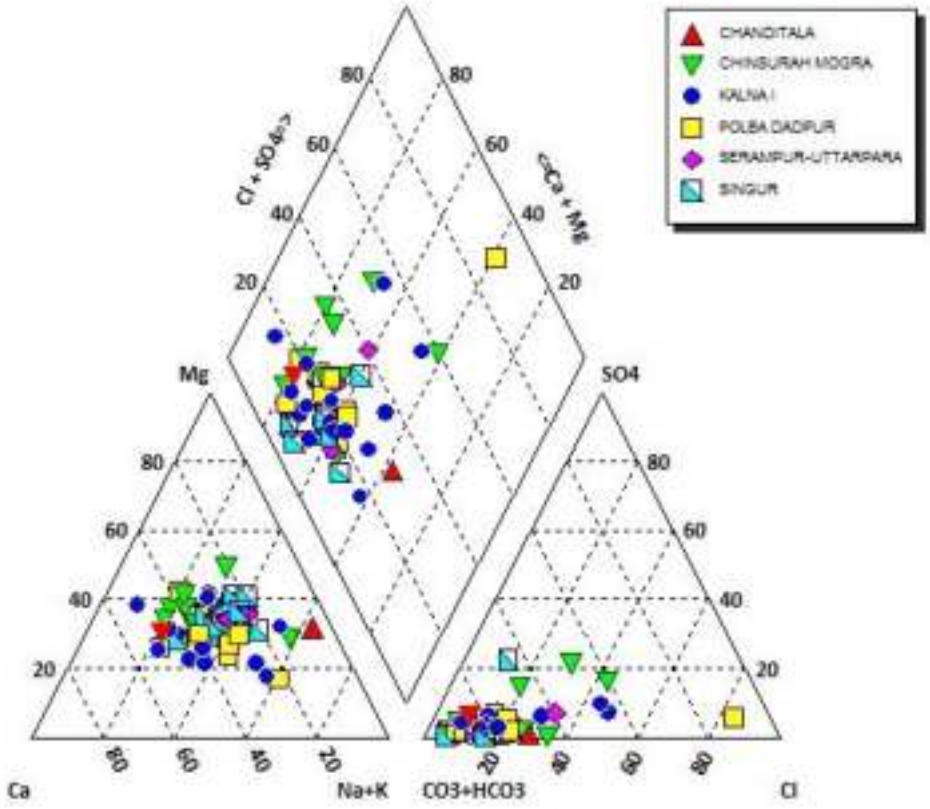


Scoeller Plot As Affected Blocks - NAQM (2012 - 2014)

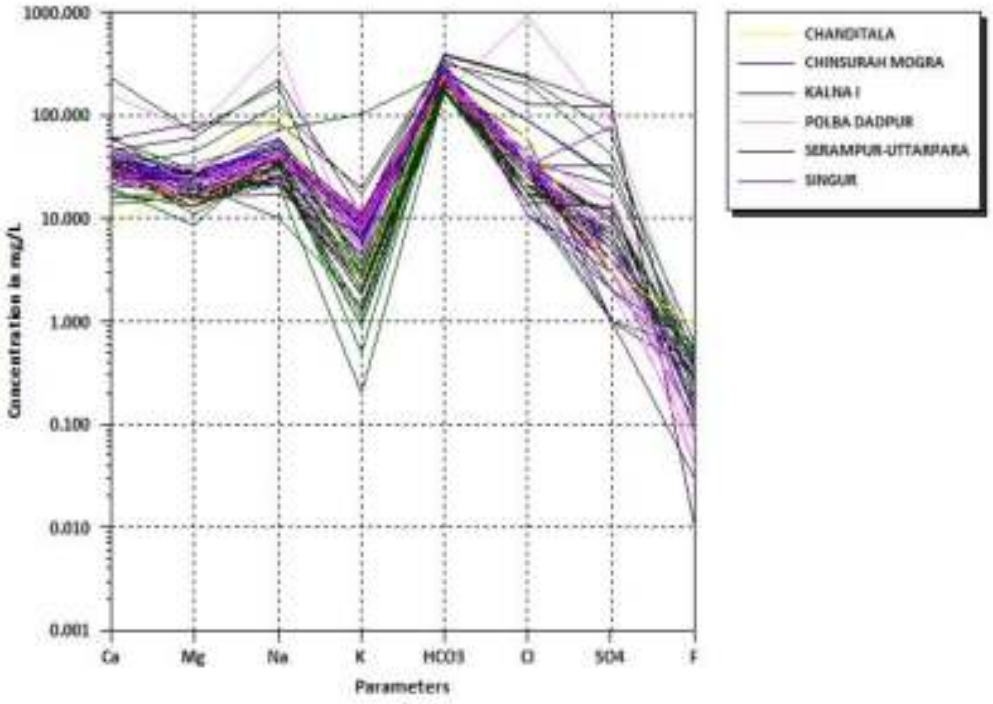


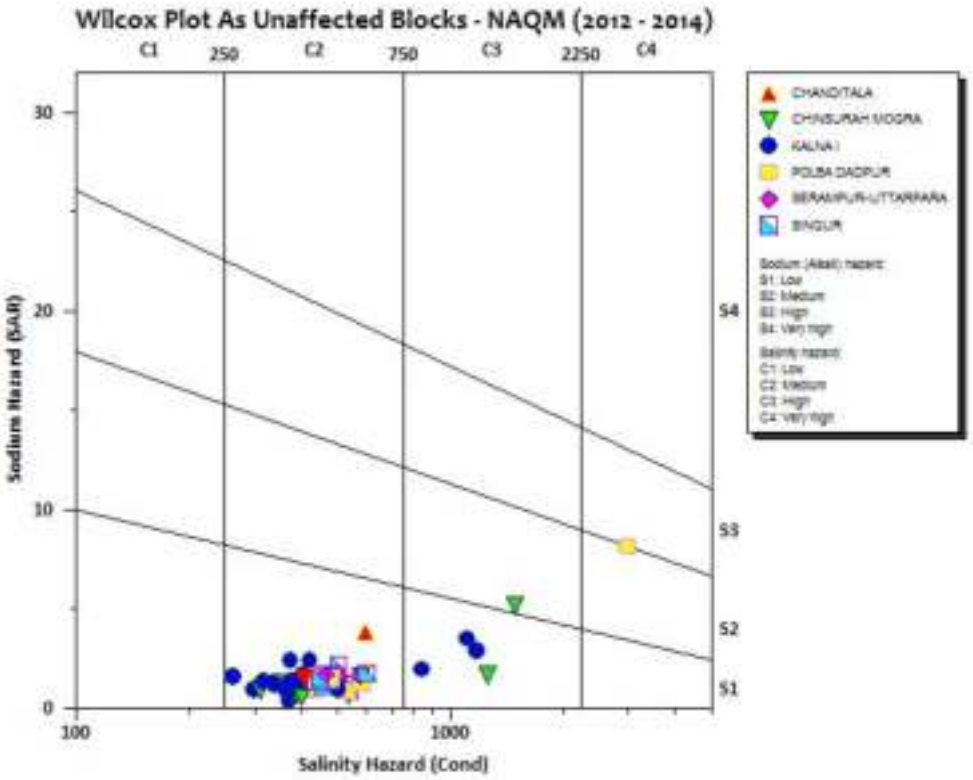

Wilcox Diagram As Affected Blocks NAQM (2012 - 2014)
C1
250
C2
750
C3
2250
C4
Sodium Hazard (SAR)
Salinity Hazard (Cond)
S4
S3
S2
S1
KALNA II
AMDANGA
BAGDAH
BALAGARH
BARACKPORE I
BONGAON
CHAKDAH
GAIGHATA
HABRA I
HARINGHATA
SHANTIPUR
KRISHNAGAR I
KRISHNAGAR II
NABADWIP
RANDIA
PURBASTHALI-I
PURBASTHALI-II
RANAGHAT I
RANAGHAT II
HABRA II
Sodium (Alkali) hazard:
S1: Low
S2: Medium
S3: High
S4: Very high
Salinity hazard
C1: Low
C2: Medium
C3: High
C4: Very high

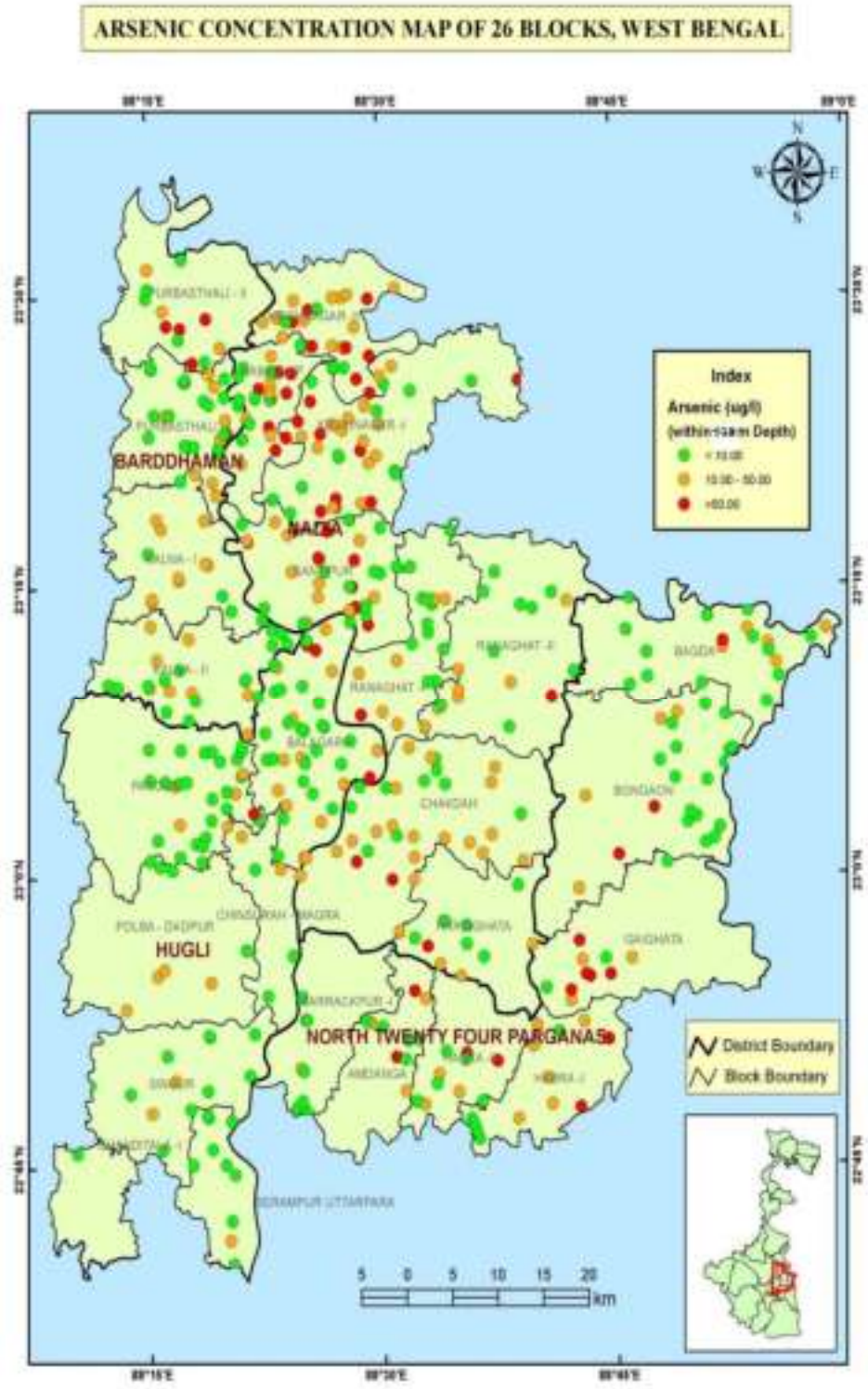
Piper Plot As Unaffected Blocks NAQM (2012 - 2014)



Schoeller Plot of As Unaffected Block - NAQM (2012 - 2014)

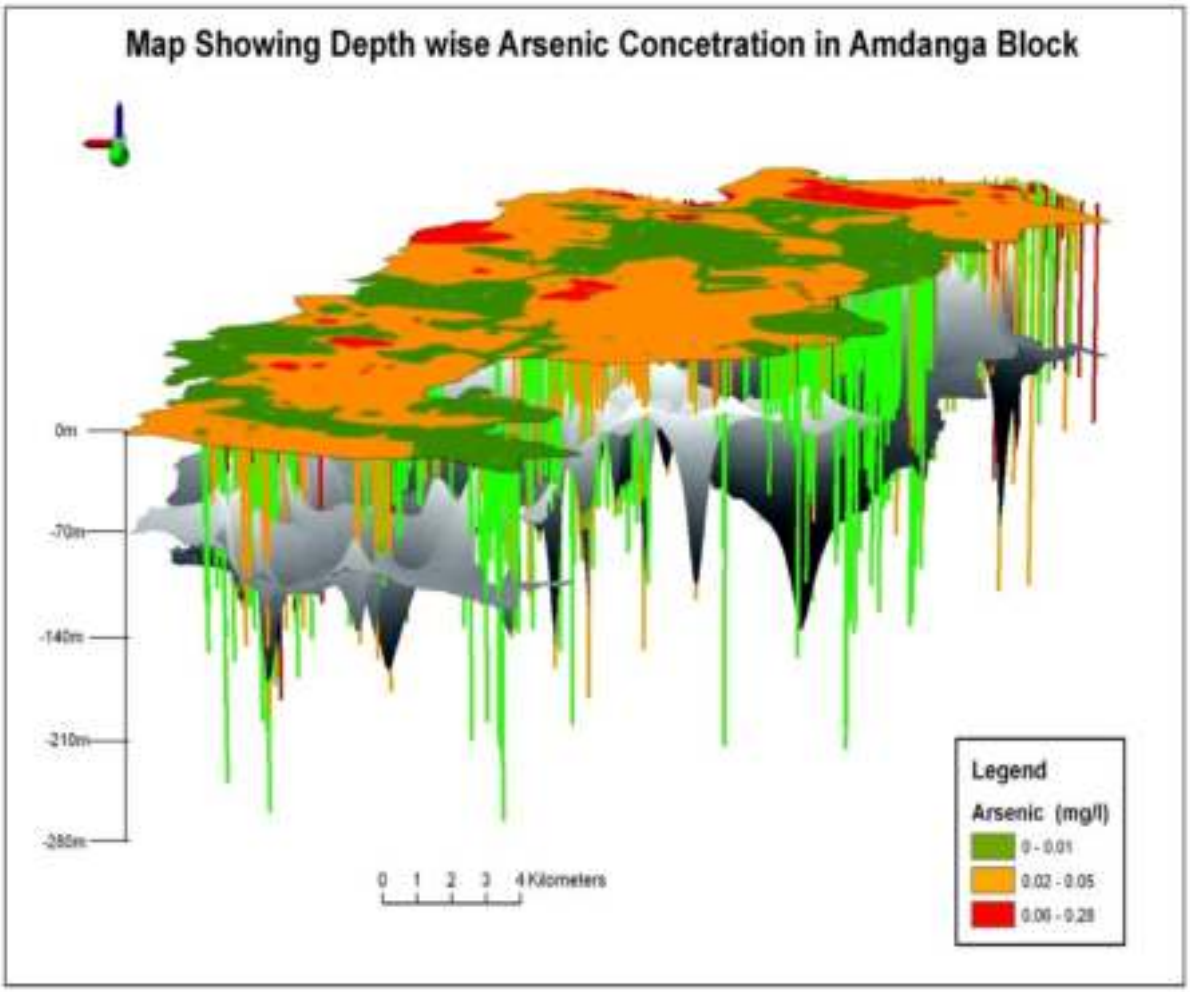



Wilcox Plot As Unaffected Blocks - NAQM (2012 - 2014)
C1
250
C2
750
C3
2250
C4
30
20
10
0
Sodium Hazard (SAR)
S4
S3
S2
S1
100
1000
Salinity Hazard (Cond)
CHANDITALA
CHINSURAH MOGRA
KALYANI
POLBA DADPUR
SERAMPUR-UTTARPARA
SINGUR
Sodium (Alkali) hazard:
S1: Low
S2: Medium
S3: High
S4: Very high
Salinity hazard:
C1: Low
C2: Medium
C3: High
C4: Very high



Analysis of 510 No. of samples in the study area reveals that Arsenic concentration varies from 0.1 to 273.8 µg/l in the shallow aquifer within the depth of about 160 m bgl.

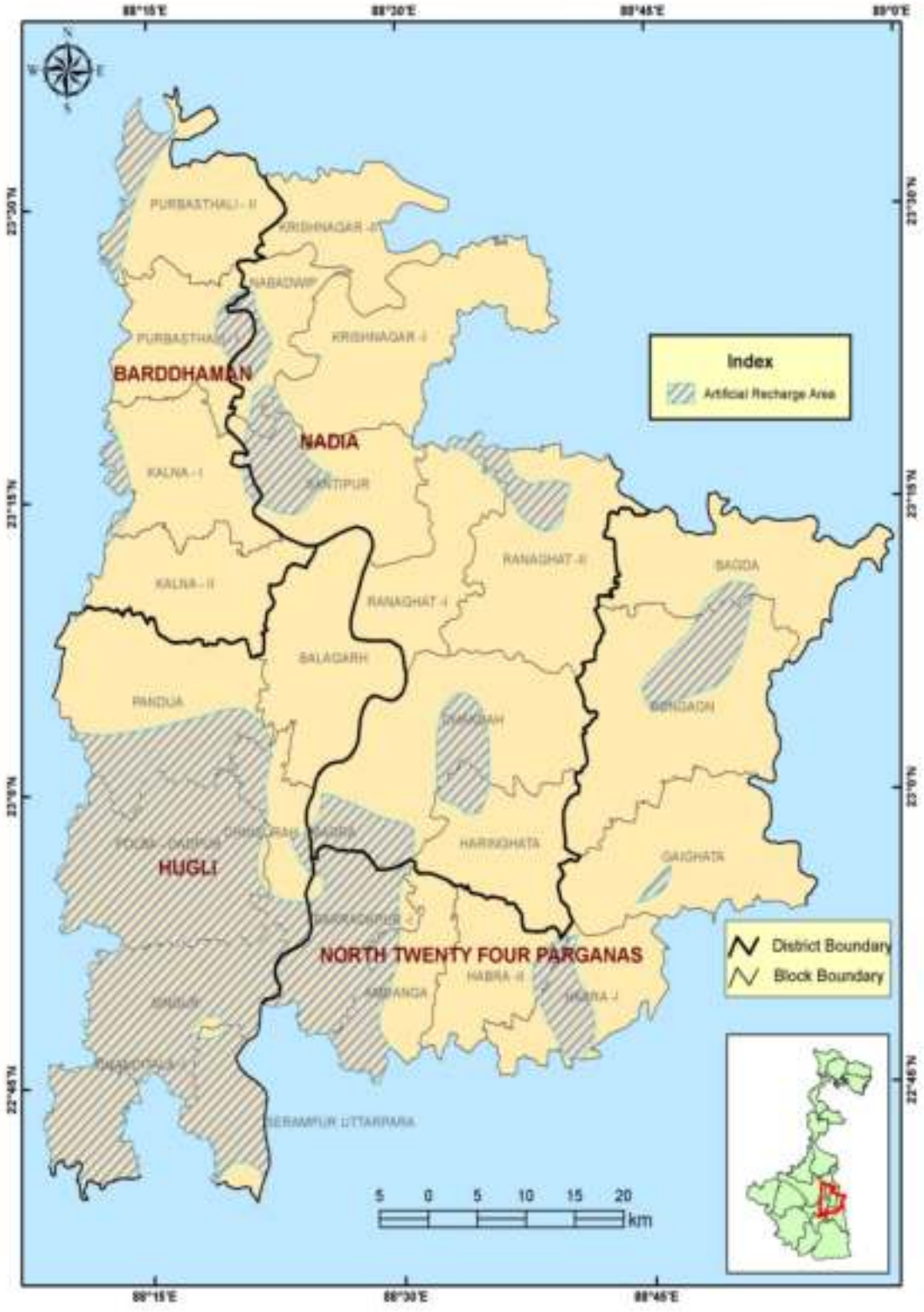
Data Source: CGWB, ER, Kolkata



- ✓ **Vertical colored lines indicate tube wells (1,328 nos.) classified as per As concentration. 38% of total, i.e. 509 nos. of TWs (37%- depth: 6-167 mbgl, & 1% - depth upto 274 m) have As >0.01mg/l.**
- ✓ **2D multi-colored As zone map is prepared as per As concentration.**
- ✓ **3D isopach surface (grey colored) depicts TWs with equal depth of As (>0.01 mg/l).**

Data Source: PHED, Govt. of West Bengal

ARTIFICIAL RECHARGE AREA MAP OF 26 BLOCKS, WEST BENGAL



PART-II

Block wise Aquifer Maps and Management Plans of 26 Blocks

Block wise report of **Bardhaman District**
Kalna – I
1)Salient Information
Block Name: KALNA I
Area(in Km^2): 178.22
District: **BARDHAMAN**
State:West Bengal
Population(as on 2011):

Name of the Block	Population of CD Block (2011 census)
KALNA I	148673

Approximate Decadal Growth Rate from 2001-2011:

Rainfall:
Average annual rainfall in **: KALNA I**
(as in the district) for the period 2009 -13 (in mm)

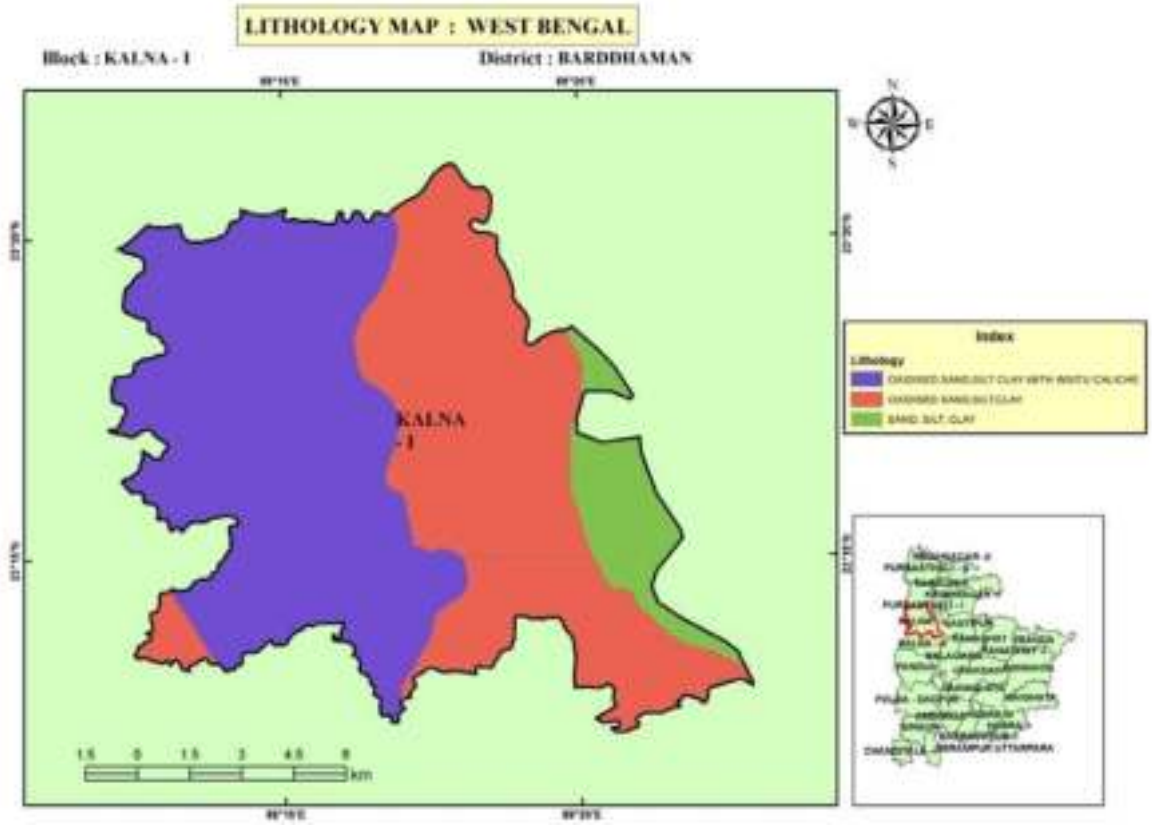
Block	Normal	Actual (Annual)				
		2009	2010	2011	2012	2013
KALNA I	1271	1229	856	1322	1030	1216

Aquifer Wise Ground Water Resource Availability & Extraction:
(in MCM)

Resource Availability	Aquifer I	Aquifer II	Extraction (for Aquifer I)
Dynamic Resource	11195.83	-	0.320796
Static Resource	4392.05	-	-

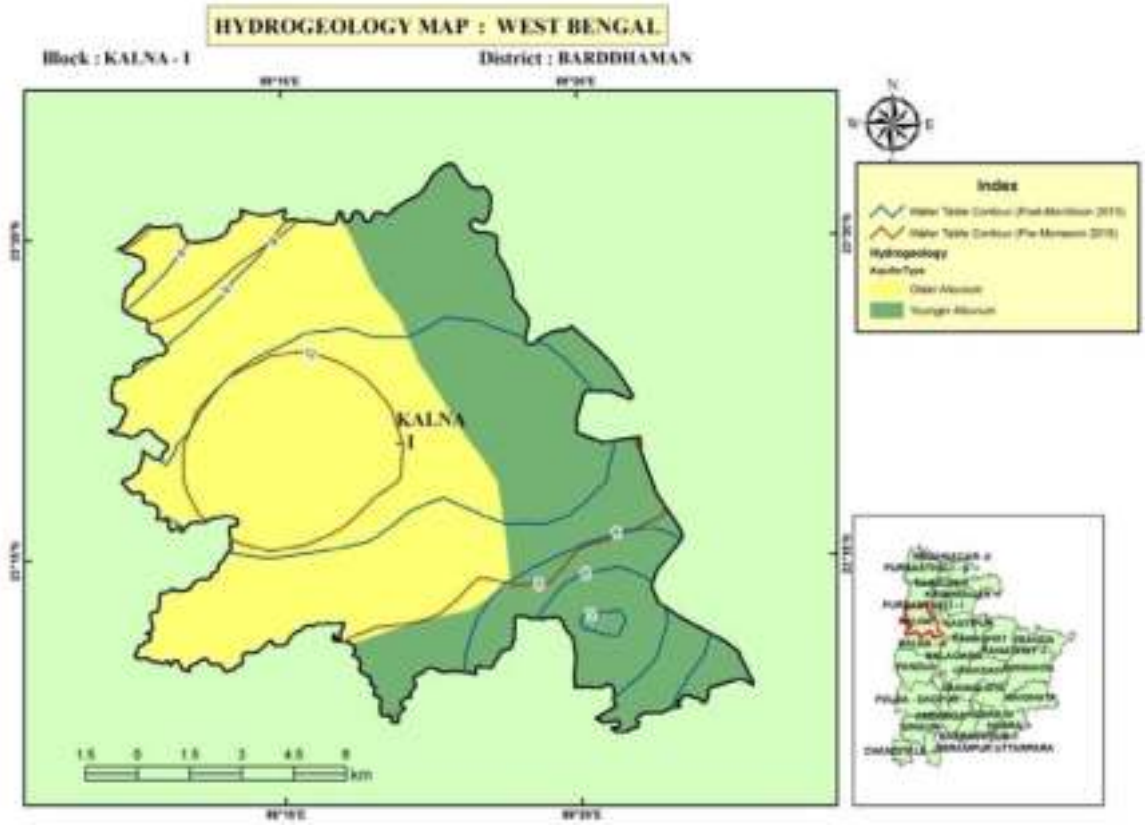
2)Disposition of Aquifer:

Block	Depth range of Aquifer in m bgl	
	1st Aquifer	2nd aquifer
KALNA I	6-135	168-254



Aquifer Wise Water Level Ranges & Pre-monsoon and Post-monsoon long term water level trends (1995 to 2011)

SI. No.	Block	Aquifer	Pre-monsoon Trend		Post-monsoon Trend	
			Water Level Range(mbgl)	**Pre trend (- rising & + Falling)**	Water Level Range(mbgl)	**Post trend (- rising & + Falling)**
1.	**Kalna I**	**1**	**-**	**1.32**	**1.35-17.45**	**8.53**
2.	**Kalna I**	**2**		**-**	**13.35**	**-**

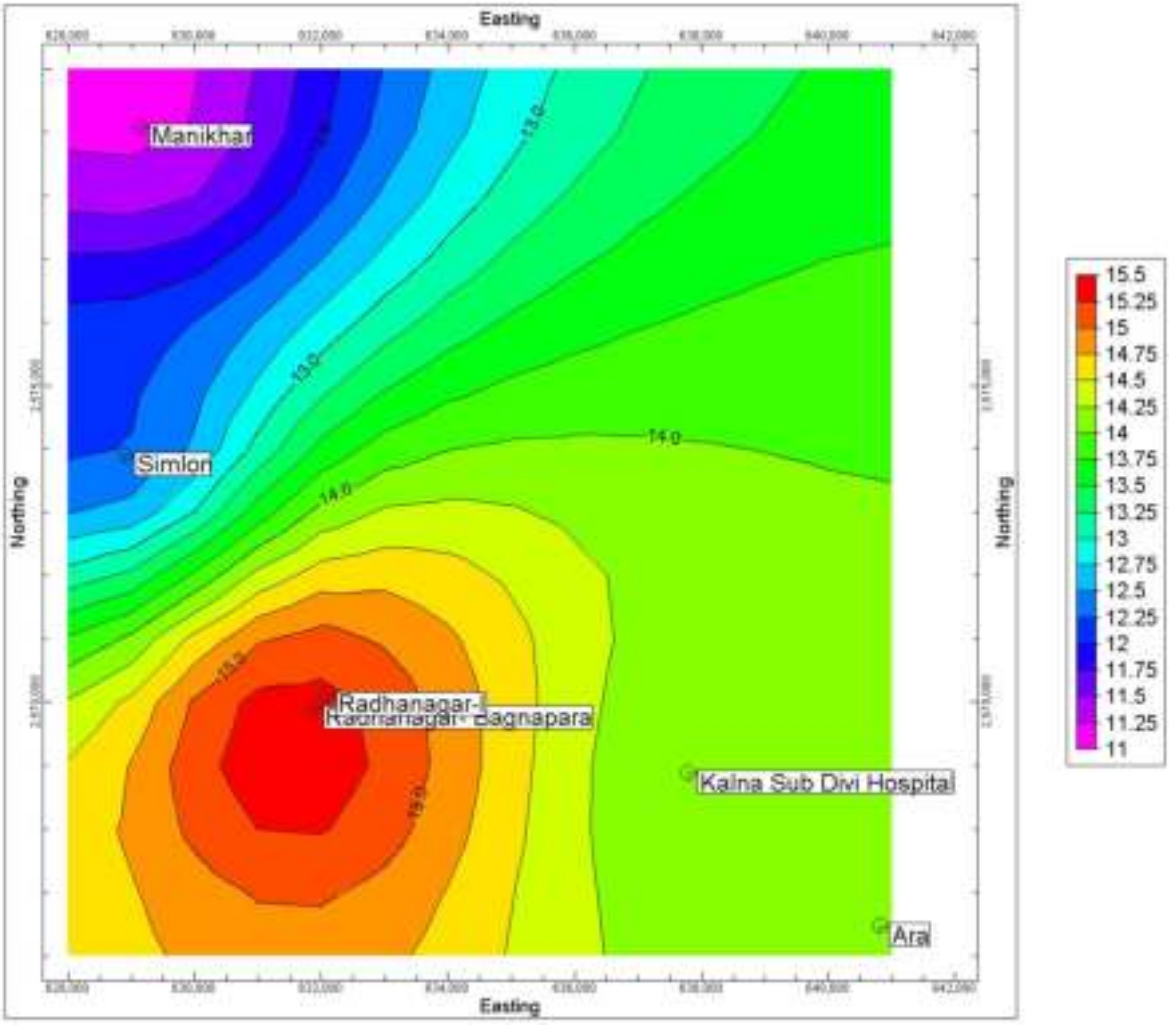


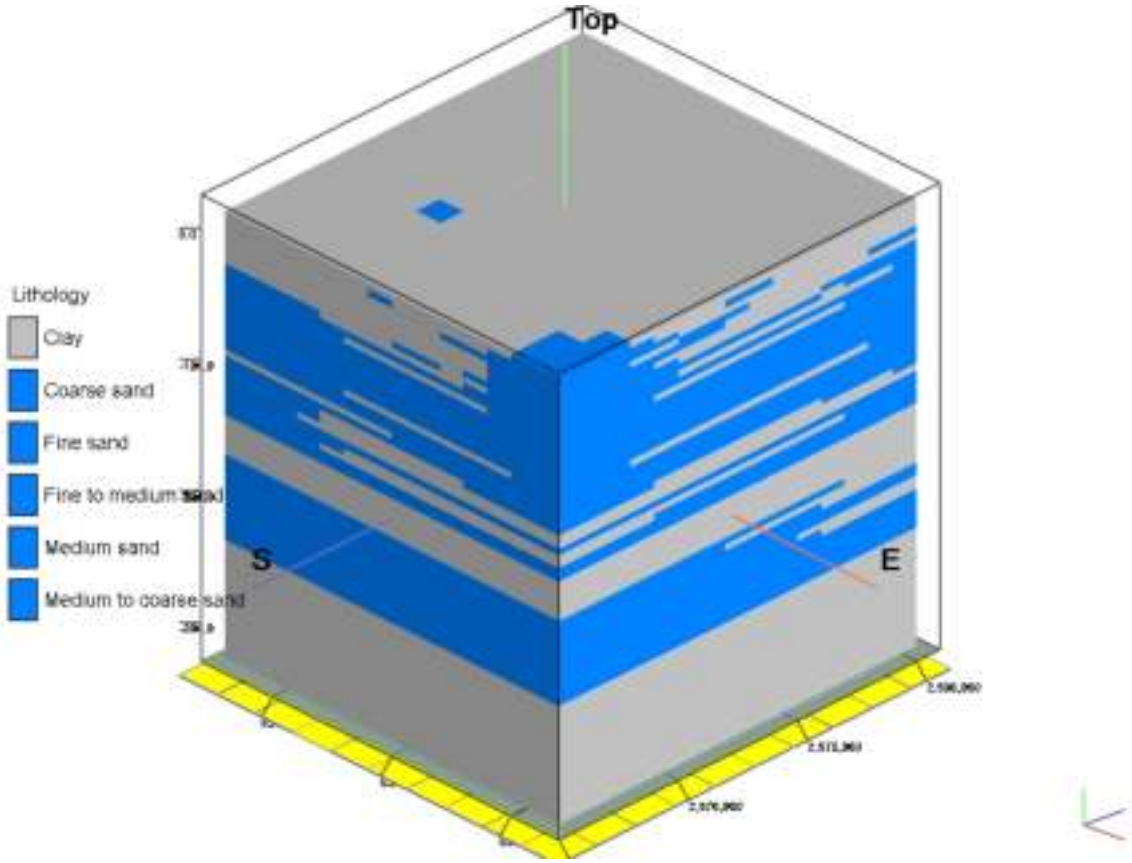
Thickness of Aquifer (Average):

Block	Area (sq km)	Thickness of the Granular Zone in 1st aquifer (m)	Thickness of the Granular Zone /Productive Zone below pre-monsoon WL (m)
KALNA I	178.22	135	123.22

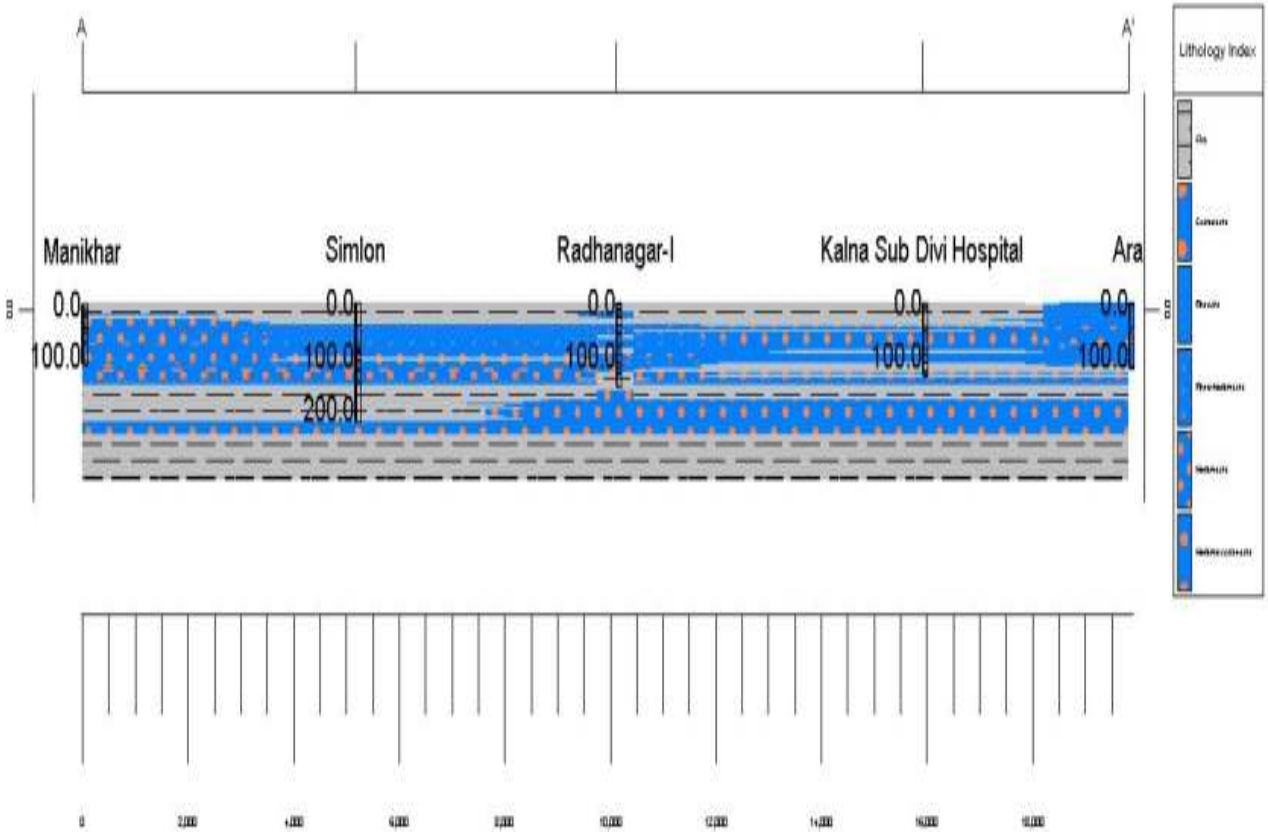
Aquifer-wise Statement

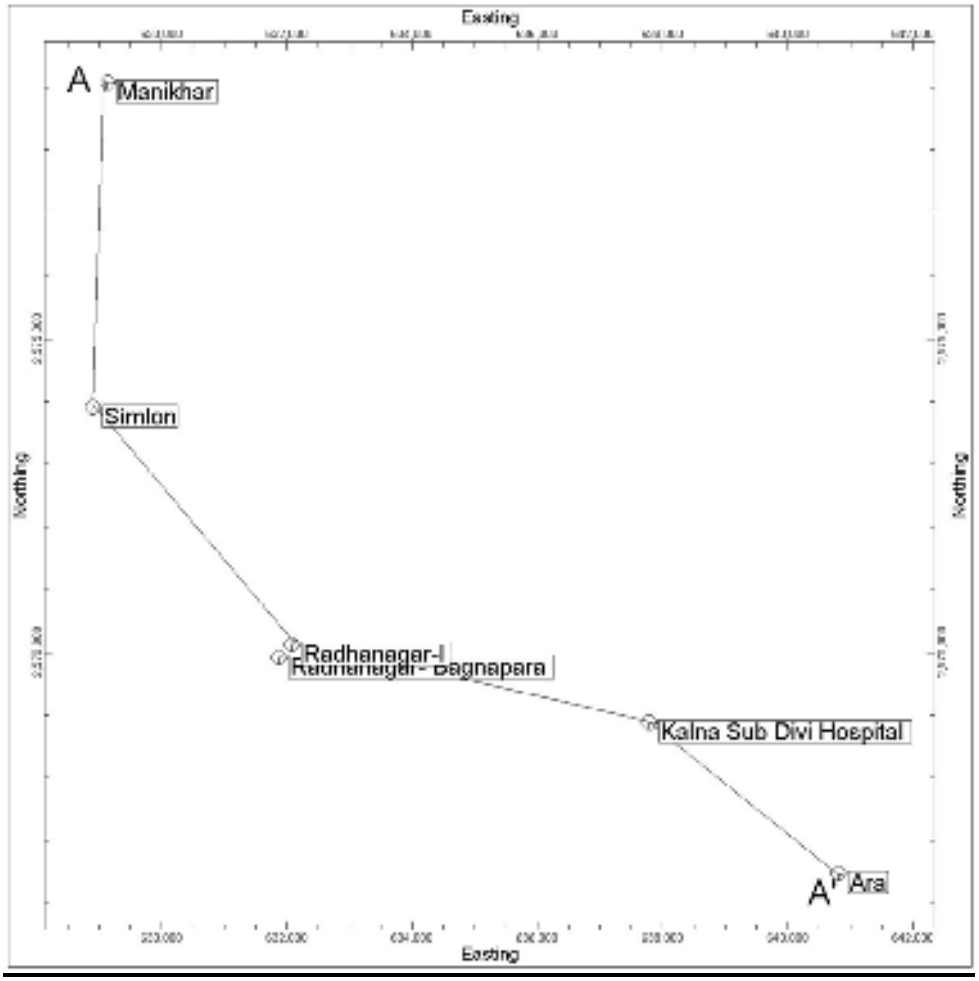
Sl. No.	Name of Block	1st Aquifer			2nd Aquifer		Remarks (T in m^2/day))
		Depth Range (mbgl)	Discharge (m^3/hr)	T (m^2/day)	Depth Range/Discharge/T	Discharge (m^3/hr)	
		1st			2nd		
13	Kalna I	6-141	Up to 62.28		168-254		


Easting
Northing
Manikhar
Simlon
Radhanagar-I
Radhanagar- Bagnapara
Kalna Sub Divi Hospital
Ara
13.0
14.0
15.5
15.25
15
14.75
14.5
14.25
14
13.75
13.5
13.25
13
12.75
12.5
12.25
12
11.75
11.5
11.25
11


Top
Lithology
Clay
Coarse sand
Fine sand
Fine to medium sand
Medium sand
Medium to coarse sand
S
E

Cross-Section A-A'





3)Ground Water Resource,Extraction,Contamination & Other Issues:

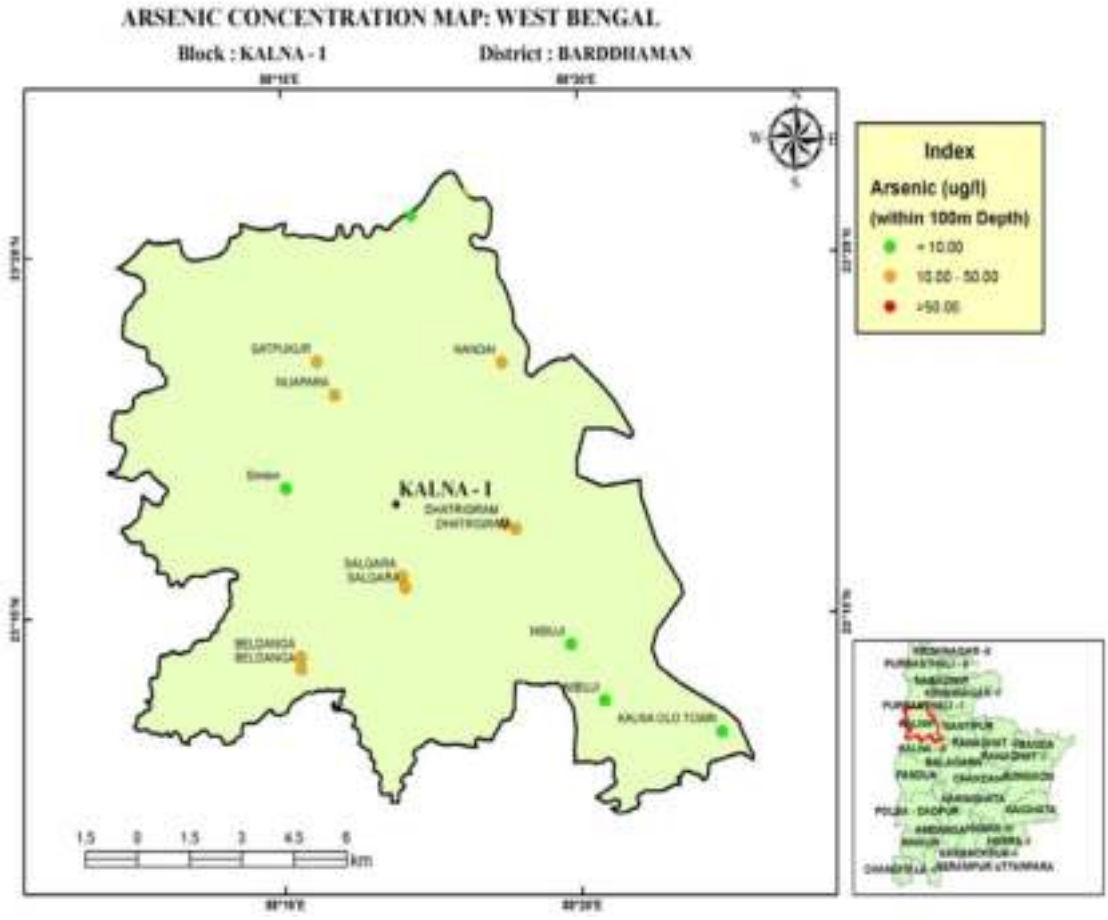
Aquifer Wise Resource Availability & Extraction:

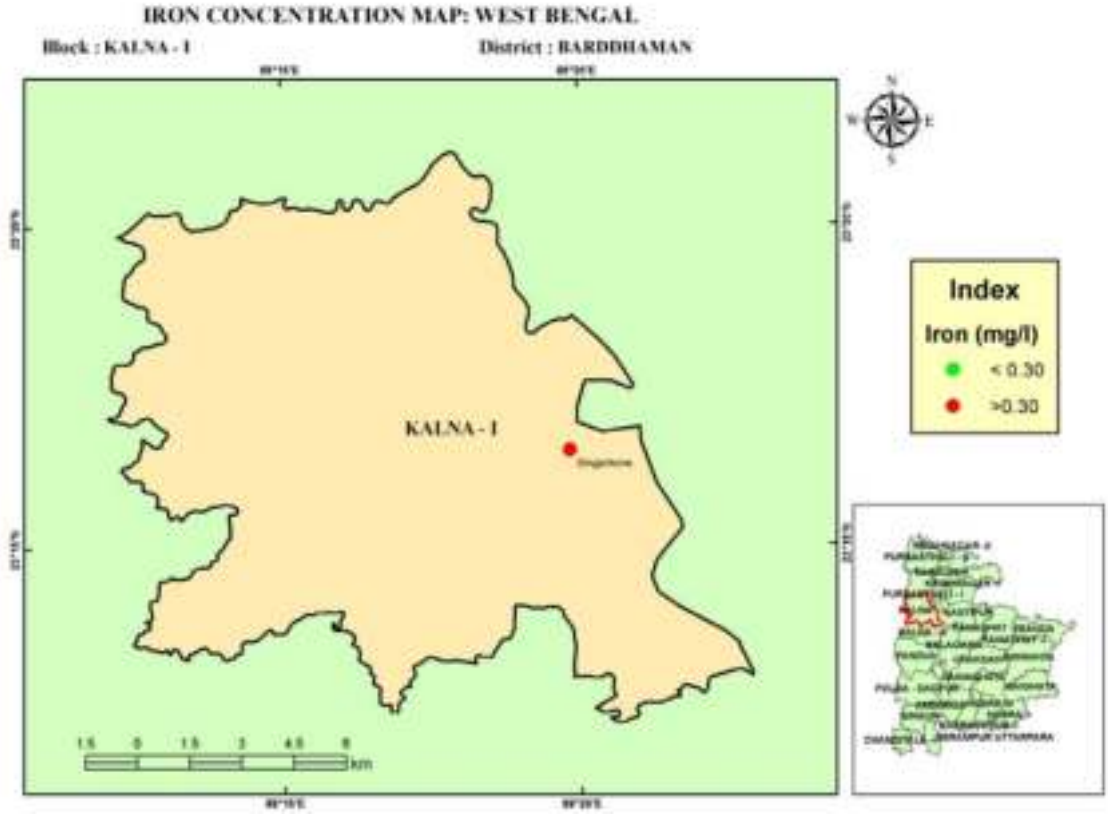
Block	Net ground water availability (MCM)	Gross ground water draft (MCM)	Stage of development (%)	Category
Kalna I	11195.83	3239.08	28.52	Safe

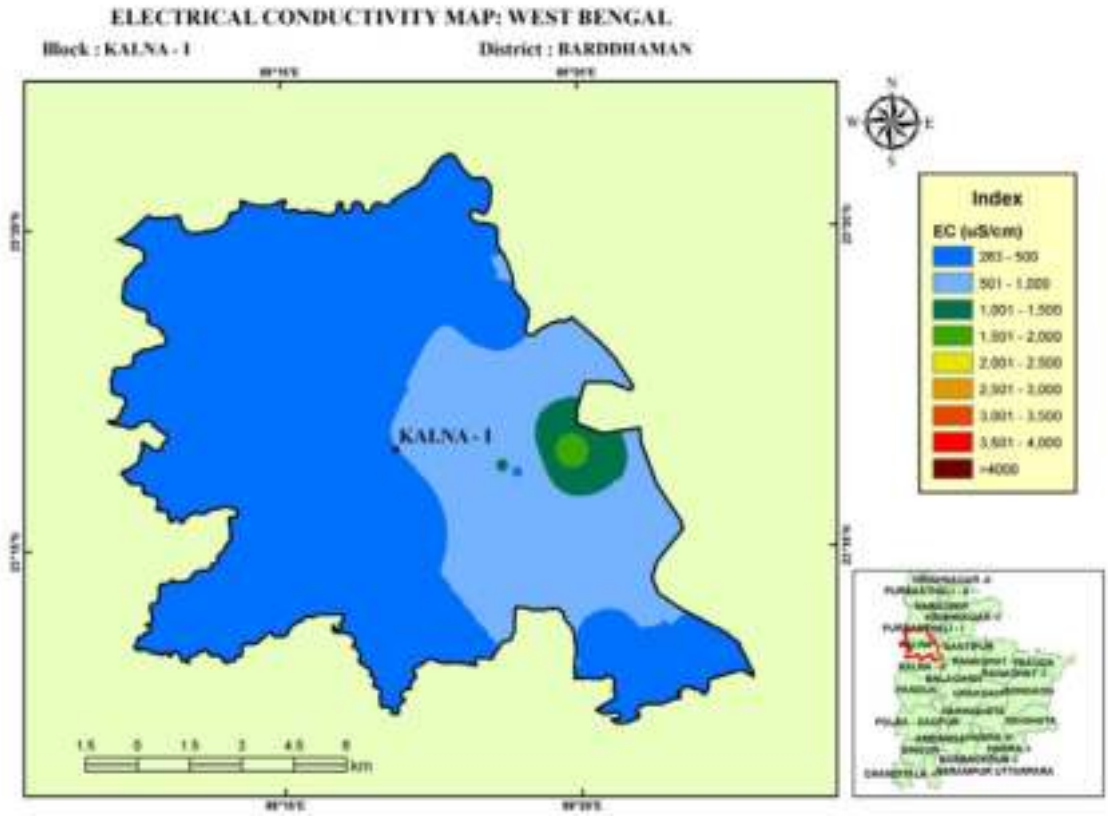
Chemical Quality Of GroundWater & Contamination:

Range of Chemical Pollutants:

Block	As(mg/l)	Fe(mg/l)	Ec(µS/cm)	F(mg/l)	No_3(mg/l)
Kalna I	**Nd/ns-0.037**	**-**	**263-1180**	**0.05-0.61**	**negligible-11**




IRON CONCENTRATION MAP: WEST BENGAL
Block : KALNA - I
District : BARDDHAMAN
KALNA - I
Index
Iron (mg/l)
< 0.30
>0.30
km



4)Ground Water Resource Enhancement& Management Plan:

Ground Water Management Plan for Drinking purpose.

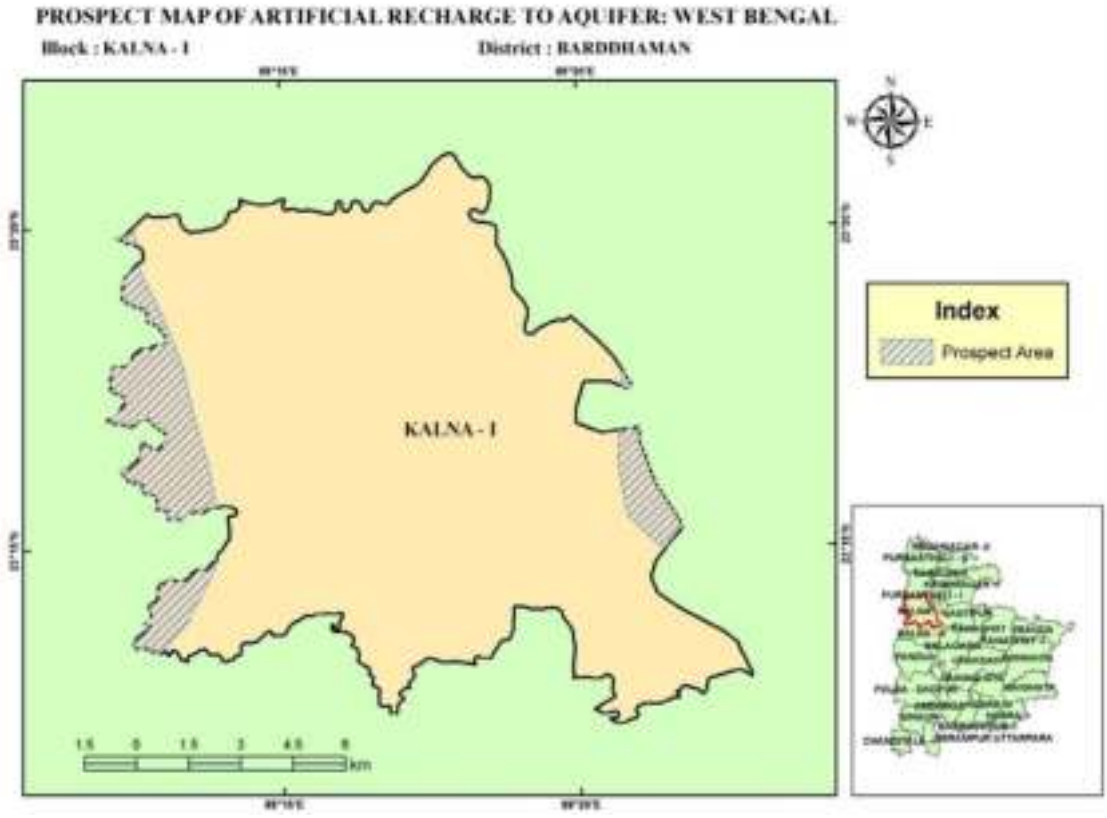
Aquifer Wise Space Available For Recharge and Proposed Interventions:

Area suitable for recharge in the study area:

District	Block Name	Geographical Area (in sq. km)	Total Area suitable for recharge (sq km.)
BARDDHAMAN	Kalna-I	178.22	17.07

Proposed Artificial Recharge Structures in the area in :

District	Block	Total Surface water available in MCM for recharge	Source Water Allocation (MCM)			Number of Structures feasible			Structure-wise Cost Estimate in lakh Rs.			Total cost in lakh Rs
			Percolation Tanks	REET with RS	Injection Well	Percolation Tanks	REET with RS	Injection Well	Percolation Tanks	REET with RS	Injection Well	
BARDDHAMAN	Kalna-I	104.65	49	28	28	98	278	93	392	834	1116	2342



Ground Water Management Plan for Irrigation Purpose (Area in sq. km.)

Sr No.	Name of Block	Cultivable area in ha	Net irrigated area in ha	Area to be irrigated in ha	SOD in %	Category
1	Kalna I	12818.00	8210.00	4608.00	28.52	Safe

Kalna II

1)Salient Information

Block Name: Kalna II

Area(in Km^2): 172.64

District:

State:West Bengal

Population(as on 2011):

Name of the Block	Population of CD Block (2011 census)
Kalna II	133485

Approximate Decadal Growth Rate from 2001-2011:

Rainfall:

Average annual rainfall in **: Kalna II**
(as in the district) for the period 2009 -13 (in mm)

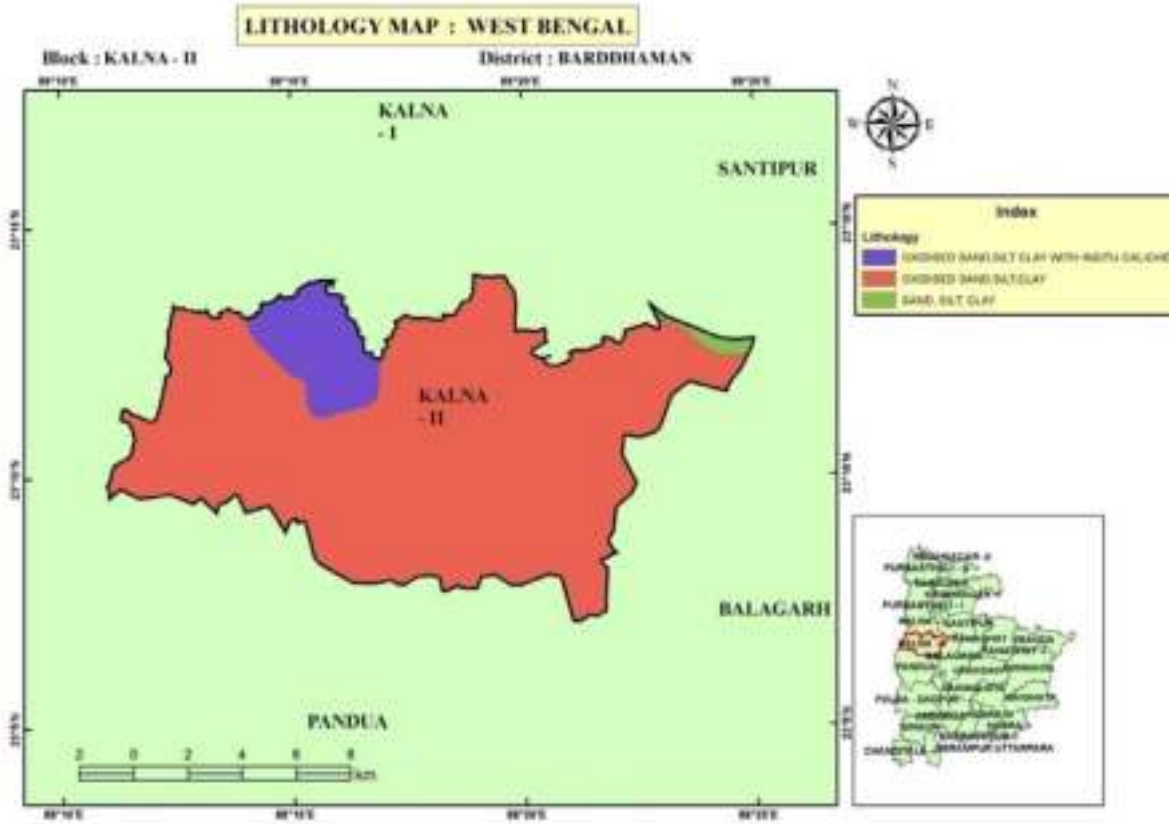
Block	Normal	Actual (Annual)				
		2009	2010	2011	2012	2013
Kalna II	1271	1229	856	1322	1030	1216

Aquifer Wise Ground Water Resource Availability & Extraction: (in MCM)

Resource Availability	Aquifer I	Aquifer II	Extraction (for Aquifer I)
Dynamic Resource	7820.50	-	7295.42
Static Resource	7295.42	-	-

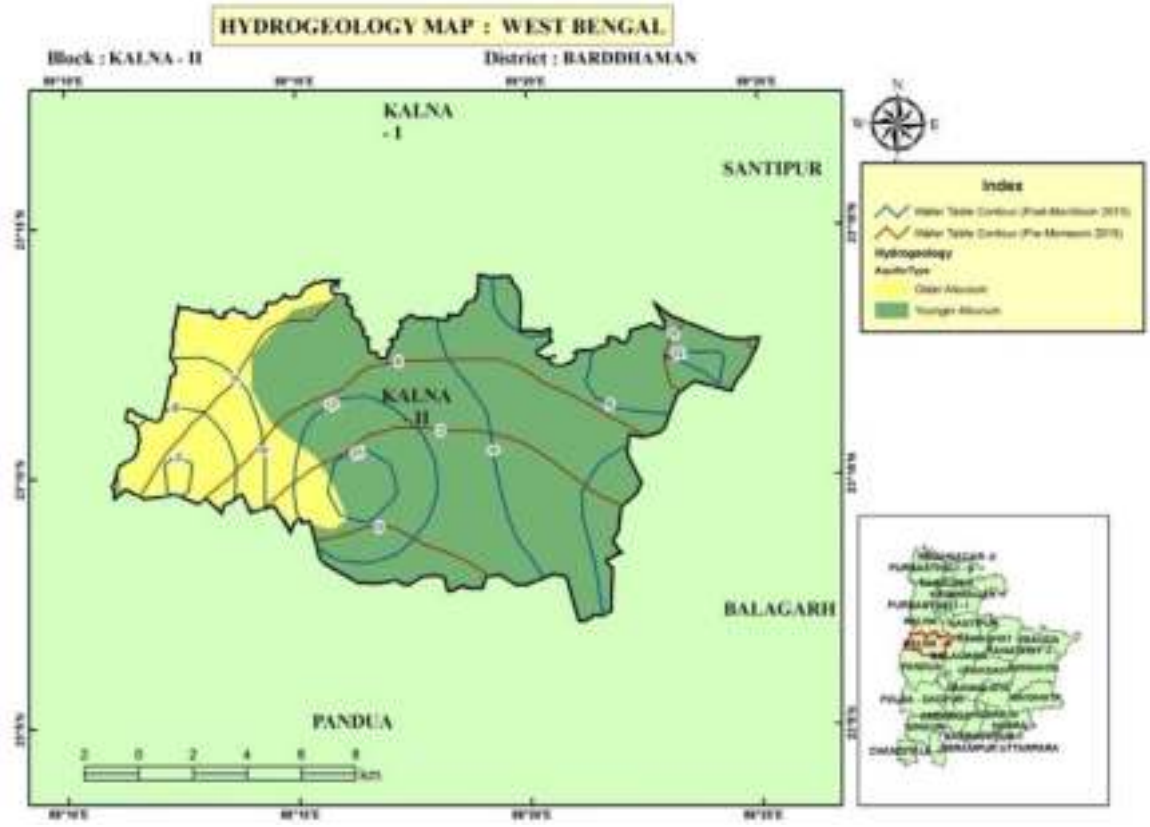
2)Disposition of Aquifer:

Block	Depth range of Aquifer in m bgl	
Kalna II	1st Aquifer	2nd aquifer
	15-27, 61-225	-



Aquifer Wise Water Level Ranges & Pre-monsoon and Post-monsoon long term water level trends (1995 to 2011)

SI. No.	Block	Aquifer	Pre-monsoon Trend		Post-monsoon Trend	
			Water Level Range(mbgl)	**Pre trend (- rising & + Falling)**	Water Level Range(mbgl)	**Post trend (- rising & + Falling)**
1.	**Kalna II**	**1**	**-**	**-2.74**	**7.45-17.95**	**30.55**
2.	**Kalna II**	**2**	**-**	**-**	**21.05**	**-**

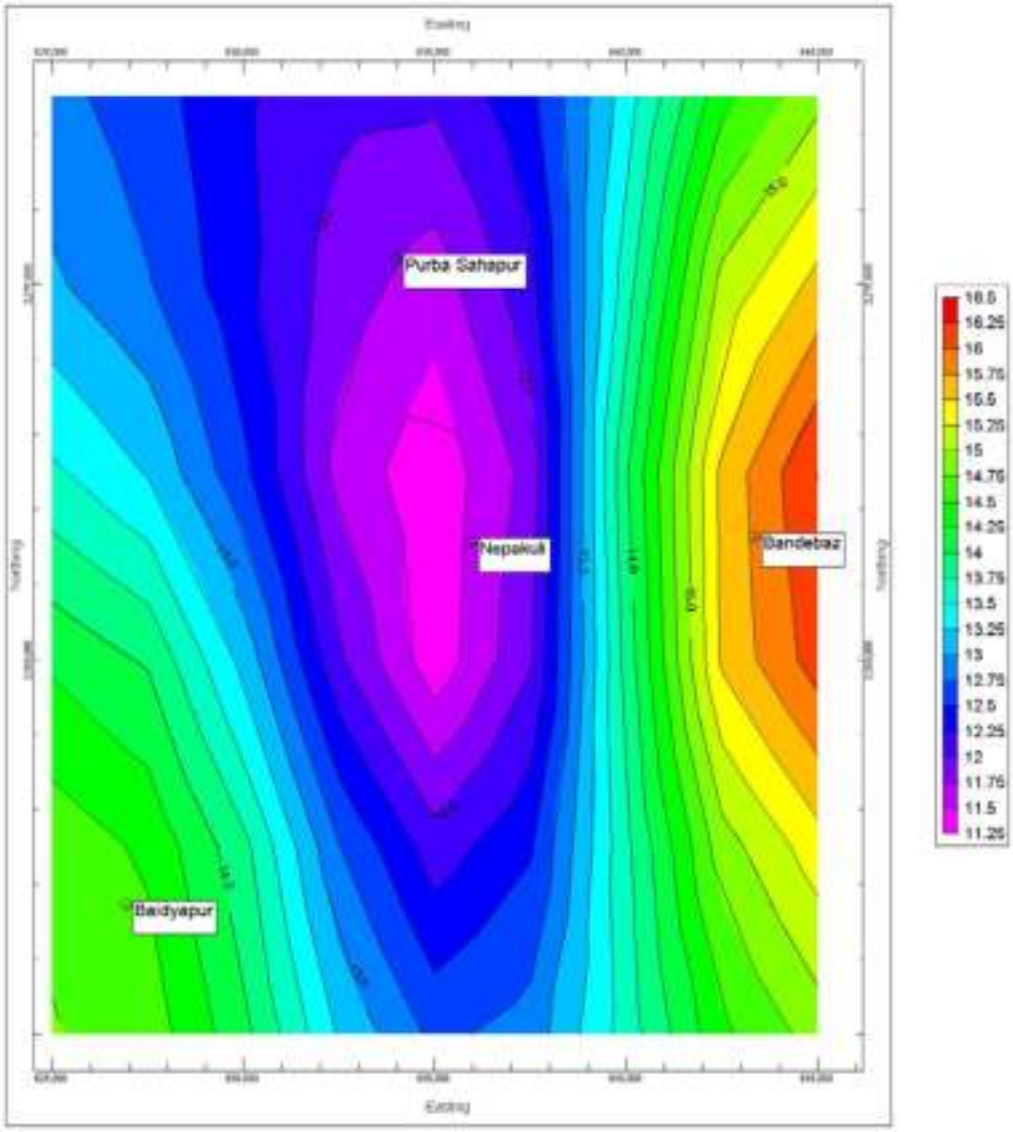


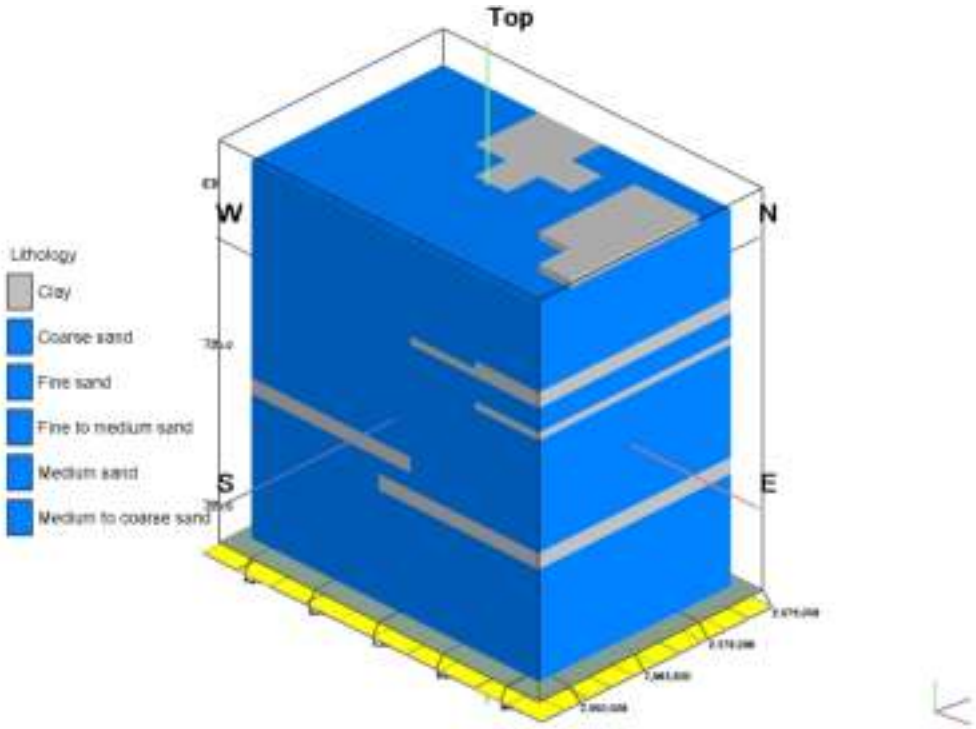
Thickness of Aquifer(Average):

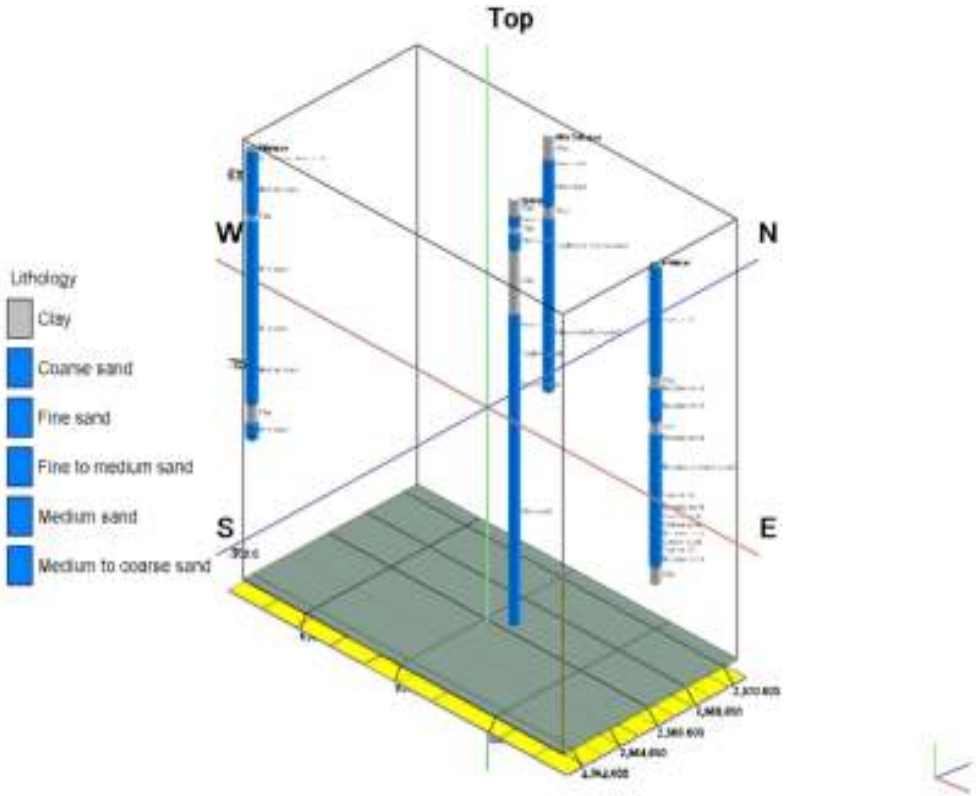
Block	Geographic Area (sq km)	Thickness of the Granular Zone in 1st aquifer (m)	Thickness of the Granular Zone /Productive Zone below pre-monsoon WL (m)
Kalna II	172.64	225	211.29

Aquifer-wise Statement

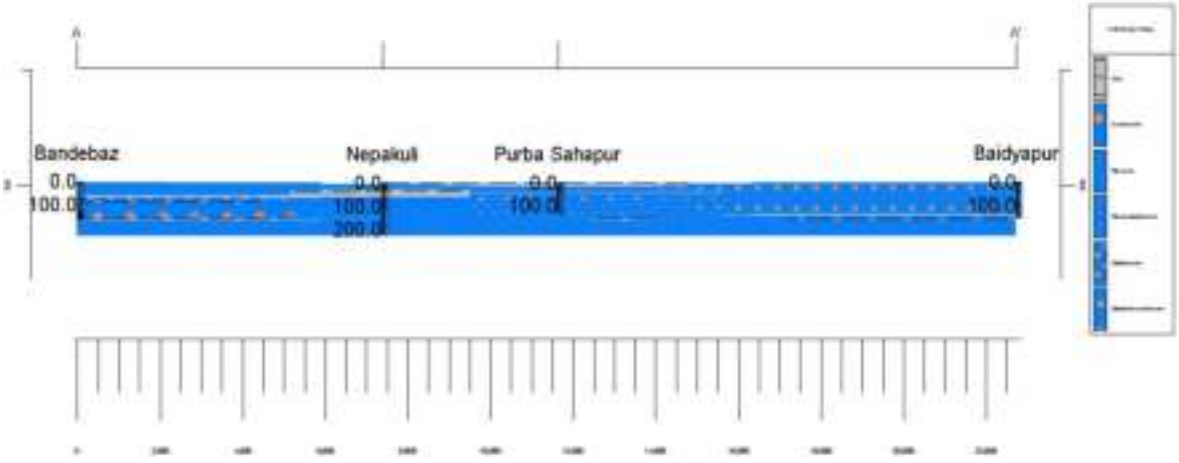
Sl. No.	Name of Block	1st Aquifer			2nd Aquifer		Remarks (T)
		Depth Range (mbgl)	Discharge (m^3/hr)	T (m^2/day)	Depth Range	Discharge (m^3/hr)	
		1st					
13	Kalna II	28-135	Up to 24.96	435-483	128-249	12.36-34.2	14.40-1530

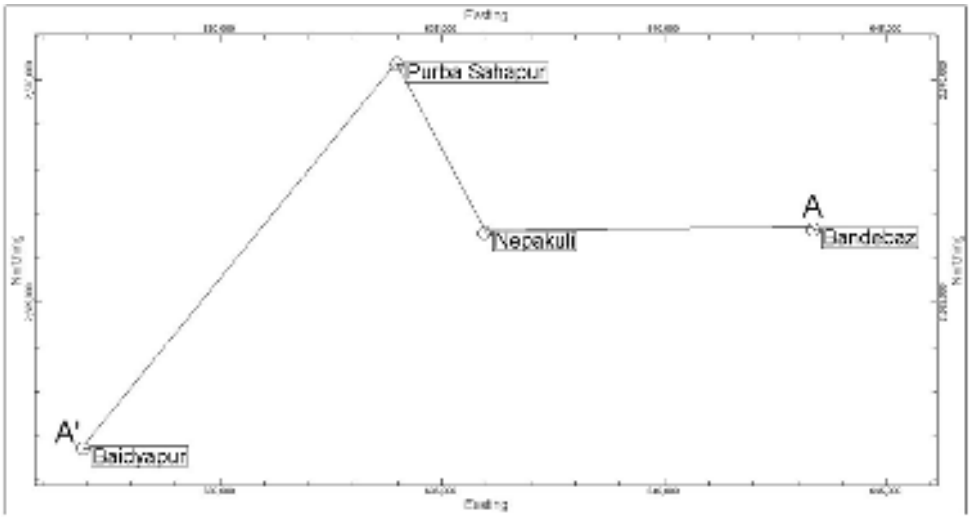



Top
W
N
S
E
Lithology
Clay
Coarse sand
Fine sand
Fine to medium sand
Medium sand
Medium to coarse sand


Top
W
N
S
E
Lithology
Clay
Coarse sand
Fine sand
Fine to medium sand
Medium sand
Medium to coarse sand

Cross-Section A-A'





3)Ground Water Resource,Extraction,Contamination & Other Issues:

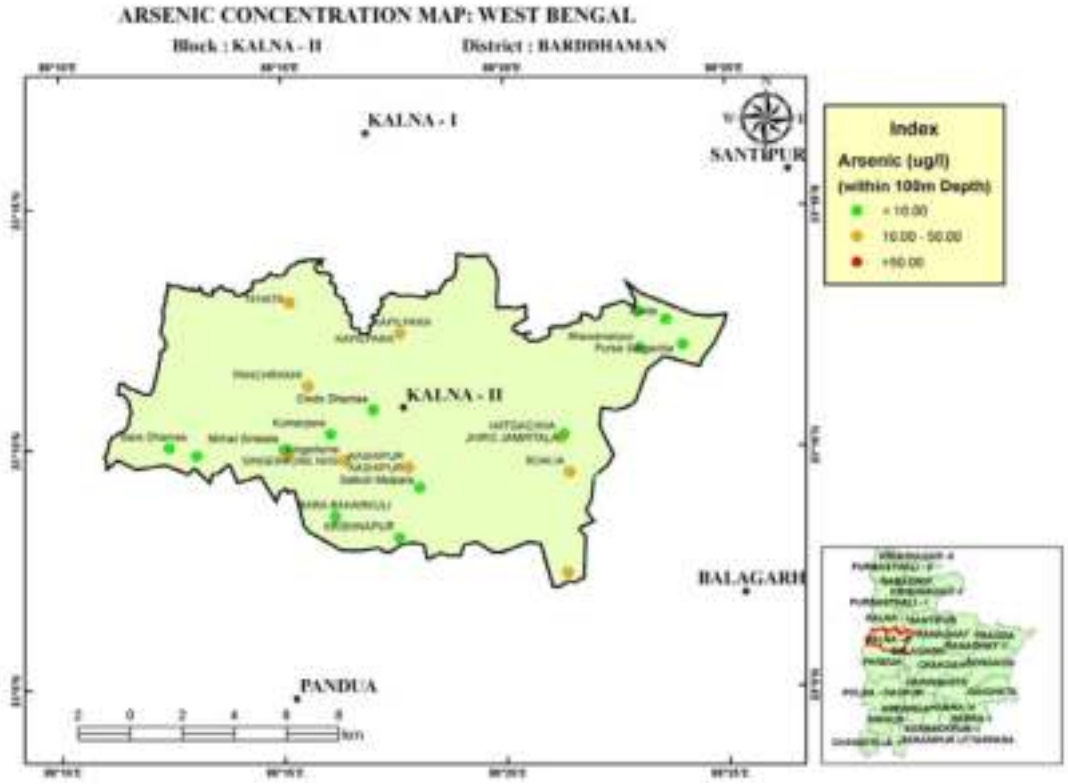
Aquifer Wise Resource Availability & Extraction:

Block	Net ground water availability (MCM)	Gross ground water draft (MCM)	Stage of development (%)	Category
Kalna II	7820.50	4365.92	55.45	Semi Critical

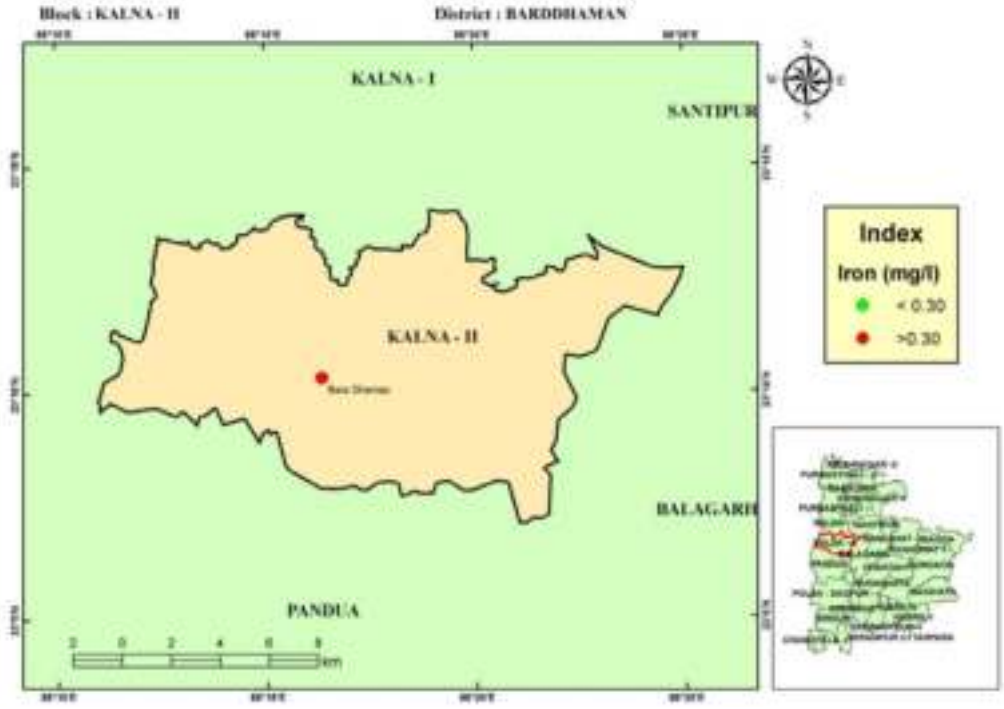
Chemical Quality Of GroundWater & Contamination:

Range Of Chemical Pollutants:

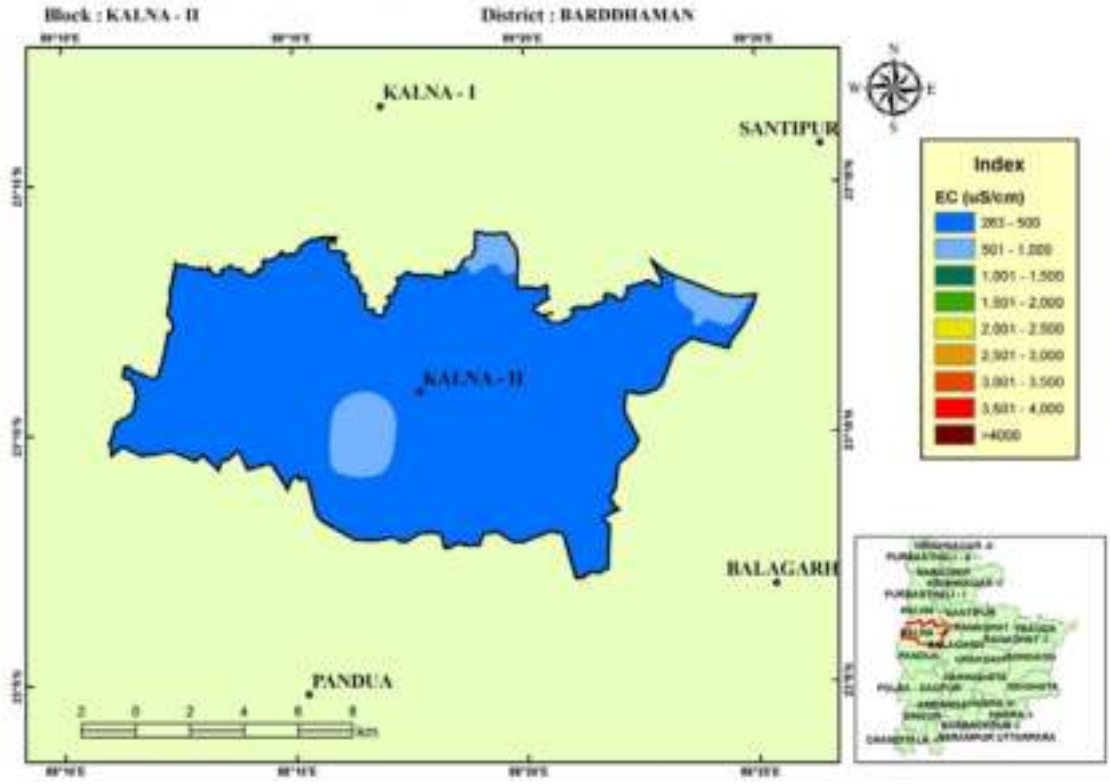
Block	As(mg/l)	Fe(mg/l)	Ec(µS/cm)	F(mg/l)	No_3(mg/l)
Kalna II	**Negligible/ns-0.030**	**1.14-10**	**304-1720**	**0.16-0.61**	**Negligible-11**



IRON CONCENTRATION MAP: WEST BENGAL



ELECTRICAL CONDUCTIVITY MAP: WEST BENGAL



Percentage of tube wells having arsenic content in the **block:**

SI.No.	Blocks	Arsenic (<0.01 ing/1)	Arsenic (>0.01-<0.05 mg/1)	Arsenic (> 0.05 mg/1)	Total Tube well
1	Kalna II	94.01	3.57	2.23	1119

4)Ground Water Resource Enhancement& Management Plan:
Ground Water Management Plan for Drinking purpose.

Suggestions on supply of ground water to the risk population For drinking purpose.

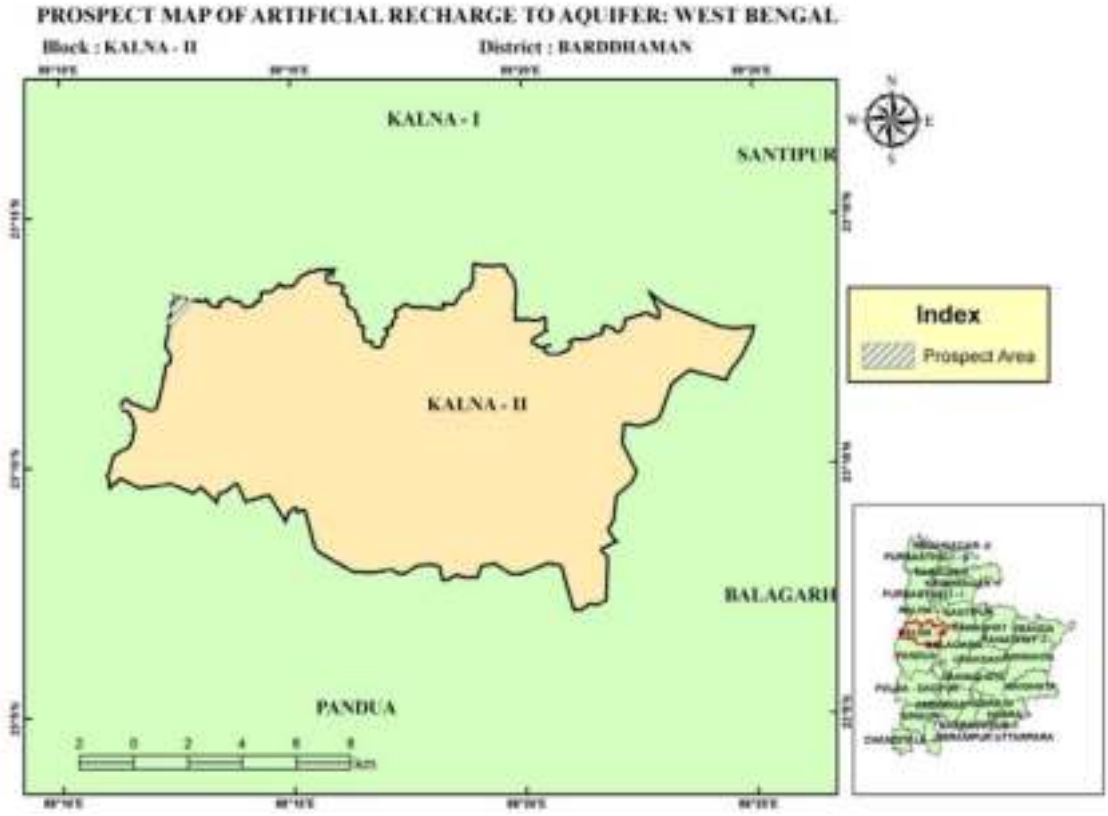
District	Block (As affected)	No. of habitations in the risk zone where As concentration >0.05 mg/L	No. of habitations in the risk zone where As concentration 0.01 to 0.05 mg/L	Risk Population (2011) where As concentration >0.05 mg/L
Barddhaman	KALNA- II	6	12	157235

Aquifer Wise Space Available For Recharge and Proposed Interventions:
Area suitable for recharge in the study area:

District	Block Name	Geographical Area (in sq. km)	Total Area suitable for recharge (sq km.)
BARDDHAMAN	Kalna-II	172.64	0.72

Proposed Artificial Recharge Structures in the area in :

District	Block	Total Surface water available in MCM for recharge	Source Water Allocation (MCM)			Number of Structures feasible			Structure-wise Cost Estimate in lakh Rs.			Total cost in lakh Rs
			Percolation Tanks	REET with RS	Injection Well	Percolation Tanks	REET with RS	Injection Well	Percolation Tanks	REET with RS	Injection Well	
BARDDHAMAN	Kalna-II	102.68	48	27	27	96	273	91	384	819	1092	2295



Ground Water Management Plan For Irrigation Purpose

Area in sq, km.

Sr No.	Name of Block	Cultivable area in ha	Net irrigated area in ha	Area to be irrigated in ha	SOD in %	Category
1	Kalna II	13958	8276	5682.00	55.45	Semi Critical

Purbasthali I

1)Salient Information

Block Name: Purbasthali I

Area(in Km^2): 151.28

District:**BARDHAMAN**

State:West Bengal

Population(as on 2011):

Name of the Block	Population of CD Block (2011 census)
Purbasthali I	153703

Approximate Decadal Growth Rate from 2001-2011:

Rainfall:

Average annual rainfall in **: Purbasthali I**

(as in the district) for the period 2009 -13 (in mm)

Block	Normal	Actual (Annual)				
		2009	2010	2011	2012	2013
Purbasthali I	1271	1229	856	1322	1030	1216

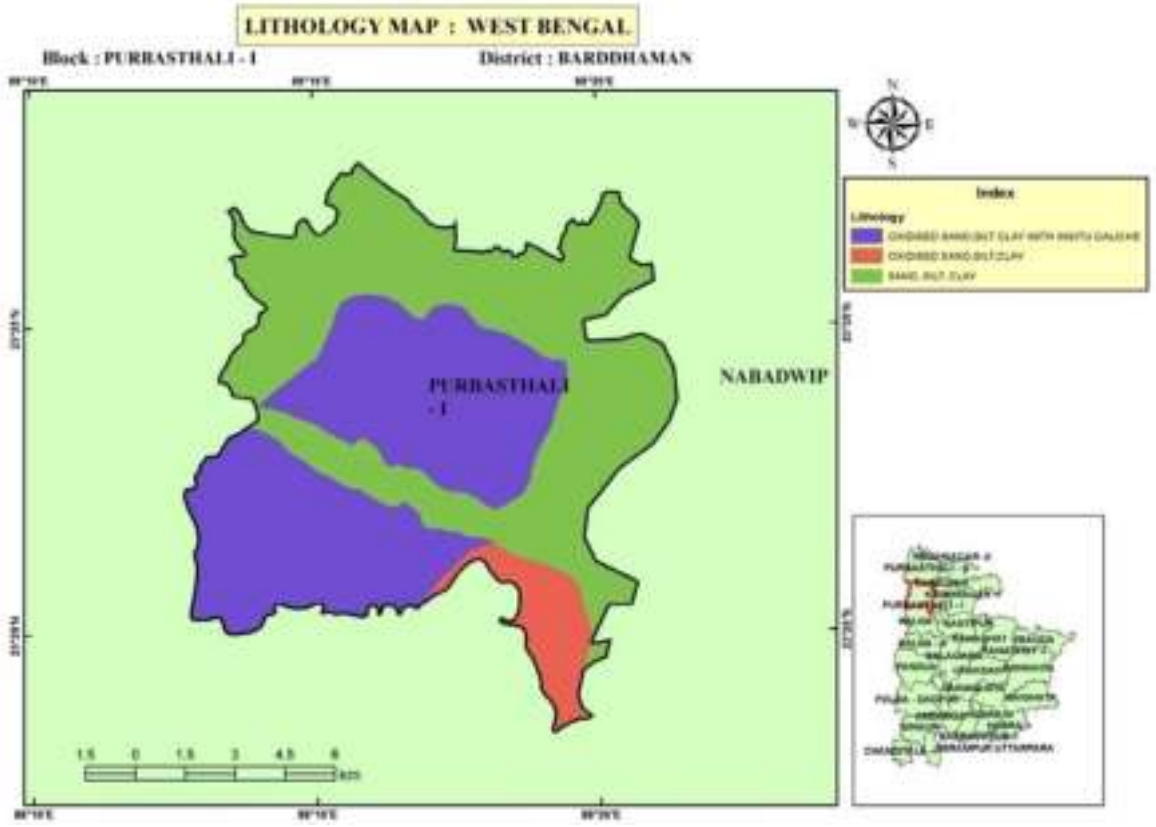
Aquifer Wise Ground Water Resource Availability & Extraction:

(in MCM)

Resource Availability	Aquifer I	Aquifer II	Extraction (for Aquifer I)
Dynamic Resource	8217.79	-	0.272304
Static Resource	52032.12	-	-

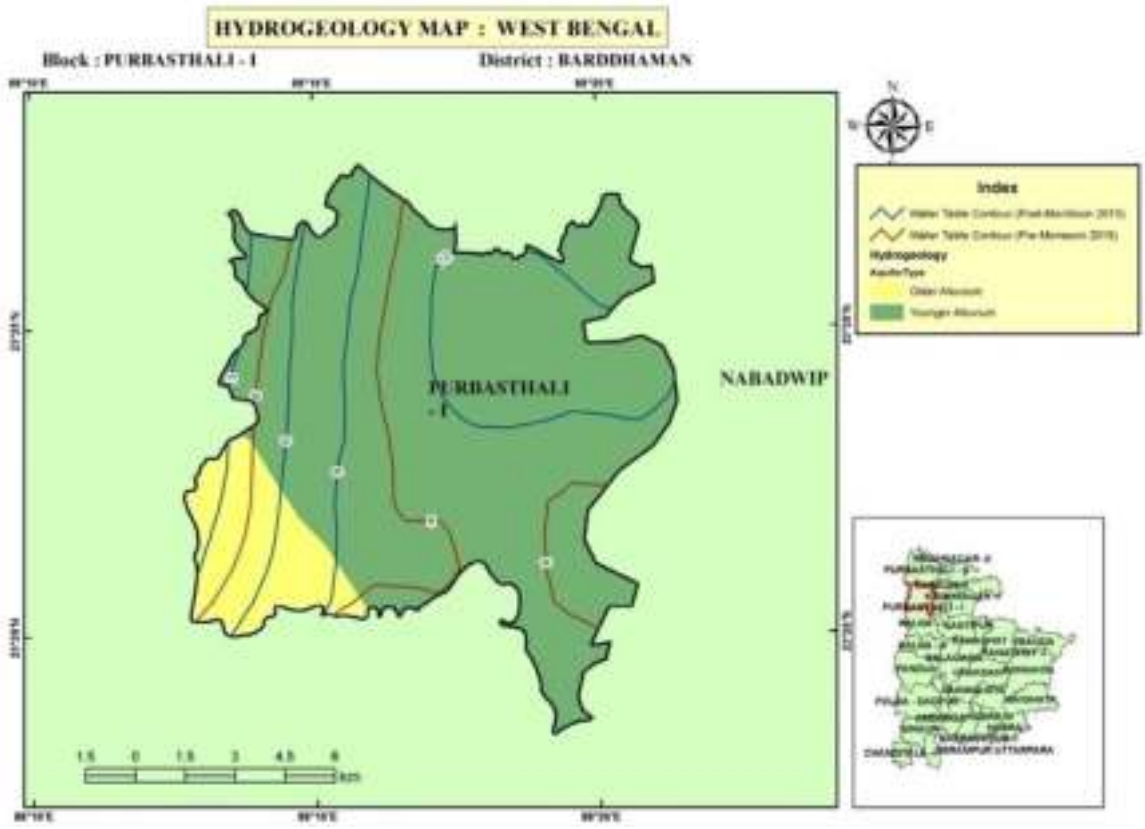
2)Disposition of Aquifer:

Block	Depth range of Aquifer in m bgl	
Purbasthali I	**1st Aquifer**	**2nd aquifer**
	15-37, 46-117, 123-185	192-195, 206-215, 240-265, 286-330



Aquifer Wise Water Level Ranges & Pre-monsoon and Post-monsoon long term water level trends (1995 to 2011)

Sl. No.	Block	Aquifer	Pre-monsoon Trend		Post-monsoon Trend	
			Water Level Range(mbgl)	**Pre trend (- rising & + Falling)**	Water Level Range(mbgl)	**Post trend (- rising & + Falling)**
1.	**Purbasthali I**	**1**	**-**	**5.30**	**2.3-13.2**	**11.16**
2.	**Purbasthali I**	**2**	**-**		**7.2-13.45**	

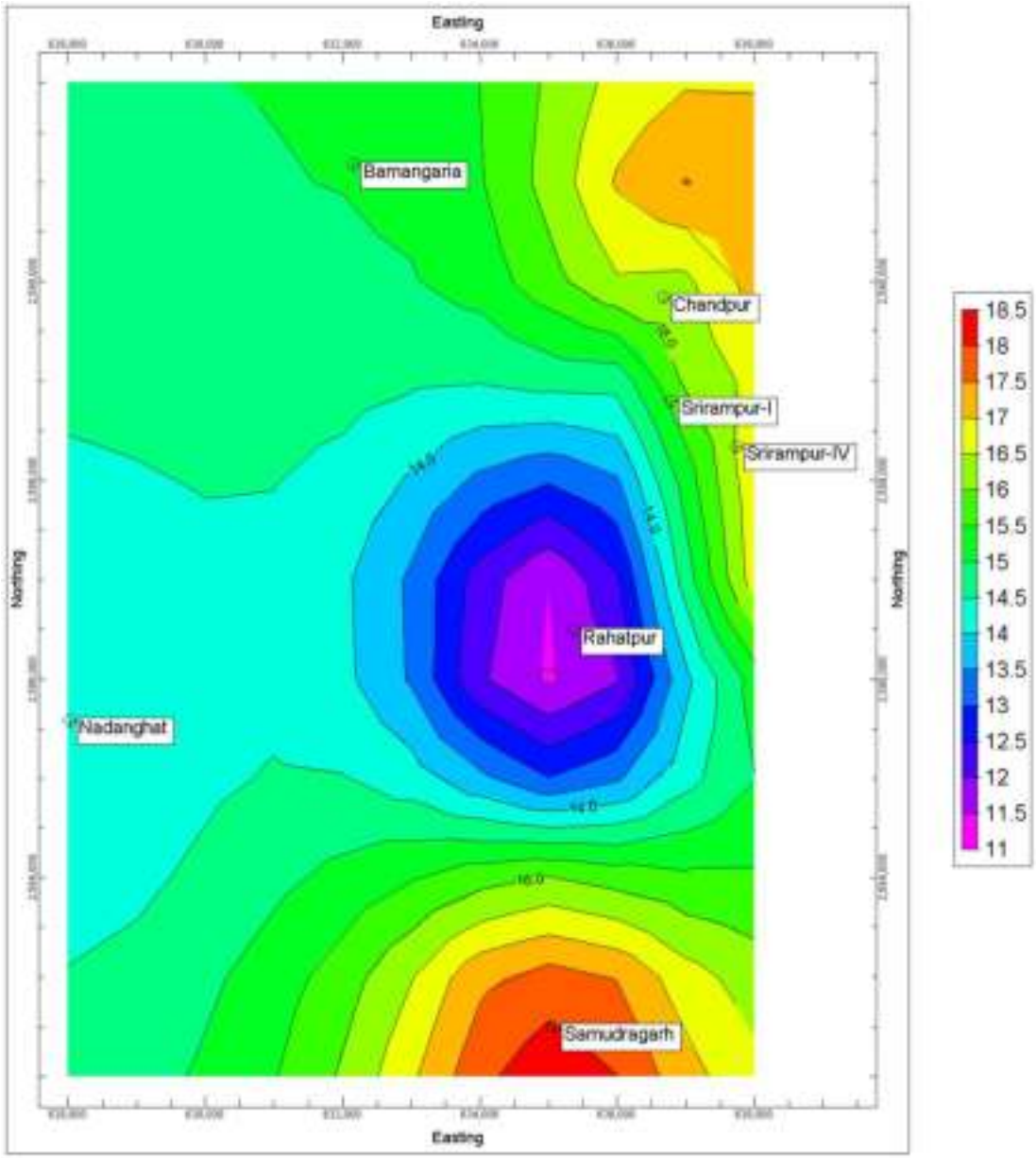


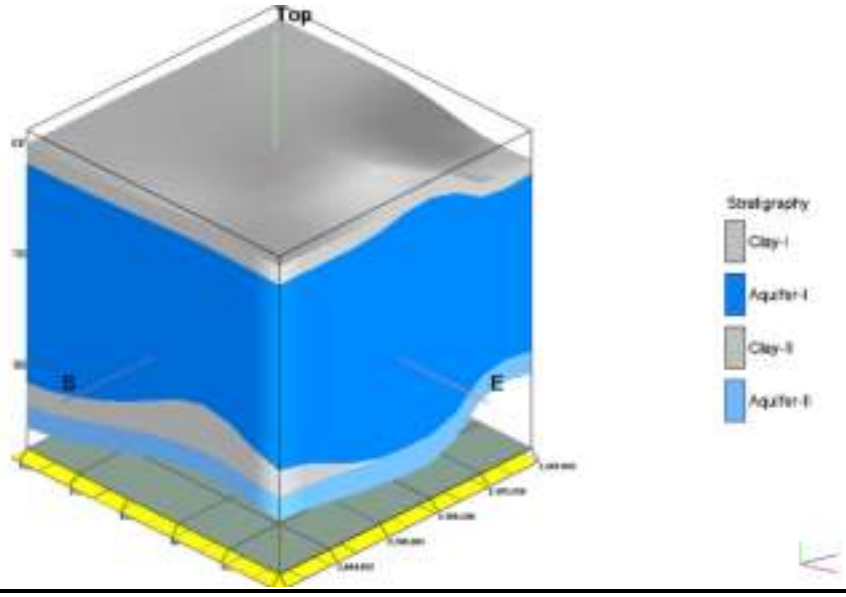
Thickness of Aquifer(Average):

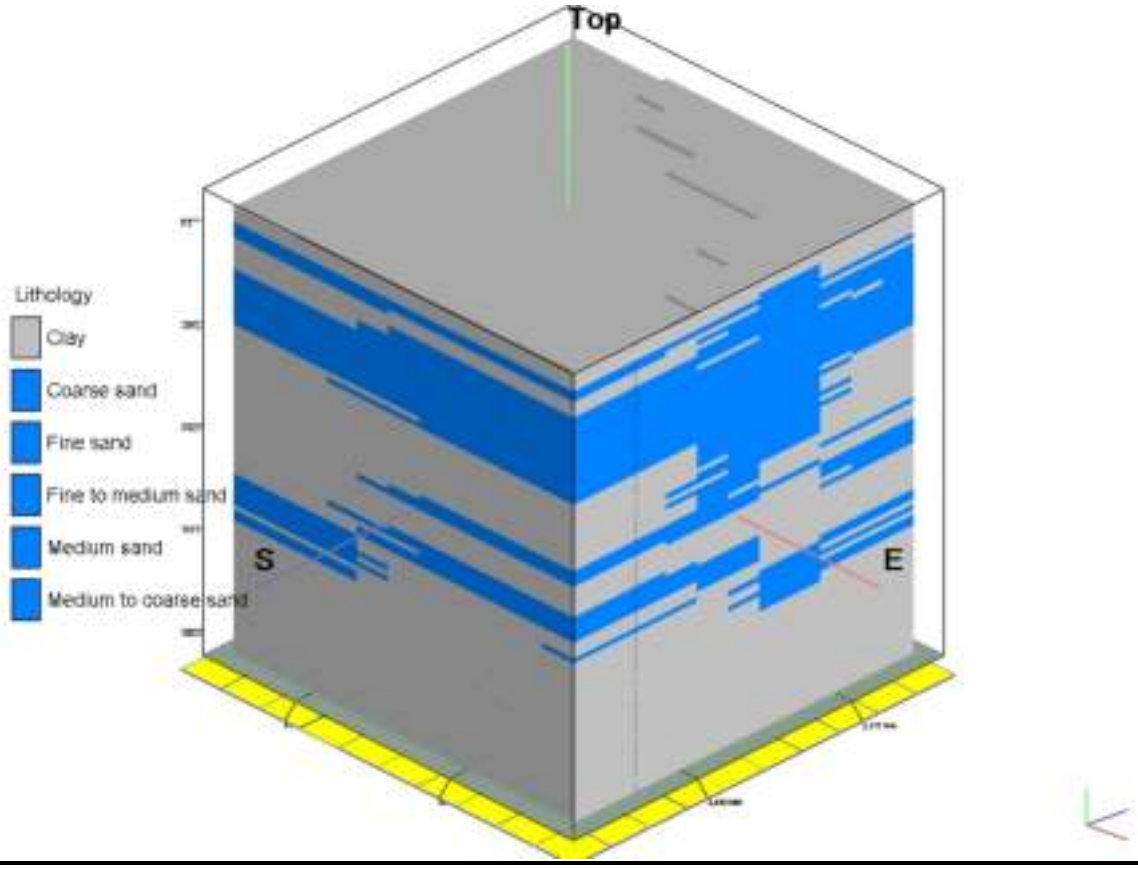
Block	Geographic Area (sq km)	Thickness of the Granular Zone in 1st aquifer (m)	Thickness of the Granular Zone /Productive Zone below pre-monsoon WL (m)
Purbasthali I	151.28	185	171.97

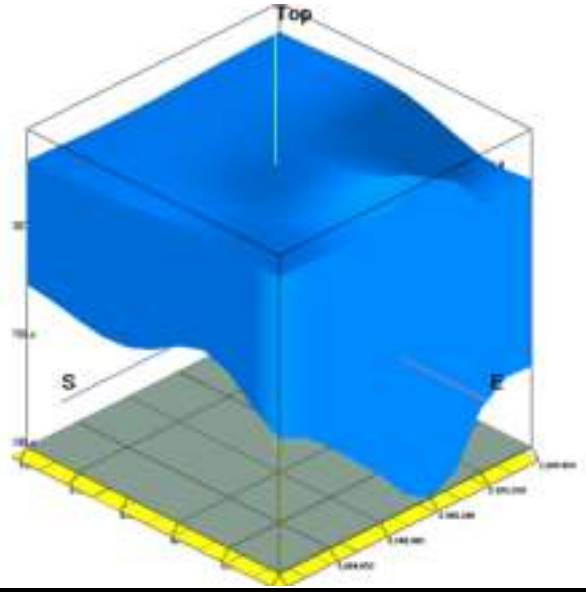
Aquifer-wise Statement

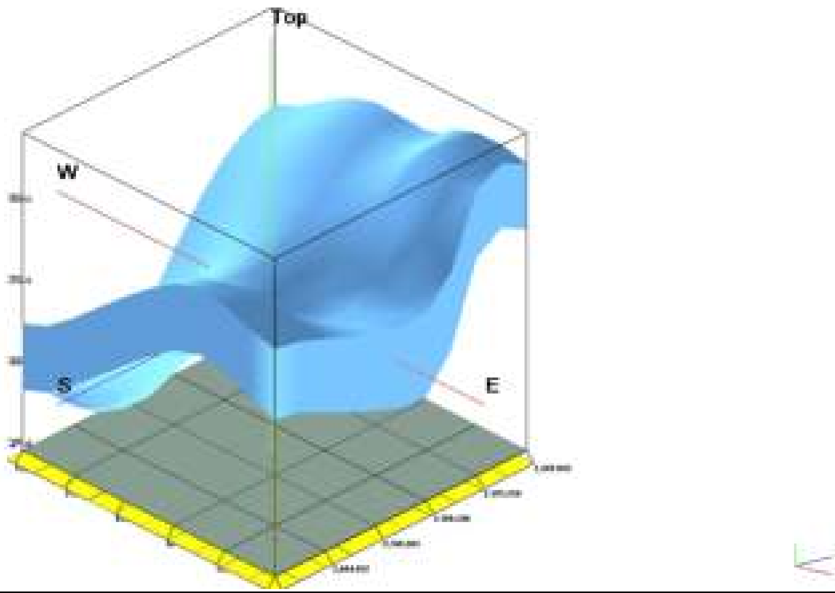
Sl. No.	Name of Block	1st Aquifer			2nd Aquifer		Remarks (T)
		Depth Range (mbgl)	Discharge (m^3/hr)	T (m^2/day)	Depth Range	Discharge (m^3/hr)	
		1st					
13	Purbasthali I	15-185	18		192-330		

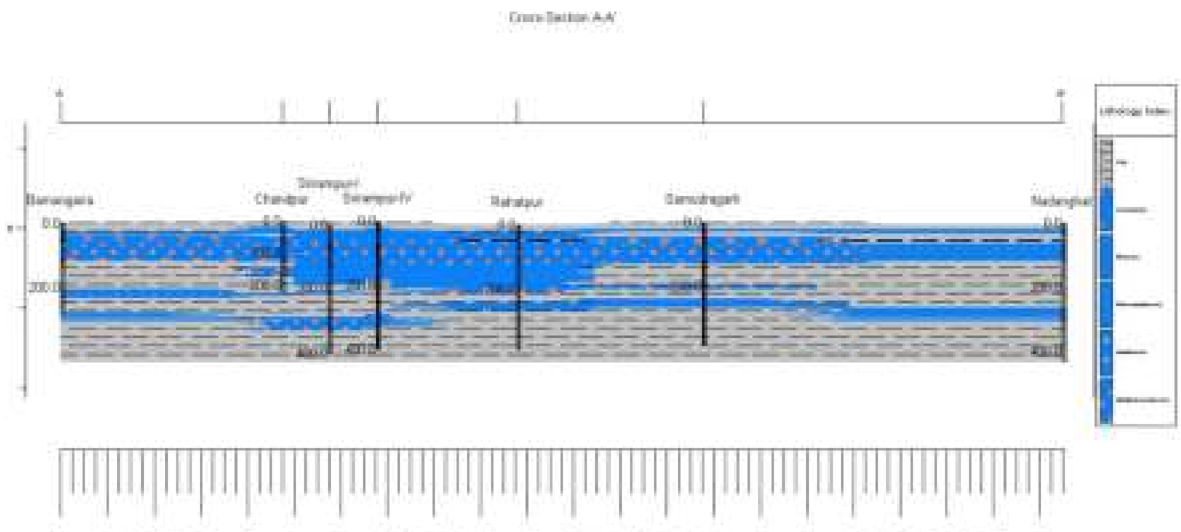

Easting
Northing
Bamangaria
Chandpur
Srirampur-I
Srirampur-IV
Rahatpur
Nadanghat
Samudragarh
18.5
18
17.5
17
16.5
16
15.5
15
14.5
14
13.5
13
12.5
12
11.5
11

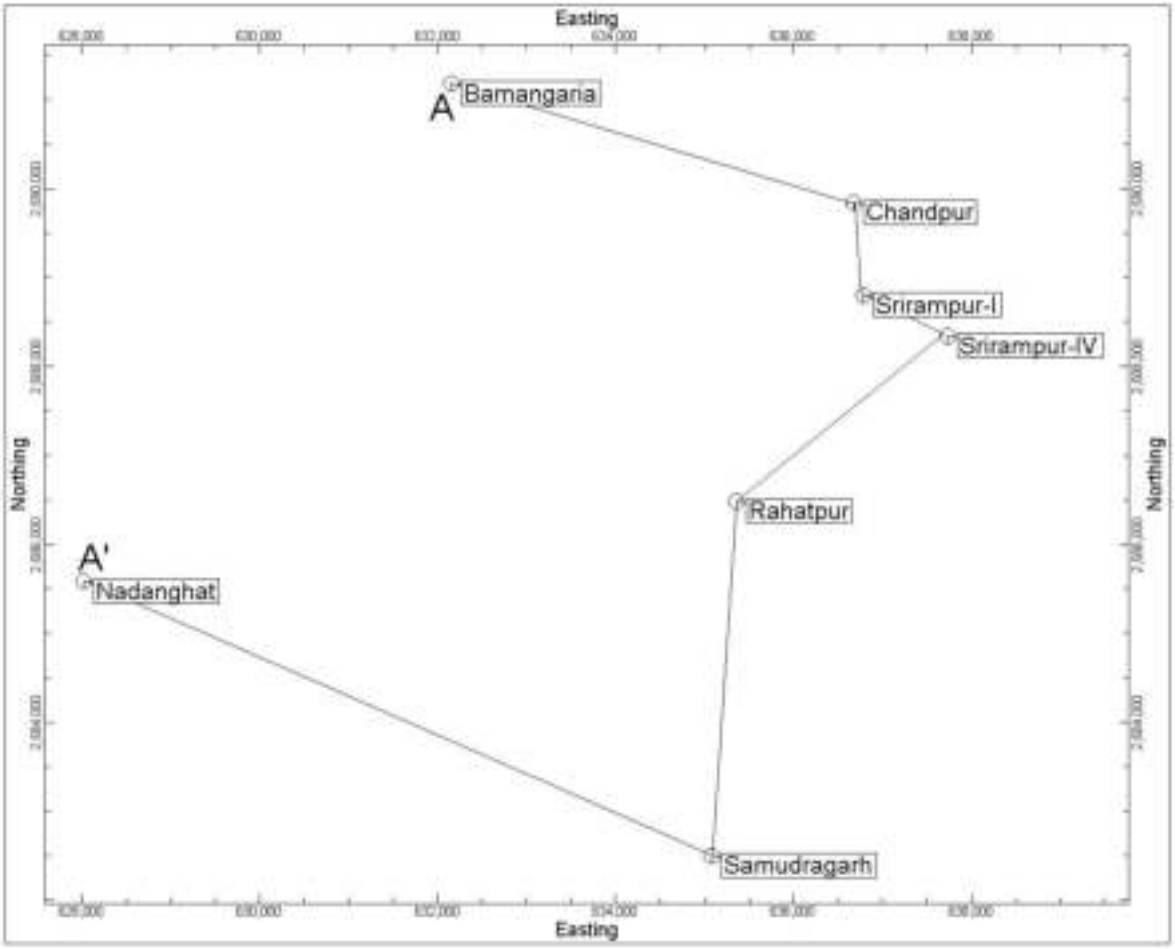

Top
B
E
Stratigraphy
Clay-I
Aquifer-I
Clay-II
Aquifer-II


Top
Lithology
Clay
Coarse sand
Fine sand
Fine to medium sand
Medium sand
Medium to coarse sand
S
E


Top
S
E


Top
W
S
E


Cross Section A-A'



3)Ground Water Resource,Extraction,Contamination & Other Issues:

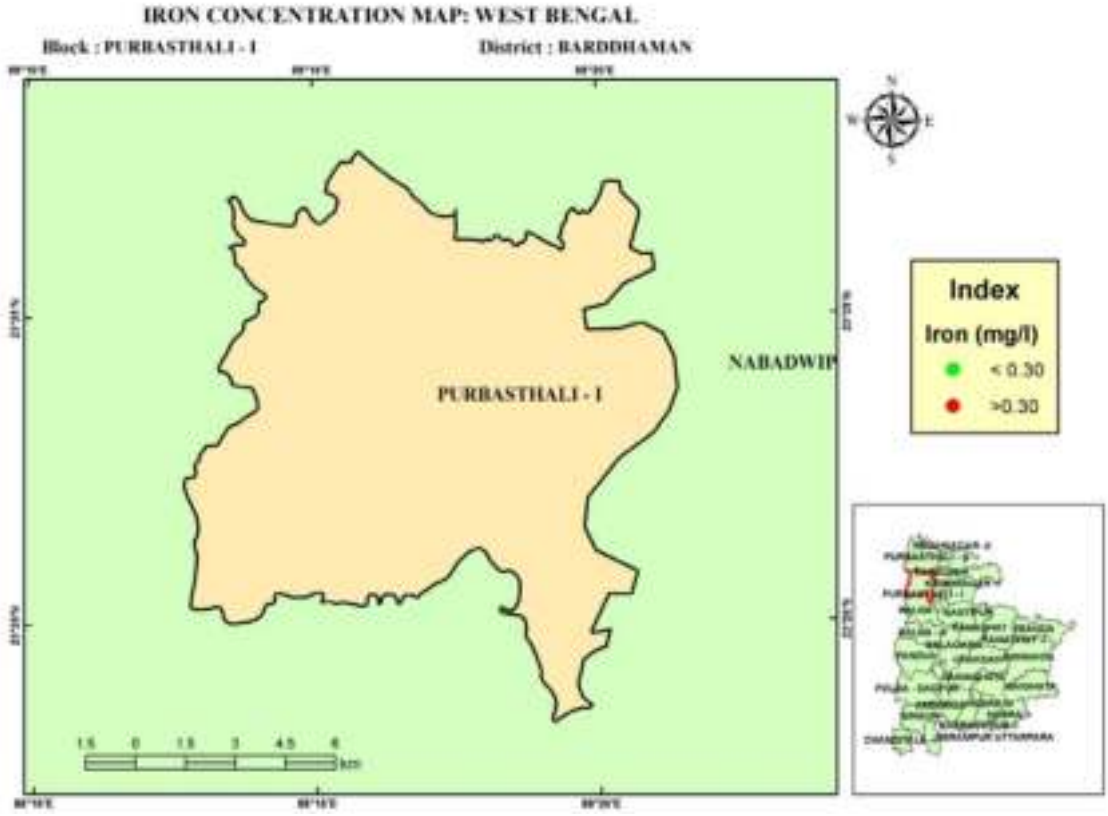
Aquifer Wise Resource Availability & Extraction:

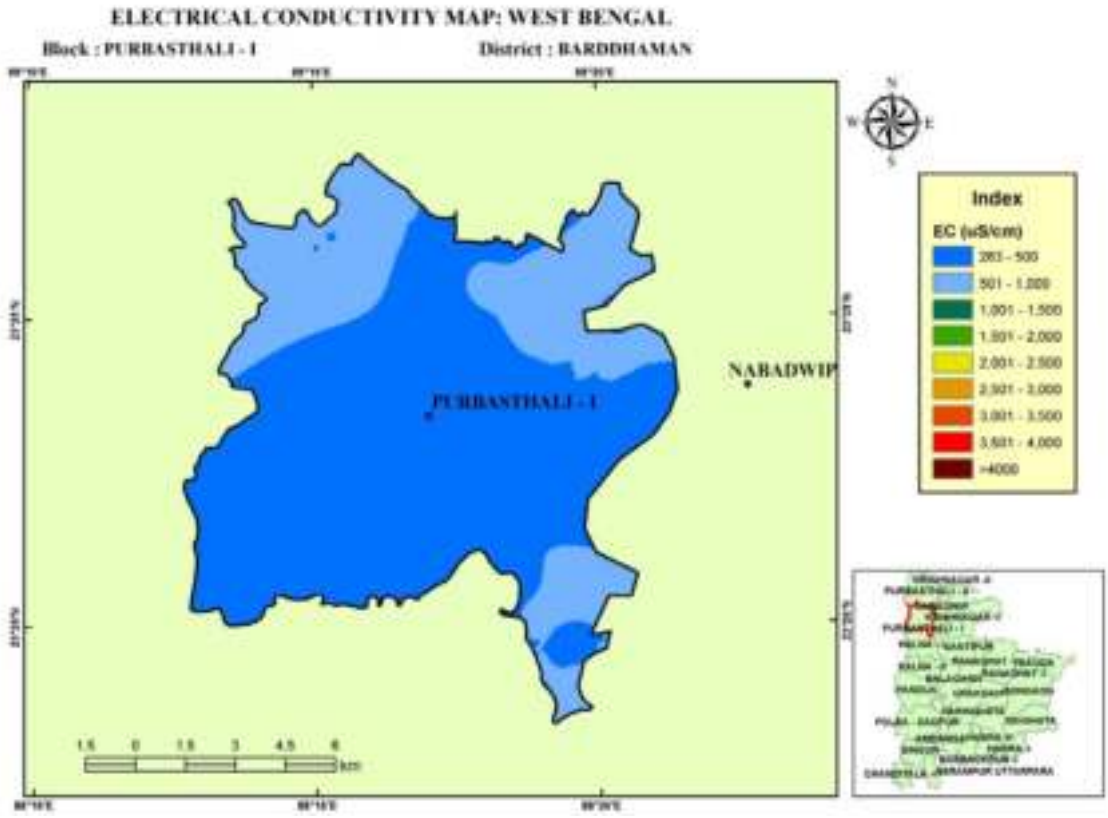
Block	Net ground water availability (MCM)	Gross ground water draft (MCM)	Stage of development (%)	Category
Purbasthali I	8217.79	4021.34	48.93	Safe

Chemical Quality Of GroundWater & Contamination:

Range Of Chemical Pollutants:

Block	As(mg/l)	Fe(mg/l)	Ec(µS/cm)	F(mg/l)	No_3(mg/l)
Purbasthali I	**Negligible-0.274**	**0-0.88**	**266-1030**	**0.60-0.65**	**Negligible-37**


IRON CONCENTRATION MAP: WEST BENGAL
Block : PURBASTHALI - I
District : BARDDHAMAN
PURBASTHALI - I
NABADWIP
Index
Iron (mg/l)
< 0.30
>0.30
km



Percentage of tube wells having arsenic content in the **block:**

SI.No.	Blocks	Arsenic (<0.01 ing/1)	Arsenic (>0.01-<0.05 mg/1)	Arsenic (> 0.05 mg/1)	Total Tube well
1	Purbasthali I	86.99	5.90	7.11	1407

4)Ground Water Resource Enhancement& Management Plan:

Ground Water Management Plan for Drinking purpose.

Suggestions on supply of ground water to the risk population For drinking purpose.

District	Block (As affected)	No. of habitations in the risk zone where As concentration >0.05 mg/L	No. of habitations in the risk zone where As concentration 0.01 to 0.05 mg/L	Risk Population (2011) where As concentration >0.05 mg/L
BARDDHAMAN	PURBASTHALI- I	22	21	153703

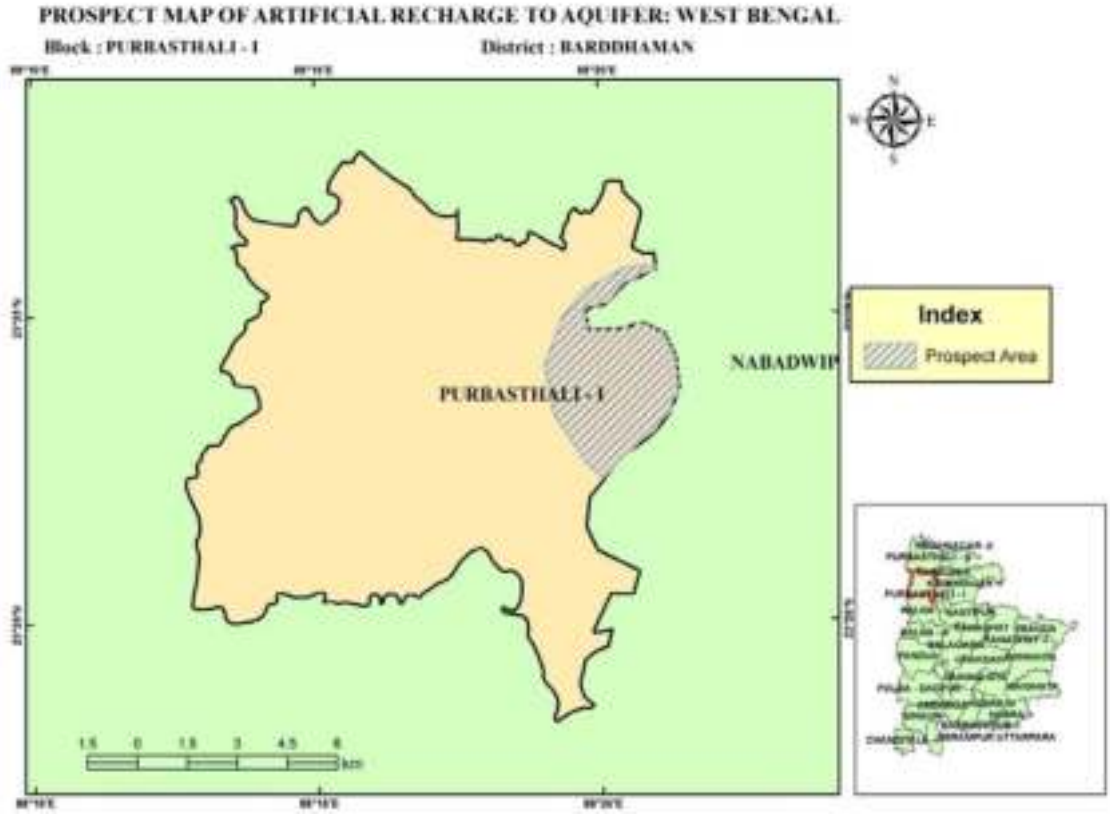
Aquifer Wise Space Available For Recharge and Proposed Interventions:

Area suitable for recharge in the study area:

District	Block Name	Geographical Area (in sq. km)	Total Area suitable for recharge (sq km.)
BARDDHAMAN	Purbasthali-I	151.28	15.40

Proposed Artificial Recharge Structures in the area in :

District	Block	Total Surface water available in MCM for recharge	Source Water Allocation (MCM)			Number of Structures feasible			Structure-wise Cost Estimate in lakh Rs.			Total cost in lakh Rs
			Percolation Tanks	RET with RS	Injection Well	Percolation Tanks	RET with RS	Injection Well	Percolation Tanks	RET with RS	Injection Well	
BARDDHAMAN	Purbasthali-I	88.53	42	24	24	83	235	78	332	705	936	1973



Ground Water Management Plan For Irrigation Purpose

Area in sq, km.

Sr No.	Name of Block	Cultivable area in ha	Net irrigated area in ha	Area to be irrigated in ha	SOD in %	Category
1	Purbasthali I	11871	7006	4865.00	48.93	Safe

Purbasthali II

1)Salient Information

Block Name: Purbasthali II

Area(in Km^2): 199.61

District: **BARDHAMAN**

State:West Bengal

Population(as on 2011):

Name of the Block	Population of CD Block (2011 census)
Purbasthali II	212355

Approximate Decadal Growth Rate from 2001-2011:

Rainfall:

Average annual rainfall in **: Purbasthali II**

(as in the district) for the period 2009 -13 (in mm)

Block	Normal	Actual (Annual)				
		2009	2010	2011	2012	2013
Purbasthali II	1271	1229	856	1322	1030	1216

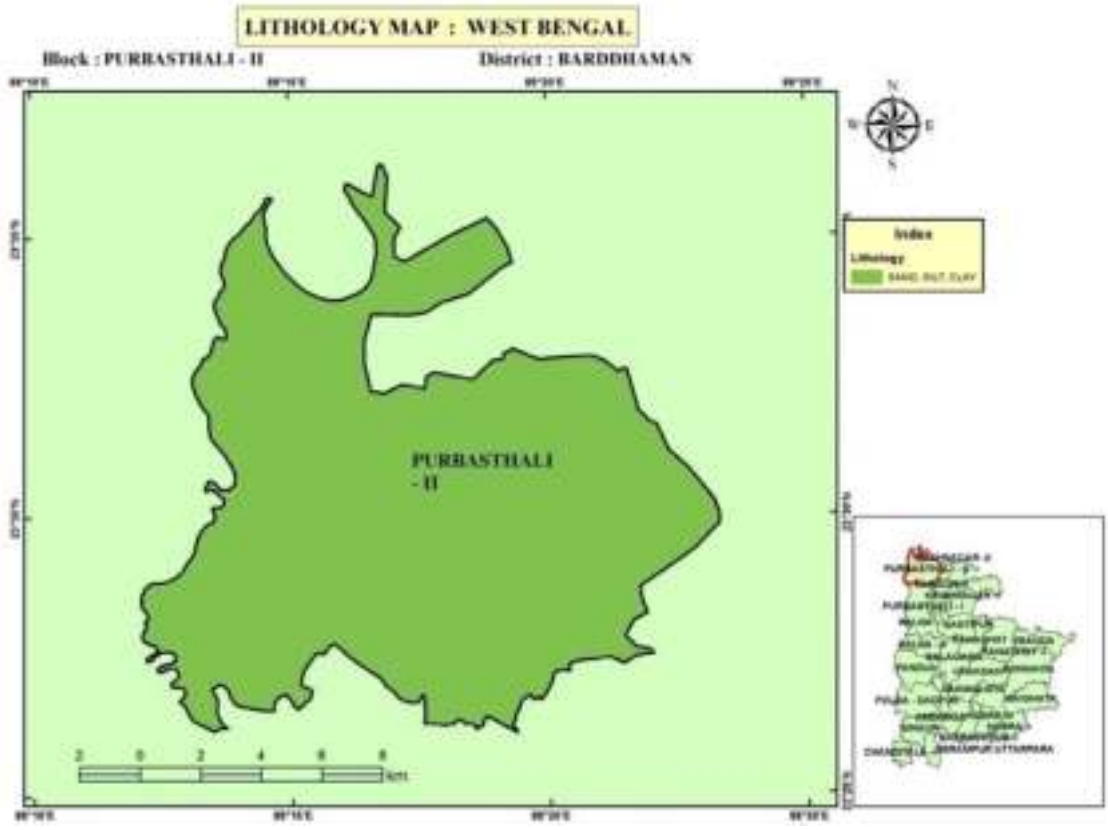
Aquifer Wise Ground Water Resource Availability & Extraction:

(in MCM)

Resource Availability	Aquifer I	Aquifer II	Extraction (for Aquifer I)
Dynamic Resource	10255.29	-	0.359298
Static Resource	5763.14	-	-

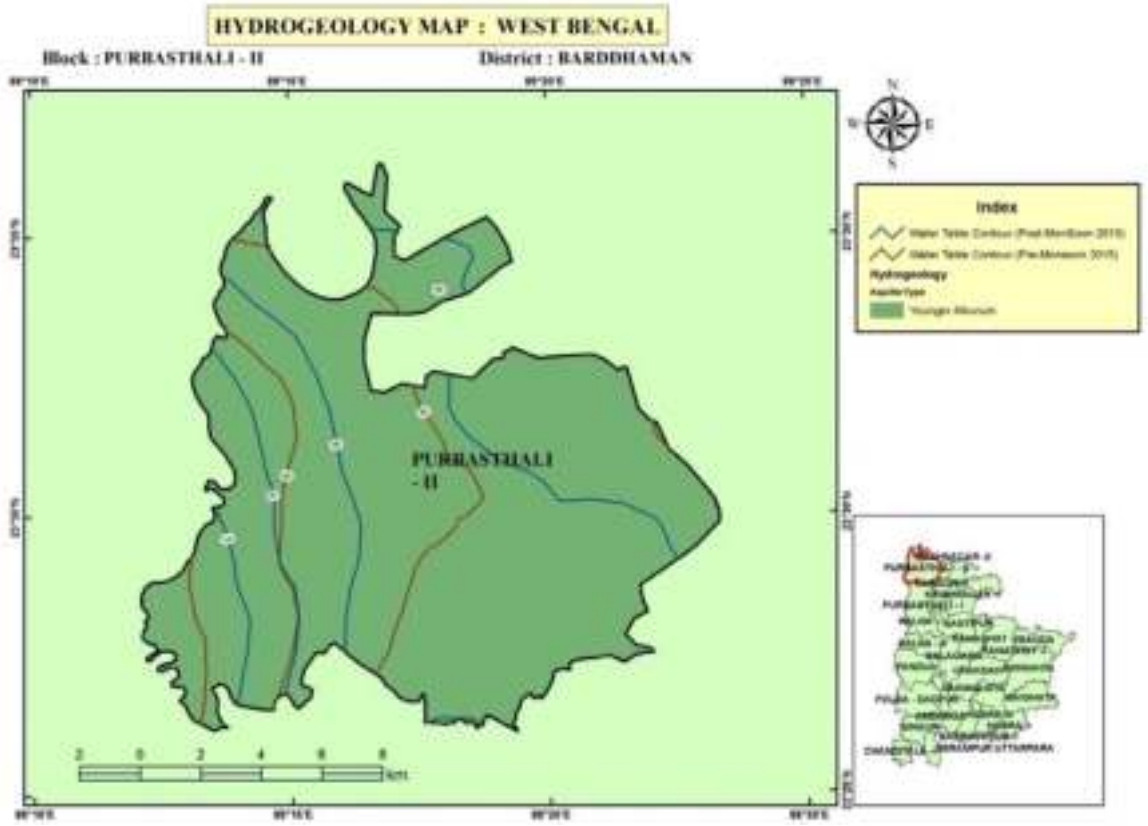
2)Disposition of Aquifer:

Block	Depth range of Aquifer in m bgl	
Purbasthali II	**1st Aquifer**	**2nd aquifer**
	15-58, 61-127, 136-153	193-222



Aquifer Wise Water Level Ranges & Pre-monsoon and Post-monsoon long term water level trends (1995 to 2011)

Sl. No.	Block	Aquifer	Pre-monsoon Trend		Post-monsoon Trend	
			Water Level Range(mbgl)	**Pre trend (- rising & + Falling)**	Water Level Range(mbgl)	**Post trend (- rising & + Falling)**
1	**Purbasthali II**	**1**	**-**	**12.73**	**8.75**	**19.38**
2	**Purbasthali II**	**2**	**-**	**-**	**6.4**	**-**

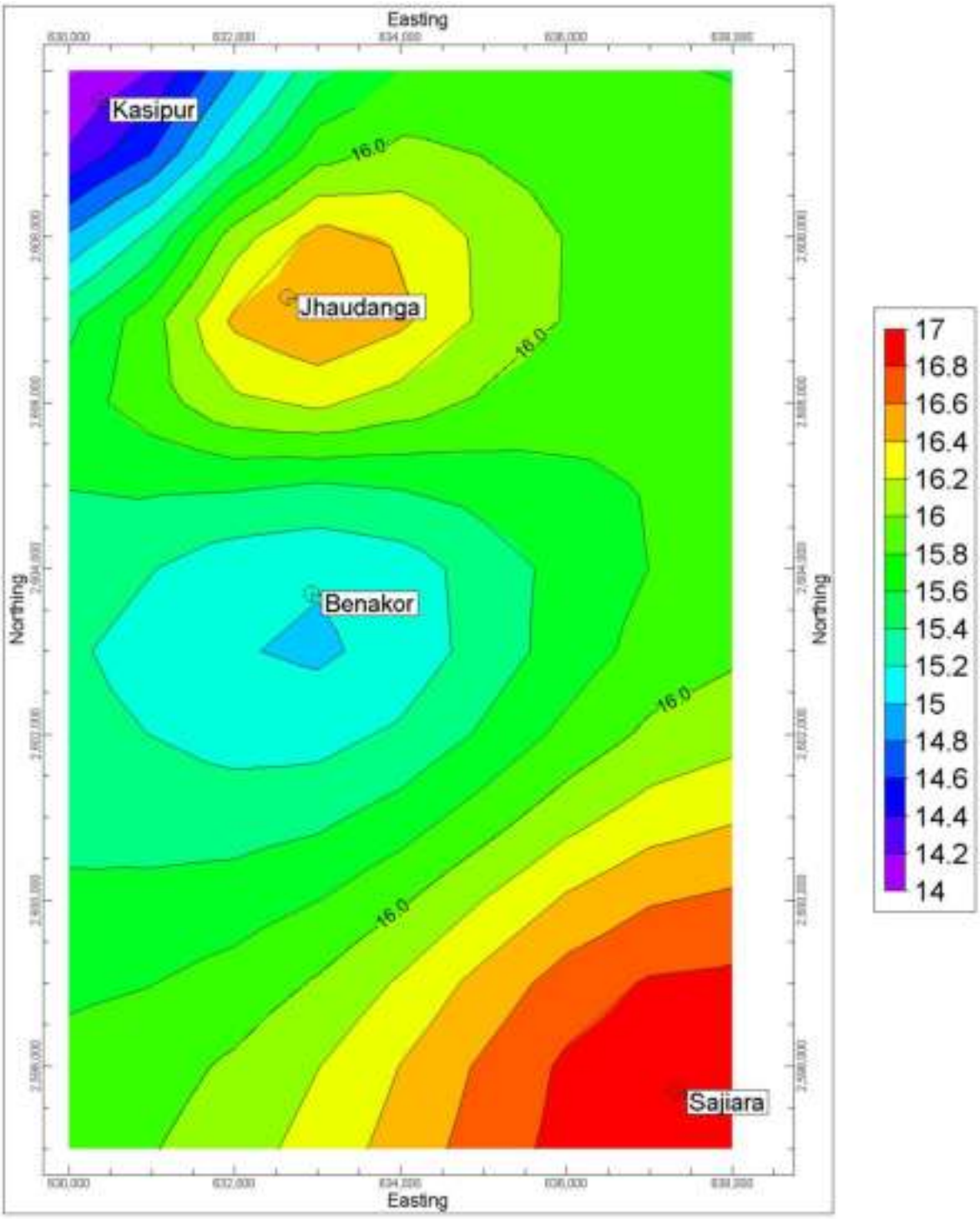


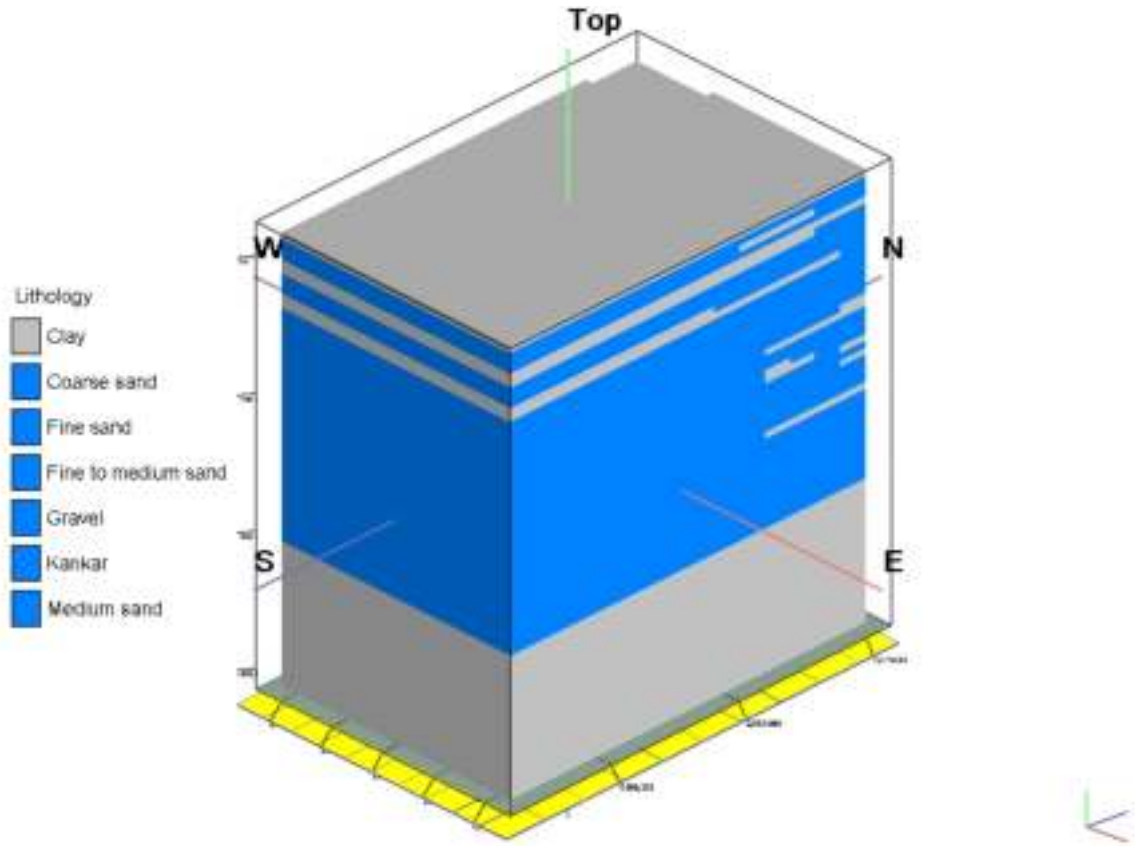
Thickness of Aquifer(Average):

Block	Geographic Area (sq km)	Thickness of the Granular Zone in 1st aquifer (m)	Thickness of the Granular Zone /Productive Zone below pre-monsoon WL (m)
Purbasthali II	199.61	153	144.36

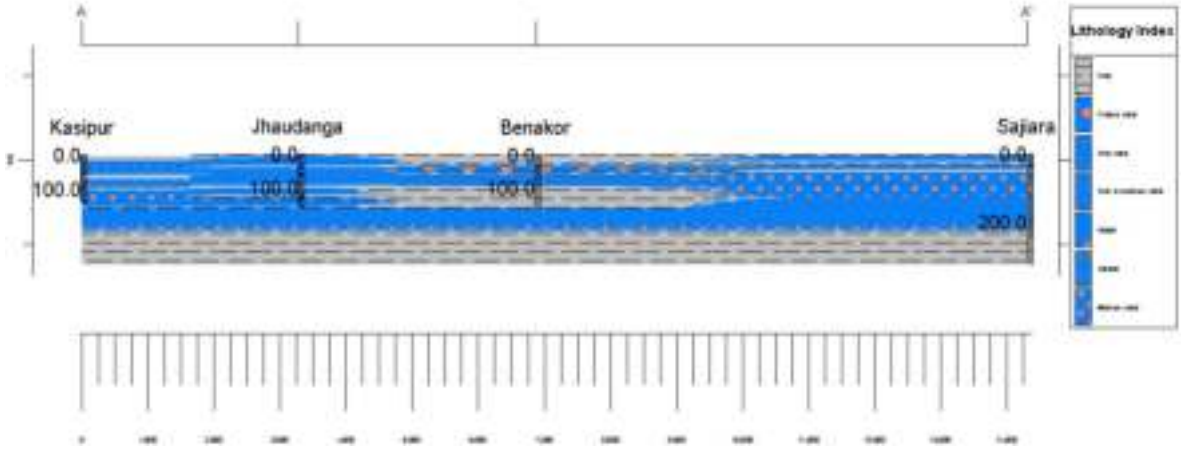
Aquifer-wise Statement

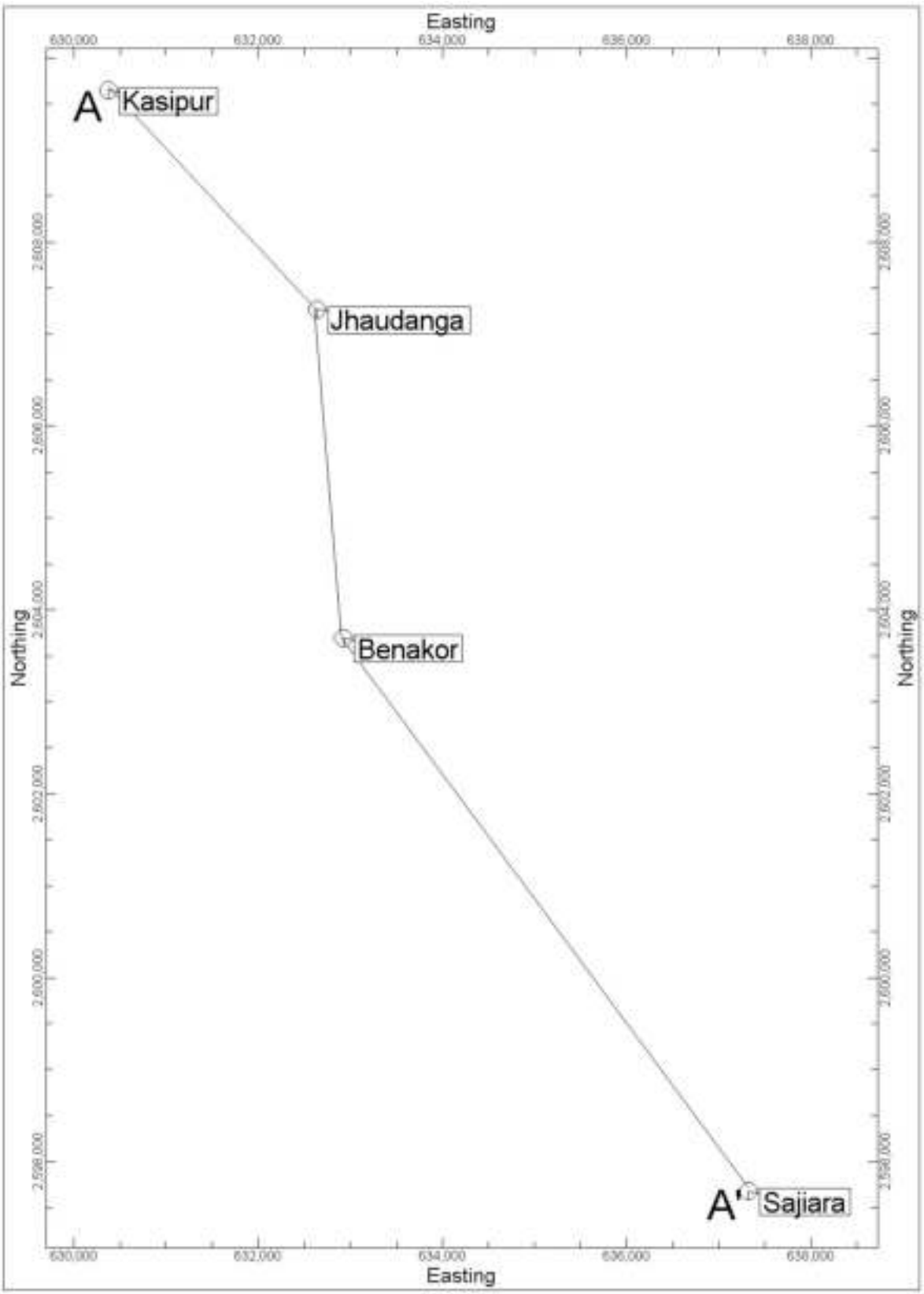
Sl. No.	Name of Block	1st Aquifer			2nd Aquifer		Remarks (T)
		Depth Range (mbgl)	Discharge (m^3/hr)	T (m^2/day)	Depth Range	Discharge (m^3/hr)	
		1st					
13	Purbasthali II	15-153	12.36-34.20	14.40-1998	193-222		


Easting
Kasipur
Jhaudanga
Benakor
Sajiara
16.0
16.0
16.0
16.0
Northing
Northing
Easting
17
16.8
16.6
16.4
16.2
16
15.8
15.6
15.4
15.2
15
14.8
14.6
14.4
14.2
14


Top
W
N
S
E
Lithology
Clay
Coarse sand
Fine sand
Fine to medium sand
Gravel
Kankar
Medium sand

Cross-Section A-A'




Easting
630,000
632,000
634,000
636,000
638,000
A
Kasipur
Jhaudanga
Benakor
A'
Sajiara
Northing
2,608,000
2,606,000
2,604,000
2,602,000
2,600,000
2,598,000
Northing
Easting

3)Ground Water Resource,Extraction,Contamination & Other Issues:

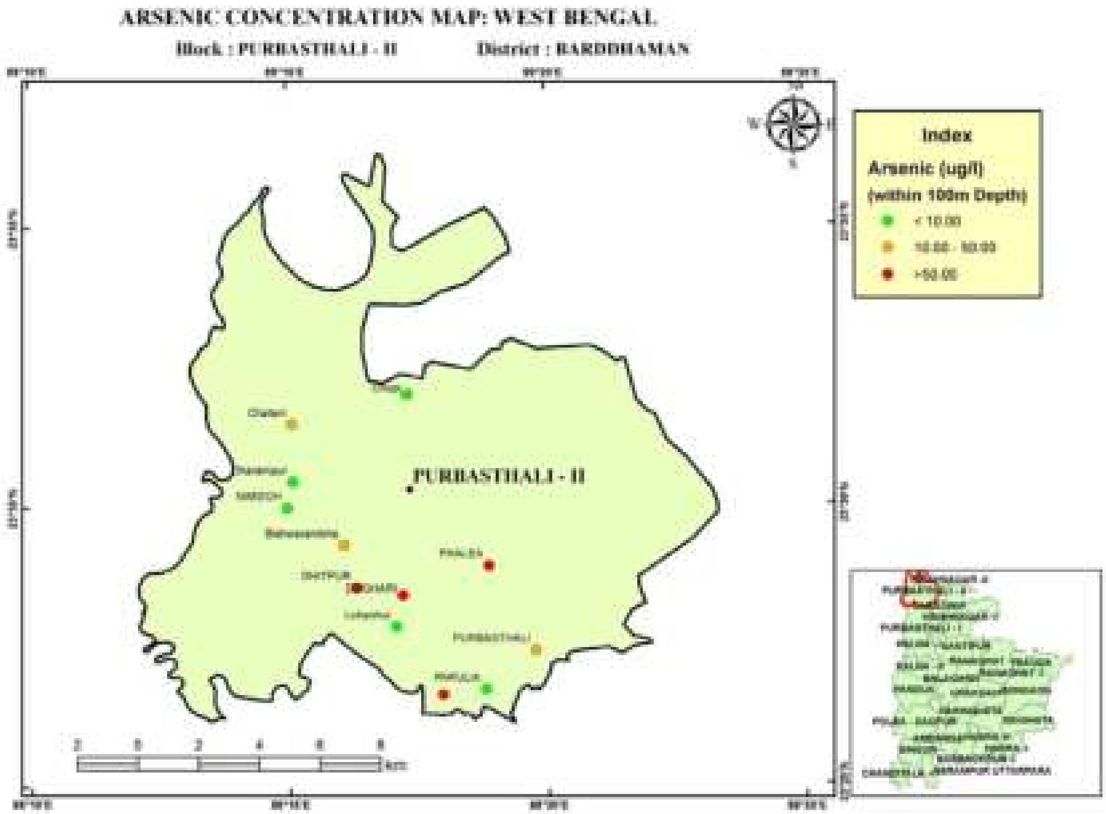
Aquifer Wise Resource Availability & Extraction:

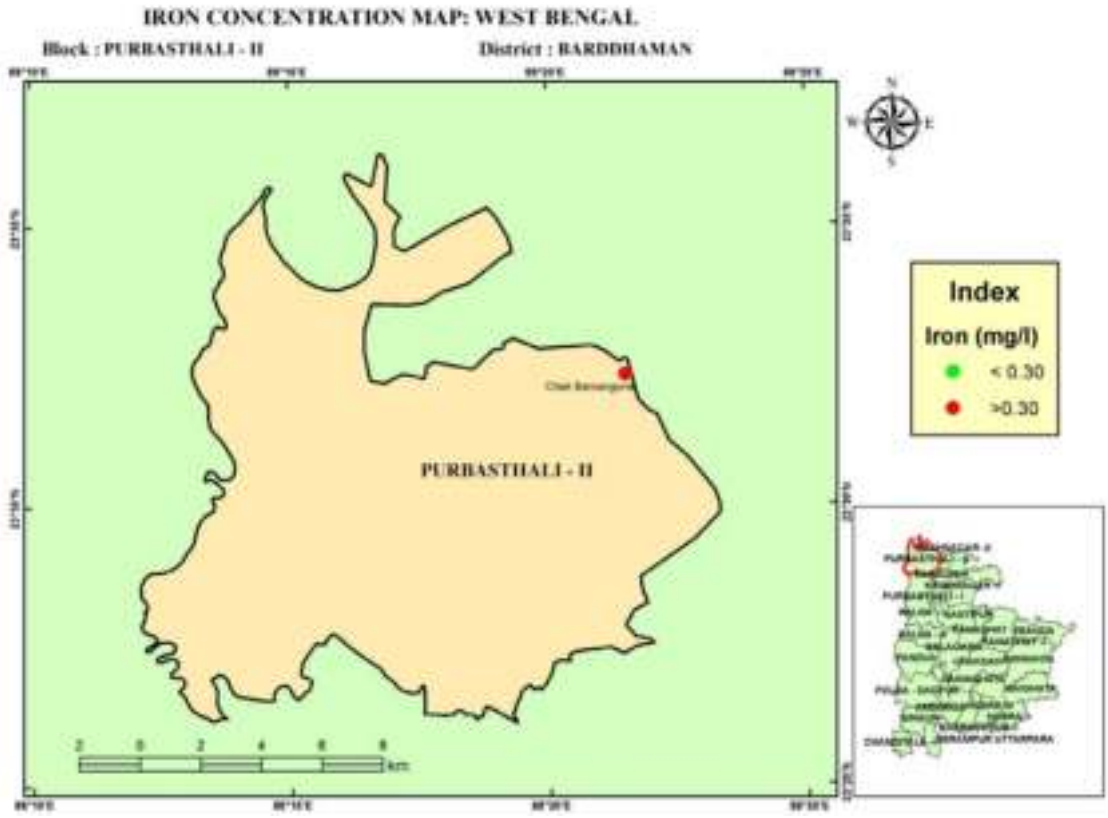
Block	Net ground water availability (MCM)	Gross ground water draft (MCM)	Stage of development (%)	Category
Purbasthali II	10255.29	7703.92	75.12	Safe

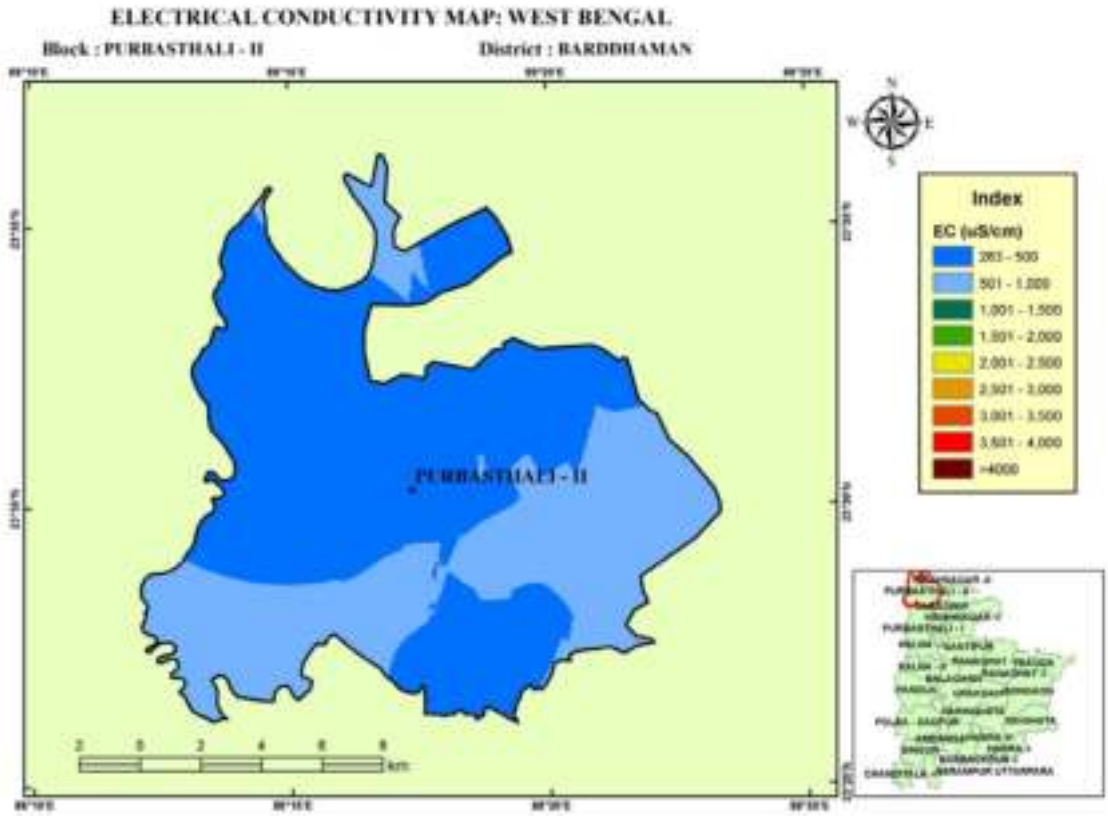
Chemical Quality Of GroundWater & Contamination:

Range Of Chemical Pollutants:

Block	As(mg/l)	Fe(mg/l)	Ec(µS/cm)	F(mg/l)	No_3(mg/l)
Purbasthali II	**0.013-0.198**	**0-0.48**	**270-515**	**Negligible-0.38**	**Negligible-25**


ARSENIC CONCENTRATION MAP: WEST BENGAL
Block : PURBASTHALI - II
District : BARDDHAMAN
PURBASTHALI - II
Index
Arsenic (ug/l)
(within 100m Depth)
< 10.00
10.00 - 50.00
>50.00
km


IRON CONCENTRATION MAP: WEST BENGAL
Block : PURBASTHALI - II
District : BARDDHAMAN
PURBASTHALI - II
Index
Iron (mg/l)
< 0.30
>0.30



Percentage of tube wells having arsenic content in the block:

SI.No.	Blocks	Arsenic (<0.01 ing/1)	Arsenic (>0.01-<0.05 mg/1)	Arsenic (> 0.05 mg/1)	Total Tube well
1	Purbasthali II	63.69	19.29	16.95	1581

4) Ground Water Resource Enhancement& Management Plan:

Ground Water Management Plan for Drinking purpose.

Suggestions on supply of ground water to the risk population For drinking purpose.

District	Block (As affected)	No. of habitations in the risk zone where As concentration >0.05 mg/L	No. of habitations in the risk zone where As concentration 0.01 to 0.05 mg/L	Risk Population (2011) where As concentration >0.05 mg/L
Barddhaman	PURBASTHALI- II	58	26	212355

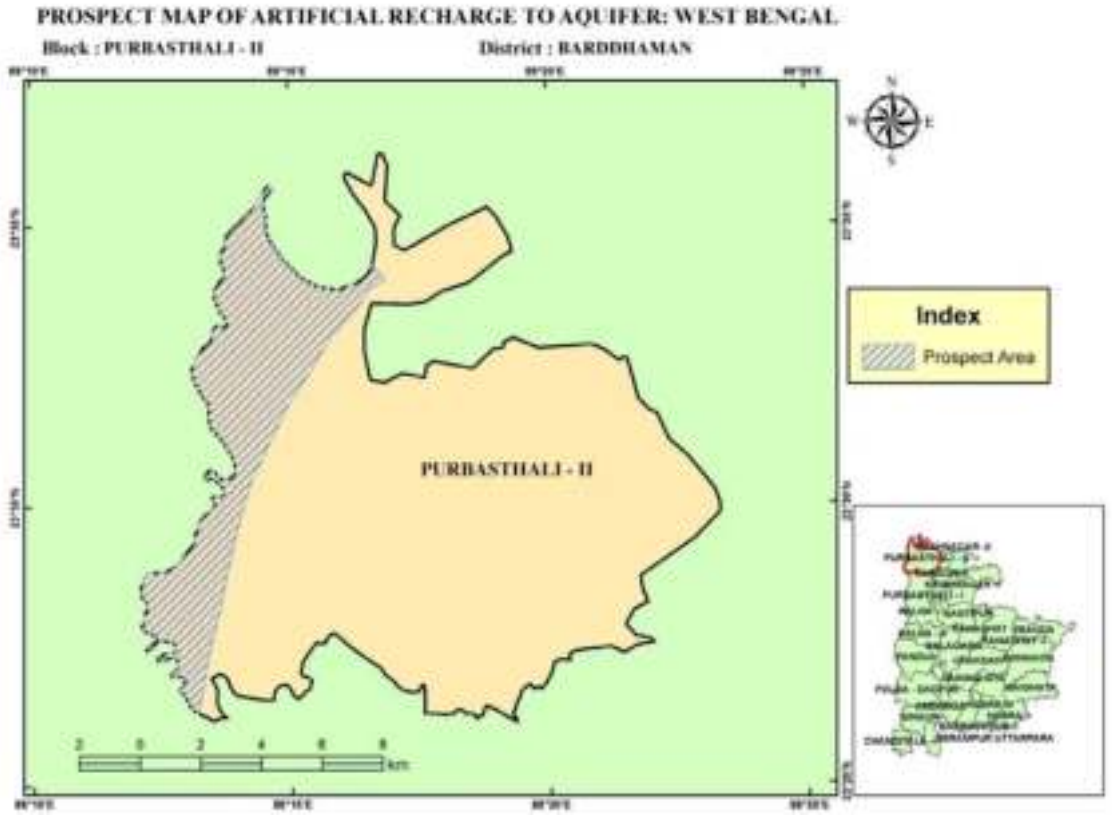
Aquifer Wise Space Available For Recharge and Proposed Interventions:

Area suitable for recharge in the study area:

District	Block Name	Geographical Area (in sq. km)	Total Area suitable for recharge (sq km.)
BARDDHAMAN	Purbasthali-II	199.61	37.62

Proposed Artificial Recharge Structures in the area in :

District	Block	Total Surface water available in MCM for recharge	Source Water Allocation (MCM)			Number of Structures feasible			Structure-wise Cost Estimate in lakh Rs.			Total cost in lakh Rs
			Percolation Tanks	RET with RS	Injection Well	Percolation Tanks	RET with RS	Injection Well	Percolation Tanks	RET with RS	Injection Well	
BARDDHAMAN	Purbasthali-II	114.79	54	30	30	108	305	102	432	915	1224	2571



Area in sq, km.

Sr No.	Name of Block	Cultivable area in ha	Net irrigated area in ha	Area to be irrigated in ha	SOD in %	Category
1	Purbasthali II	14810	10718	4092.00	75.12	Safe

Hugli District

Balagarh

1)Salient Information

Block Name: Balagarh

Area(in Km^2): 215.52

District: Hugly

State:West Bengal

Population(as on 2011):

Name of the Block	Population of CD Block (2011 census)
Balagarh	200810

Approximate Decadal Growth Rate from 2001-2011:

Rainfall:

Average annual rainfall in : **Balagarh**

(as in the district) for the period 2009 -13 (in mm)

Block	Normal	Actual (Annual)				
		2009	2010	2011	2012	2013
Balagarh	1516	1263	1044	1556	1152	1494

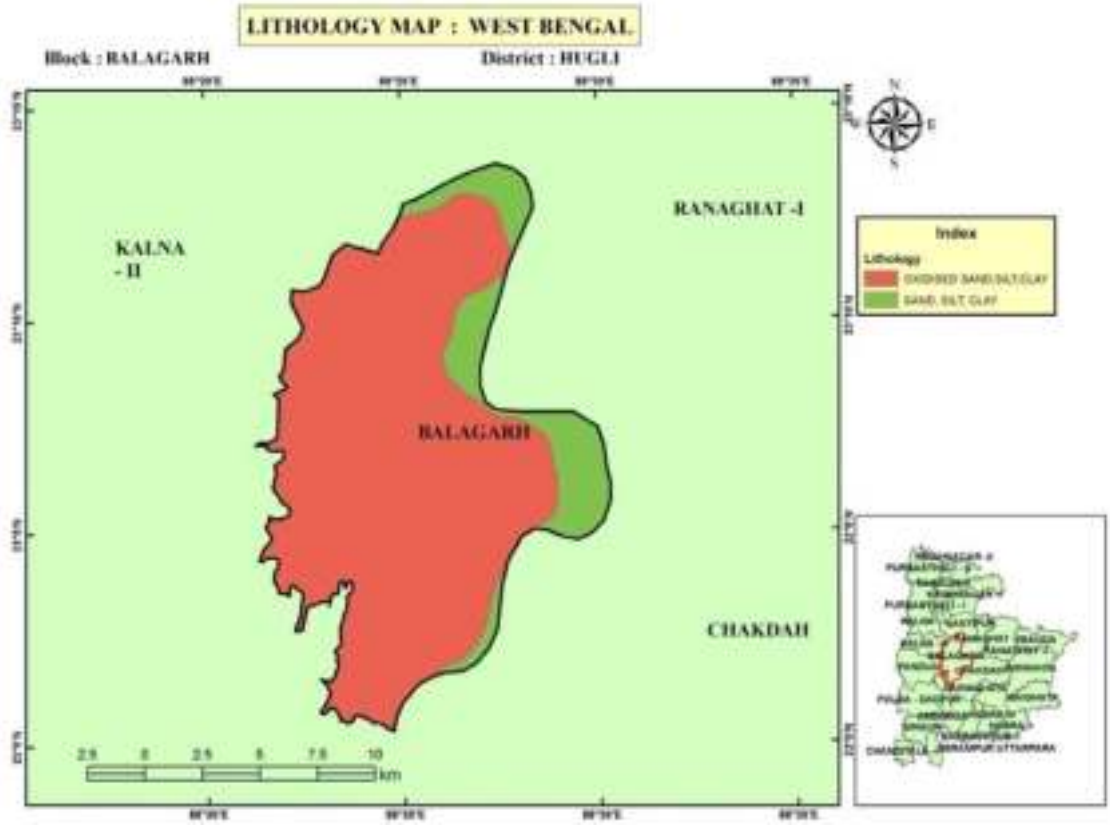
Aquifer Wise Ground Water Resource Availability & Extraction:

(in MCM)

Resource Availability	Aquifer I	Aquifer II	Extraction (for Aquifer I)
Dynamic Resource	11973.63	-	0.387936
Static Resource	6049.04	-	-

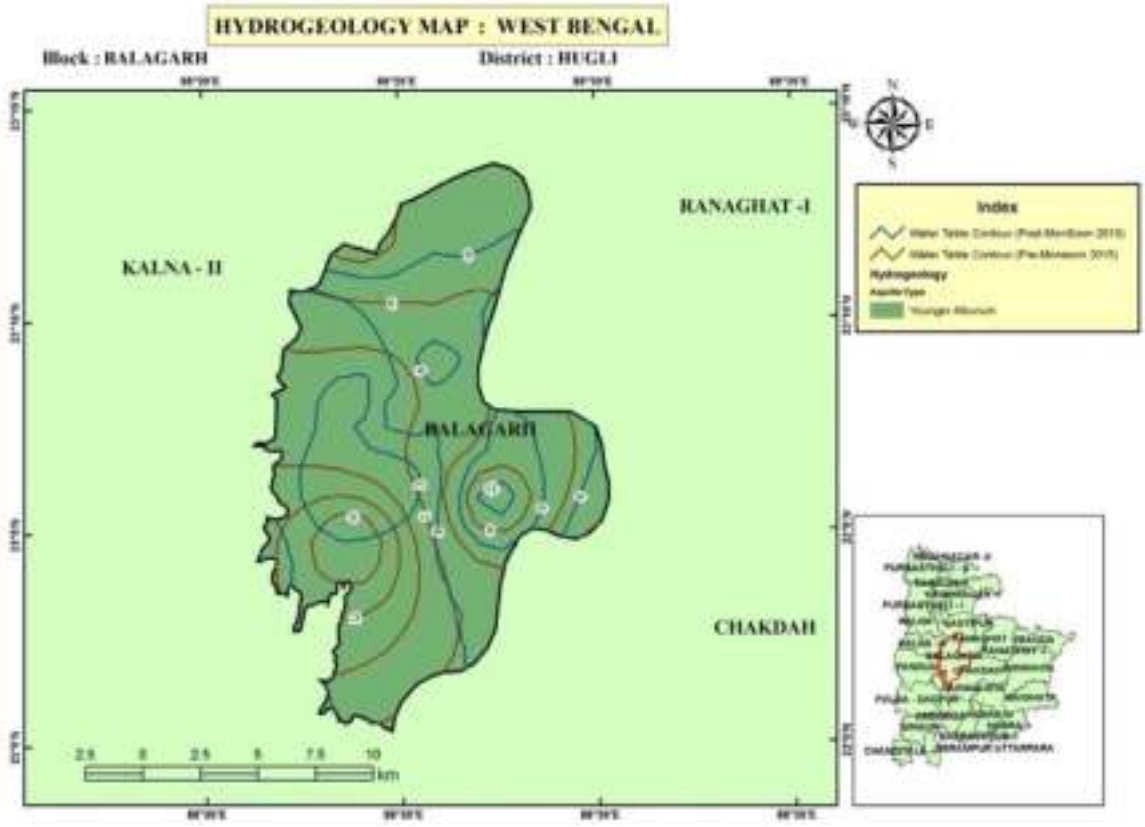
2)Disposition of Aquifer:

Block	Depth range of Aquifer in m bgl	
	1st Aquifer	2nd aquifer
Balagarh	30-186	193-200



Aquifer Wise Water Level Ranges & Pre-monsoon and Post-monsoon long term water level trends (1995 to 2011)

Sl. No.	Block	Aquifer	Pre-monsoon Trend		Post-monsoon Trend	
			Water Level Range(mbgl)	**Pre trend (- rising & + Falling)**	Water Level Range(mbgl)	**Post trend (- rising & + Falling)**
1.	**Balagarh**	1		2.60		13.75
2.	**Balagarh**	2		-		-



Thickness of Aquifer(Average):

Block	Area (sq km)	Thickness of the Granular Zone in 1st aquifer (m)	Thickness of the Granular Zone /Productive Zone below pre-monsoon WL (m)
Balagarh	215.52	186	175.42

Aquifer-wise Statement

Sl. No.	Name of Block	1st Aquifer			2nd Aquifer		Remarks (T, m^2/day), S
		Depth Range (mbgl)	Discharge (m^3/hr)	T (m^2/day), S	Depth Range	Discharge (m^3/hr)	
		1st					
13		30-186	450-2160	1827-2108, $7.27*10^{-4}$	193-200	456-2760	2355-4341, $3.17*10^{-4}$-$1.87*10^{-5}$

3)Ground Water Resource,Extraction,Contamination & Other Issues:

Aquifer Wise Resource Availability & Extraction:

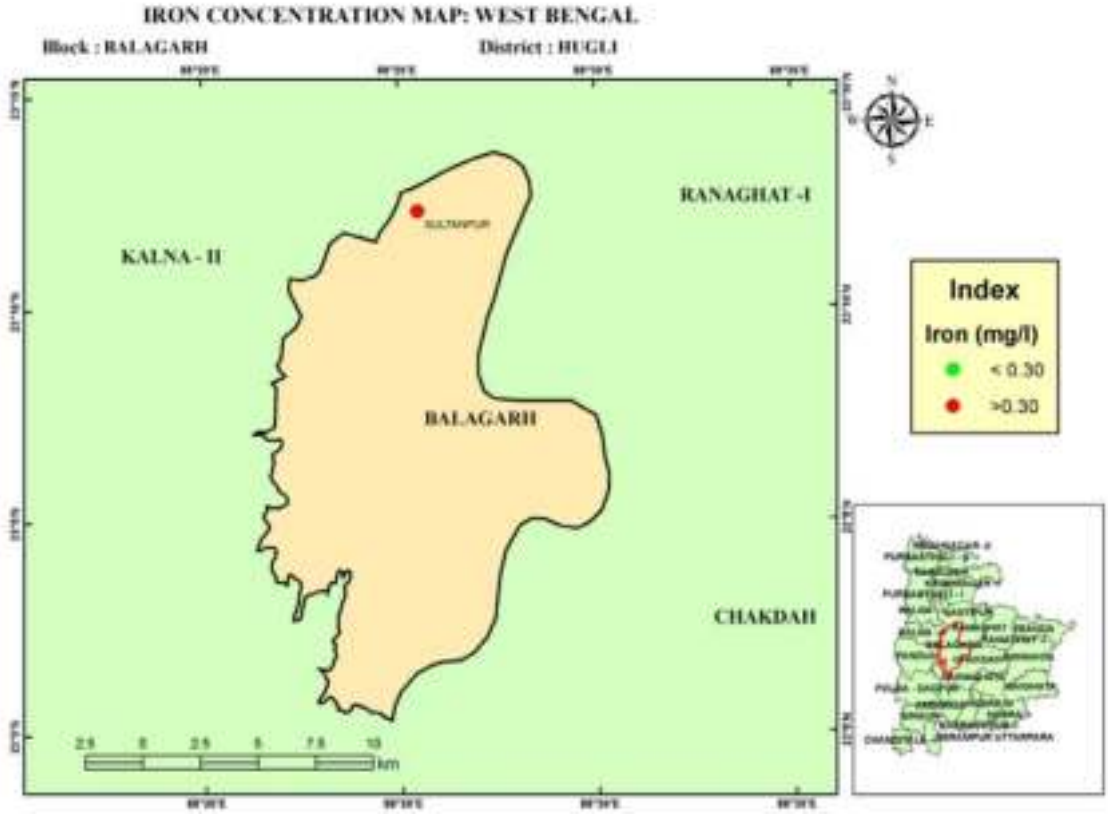
Block	Net ground water availability (MCM)	Gross ground water draft (MCM)	Stage of development (%)	Category
Balagarh	11973.63	5522.74	45.79	Safe

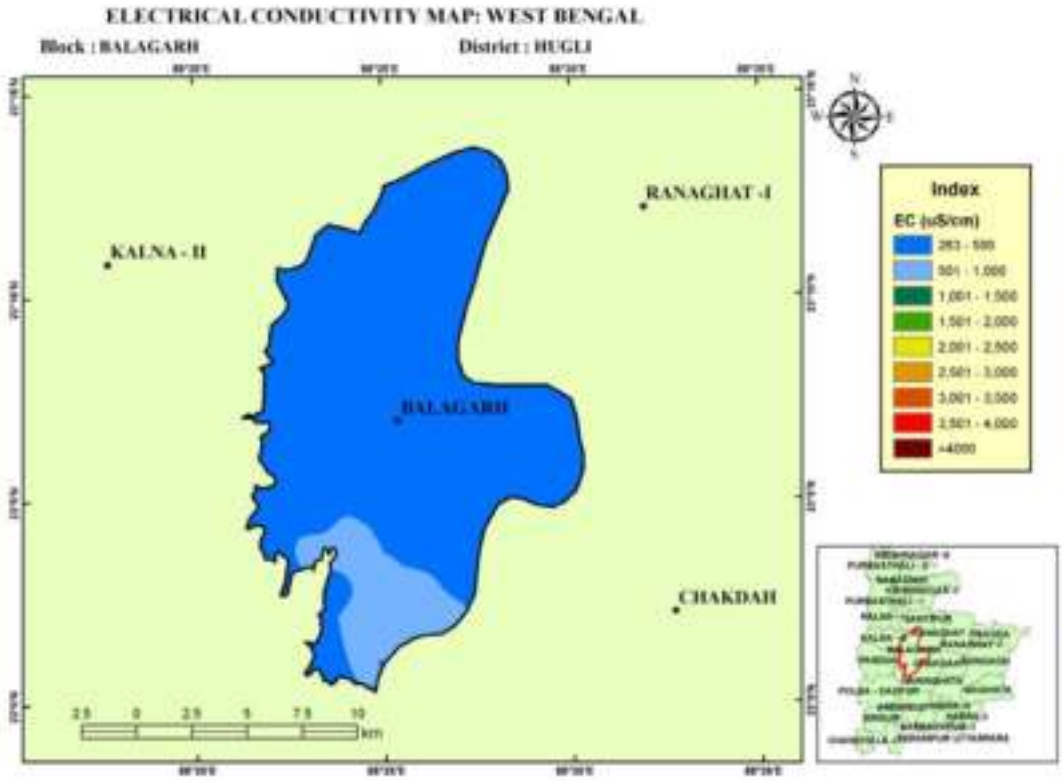
Chemical Quality Of GroundWater & Contamination:

Range Of Chemical Pollutants:

Block	As(mg/l)	Fe(mg/l)	Ec(µS/cm)	F(mg/l)	No_3(mg/l)
Balagarh	**Neglible-0.066**	**-**	**260-988**	**0.11-0.69**	**Neglible-12**


ARSENIC CONCENTRATION MAP: WEST BENGAL
Block : BALAGARH
District : HUGLI
KALNA - II
RANAGHAT -I
CHAKDAH
BALAGARH
Index
Arsenic (ug/l)
(within 100m Depth)
< 10.00
10.00 - 50.00
>50.00
km


IRON CONCENTRATION MAP: WEST BENGAL
Block : BALAGARH
District : HUGLI
KALNA - II
RANAGHAT -I
BALAGARH
CHAKDAH
SULTANPUR
Index
Iron (mg/l)
< 0.30
>0.30
km



Percentage of tube wells having arsenic content in the **block:**

SI.No.	Blocks	Arsenic (<0.01 ing/1)	Arsenic (>0.01-<0.05 mg/1)	Arsenic (> 0.05 mg/1)	Total Tube well
1	**Balagarh**	63.54	24.25	12.22	2087

4)Ground Water Resource Enhancement& Management Plan:

Ground Water Management Plan for Drinking purpose.

Suggestions on supply of ground water to the risk population For drinking purpose.

District	Block (As affected)	No. of habitations in the risk zone where As concentration >0.05 mg/L	No. of habitations in the risk zone where As concentration 0.01 to 0.05 mg/L	Risk Population (2011) where As concentration >0.05 mg/L
HUGLI	BALAGARH	87	124	200810

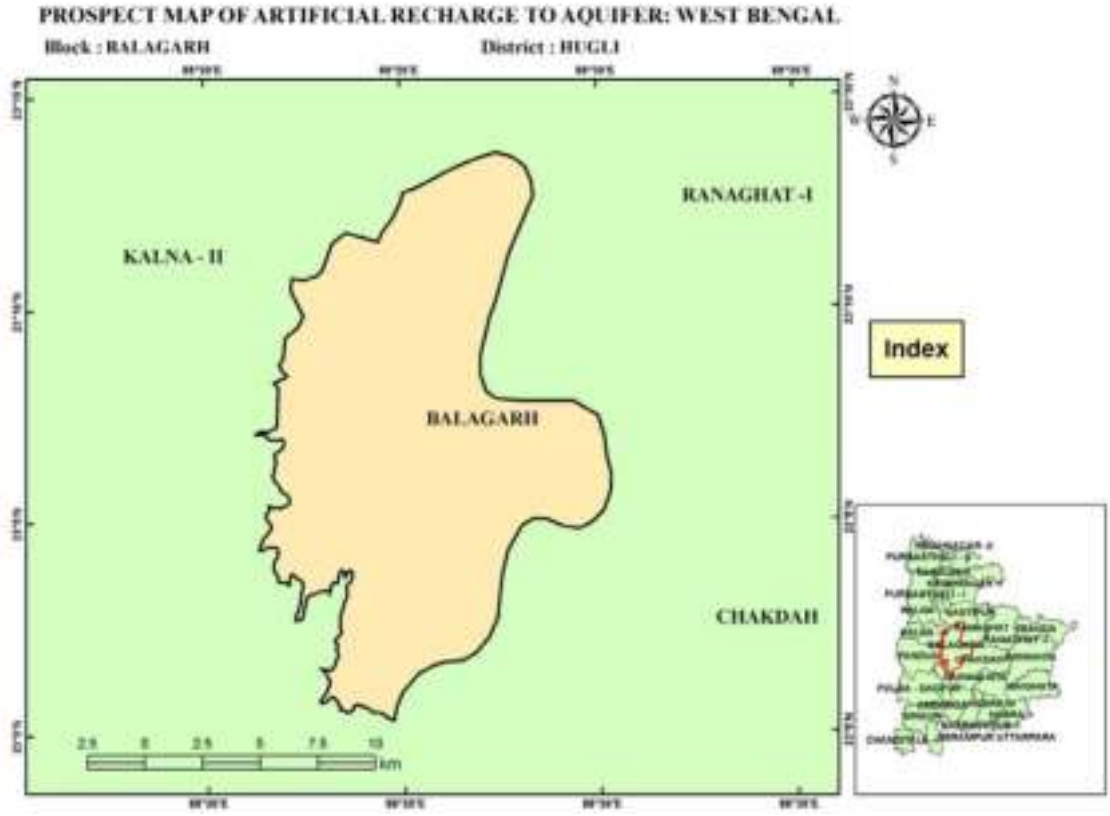
Aquifer Wise Space Available For Recharge and Proposed Interventions:

Area suitable for recharge in the study area:

District	Block Name	Geographical Area (in sq. km)	Total Area suitable for recharge (sq km.)
HUGLI	Balagarh	215.52	0

Proposed Artificial Recharge Structures in the area in :

District	Block	Total Surface water available in MCM for rechargе	Source Water Allocation (MCM)			Number of Structures feasible			Structure-wise Cost Estimate in lakh Rs.			Total cost in lakh Rs
			Percolation Tanks	REET with RS	Injection Well	Percolation Tanks	RET with RS	Injection Well	Percolation Tanks	REET with RS	Injection Well	
HUGLI	Balagarh	156.05	73	41	41	146	414	138	2920	3312	552	6784



Ground Water Management Plan For Irrigation Purpose

Area in sq, km.

Sr No.	Name of Block	Cultivable area in ha	Net irrigated area in ha	Area to be irrigated in ha	SOD in %	Category
1	Balagarh	15693	8195	7498.00	45.79	Safe

Chanditala I

1)Salient Information

Block Name: Chanditala I

Area(in Km^2): 93.00

District: Hugly

State: West Bengal

Population(as on 2011):

Name of the Block	Population of CD Block (2011 census)
Chanditala I	104677

Approximate Decadal Growth Rate from 2001-2011:

Rainfall:

Average annual rainfall in **: Chanditala I**

(as in the district) for the period 2009 -13 (in mm)

Block	Normal	Actual (Annual)				
		2009	2010	2011	2012	2013
Chanditala I	1516	1263	1044	1556	1152	1494

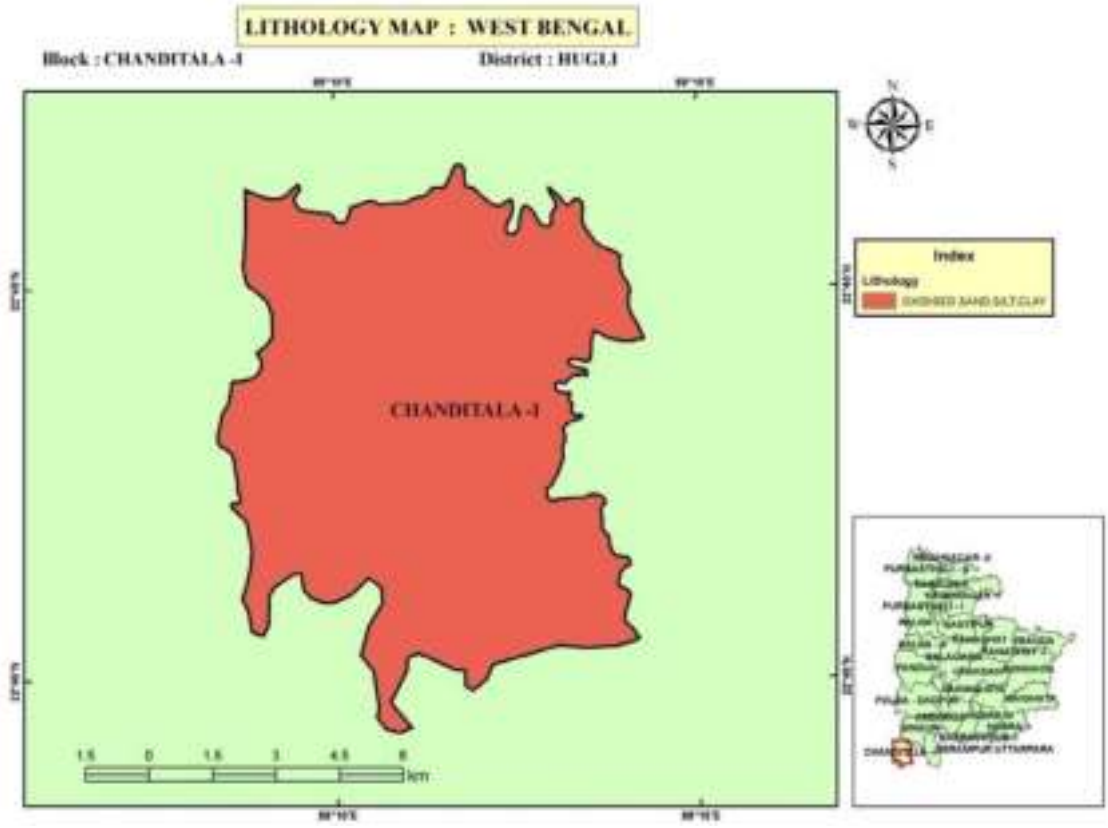
Aquifer Wise Ground Water Resource Availability & Extraction:

(in MCM)

Resource Availability	Aquifer I	Aquifer II	Extraction (for Aquifer I)
Dynamic Resource	3781.26	-	0.1674
Static Resource	1834.26	-	-

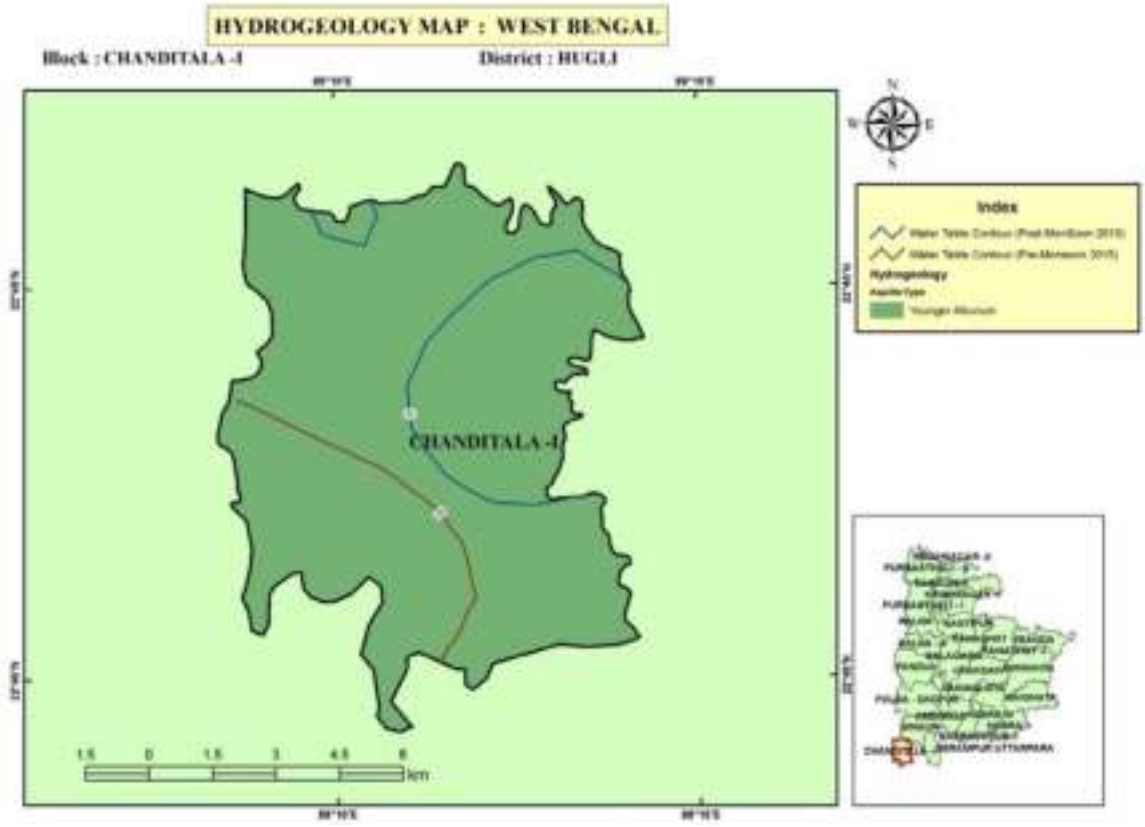
2)Disposition of Aquifer:

Block	Depth range of Aquifer in m bgl	
Chanditala I	**1st Aquifer**	**2nd aquifer**
	3-36, 40-137	146-155



Aquifer Wise Water Level Ranges & Pre-monsoon and Post-monsoon long term water level trends (1995 to 2011)

Sl. No.	Block	Aquifer	Pre-monsoon Trend		Post-monsoon Trend	
			Water Level Range(mbgl)	**Pre trend (- rising & + Falling)**	Water Level Range(mbgl)	**Post trend (- rising & + Falling)**
1.	Chanditala I	1		33.85		18.50
2.	Chanditala I	2				



Thickness of Aquifer(Average):

Block	Area (sq km)	Thickness of the Granular Zone in 1st aquifer (m)	Thickness of the Granular Zone /Productive Zone below pre-monsoon WL (m)
Chanditala I	93	137	123.27

Aquifer-wise Statement

Sl. No.	Name of Block	1st Aquifer			2nd Aquifer		Remarks; T(m^2/day)
		Depth Range (mbgl)	Discharge (m^3/hr)	T (m^2/day)	Depth Range	Discharge (m^3/hr)	
		1st					
13	Chanditala I	3-36, 40-137	50.61		146-155	30.90	745.39

3)Ground Water Resource,Extraction,Contamination & Other Issues:

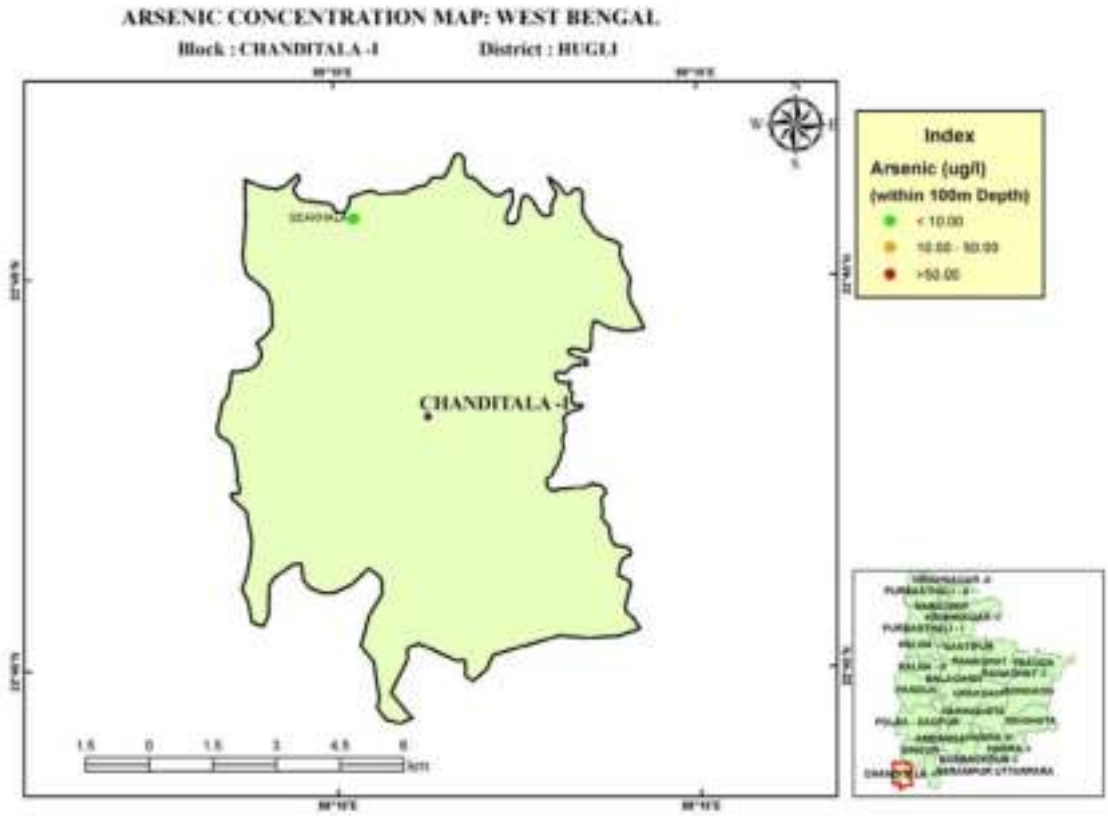
Aquifer Wise Resource Availability & Extraction:

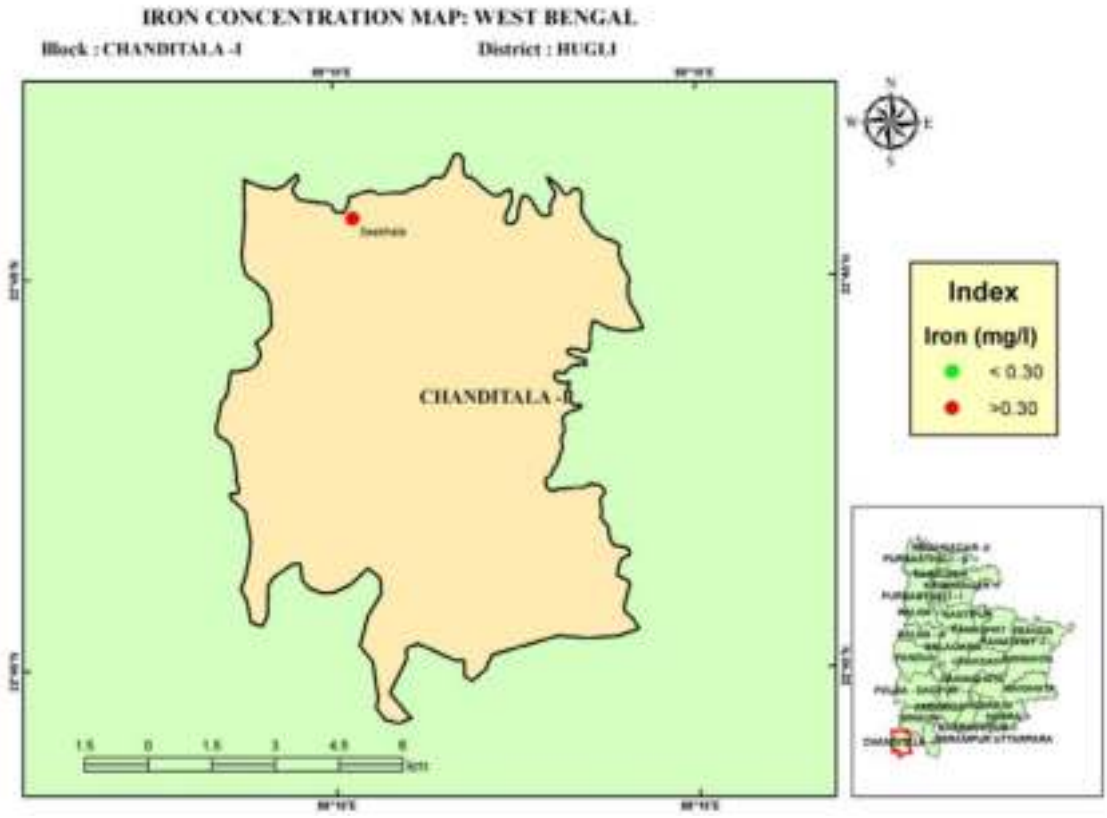
Block	Net ground water availability (MCM)	Gross ground water draft (MCM)	Stage of development (%)	Category
Chanditala I	3781.26	774.37	46.11	Safe

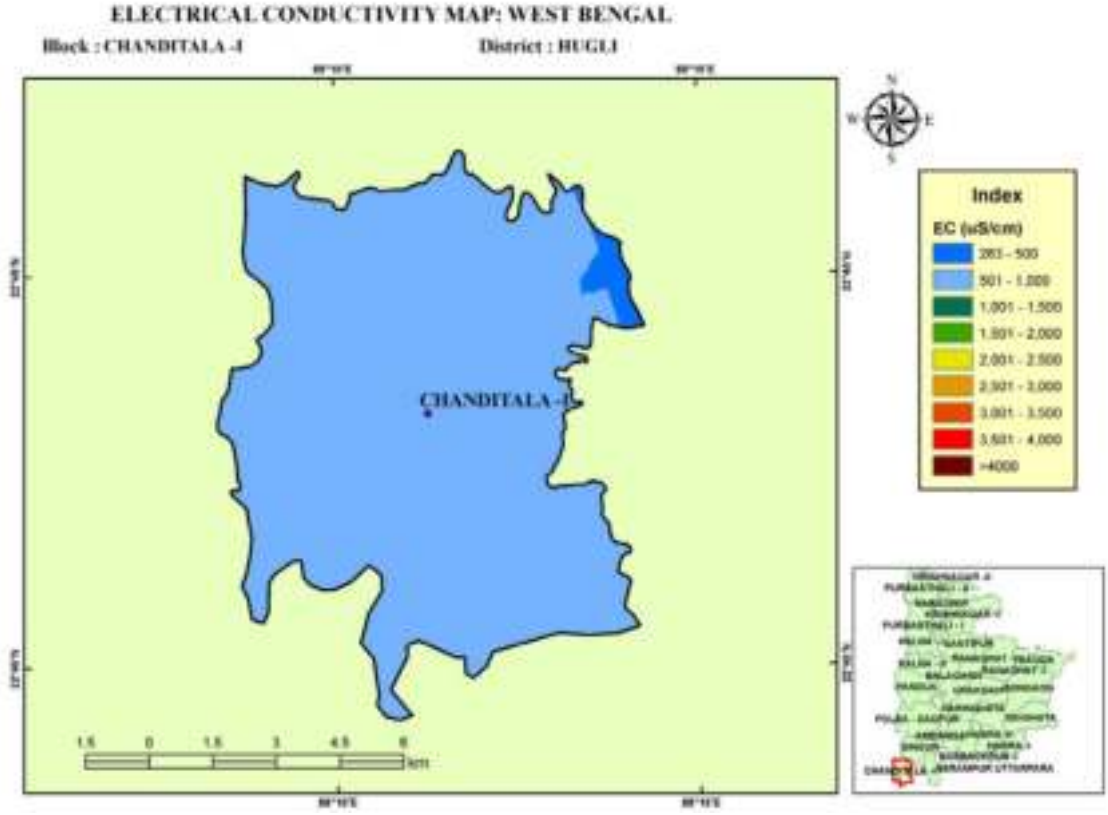
Chemical Quality Of GroundWater & Contamination:

Range Of Chemical Pollutants:

Block	As(mg/l)	Fe(mg/l)	Ec(µS/cm)	F(mg/l)	No_3(mg/l)
Chanditala I	-	0.64	593	0.92	11


ARSENIC CONCENTRATION MAP: WEST BENGAL
Block : CHANDITALA -I
District : HUGLI
Index
Arsenic (ug/l)
(within 100m Depth)
< 10.00
10.00 - 50.00
>50.00
CHANDITALA -I
km


IRON CONCENTRATION MAP: WEST BENGAL
Block : CHANDITALA -I
District : HUGLI
CHANDITALA -I
Index
Iron (mg/l)
< 0.30
>0.30


ELECTRICAL CONDUCTIVITY MAP: WEST BENGAL
Block : CHANDITALA -I
District : HUGLI
CHANDITALA - I
Index
EC (uS/cm)
283 - 500
501 - 1,000
1,001 - 1,500
1,501 - 2,000
2,001 - 2,500
2,501 - 3,000
3,001 - 3,500
3,501 - 4,000
>4000
1.5 0 1.5 3 4.5 6
km

Percentage of tube wells having arsenic content in the block:

SI.No.	Blocks	Arsenic (<0.01 ing/1)	Arsenic (>0.01-<0.05 mg/1)	Arsenic (> 0.05 mg/1)	Total Tube well
1					

4)Ground Water Resource Enhancement& Management Plan:

Ground Water Management Plan for Drinking purpose.

Suggestions on supply of ground water to the risk population For drinking purpose.

District	Block (As affected)	No. of habitations in the risk zone where As concentration >0.05 mg/L	No. of habitations in the risk zone where As concentration 0.01 to 0.05 mg/L	Risk Population (2011) where As concentration >0.05 mg/L
	-	-	-	-

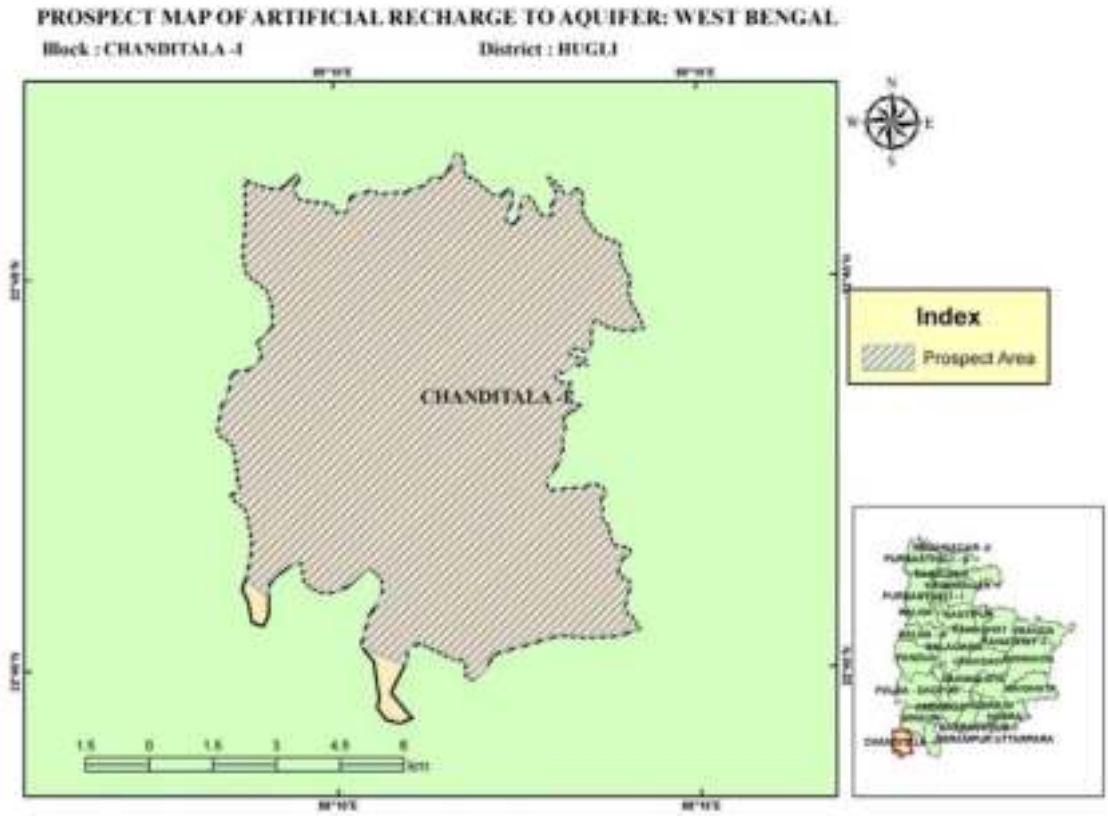
Aquifer Wise Space Available For Recharge and Proposed Interventions:

Area suitable for recharge in the study area:

District	Block Name	Geographical Area (in sq. km)	Total Area suitable for recharge (sq km.)
HUGLI	Chanditala-I	93.00	87.46

Proposed Artificial Recharge Structures in the area in :

District	Block	Total Surface water available in MCM for recharge	Source Water Allocation (MCM)			Number of Structures feasible			Structure-wise Cost Estimate in lakh Rs.			Total cost in lakh Rs
			Percolation Tanks	REET with RS	Injection Well	Percolation Tanks	RET with RS	Injection Well	Percolation Tanks	REET with RS	Injection Well	
HUGLI	Chanditala-I	72.14	34	19	19	68	192	64	1360	1536	256	3152



Ground Water Management Plan For Irrigation Purpose.

Area in sq, km.

Sr No.	Name of Block	Cultivable area in ha	Net irrigated area in ha	Area to be irrigated in ha	SOD in %	Category
1	Chanditala I	6879	4409	2470.00	46.11	Safe

Chinsurah

1)Salient Information

Block Name: Chinsurah

Area(in Km^2): 96.35

District: Hugly

State:West Bengal

Population(as on 2011):

Name of the Block	Population of CD Block (2011 census)
Chinsurah	86792

Approximate Decadal Growth Rate from 2001-2011:

Rainfall:

Average annual rainfall in **: Chinsurah**

(as in the district) for the period 2009 -13 (in mm)

Block	Normal	Actual (Annual)				
		2009	2010	2011	2012	2013
Chinsurah	1516	1263	1044	1556	1152	1494

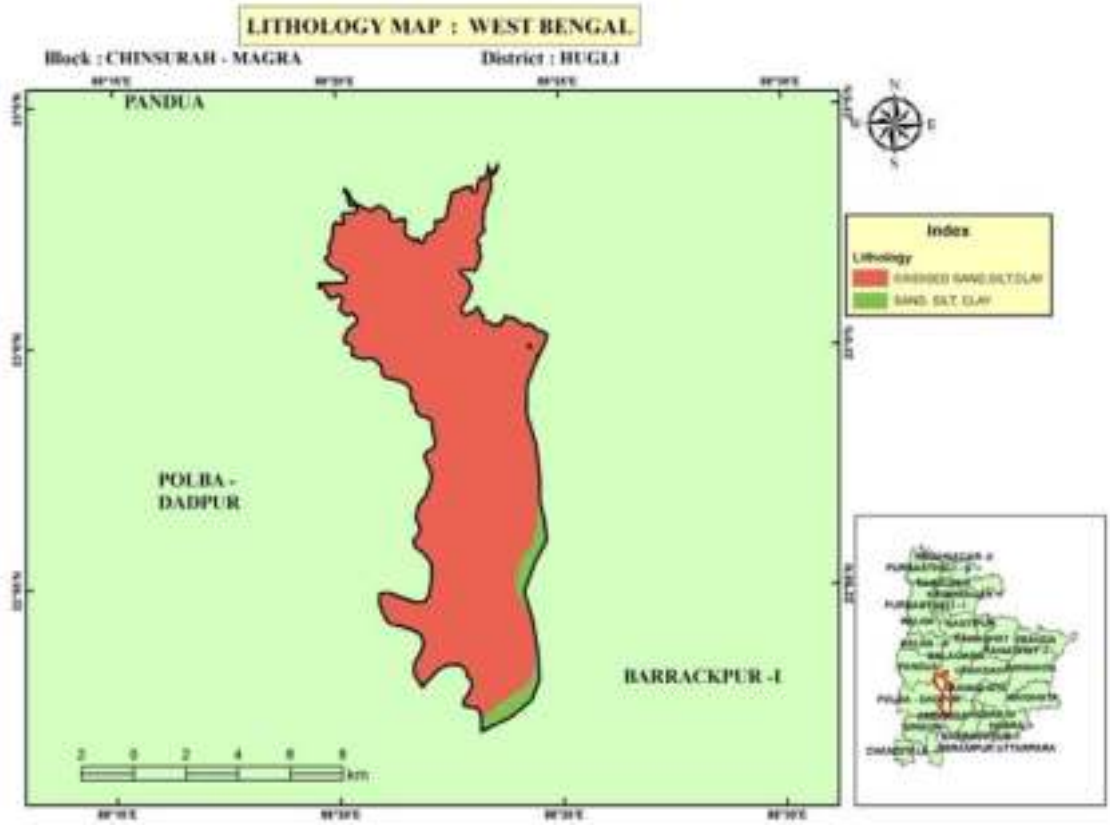
Aquifer Wise Ground Water Resource Availability & Extraction:

(in MCM)

Resource Availability	Aquifer I	Aquifer II	Extraction (for Aquifer I)
Dynamic Resource	4628.39	-	0.17343
Static Resource	2266.77	-	-

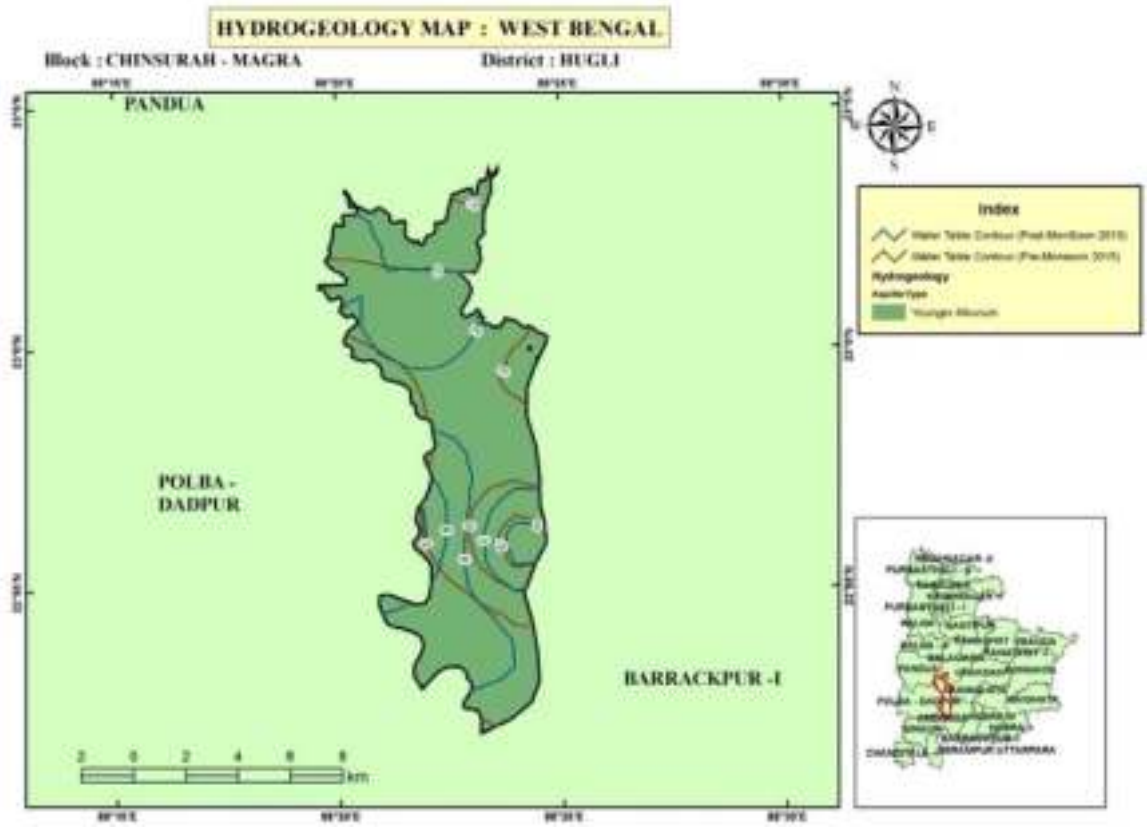
2)Disposition of Aquifer:

Block	Depth range of Aquifer in m bgl	
Chinsurah	1st Aquifer	2nd aquifer
	9-44, 51-160	168-205



Aquifer Wise Water Level Ranges & Pre-monsoon and Post-monsoon long term water level trends (1995 to 2011)

Sl. No.	Block	Aquifer	Pre-monsoon Trend		Post-monsoon Trend	
			Water Level Range(mbgl)	**Pre trend (- rising & + Falling)**	Water Level Range(mbgl)	**Pre trend (- rising & + Falling)**
1.	**Chinsura**	**1**	**-**	**18.99**	**2.45-13.38**	**26.38**
2.	**Chinsura**	**2**	**-**		**-**	

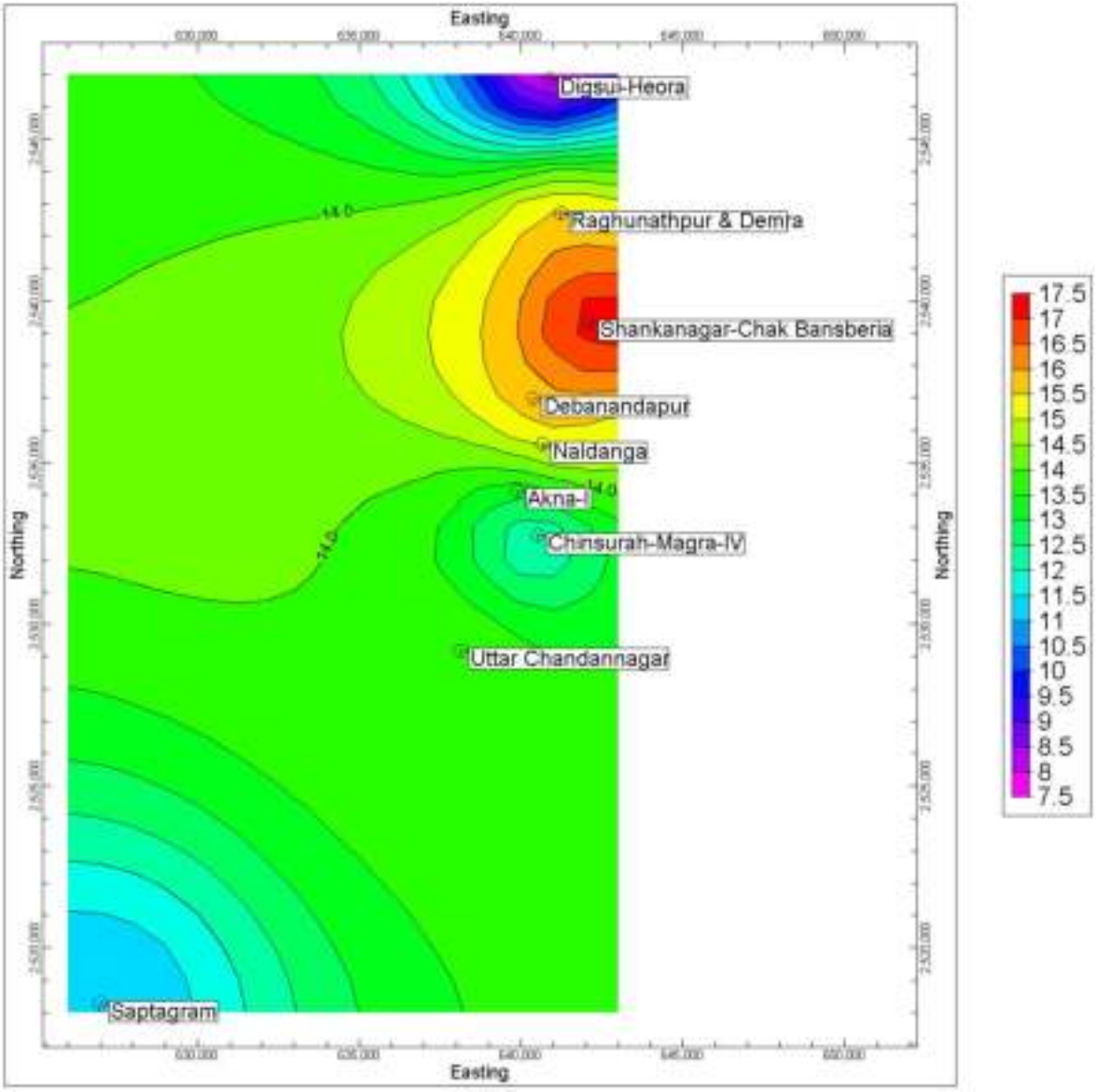


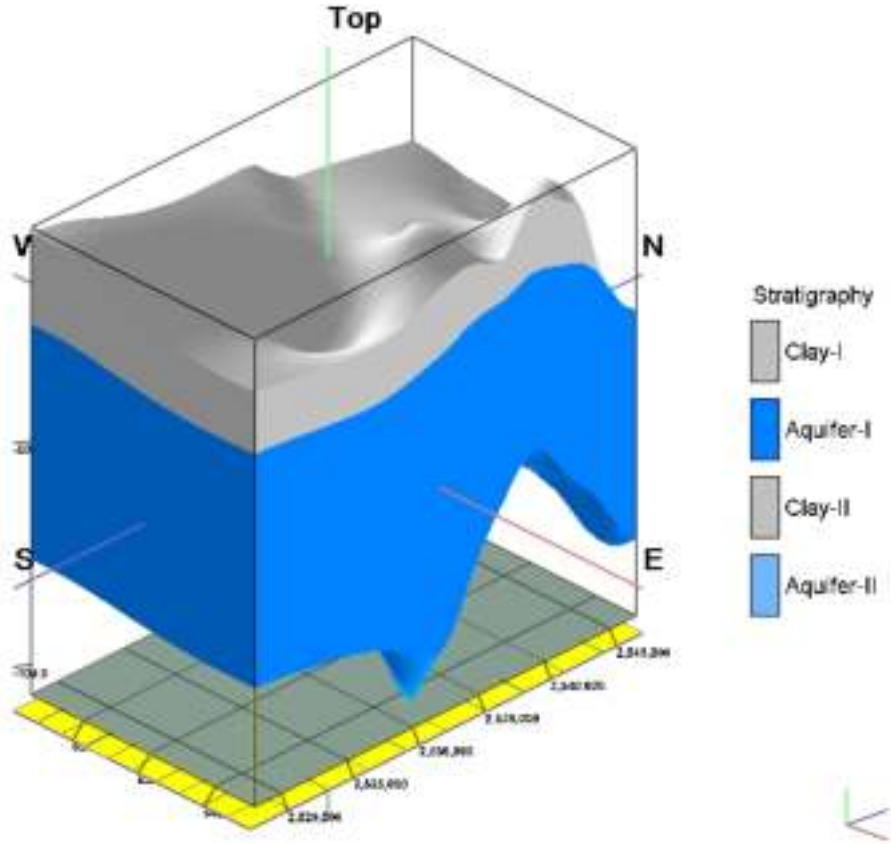
Thickness of Aquifer(Average):

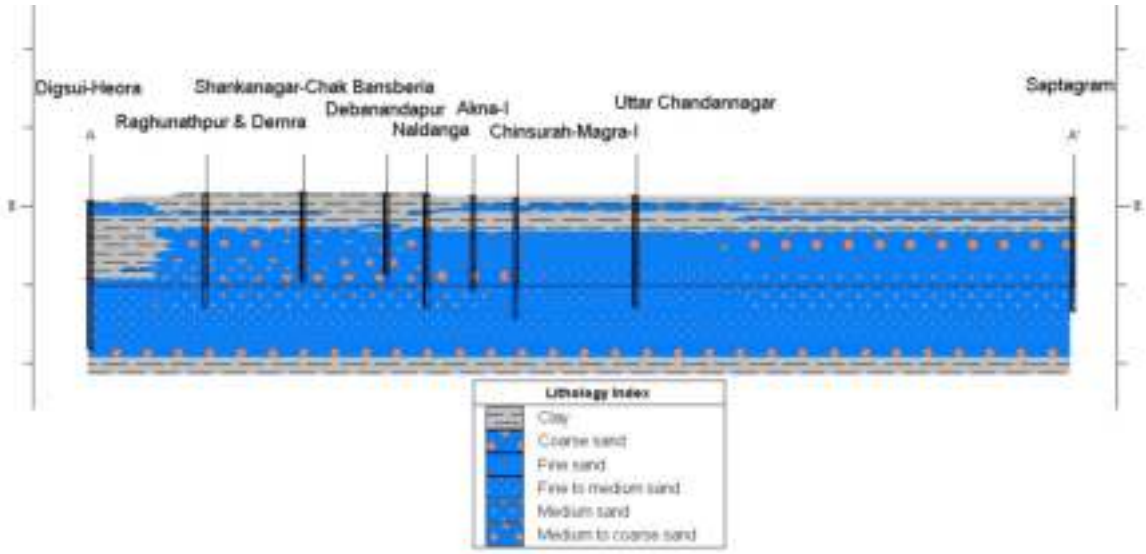
Block	Area (sq km)	Thickness of the Granular Zone in 1st aquifer (m)	Thickness of the Granular Zone /Productive Zone below pre-monsoon WL (m)
Chinsurah	96.35	160	147.04

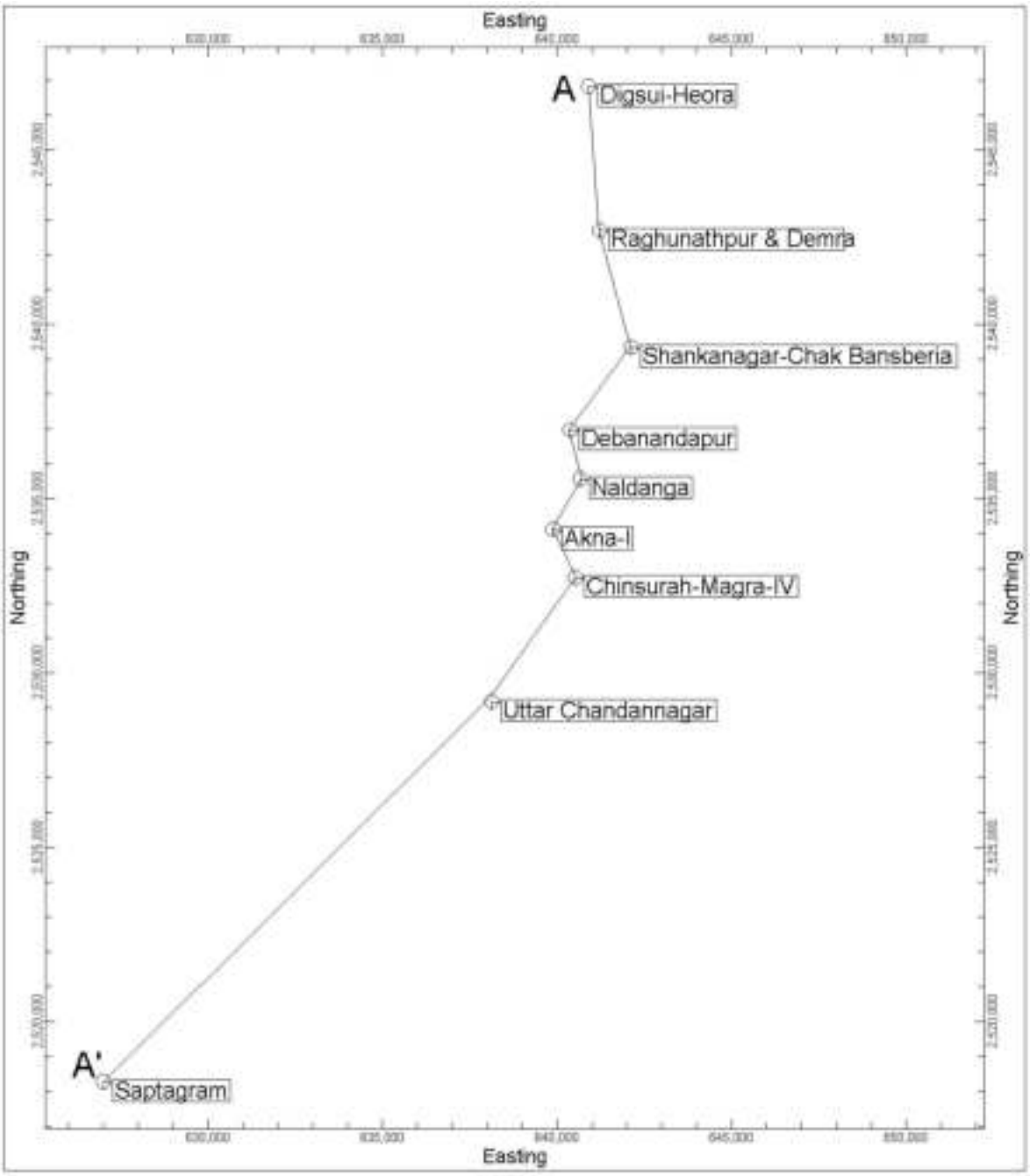
Aquifer-wise Statement

Sl. No.	Name of Block	1st Aquifer			2nd Aquifer		Remarks T (m^2/day), S
		Depth Range (mbgl)	Discharge (m^3/hr)	T (m^2/day), S	Depth Range	Discharge (m^3/hr)	
		1st					
13	**Chinsura**	9-160	54.6 - 254.4		168-205	102.20	




Top
W
N
S
E
Stratigraphy
Clay-I
Aquifer-II
Clay-II
Aquifer-III


Digsui-Heora
Shankanagar-Chak Bansberia
Debanandapur
Akna-I
Uttar Chandannagar
Septagram
Raghunathpur & Demra
Naldanga
Chinsurah-Magra-I
A
A'
Lithology Index
Clay
Coarse sand
Fine sand
Fine to medium sand
Medium sand
Medium to coarse sand


Easting
A
Digsui-Heora
Raghunathpur & Demra
Shankanagar-Chak Bansberia
Debanandapur
Naldanga
Akna-I
Chinsurah-Magra-IV
Uttar Chandannagar
A'
Saptagram
Northing
Northing
Easting

3)Ground Water Resource,Extraction,Contamination & Other Issues:

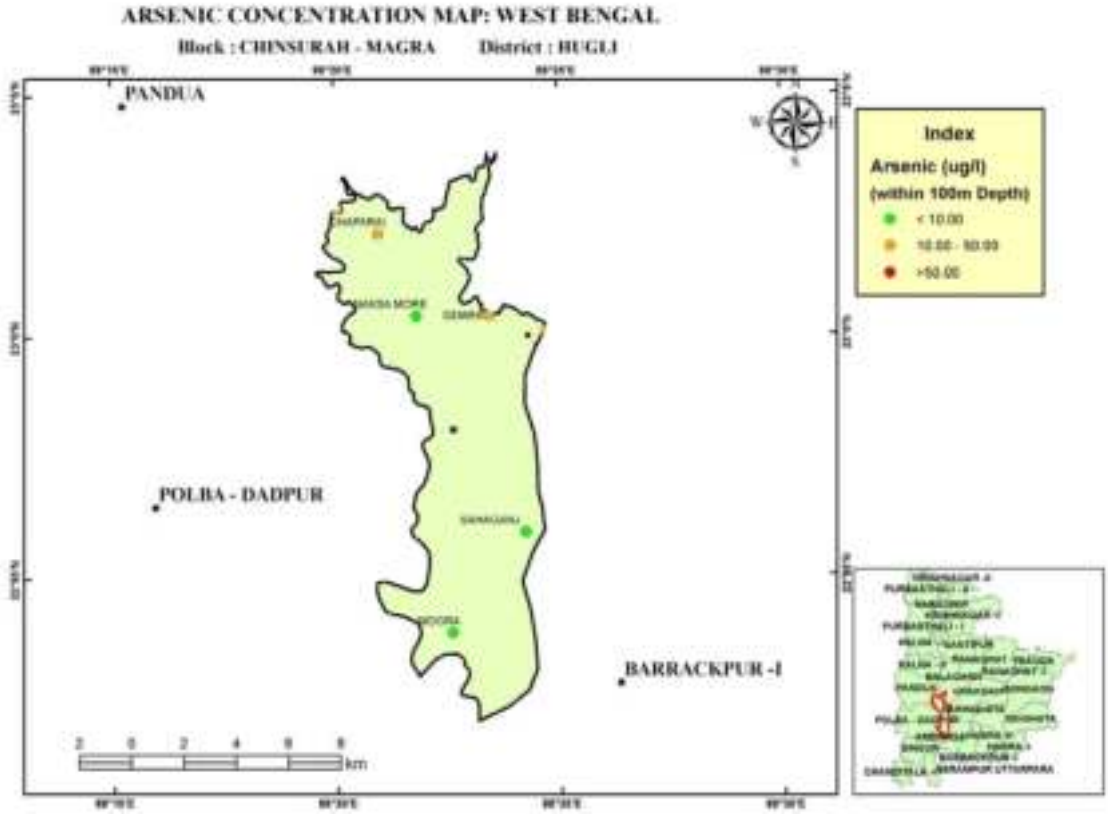
Aquifer Wise Resource Availability & Extraction:

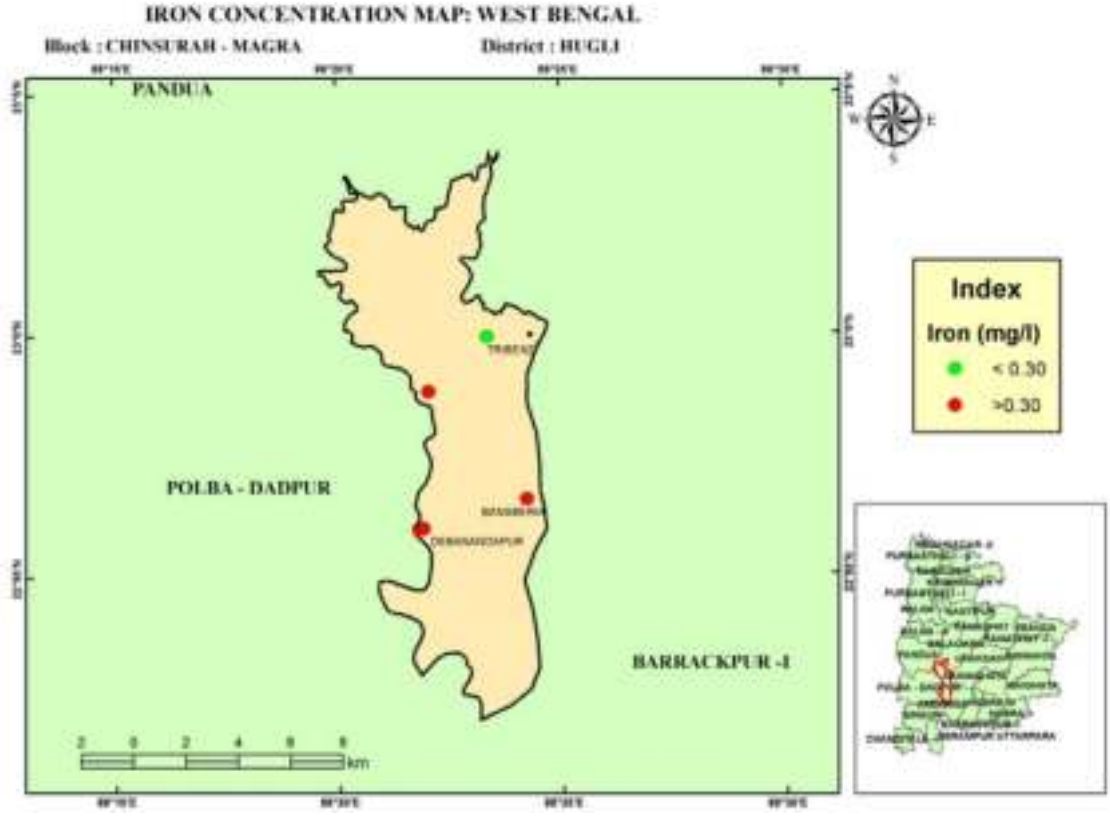
Block	Net ground water availability (MCM)	Gross ground water draft (MCM)	Stage of development (%)	Category
Chinsura	4628.39	1782.22	38.50	Semi Critical

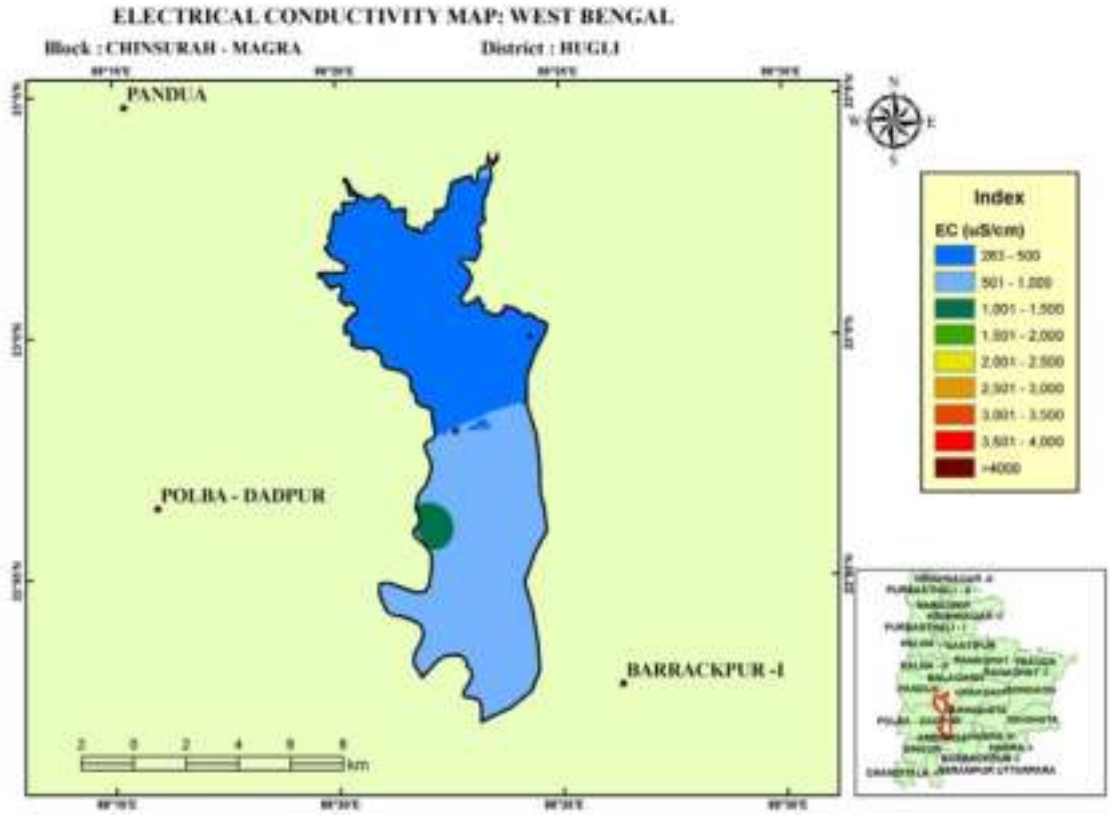
Chemical Quality Of GroundWater & Contamination:

Range Of Chemical Pollutants:

Block	As(mg/l)	Fe(mg/l)	Ec(µS/cm)	F(mg/l)	No_3(mg/l)
Chinsura	**Ns-0.025**	**0.36-0.51**	**311-1490**	**Negligible-0.38**	**Negligible-33**


ARSENIC CONCENTRATION MAP: WEST BENGAL
Block : CHINSURAH - MAGRA
District : HUGLI
PANDUA
POLBA - DADPUR
BARRACKPUR -I
Index
Arsenic (ug/l)
(within 100m Depth)
< 10.00
10.00 - 50.00
>50.00
km


IRON CONCENTRATION MAP: WEST BENGAL
Block : CHINSURAH - MAGRA
District : HUGLI
PANDUA
POLBA - DADPUR
BARRACKPUR -I
Index
Iron (mg/l)
< 0.30
>0.30
km



Percentage of tube wells having arsenic content in the **block:**

SI.No.	Blocks	Arsenic (<0.01 ing/1)	Arsenic (>0.01-<0.05 mg/1)	Arsenic (> 0.05 mg/1)	Total Tube well
1	Chinsura				

4)Ground Water Resource Enhancement& Management Plan:

Ground Water Management Plan for Drinking purpose.

Suggestions on supply of ground water to the risk population For drinking purpose.

District	Block (As affected)	No. of habitations in the risk zone where As concentration >0.05 mg/L	No. of habitations in the risk zone where As concentration 0.01 to 0.05 mg/L	Risk Population (2011) where As concentration >0.05 mg/L
	-	-	-	-

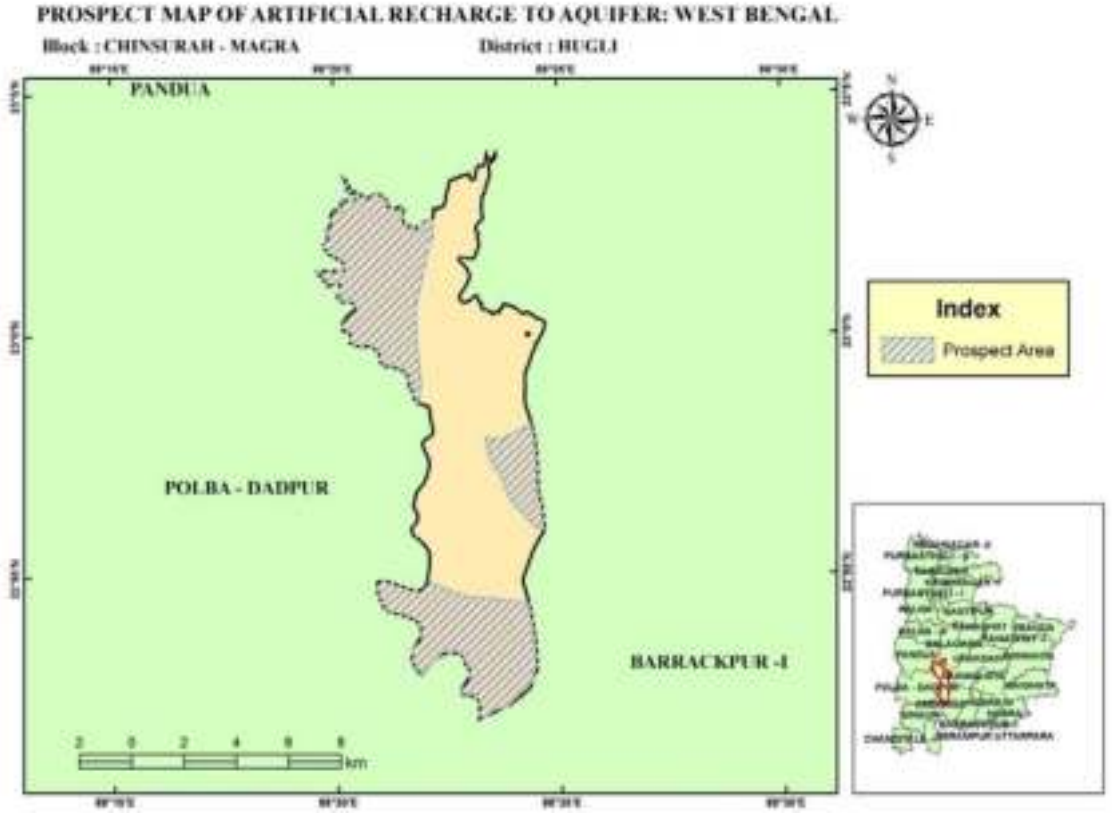
Aquifer Wise Space Available For Recharge and Proposed Interventions:

Area suitable for recharge in the study area:

District	Block Name	Area (in sq. km)	Total Area suitable for recharge (sq km.)
HUGLI	Chinsura	96.35	43.74

Proposed Artificial Recharge Structures in the area in :

District	Block	Total Surface water available in MCM for rechargе	Source Water Allocation (MCM)			Number of Structures feasible			Structure-wise Cost Estimate in lakh Rs.			Total cost in lakh Rs
			Percolation Tanks	REET with RS	Injection Well	Percolation Tanks	RET with RS	Injection Well	Percolation Tanks	REET with RS	Injection Well	
HUGLI	Chinsura	83.52	39	22	22	78	222	74	1560	1776	296	3632



Ground Water Management Plan For Irrigation Purpose.

Area in sq, km.

Sr No.	Name of Block	Cultivable area in ha	Net irrigated area in ha	Area to be irrigated in ha	SOD in %	Category
1	Chinsurah	3752	2328	1424.00	38.50	Semi Critical

Pandua

1)Salient Information

Block Name: Pandua

Area(in Km^2): 284.03

District: Hugly

State:West Bengal

Population(as on 2011):

Name of the Block	Population of CD Block (2011 census)
Pandua	265863

Approximate Decadal Growth Rate from 2001-2011:

Rainfall:

Average annual rainfall in **: Pandua**

(as in the district) for the period 2009 -13 (in mm)

Block	Normal	Actual (Annual)				
		2009	2010	2011	2012	2013
Pandua	1516	1263	1044	1556	1152	1494

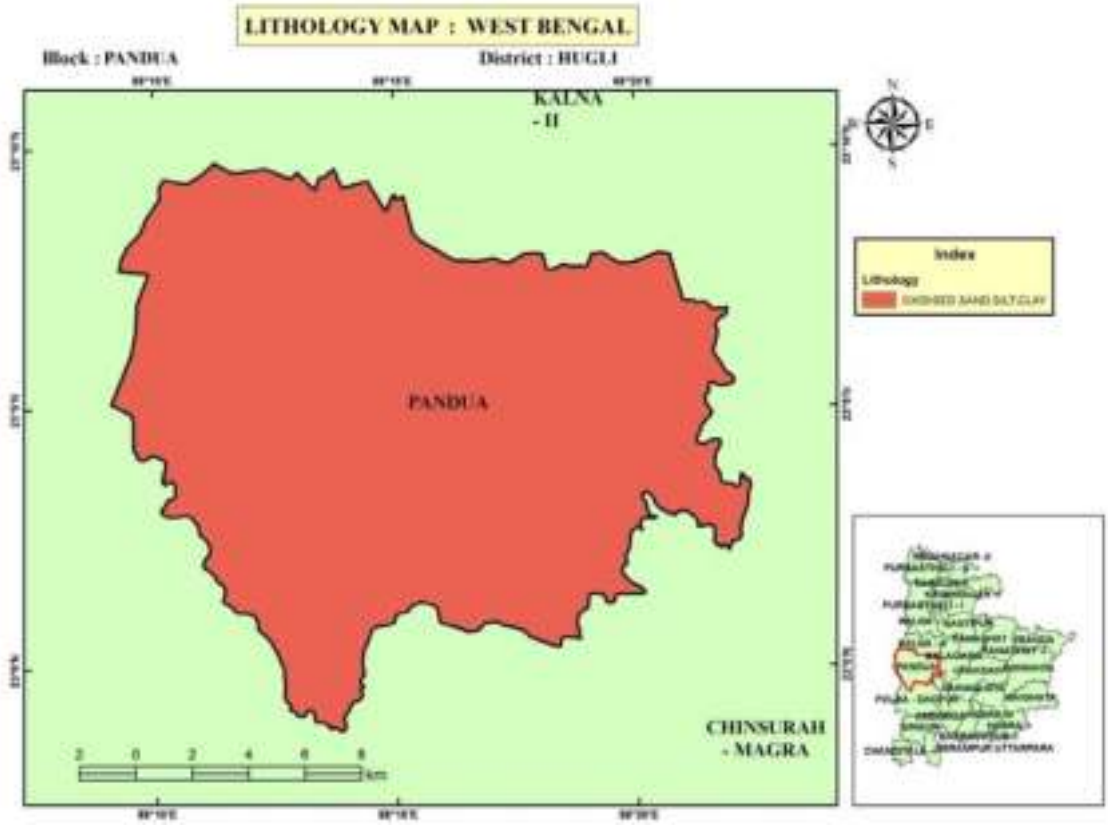
Aquifer Wise Ground Water Resource Availability & Extraction:

(in MCM)

Resource Availability	Aquifer I	Aquifer II	Extraction (for Aquifer I)
Dynamic Resource	11241.31	-	0.511254
Static Resource	5931.91	-	-

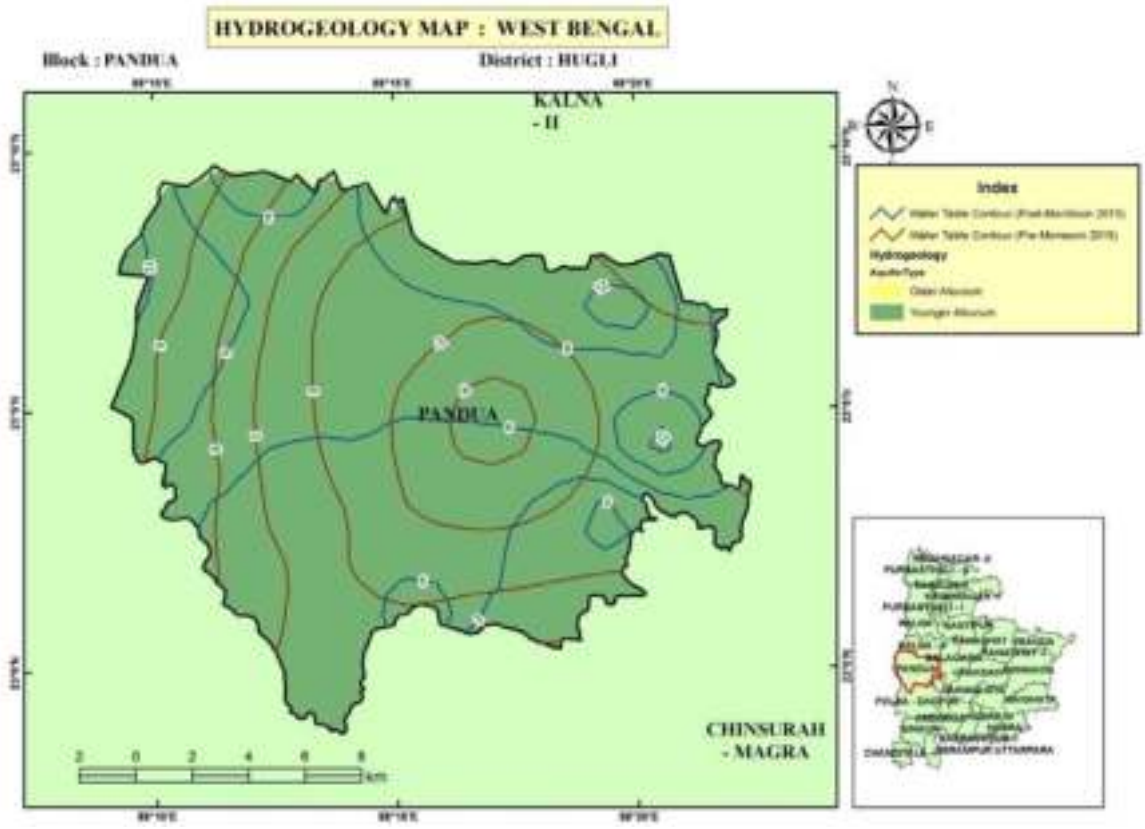
2)Disposition of Aquifer:

Block	**Depth range of Aquifer in m bgl**	
Pandua	**1st Aquifer**	**2nd aquifer**
	44-131, 138-147	169-172, 193-212



Aquifer Wise Water Level Ranges & Pre-monsoon and Post-monsoon long term water level trends (1995 to 2011)

Sl. No.	Block	Aquifer	Pre-monsoon Trend		Post-monsoon Trend	
			Water Level Range(mbgl)	**Pre trend (- rising & + Falling)**	Water Level Range(mbgl)	**Pre trend (- rising & + Falling)**
1.	**Pandua**	**1**	**-**	**16.09**	**3.25-21.3**	**25.32**
2.	**Pandua**	**2**	**-**	**-**	**-**	**-**

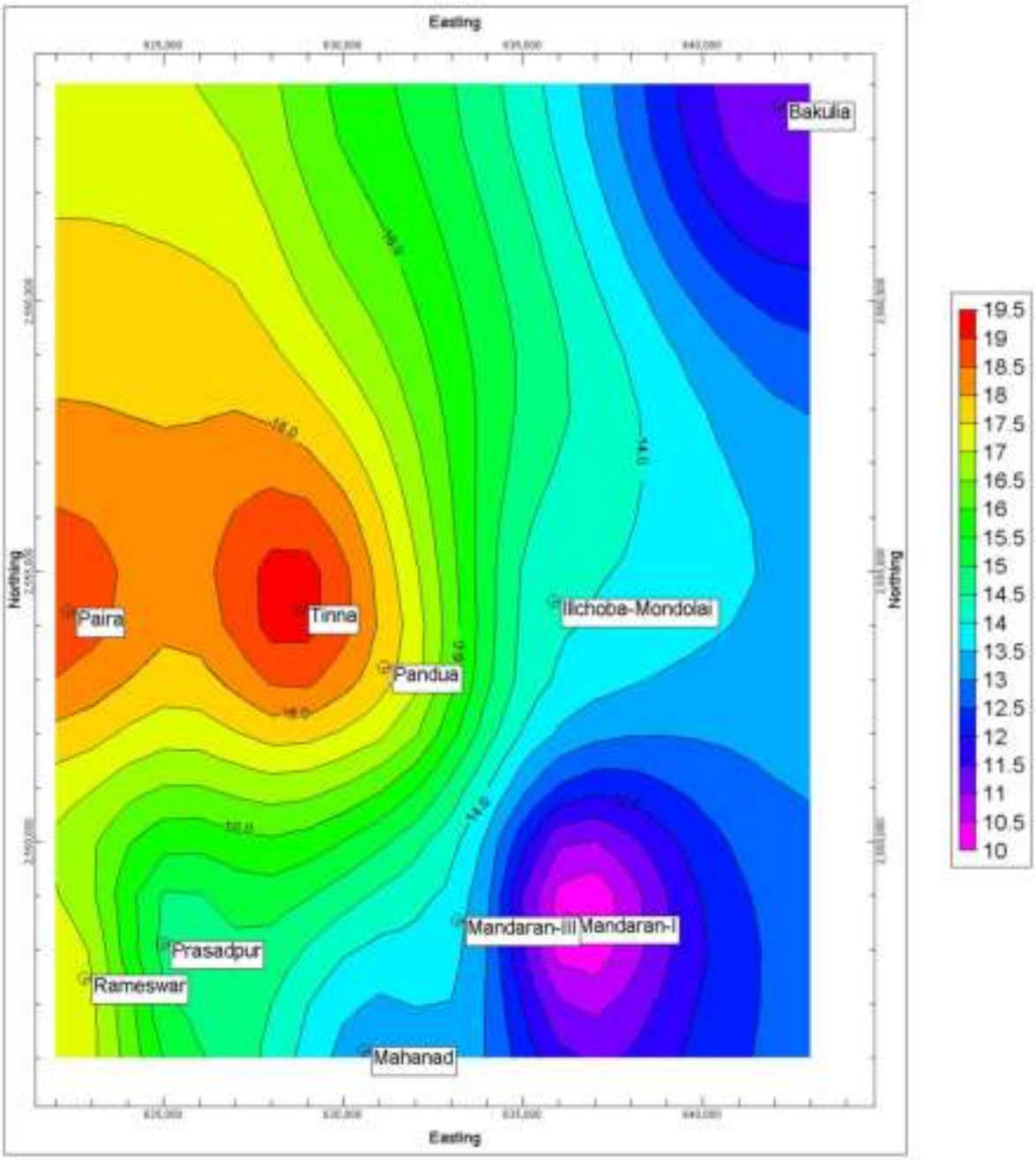


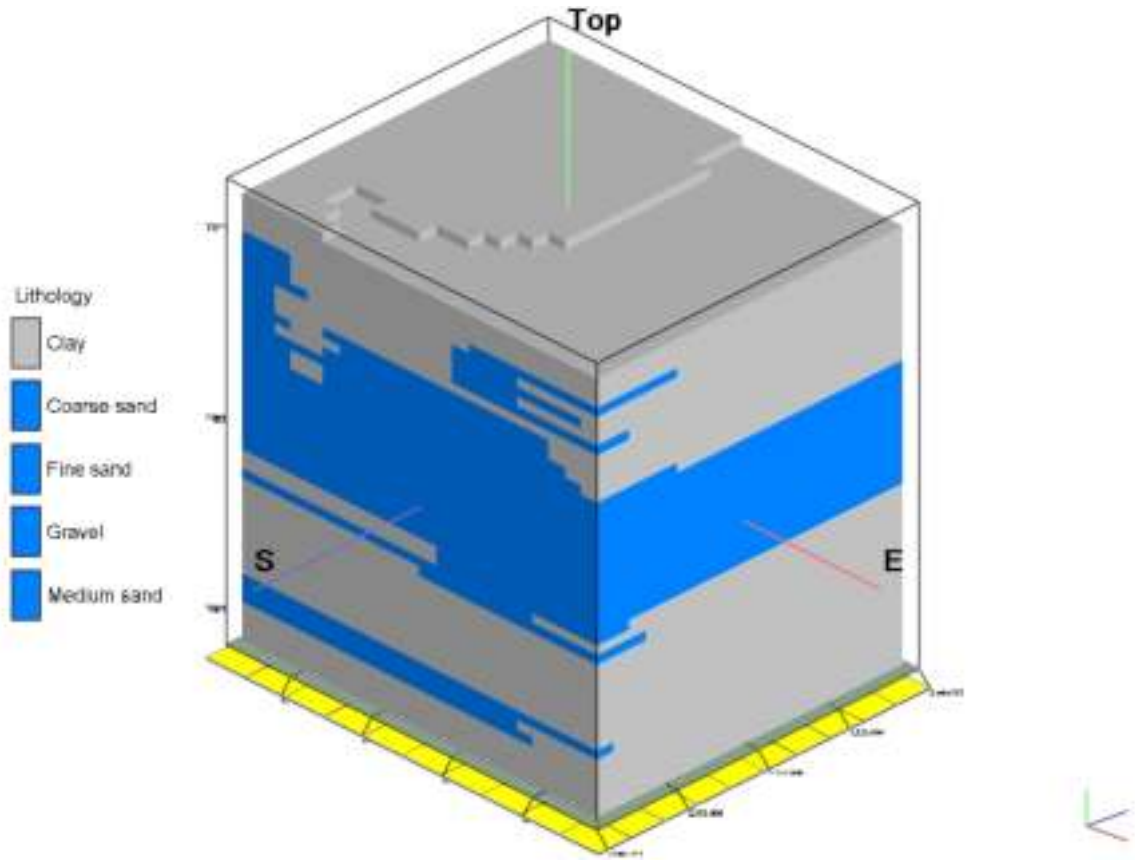
Thickness of Aquifer(Average):

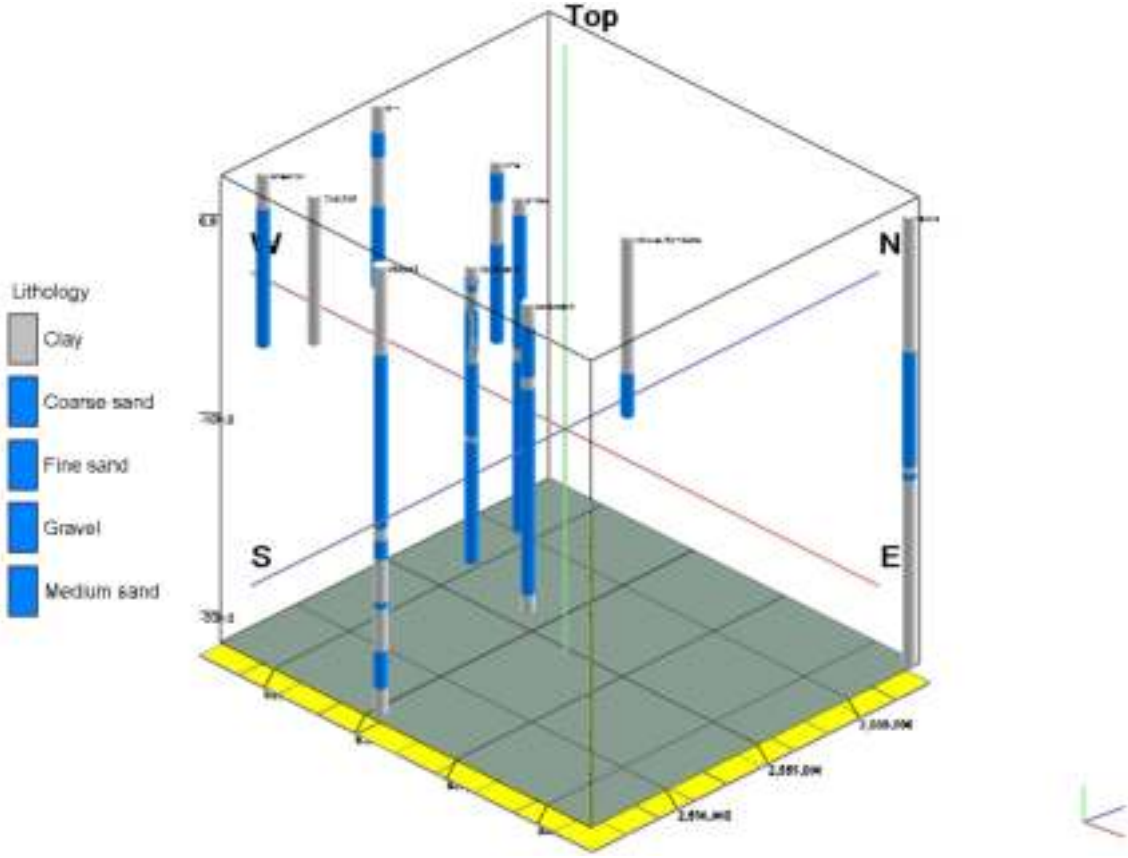
Block	Geographical Area (sq km)	Thickness of the Granular Zone in 1st aquifer (m)	Thickness of the Granular Zone /Productive Zone below pre-monsoon WL (m)
Pandua	284.03	147	130.53

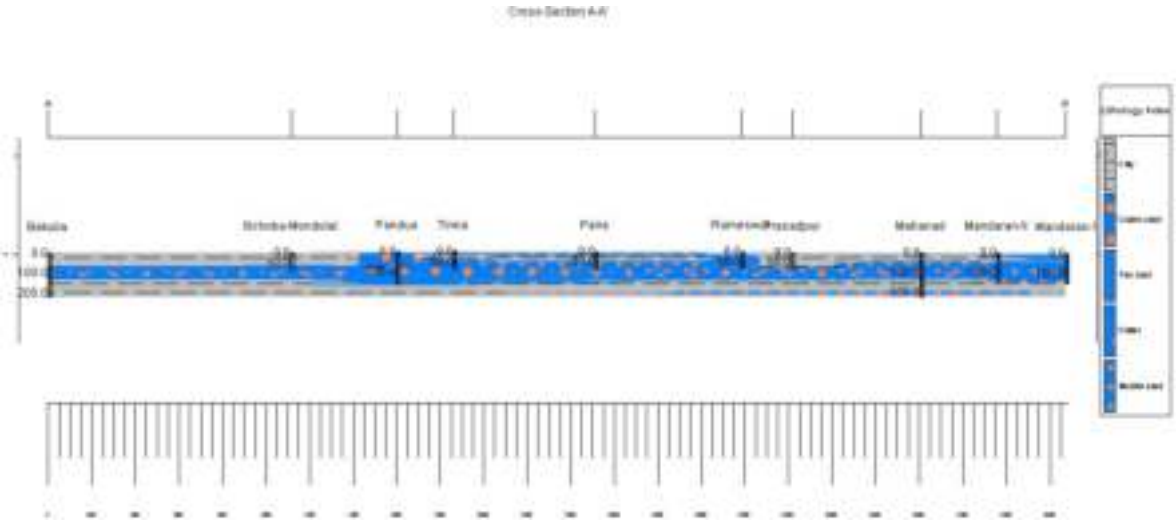
Aquifer-wise Statement

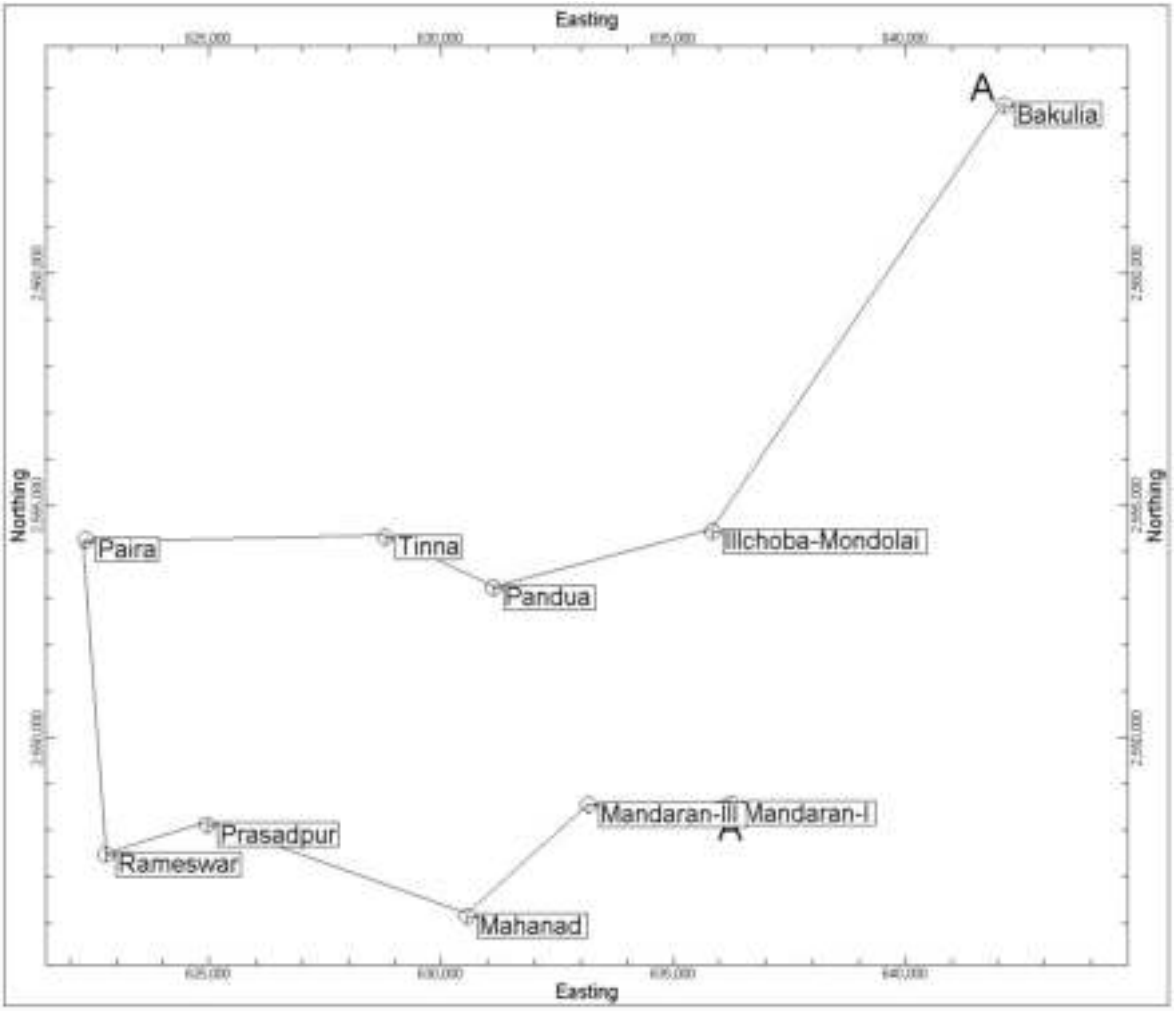
Sl. No.	Name of Block	1st Aquifer			2nd Aquifer		Remarks T (m^2/day), S
		Depth Range (mbgl)	Discharge (m^3/hr)	T (m^2/day)	Depth Range(mbgl)	Discharge (m^3/hr)	
		1st					
13	Pandua	44-147	111.28-251.4		169-212	24.24-87	


Easting
Northing
Bakulia
Paira
Tinna
Pandua
Ilichoba-Mondolai
Mandaran-III
Mandaran-I
Prasadpur
Rameswar
Mahanad
19.5
19
18.5
18
17.5
17
16.5
16
15.5
15
14.5
14
13.5
13
12.5
12
11.5
11
10.5
10


Top
Lithology
Clay
Coarse sand
Fine sand
Gravel
Medium sand
S
E


Top
W
N
S
E
Lithology
Clay
Coarse sand
Fine sand
Gravel
Medium sand





3)Ground Water Resource,Extraction,Contamination & Other Issues:

Aquifer Wise Resource Availability & Extraction:

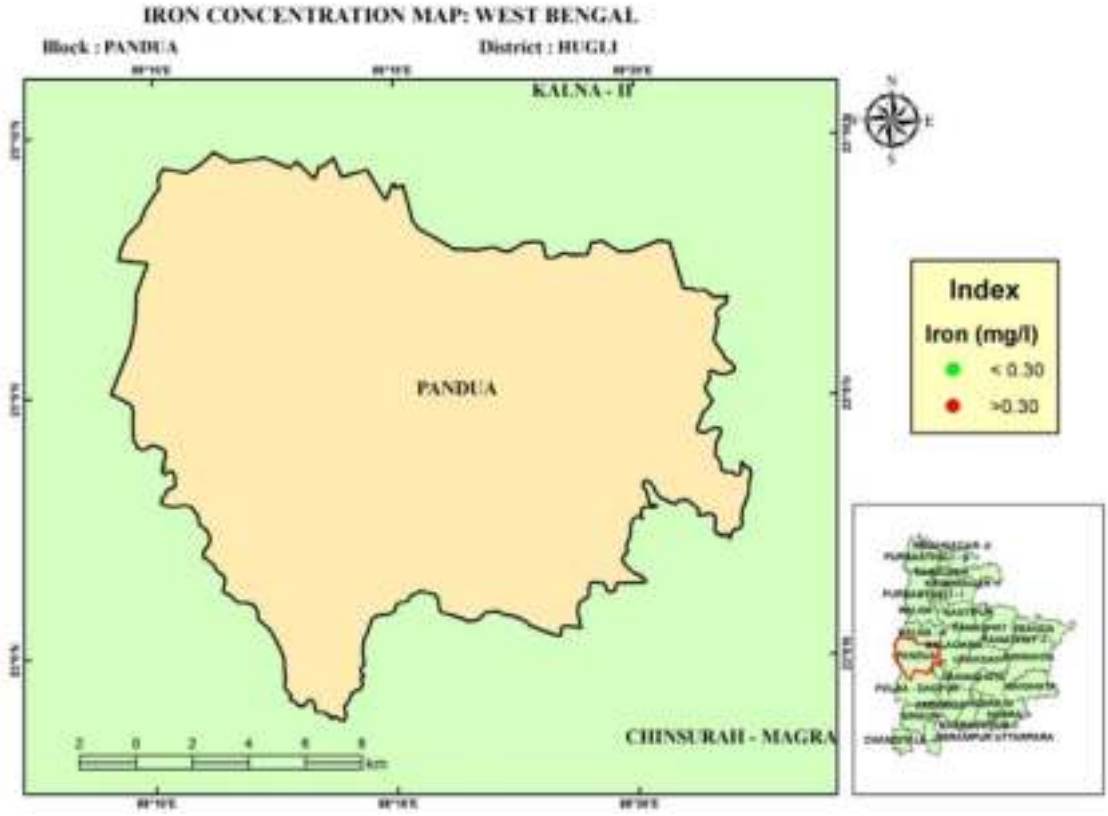
Block	Net ground water availability (MCM)	Gross ground water draft (MCM)	Stage of development (%)	Category
Pandua	11241.31	5603.45	49.38	Semi Critical

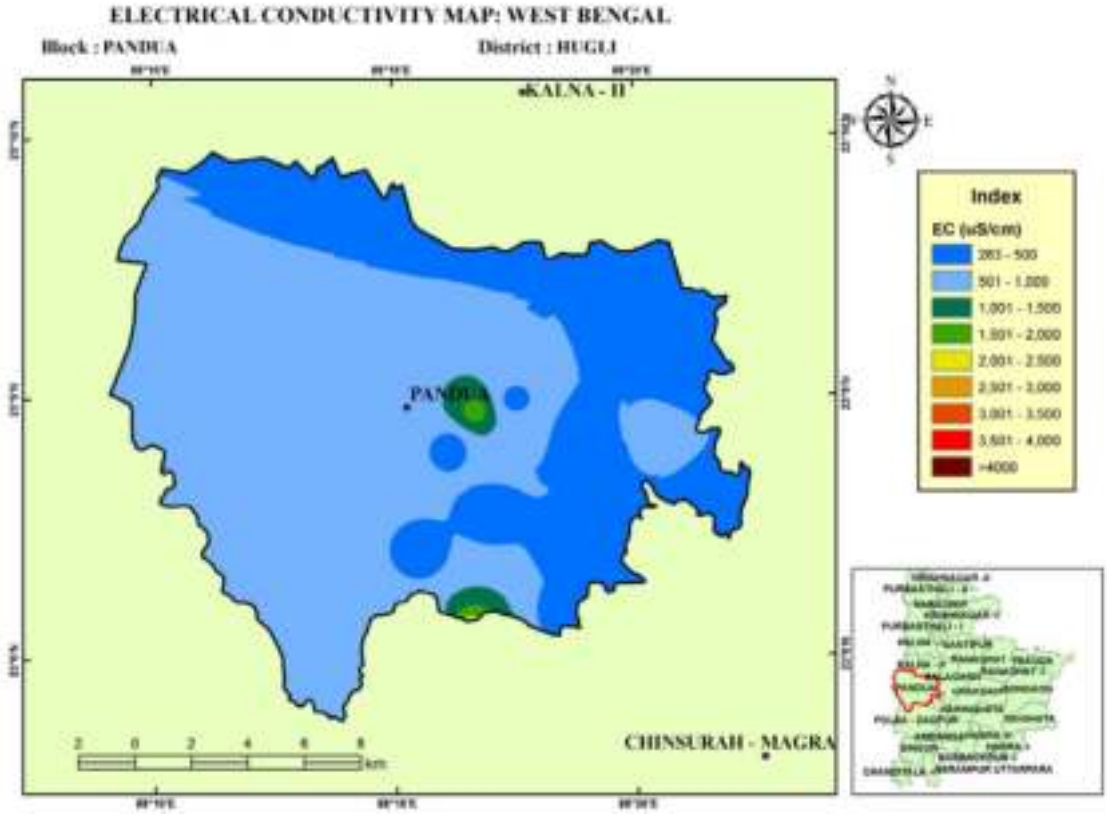
Chemical Quality Of GroundWater & Contamination:

Range Of Chemical Pollutants:

Block	As(mg/l)	Fe(mg/l)	Ec(µS/cm)	F(mg/l)	No_3(mg/l)
Pandua	**Negligible-0.063**	**-**	**269-1730**	**1-0.85**	**Negligible-36**


ARSENIC CONCENTRATION MAP: WEST BENGAL
Block : PANDUA
District : HUGLI
KALNA - II
PANDUA
CHINSURAH - MAGRA
Index
Arsenic (ug/l)
(within 100m Depth)
< 10.00
10.00 - 50.00
>50.00


IRON CONCENTRATION MAP: WEST BENGAL
Block : PANDUA
District : HUGLI
KALNA - II
PANDUA
CHINSURAH - MAGRA
Index
Iron (mg/l)
< 0.30
>0.30



Percentage of tube wells having arsenic content in the **block:**

SI.No.	Blocks	Arsenic (<0.01 ing/1)	Arsenic (>0.01-<0.05 mg/1)	Arsenic (> 0.05 mg/1)	Total Tube well
1					

4)Ground Water Resource Enhancement& Management Plan:

Ground Water Management Plan for Drinking purpose.

Suggestions on supply of ground water to the risk population for drinking purpose.

District	Block (As affected)	No. of habitations in the risk zone where As concentration >0.05 mg/L	No. of habitations in the risk zone where As concentration 0.01 to 0.05 mg/L	Risk Population (2011) where As concentration >0.05 mg/L
HUGLI	PANDUA	1		265863

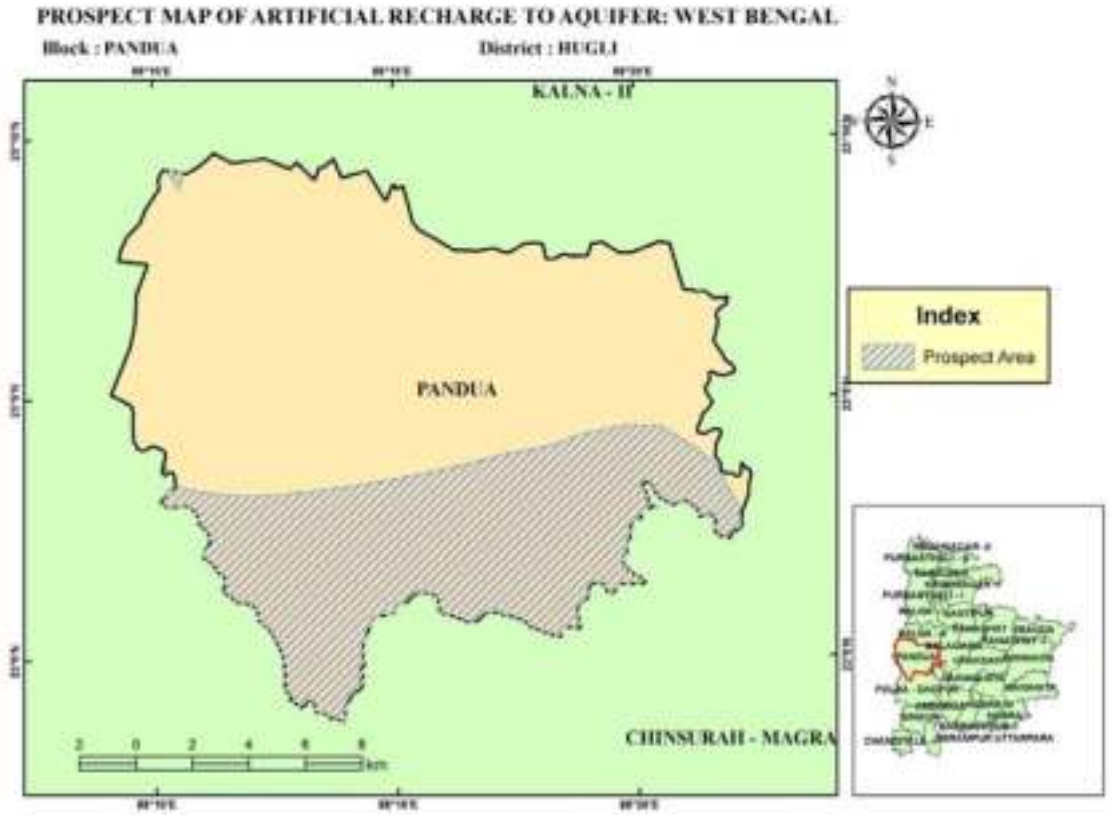
Aquifer Wise Space Available For Recharge and Proposed Interventions:

Area suitable for recharge in the study area:

	Block Name	Area (in sq. km)	Total Area suitable for recharge (sq km.)
HUGLI	Pandua	284.03	96.81

Proposed Artificial Recharge Structures in the area in :

District	Block	Total Surface water available in MCM for recharge	Source Water Allocation (MCM)			Number of Structures feasible			Structure-wise Cost Estimate in lakh Rs.			Total cost in lakh Rs
			Percolation Tanks	REET with RS	Injection Well	Percolation Tanks	REET with RS	Injection Well	Percolation Tanks	REET with RS	Injection Well	
HUGLI	Pandua	213.39	100	57	57	200	567	189	4000	4536	756	9292



Area in sq, km.

Sr No.	Name of Block	Cultivable area in ha	Net irrigated area in ha	Area to be irrigated in ha	SOD in %	Category
1	Pandua	23022	10691	12331.00	49.38	Semi Critical

Polba-Dadpur

1)Salient Information

Block Name: Polba-Dadpur

Area(in Km^2): 287.85

District: Hugly

State:West Bengal

Population(as on 2011):

Name of the Block	Population of CD Block (2011 census)
Polba-Dadpur	263555

Approximate Decadal Growth Rate from 2001-2011: 21%

Rainfall:

Average annual rainfall in **: Polba-Dadpur**

(as in the district) for the period 2009 -13 (in mm)

Block	Normal	Actual (Annual)				
		2009	2010	2011	2012	2013
Polba-Dadpur	1516	1263	1044	1556	1152	1494

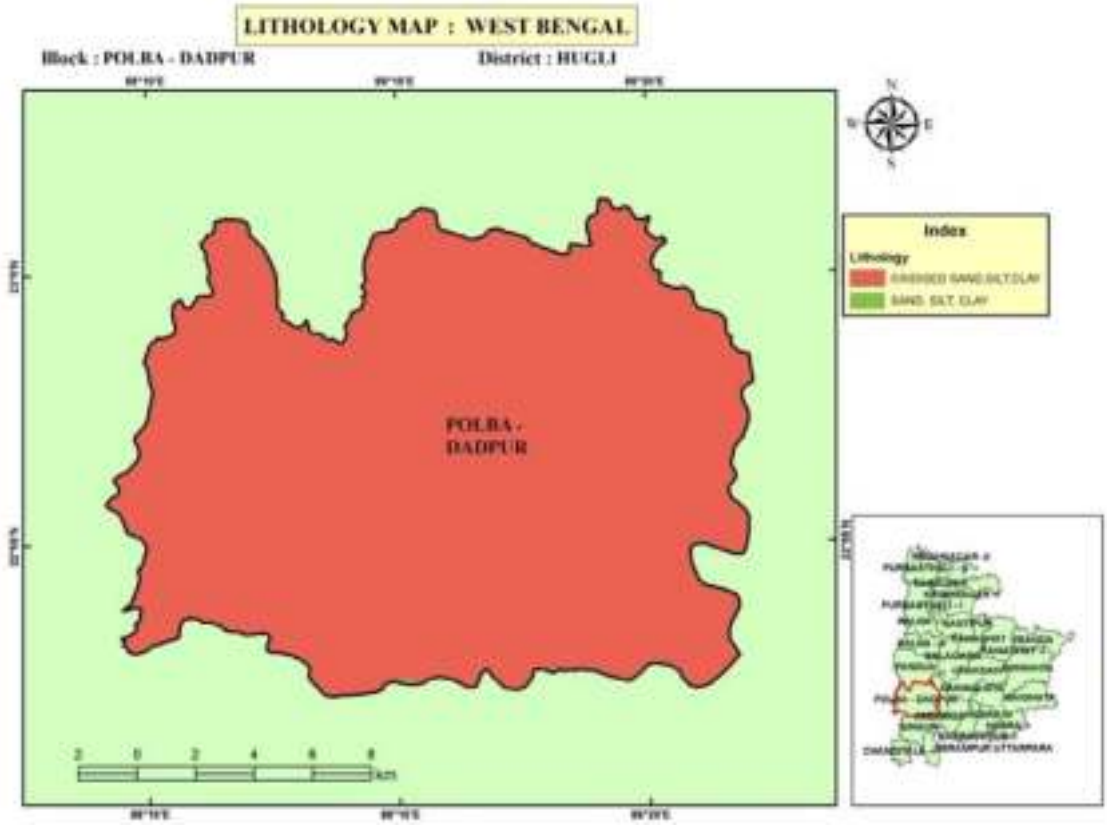
Aquifer Wise Ground Water Resource Availability & Extraction:

(in MCM)

Resource Availability	Aquifer I	Aquifer II	Extraction (for Aquifer I)
Dynamic Resource	11514.14	-	0.51813
Static Resource	6427.58	-	-

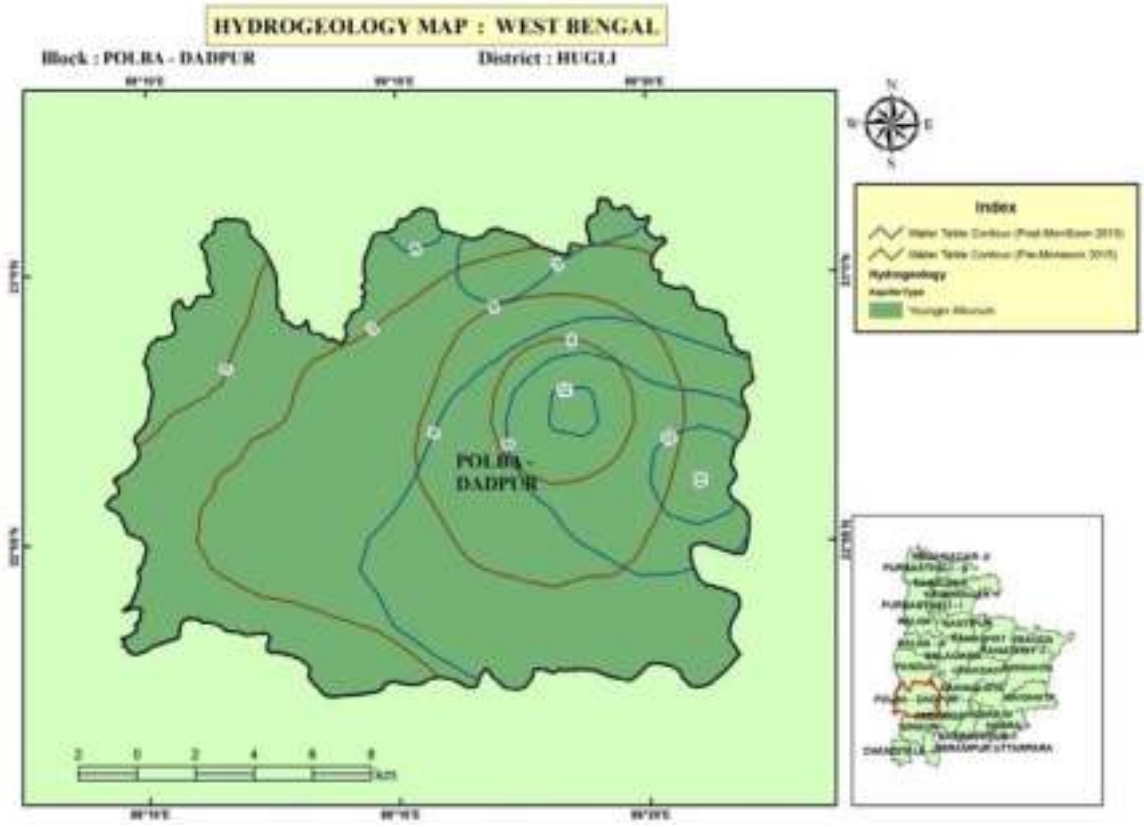
2)Disposition of Aquifer:

Block	**Depth range of Aquifer in m bgl**	
Polba-Dadpur	**1st Aquifer**	**2nd aquifer**
	21-155	186-224



Aquifer Wise Water Level Ranges & Pre-monsoon and Post-monsoon long term water level trends (1995 to 2011)

Sl. No.	Block	Aquifer	Pre-monsoon Trend		Post-monsoon Trend	
			Water Level Range(mbgl)	**Pre trend (- rising & + Falling)**	Water Level Range(mbgl)	**Pre trend (- rising & + Falling)**
1.	**Polba-Dadpur**	**1**	**-**	**35.28**	**3.84-23.25**	**33.96**
2.	**Polba-Dadpur**	**2**	**-**	**-**	**-**	**-**

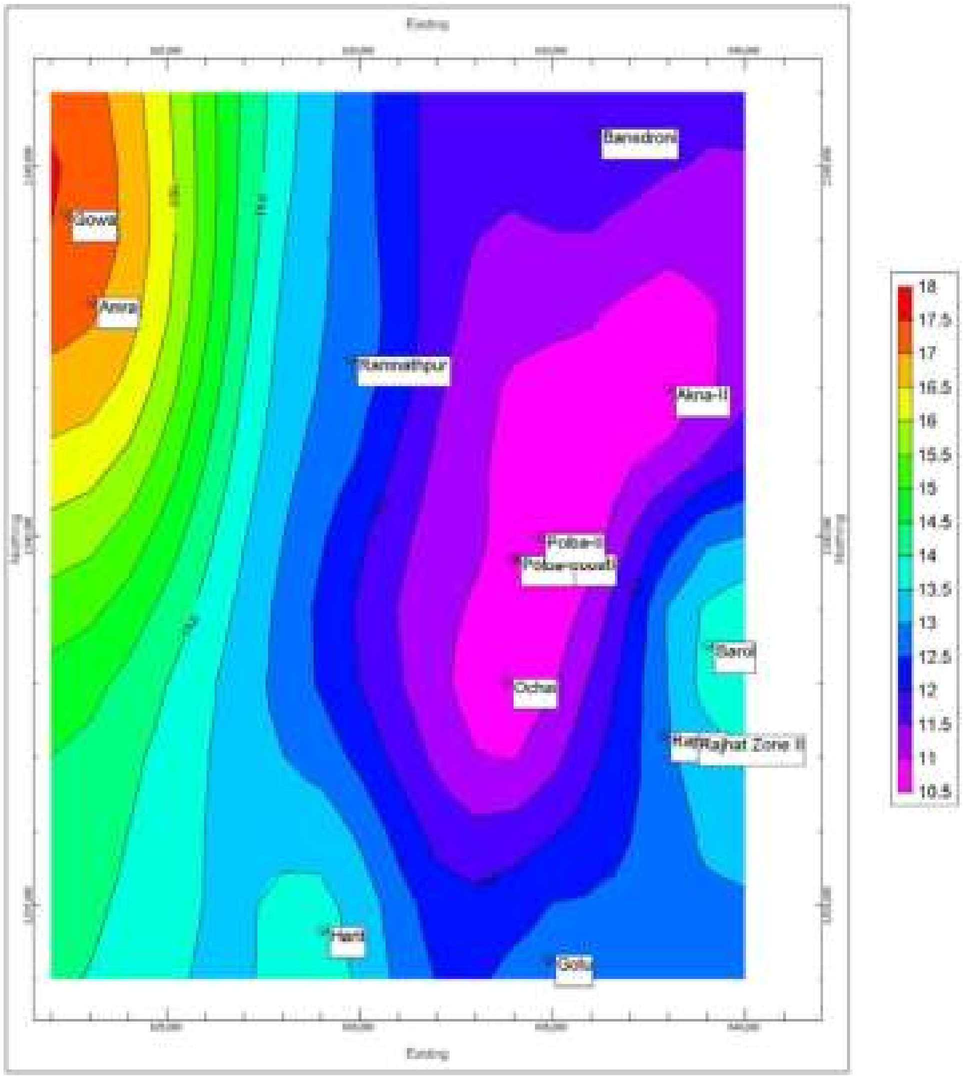


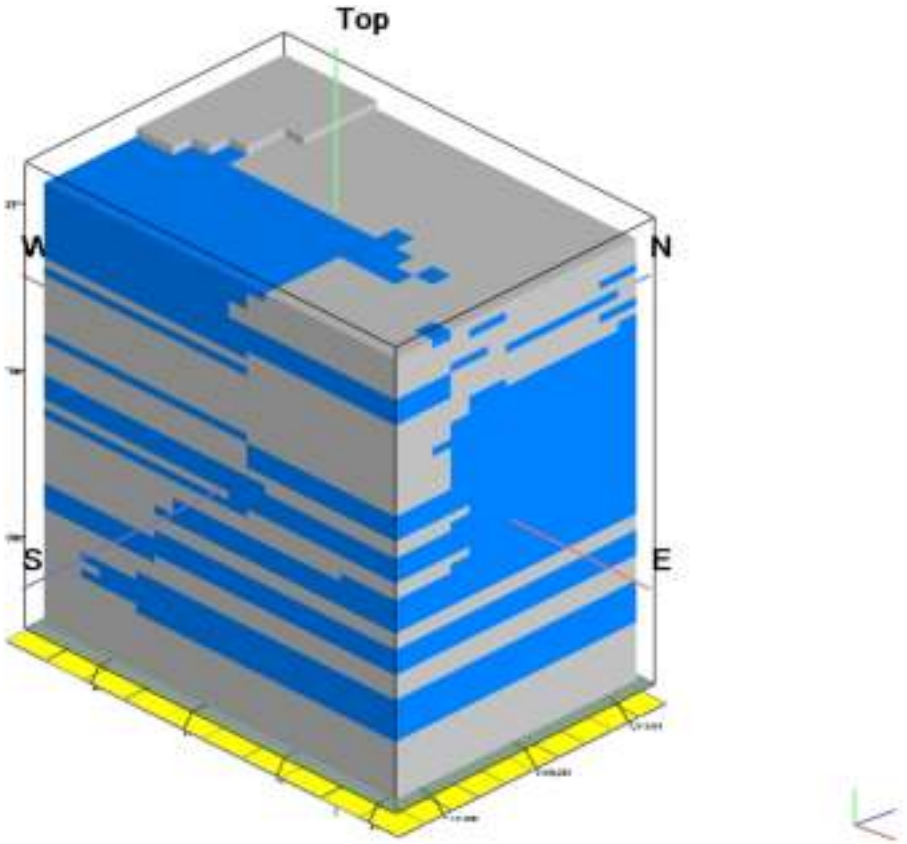
Thickness of Aquifer(Average):

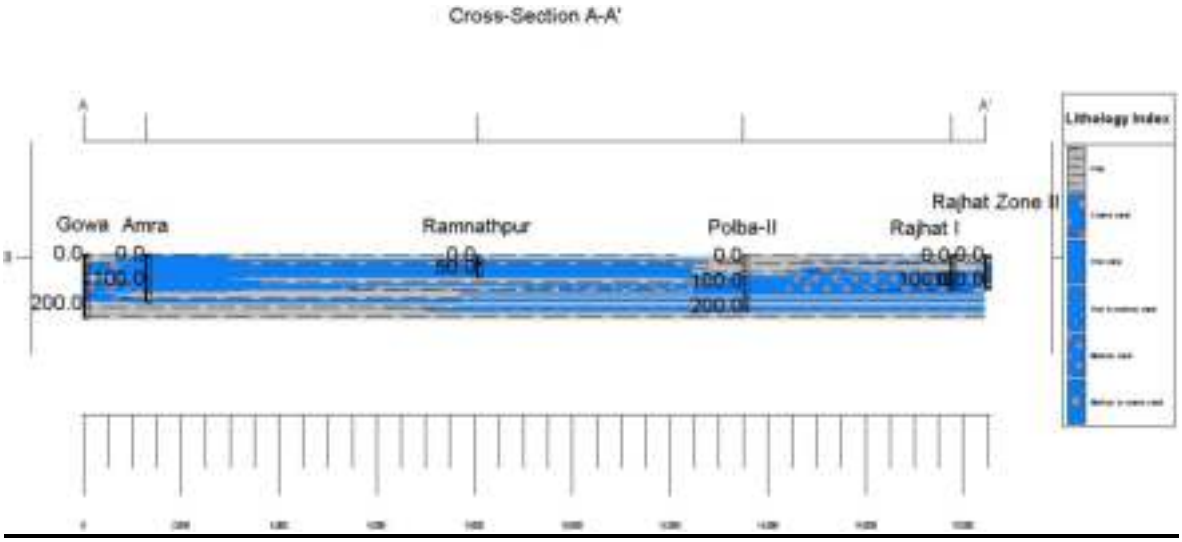
Block	Geographic Area (sq km)	Thickness of the Granular Zone in 1st aquifer (m)	Thickness of the Granular Zone /Productive Zone below pre-monsoon WL (m)
Polba-Dadpur	287.85	155	139.56

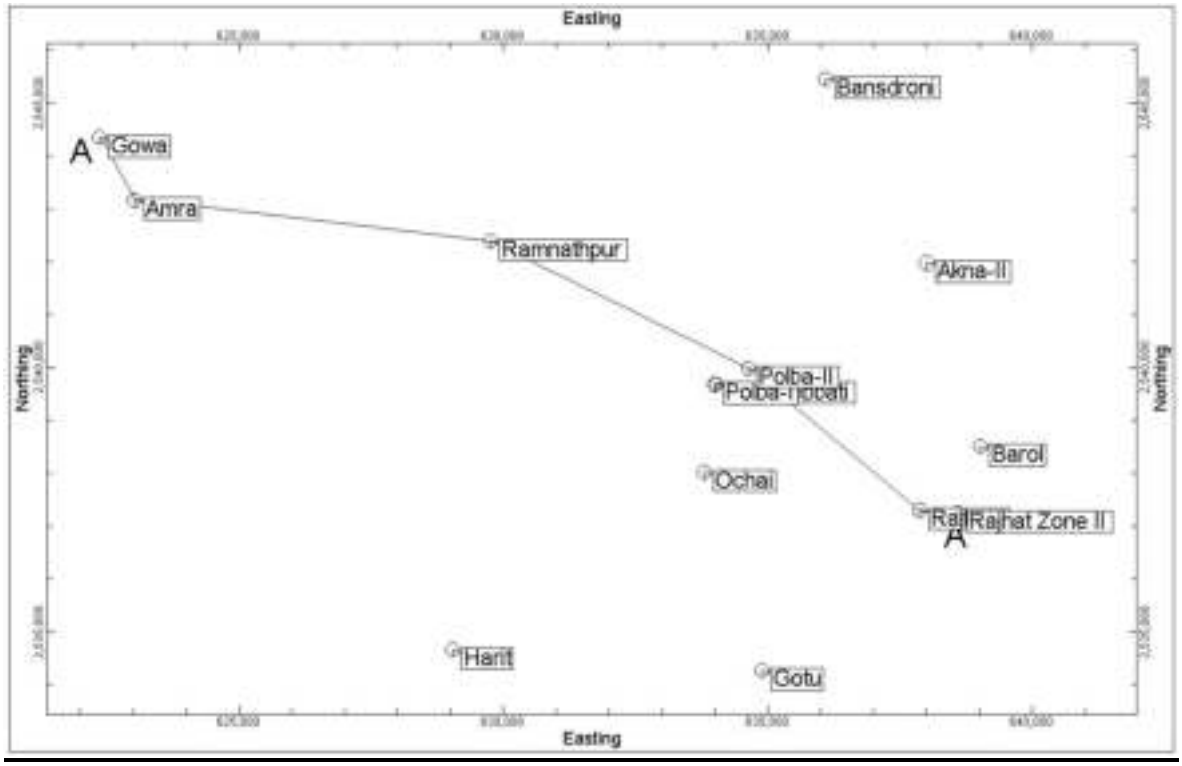
Aquifer-wise Statement

Sl. No.	Name of Block	1st Aquifer			2nd Aquifer		Remarks T (m^2/day)
		Depth Range (mbgl)	Discharge (m^3/hr)	T (m^2/day)	Depth Range	Discharge (m^3/hr)	
		1st					
	Polba-Dadpur	21-155	279.6		186-224	1.32	

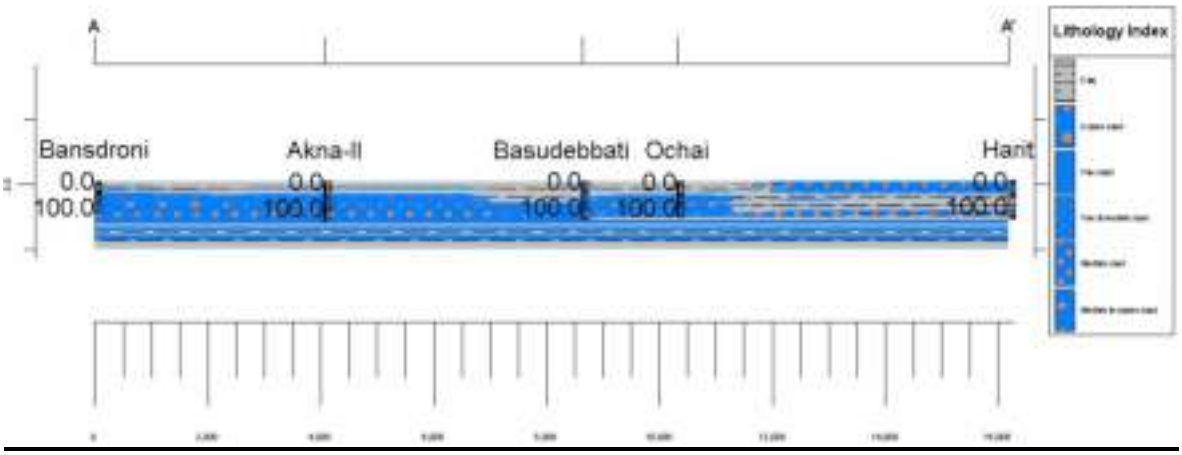

Easting
Northing
Bansdroni
Gowa
Amra
Ramnathpur
Akna-II
Polba-II
Polba-count
Sarol
Ochai
Hat
Rajhat Zone II
Hati
Sobi
18
17.5
17
16.5
16
15.5
15
14.5
14
13.5
13
12.5
12
11.5
11
10.5

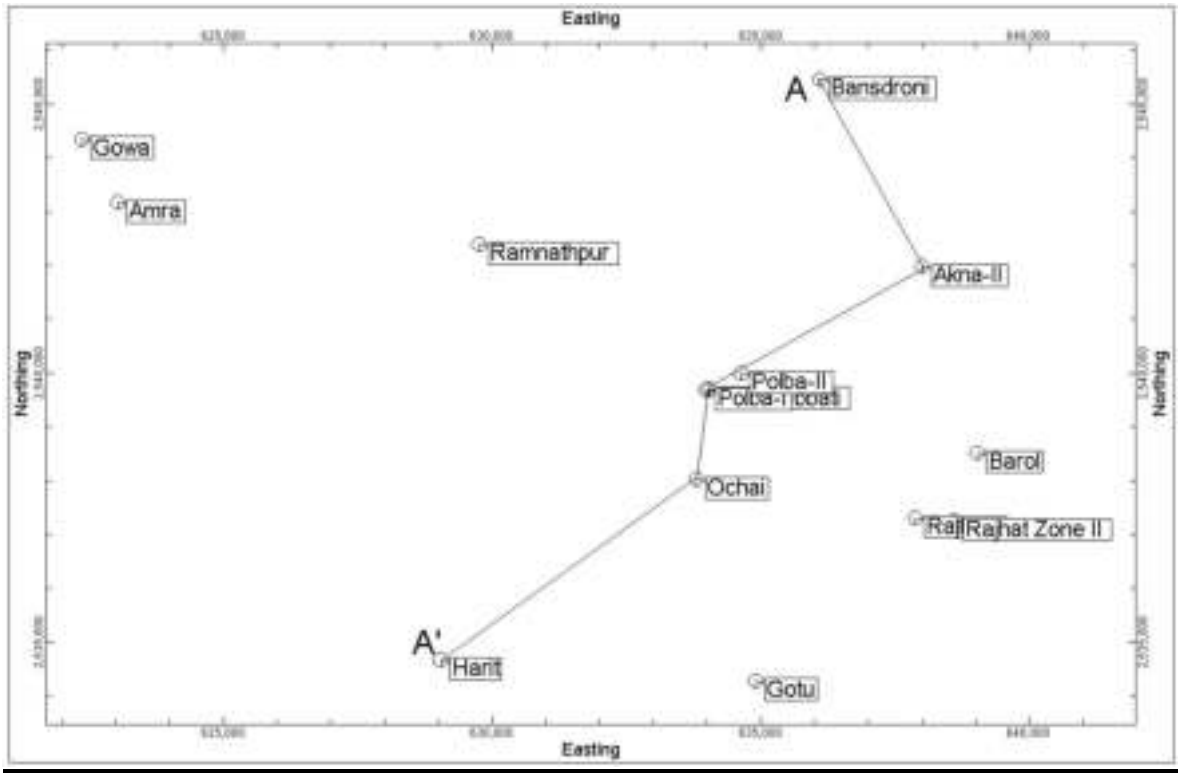

Top
W
N
S
E


Cross-Section A-A'
A
A'
Gowa
Amra
Ramnathpur
Polba-II
Rajhat I
Rajhat Zone II
Lithology Index


Easting
Northing
Bansdroni
A
Gowa
Amra
Ramnathpur
Akna-II
Polba-II
Barol
Ochai
Rajhat Zone II
Harit
Gotu

Cross-Section A-A'




Easting
Northing
A
Bansdroni
Gowa
Amra
Ramnathpur
Akna-II
Polba-II
Polba-I (part)
Barol
Ochai
Rajarhat Zone II
A'
Harit
Gotu
Easting

3)Ground Water Resource,Extraction,Contamination & Other Issues:

Aquifer Wise Resource Availability & Extraction:

Block	Net ground water availability (MCM)	Gross ground water draft (MCM)	Stage of development (%)	Category
Polba-Dadpur	11514.14	5462.19	47.05	Semi Critical

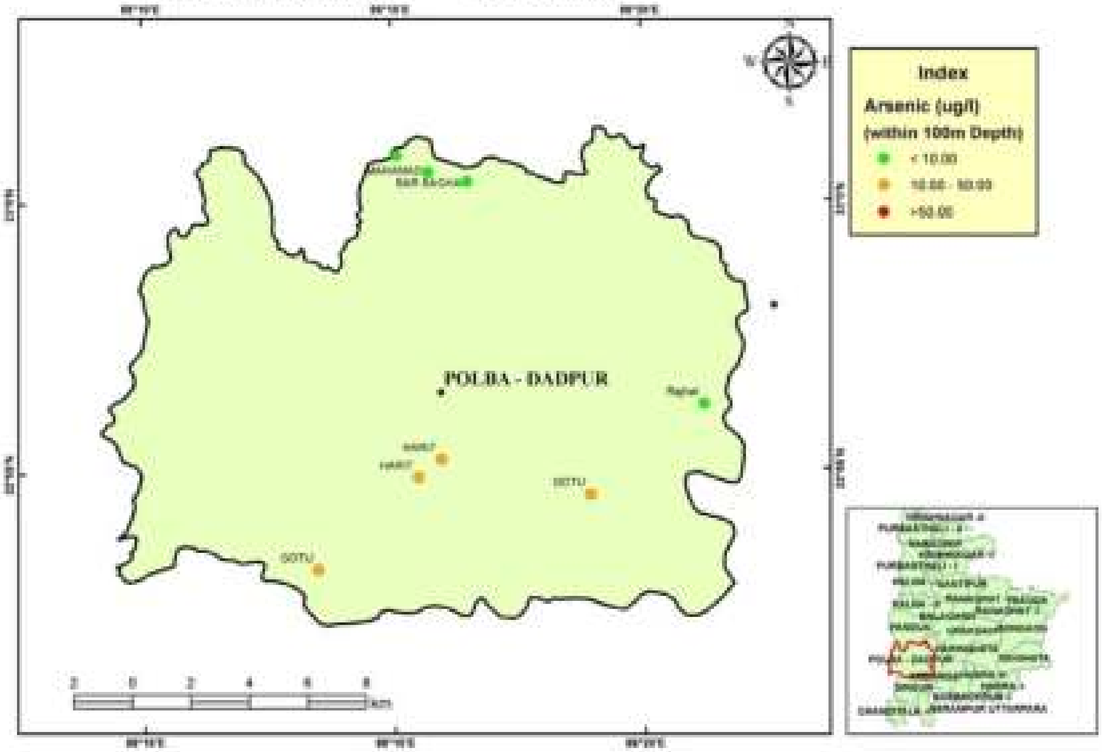
Chemical Quality Of GroundWater & Contamination:

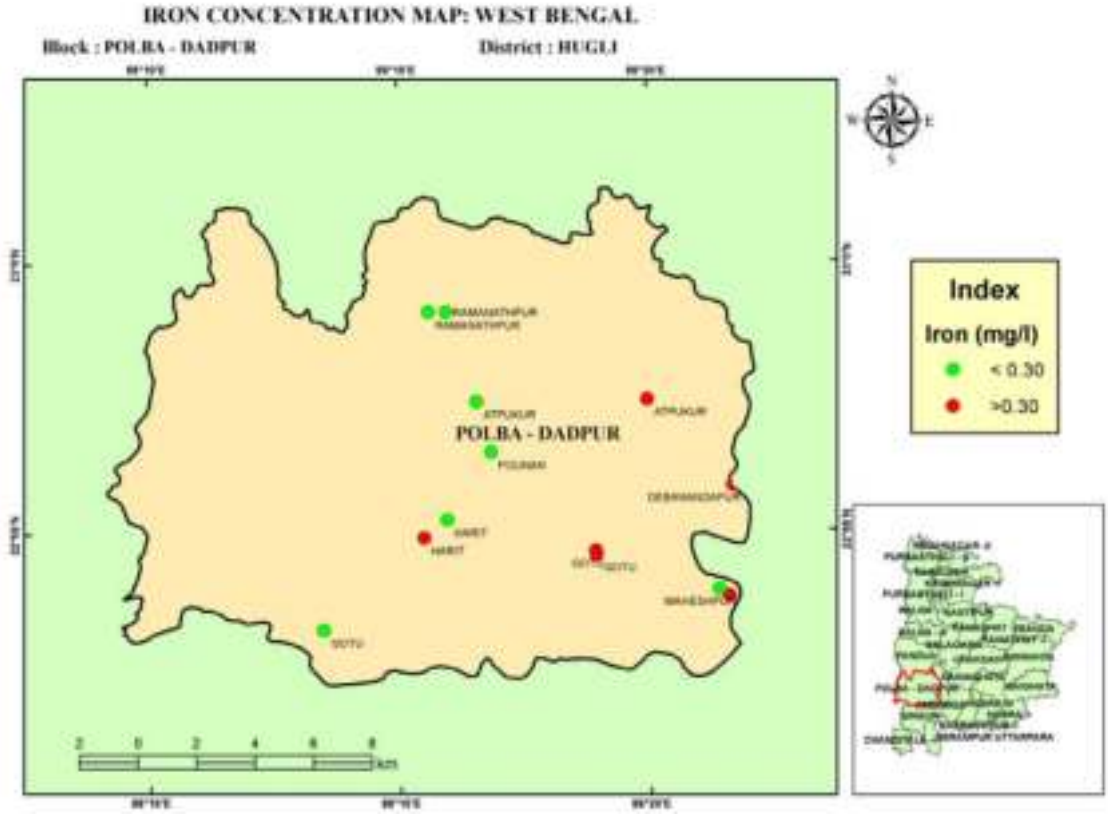
Range Of Chemical Pollutants:

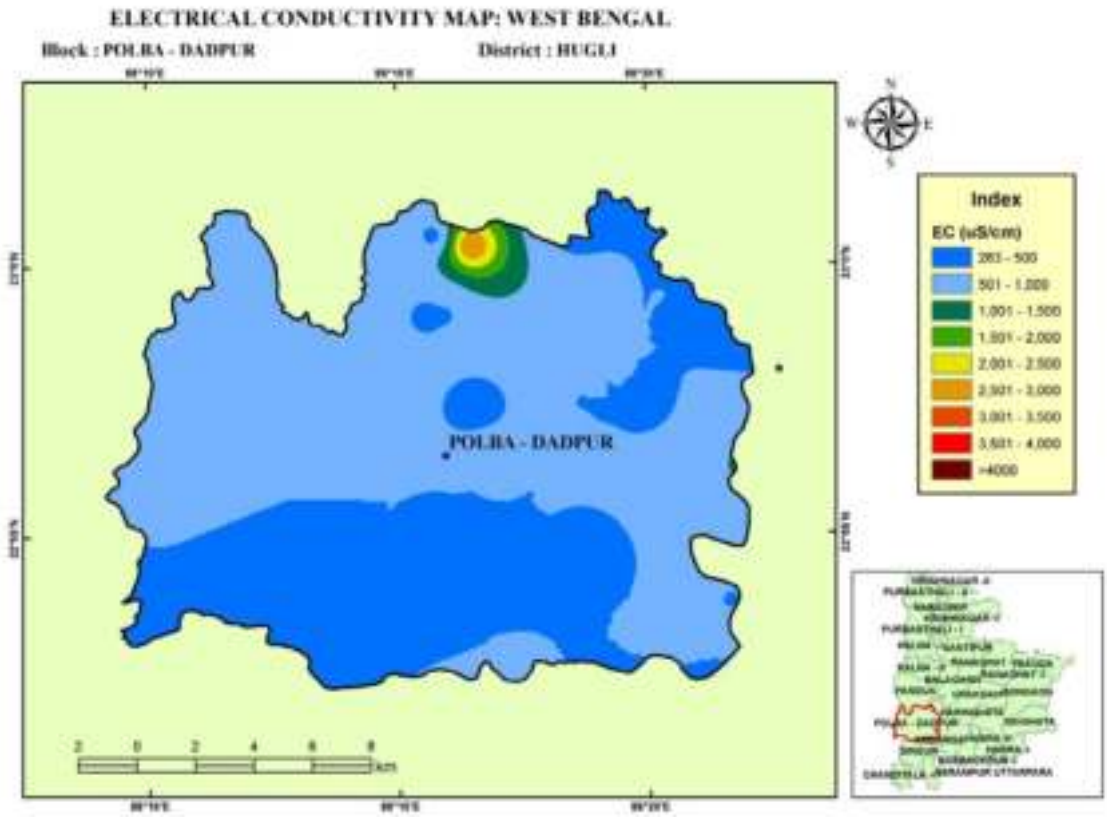
Block	As(mg/l)	Fe(mg/l)	Ec(µS/cm)	F(mg/l)	No_3(mg/l)
Polba-Dadpur	**Negligible-0.030**	**0.1-2.84**	**374-2290**	**Negligible-0.46**	**Negligible-23**

ARSENIC CONCENTRATION MAP: WEST BENGAL

Block : POLBA - DADPUR District : HUGLI




IRON CONCENTRATION MAP: WEST BENGAL
Block : POLBA - DADPUR
District : HUGLI
POLBA - DADPUR
Index
Iron (mg/l)
< 0.30
>0.30



Percentage of tube wells having arsenic content in the **block:**

SI.No.	Blocks	Arsenic (<0.01 ing/1)	Arsenic (>0.01-<0.05 mg/1)	Arsenic (> 0.05 mg/1)	Total Tube well
1					

4)Ground Water Resource Enhancement& Management Plan:

Ground Water Management Plan for Drinking purpose.

Suggestions on supply of ground water to the risk population For drinking purpose.

District	Block (As affected)	No. of habitations in the risk zone where As concentration >0.05 mg/L	No. of habitations in the risk zone where As concentration 0.01 to 0.05 mg/L	Risk Population (2011) where As concentration >0.05 mg/L
HUGLI				

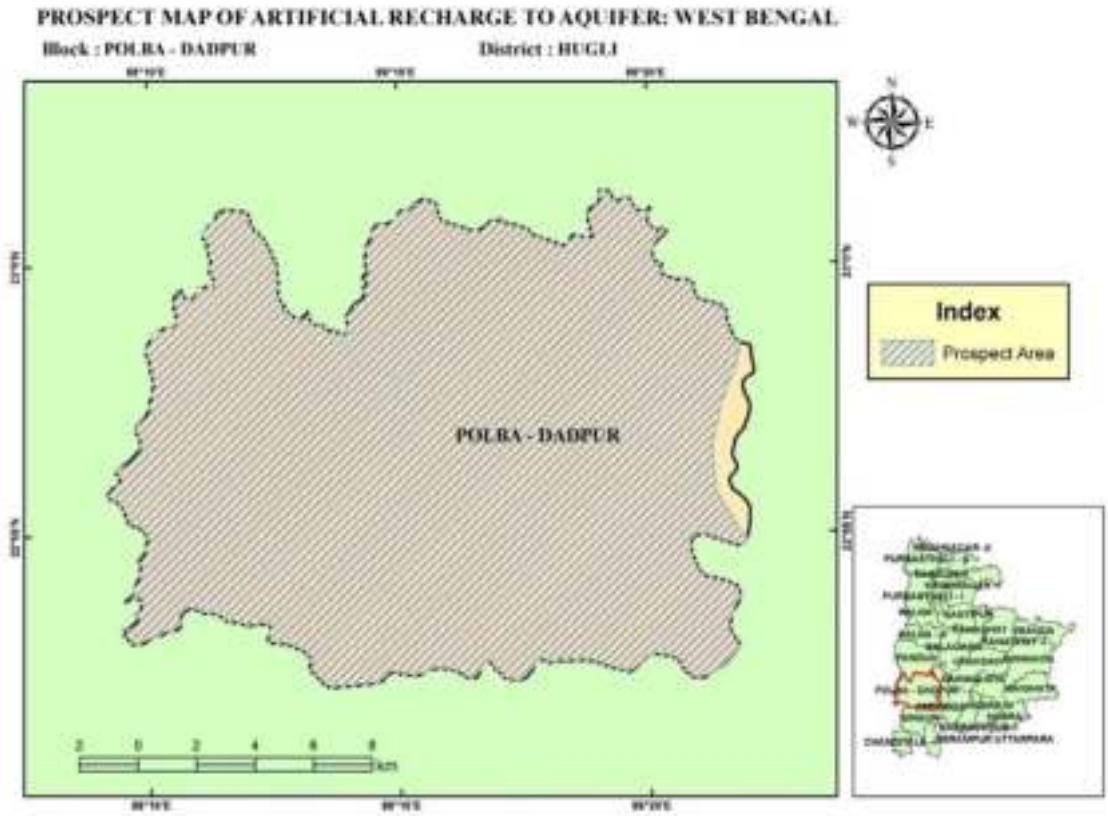
Aquifer Wise Space Available For Recharge and Proposed Interventions:

Area suitable for recharge in the study area:

District	Block Name	Area (in sq. km)	Total Area suitable for recharge (sq km.)
HUGLI	Polba-Dadpur	287.85	282.28

Proposed Artificial Recharge Structures in the area in :

District	Block	Total Surface water available in MCM for recharge	Source Water Allocation (MCM)			Number of Structures feasible			Structure-wise Cost Estimate in lakh Rs.			Total cost in lakh Rs
			Percolation Tanks	REET with RS	Injection Well	Percolation Tanks	REET with RS	Injection Well	Percolation Tanks	REET with RS	Injection Well	
HUGLI	Polba-Dadpur	220.54	103	59	59	207	585	195	4140	4680	780	9600



Ground Water Management Plan For Irrigation Purpose.

Area in sq, km.

Sr No.	Name of Block	Cultivable area in ha	Net irrigated area in ha	Area to be irrigated in ha	SOD in %	Category
1	Polba-Dadpur	19468	10573	8895.00	47.05	Semi Critical

Singur

1)Salient Information

Block Name: Singur

Area(in Km^2): 206.23

District: Hugly

State:West Bengal

Population(as on 2011):

Name of the Block	Population of CD Block (2011 census)
Singur	223951

Approximate Decadal Growth Rate from 2001-2011:

Rainfall:

Average annual rainfall in **: Singur**

(as in the district) for the period 2009 -13 (in mm)

Block	Normal	Actual (Annual)				
		2009	2010	2011	2012	2013
Singur	1516	1263	1044	1556	1152	1494

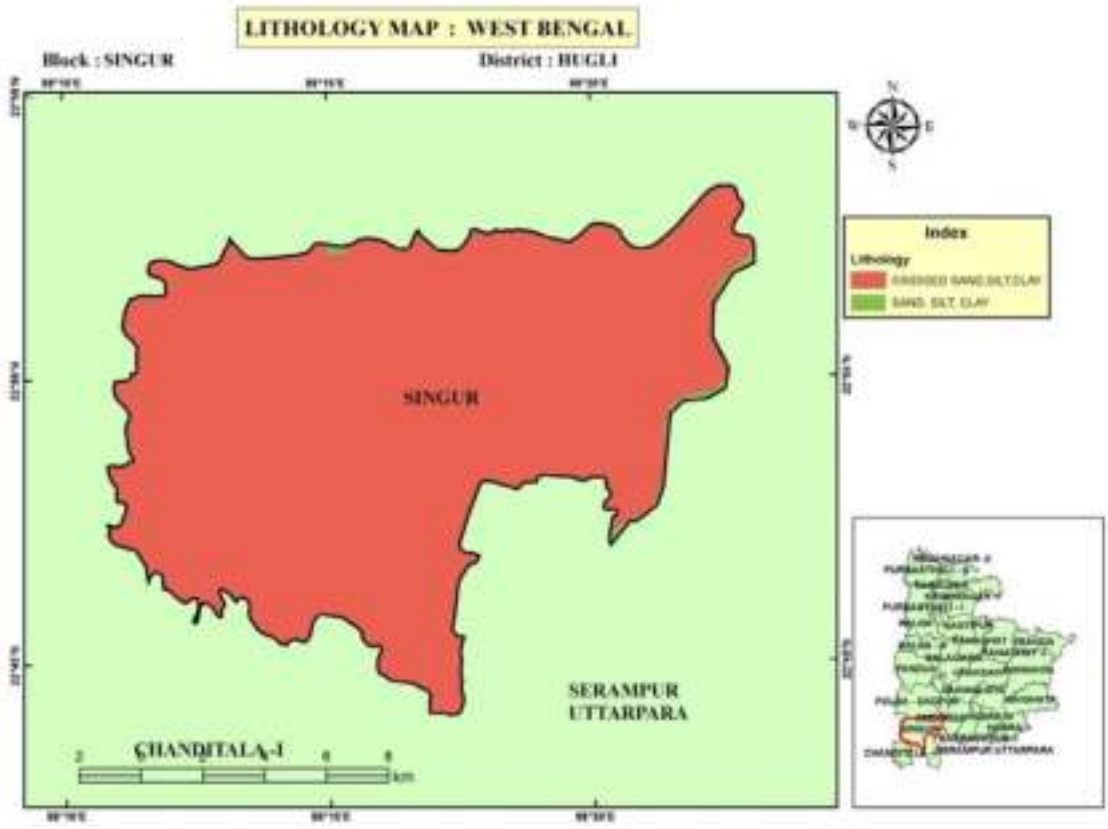
Aquifer Wise Ground Water Resource Availability & Extraction:

(in MCM)

Resource Availability	Aquifer I	Aquifer II	Extraction (for Aquifer I)
Dynamic Resource	7247.79	-	0.371214
Static Resource	6861.02	-	-

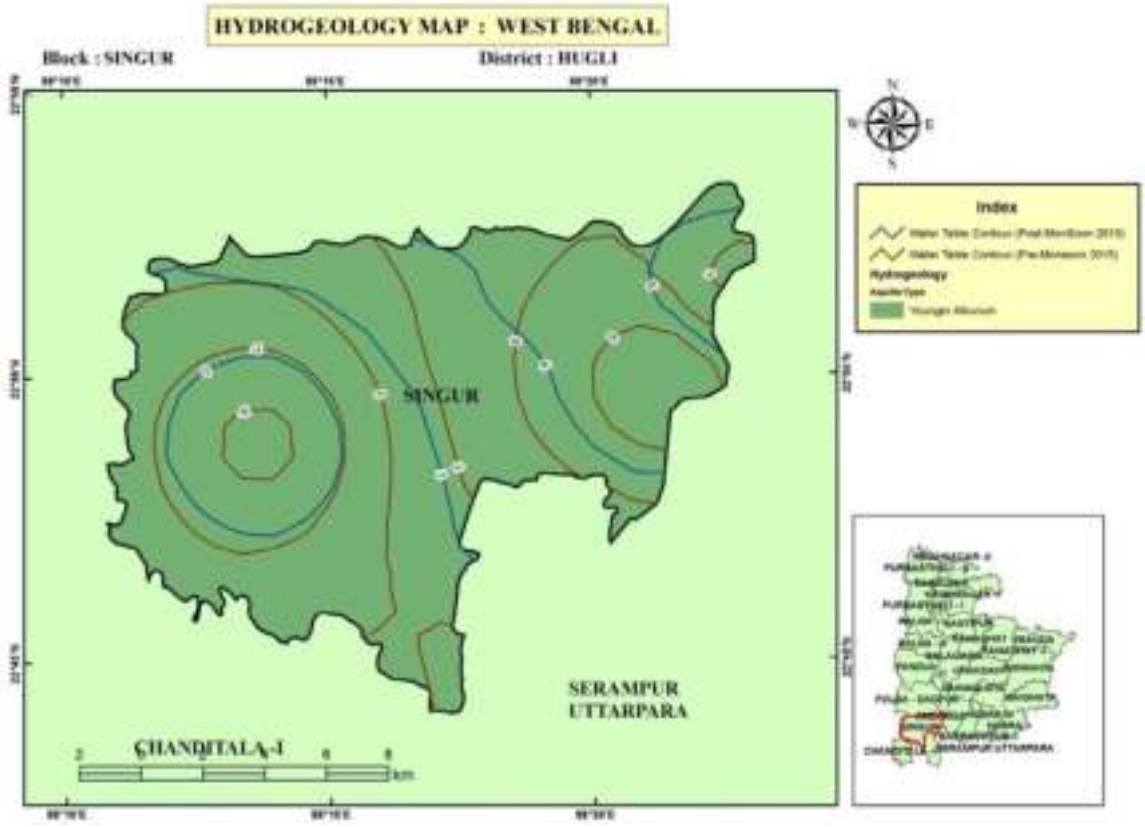
2)Disposition of Aquifer:

Block	Depth range of Aquifer in m bgl	
Singur	1st Aquifer	2nd aquifer
	51-225	



Aquifer Wise Water Level Ranges & Pre-monsoon and Post-monsoon long term water level trends (1995 to 2011)

Sl. No.	Block	Aquifer	Pre-monsoon Trend		Post-monsoon Trend	
			Water Level Range(mbgl)	**Pre trend (- rising & + Falling)**	Water Level Range(mbgl)	**Pre trend (- rising & + Falling)**
1.	**Singur**	**1**	**-**	**43.70**	**11.65-12.33**	**29.14**
2.	**Singur**	**2**	**-**	**-**	**-**	

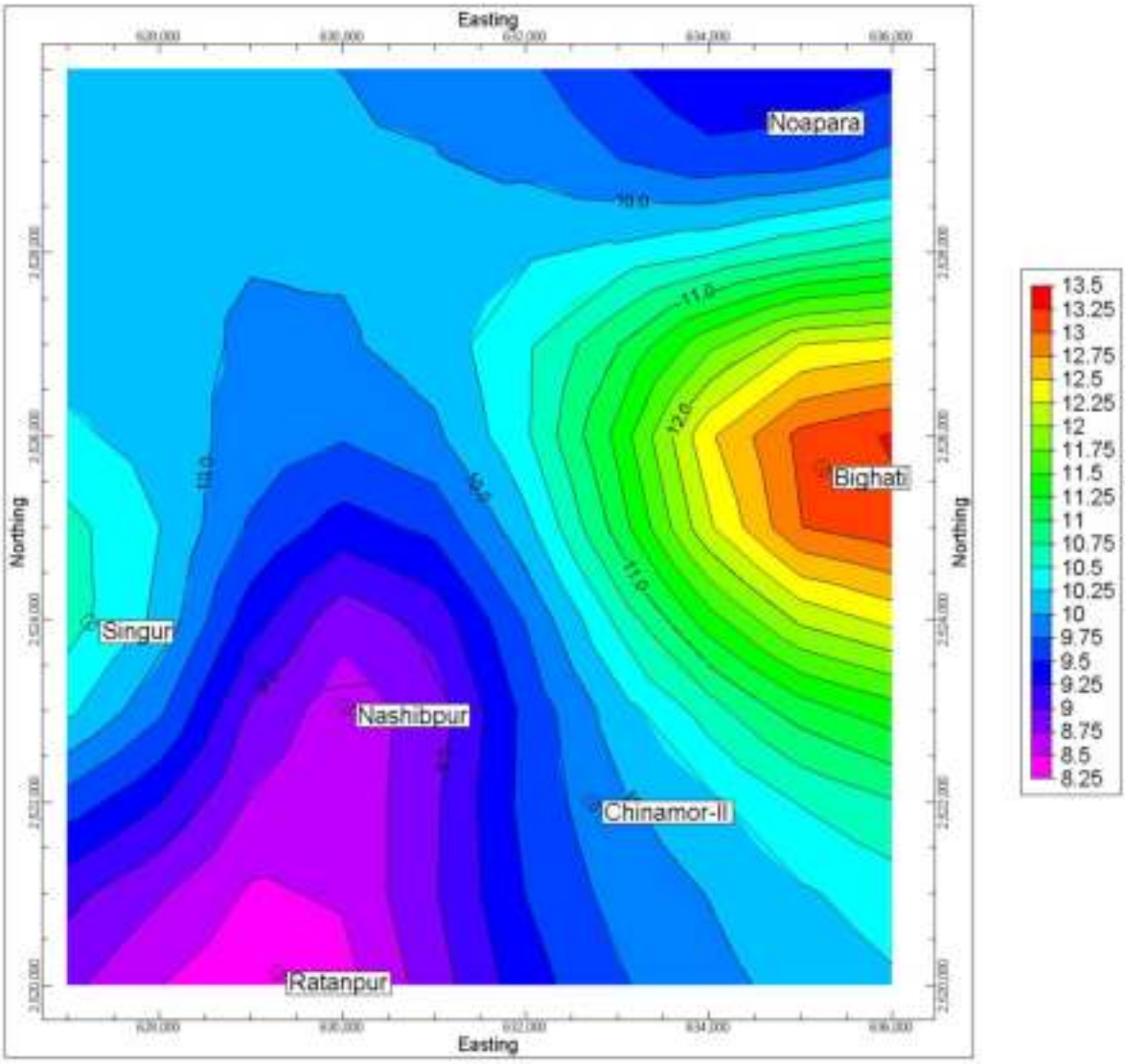

HYDROGEOLOGY MAP : WEST BENGAL
Block : SINGUR
District : HUGLI
SINGUR
SERAMPUR
UTTARPARA
CHANDITALA-I
Index

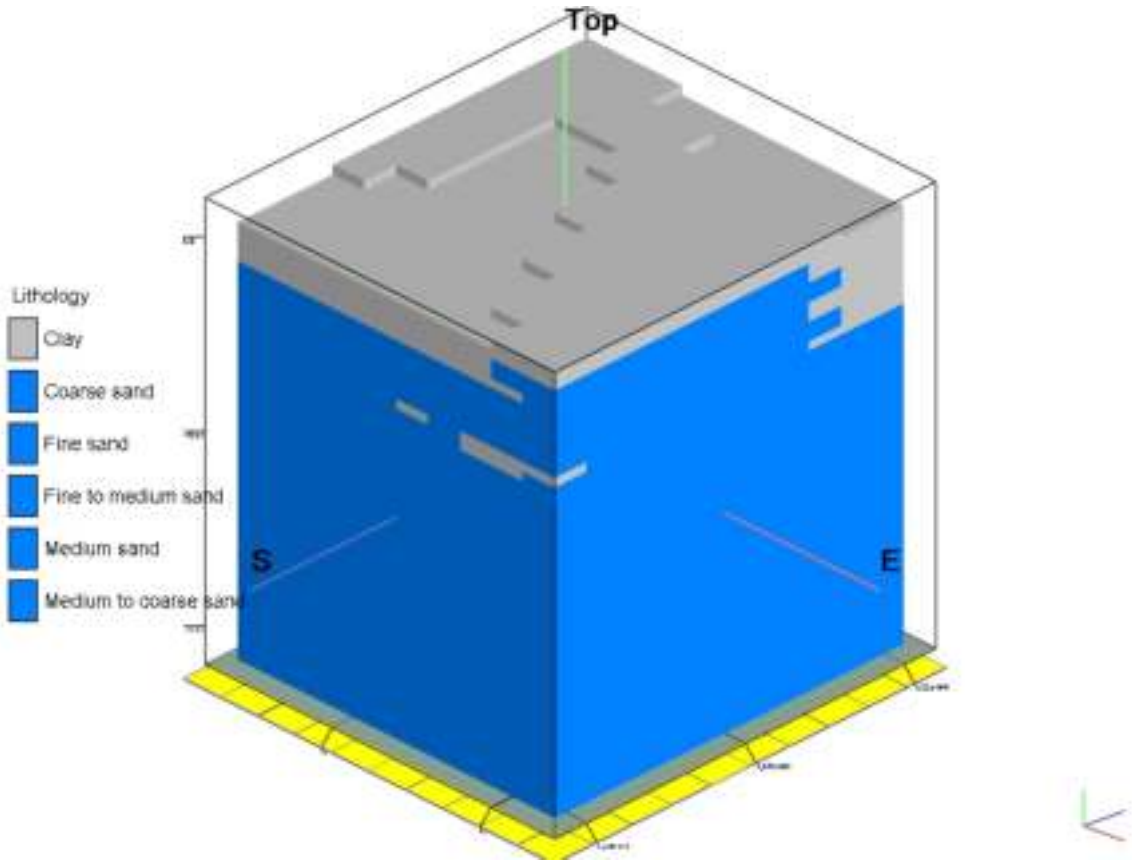
Thickness of Aquifer(Average):

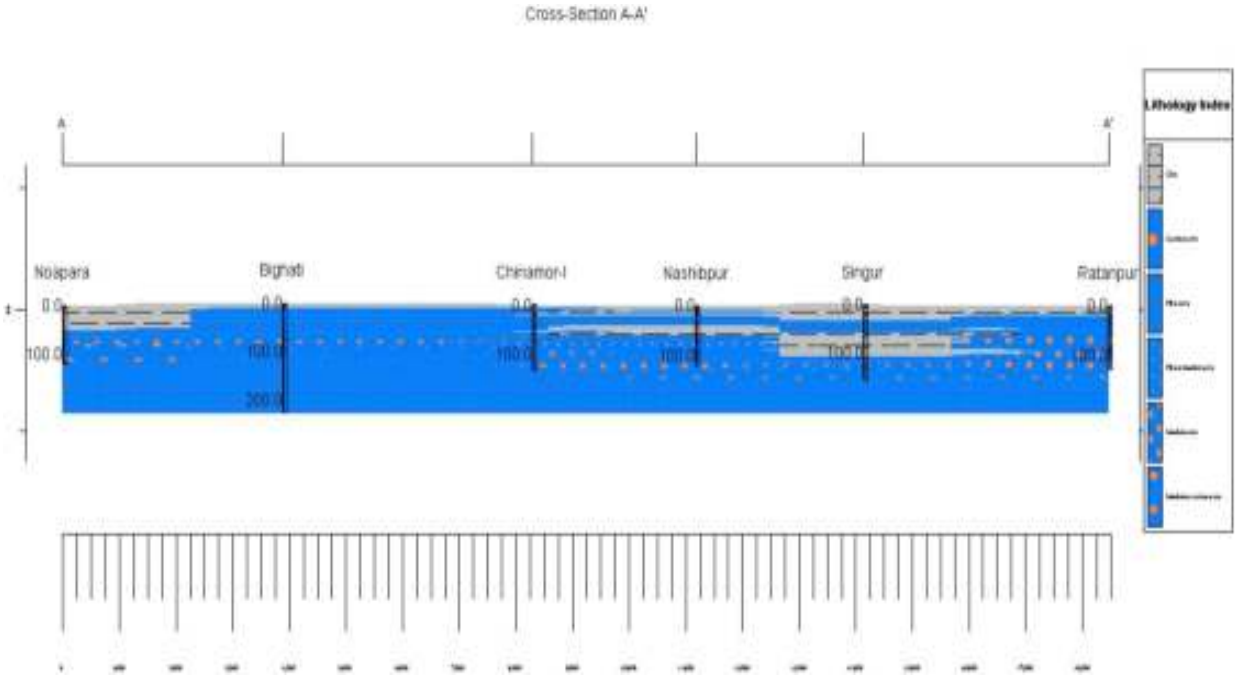
Block	Area (sq km)	Thickness of the Granular Zone in 1st aquifer (m)	Thickness of the Granular Zone /Productive Zone below pre-monsoon WL (m)
Singur	206.23	225	207.93

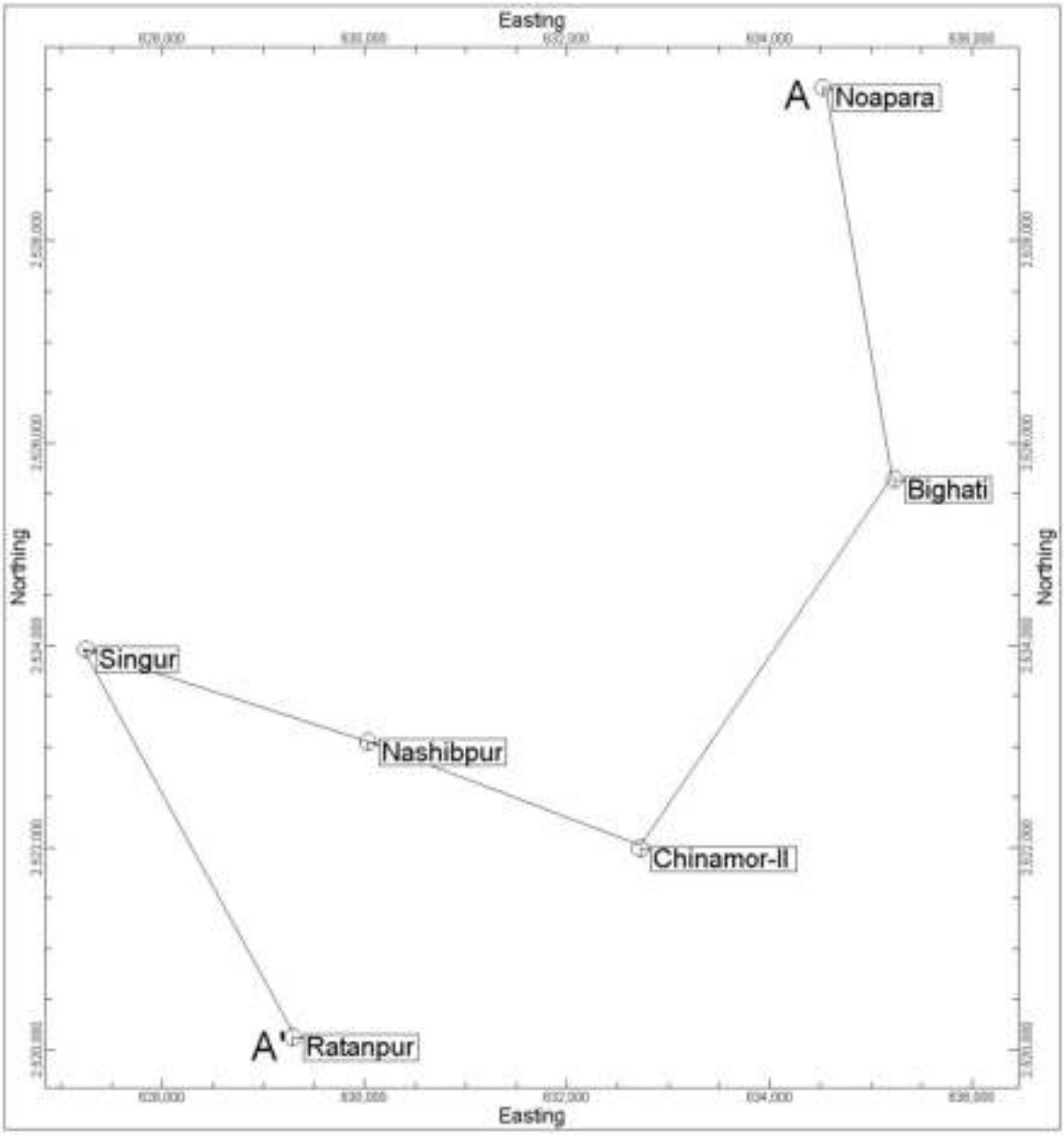
Aquifer-wise Statement

Sl. No.	Name of Block	1st Aquifer			2nd Aquifer		Remarks
		Depth Range (mbgl)	Discharge (m^3/hr)	T (m^2/day)	Depth Range/Discharge/T	Discharge (m^3/hr)	
		1st					
13	**Singur**	51-225	0.71-217.2				


Easting
Northing
Noapara
Bighati
Singur
Nashibpur
Chinamor-II
Ratanpur
13.5
13.25
13
12.75
12.5
12.25
12
11.75
11.5
11.25
11
10.75
10.5
10.25
10
9.75
9.5
9.25
9
8.75
8.5
8.25


Top
Lithology
Clay
Coarse sand
Fine sand
Fine to medium sand
Medium sand
Medium to coarse sand
S
E


Cross-Section A-A'
A
A'
Lithology Index
Nolapara
Bighati
Chinamori
Nashibpur
Singur
Ratanpur


Easting
Northing
A
Noapara
Bighati
Singur
Nashibpur
Chinamor-II
A'
Ratanpur

3)Ground Water Resource,Extraction,Contamination & Other Issues:

Aquifer Wise Resource Availability & Extraction:

Block	Net ground water availability (MCM)	Gross ground water draft (MCM)	Stage of development (%)	Category
Singur	7247.79	2648.91	36.54	Semi Critical

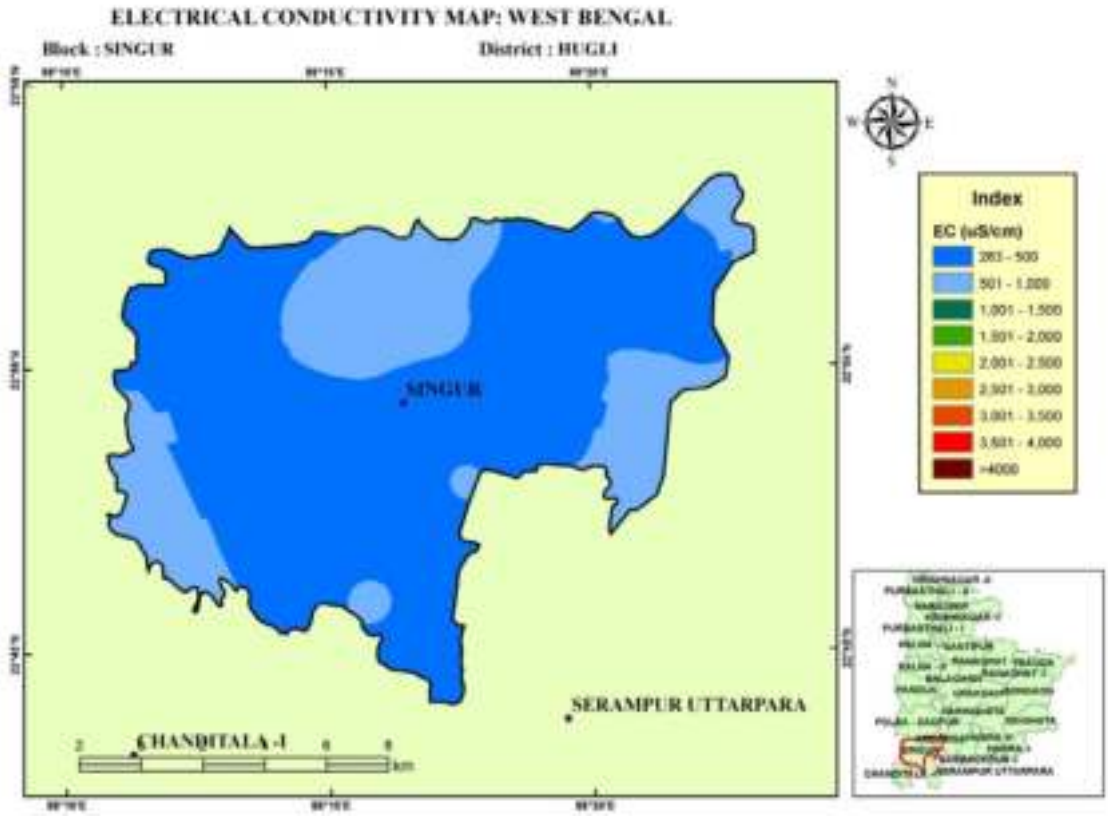
Chemical Quality Of GroundWater & Contamination:

Range Of Chemical Pollutants:

Block	As(mg/l)	Fe(mg/l)	Ec(µS/cm)	F(mg/l)	No_3(mg/l)
Singur	-	**0.07-0.78**	**450-599**	**Negligible-0.23**	**Negligible-7**


ARSENIC CONCENTRATION MAP: WEST BENGAL
Block : SINGUR
District : HUGLI
Index
Arsenic (ug/l)
(within 100m Depth)
< 10.00
10.00 - 50.00
>50.00
SINGUR
SERAMPUR UTTARPARA
CHANDITALA -I


IRON CONCENTRATION MAP: WEST BENGAL
Block : SINGUR
District : HUGLI
SINGUR
SERAMPUR UTTARPARA
CHANDITALA -I
Index
Iron (mg/l)
< 0.30
>0.30



Percentage of tube wells having arsenic content in the **block:**

SI.No.	Blocks	Arsenic (<0.01 ing/1)	Arsenic (>0.01-<0.05 mg/1)	Arsenic (> 0.05 mg/1)	Total Tube well
1					

4)Ground Water Resource Enhancement& Management Plan:

Ground Water Management Plan for Drinking purpose.

Suggestions on supply of ground water to the risk population For drinking purpose.

District	Block (As affected)	No. of habitations in the risk zone where As concentration >0.05 mg/L	No. of habitations in the risk zone where As concentration 0.01 to 0.05 mg/L	Risk Population (2011) where As concentration >0.05 mg/L
HUGLI	Singur			

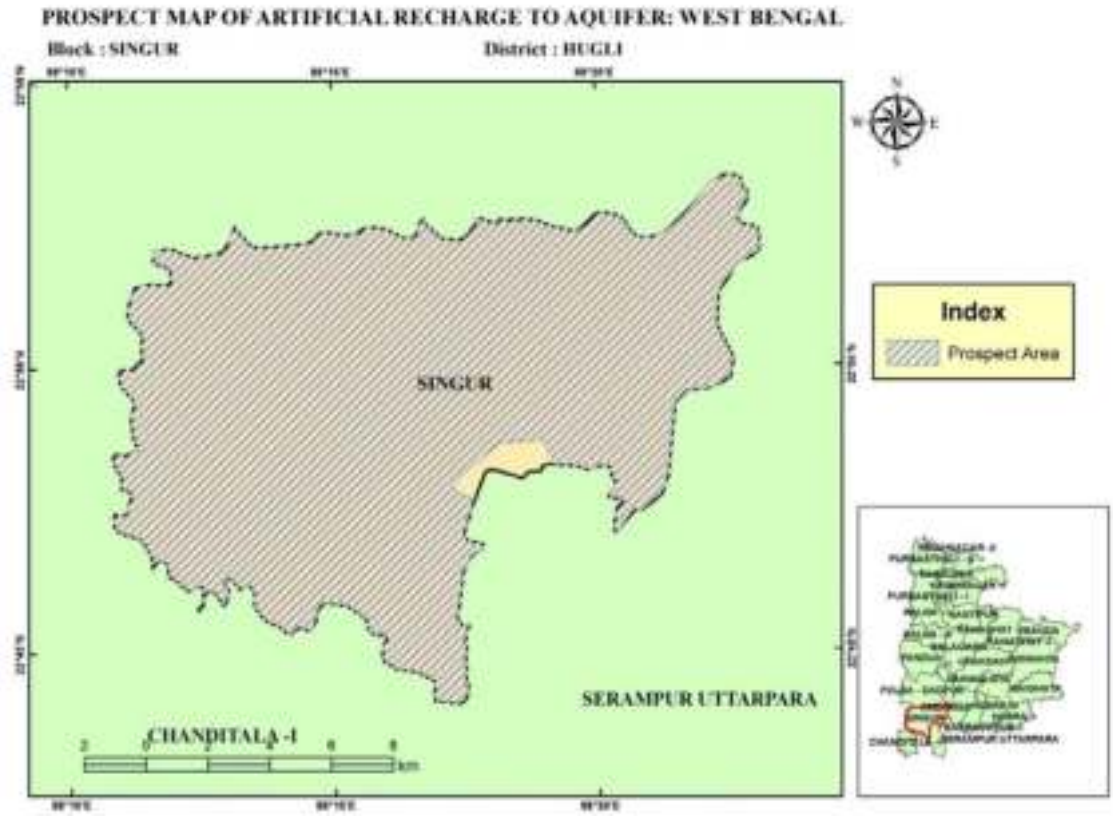
Aquifer Wise Space Available For Recharge and Proposed Interventions:

Area suitable for recharge in the study area:

District	Block Name	Area (in sq. km)	Total Area suitable for recharge (sq km.)
HUGLI	Singur	206.23	202.76

Proposed Artificial Recharge Structures in the area in :

District	Block	Total Surface water available in MCM for recharge	Source Water Allocation (MCM)			Number of Structures feasible			Structure-wise Cost Estimate in lakh Rs.			Total cost in lakh Rs
			Percolation Tanks	REET with RS	Injection Well	Percolation Tanks	REET with RS	Injection Well	Percolation Tanks	REET with RS	Injection Well	
HUGLI	Singur	154.26	72	41	41	145	410	137	2900	3280	548	6728



Ground Water Management Plan For Irrigation Purpose.

Area in sq, km.

Sr No.	Name of Block	Cultivable area in ha	Net irrigated area in ha	Area to be irrigated in ha	SOD in %	Category
1	Singur	10069	3117	6952.00	36.54	Semi Critical

1)Salient Information

Block Name: Srirampur-Uttarpara

Area(in Km^2): 93.07

District: Hugly

State:West Bengal

Population(as on 2011):

Name of the Block	Population of CD Block (2011 census)
Srirampur-Uttarpara	36389

Approximate Decadal Growth Rate from 2001-2011:

Rainfall:

Average annual rainfall in : **Srirampur-Uttarpara**

(as in the district) for the period 2009 -13 (in mm)

Block	Normal	Actual (Annual)				
		2009	2010	2011	2012	2013
Srirampur-Uttarpara	1516	1263	1044	1556	1152	1494

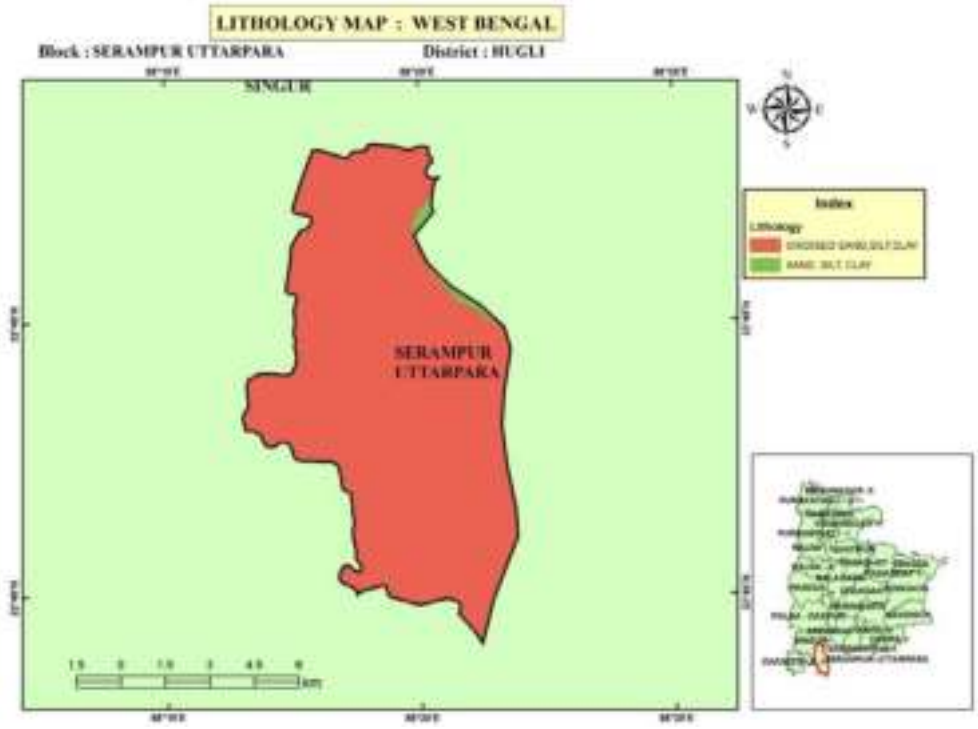
Aquifer Wise Ground Water Resource Availability & Extraction:

(in MCM)

Resource Availability	Aquifer I	Aquifer II	Extraction (for Aquifer I)
Dynamic Resource	3447.94	-	0.167526
Static Resource	2802.37	-	-

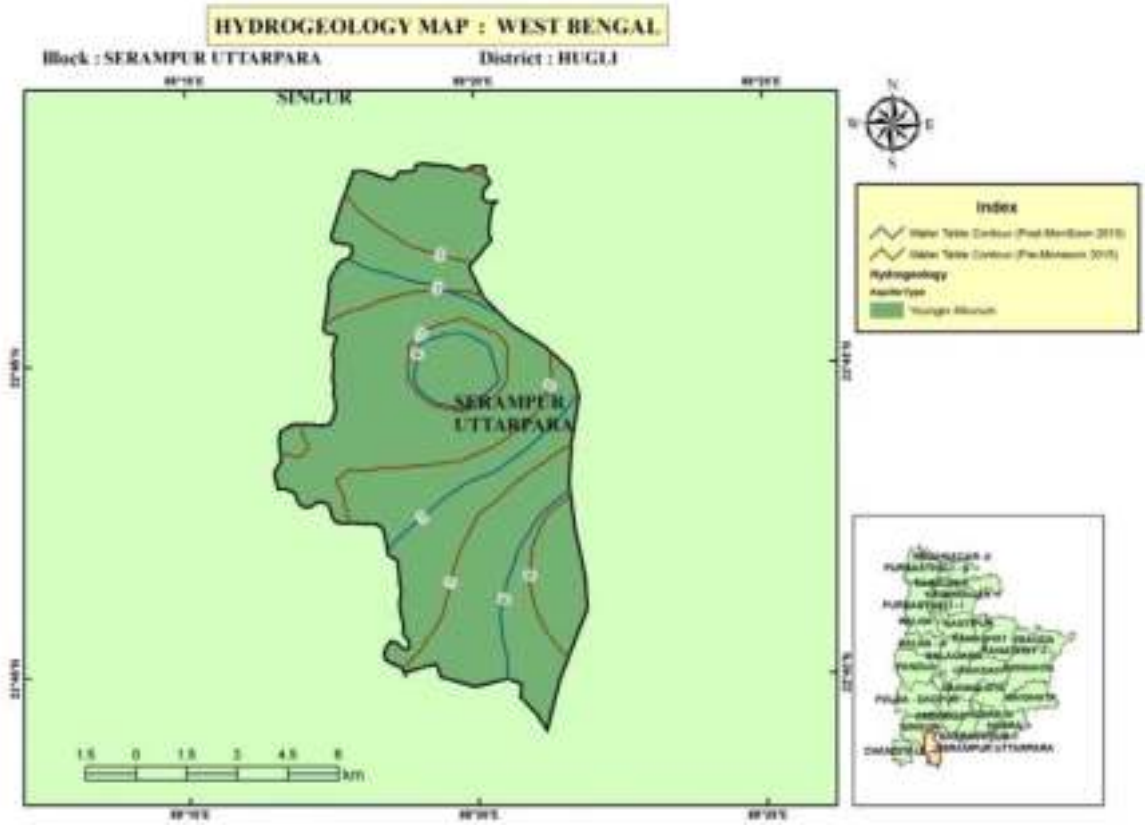
2)Disposition of Aquifer:

Block	Depth range of Aquifer in m bgl	
Srirampur-Uttarpara	1st Aquifer	2nd aquifer
	15-18, 48-196	



Aquifer Wise Water Level Ranges & Pre-monsoon and Post-monsoon long term water level trends (1995 to 2011)

Sl. No.	Block	Aquifer	Pre-monsoon Trend		Post-monsoon Trend	
			Water Level Range(mbgl)	**Pre trend (- rising & + Falling)**	Water Level Range(mbgl)	**Pre trend (- rising & + Falling)**
1.	Srirampur-Uttarpara	1		14.51		16.17
2.	Srirampur-Uttarpara	2				

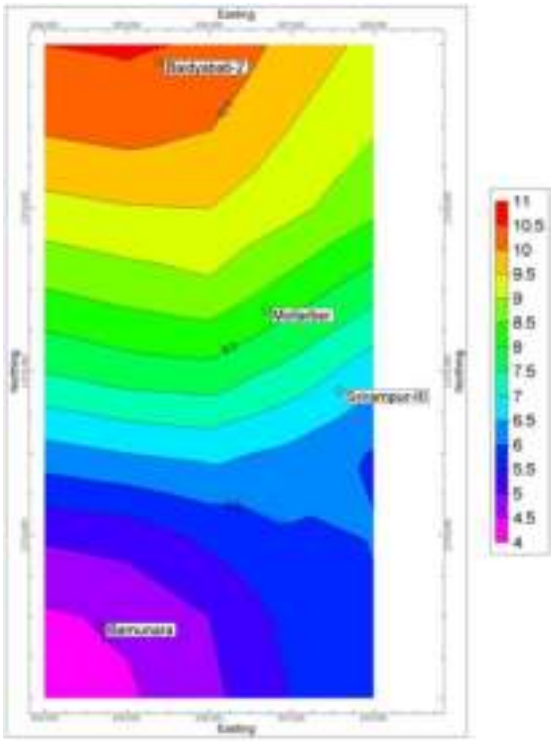


Thickness of Aquifer(Average):

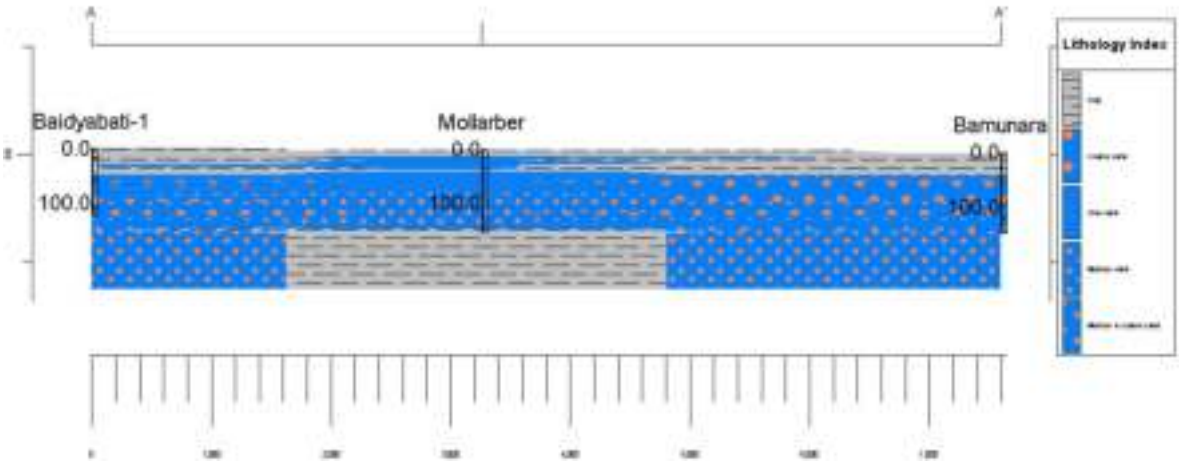
Block	Geographic Area (sq km)	Thickness of the Granular Zone in 1st aquifer (m)	Thickness of the Granular Zone /Productive Zone below pre-monsoon WL (m)
Srirampur-Uttarpara	93.07	196	188.19

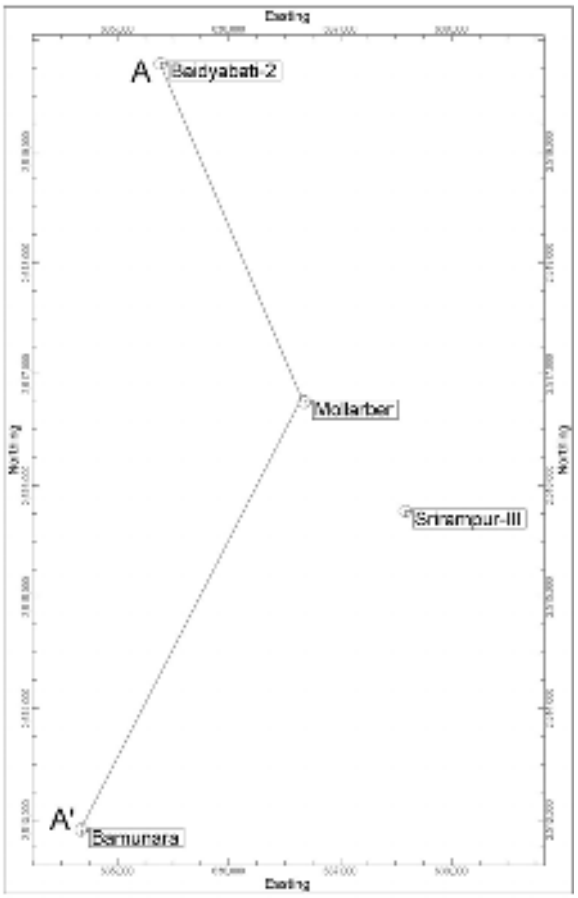
Aquifer-wise Statement

Sl. No.	Name of Block	1st Aquifer			2nd Aquifer		Remarks
		Depth Range (mbgl)	Discharge (m^3/hr)	T (m^2/day)	Depth Range/Discharge/T	Discharge (m^3/hr)	
		1st					
13	Srirampur-Uttarpara	15-196	273.0				



Cross-Section A-A'





3)Ground Water Resource,Extraction,Contamination & Other Issues:

Aquifer Wise Resource Availability & Extraction:

Block	Net ground water availability (MCM)	Gross ground water draft (MCM)	Stage of development (%)	Category
Shrirampur	3447.94	1717.38	49.81	Safe

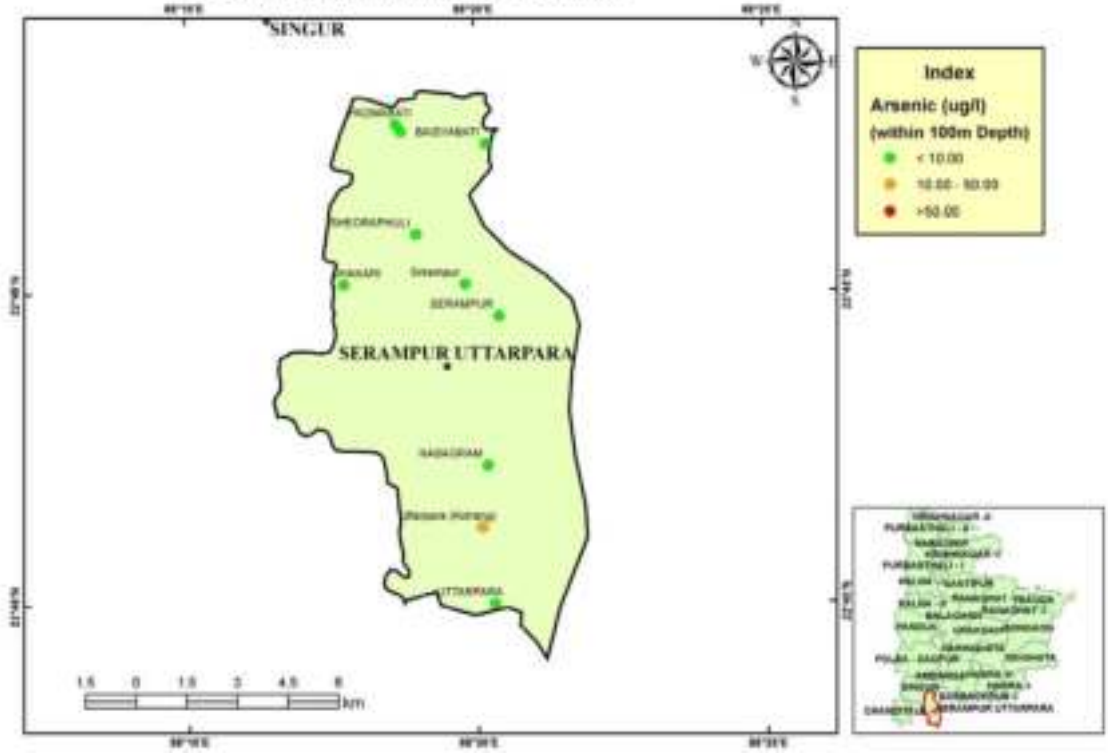
Chemical Quality Of GroundWater & Contamination:

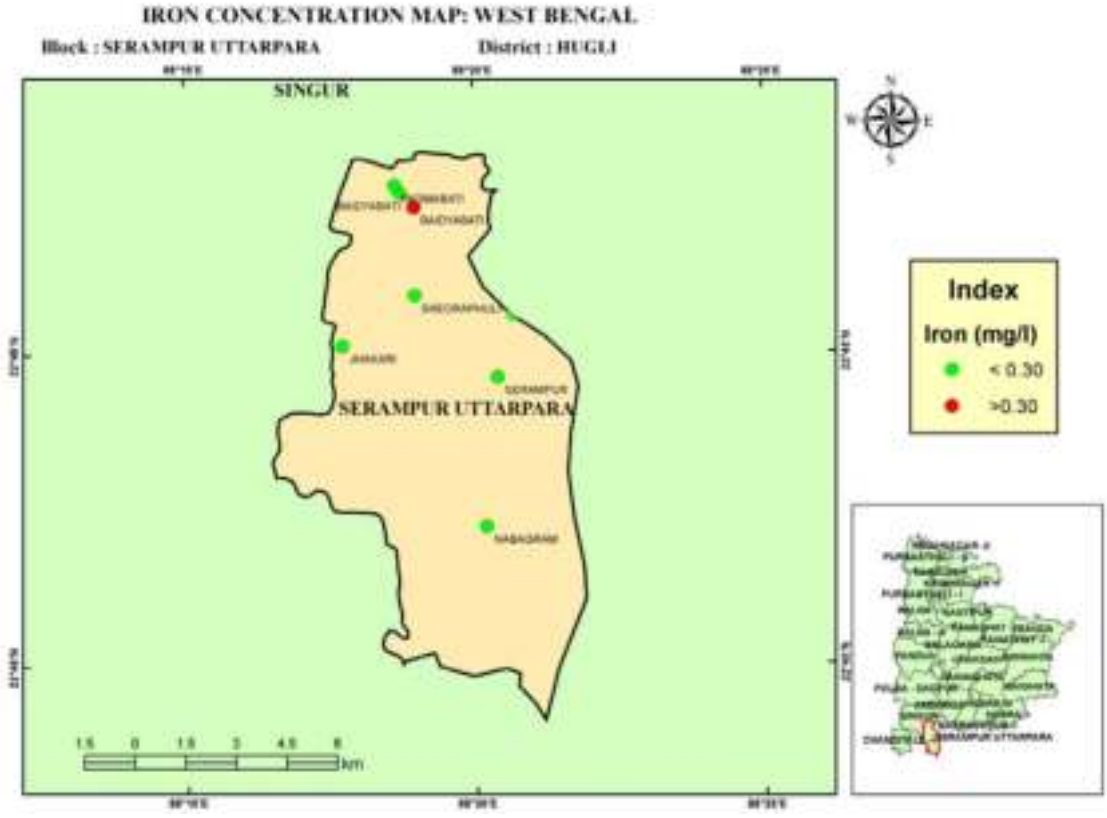
Range Of Chemical Pollutants:

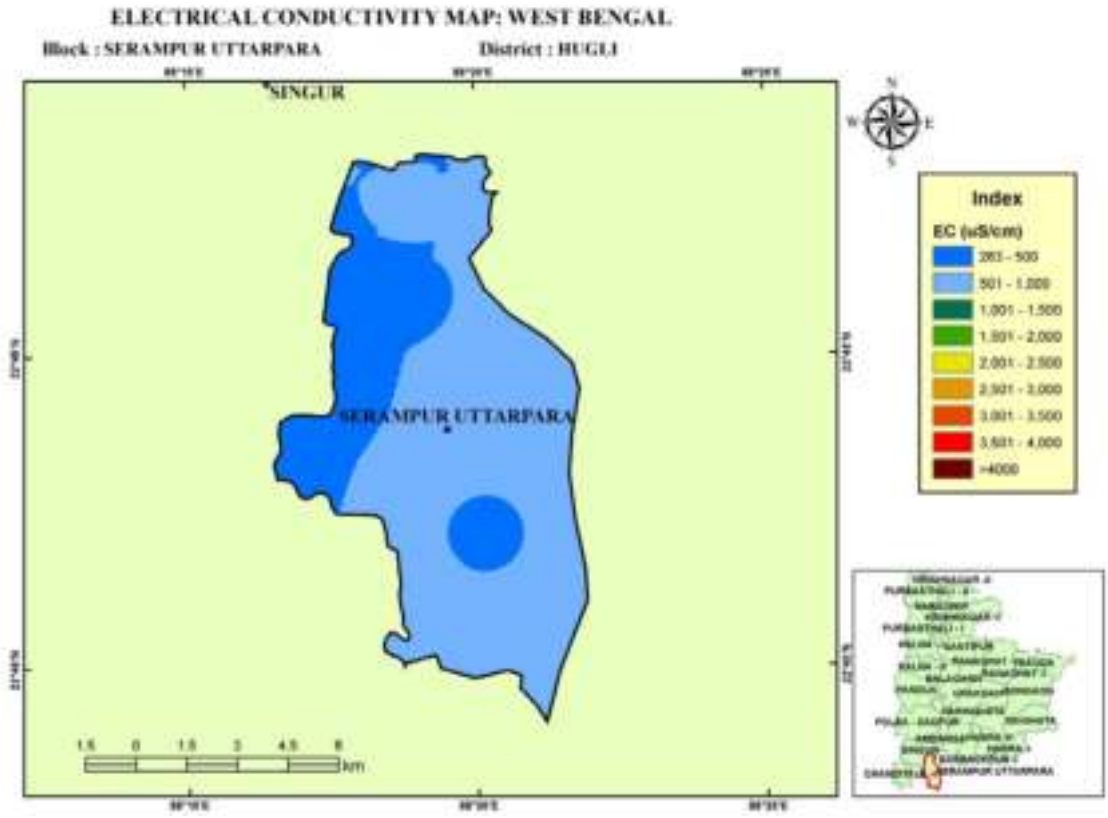
Block	As(mg/l)	Fe(mg/l)	Ec(µS/cm)	F(mg/l)	No_3(mg/l)
Shrirampur	-	**0.1-0.86**	**448-572**	**Negligible-0.28**	**Negligible-17**

ARSENIC CONCENTRATION MAP: WEST BENGAL

Block : SERAMPUR UTTARPARA District : HUGLI




IRON CONCENTRATION MAP: WEST BENGAL
Block : SERAMPUR UTTARPARA
District : HUGLI
SINGUR
SERAMPUR UTTARPARA
Index
Iron (mg/l)
< 0.30
>0.30
km



Percentage of tube wells having arsenic content in the **block:**

SI.No.	Blocks	Arsenic (<0.01 ing/1)	Arsenic (>0.01-<0.05 mg/1)	Arsenic (> 0.05 mg/1)	Total Tube well
1	Shrirampur				

4)Ground Water Resource Enhancement& Management Plan:

Ground Water Management Plan for Drinking purpose.

Suggestions on supply of ground water to the risk population For drinking purpose.

District	Block (As affected)	No. of habitations in the risk zone where As concentration >0.05 mg/L	No. of habitations in the risk zone where As concentration 0.01 to 0.05 mg/L	Risk Population (2011) where As concentration >0.05 mg/L
HUGLI	Shrirampur	-	-	-

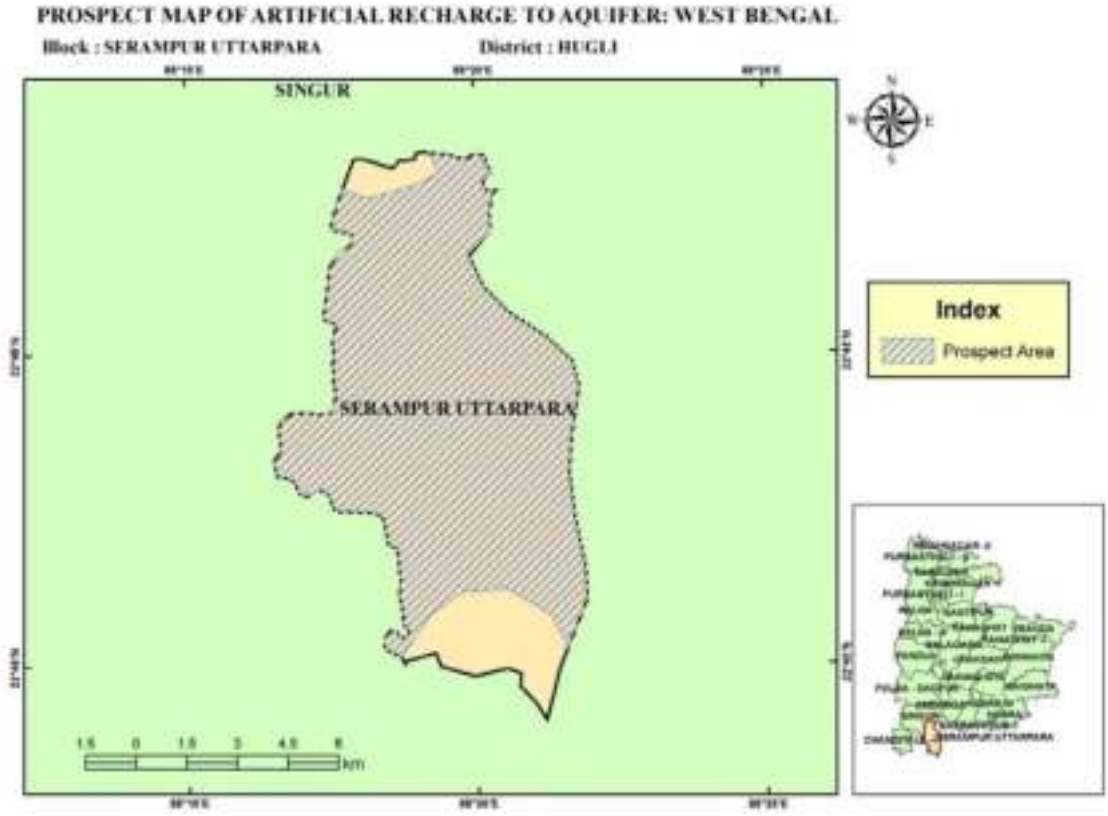
Aquifer Wise Space Available For Recharge and Proposed Interventions:

Area suitable for recharge in the study area:

District	Block Name	Area (in sq. km)	Total Area suitable for recharge (sq km.)
HUGLI	Shrirampur	93.07	80.36

Proposed Artificial Recharge Structures in the area in :

District	Block	Total Surface water available in MCM for rechargе	Source Water Allocation (MCM)			Number of Structures feasible			Structure-wise Cost Estimate in lakh Rs.			Total cost in lakh Rs
			Percolation Tanks	REET with RS	Injection Well	Percolation Tanks	REET with RS	Injection Well	Percolation Tanks	REET with RS	Injection Well	
HUGLI	Shrirampur	28.80	14	8	8	27	76	25	540	608	100	1248



Ground Water Management Plan For Irrigation Purpose.

Area in sq, km.

Sr No.	Name of Block	Cultivable area in ha	Net irrigated area in ha	Area to be irrigated in ha	SOD in %	Category
1	Srirampur-Uttarpara	1342	419	923.00	49.81	Safe

Chakdah

1)Salient Information

Block Name: Chakdah

Area(in Km^2): 346.61

District: Nadia

State:West Bengal

Population(as on 2011):

Name of the Block	Population of CD Block (2011 census)
Chakdah	314383

Approximate Decadal Growth Rate from 2001-2011:

Rainfall:

Average annual rainfall in **: Chakdah**

(as in the district) for the period 2009 -13 (in mm)

Block	Normal	Actual (Annual)				
		2009	2010	2011	2012	2013
Chakdah	1401	1209	940	1488	1039	1245

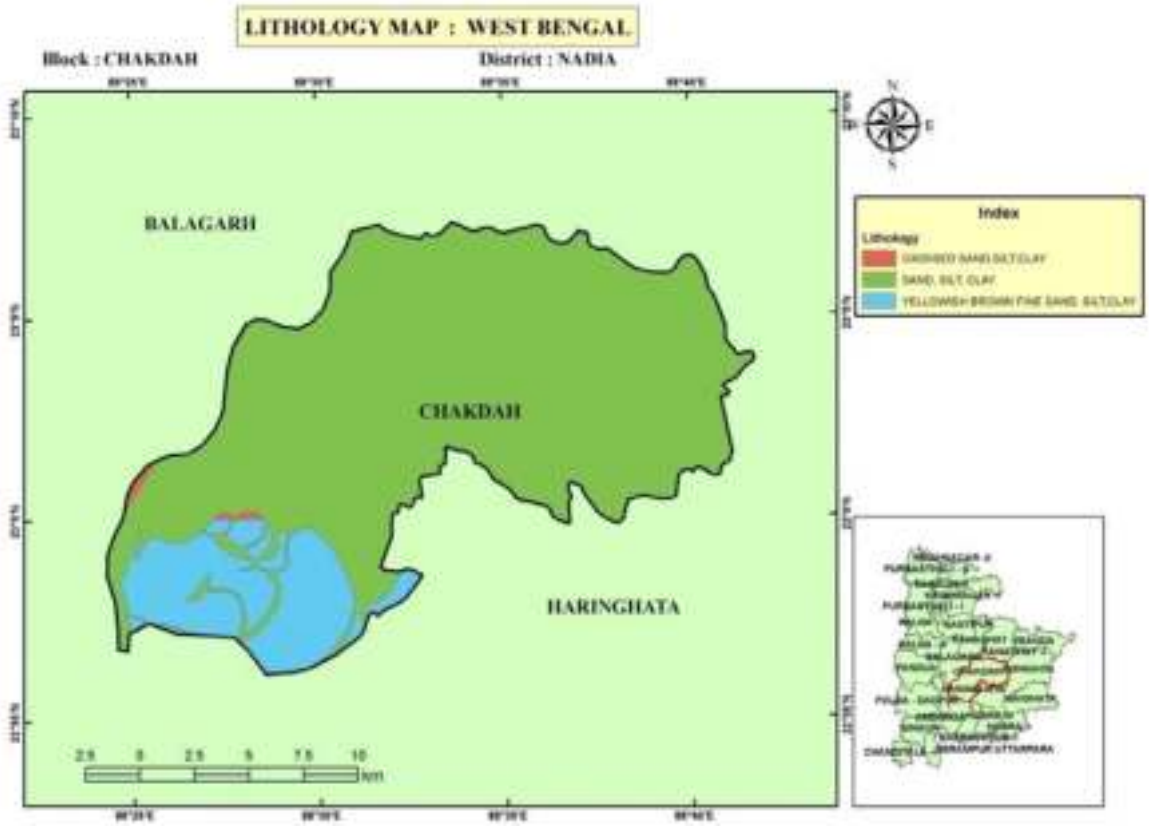
Aquifer Wise Ground Water Resource Availability & Extraction:

(in MCM)

Resource Availability	Aquifer I	Aquifer II	Extraction (for Aquifer I)
Dynamic Resource	16057.89	-	0.623898
Static Resource	7726.63	-	-

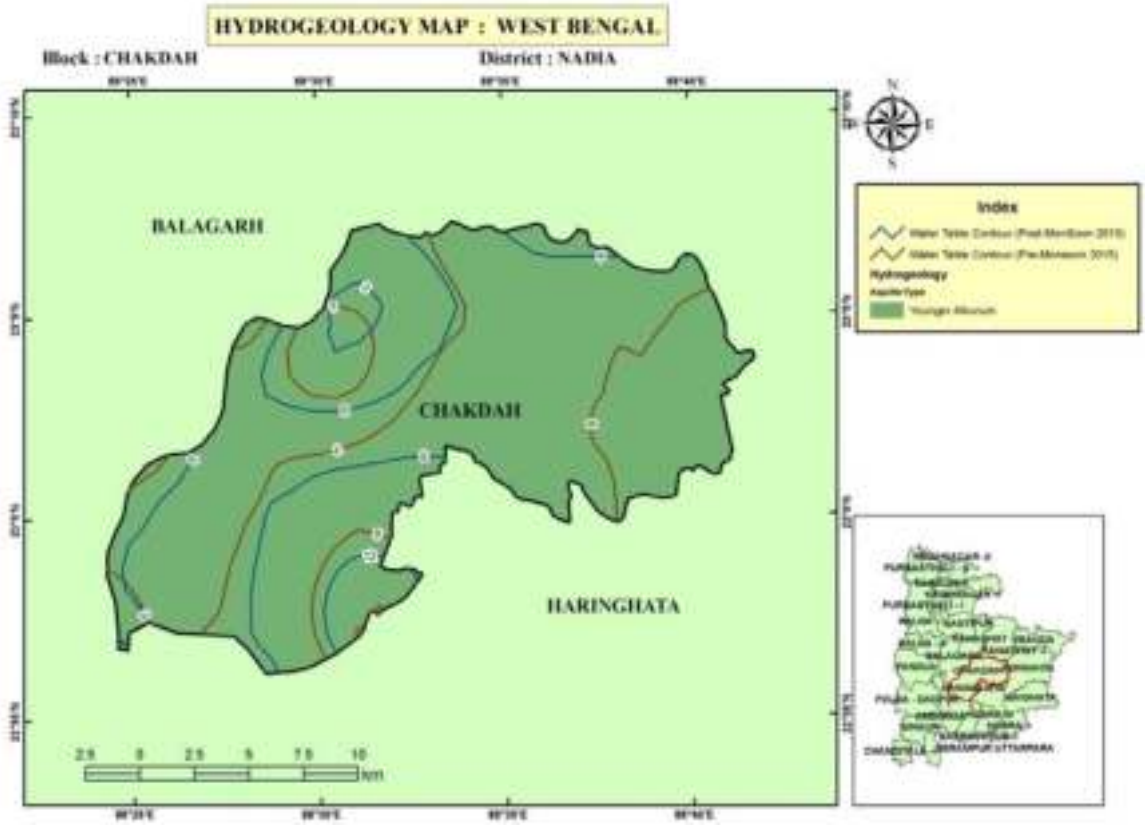
2)Disposition of Aquifer:

Block	Depth range of Aquifer in m bgl	
	1st Aquifer	2nd aquifer
Chakdah	12-120	



Aquifer Wise Water Level Ranges & Pre-monsoon and Post-monsoon long term water level trends (1995 to 2011)

Sl. No.	Block	Aquifer	Pre-monsoon Trend		Post-monsoon Trend	
			Water Level Range(mbgl)	**Pre trend (- rising & + Falling)**	Water Level Range(mbgl)	**Post trend (- rising & + Falling)**
1.	**Chakdah**	**1**	**1-8.59**	**6.09**	**1.81-8.75**	**11.63**
2.	**Chakdah**	**2**	**-**	**-**	**-**	**-**

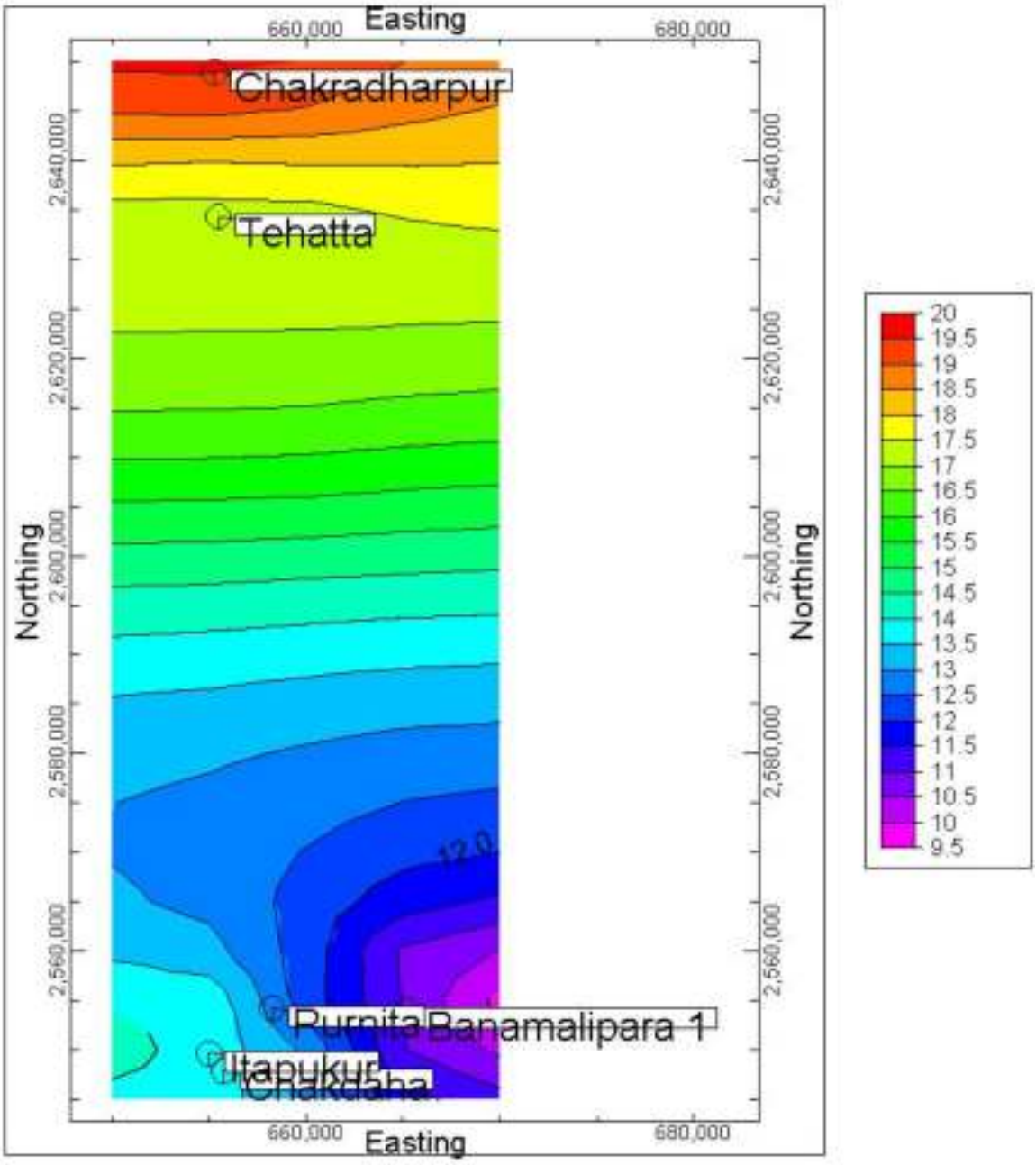


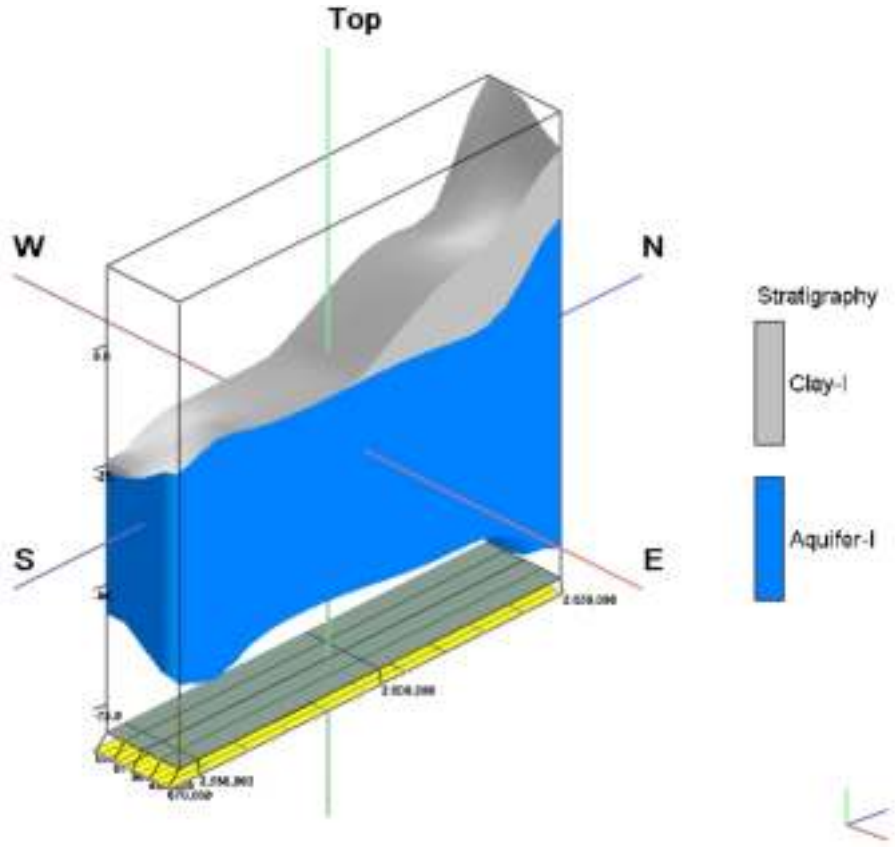
Thickness of Aquifer(Average):

Block	Geographic Area (sq km)	Thickness of the Granular Zone in 1st aquifer (m)	Thickness of the Granular Zone /Productive Zone below pre-monsoon WL (m
Chakdah	346.61	120	111.46

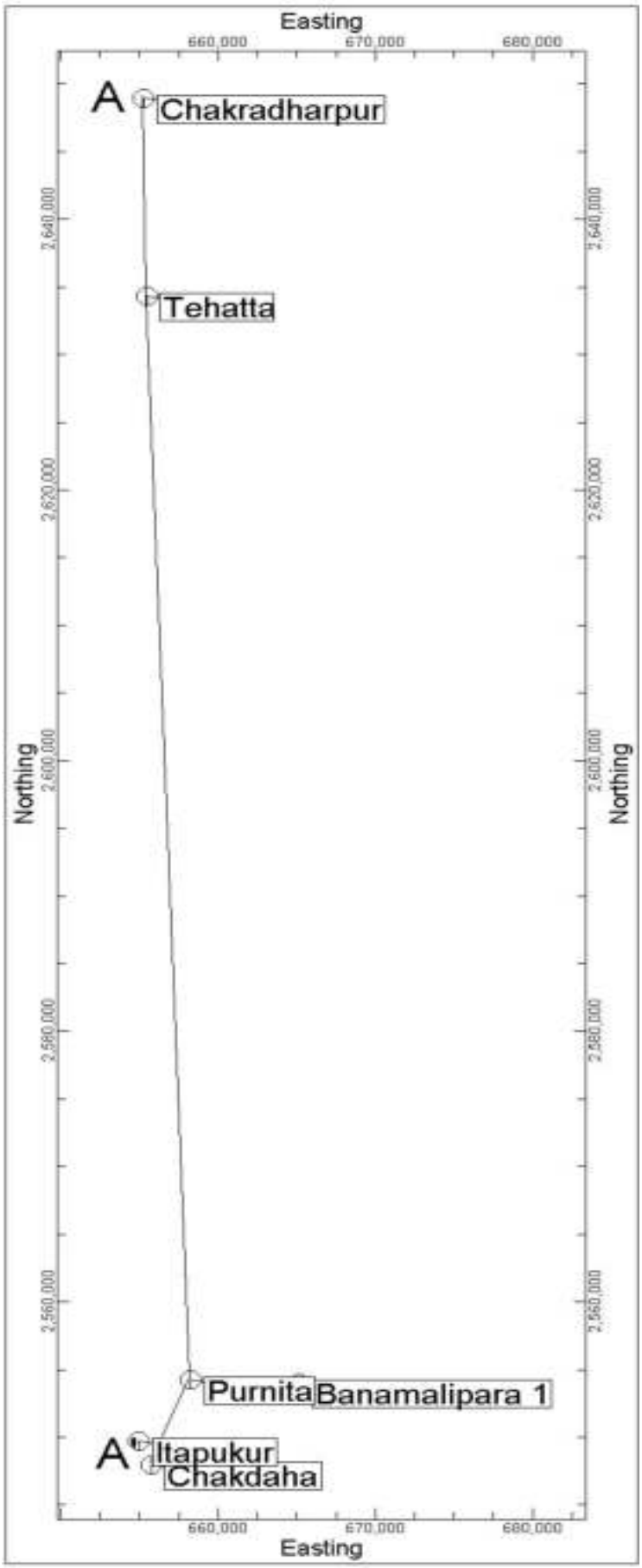
Aquifer-wise Statement

Sl. No.	Name of Block	1st Aquifer			2nd Aquifer		Remarks T (m^2/day)
		Depth Range (mbgl)	Discharge (m^3/hr)	T (m^2/day)	Depth Range	Discharge (m^3/hr)	
		1st					
13	Chakdah	12-120	36-223.88	753.78			


Easting
660,000
680,000
Chakradharpur
Tehatta
Purnita
Banamalipara 1
Itapukur
2,640,000
2,620,000
2,600,000
2,580,000
2,560,000
Northing
20
19.5
19
18.5
18
17.5
17
16.5
16
15.5
15
14.5
14
13.5
13
12.5
12
11.5
11
10.5
10
9.5


Top
W
N
S
E
Stratigraphy
Clay-I
Aquifer-I


Chakradharpur
Tehatta
Pumita
Chakdaha
A
A'
Lithology Index
Clay
Coarse sand
Fine sand
Fine to medium sand
Medium sand
Medium to coarse sand


Easting
660,000
670,000
680,000
A
Chakradharpur
Tehatta
Purnita
Banamalipara 1
A'
Itapukur
Chakdaha
2,640,000
2,620,000
2,600,000
2,580,000
2,560,000
Northing
Northing
660,000
670,000
680,000
Easting

3)Ground Water Resource,Extraction,Contamination & Other Issues:

Aquifer Wise Resource Availability & Extraction:

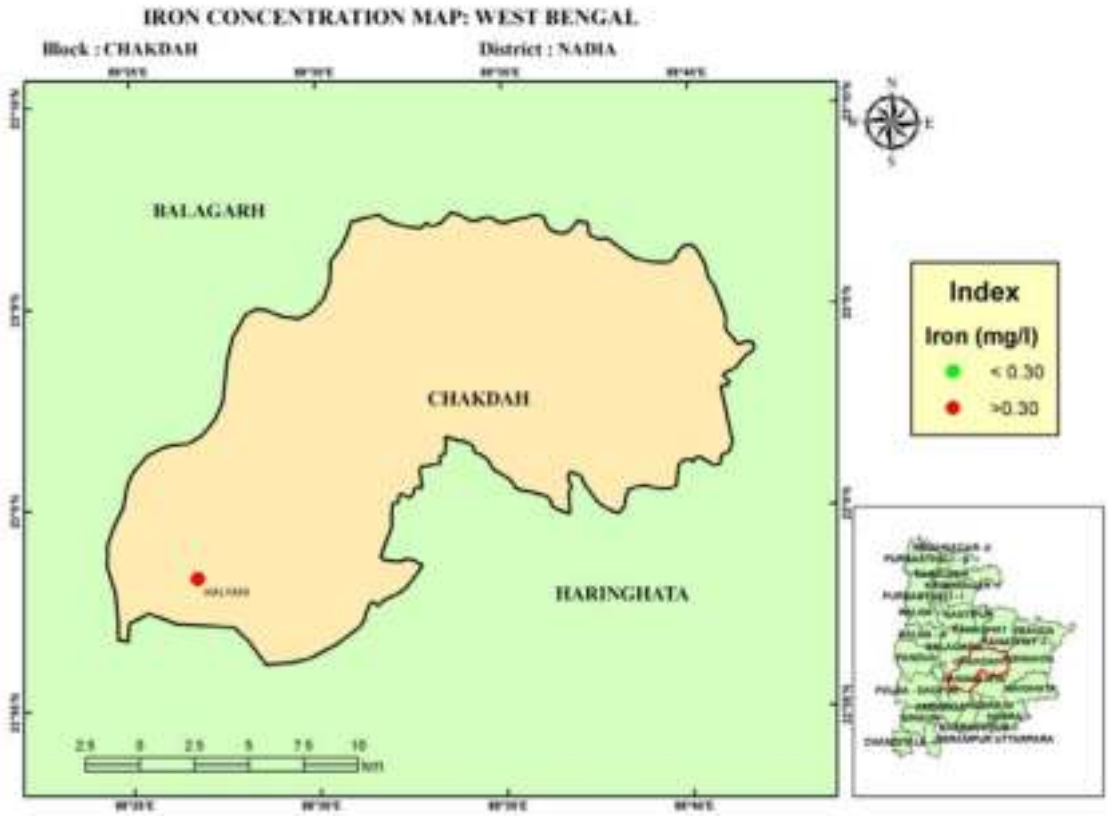
Block	Net ground water availability (MCM)	Gross ground water draft (MCM)	Stage of development (%)	Category
Chakdah	16057.89	8451.31	52.63	Safe

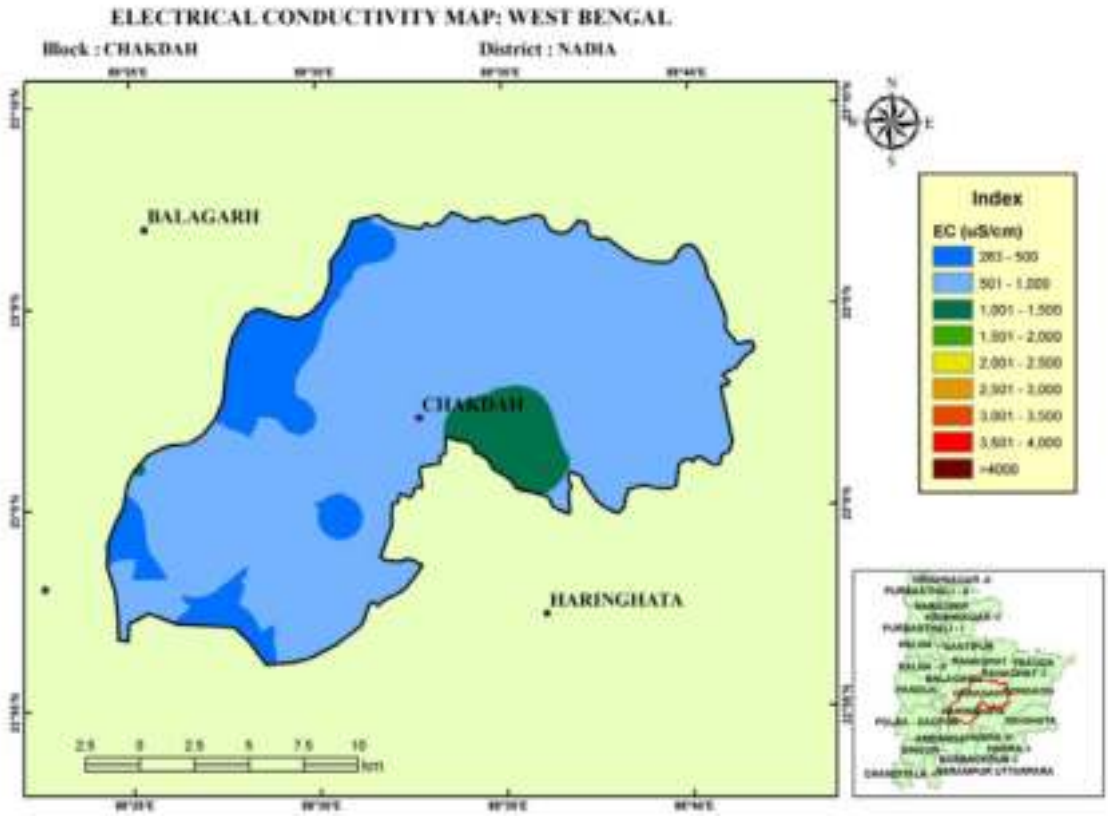
Chemical Quality Of GroundWater & Contamination:

Range Of Chemical Pollutants:

Block	As(mg/l)	Fe(mg/l)	Ec(µS/cm)	F(mg/l)	No_3(mg/l)
Chakdah	**Negligible-0.009**	**-**	**434-1430**	**Bdl-0.53**	**0-8.7**


ARSENIC CONCENTRATION MAP: WEST BENGAL
Block : CHAKDAH
District : NADIA
Index
Arsenic (ug/l)
(within 100m Depth)
< 10.00
10.00 - 50.00
>50.00
BALAGARH
CHAKDAH
HARINGHATA
2.5 0 2.5 5 7.5 10
km


IRON CONCENTRATION MAP: WEST BENGAL
Block : CHAKDAH
District : NADIA
BALAGARH
CHAKDAH
HARINGHATA
Index
Iron (mg/l)
< 0.30
>0.30
2.5 0 2.5 5 7.5 10
km



Percentage of tube wells having arsenic content in the **block:**

SI.No.	Blocks	Arsenic (<0.01 ing/1)	Arsenic (>0.01-<0.05 mg/1)	Arsenic (> 0.05 mg/1)	Total Tube well
1	**Chakdah**	27.49	38.05	34.42	2263

4)Ground Water Resource Enhancement& Management Plan:

Ground Water Management Plan for Drinking purpose.

Suggestions on supply of ground water to the risk population For drinking purpose.

District	Block (As affected)	No. of habitations in the risk zone where As concentration >0.05 mg/L	No. of habitations in the risk zone where As concentration 0.01 to 0.05 mg/L	Risk Population (2011) where As concentration >0.05 mg/L
NADIA	CHAKDAH	168	47	314383

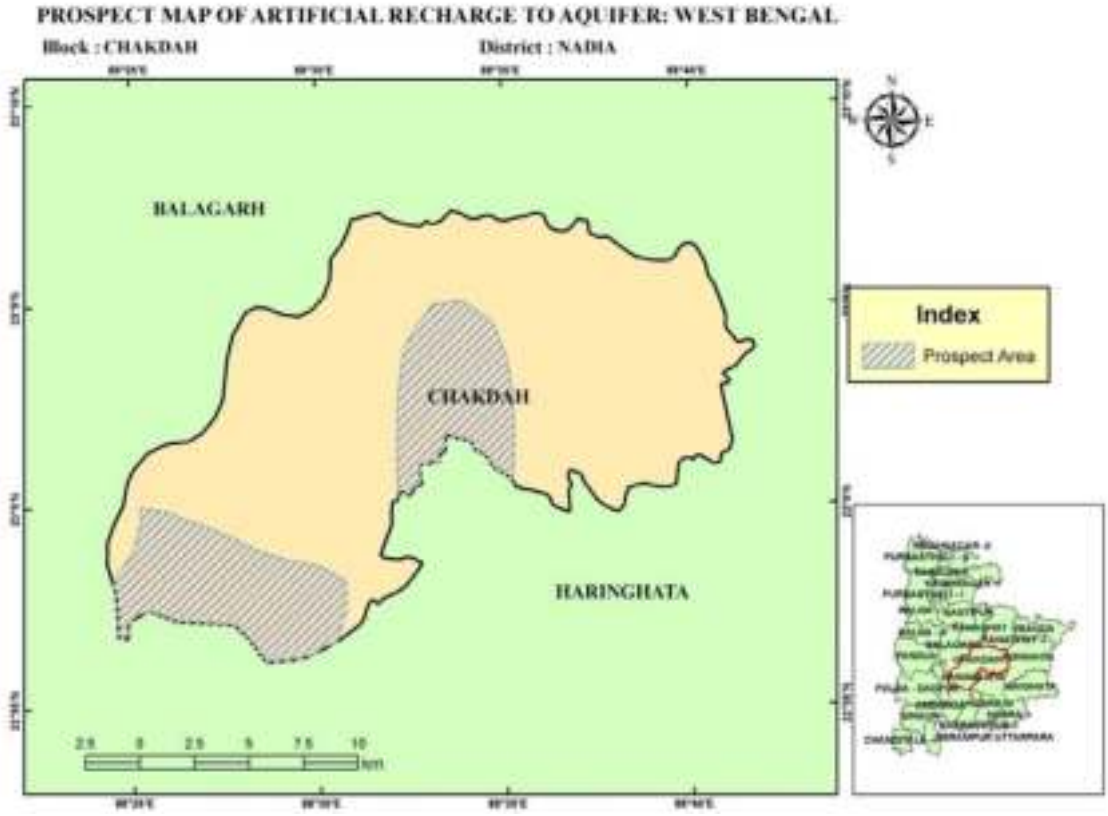
Aquifer Wise Space Available For Recharge and Proposed Interventions:

Area suitable for recharge in the study area:

District	Block Name	Area (in sq. km)	Total Area suitable for recharge (sq km.)
NADIA	Chakdah	346.61	80.48

Proposed Artificial Recharge Structures in the area in :

District	Block	Total Surface water available in MCM for rechargе	Source Water Allocation (MCM)			Number of Structures feasible			Structure-wise Cost Estimate in lakh Rs.			Total cost in lakh Rs
			Percolation Tanks	REET with RS	Injection Well	Percolation Tanks	RET with RS	Injection Well	Percolation Tanks	REET with RS	Injection Well	
NADIA	Chakdah	16.41	8	4	4	15	44	15	300	352	60	712



Ground Water Management Plan For Irrigation Purpose.

Area in sq, km.

Sr No.	Name of Block	Cultivable area in ha	Net irrigated area in ha	Area to be irrigated in ha	SOD in %	Category
1	Chakdah	20683	7871	12812.00	52.63	Safe

Haringhata

1)Salient Information

Block Name: Haringhata

Area(in Km^2): 164.28

District: Nadia

State:West Bengal

Population(as on 2011):

Name of the Block	Population of CD Block (2011 census)
Haringhata	207459

Approximate Decadal Growth Rate from 2001-2011:

Rainfall:

Average annual rainfall in **: Haringhata**

(as in the district) for the period 2009 -13 (in mm)

Block	Normal	Actual (Annual)				
		2009	2010	2011	2012	2013
Haringhata	1401	1209	940	1488	1039	1245

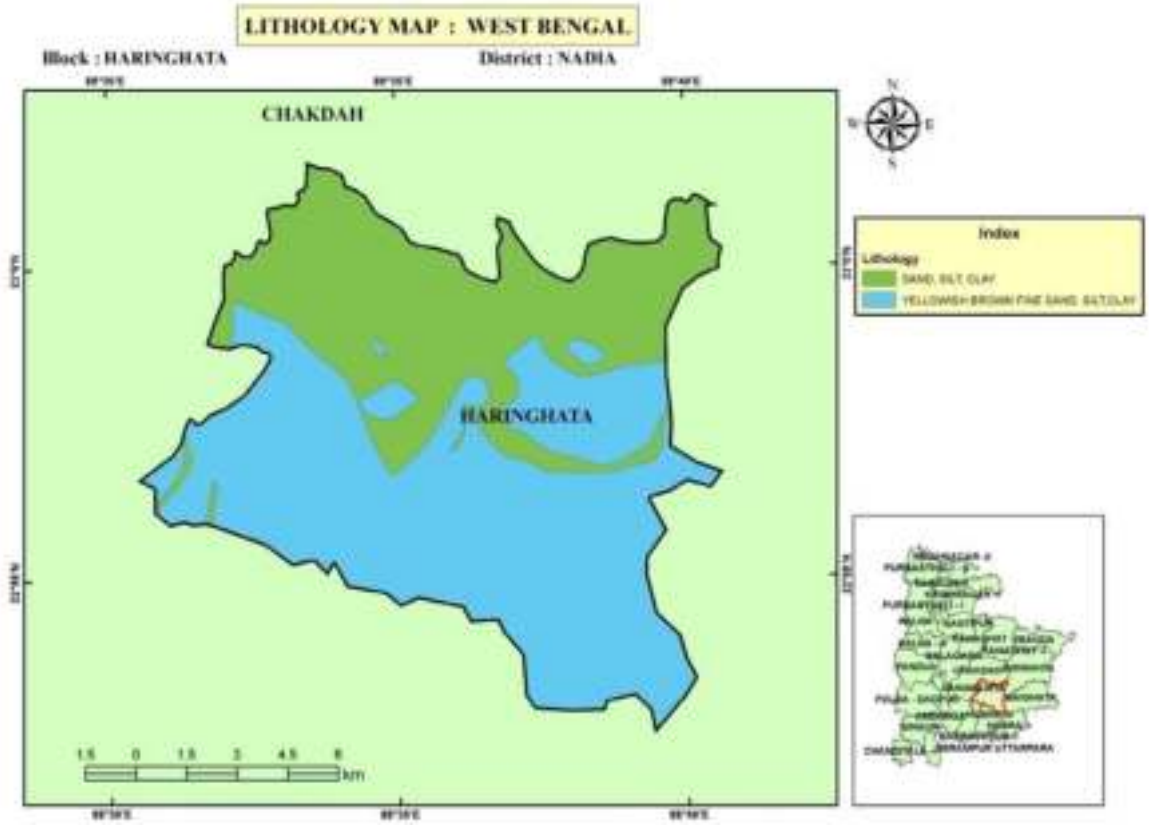
Aquifer Wise Ground Water Resource Availability & Extraction:

(in MCM)

Resource Availability	Aquifer I	Aquifer II	Extraction (for Aquifer I)
Dynamic Resource	8321.47	-	0.295704
Static Resource	4711.55	-	-

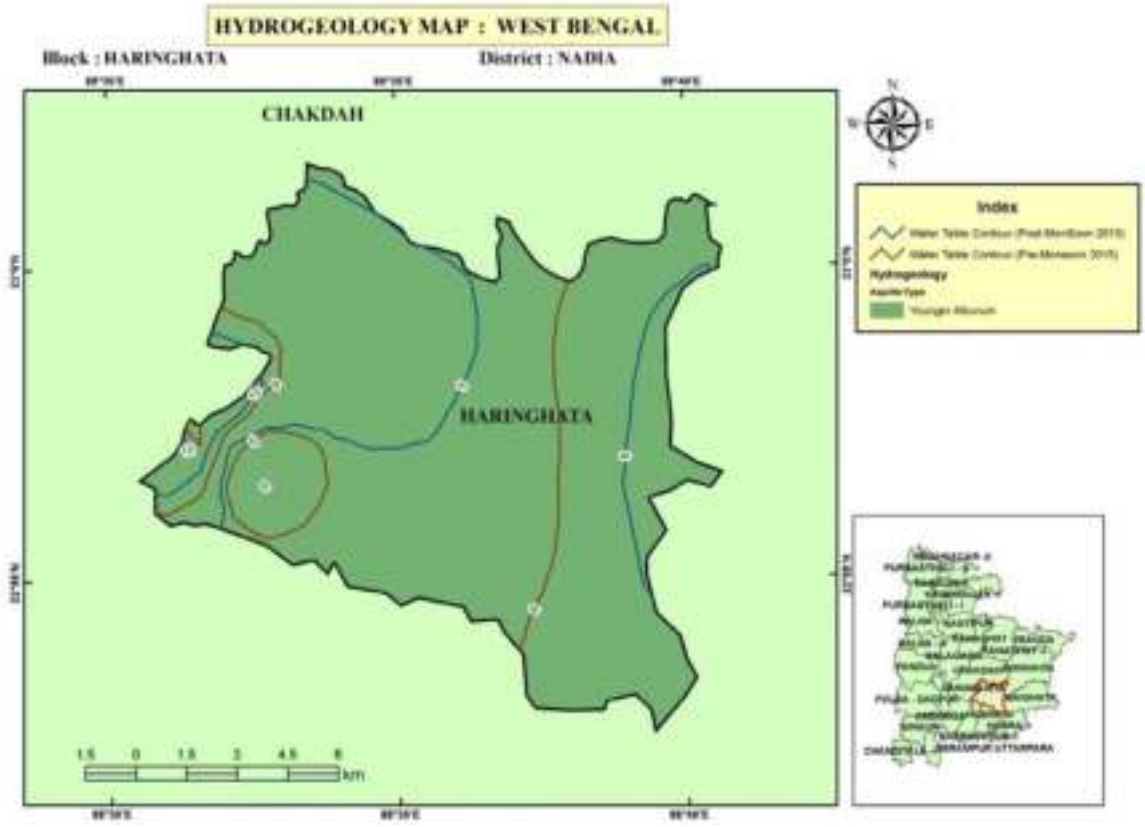
2)Disposition of Aquifer:

Block	Depth range of Aquifer in m bgl	
	1st Aquifer	2nd aquifer
Haringhata	16-150	157-179


LITHOLOGY MAP : WEST BENGAL
Block : HARINGHATA
District : NADIA
CHAKDAH
HARINGHATA
Index
Lithology
SAND, SILT, CLAY
YELLOWISH BROWN FINE SAND, SILT,CLAY
km

Aquifer Wise Water Level Ranges & Pre-monsoon and Post-monsoon long term water level trends (1995 to 2011)

Sl. No.	Block	Aquifer	Pre-monsoon Trend		Post-monsoon Trend	
			Water Level Range(mbgl)	**Pre trend (- rising & + Falling)**	Water Level Range(mbgl)	**Post trend (- rising & + Falling)**
1.	Haringhata	1		8.8		10.3
2.	Haringhata	2		-		-



Thickness of Aquifer(Average):

Block	Area (sq km)	Thickness of the Granular Zone in 1st aquifer (m)	Thickness of the Granular Zone /Productive Zone below pre-monsoon WL (m)
Haringhata	164.28	150	143.4

Aquifer-wise Statement

Sl. No.	Name of Block	1st Aquifer			2nd Aquifer		
		Depth Range (mbgl)	Discharge (m^3/hr)	T (m^2/day)	Depth Range	Discharge (m^3/hr)	T (m^2/day)
		1st					
13	Haringhata	16-150	4.5-14.15		157-179	16.2	

3)Ground Water Resource,Extraction,Contamination & Other Issues:

Aquifer Wise Resource Availability & Extraction:

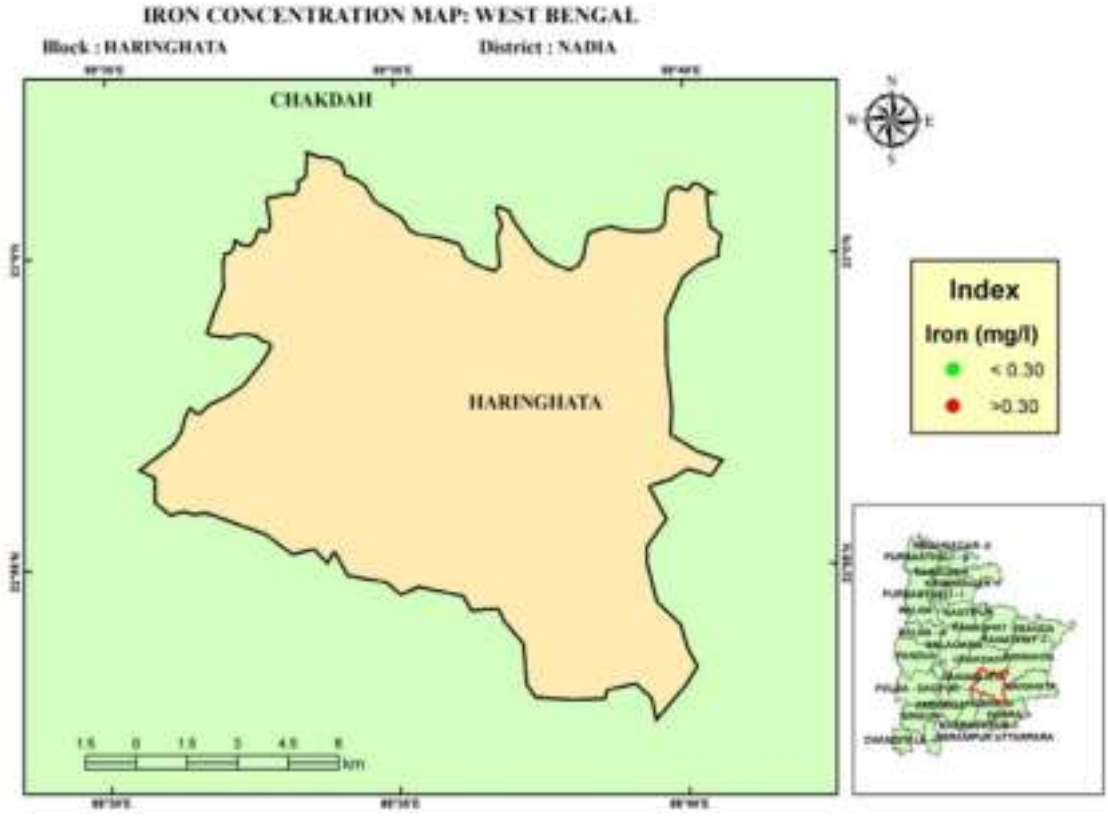
Block	Net ground water availability (MCM)	Gross ground water draft (MCM)	Stage of development (%)	Category
Haringhata	8321.47	6276.05	75.42	Safe

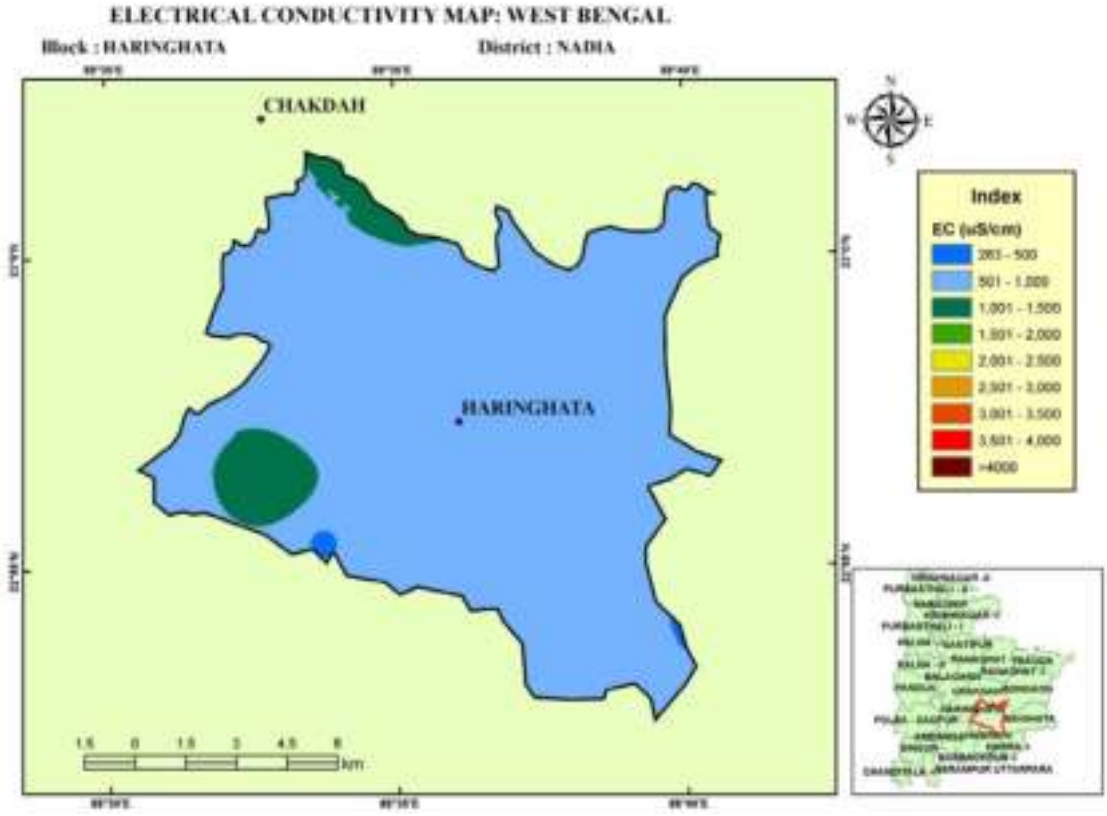
Chemical Quality Of GroundWater & Contamination:

Range Of Chemical Pollutants:

Block	As(mg/l)	Fe(mg/l)	Ec(µS/cm)	F(mg/l)	No_3(mg/l)
Haringhata	-	-	472-1450	0.3	-


ARSENIC CONCENTRATION MAP: WEST BENGAL
Block : HARINGHATA
District : NADIA
CHAKDAH
HARINGHATA
Index
Arsenic (ug/l)
(within 100m Depth)
< 10.00
10.00 - 50.00
>50.00


IRON CONCENTRATION MAP: WEST BENGAL
Block : HARINGHATA
District : NADIA
CHAKDAH
HARINGHATA
Index
Iron (mg/l)
< 0.30
>0.30
km



Percentage of tube wells having arsenic content in the **block:**

SI.No.	Blocks	Arsenic (<0.01 ing/1)	Arsenic (>0.01-<0.05 mg/1)	Arsenic (> 0.05 mg/1)	Total Tube well
1	Haringhata	36.29	33.82	29.90	1174

4)Ground Water Resource Enhancement& Management Plan:

Ground Water Management Plan for Drinking purpose.

Suggestions on supply of ground water to the risk population For drinking purpose.

District	Block (As affected)	No. of habitations in the risk zone where As concentration >0.05 mg/L	No. of habitations in the risk zone where As concentration 0.01 to 0.05 mg/L	Risk Population (2011) where As concentration >0.05 mg/L
NADIA	HARINGHATA	124	53	207459

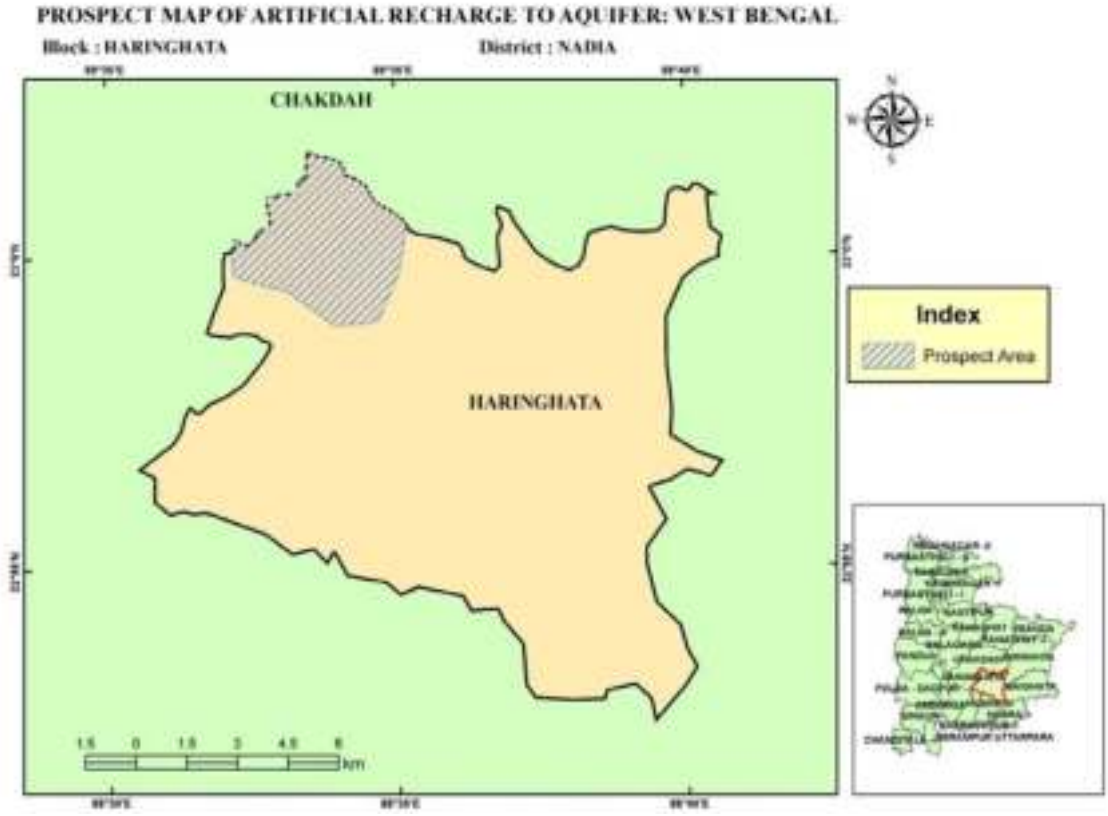
Aquifer Wise Space Available For Recharge and Proposed Interventions:

Area suitable for recharge in the study area:

District	Block Name	Area (in sq. km)	Total Area suitable for recharge (sq km.)
NADIA	Haringhata	164.28	16. 35

Proposed Artificial Recharge Structures in the area in :

District	Block	Total Surface water available in MCM for recharge	Source Water Allocation (MCM)			Number of Structures feasible			Structure-wise Cost Estimate in lakh Rs.			Total cost in lakh Rs
			Percolation Tanks	REET with RS	Injection Well	Percolation Tanks	RET with RS	Injection Well	Percolation Tanks	REET with RS	Injection Well	
NADIA	Haringhata	7.85	4	2	2	7	21	7	140	168	28	336



Ground Water Management Plan For Irrigation Purpose.

Area in sq, km.

Sr No.	Name of Block	Cultivable area in ha	Net irrigated area in ha	Area to be irrigated in ha	SOD in %	Category
1	Haringhata	10453	6769	3684.00	75.42	Safe

Krishnanagar I

1)Salient Information

Block Name: Krishnanagar I

Area(in Km^2): 275.88

District: Nadia

State:West Bengal

Population(as on 2011):

Name of the Block	Population of CD Block (2011 census)
Krishnanagar I	285885

Approximate Decadal Growth Rate from 2001-2011:

Rainfall:

Average annual rainfall in **: Krishnanagar I**

(as in the district) for the period 2009 -13 (in mm)

Block	Normal	Actual (Annual)				
		2009	2010	2011	2012	2013
Krishnanagar I	1401	1209	940	1488	1039	1245

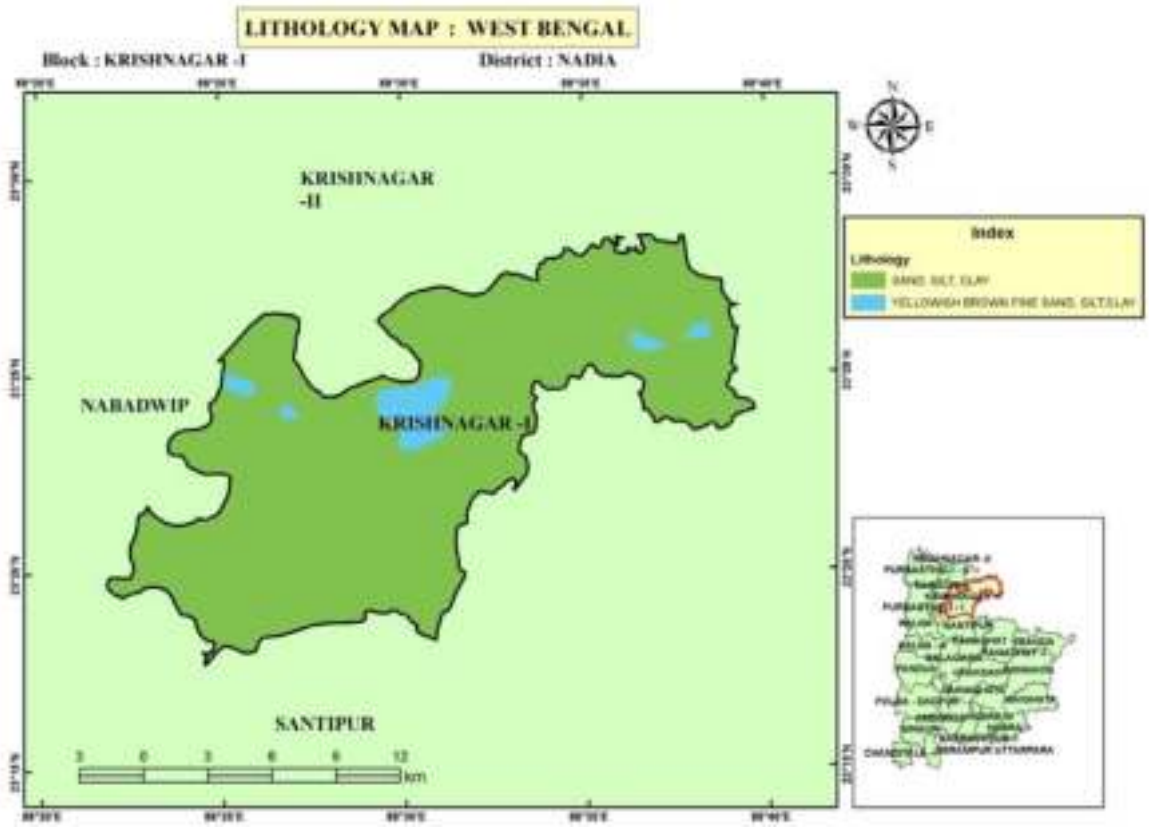
Aquifer Wise Ground Water Resource Availability & Extraction:

(in MCM)

Resource Availability	Aquifer I	Aquifer II	Extraction (for Aquifer I)
Dynamic Resource	14562.95	-	0.496584
Static Resource	8838.64	-	-

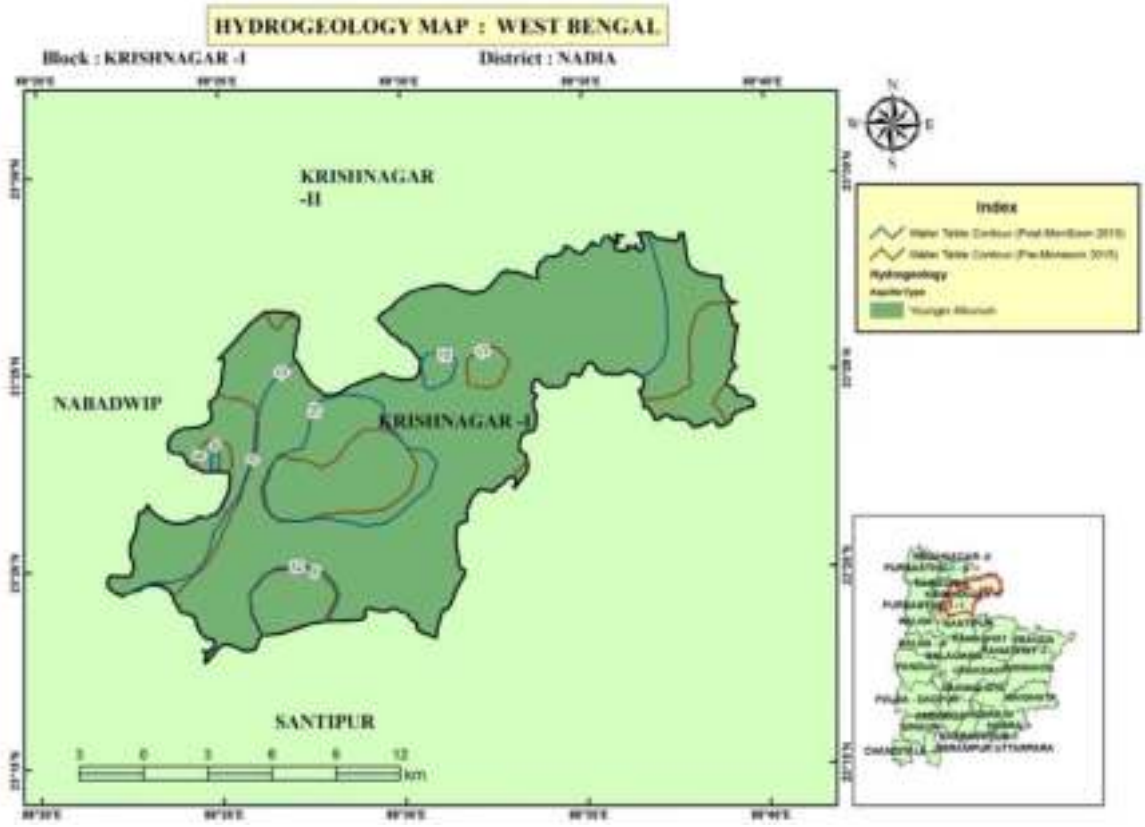
2)Disposition of Aquifer:

Block	Depth range of Aquifer in m bgl	
	1st Aquifer	2nd aquifer
Krishnanagar I	6-132, 147-154, 160-166	173-178, 174-212, 227-264



Aquifer Wise Water Level Ranges & Pre-monsoon and Post-monsoon long term water level trends (1995 to 2011)

Sl. No.	Block	Aquifer	Pre-monsoon Trend		Post-monsoon Trend	
			Water Level Range(mbgl)	**Pre trend (- rising & + Falling)**	Water Level Range(mbgl)	**Post trend (- rising & + Falling)**
1.	**Krishnanagar I**	**1**	**4.12-8.75**	**0.01**	**2.96-5.76**	**7.29**
2.	**Krishnanagar I**	**2**	**-**	**-**	**-**	**-**

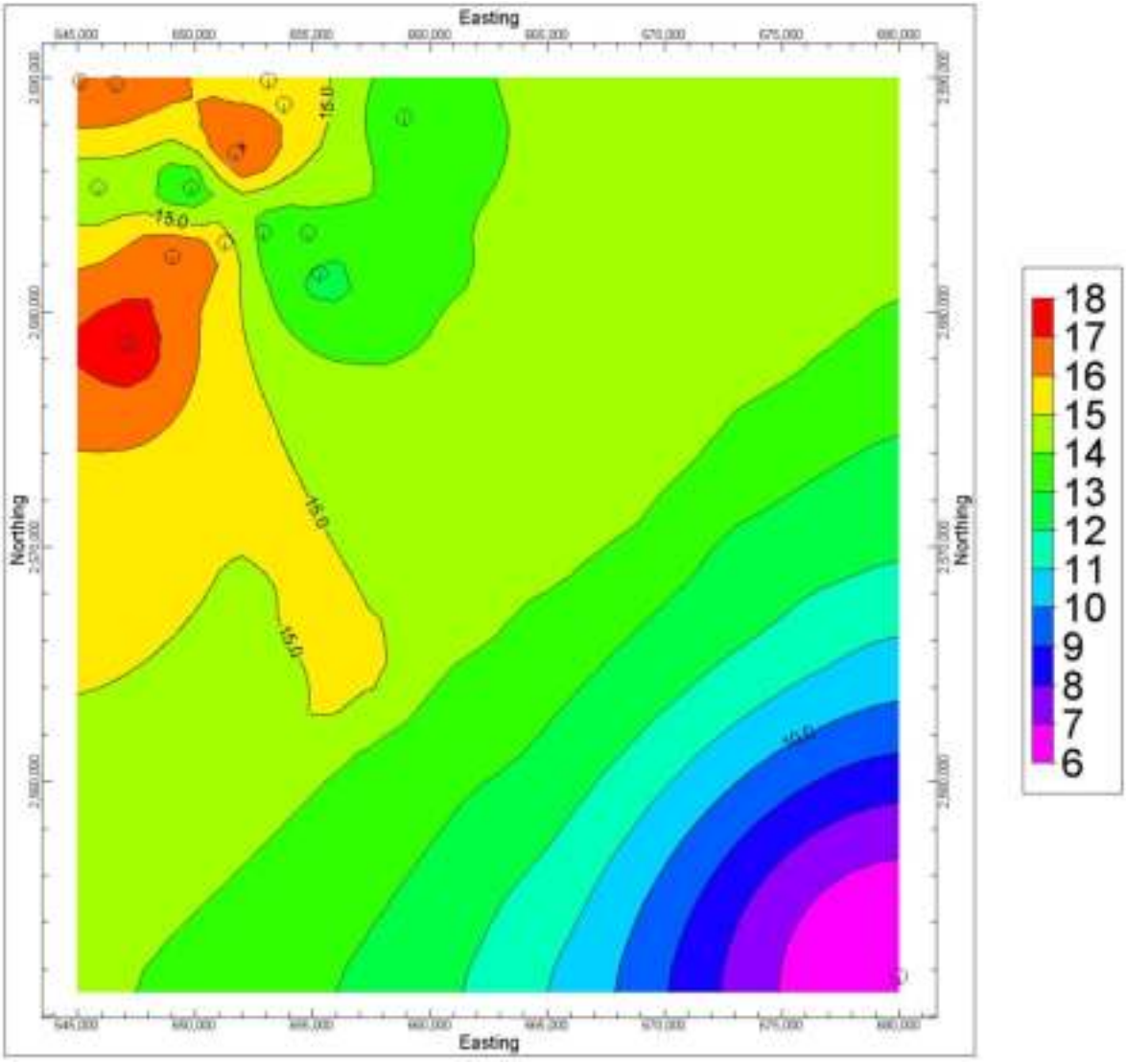


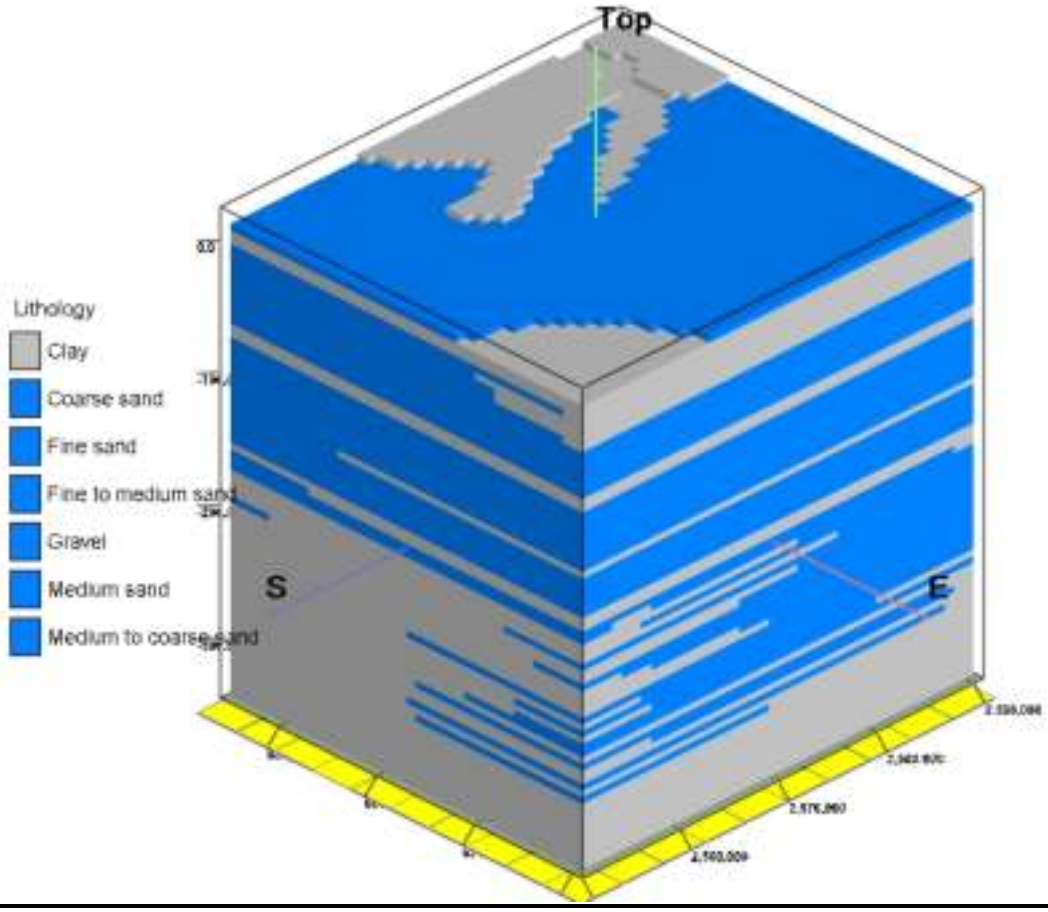
Thickness of Aquifer(Average):

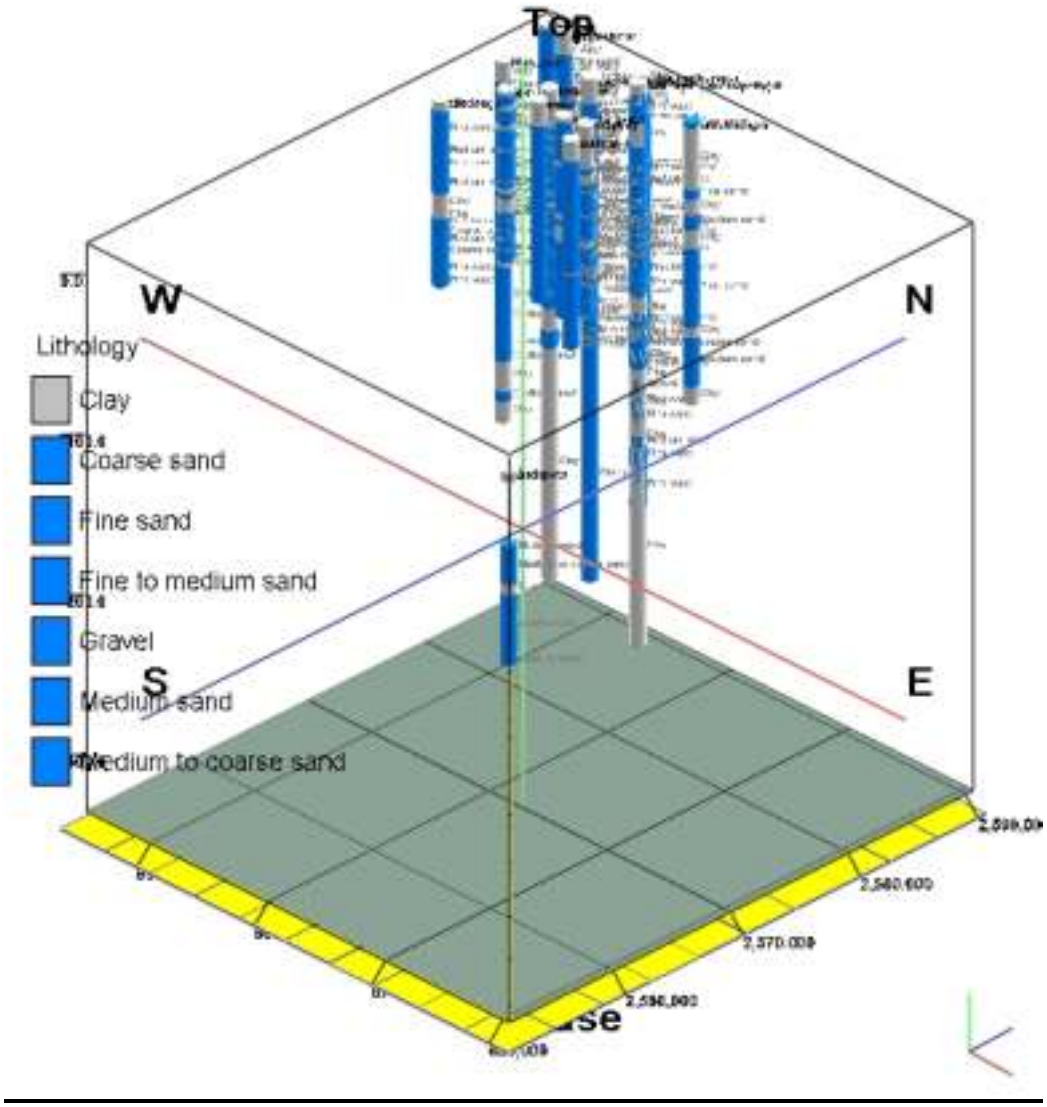
Block	Geographic Area (sq km)	Thickness of the Granular Zone in 1st aquifer (m)	Thickness of the Granular Zone /Productive Zone below pre-monsoon WL (m)
Krishnanagar I	275.88	166	160.19

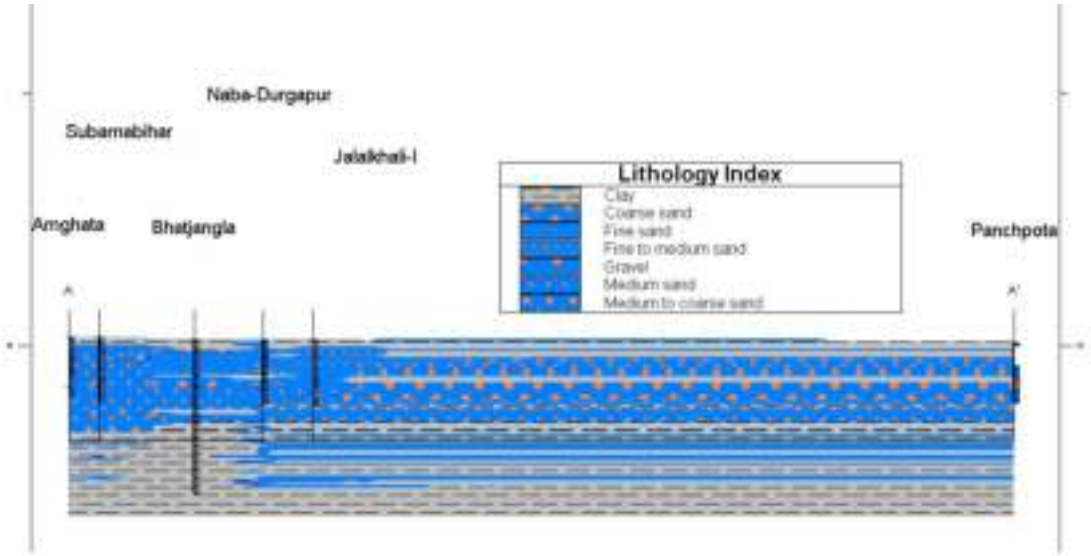
Aquifer-wise Statement

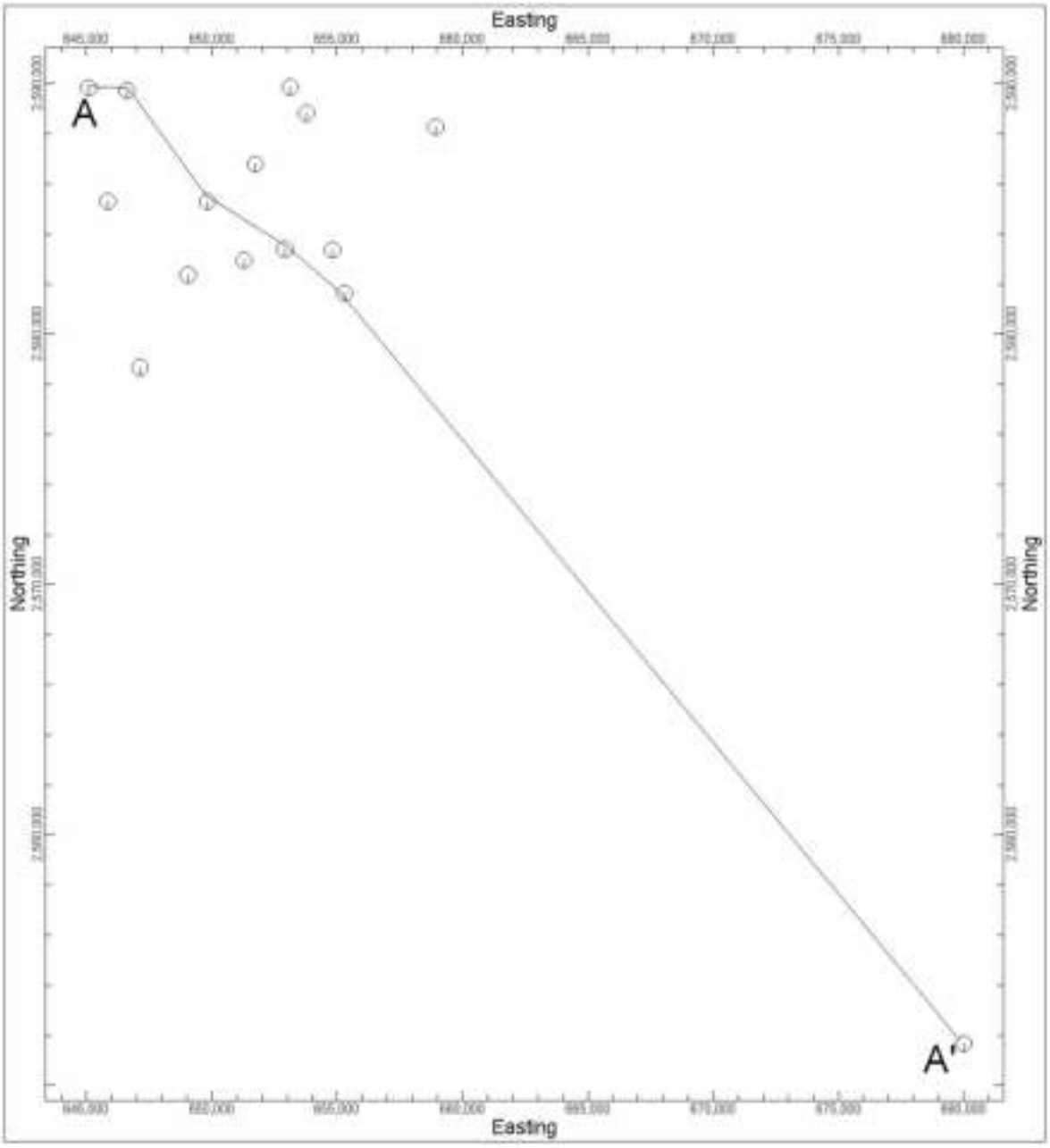
Sl. No.	Name of Block	1st Aquifer			2nd Aquifer		Remarks T (m^2/day)
		Depth Range (mbgl)	Discharge (m^3/hr)	T (m^2/day)	Depth Range	Discharge (m^3/hr)	
		1st					
13	Krishnanagar I	6-166	72.03-221.44	1159.55	173-264	41.4-86.94	336.84-4666.5


Easting
Northing
15.0
18
17
16
15
14
13
12
11
10
9
8
7
6


Top
Lithology
Clay
Coarse sand
Fine sand
Fine to medium sand
Gravel
Medium sand
Medium to coarse sand
S
E


Top
W
N
S
E
Lithology
Clay
Coarse sand
Fine sand
Fine to medium sand
Gravel
Medium sand
Medium to coarse sand


Naba-Durgapur
Subarnabihar
Jalalkhali-I
Amghata
Bhatjangla
Panchpota
Lithology Index
Clay
Coarse sand
Fine sand
Fine to medium sand
Gravel
Medium sand
Medium to coarse sand
A
A'


Easting
Northing
A
A'
Easting
Northing

3)Ground Water Resource,Extraction,Contamination & Other Issues:

Aquifer Wise Resource Availability & Extraction:

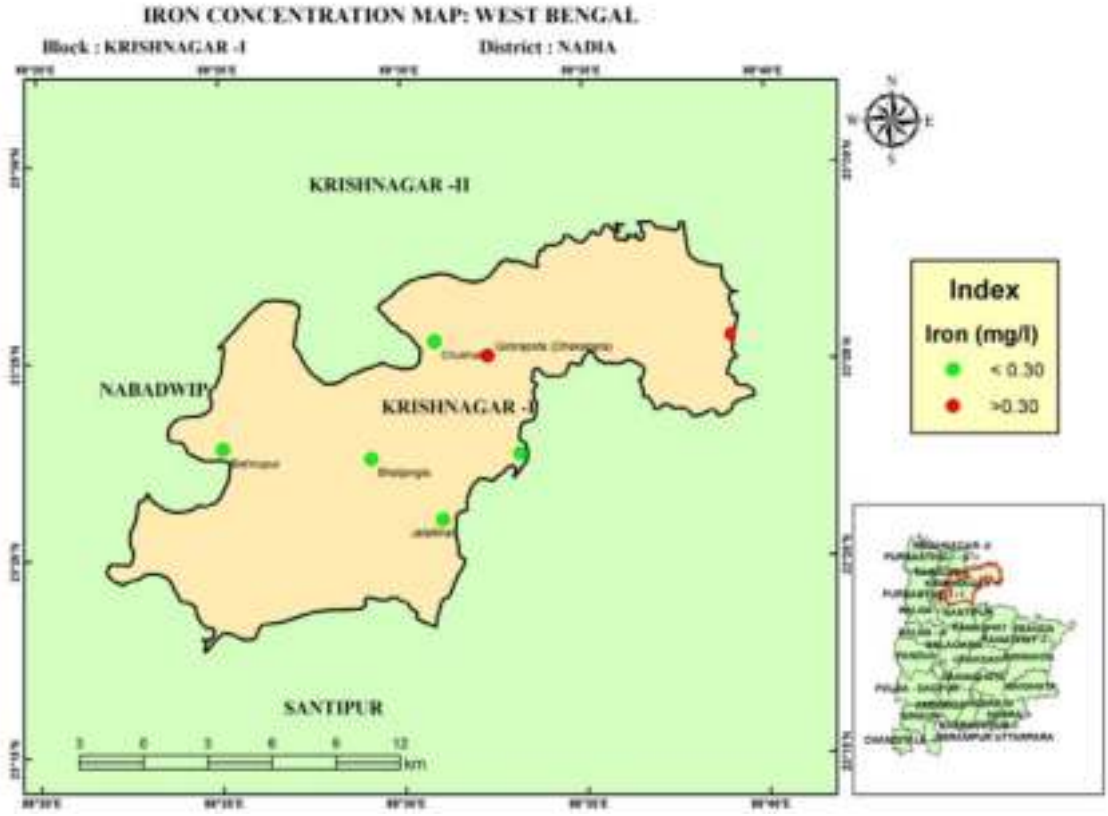
Block	Net ground water availability (MCM)	Gross ground water draft (MCM)	Stage of development (%)	Category
Krishnanagar I	14562.95	11343.81	77.89	Safe

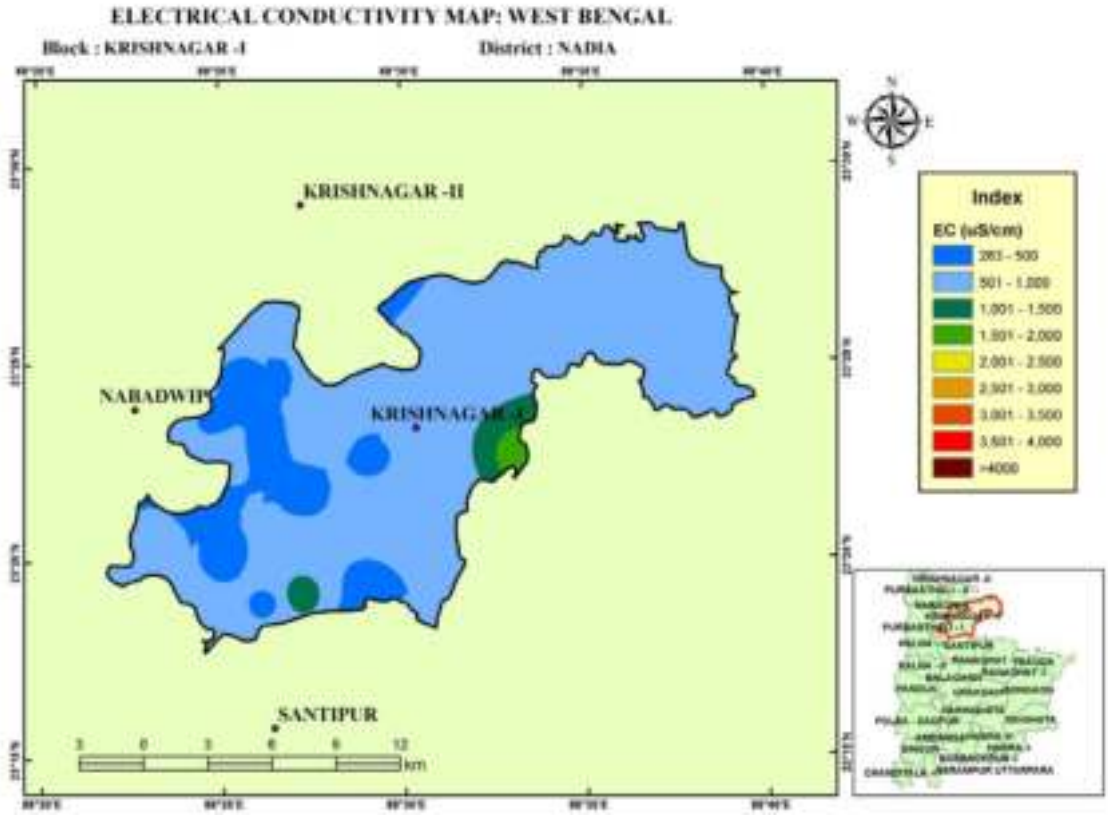
Chemical Quality Of GroundWater & Contamination:

Range Of Chemical Pollutants:

Block	As(mg/l)	Fe(mg/l)	Ec(µS/cm)	F(mg/l)	No_3(mg/l)
Krishnanagar I	-	Bdl-1.37	299-1880	Bdl-0.6	0.32-52


ARSENIC CONCENTRATION MAP: WEST BENGAL
Block : KRISHNAGAR -I
District : NADIA
KRISHNAGAR -II
NABADWIP
KRISHNAGAR -I
SANTIPUR
Index
Arsenic (ug/l)
(within 100m Depth)
< 10.00
10.00 - 50.00
>50.00
km


IRON CONCENTRATION MAP: WEST BENGAL
Block : KRISHNAGAR -I
District : NADIA
KRISHNAGAR -II
NABADWIP
KRISHNAGAR -I
SANTIPUR
km
Index
Iron (mg/l)
< 0.30
>0.30



Percentage of tube wells having arsenic content in the **block:**

SI.No.	Blocks	Arsenic (<0.01 ing/1)	Arsenic (>0.01-<0.05 mg/1)	Arsenic (> 0.05 mg/1)	Total Tube well
1	**Krishnanagar I**	38.61	39.17	22.21	2494

4)Ground Water Resource Enhancement& Management Plan:

Ground Water Management Plan for Drinking purpose.

Suggestions on supply of ground water to the risk population For drinking purpose.

District	Block (As affected)	No. of habitations in the risk zone where As concentration >0.05 mg/L	No. of habitations in the risk zone where As concentration 0.01 to 0.05 mg/L	Risk Population (2011) where As concentration >0.05 mg/L
NADIA	KRISHNAGAR - I	156	93	285885

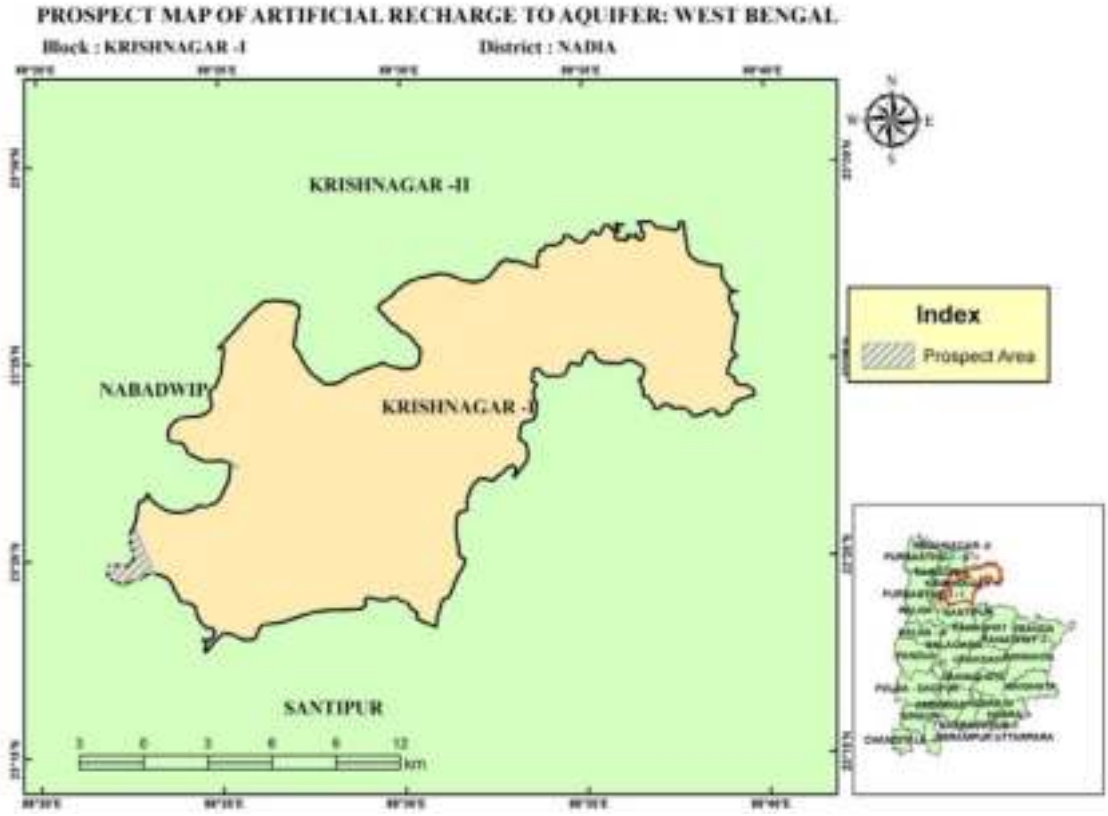
Aquifer Wise Space Available For Recharge and Proposed Interventions:

Area suitable for recharge in the study area:

District	Block Name	Area (in sq. km)	Total Area suitable for recharge (sq km.)
NADIA	Krishnanagar-I	275.88	2.85

Proposed Artificial Recharge Structures in the area in :

District	Block	Total Surface water available in MCM for recharge	Source Water Allocation (MCM)			Number of Structures feasible			Structure-wise Cost Estimate in lakh Rs.			Total cost in lakh Rs
			Percolation Tanks	REET with RS	Injection Well	Percolation Tanks	RET with RS	Injection Well	Percolation Tanks	REET with RS	Injection Well	
NADIA	Krishnanagar-I	13.32	6	4	4	12	35	12	240	280	48	568



Ground Water Management Plan For Irrigation Purpose

Area in sq, km.

Sr No.	Name of Block	Cultivable area in ha	Net irrigated area in ha	Area to be irrigated in ha	SOD in %	Category
1	Krishnanagar I	12106	8172	3934.00	77.89	Safe

Krishnanagar II

1)Salient Information

Block Name: Krishnanagar II

Area(in Km^2): 141.46

District: Nadia

State:West Bengal

Population(as on 2011):

Name of the Block	Population of CD Block (2011 census)
Krishnanagar II	134032

Approximate Decadal Growth Rate from 2001-2011: 21%

Rainfall:

Average annual rainfall in **: Krishnanagar II**

(as in the district) for the period 2009 -13 (in mm)

Block	Normal	Actual (Annual)				
		2009	2010	2011	2012	2013
Krishnanagar II	1401	1209	940	1488	1039	1245

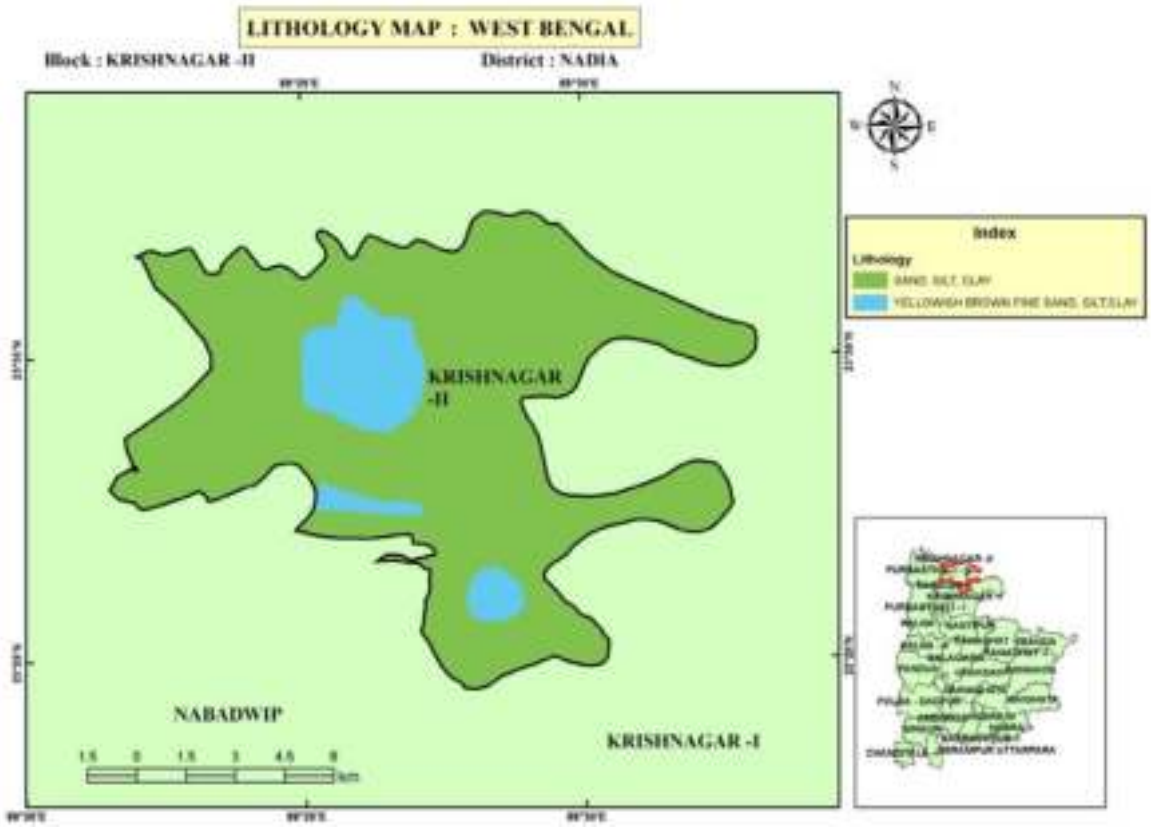
Aquifer Wise Ground Water Resource Availability & Extraction:

(in MCM)

Resource Availability	Aquifer I	Aquifer II	Extraction (for Aquifer I)
Dynamic Resource	5588.29	-	0.254628
Static Resource	3447.10	-	-

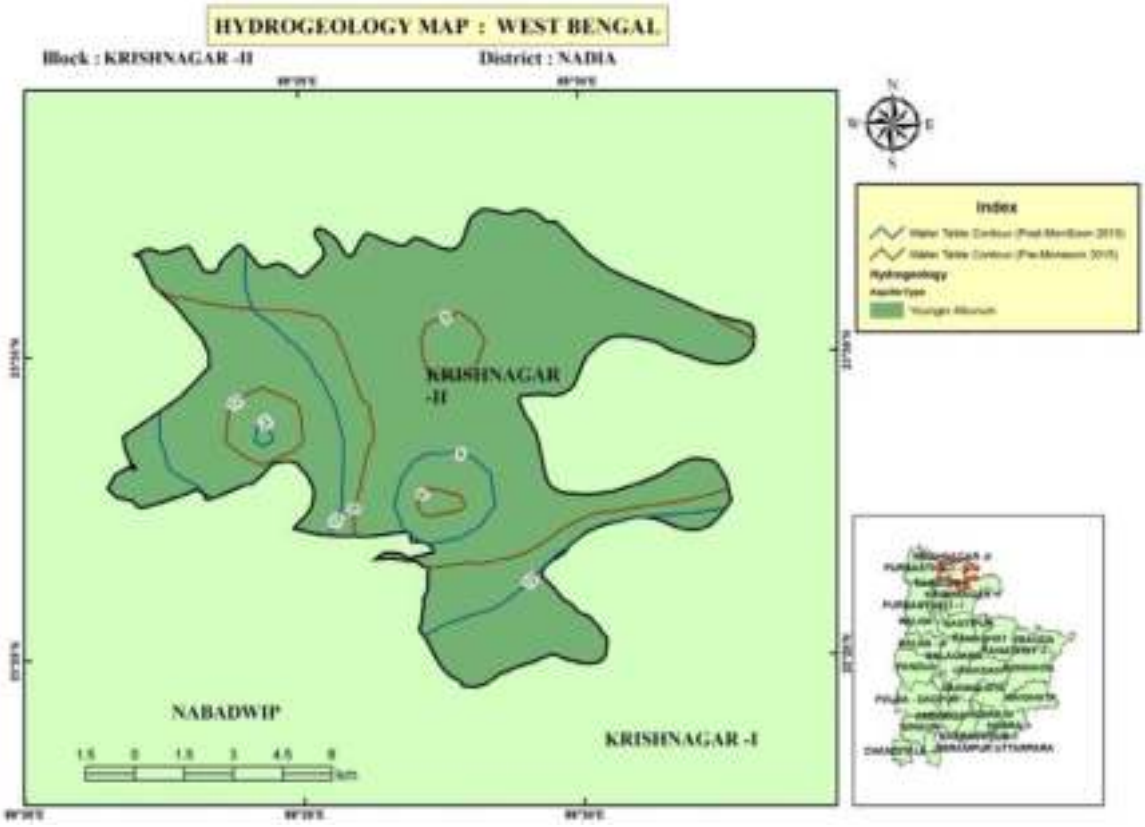
2)Disposition of Aquifer:

Block	Depth range of Aquifer in m bgl	
	1st Aquifer	2nd aquifer
Krishnanagar II	7-128	230-249, 252-267, 279-285



Aquifer Wise Water Level Ranges & Pre-monsoon and Post-monsoon long term water level trends (1995 to 2011)

Sl. N	Block	Aquifer	Pre-monsoon Trend		Post-monsoon Trend	
			Water Level Range(mbgl)	**Pre trend (- rising & + Falling)**	Water Level Range(mbgl)	**Post trend (- rising & + Falling)**
1.	**Krishnanagar II**	**1**	**3.17-7.35**	**1.79**	**3.52-6.24**	**8.52**
2	**Krishnanagar II**	**2**	**-**	**-**	**-**	**-**

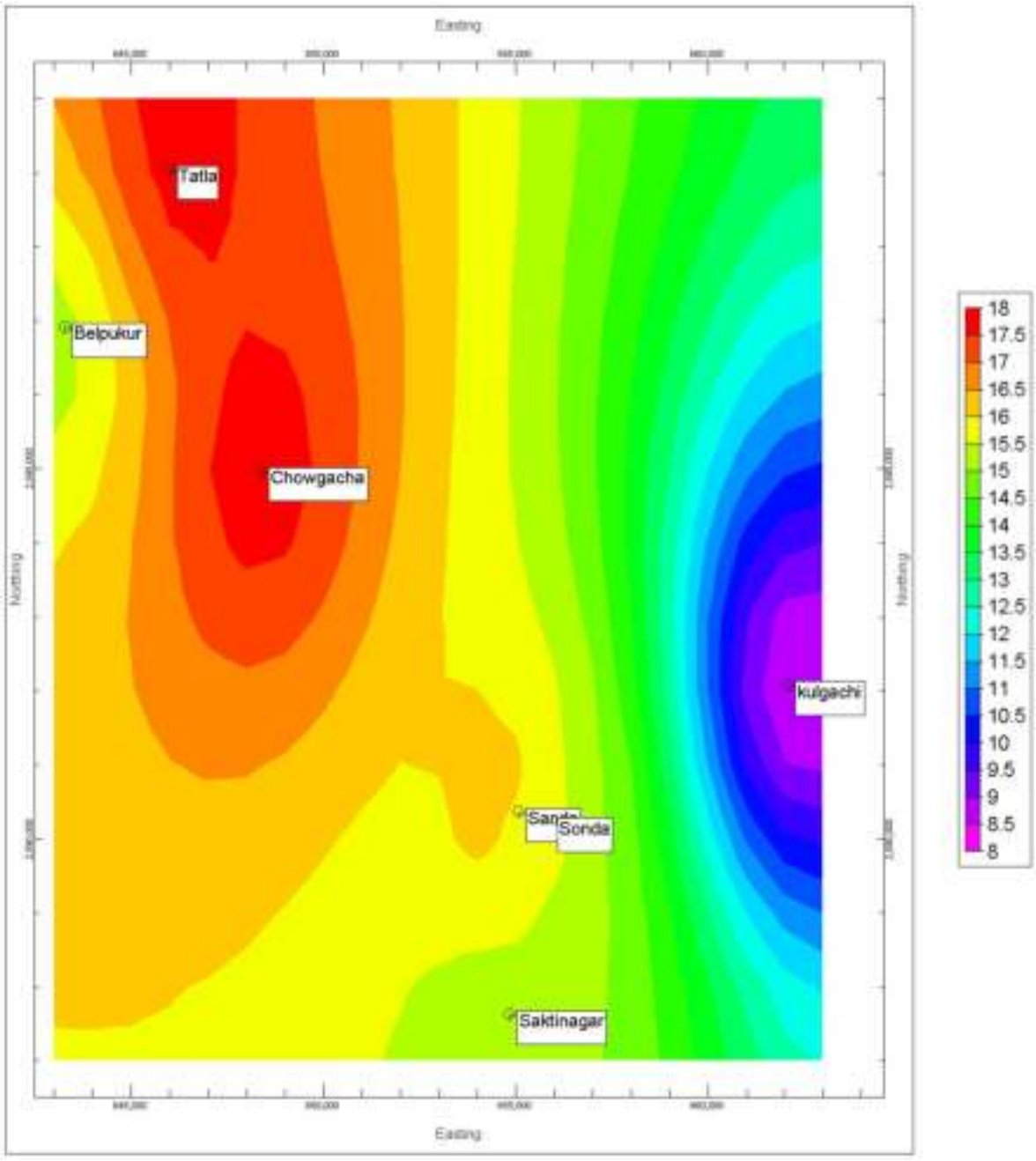


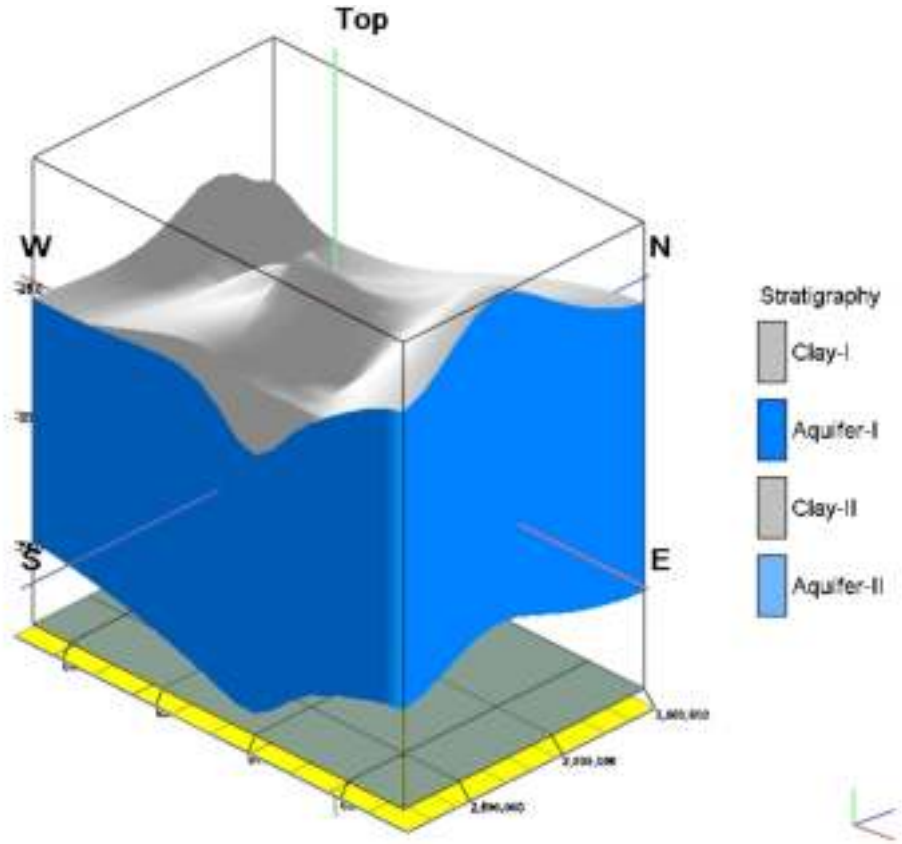
Thickness of Aquifer(Average):

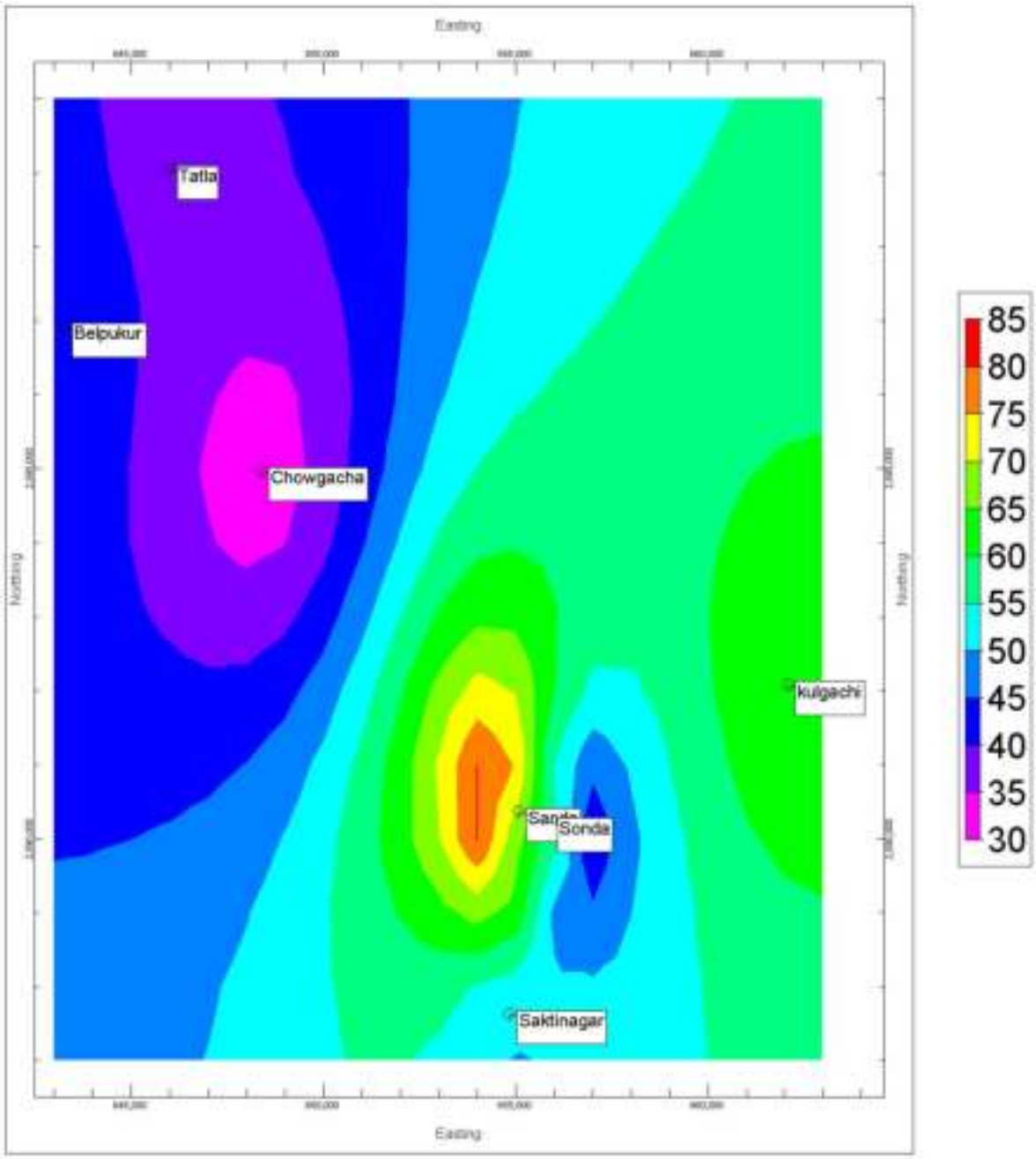
Block	Geographic Area (sq km)	Thickness of the Granular Zone in 1st aquifer (m)	Thickness of the Granular Zone /Productive Zone below pre-monsoon WL (m)
Krishnanagar II	141.46	128	121.84

Aquifer-wise Statement

Sl. No.	Name of Block	1st Aquifer			2nd Aquifer		Remarks
		Depth Range (mbgl)	Discharge (m^3/hr)	T (m^2/day)	Depth Range/Discharge/T	Discharge (m^3/hr)	
		1st					
13	Krishnanagar II	7-128	57-87		230-285		


Easting
Northing
Tatla
Belpukur
Chowgacha
kulgachi
Sonda
Saktinagar
18
17.5
17
16.5
16
15.5
15
14.5
14
13.5
13
12.5
12
11.5
11
10.5
10
9.5
9
8.5
8


Top
W
N
S
E
Stratigraphy
Clay-I
Aquifer-I
Clay-II
Aquifer-II


Easting
Northing
Tatla
Belpukur
Chowgacha
kulgachi
Sonda
Saktinagar
85
80
75
70
65
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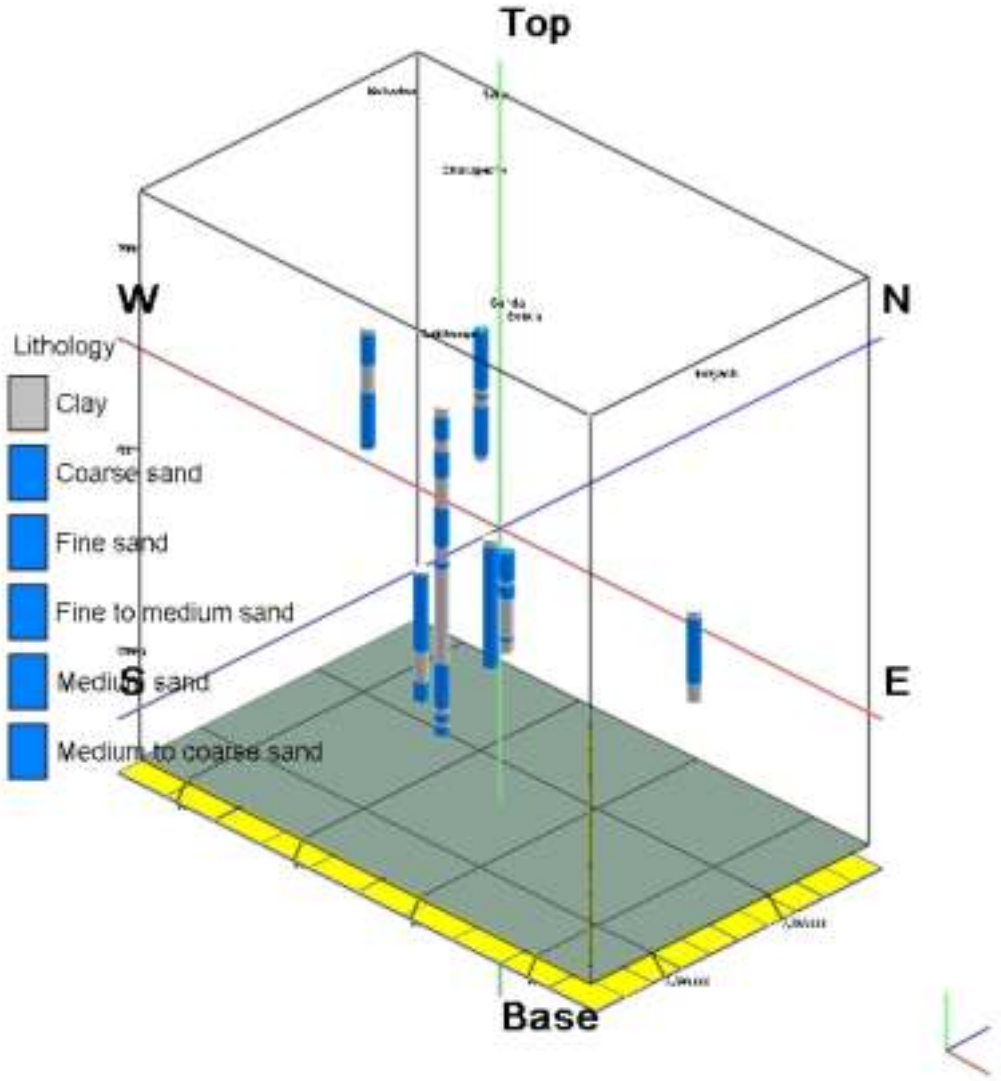
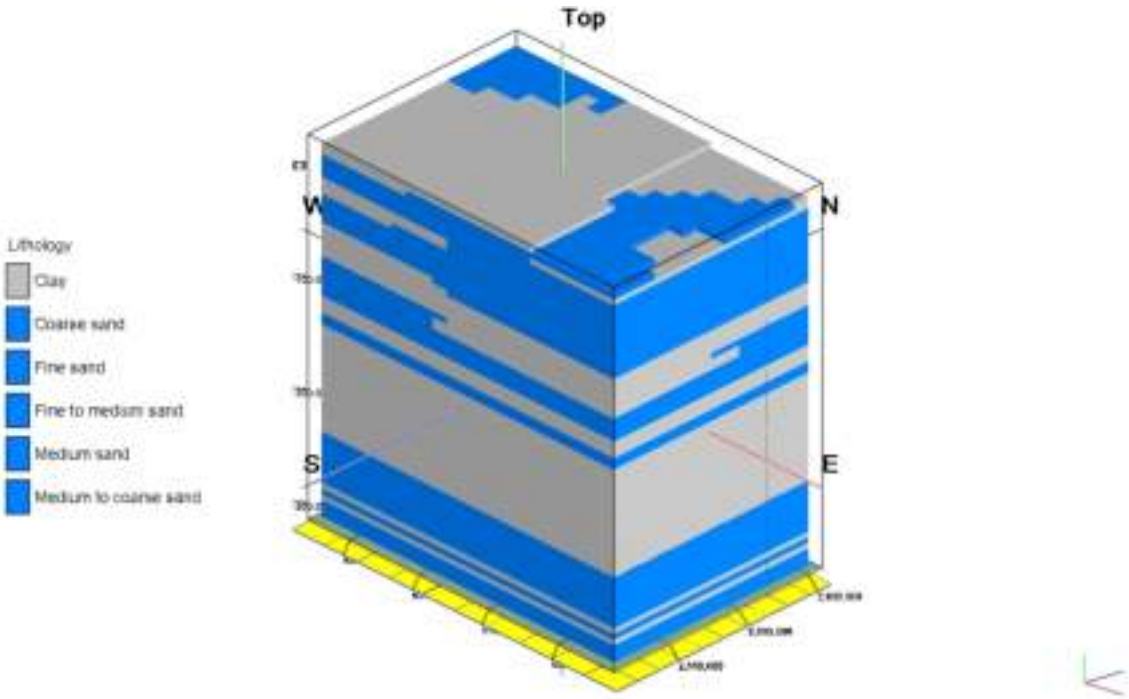
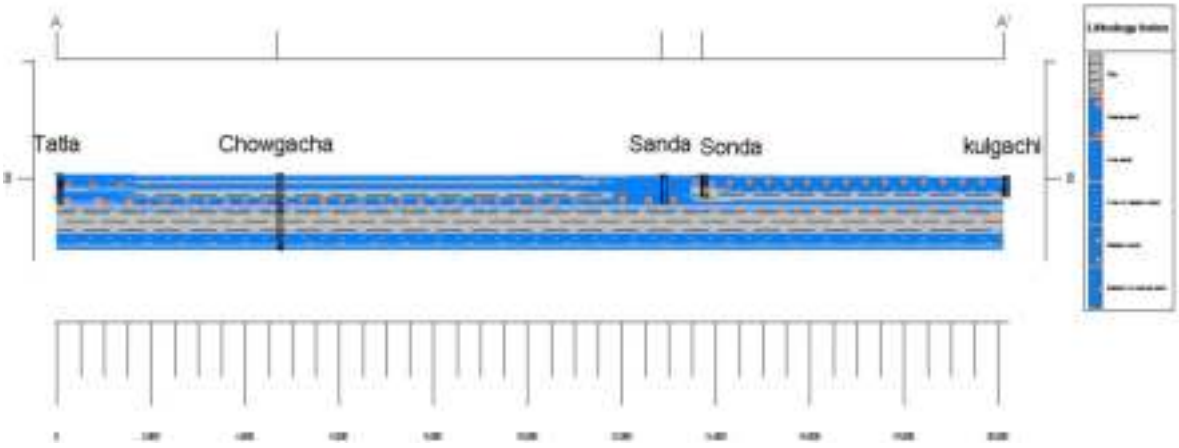
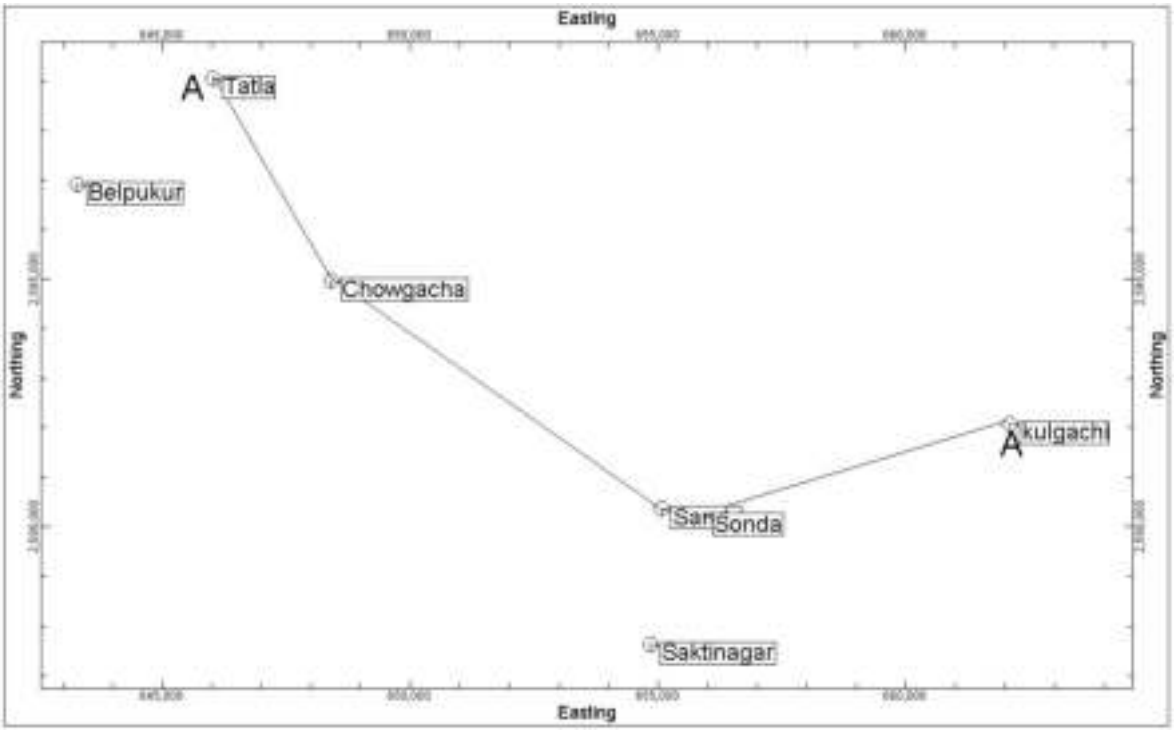
55
50
45
40
35
30


Top
W
N
S
E
Base
Lithology
Clay
Coarse sand
Fine sand
Fine to medium sand
Medium sand
Medium to coarse sand


Top
W
N
S
E
Lithology
Clay
Coarse sand
Fine sand
Fine to medium sand
Medium sand
Medium to coarse sand

Cross-Section A-A'





3)Ground Water Resource,Extraction,Contamination & Other Issues:

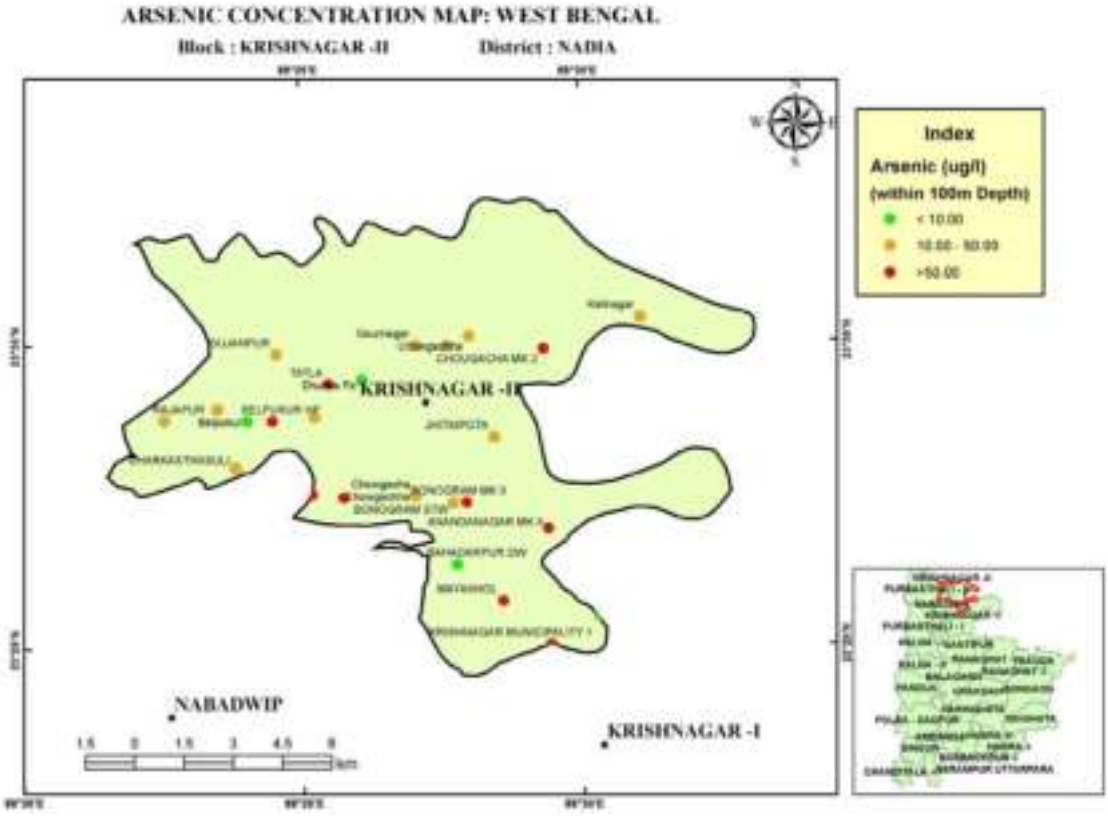
Aquifer Wise Resource Availability & Extraction:

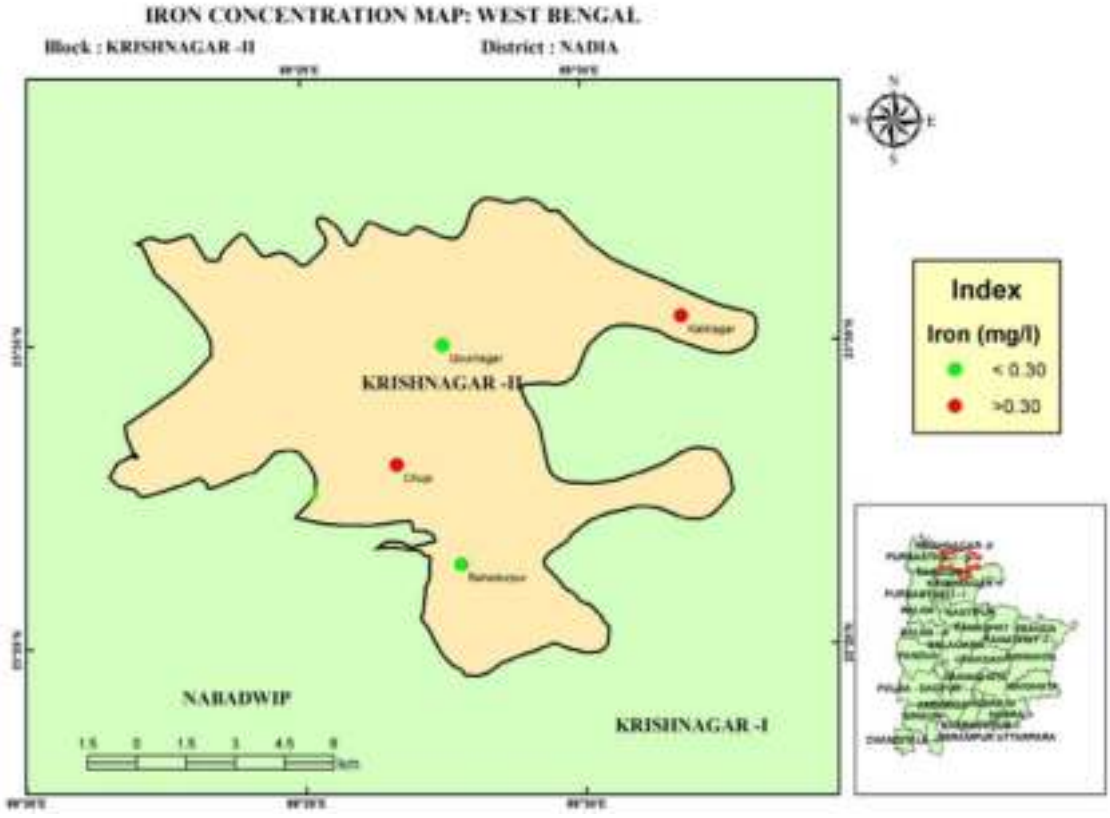
Block	Net ground water availability (MCM)	Gross ground water draft (MCM)	Stage of development (%)	Category
Krishnanagar II	5588.29	4476.23	80.00	Safe

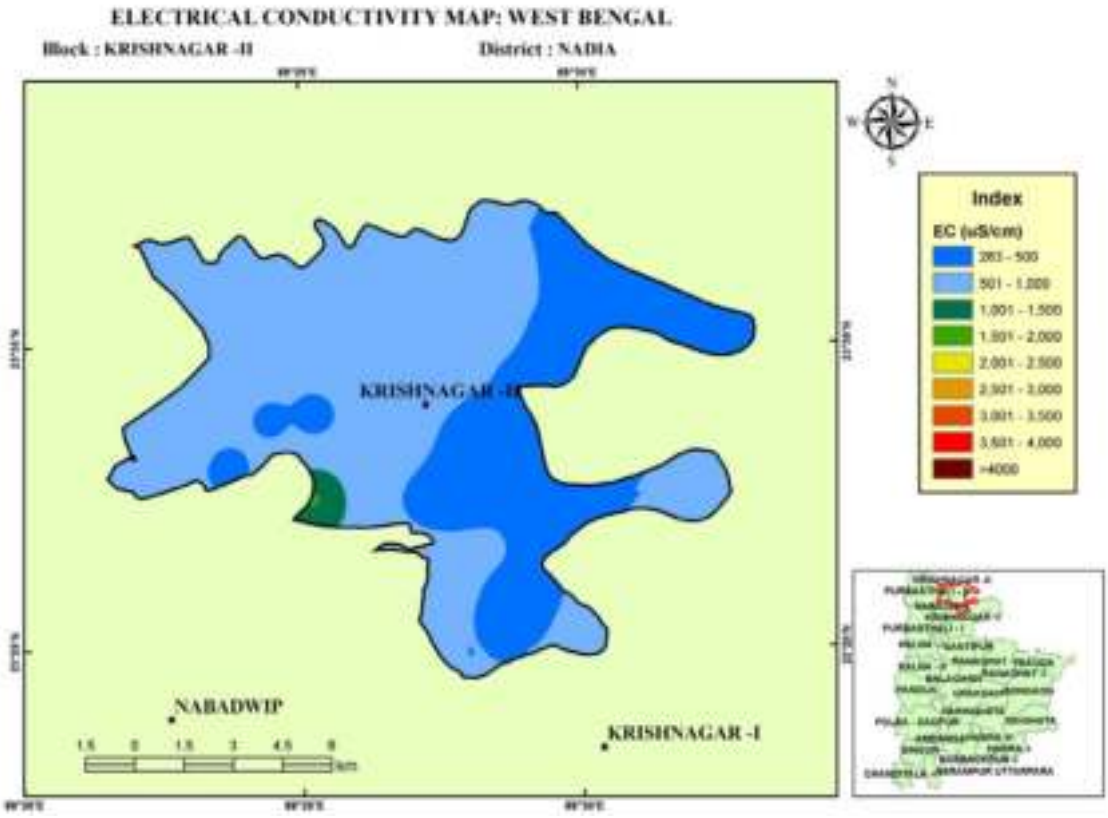
Chemical Quality Of GroundWater & Contamination:

Range Of Chemical Pollutants:

Block	As(mg/l)	Fe(mg/l)	Ec(µS/cm)	F(mg/l)	No_3(mg/l)
Krishnanagar II	-	Bdl-1.99	251-715	Bdl-0.5	0.25-98


ARSENIC CONCENTRATION MAP: WEST BENGAL
Block : KRISHNAGAR -II
District : NADIA
Index
Arsenic (ug/l)
(within 100m Depth)
< 10.00
10.00 - 50.00
>50.00
KRISHNAGAR -II
NABADWIP
KRISHNAGAR -I


IRON CONCENTRATION MAP: WEST BENGAL
Block : KRISHNAGAR -II
District : NADIA
KRISHNAGAR -II
NABADWIP
KRISHNAGAR -I
Index
Iron (mg/l)
< 0.30
>0.30



Percentage of tube wells having arsenic content in the **block:**

SI.No.	Blocks	Arsenic (<0.01 ing/1)	Arsenic (>0.01-<0.05 mg/1)	Arsenic (> 0.05 mg/1)	Total Tube well
1	Krishnanagar II	1.52	66.63	31.85	986

4)Ground Water Resource Enhancement& Management Plan:

Ground Water Management Plan for Drinking purpose.

Suggestions on supply of ground water to the risk population For drinking purpose.

District	Block (As affected)	No. of habitations in the risk zone where As concentration >0.05 mg/L	No. of habitations in the risk zone where As concentration 0.01 to 0.05 mg/L	Risk Population (2011) where As concentration >0.05 mg/L
NADIA	KRISHNAGAR - II	67	6	134032

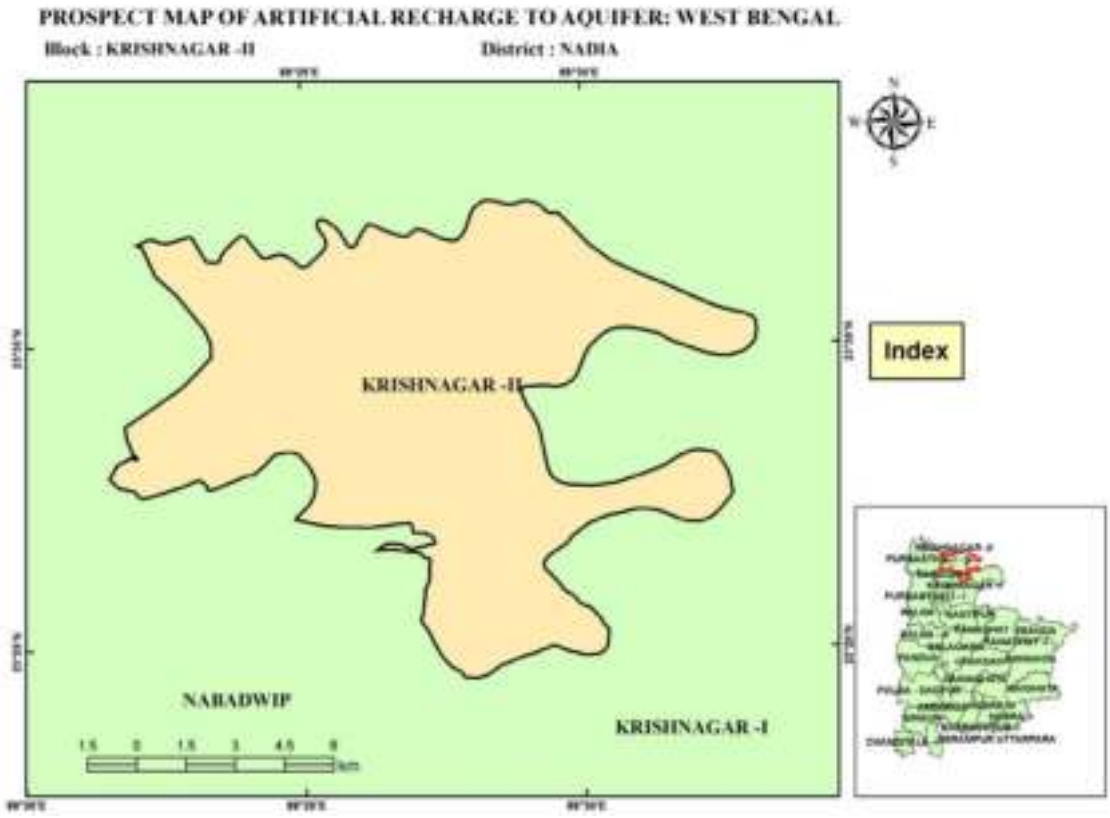
Aquifer Wise Space Available For Recharge and Proposed Interventions:

Area suitable for recharge in the study area:

District	Block Name	Area (in sq. km)	Total Area suitable for recharge (sq km.)
NADIA	Krishnanagar-II	141.46	0

Proposed Artificial Recharge Structures in the area in :

District	Block	Total Surface water available in MCM for recharge	Source Water Allocation (MCM)			Number of Structures feasible			Structure-wise Cost Estimate in lakh Rs.			Total cost in lakh Rs
			Percolation Tanks	REET with RS	Injection Well	Percolation Tanks	RET with RS	Injection Well	Percolation Tanks	REET with RS	Injection Well	
NADIA	Krishnanagar-II	5.73	3	2	2	5	15	5	100	120	20	240



Ground Water Management Plan For Irrigation Purpose.

Area in sq, km.

Sr No.	Name of Block	Cultivable area in ha	Net irrigated area in ha	Area to be irrigated in ha	SOD in %	Category
1	Krishnanagar II	8289	5725	2564.00	80.00	Safe

Nabadwip

1)Salient Information

Block Name: Nabadwip

Area(in Km^2): 103.72

District: Nadia

State:West Bengal

Population(as on 2011):

Name of the Block	Population of CD Block (2011 census)
Nabadwip	76241

Approximate Decadal Growth Rate from 2001-2011:

Rainfall:

Average annual rainfall in **: Nabadwip**

(as in the district) for the period 2009 -13 (in mm)

Block	Normal	Actual (Annual)				
		2009	2010	2011	2012	2013
Nabadwip	1401	1209	940	1488	1039	1245

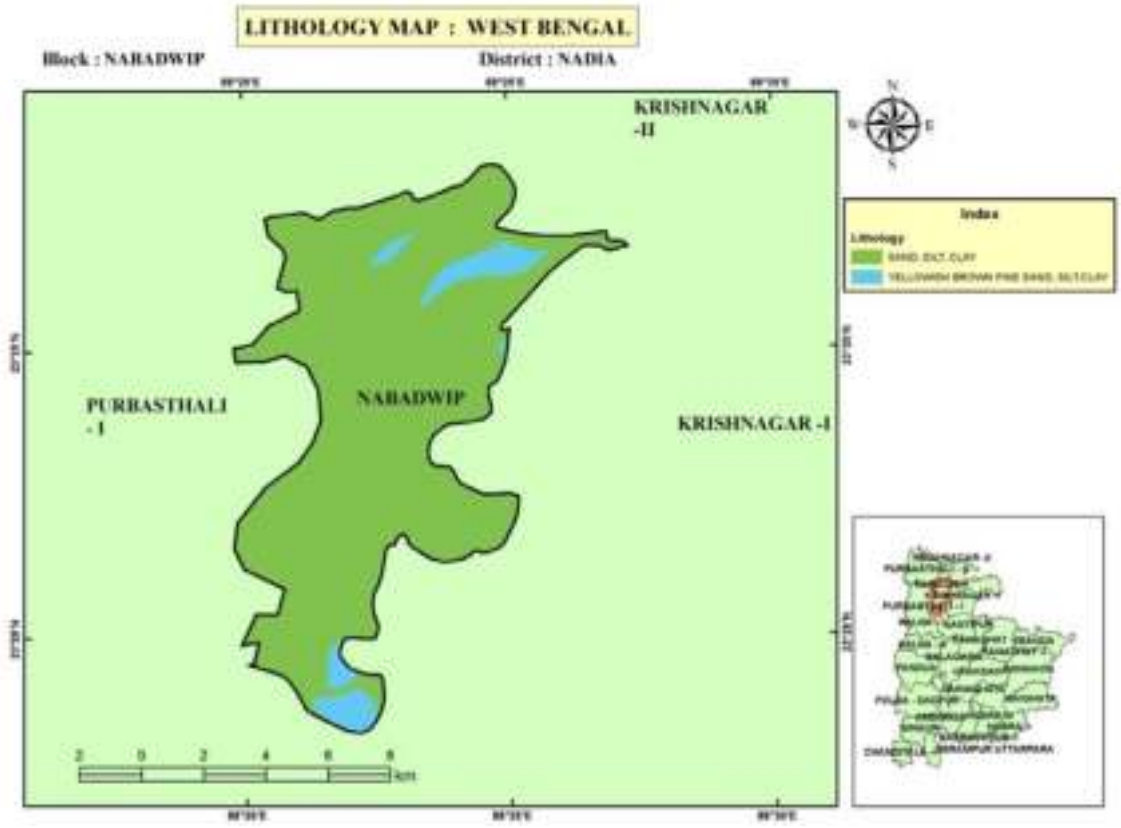
Aquifer Wise Ground Water Resource Availability & Extraction:

(in MCM)

Resource Availability	Aquifer I	Aquifer II	Extraction (for Aquifer I)
Dynamic Resource	4911.40	-	0.186696
Static Resource	3608.00	-	-

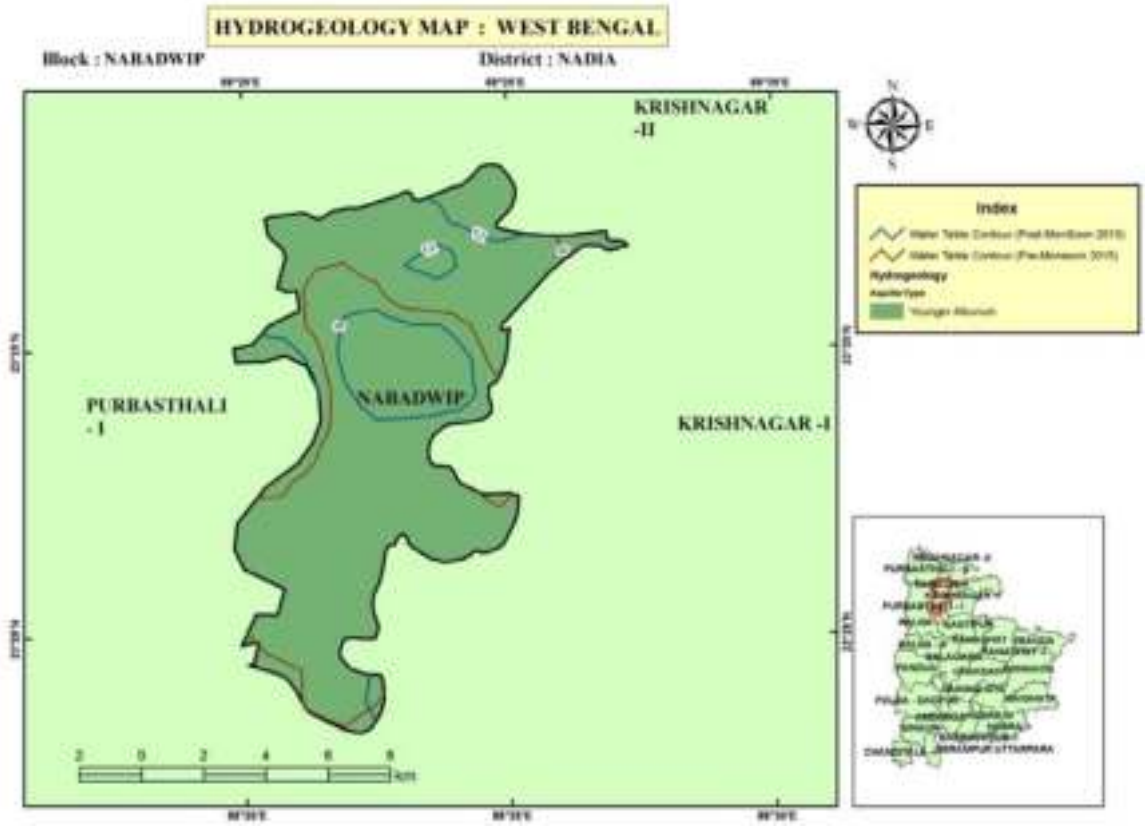
2)Disposition of Aquifer:

Block	Depth range of Aquifer in m bgl	
	1st Aquifer	2nd aquifer
Nabadwip	4-179	



Aquifer Wise Water Level Ranges & Pre-monsoon and Post-monsoon long term water level trends (1995 to 2011)

Sl. N	Block	Aquifer	Pre-monsoon Trend		Post-monsoon Trend	
			Water Level Range(mbgl)	**Pre trend (- rising & + Falling)**	Water Level Range(mbgl)	**Post trend (- rising & + Falling)**
1.	**Nabadwip**	**1**	**1.7-6.18**	**4.58**	**1.93-6.1**	**6.7**
2	**Nabadwip**	**2**	**-**	**-**	**-**	**-**

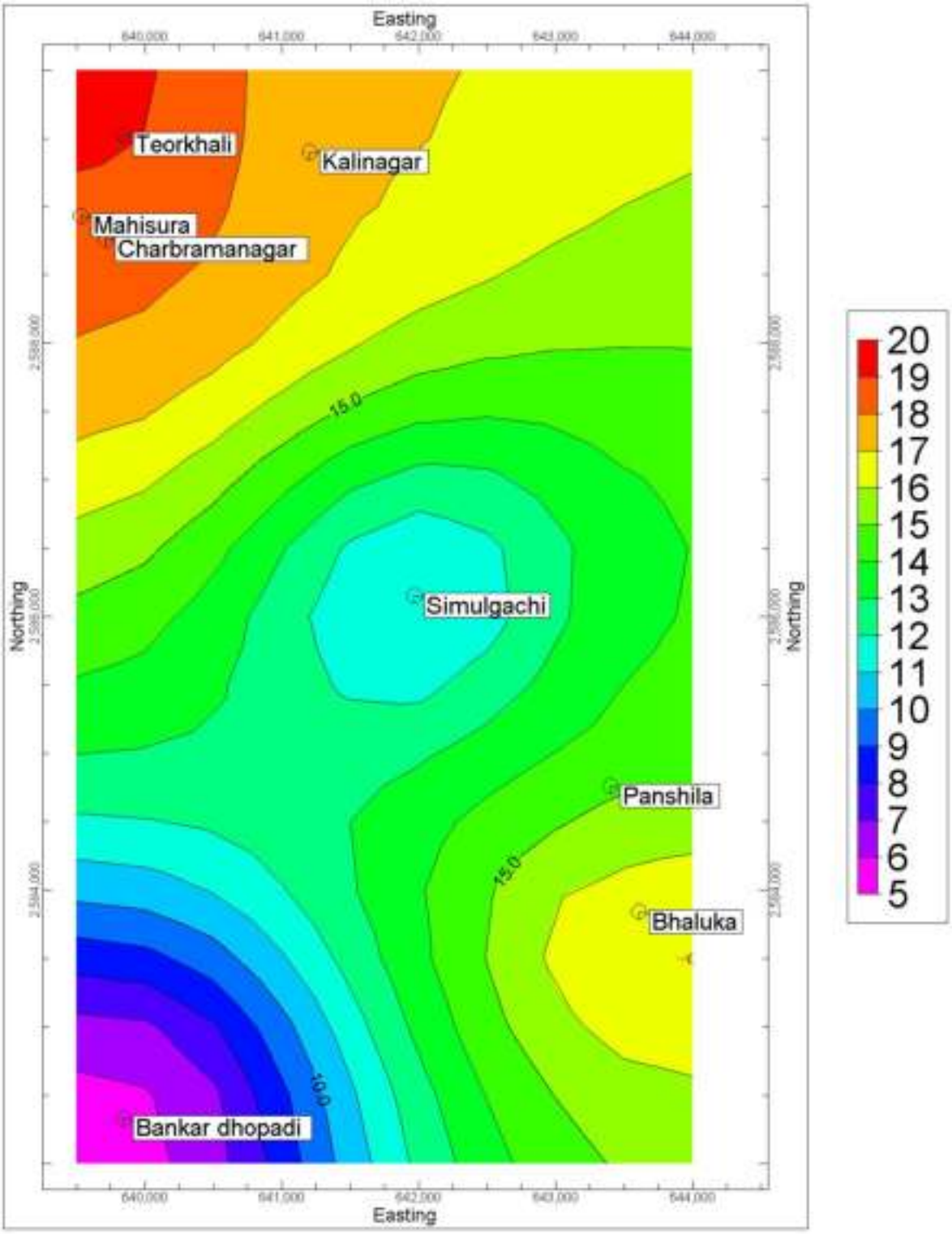


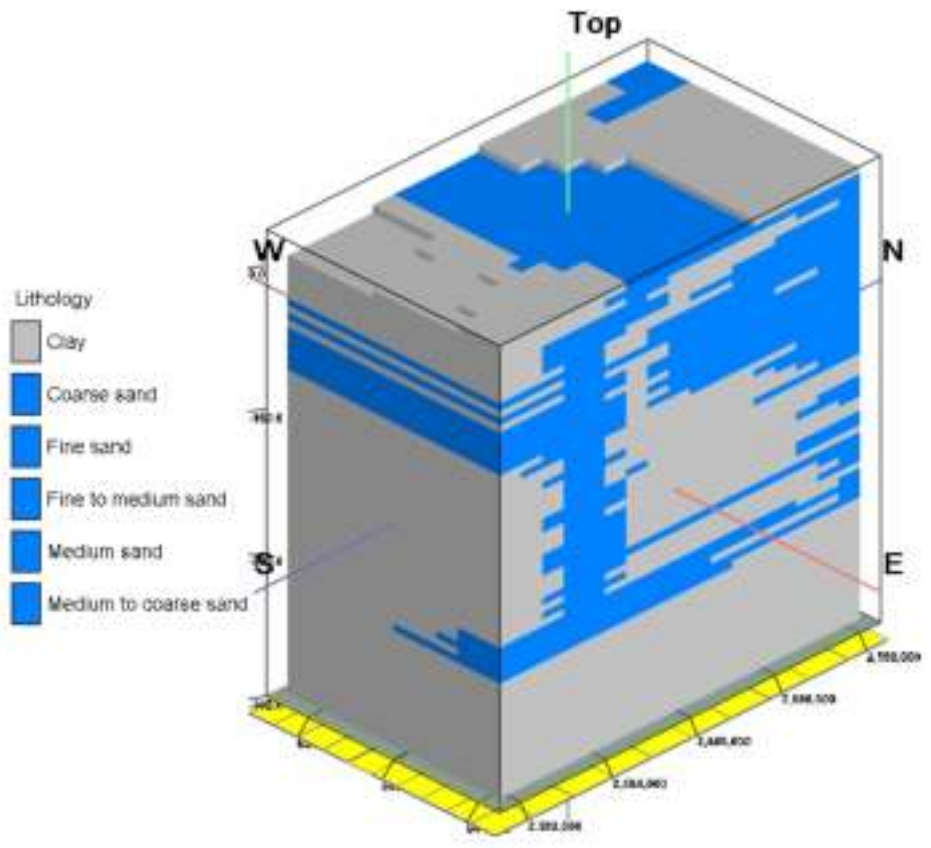
Thickness of Aquifer(Average):

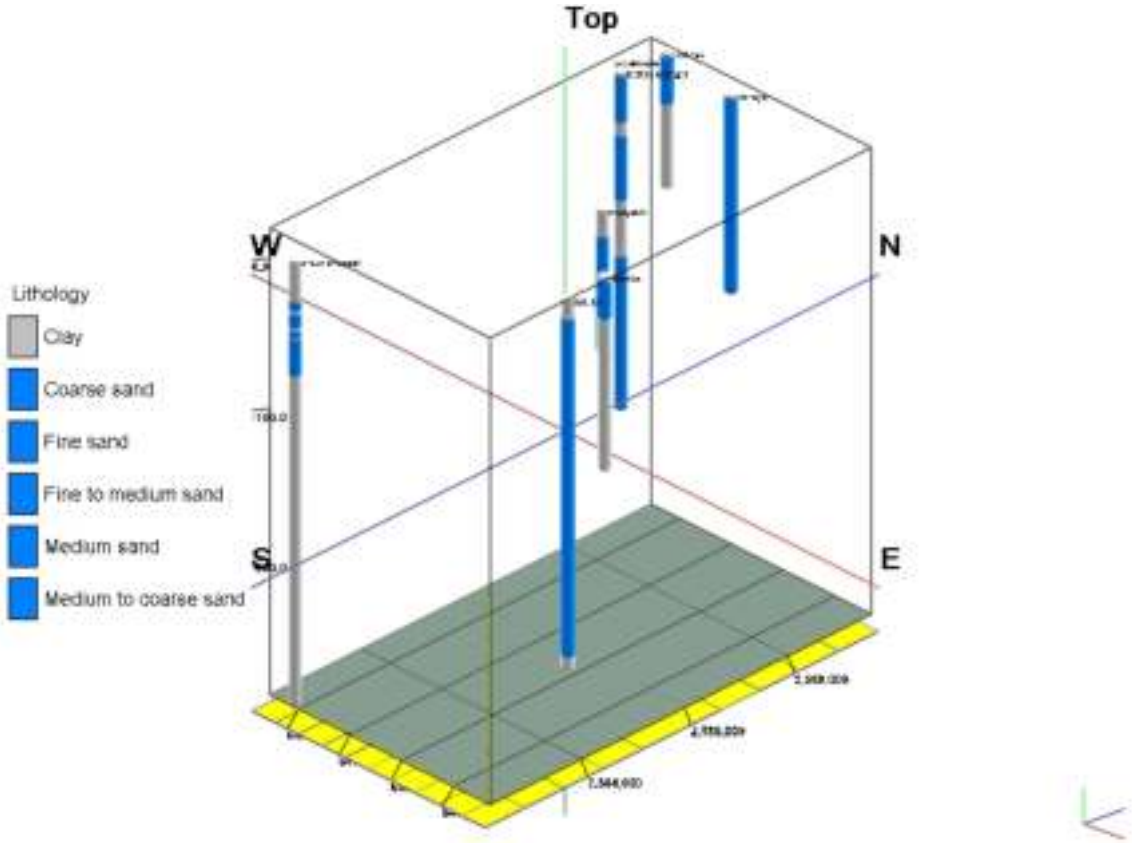
Block	Geographic Area (sq km)	Thickness of the Granular Zone in 1st aquifer (m)	Thickness of the Granular Zone /Productive Zone below pre-monsoon WL (m)
Nabadwip	103.72	179	173.93

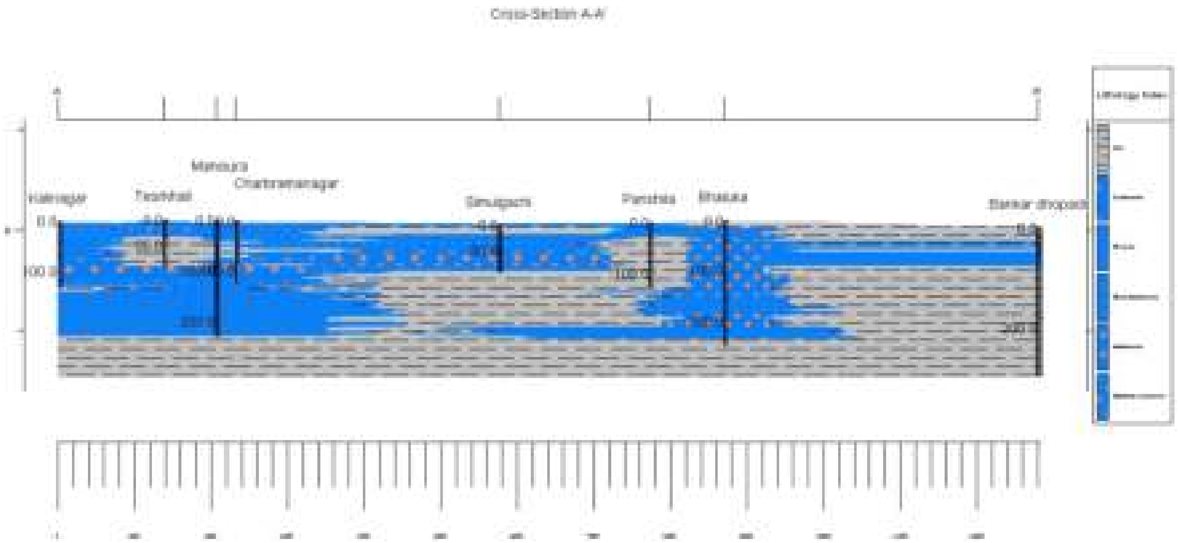
Aquifer-wise Statement

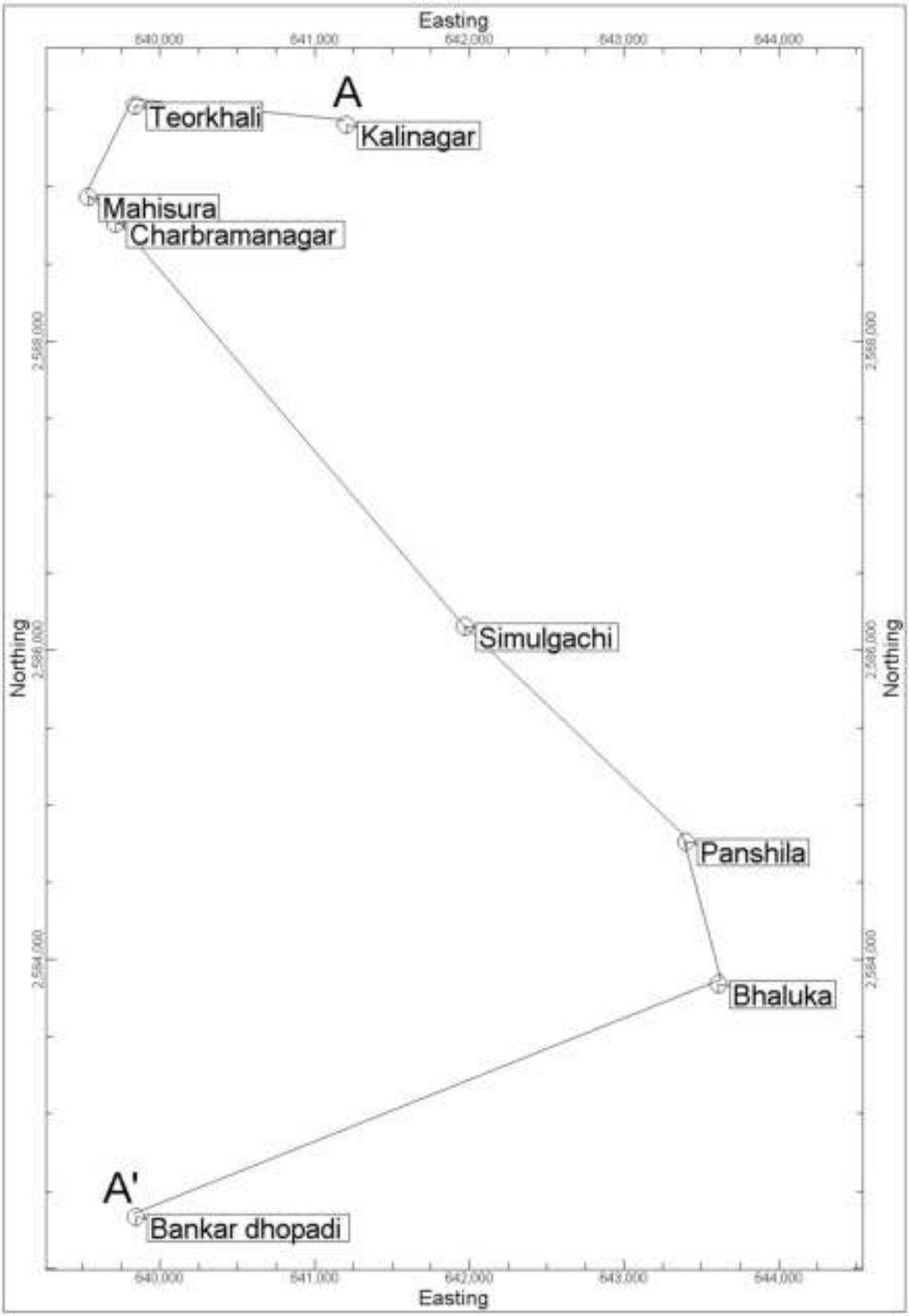
Sl. No.	Name of Block	1st Aquifer			2nd Aquifer		Remarks
		Depth Range (mbgl)	Discharge (m^3/hr)	T (m^2/day)	Depth Range/Discharge/T	Discharge (m^3/hr)	
		1st					
13	Nabadwip	4-179					


Easting
640,000
641,000
642,000
643,000
644,000
Teorkhali
Kalinagar
Mahisura
Charbramanagar
15.0
Simulgachi
Panshila
15.0
Bhaluka
10.0
Bankar dhopadi
Northing
2,598,000
2,596,000
2,594,000
20
19
18
17
16
15
14
13
12
11
10
9
8
7
6
5


Top
W
N
S
E
Lithology
Clay
Coarse sand
Fine sand
Fine to medium sand
Medium sand
Medium to coarse sand


Top
W
N
S
E
Lithology
Clay
Coarse sand
Fine sand
Fine to medium sand
Medium sand
Medium to coarse sand


Cross-Section A-A'
Mahisura
Chandramanagar
Kalinagar
Tarakhali
Simulgachi
Panshila
Bhasuka
Bankar dhopadi


Easting
640,000
641,000
642,000
643,000
644,000
A
Teorkhali
Kalinagar
Mahisura
Charbramanagar
2,598,000
2,596,000
2,594,000
Northing
Simulgachi
Panshila
Bhaluka
A'
Bankar dhopadi

3)Ground Water Resource,Extraction,Contamination & Other Issues:

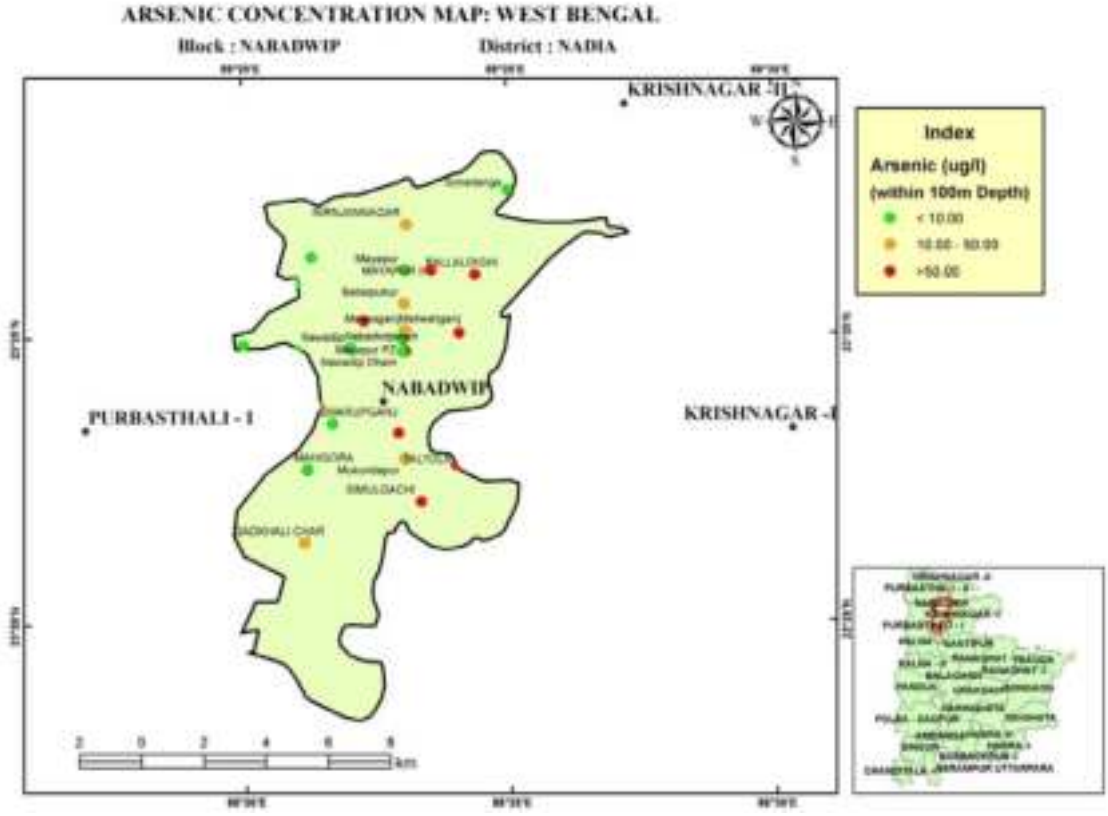
Aquifer Wise Resource Availability & Extraction:

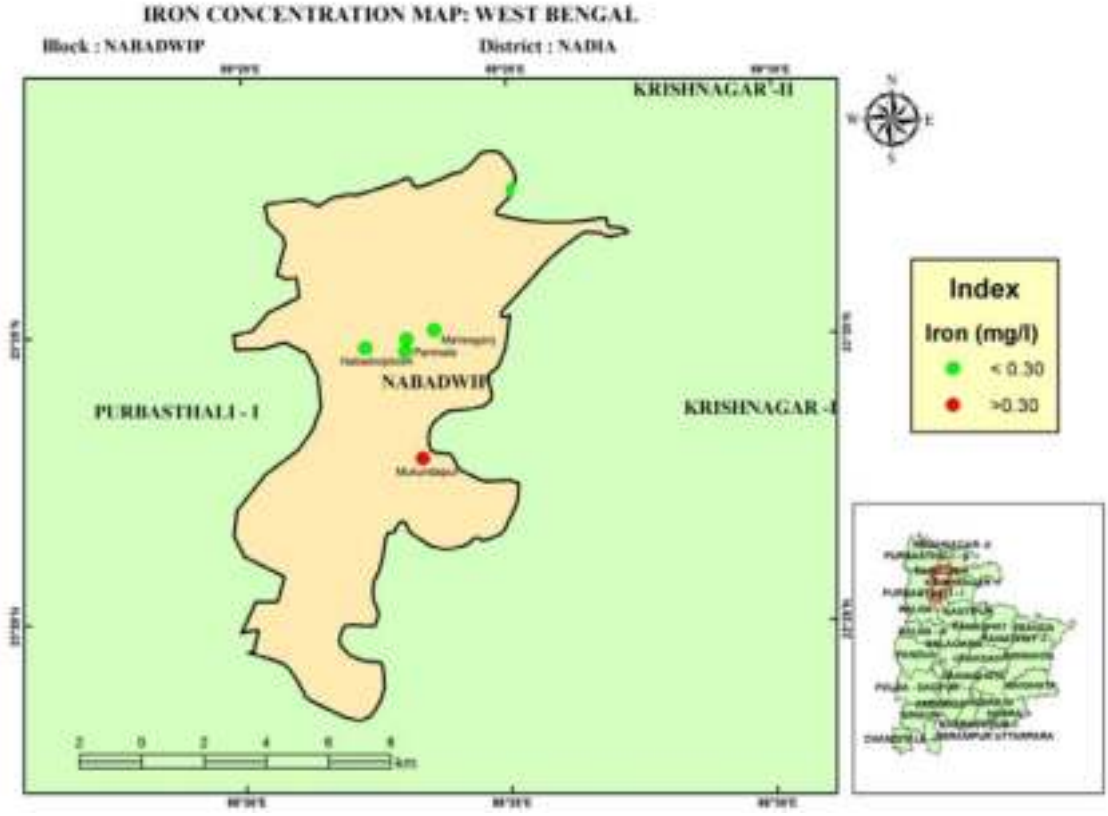
Block	Net ground water availability (MCM)	Gross ground water draft (MCM)	Stage of development (%)	Category
Nabadwip	4911.40	3217.49	65.51	Safe

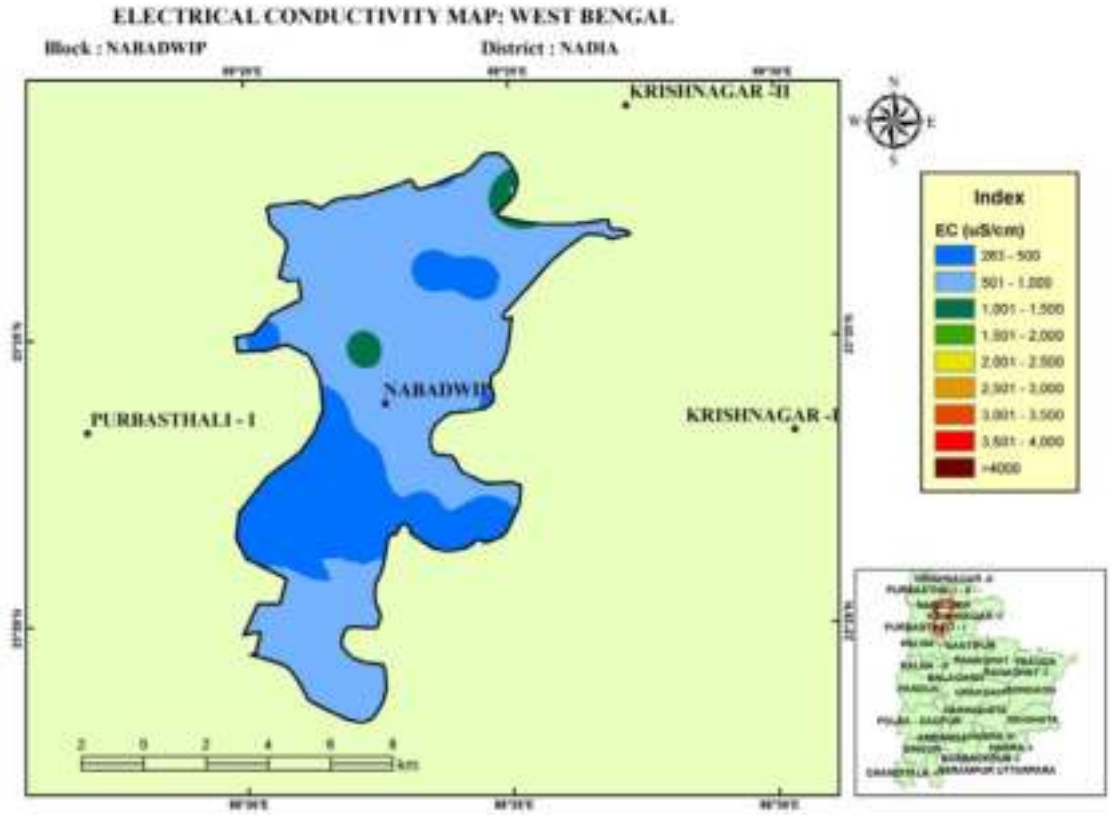
Chemical Quality Of GroundWater & Contamination:

Range Of Chemical Pollutants:

Block	As(mg/l)	Fe(mg/l)	Ec(µS/cm)	F(mg/l)	No_3(mg/l)
Nabadwip	**Negligible-0.170**	**Bdl-1.08**	**307-2050**	**Bdl/negligible-0.37**	**0.53-71**


ARSENIC CONCENTRATION MAP: WEST BENGAL
Block : NABADWIP
District : NADIA
KRISHNAGAR -II
NABADWIP
PURBASTHALI - I
KRISHNAGAR -I
Index
Arsenic (ug/l)
(within 100m Depth)
< 10.00
10.00 - 50.00
>50.00
2 0 2 4 6 8
km


IRON CONCENTRATION MAP: WEST BENGAL
Block : NABADWIP
District : NADIA
KRISHNAGAR -II
PURBASTHALI - I
NABADWIP
KRISHNAGAR -I
Index
Iron (mg/l)
< 0.30
>0.30
km



Percentage of tube wells having arsenic content in the **block:**

SI.No.	Blocks	Arsenic (<0.01 ing/1)	Arsenic (>0.01-<0.05 mg/1)	Arsenic (> 0.05 mg/1)	Total Tube well
1	Nabadwip	35.46	37.22	27.24	1303

4)Ground Water Resource Enhancement& Management Plan:

Ground Water Management Plan for Drinking purpose.

Suggestions on supply of ground water to the risk population For drinking purpose.

District	Block (As affected)	No. of habitations in the risk zone where As concentration >0.05 mg/L	No. of habitations in the risk zone where As concentration 0.01 to 0.05 mg/L	Risk Population (2011) where As concentration >0.05 mg/L
NADIA	NABADWIP	68	11	76241

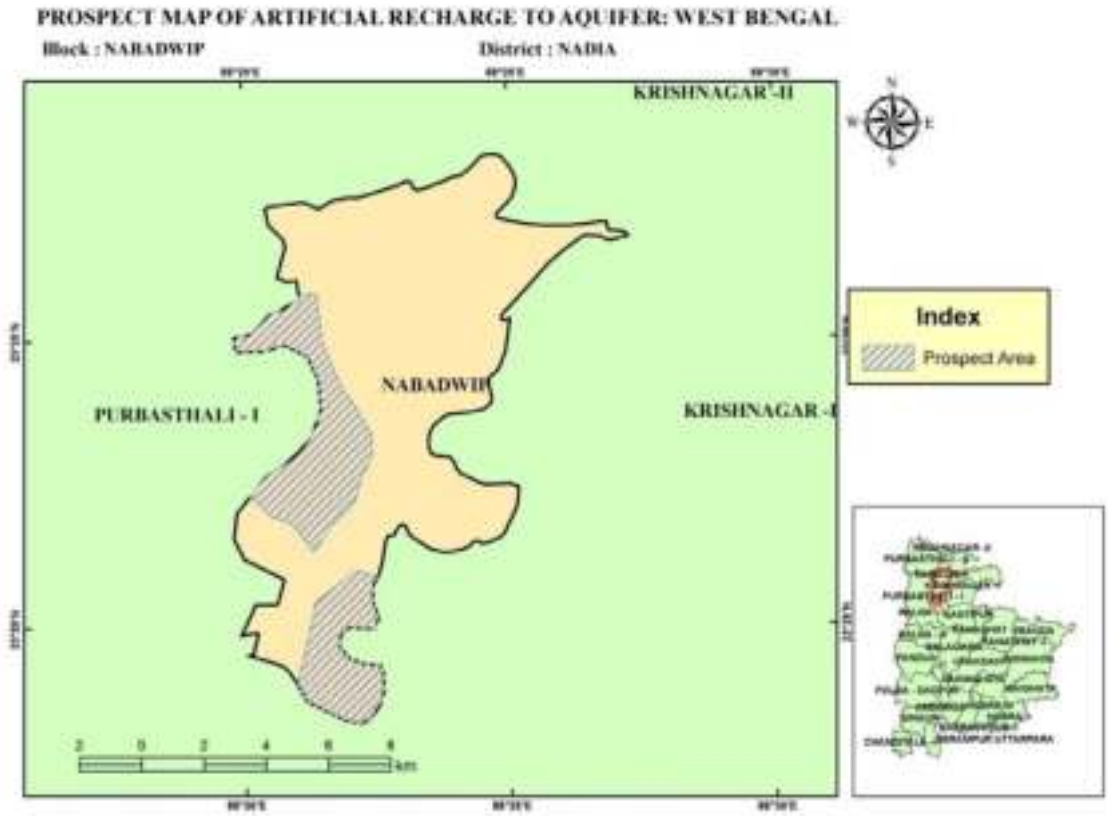
Aquifer Wise Space Available For Recharge and Proposed Interventions:

Area suitable for recharge in the study area:

District	Block Name	Area (in sq. km)	Total Area suitable for recharge (sq km.)
NADIA	Navadwip	103.72	23.82

Proposed Artificial Recharge Structures in the area in :

District	Block	Total Surface water available in MCM for recharge	Source Water Allocation (MCM)			Number of Structures feasible			Structure-wise Cost Estimate in lakh Rs.			Total cost in lakh Rs
			Percolation Tanks	REET with RS	Injection Well	Percolation Tanks	RET with RS	Injection Well	Percolation Tanks	REET with RS	Injecton Well	
NADIA	Navadwip	5.02	2	1	1	5	13	4	100	104	16	220



Ground Water Management Plan For Irrigation Purpose.

Area in sq, km.

Sr No.	Name of Block	Cultivable area in ha	Net irrigated area in ha	Area to be irrigated in ha	SOD in %	Category
1	Nabadwip	5225	2960	2265.00	64.58	Safe

Ranaghat I

1)Salient Information

Block Name: Ranaghat I

Area(in Km^2): 160.21

District: Nadia

State:West Bengal

Population(as on 2011):

Name of the Block	Population of CD Block (2011 census)
Ranaghat I	120847

Approximate Decadal Growth Rate from 2001-2011:

Rainfall:

Average annual rainfall in **: Ranaghat I**

(as in the district) for the period 2009 -13 (in mm)

Block	Normal	Actual (Annual)				
		2009	2010	2011	2012	2013
Ranaghat I	1401	1209	940	1488	1039	1245

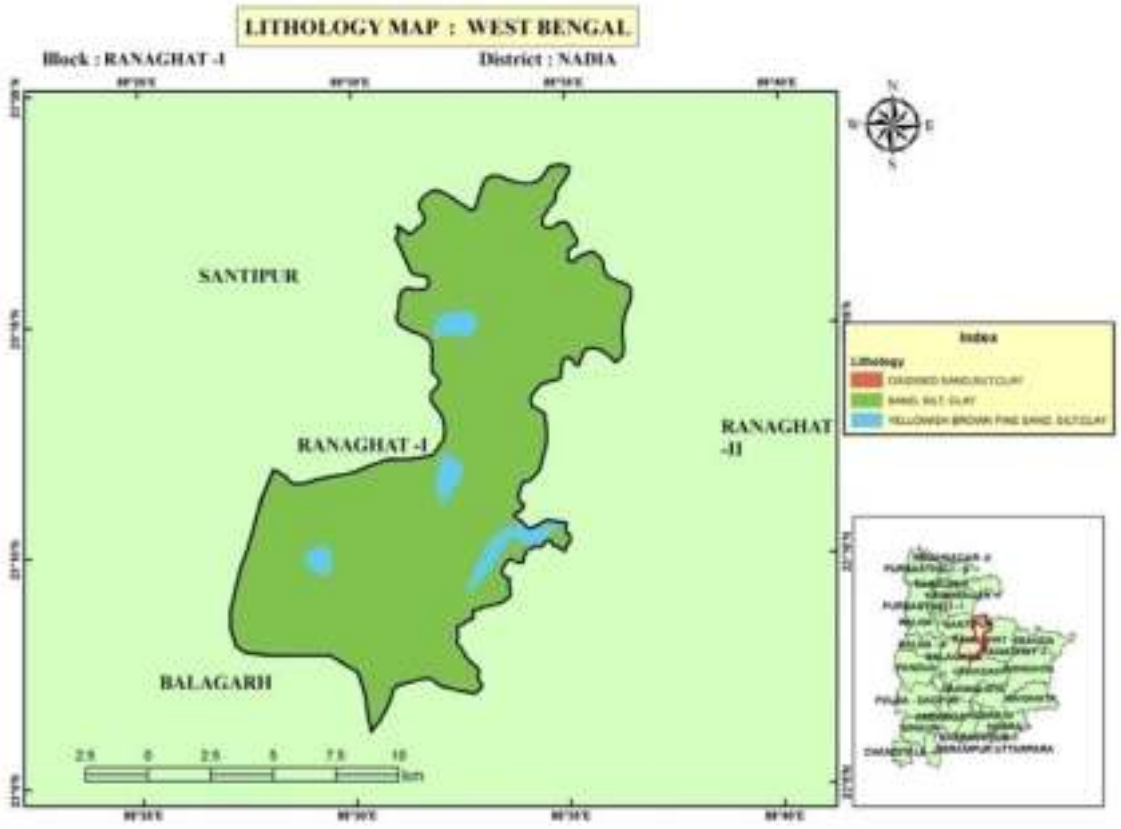
Aquifer Wise Ground Water Resource Availability & Extraction:

(in MCM)

Resource Availability	Aquifer I	Aquifer II	Extraction (for Aquifer I)
Dynamic Resource	6474.54	-	0.288378
Static Resource	5112.94	-	-

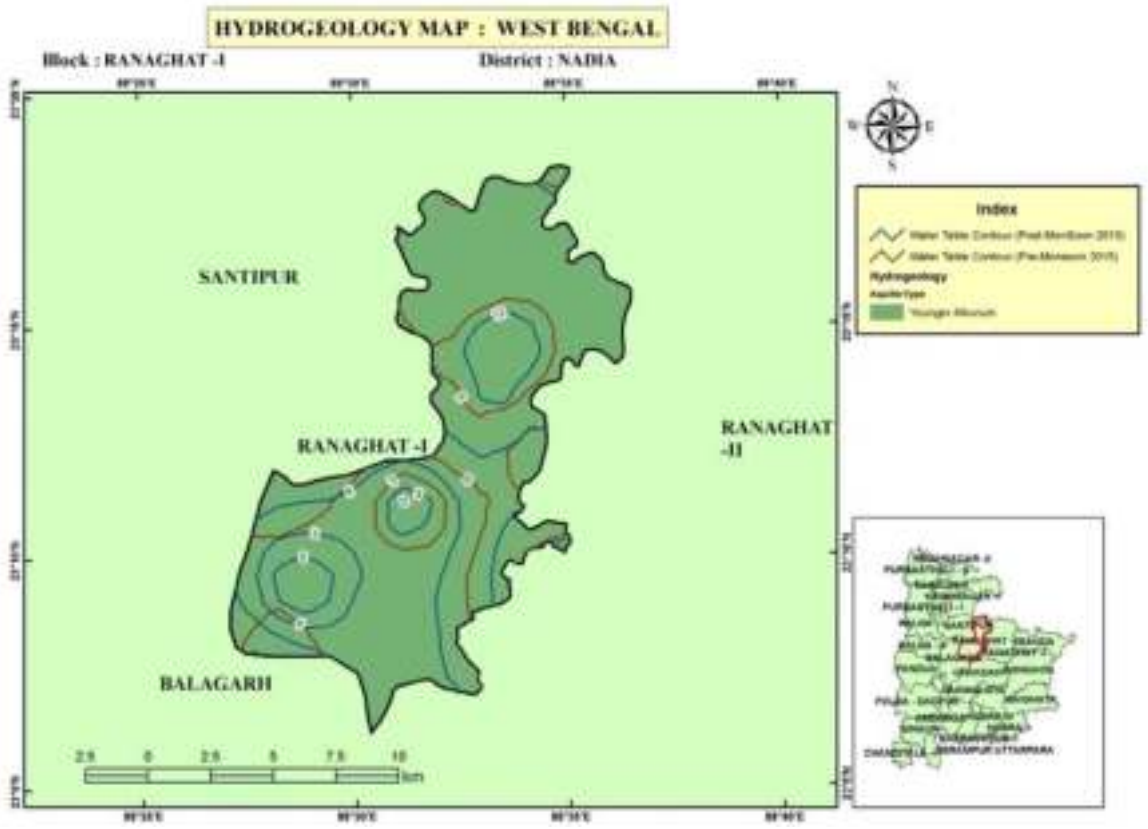
2)Disposition of Aquifer:

Block	Depth range of Aquifer in m bgl	
	1st Aquifer	2nd aquifer
Ranaghat I	3-165	



Aquifer Wise Water Level Ranges & Pre-monsoon and Post-monsoon long term water level trends (1995 to 2011)

Sl.	Block	Aquifer	Pre-monsoon Trend		Post-monsoon Trend	
			Water Level Range(mbgl)	**Pre trend (- rising & + Falling)**	Water Level Range(mbgl)	**Post trend (- rising & + Falling)**
1.	**Ranaghat I**	**1**	**4.2-5.86**	**-0.41**	**3.8-5.6**	**5.22**
2	**Ranaghat I**	**2**	**-**	**-**	**-**	**-**

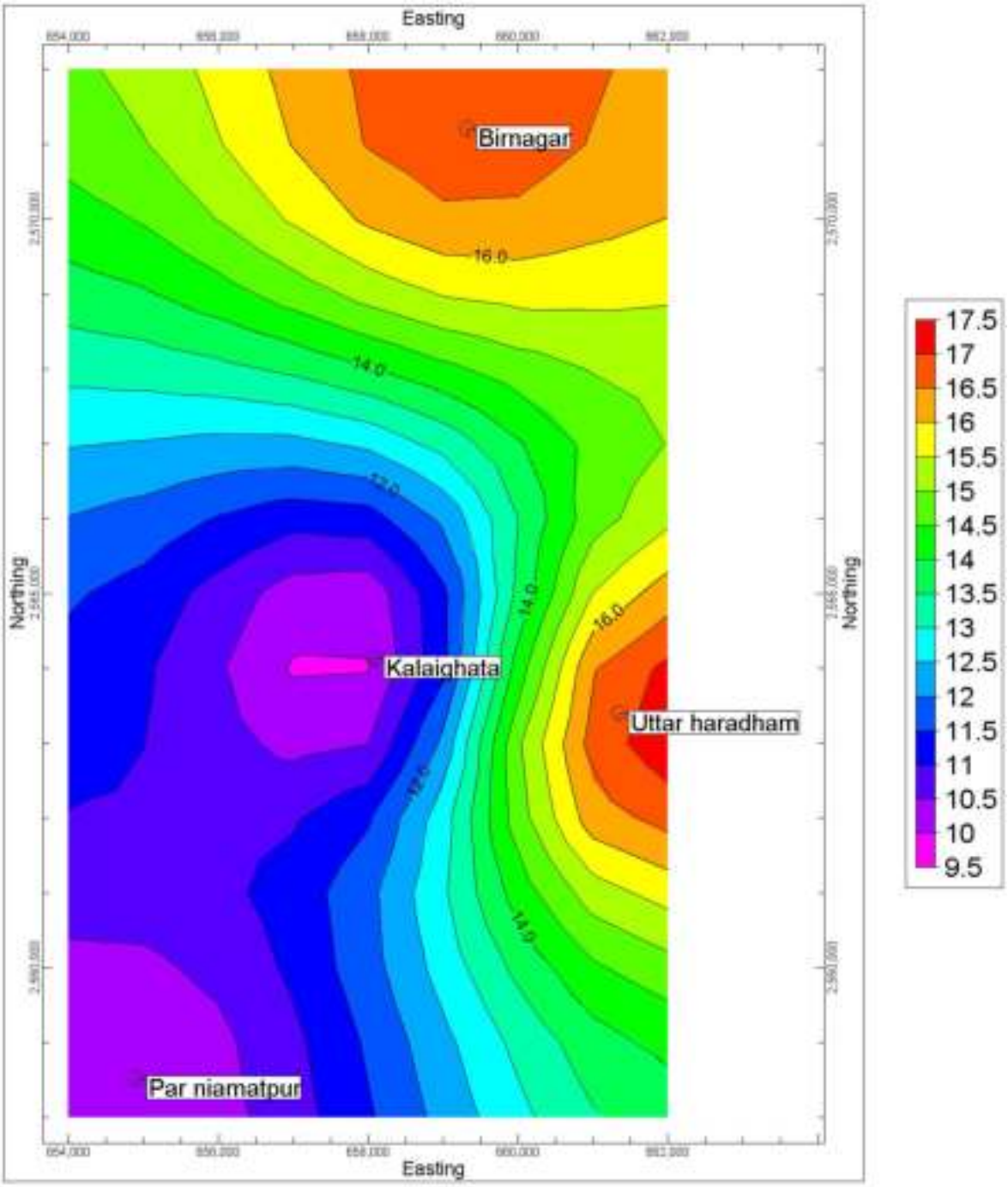


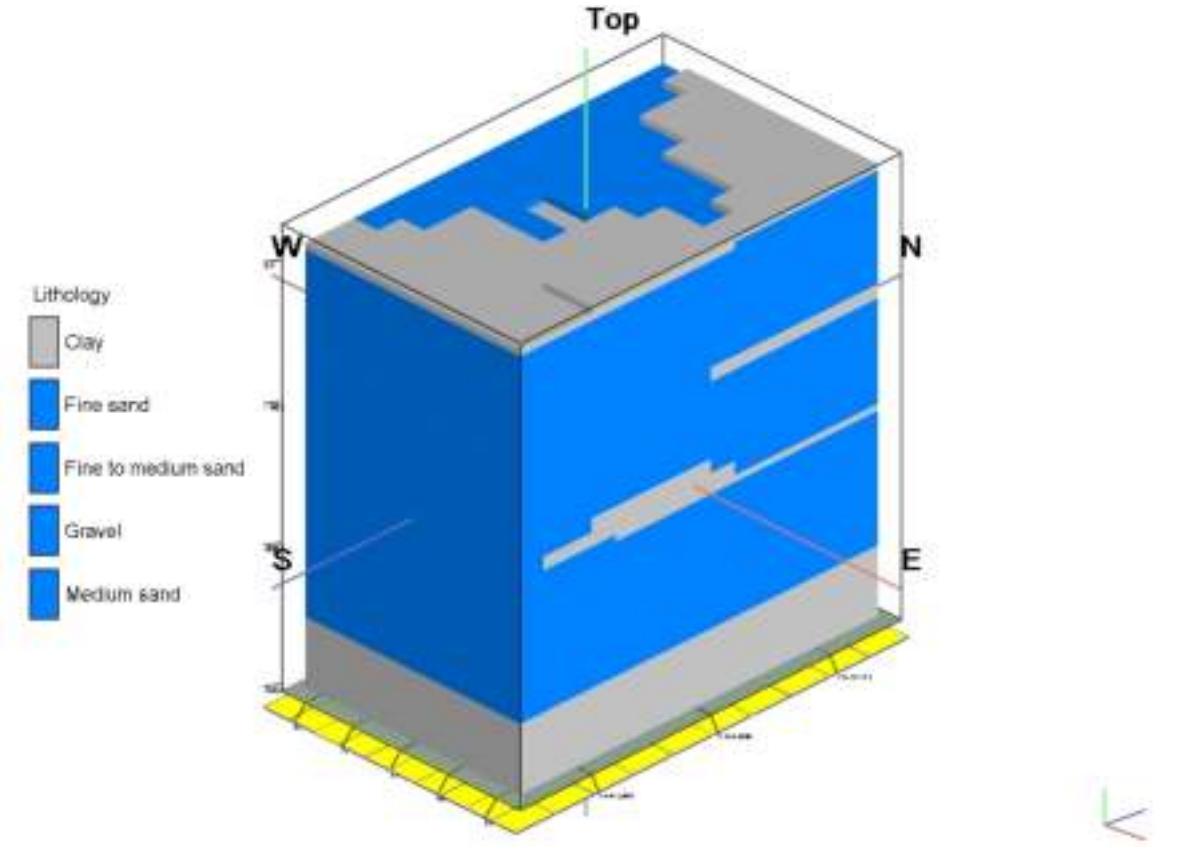
Thickness of Aquifer(Average):

Block	Geographic Area (sq km)	Thickness of the Granular Zone in 1st aquifer (m)	Thickness of the Granular Zone /Productive Zone below pre-monsoon WL (m)
Ranaghat I	160.21	165	159.57

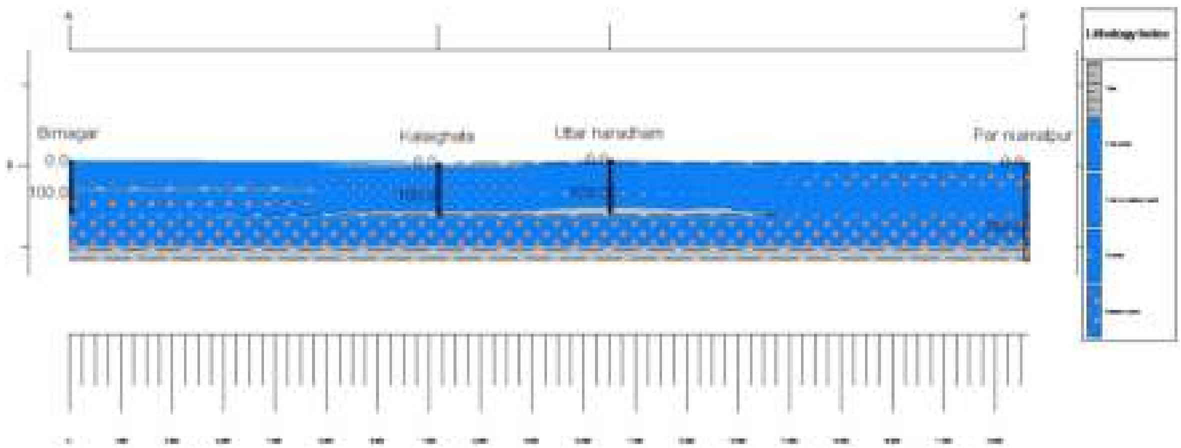
Aquifer-wise Statement

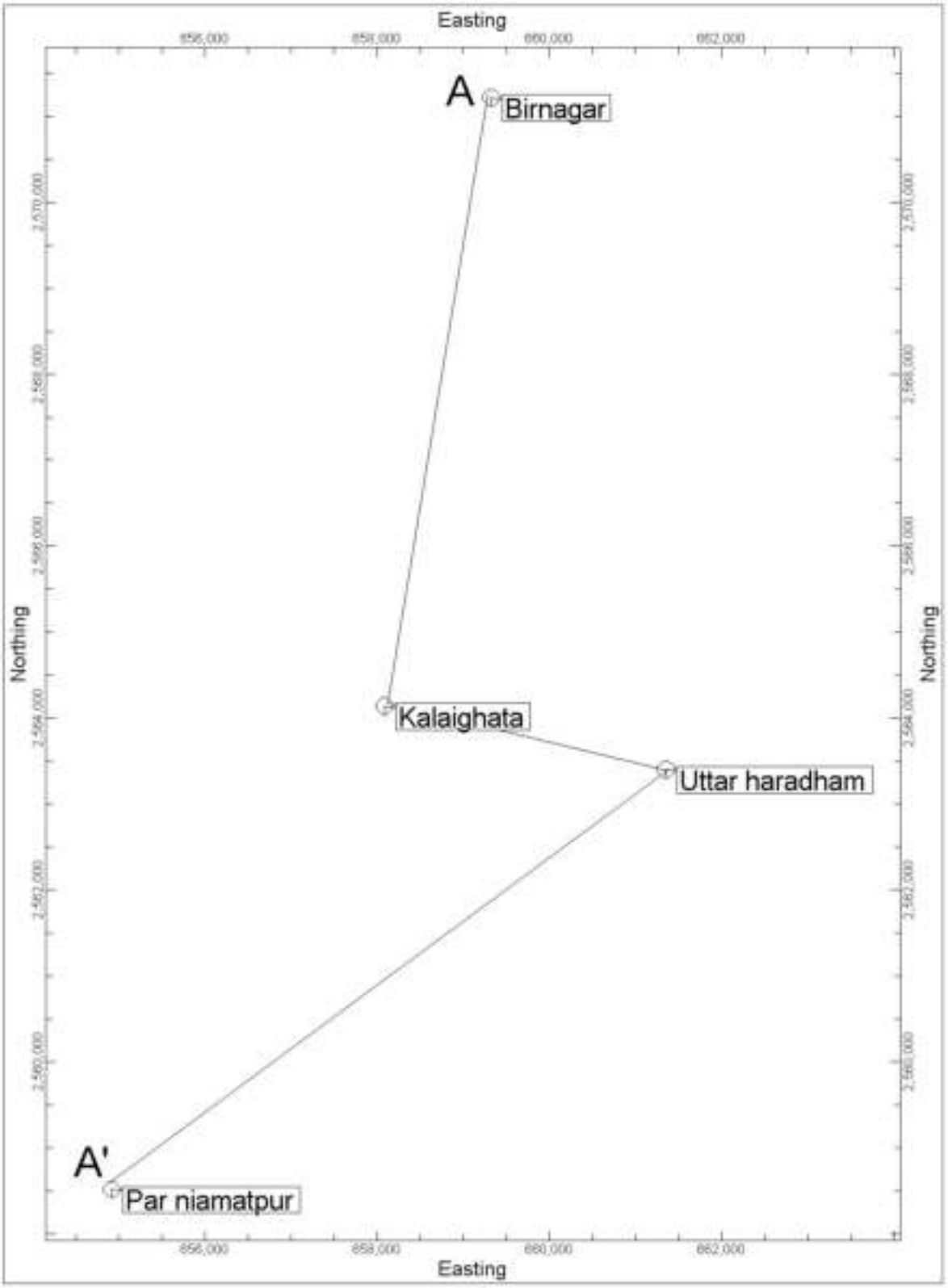
Sl. No.	Name of Block	1st Aquifer			2nd Aquifer		Remarks
		Depth Range (mbgl)	Discharge (m^3/hr)	T (m^2/day)	Depth Range/Discharge/T	Discharge (m^3/hr)	
		1st					
13	Ranaghat I	3-165					


Easting
Birnagar
16.0
14.0
12.0
14.0
16.0
Kalaighata
Uttar haradham
12.0
14.0
Par niamatpur
Northing
Northing
Easting
17.5
17
16.5
16
15.5
15
14.5
14
13.5
13
12.5
12
11.5
11
10.5
10
9.5


Top
W
N
S
E
Lithology
Clay
Fine sand
Fine to medium sand
Gravel
Medium sand

Cross-Section A-A'




Easting
656,000
658,000
660,000
662,000
A
Birnagar
Kalaighata
Uttar haradham
A'
Par niamatpur
Northing
2,570,000
2,568,000
2,566,000
2,564,000
2,562,000
2,560,000
Northing
Easting

3)Ground Water Resource,Extraction,Contamination & Other Issues:

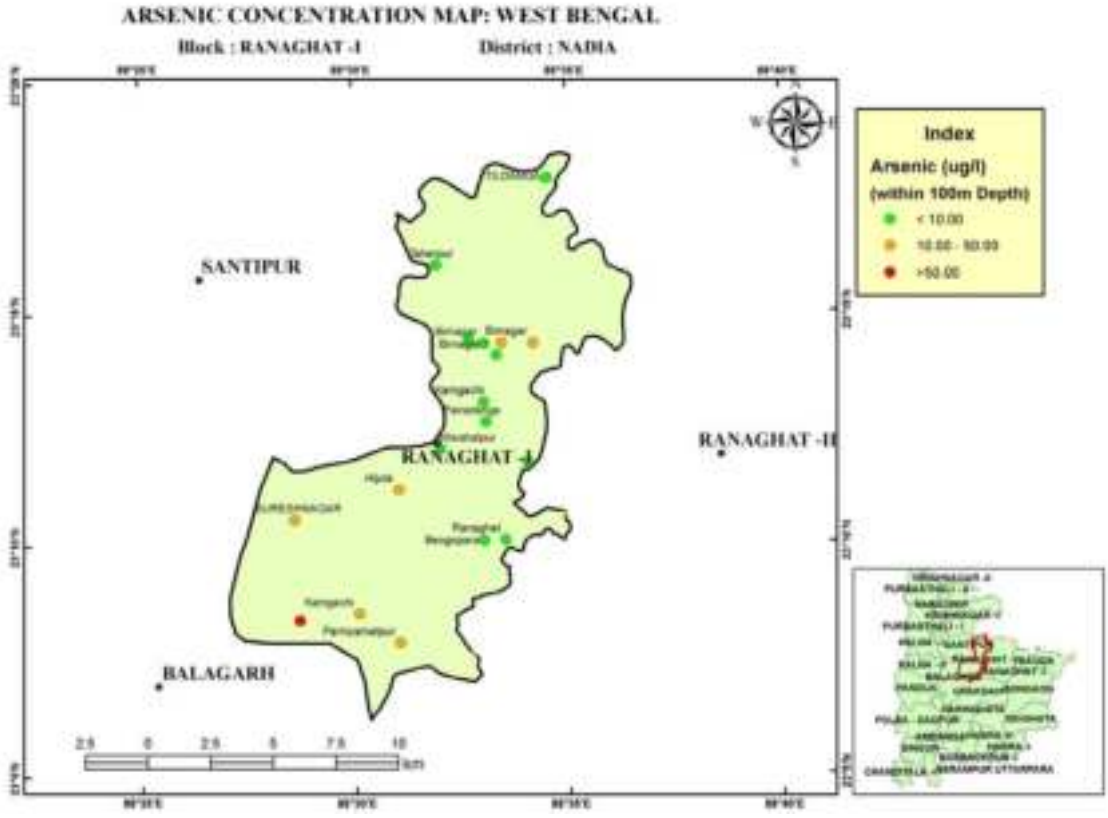
Aquifer Wise Resource Availability & Extraction:

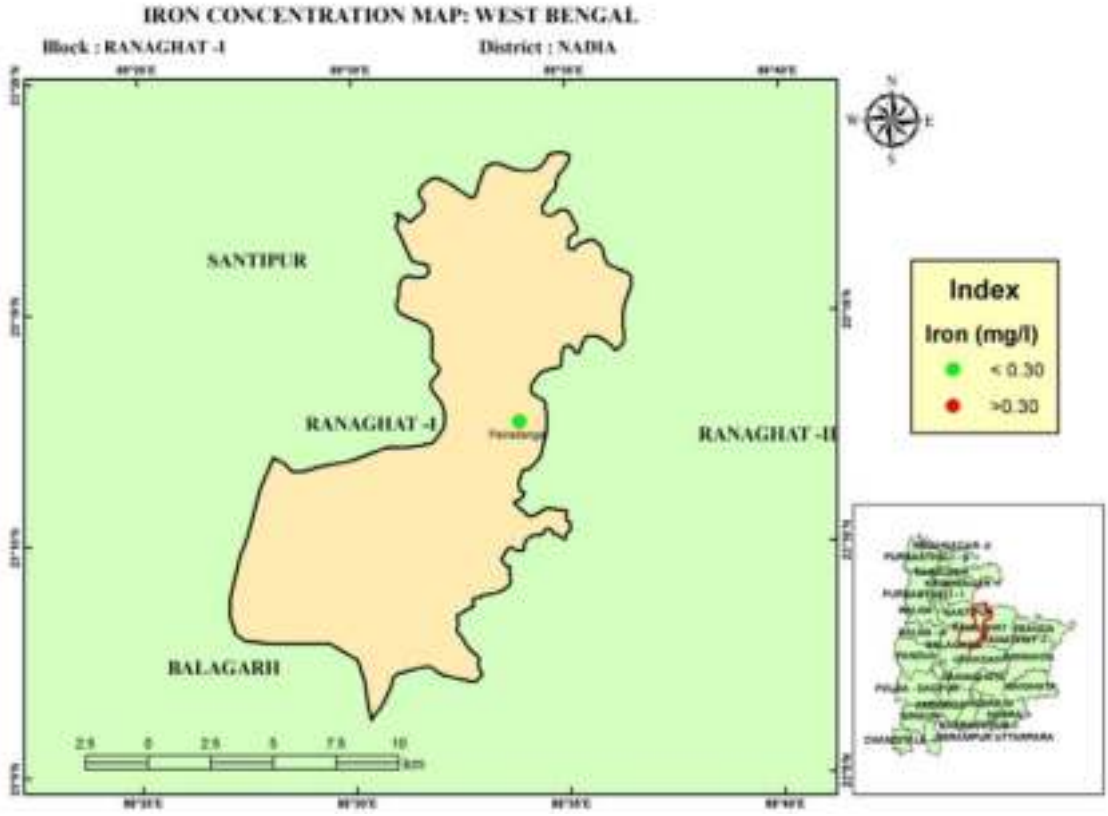
Block	Net ground water availability (MCM)	Gross ground water draft (MCM)	Stage of development (%)	Category
Ranaghat I	6474.54	4181.45	64.58	Safe

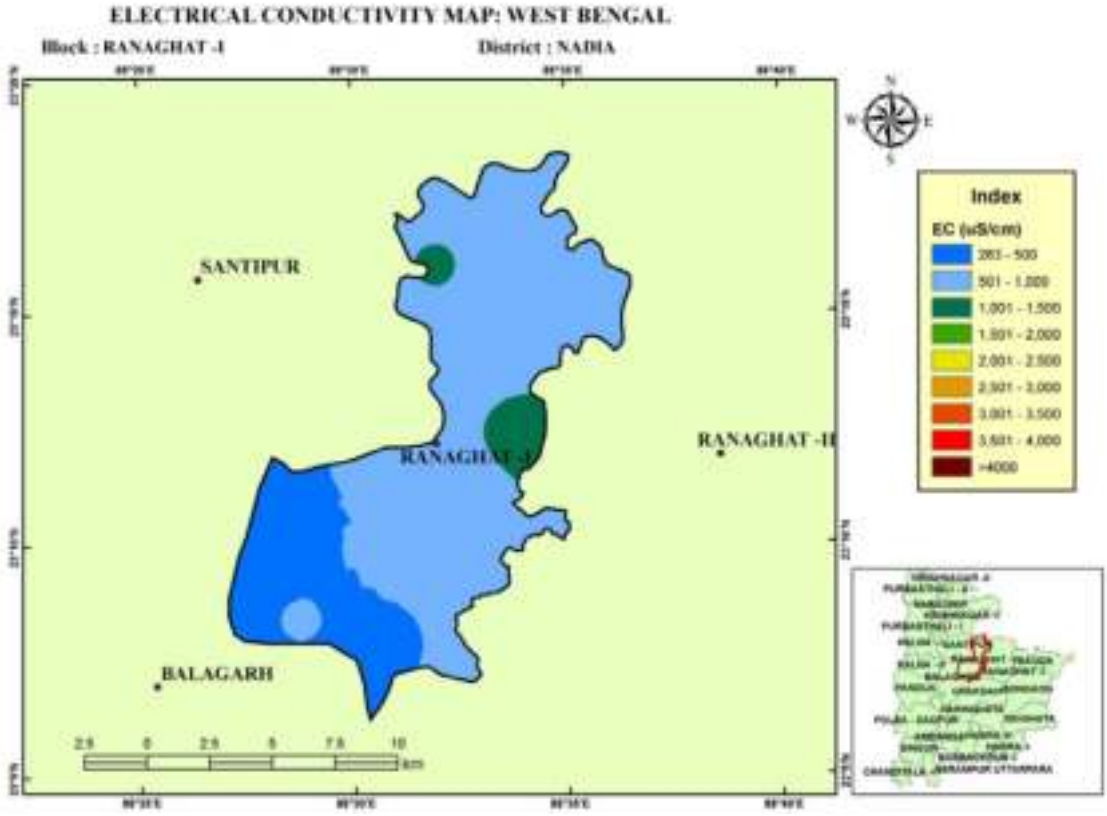
Chemical Quality Of GroundWater & Contamination:

Range Of Chemical Pollutants:

Block	As(mg/l)	Fe(mg/l)	Ec(µS/cm)	F(mg/l)	No_3(mg/l)
Ranaghat I	Sample leaked/negligible-0.012	**Bdl-0.06**	**407-1490**	**Bdl-0.51**	**-**


ARSENIC CONCENTRATION MAP: WEST BENGAL
Block : RANAGHAT -I
District : NADIA
SANTIPUR
RANAGHAT -I
RANAGHAT -II
BALAGARH
Index
Arsenic (ug/l)
(within 100m Depth)
< 10.00
10.00 - 50.00
>50.00


IRON CONCENTRATION MAP: WEST BENGAL
Block : RANAGHAT -I
District : NADIA
SANTIPUR
RANAGHAT -I
RANAGHAT -II
BALAGARH
Index
Iron (mg/l)
< 0.30
>0.30



Percentage of tube wells having arsenic content in the **block:**

SI.No.	Blocks	Arsenic (<0.01 ing/1)	Arsenic (>0.01-<0.05 mg/1)	Arsenic (> 0.05 mg/1)	Total Tube well
1	Ranaghat I	16.92	55.39	27.69	1939

4)Ground Water Resource Enhancement& Management Plan:

Ground Water Management Plan for Drinking purpose.

Suggestions on supply of ground water to the risk population For drinking purpose.

District	Block (As affected)	No. of habitations in the risk zone where As concentration >0.05 mg/L	No. of habitations in the risk zone where As concentration 0.01 to 0.05 mg/L	Risk Population (2011) where As concentration >0.05 mg/L
NADIA	RANAGHAT - I	111	36	120847

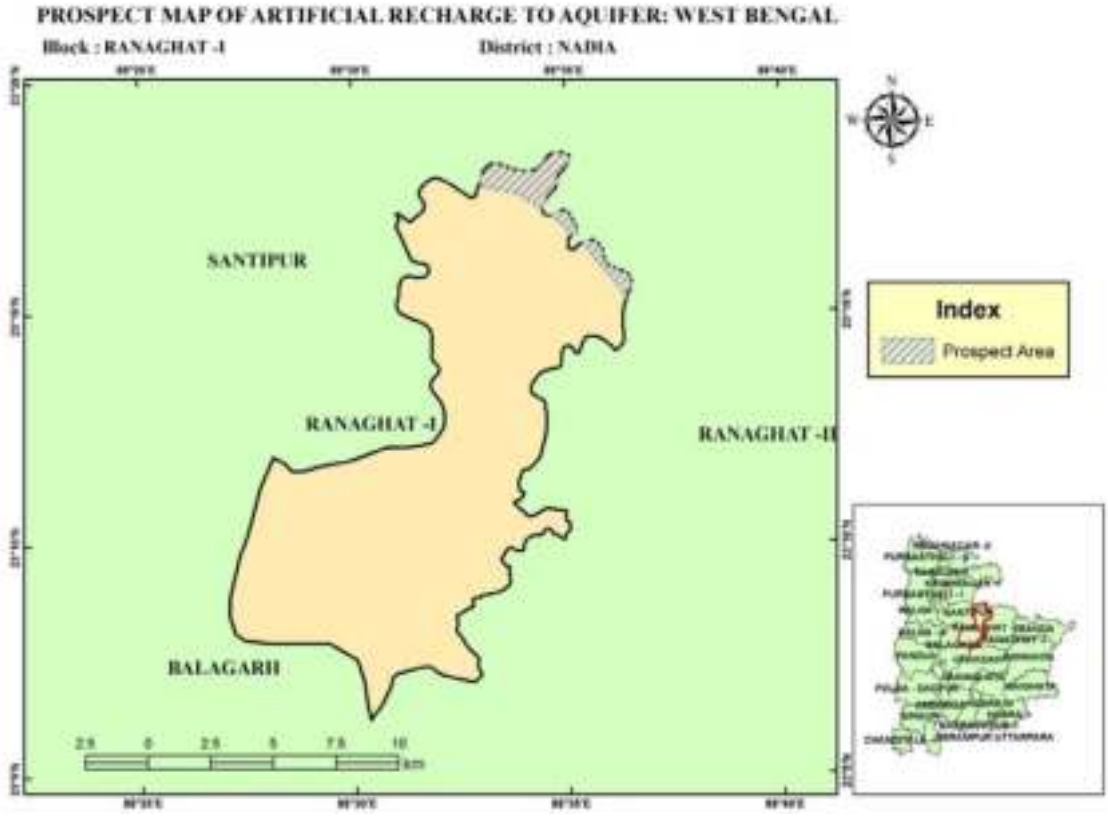
Aquifer Wise Space Available For Recharge and Proposed Interventions:

Area suitable for recharge in the study area:

District	Block Name	Area (in sq. km)	Total Area suitable for recharge (sq km.)
NADIA	Ranaghat-I	160.21	6.33

Proposed Artificial Recharge Structures in the area in :

District	Block	Total Surface water available in MCM for recharge	Source Water Allocation (MCM)			Number of Structures feasible			Structure-wise Cost Estimate in lakh Rs.			Total cost in lakh Rs
			Percolation Tanks	REET with RS	Injection Well	Percolation Tanks	RET with RS	Injection Well	Percolation Tanks	REET with RS	Injecton Well	
NADIA	Ranaghat-I	7.88	4	2	2	7	21	7	140	168	28	336



Ground Water Management Plan For Irrigation Purpose.

Area in sq, km.

Sr No.	Name of Block	Cultivable area in ha	Net irrigated area in ha	Area to be irrigated in ha	SOD in %	Category
1	Ranaghat I	11478	3893	7585.00	85.56	Safe

Shantipur

1)Salient Information

Block Name: Shantipur

Area(in Km^2): 192.16

District: Nadia

State:West Bengal

Population(as on 2011):

Name of the Block	Population of CD Block (2011 census)
Shantipur	54256

Approximate Decadal Growth Rate from 2001-2011:

Rainfall:

Average annual rainfall in **: Shantipur**

(as in the district) for the period 2009 -13 (in mm)

Block	Normal	Actual (Annual)				
		2009	2010	2011	2012	2013
Shantipur	1401	1209	940	1488	1039	1245

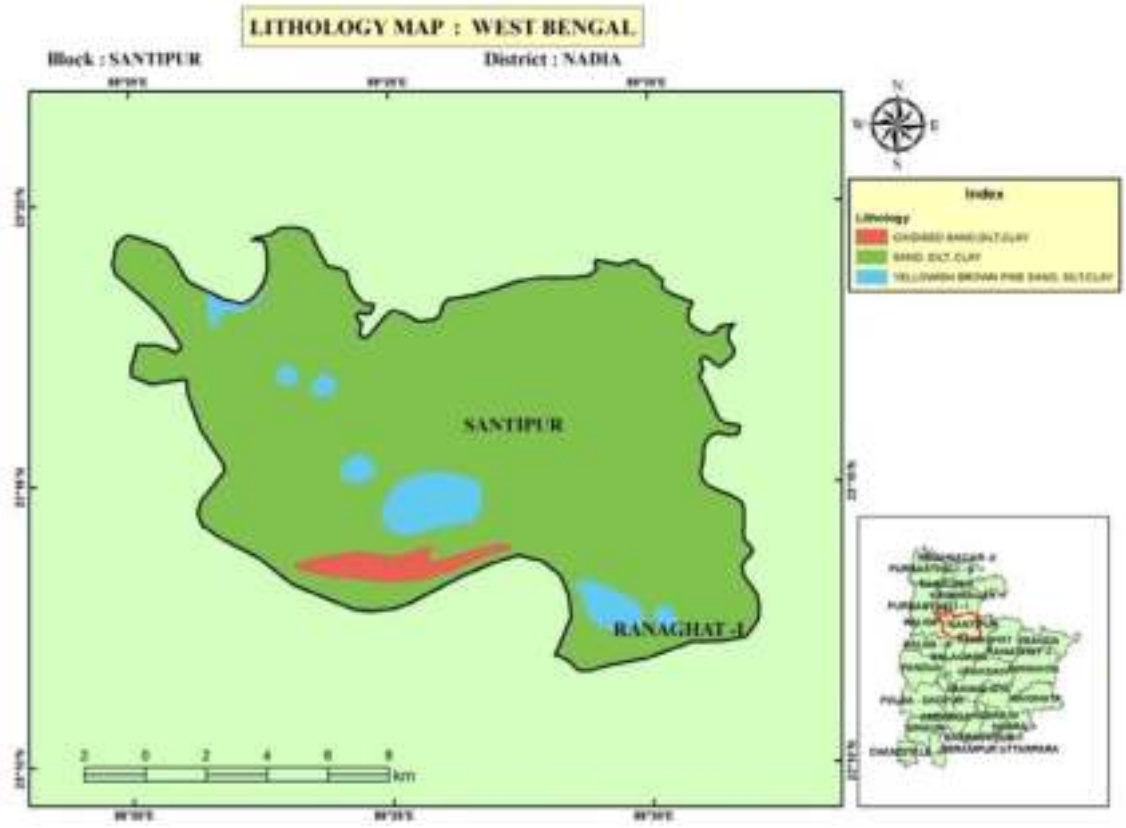
Aquifer Wise Ground Water Resource Availability & Extraction:

(in MCM)

Resource Availability	Aquifer I	Aquifer II	Extraction (for Aquifer I)
Dynamic Resource	7472.69	-	0.345888
Static Resource	5967.34	-	-

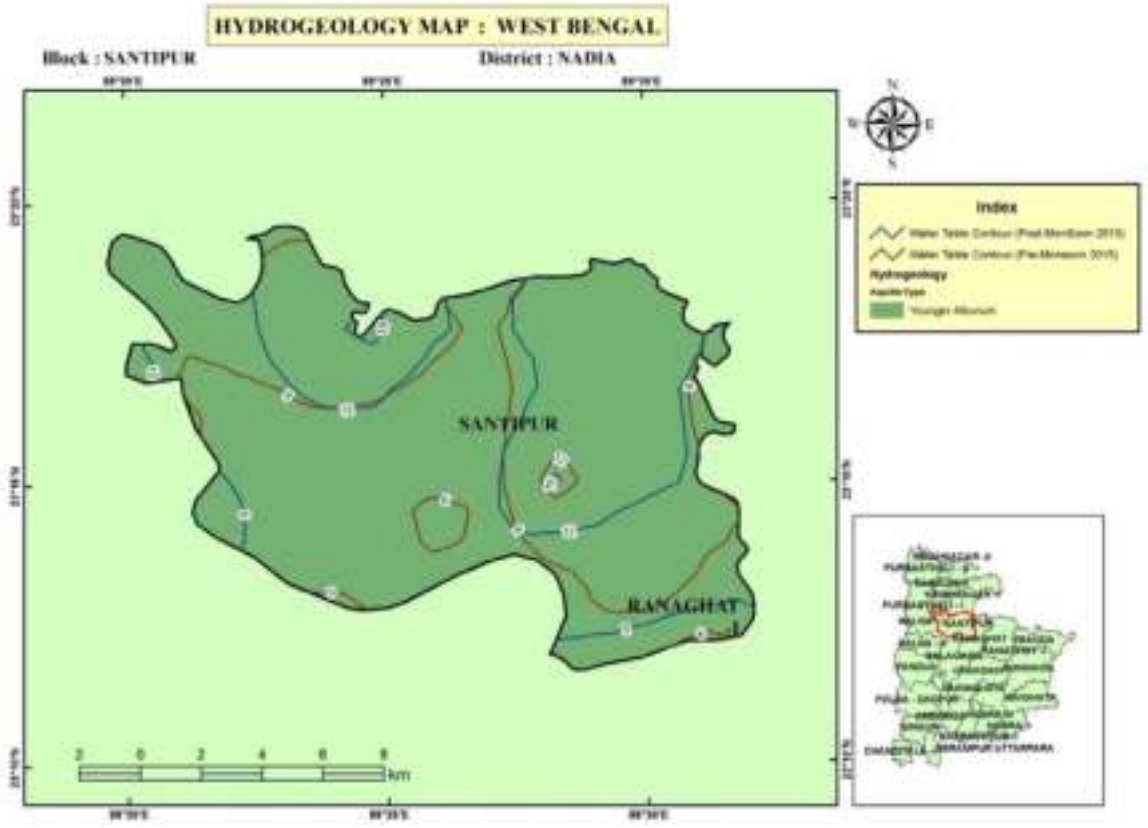
2)Disposition of Aquifer:

Block	Depth range of Aquifer in m bgl	
	1st Aquifer	2nd aquifer
Shantipur	17-136, 150-161	230-249, 252-269, 279-325



Aquifer Wise Water Level Ranges & Pre-monsoon and Post-monsoon long term water level trends (1995 to 2011)

Sl. N	Block	Aquifer	Pre-monsoon Trend		Post-monsoon Trend	
			Water Level Range(mbgl)	**Pre trend (- rising & + Falling)**	Water Level Range(mbgl)	**Post trend (- rising & + Falling)**
1.	**Shantipur**	**1**	**3.36-7.7**	**3.76**	**1.7-6.44**	**8.23**
2	**Shantipur**	**2**	**-**	**-**	**-**	**-**

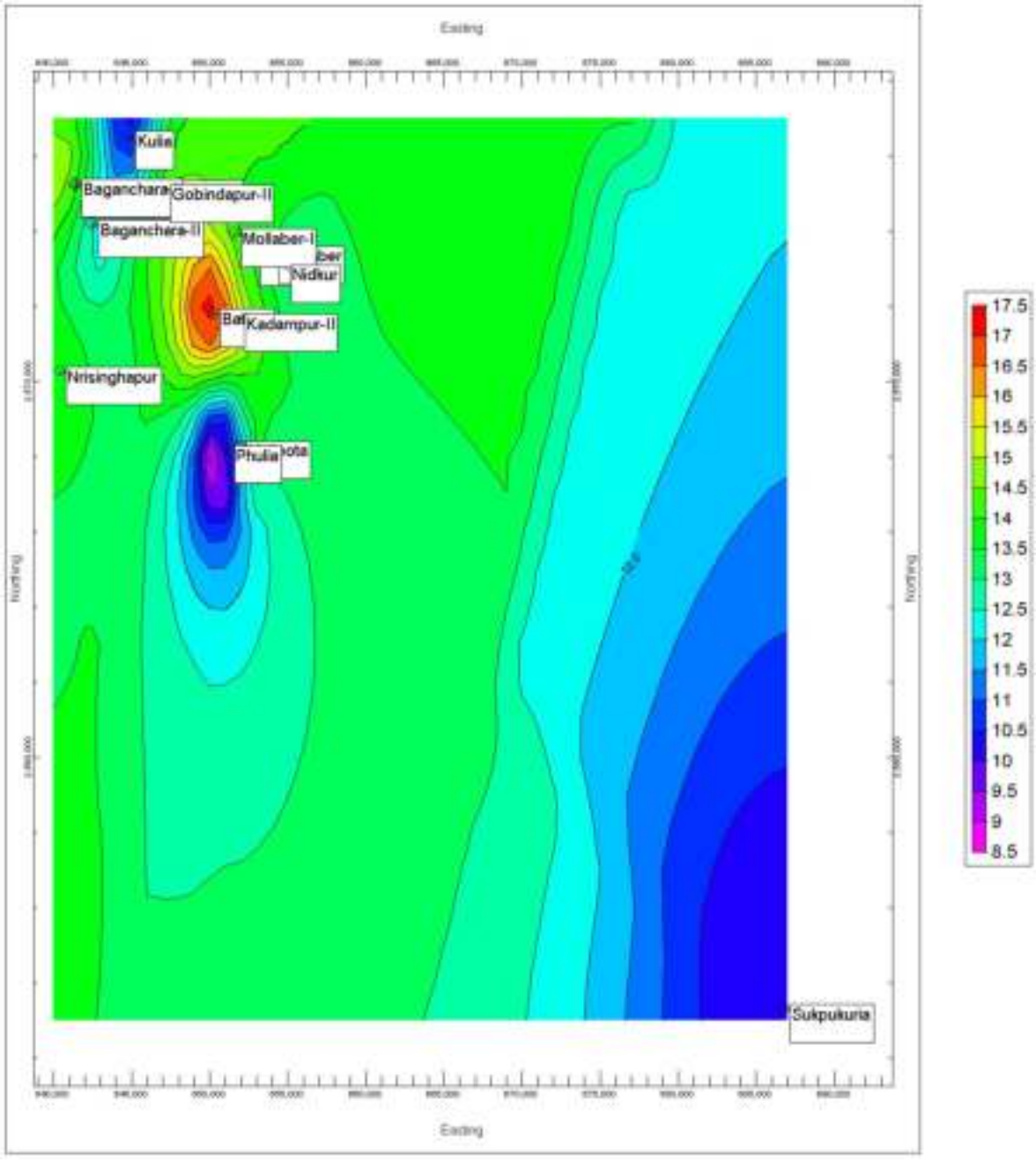


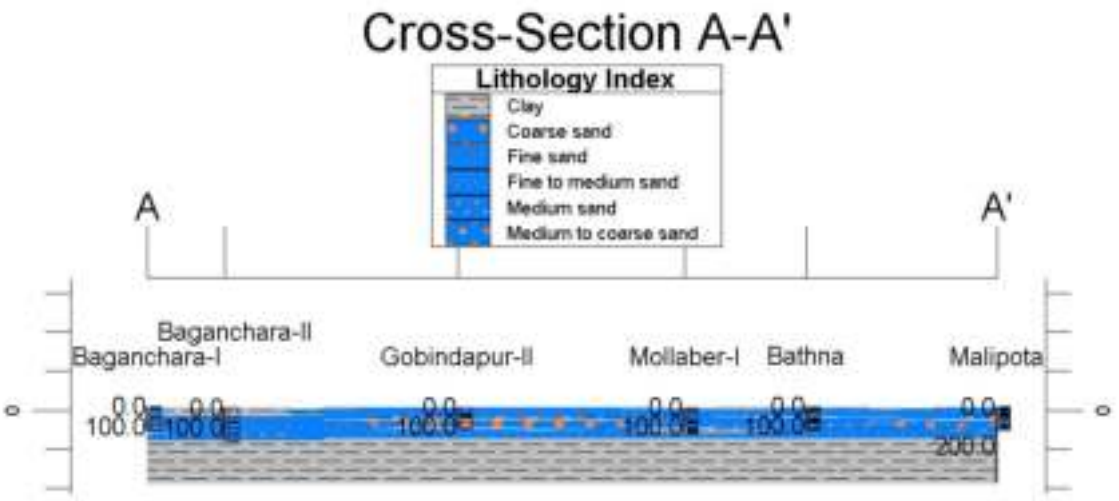
Thickness of Aquifer(Average):

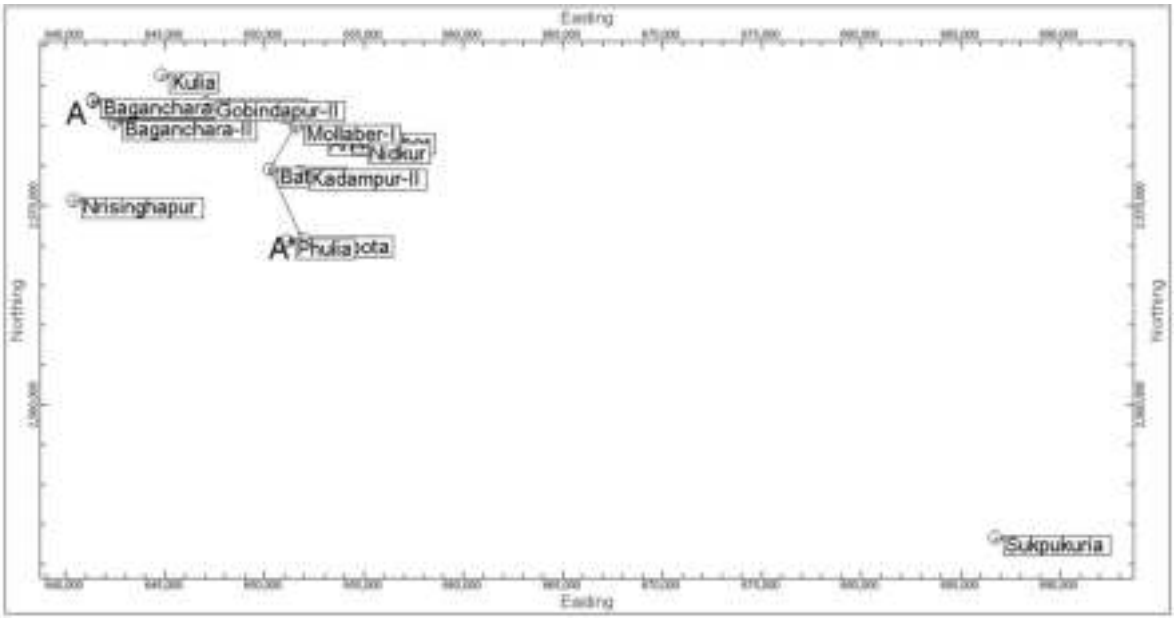
Block	Geographic Area (sq km)	Thickness of the Granular Zone in 1st aquifer (m)	Thickness of the Granular Zone /Productive Zone below pre-monsoon WL (m)
Shantipur	192.16	161	155.27

Aquifer-wise Statement

Sl. No.	Name of Block	1st Aquifer			2nd Aquifer		Remarks
		Depth Range (mbgl)	Discharge (m^3/hr)	T (m^2/day)	Depth Range/Discharge/T	Discharge (m^3/hr)	
		1st					
13	Shantipur	17-161	0.78-2.31		230-325		


Easting
Northing
Kulia
Baganchara
Gobindapur-II
Baganchera-II
Mollaber-I
Ber
Nidkur
Bar
Kadampur-II
Nrisinghapur
Phulia
Sukpukuria
17.5
17
16.5
16
15.5
15
14.5
14
13.5
13
12.5
12
11.5
11
10.5
10
9.5
9
8.5


Cross-Section A-A'
Lithology Index
Clay
Coarse sand
Fine sand
Fine to medium sand
Medium sand
Medium to coarse sand
A
A'
Baganchara-I
Baganchara-II
Gobindapur-II
Mollaber-I
Bathna
Malipota
0.0
100.0
200.0


Easting
Northing
Kulia
A
Baganchara
Gobindapur-II
Baganchara-II
Mollaber-I
Nidkur
Bat
Kadampur-II
Nrisinghapur
A'
Phulia
ota
Sukpukuria

3)Ground Water Resource,Extraction,Contamination & Other Issues:

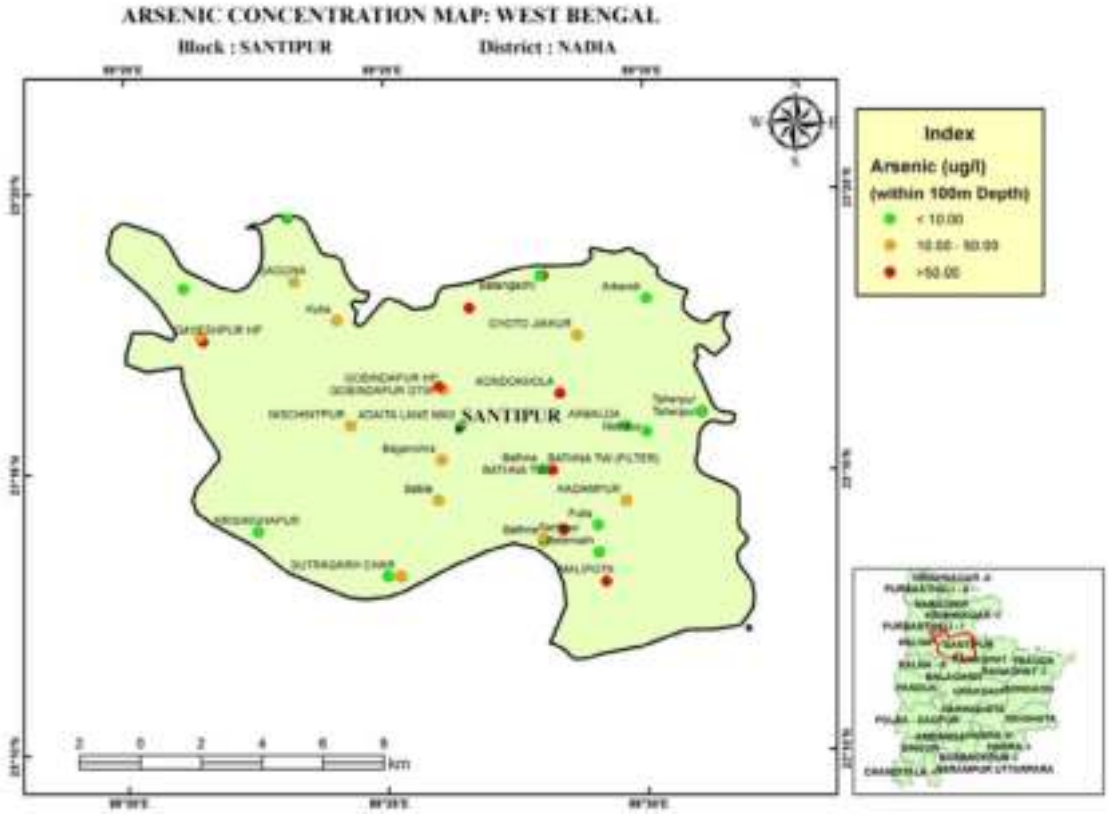
Aquifer Wise Resource Availability & Extraction:

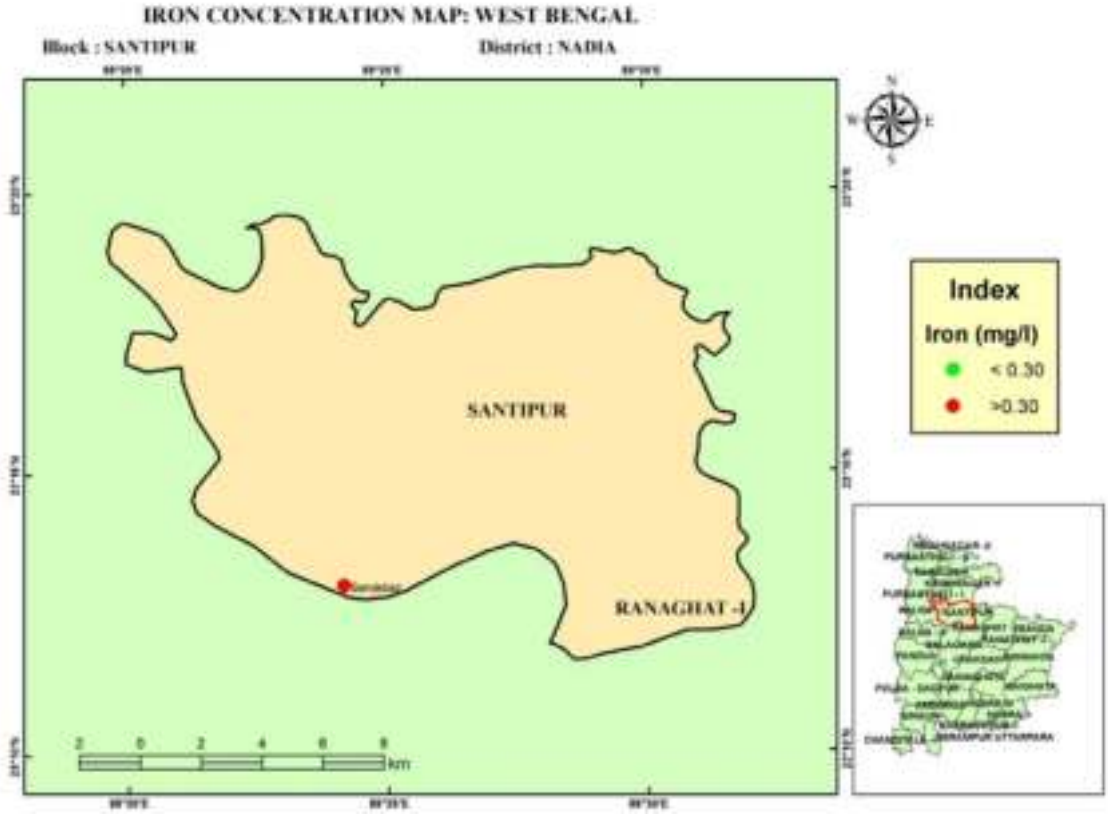
Block	Net ground water availability (MCM)	Gross ground water draft (MCM)	Stage of development (%)	Category
Shantipur	7472.69	5778.18	77.32	Safe

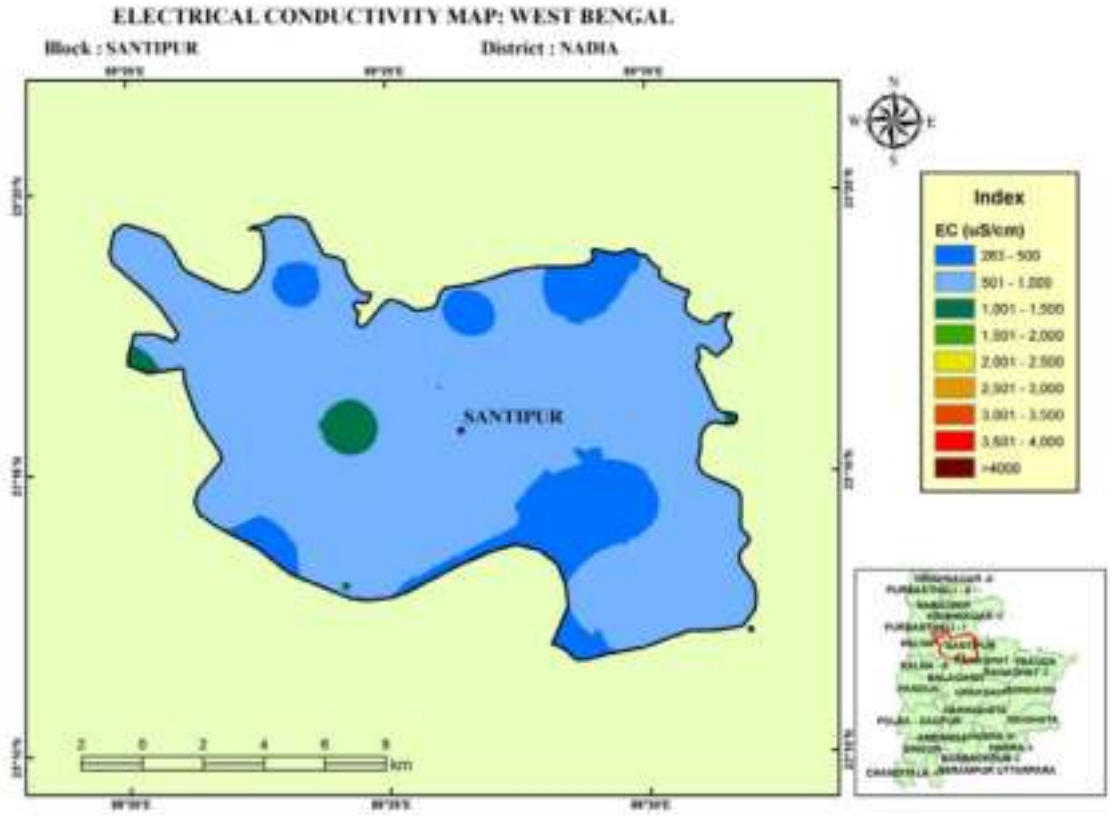
Chemical Quality Of GroundWater & Contamination:

Range Of Chemical Pollutants:

Block	As(mg/l)	Fe(mg/l)	Ec(µS/cm)	F(mg/l)	No_3(mg/l)
Shantipur	-	-	**348-810**	**Negligible-0.5**	**0.83-45**


ARSENIC CONCENTRATION MAP: WEST BENGAL
Block : SANTIPUR
District : NADIA
Index
Arsenic (ug/l)
(within 100m Depth)
< 10.00
10.00 - 50.00
>50.00
SANTIPUR
km


IRON CONCENTRATION MAP: WEST BENGAL
Block : SANTIPUR
District : NADIA
SANTIPUR
RANAGHAT -I
Index
Iron (mg/l)
< 0.30
>0.30
km



Percentage of tube wells having arsenic content in the **block:**

SI.No.	Blocks	Arsenic (<0.01 ing/1)	Arsenic (>0.01-<0.05 mg/1)	Arsenic (> 0.05 mg/1)	Total Tube well
1	Shantipur	23.94	44.41	31.65	1011

4)Ground Water Resource Enhancement& Management Plan:

Ground Water Management Plan for Drinking purpose.

Suggestions on supply of ground water to the risk population For drinking purpose.

District	Block (As affected)	No. of habitations in the risk zone where As concentration >0.05 mg/L	No. of habitations in the risk zone where As concentration 0.01 to 0.05 mg/L	Risk Population (2011) where As concentration >0.05 mg/L
NADIA	SANTIPUR	101	35	154256

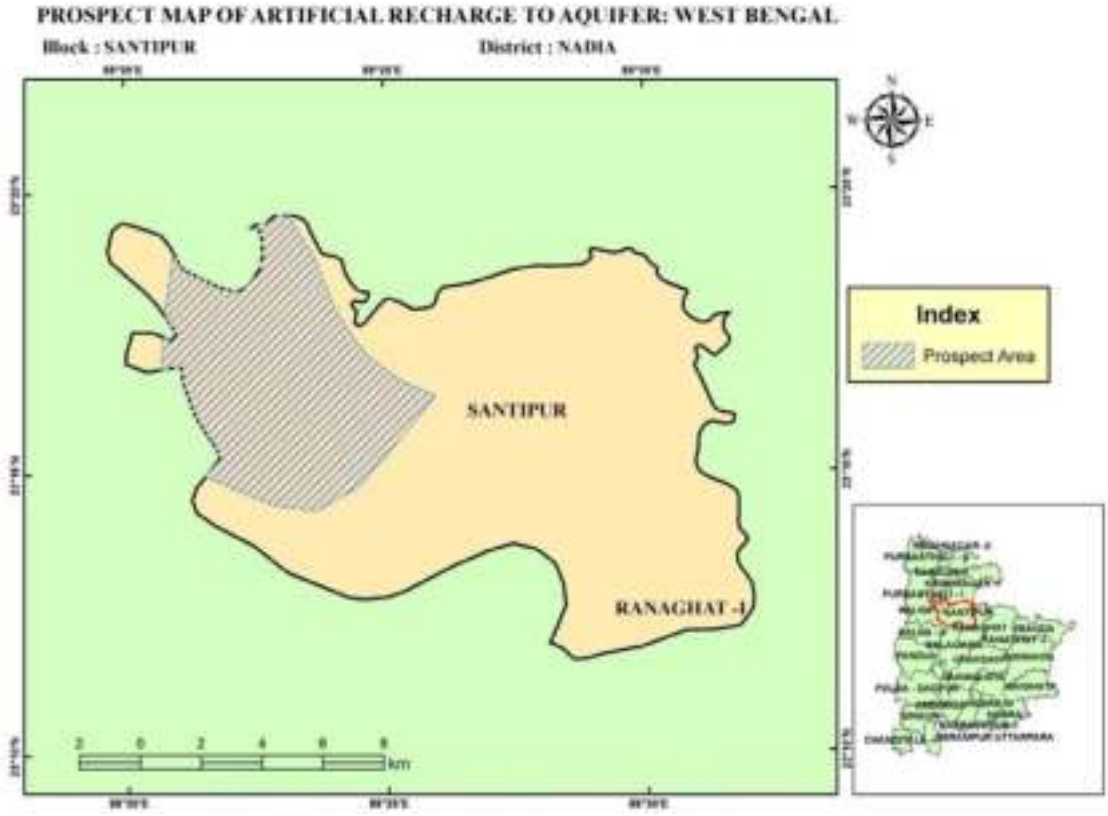
Aquifer Wise Space Available For Recharge and Proposed Interventions:

Area suitable for recharge in the study area:

	Block Name	Area (in sq. km)	Total Area suitable for recharge (sq km.)
NADIA	Shantipur	192.16	48.60

Proposed Artificial Recharge Structures in the area in :

District	Block	Total Surface water available in MCM for recharge	Source Water Allocation (MCM)			Number of Structures feassible			Structure-wise Cost Estimate in lakh Rs.			Total cost in lakh Rs
			Percolation Tanks	REET with RS	Injection Well	Percolation Tanks	REET with RS	Injection Well	Percolation Tanks	REET with RS	Injection Well	
NADIA	Shantipur	9.03	4	2	2	8	24	8	160	192	32	384



Ground Water Management Plan For Irrigation Purpose.

Area in sq, km.

Sr No.	Name of Block	Cultivable area in ha	Net irrigated area in ha	Area to be irrigated in ha	SOD in %	Category
1	Shantipur	9841	4464	5377.00	65.51	Safe

1)Salient Information

Block Name: Amdanga

Area(in Km^2): 130.61

District: North 24 Parganas

State:West Bengal

Population(as on 2011):

Name of the Block	Population of CD Block (2011 census)
Amdanga	185014

Approximate Decadal Growth Rate from 2001-2011:

Rainfall:

Average annual rainfall in **: Amdanga**

(as in the district) for the period 2009 -13 (in mm)

Block	Normal	Actual (Annual)				
		2009	2010	2011	2012	2013
Amdanga	1579	1410	1180	1669	1208	1658

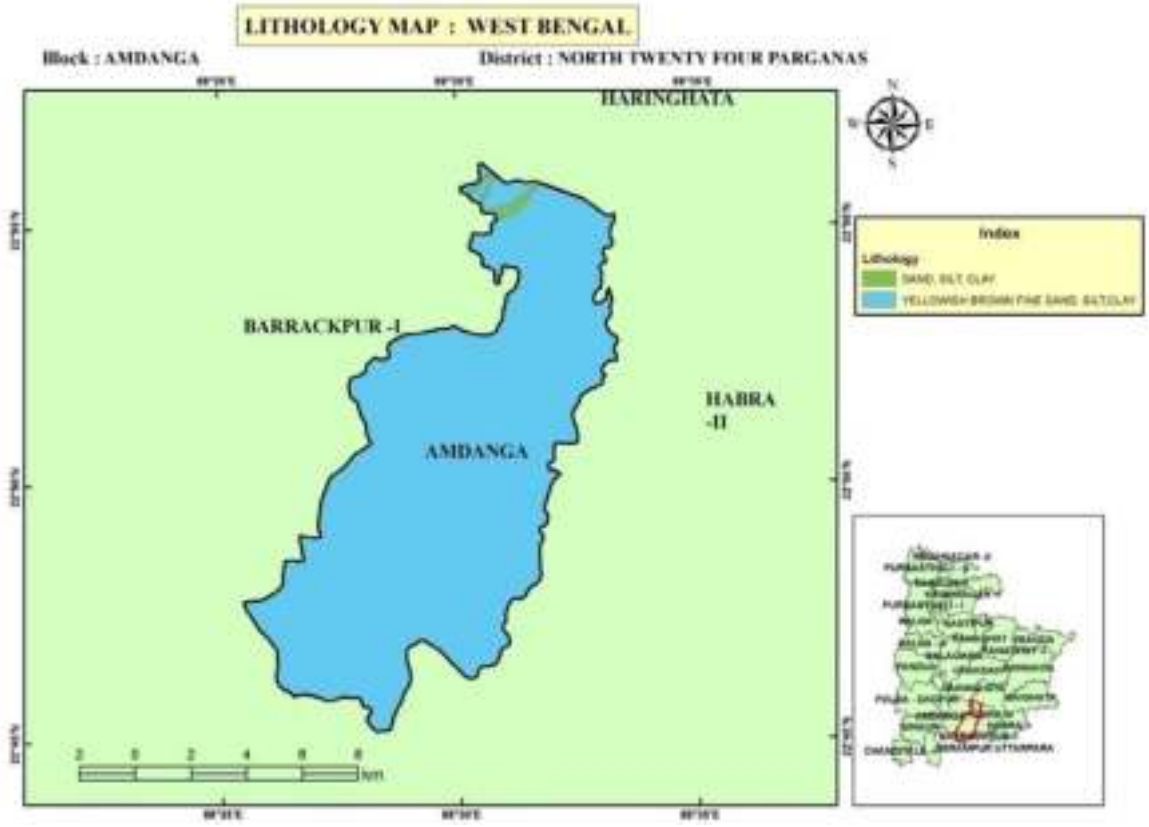
Aquifer Wise Ground Water Resource Availability & Extraction:

(in MCM)

Resource Availability	Aquifer I	Aquifer II	Extraction (for Aquifer I)
Dynamic Resource	6540.26	-	0.235098
Static Resource	4937.58	-	-

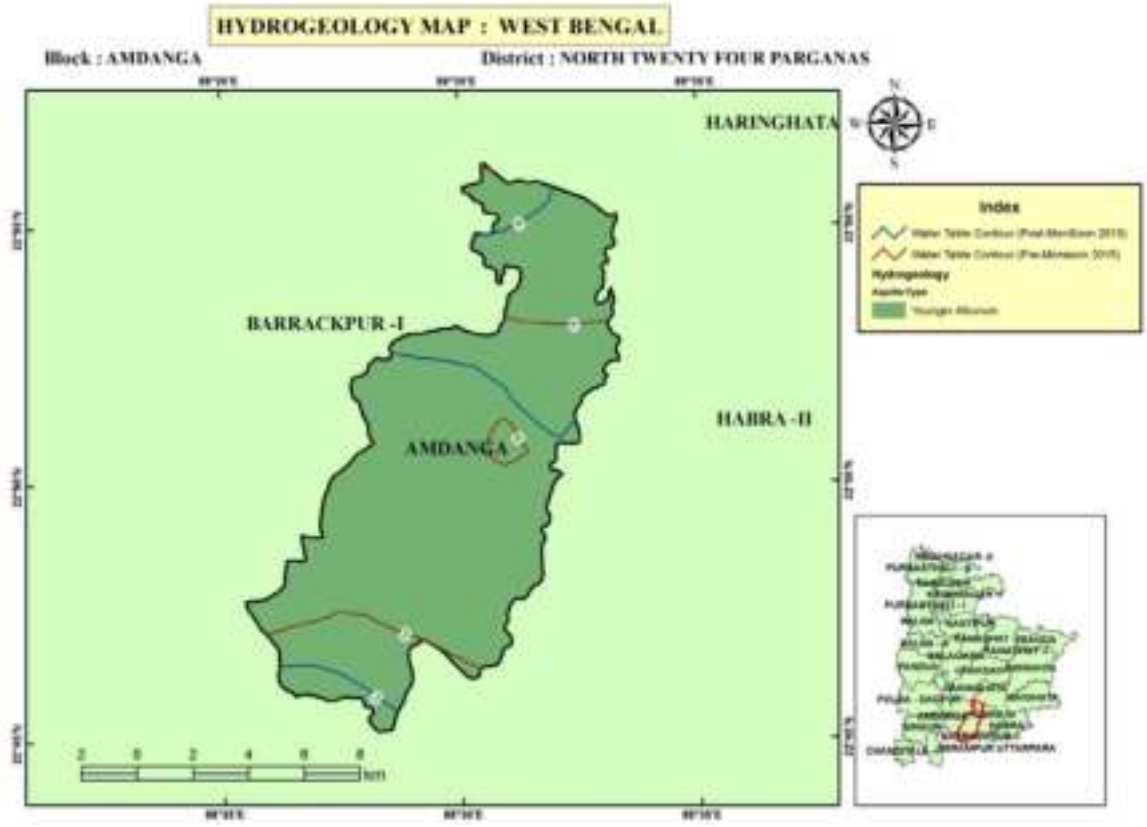
2)Disposition of Aquifer:

Block	Depth range of Aquifer in m bgl	
Amdanga	**1st Aquifer**	**2nd aquifer**
	50-200	220-245


LITHOLOGY MAP : WEST BENGAL
Block : AMDANGA
District : NORTH TWENTY FOUR PARGANAS
HARINGHATA
BARRACKPUR -I
AMDANGA
HABRA -II
Index
Lithology
SAND, SILT, CLAY
YELLOWISH BROWN FINE SAND, SILT/CLAY
km

Aquifer Wise Water Level Ranges & Pre-monsoon and Post-monsoon long term water level trends (1995 to 2011)

Sl. No.	Block	Aquifer	Pre-monsoon Trend		Post-monsoon Trend	
			Water Level Range(mbgl)	**Pre trend (- rising & + Falling)**	Water Level Range(mbgl)	**Post trend (- rising & + Falling)**
1.	**Amdanga**	**1**	**7.77-14.25**	**14.57**	**8.49-10.78**	**23.69**
2.	**Amdanga**	**2**	**-**	**-**	**-**	-



Thickness of Aquifer(Average):

Block	Geographic Area (sq km)	Thickness of the Granular Zone in 1st aquifer (m)	Thickness of the Granular Zone /Productive Zone below pre-monsoon WL (m)
Amdanga	130.61	200	189.02

Aquifer-wise Statement

Sl. No.	Name of Block	1st Aquifer			2nd Aquifer		Remarks T (m^2/day)
		Depth Range (mbgl)	Discharge (m^3/hr)	T (m^2/day)	Depth Range/Discharge/T	Discharge (m^3/hr)	
		1st					
13	Amdanga	50-200	27.68	1473.67	220-245	6.05	1956.5

3)Ground Water Resource,Extraction,Contamination & Other Issues:

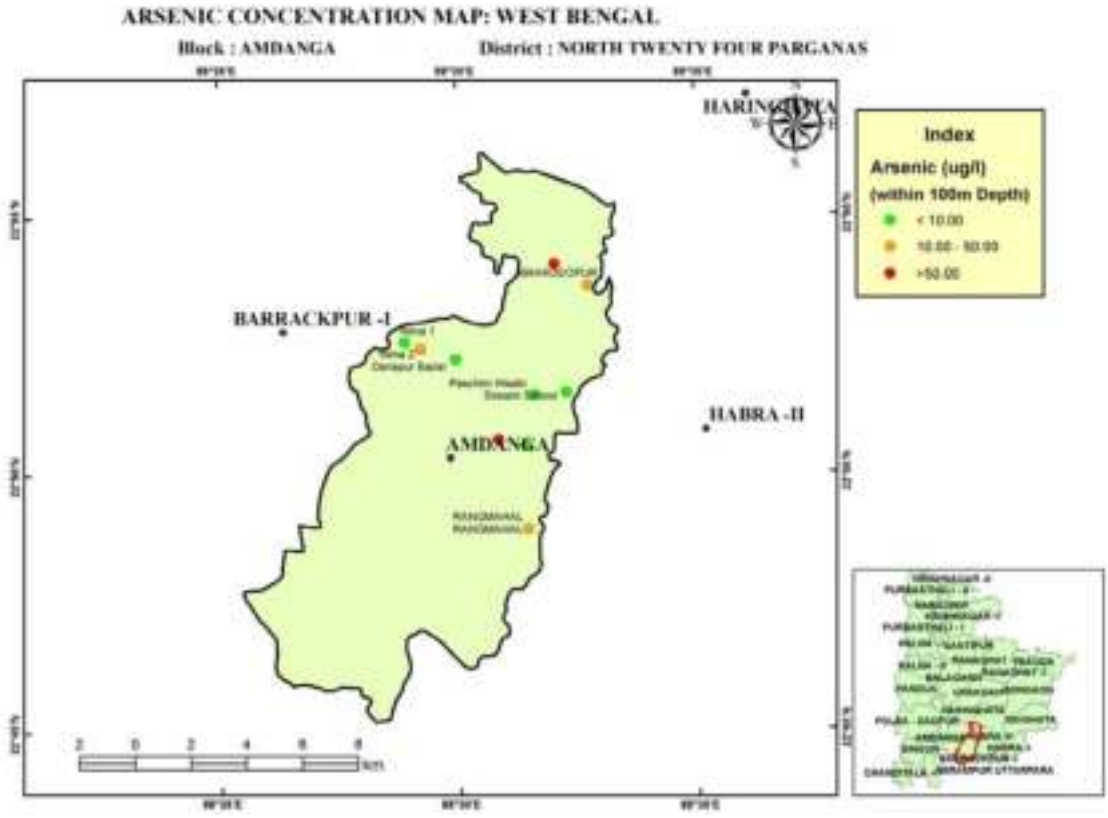
Aquifer Wise Resource Availability & Extraction:

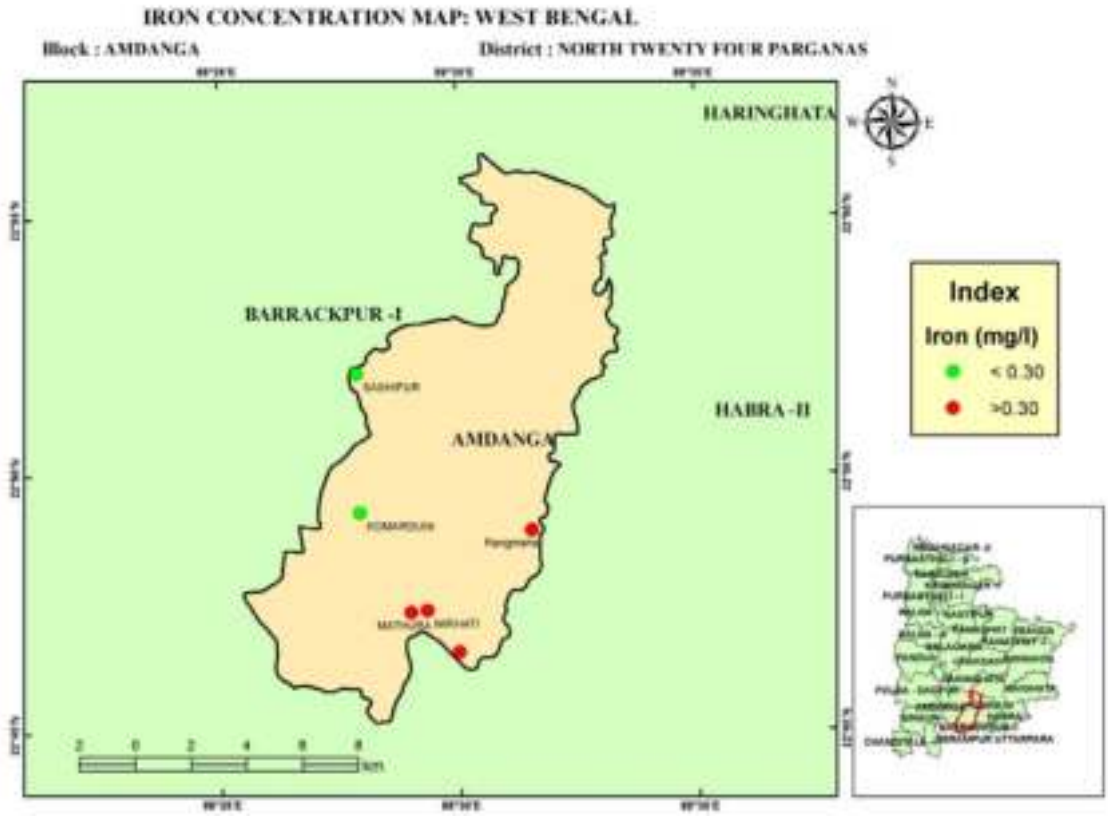
Block	Net ground water availability (MCM)	Gross ground water draft (MCM)	Stage of development (%)	Category
Amdanga	6540.26	3533.43	54.03	Safe

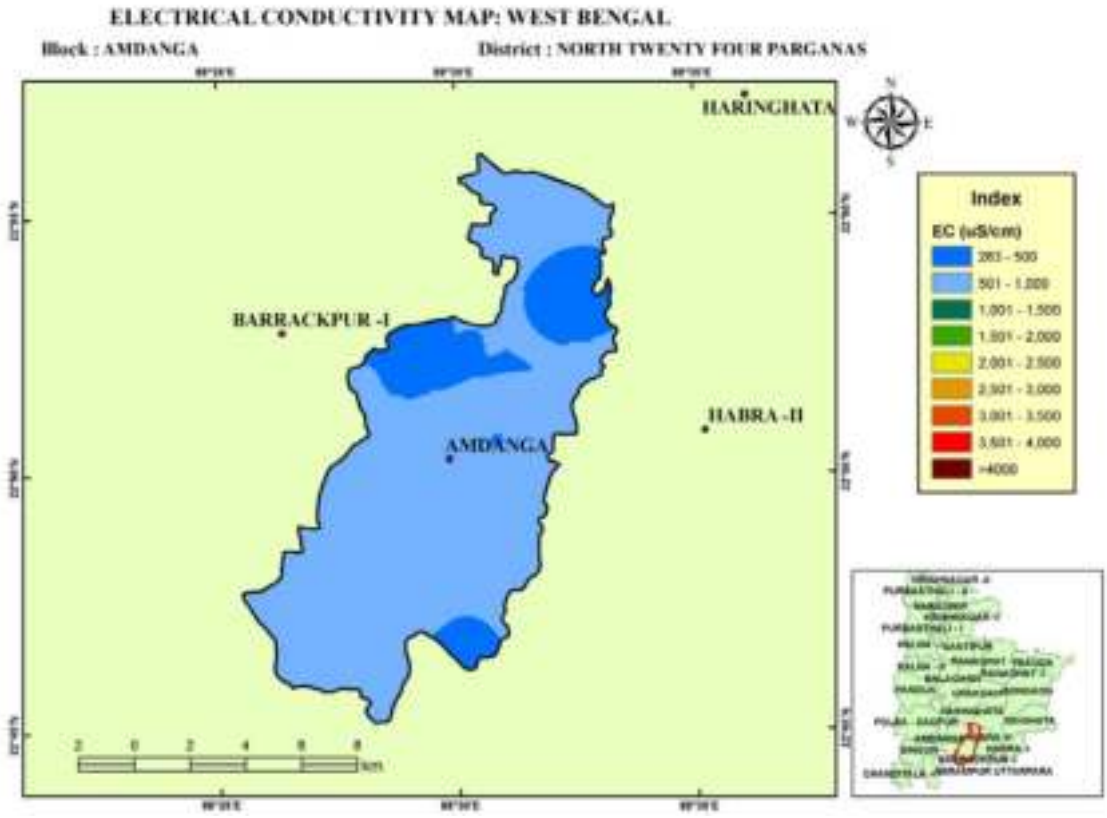
Chemical Quality Of GroundWater & Contamination:

Range Of Chemical Pollutants:

Block	As(mg/l)	Fe(mg/l)	Ec(µS/cm)	F(mg/l)	No_3(mg/l)
Amdanga	-	2.3-2.6	354-649	Bdl-0.44	0-7.7




IRON CONCENTRATION MAP: WEST BENGAL
Block : AMDANGA
District : NORTH TWENTY FOUR PARGANAS
HARINGHATA
BARRACKPUR -I
AMDANGA
HABRA -II
Index
Iron (mg/l)
< 0.30
>0.30


ELECTRICAL CONDUCTIVITY MAP: WEST BENGAL
Block : AMDANGA
District : NORTH TWENTY FOUR PARGANAS
HARINGHATA
BARRACKPUR -I
HABRA -II
AMDANGA
Index
EC (uS/cm)
251 - 500
501 - 1,000
1,001 - 1,500
1,501 - 2,000
2,001 - 2,500
2,501 - 3,000
3,001 - 3,500
3,501 - 4,000
>4000
2 0 2 4 6 8
km

Percentage of tube wells having arsenic content in the **block:**

SI.No.	Blocks	Arsenic (<0.01 ing/1)	Arsenic (>0.01-<0.05 mg/1)	Arsenic (> 0.05 mg/1)	Total Tube well
1	Amdanga	62.89	27.78	9.33	1404

4)Ground Water Resource Enhancement& Management Plan:

Ground Water Management Plan for Drinking purpose.

Suggestions on supply of ground water to the risk population For drinking purpose.

District	Block (As affected)	No. of habitations in the risk zone where As concentration >0.05 mg/L	No. of habitations in the risk zone where As concentration 0.01 to 0.05 mg/L	Risk Population (2011) where As concentration >0.05 mg/L
N 24 PGS	AMDANGA	56	95	185014

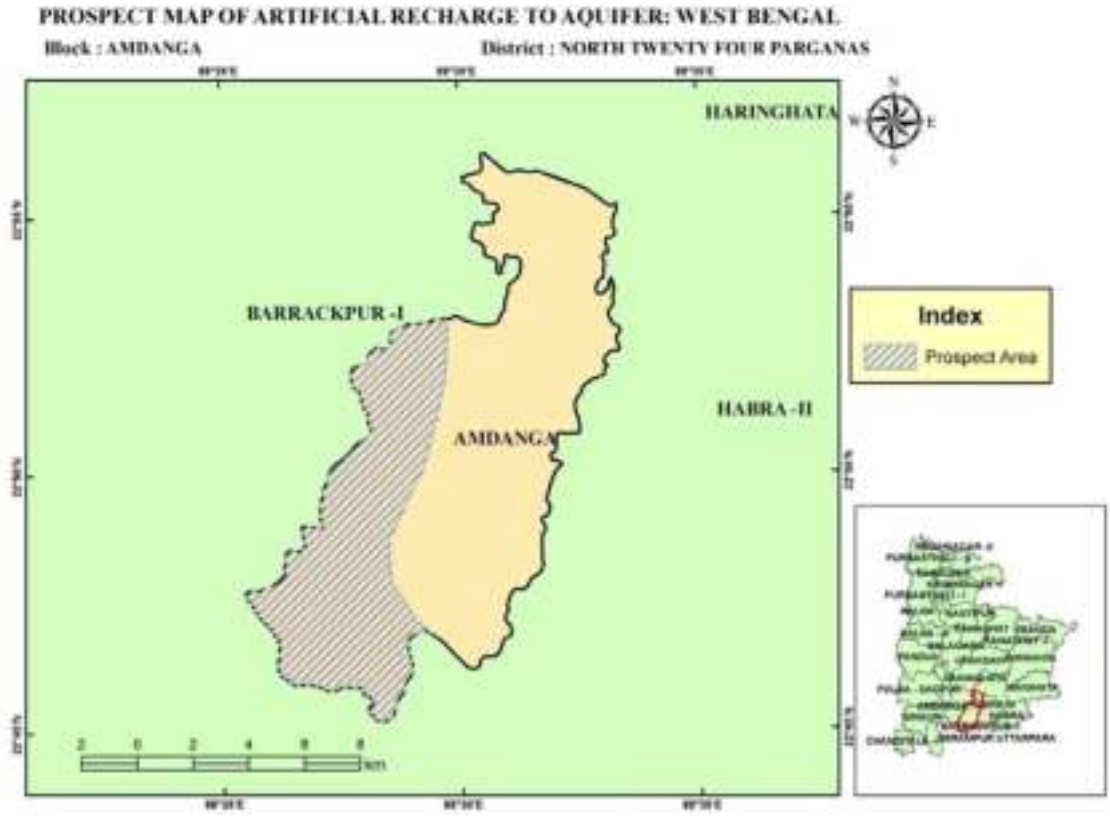
Aquifer Wise Space Available For Recharge and Proposed Interventions:

Area suitable for recharge in the study area:

District	Block Name	Area (in sq. km)	Total Area suitable for recharge (sq km.)
NORTH 24 PARGANAS	Amdanga	130.61	49.02

Proposed Artificial Recharge Structures in the area in :

District	Block	Total Surface water available in MCM for recharge	Source Water Allocation (MCM)			Number of Structures feasible			Structure-wise Cost Estimate in lakh Rs.			Total cost in lakh Rs
			Percolation Tanks	REET with RS	Injection Well	Percolation Tanks	RET with RS	Injection Well	Percolation Tanks	REET with RS	Injecton Well	
NORTH 24 PARGANAS	Amdanga	18.35	9	5	5	17	49	16	340	392	64	796



Ground Water Management Plan For Irrigation Purpose.

Area in sq, km.

Sr No.	Name of Block	Cultivable area in ha	Net irrigated area in ha	Area to be irrigated in ha	SOD in %	Category
1	Amdanga	8155	4516	3639.00	54.03	Safe

1)Salient Information

Block Name: Bagdah

Area(in Km^2):228.62

District: North 24 Parganas

State:West Bengal

Population(as on 2011):

Name of the Block	Population of CD Block (2011 census)
Bagdah	242974

Approximate Decadal Growth Rate from 2001-2011:

Rainfall:

Average annual rainfall in **: Bagdah**

(as in the district) for the period 2009 -13 (in mm)

Block	Normal	Actual (Annual)				
		2009	2010	2011	2012	2013
Bagdah	1579	1410	1180	1669	1208	1658

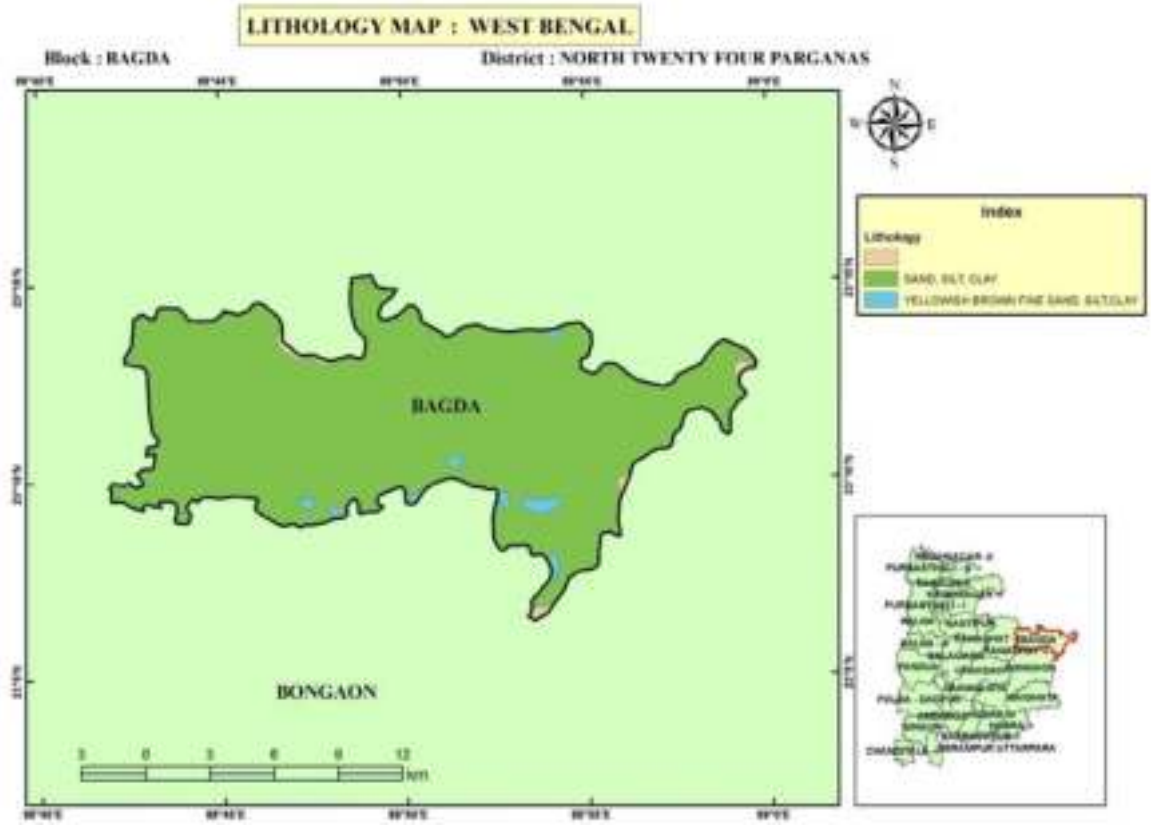
Aquifer Wise Ground Water Resource Availability & Extraction:

(in MCM)

Resource Availability	Aquifer I	Aquifer II	Extraction (for Aquifer I)
Dynamic Resource	12673.84	-	0.411516
Static Resource	6934.96	-	-

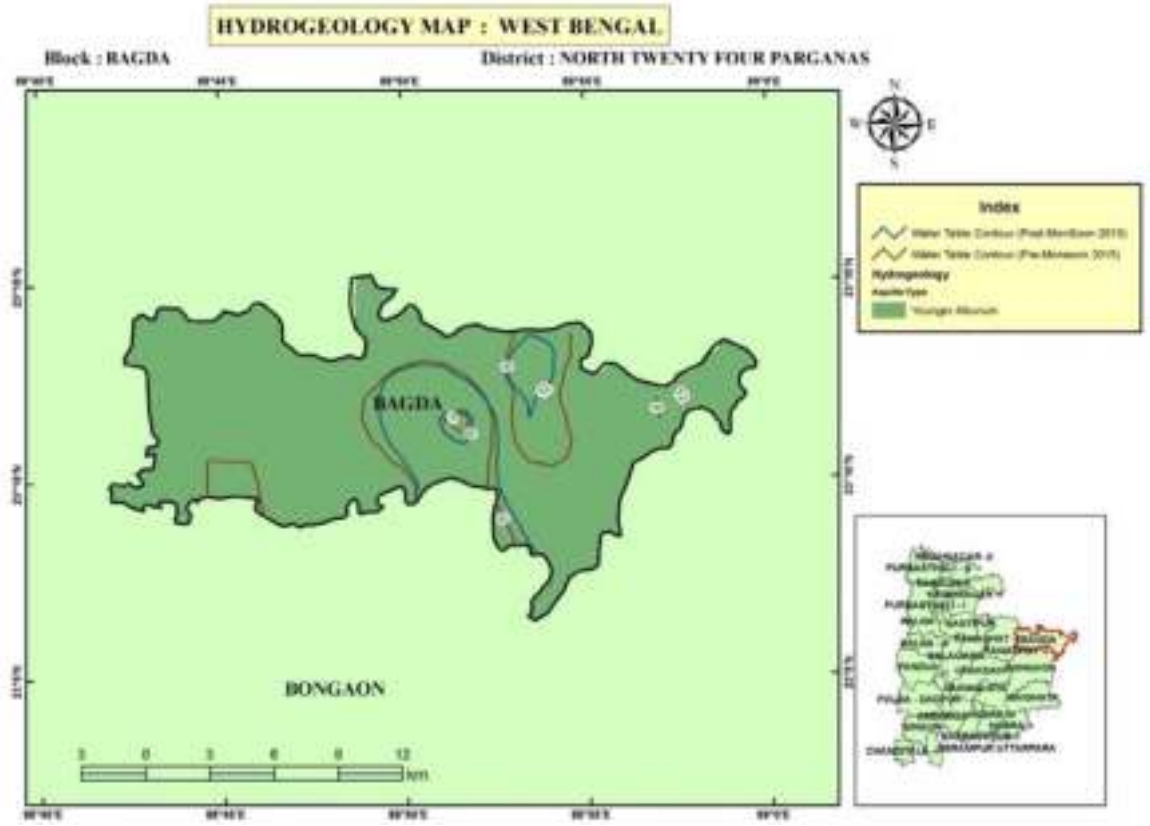
2)Disposition of Aquifer:

Block	Depth range of Aquifer in m bgl	
Bagdah	**1st Aquifer**	**2nd aquifer**
	25-157	163-215, 227-253



Aquifer Wise Water Level Ranges & Pre-monsoon and Post-monsoon long term water level trends (1995 to 2011)

Sl. No.	Block	Aquifer	Pre-monsoon Trend		Post-monsoon Trend	
			Water Level Range(mbgl)	**Pre trend (- rising & + Falling)**	Water Level Range(mbgl)	**Post trend (- rising & + Falling)**
1.	**Bagdah**	**1**	**1.07-5.74**	**4.08**	**1.97-5.84**	**8.06**
2.	**Bagdah**	**2**	**1.19-4.54**	**-**	**0.76-5.1**	**-**

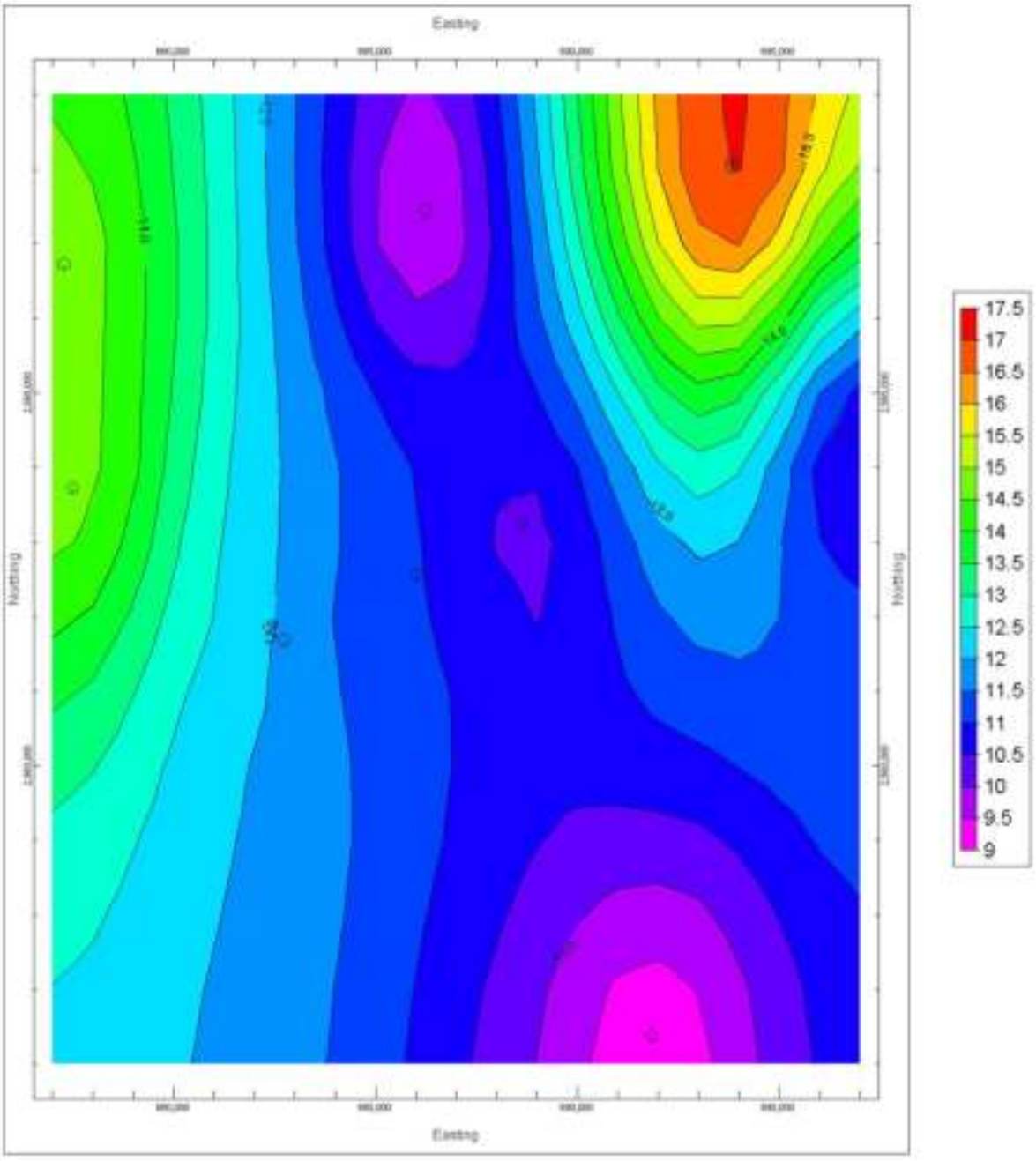


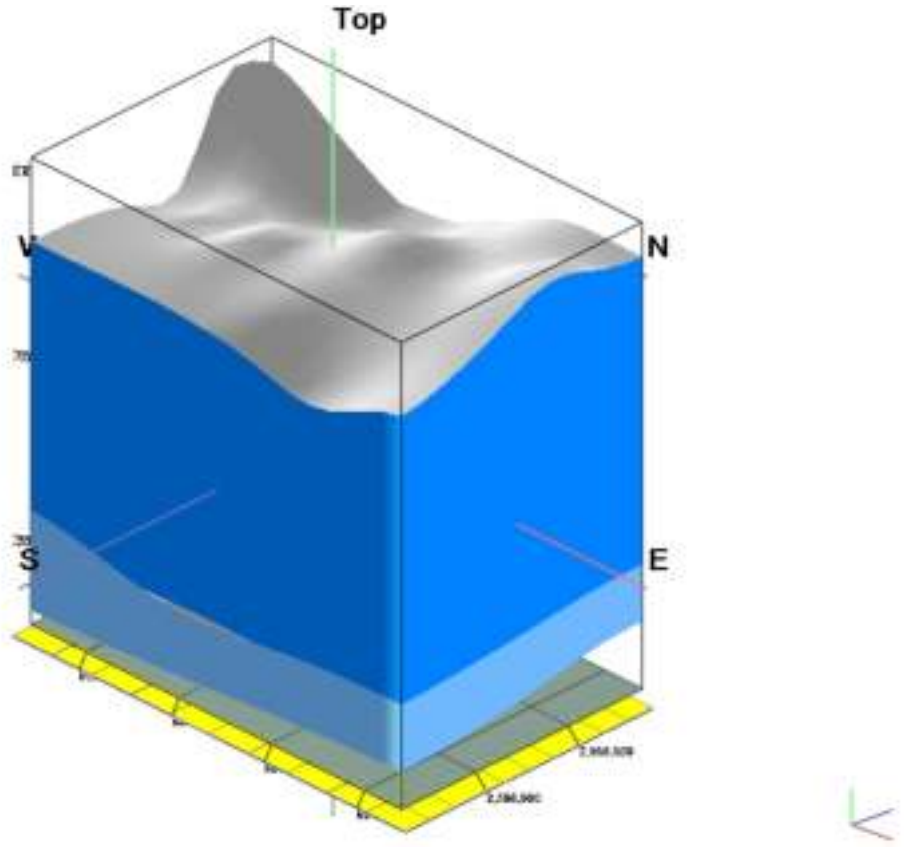
Thickness of Aquifer(Average):

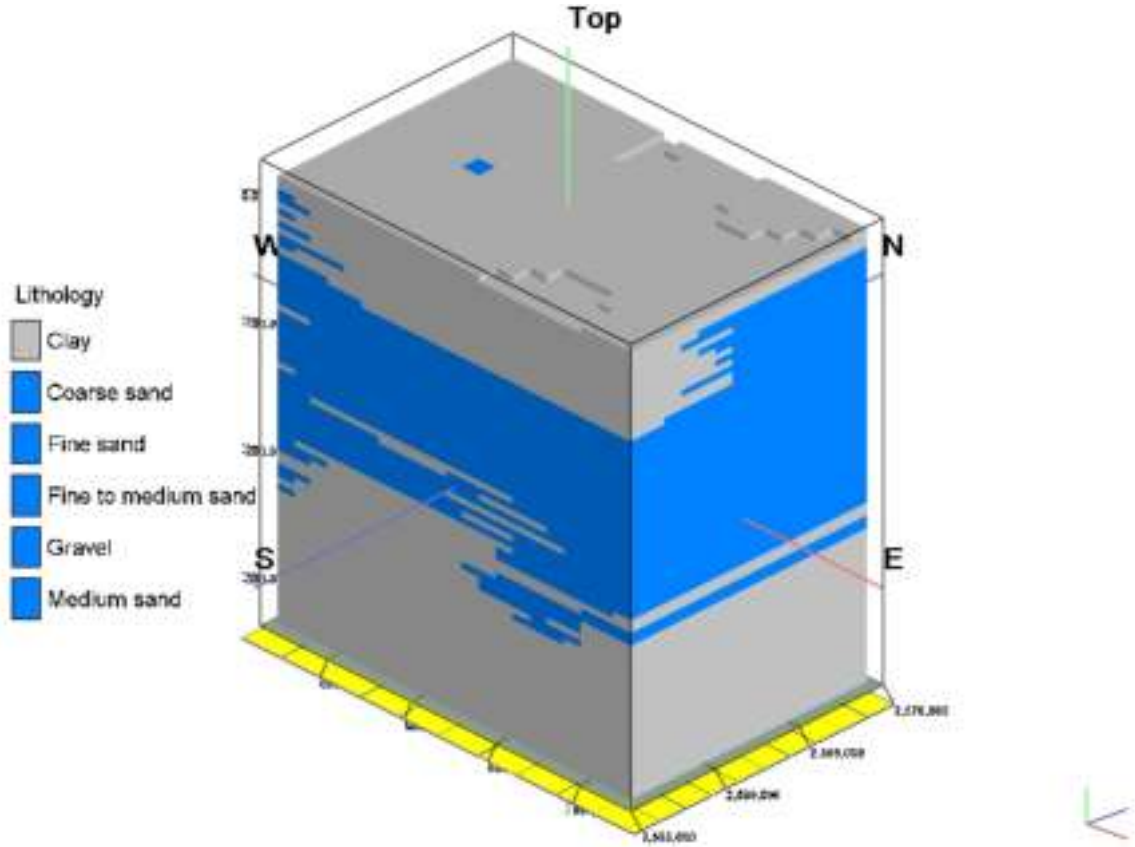
Block	Geographic Area (sq km)	Thickness of the Granular Zone in 1st aquifer (m)	Thickness of the Granular Zone /Productive Zone below pre-monsoon WL (m)
Bagdah	228.62	157	151.67

Aquifer-wise Statement

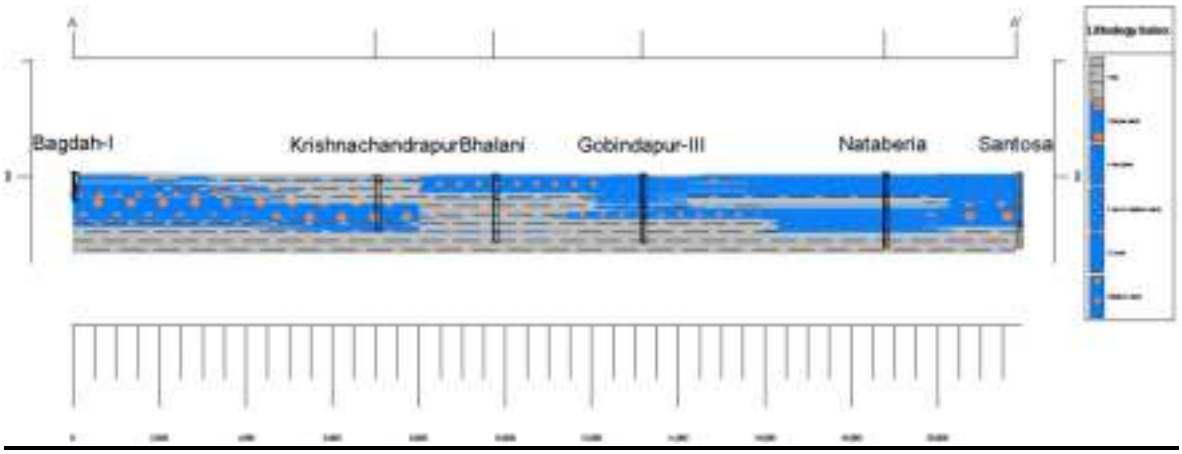
Sl. No.	Name of Block	1st Aquifer			2nd Aquifer		Remarks T (m^2/day), S
		Depth Range (mbgl)	Discharge (m^3/hr)	T (m^2/day)	Depth Range/Discharge/T	Discharge (m^3/hr)	
		1st					
13	Bagdah	25-157	85.21		163-253	29.16-79.2	970.8, $4*10^{-4}$

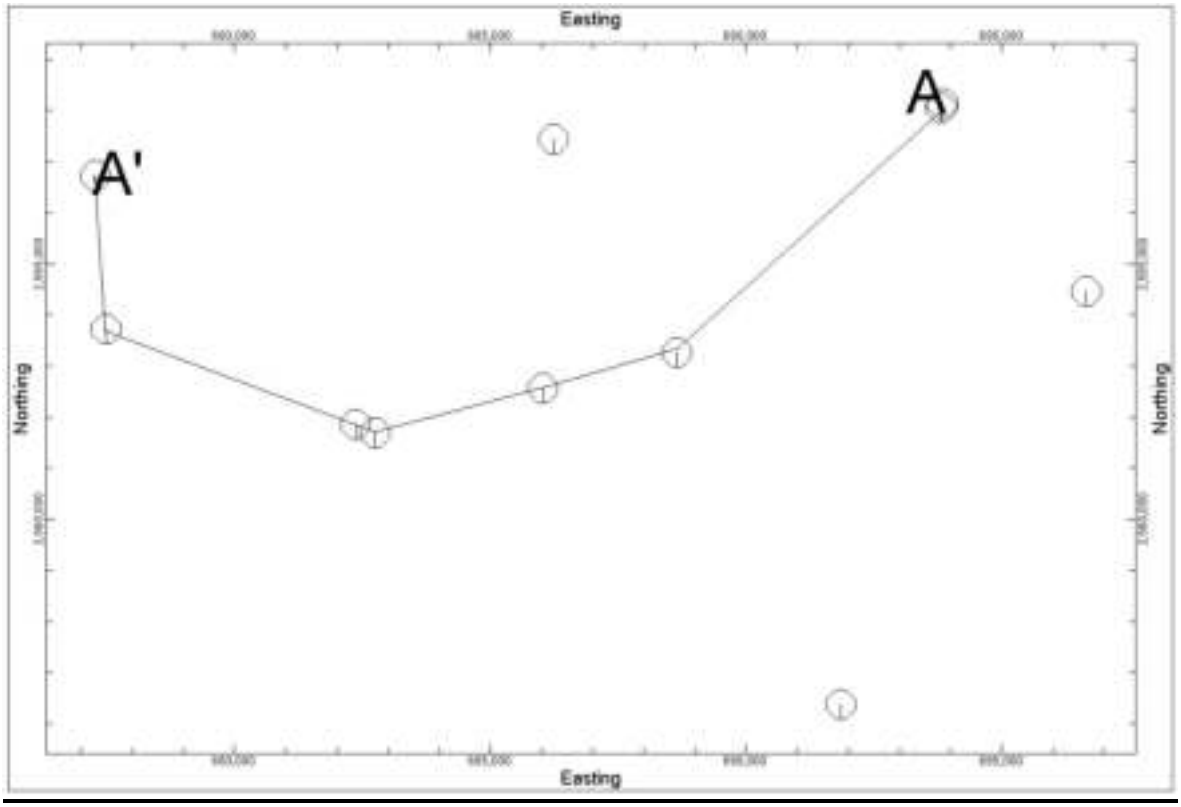

Easting
Northing
17.5
17
16.5
16
15.5
15
14.5
14
13.5
13
12.5
12
11.5
11
10.5
10
9.5
9


Top
W
N
S
E


Top
W
N
S
E
Lithology
Clay
Coarse sand
Fine sand
Fine to medium sand
Gravel
Medium sand

Cross-Section A-A'





3)Ground Water Resource,Extraction,Contamination & Other Issues:

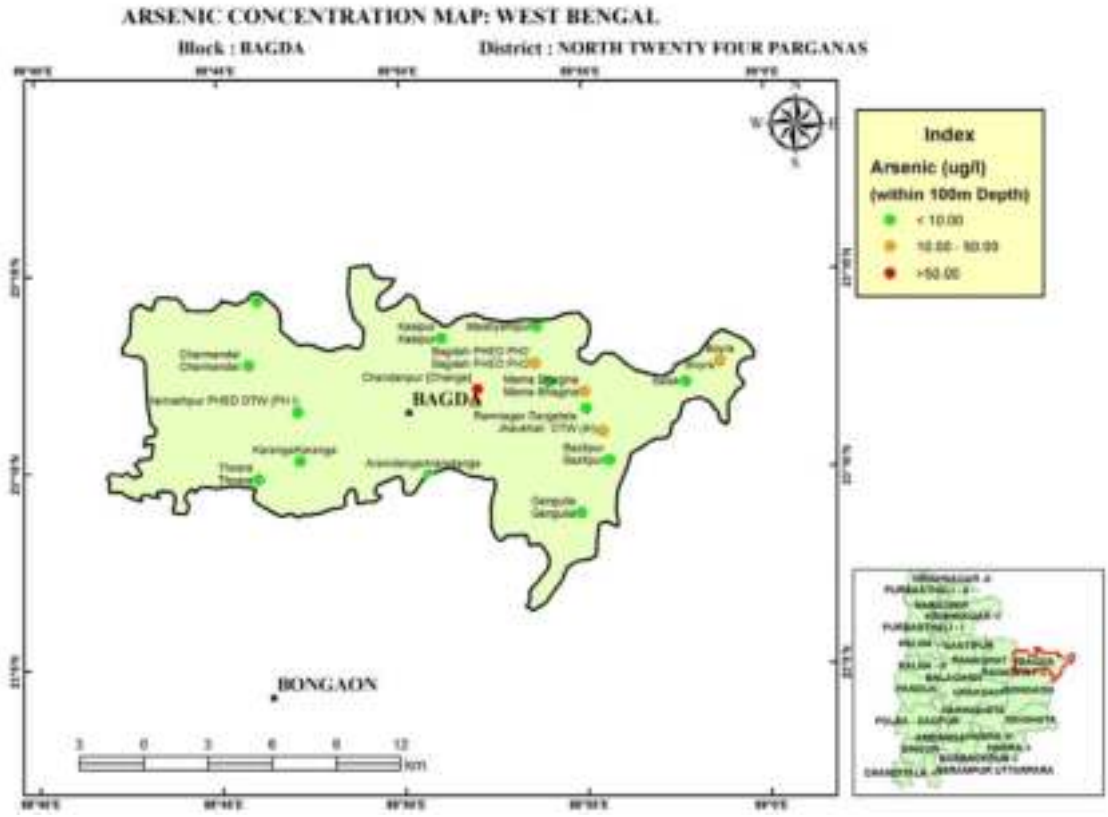
Aquifer Wise Resource Availability & Extraction:

Block	Net ground water availability (MCM)	Gross ground water draft (MCM)	Stage of development (%)	Category
Bagdah	12673.84	9713.10	76.64	Safe

Chemical Quality Of GroundWater & Contamination:

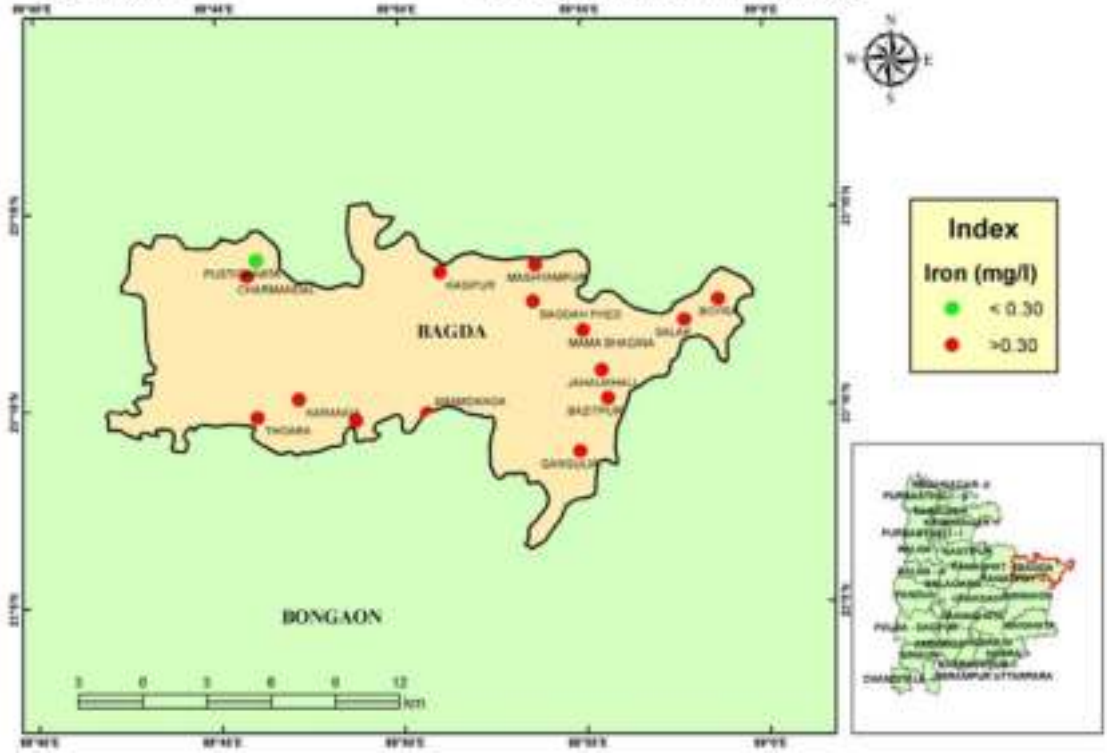
Range Of Chemical Pollutants:

Block	As(mg/l)	Fe(mg/l)	Ec(µS/cm)	F(mg/l)	No_3(mg/l)
Bagdah	-	Bdl-7.77	275-734	Bdl-0.04	Negligible-76



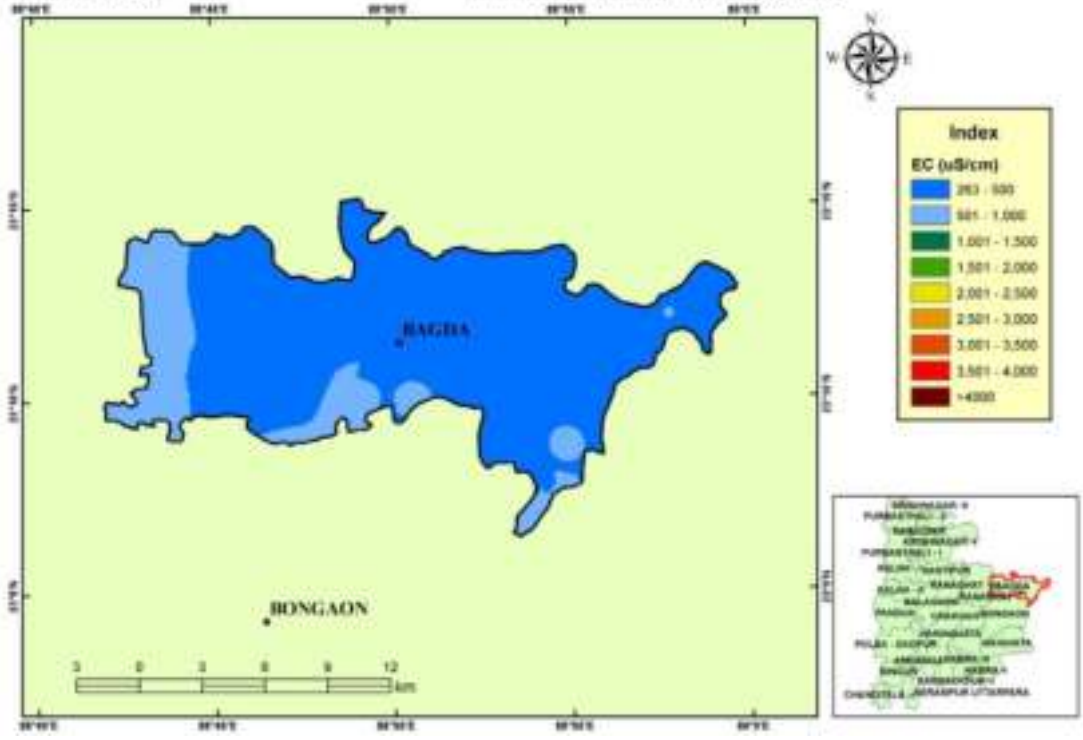
IRON CONCENTRATION MAP: WEST BENGAL

Block : BAGDA District : NORTH TWENTY FOUR PARGANAS



ELECTRICAL CONDUCTIVITY MAP: WEST BENGAL

Block : BAGDA District : NORTH TWENTY FOUR PARGANAS



Percentage of tube wells having arsenic content in the block:

SI.No.	Blocks	Arsenic (<0.01 ing/1)	Arsenic (>0.01-<0.05 mg/1)	Arsenic (> 0.05 mg/1)	Total Tube well
1	Bagdah	23.67	54.47	21.86	1711

4)Ground Water Resource Enhancement& Management Plan:

Ground Water Management Plan for Drinking purpose.

Suggestions on supply of ground water to the risk population For drinking purpose.

District	Block (As affected)	No. of habitations in the risk zone where As concentration >0.05 mg/L	No. of habitations in the risk zone where As concentration 0.01 to 0.05 mg/L	Risk Population (2011) where As concentration >0.05 mg/L
N 24 PGS	BAGDA	137	143	242974

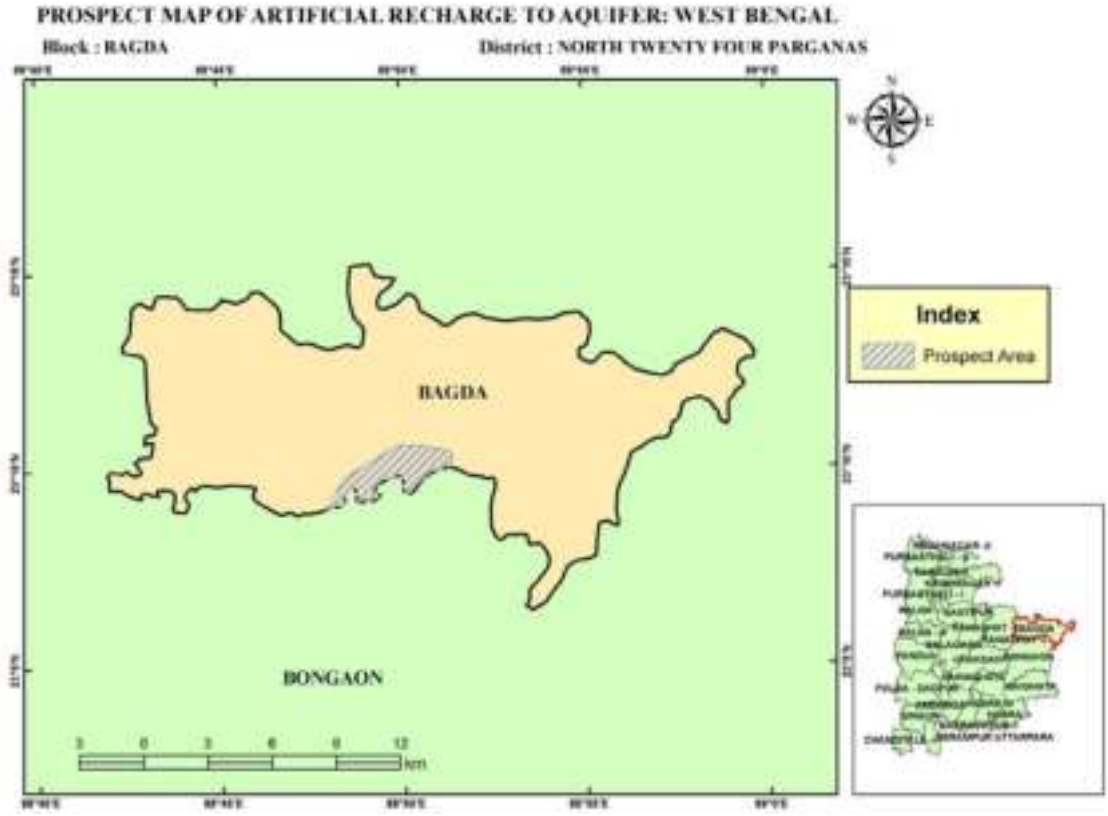
Aquifer Wise Space Available For Recharge and Proposed Interventions:

Area suitable for recharge in the study area:

District	Block Name	Area (in sq. km)	Total Area suitable for recharge (sq km.)
NORTH 24 PARGANAS	Bagdah	228.62	8.27

Proposed Artificial Recharge Structures in the area in :

District	Block	Total Surface water available in MCM for recharge	Source Water Allocation (MCM)			Number of Structures feasible			Structure-wise Cost Estimate in lakh Rs.			Total cost in lakh Rs
			Percolation Tanks	REET with RS	Injection Well	Percolation Tanks	RET with RS	Injection Well	Percolation Tanks	REET with RS	Injection Well	
NORTH 24 PARGANAS	Bagdah	30.75	14	8	8	29	82	27	580	656	108	1344



Ground Water Management Plan For Irrigation Purpose.

Area in sq, km.

Sr No.	Name of Block	Cultivable area in ha	Net irrigated area in ha	Area to be irrigated in ha	SOD in %	Category	Remarks for GW Management Plan
1	Bagdah	17667	8636	9031.00	76.64	Safe	Can be developed for GW based Irrigation

1)Salient Information

Block Name: Bongaon

Area(in Km^2):145.34

District: North 24 Parganas

State:West Bengal

Population(as on 2011):

Name of the Block	Population of CD Block (2011 census)
Bongaon	380903

Approximate Decadal Growth Rate from 2001-2011:

Rainfall:

Average annual rainfall in **: Bongaon**

(as in the district) for the period 2009 -13 (in mm)

Block	Normal	Actual (Annual)				
		2009	2010	2011	2012	2013
Bongaon	1579	1410	1180	1669	1208	1658

Aquifer Wise Ground Water Resource Availability & Extraction:

(in MCM)

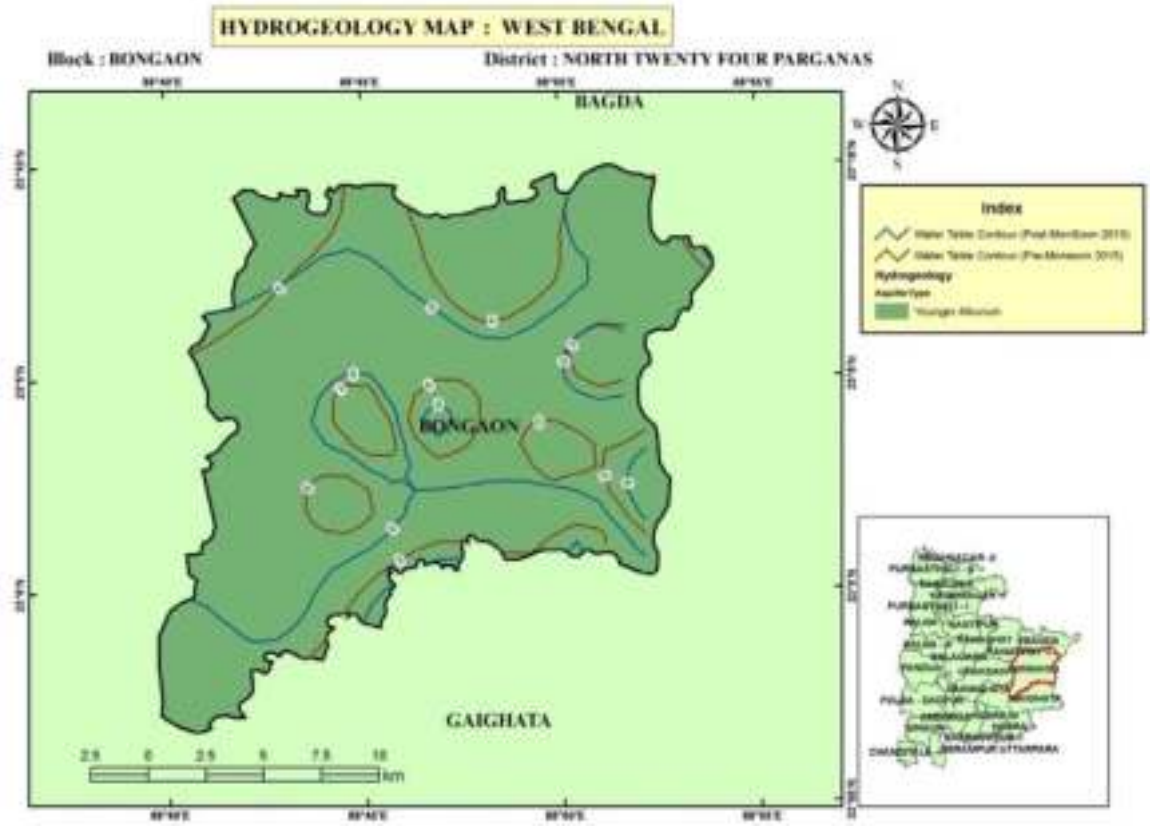
Resource Availability	Aquifer I	Aquifer II	Extraction (for Aquifer I)
Dynamic Resource	18561.12	-	0.64539
Static Resource	10110.39	-	-

2)Disposition of Aquifer:

Block	Depth range of Aquifer in m bgl	
	1st Aquifer	2nd aquifer
Bongaon	12-146	163-167, 193-252, 342-354, 363-394

Aquifer Wise Water Level Ranges & Pre-monsoon and Post-monsoon long term water level trends (1995 to 2011)

Sl. No.	Block	Aquifer	Pre-monsoon Trend		Post-monsoon Trend	
			Water Level Range(mbgl)	**Pre trend (- rising & + Falling)**	Water Level Range(mbgl)	**Post trend (- rising & + Falling)**
1.	**Bongaon**	**1**	**0.59-5.09**	**1.76**	**1.65-6.1**	**3.62**
2.	**Bongaon**	**2**	**0.8-4.1**	**-**	**2.2-4.9**	**-**

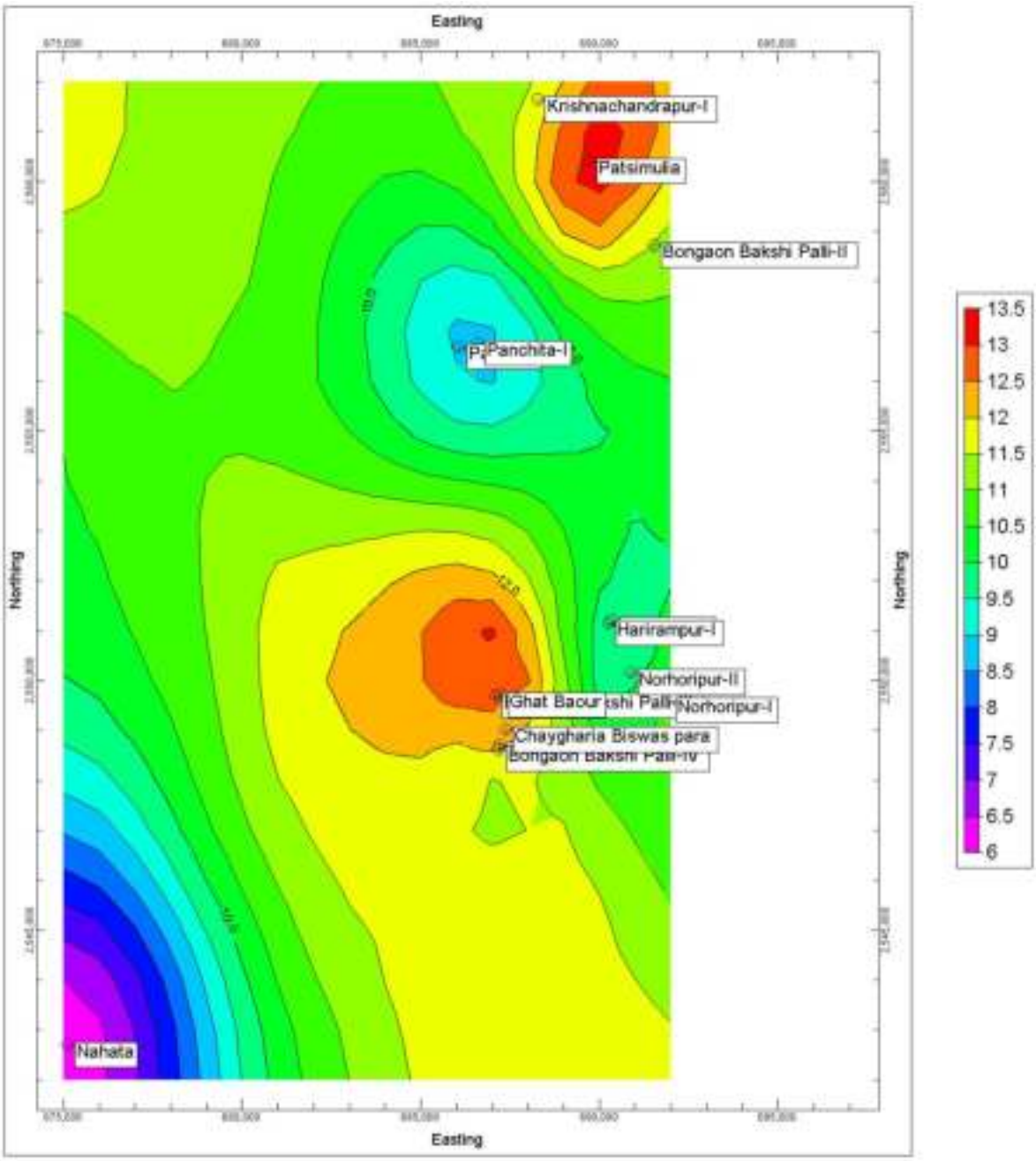


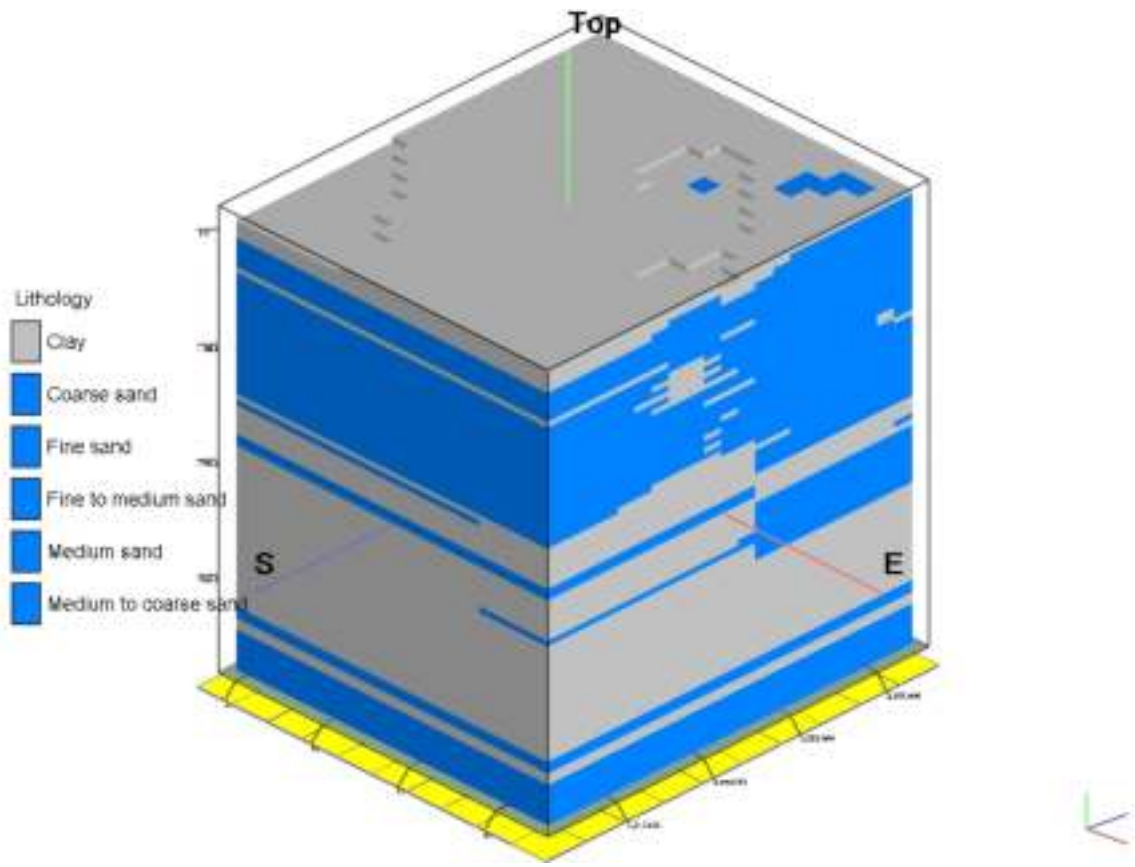
Thickness of Aquifer(Average):

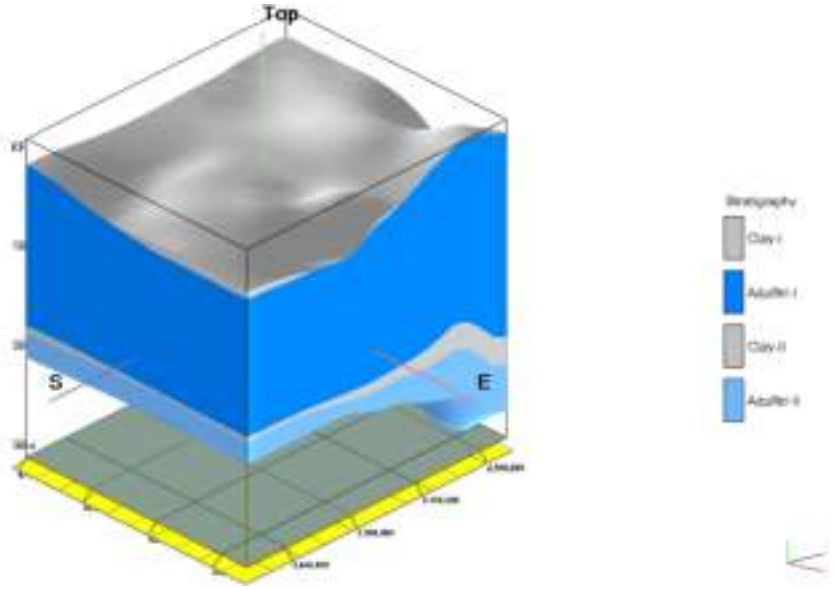
Block	Geographic Area (sq km)	Thickness of the Granular Zone in 1st aquifer (m)	Thickness of the Granular Zone /Productive Zone below pre-monsoon WL (m)
Bongaon	358.55	146	140.99

Aquifer-wise Statement

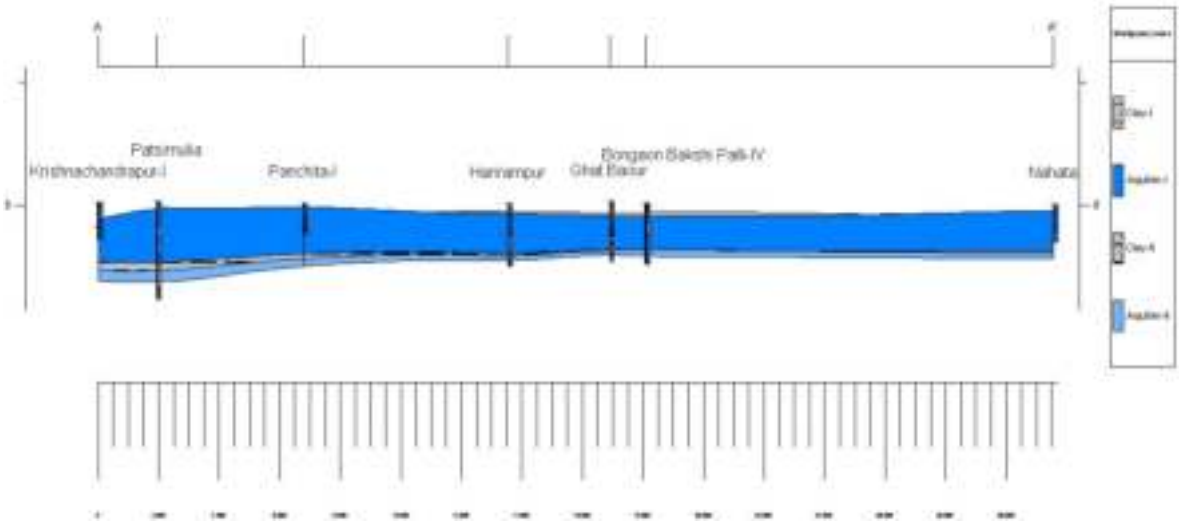
Sl. No.	Name of Block	1st Aquifer			2nd Aquifer		Remarks T (m^2/day)
		Depth Range (mbgl)	Discharge (m^3/hr)	T (m^2/day)	Depth Range	Discharge (m^3/hr)	
		1st					
13	**Bongaon**	12-146	133.2		163-394	8.5-28.8	

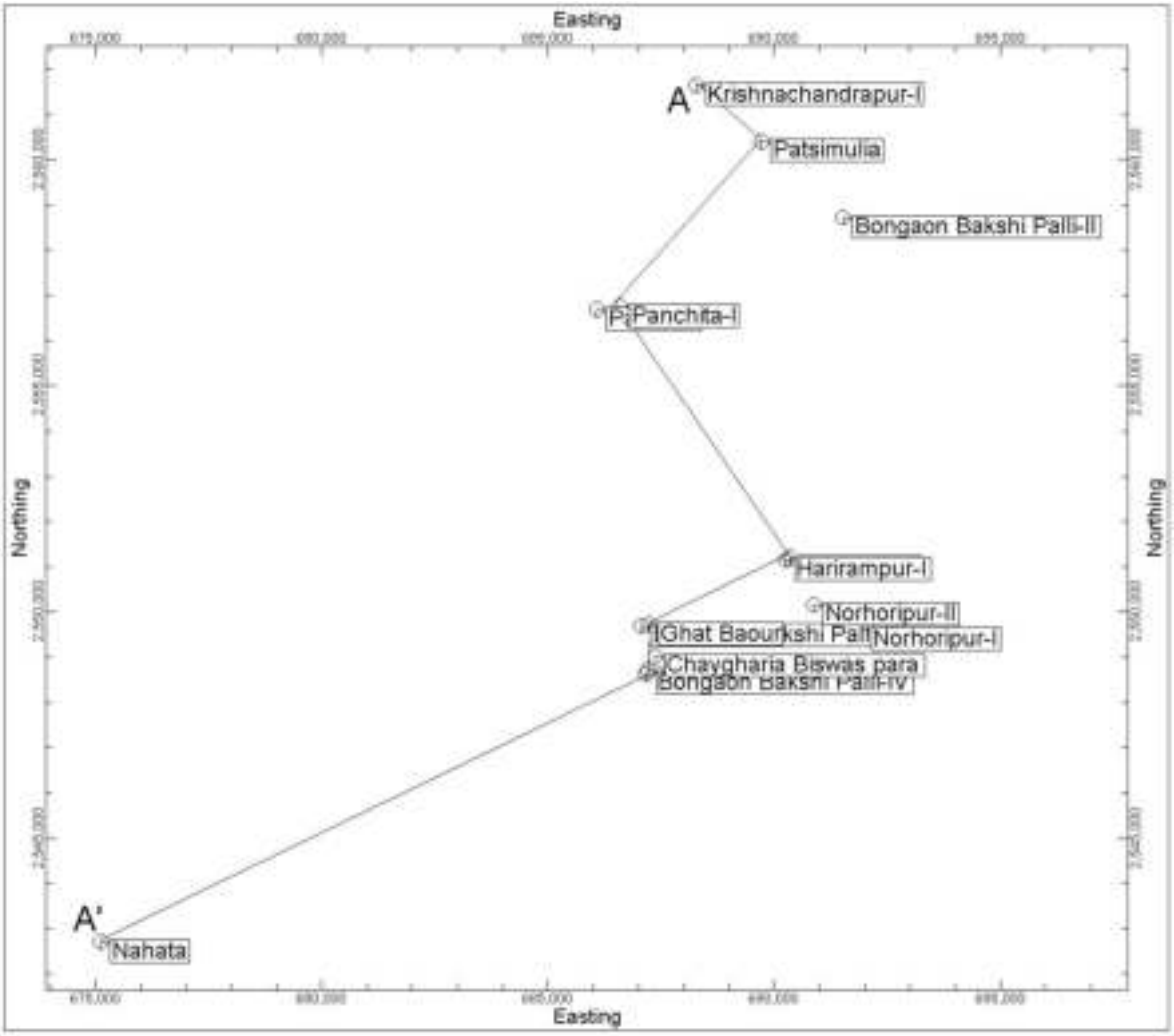

Easting
Northing
Krishnachandrapur-I
Patsimulia
Bongaon Bakshi Palli-II
Panchita-I
Harirampur-I
Norhoripur-II
Norhoripur-I
Chaygharia Biswas para
Nahata
13.5
13
12.5
12
11.5
11
10.5
10
9.5
9
8.5
8
7.5
7
6.5
6


Top
Lithology
Clay
Coarse sand
Fine sand
Fine to medium sand
Medium sand
Medium to coarse sand
S
E

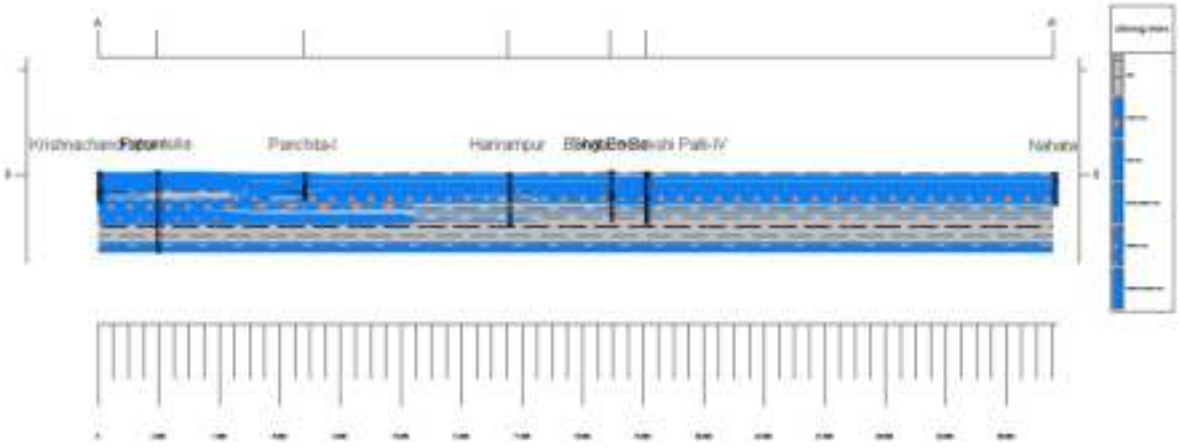


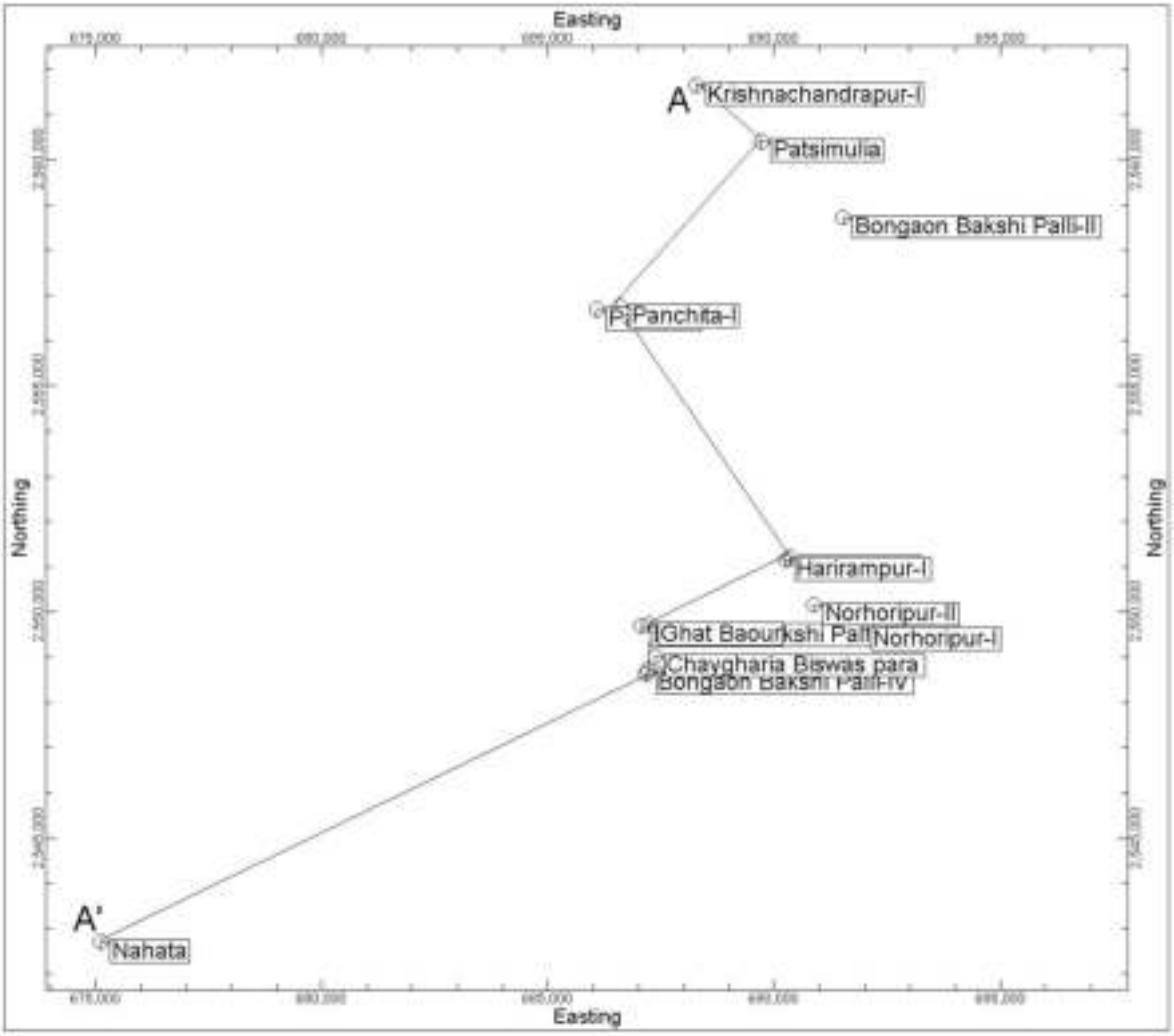
Cross-Section A-A'




Easting
Northing
A
Krishnachandrapur-I
Patsimulia
Bongaon Bakshi Palli-II
Panchita-I
Harirampur-I
Norhoripur-II
Ghat Baourkshi Pall
Norhoripur-I
Chaygharia Biswas para
Bongaon Bakshi Palli-IV
A'
Nahata
Easting
Northing

Cross-Section A-A'




Easting
Northing
A
Krishnachandrapur-I
Patsimulia
Bongaon Bakshi Palli-II
Panchita-I
Harirampur-I
Norhoripur-II
Ghat Baourkshi Pall
Norhoripur-I
Chaygharia Biswas para
Bongaon Bakshi Palli-IV
A'
Nahata
Easting
Northing

3)Ground Water Resource,Extraction,Contamination & Other Issues:

Aquifer Wise Resource Availability & Extraction:

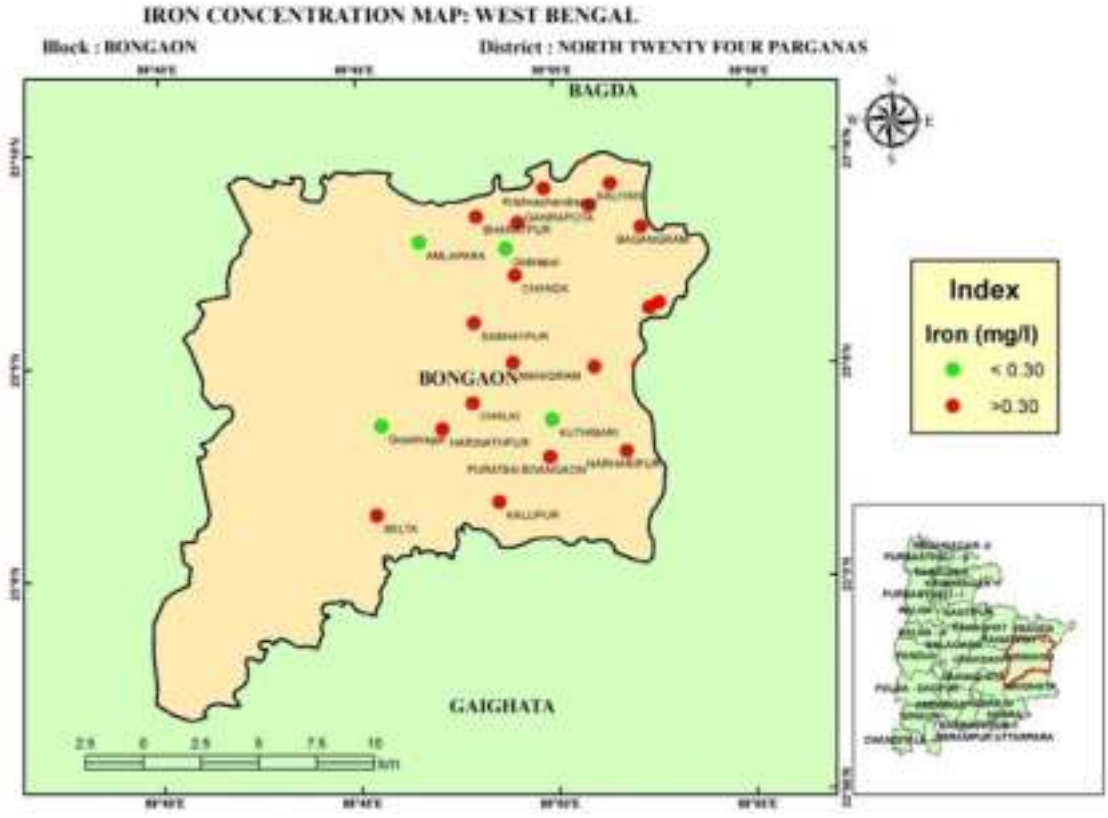
Block	Net ground water availability (MCM)	Gross ground water draft (MCM)	Stage of development (%)	Category
Bongaon	18561.12	12567.17	67.71	Safe

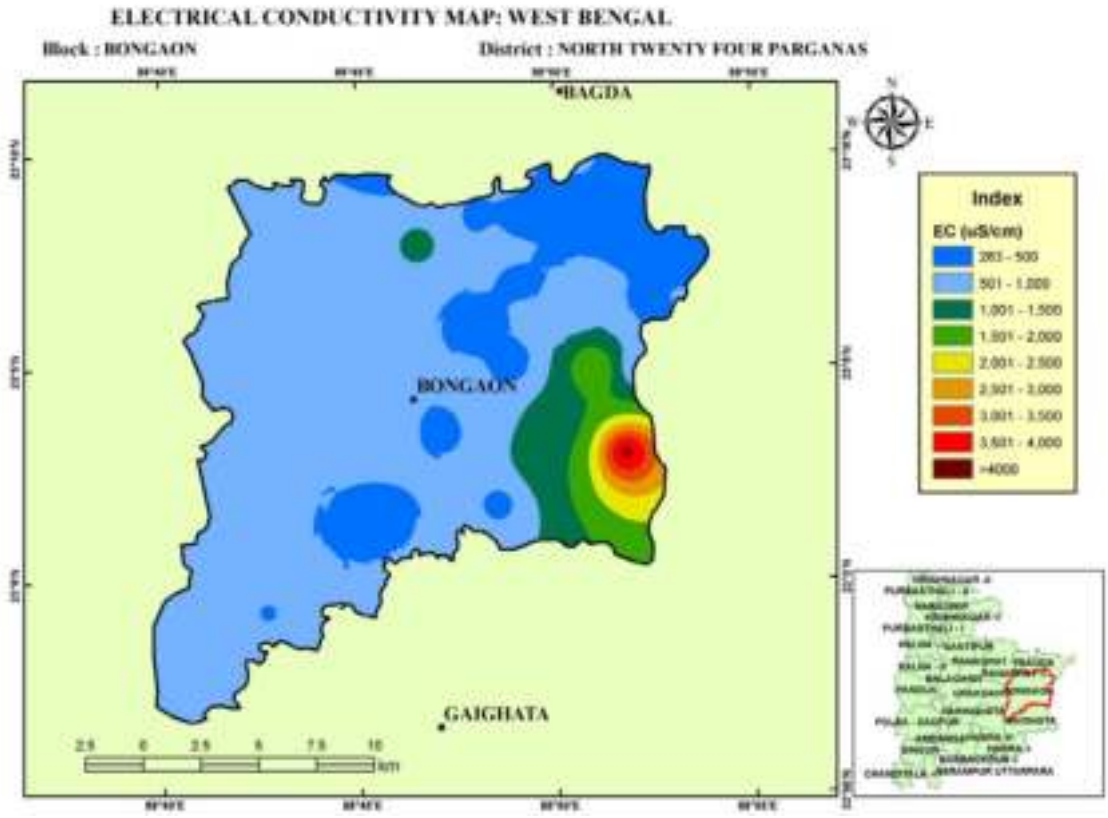
Chemical Quality Of GroundWater & Contamination:

Range Of Chemical Pollutants:

Block	As(mg/l)	Fe(mg/l)	Ec(µS/cm)	F(mg/l)	No_3(mg/l)
Bongaon	**0-0.004**	**Bdl/0.017-5.09**	**316-4080**	**Bdl-0.52**	**Negligible-108**


ARSENIC CONCENTRATION MAP: WEST BENGAL
Block : BONGAON
District : NORTH TWENTY FOUR PARGANAS
BAGDA
BONGAON
GAIGHATA
ISLAMPUR
Index
Arsenic (ug/l)
(within 100m Depth)
< 10.00
10.00 - 50.00
>50.00
2.5 0 2.5 5 7.5 10
km


IRON CONCENTRATION MAP: WEST BENGAL
Block : BONGAON
District : NORTH TWENTY FOUR PARGANAS
BAGDA
BONGAON
GAIGHATA
Index
Iron (mg/l)
< 0.30
>0.30



Percentage of tube wells having arsenic content in the **block:**

SI.No.	Blocks	Arsenic (<0.01 ing/1)	Arsenic (>0.01-<0.05 mg/1)	Arsenic (> 0.05 mg/1)	Total Tube well
1	**Bongaon**	25.72	42.72	31.39	1835

4)Ground Water Resource Enhancement& Management Plan:

Ground Water Management Plan for Drinking purpose.

Suggestions on supply of ground water to the risk population For drinking purpose.

District	Block (As affected)	No. of habitations in the risk zone where As concentration >0.05 mg/L	No. of habitations in the risk zone where As concentration 0.01 to 0.05 mg/L	Risk Population (2011) where As concentration >0.05 mg/L
N 24 PGS	BONGAON	261	97	380903

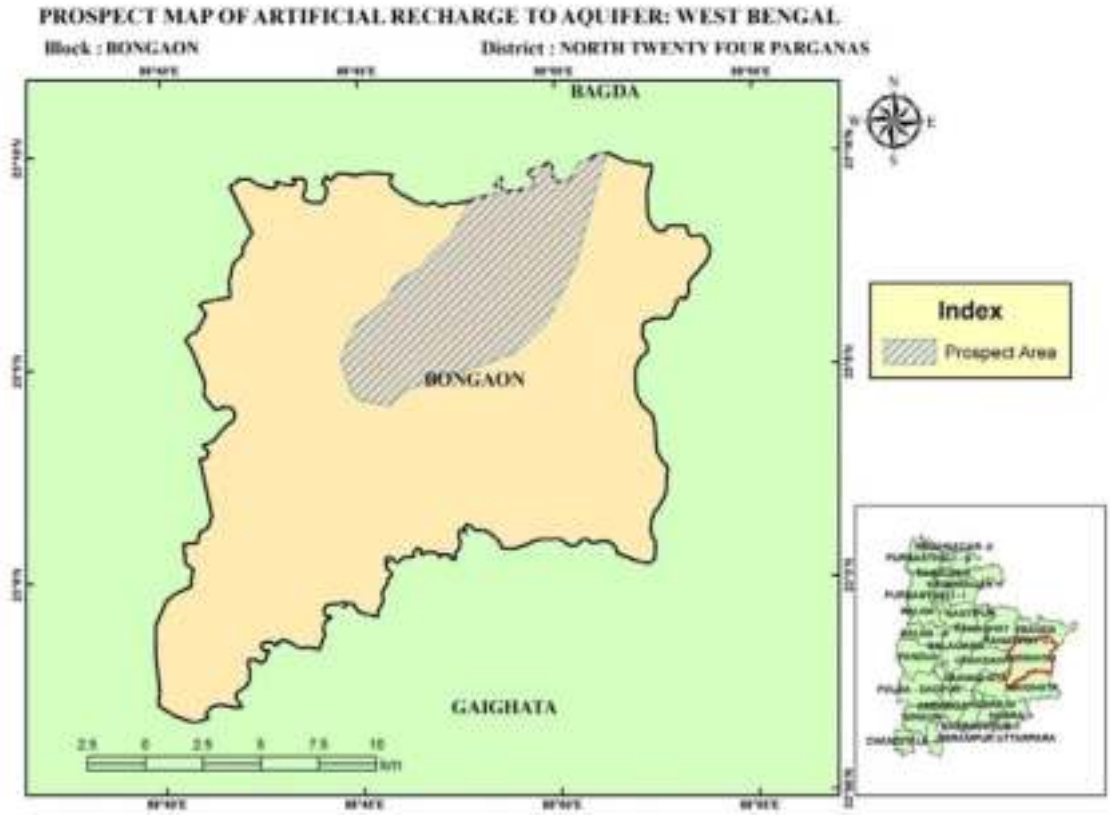
Aquifer Wise Space Available For Recharge and Proposed Interventions:

Area suitable for recharge in the study area:

District	Block Name	Area (in sq. km)	Total Area suitable for recharge (sq km.)
NORTH 24 PARGANAS	Bongaon	358.55	59.99

Proposed Artificial Recharge Structures in the area in :

District	Block	Total Surface water available in MCM for recharge	Source Water Allocation (MCM)			Number of Structures feasible			Structure-wise Cost Estimate in lakh Rs.			Total cost in lakh Rs
			Percolation Tanks	REET with RS	Injection Well	Percolation Tanks	RET with RS	Injection Well	Percolation Tanks	REET with RS	Injecton Well	
NORTH 24 PARGANAS	Bongaon	47.61	22	13	13	45	126	42	900	1008	168	2076



Ground Water Management Plan For Irrigation Purpose

Area in sq, km.

Sr No.	Name of Block	Cultivable area in ha	Net irrigated area in ha	Area to be irrigated in ha	SOD in %	Category
1	Bongaon	26109	16940	9169.00	67.71	Safe

1)Salient Information

Block Name: Barrackpore I

Area(in Km^2): 358.55

District: North 24 Parganas

State:West Bengal

Population(as on 2011):

Name of the Block	Population of CD Block (2011 census)
Barrackpore I	94278

Approximate Decadal Growth Rate from 2001-2011:

Rainfall:

Average annual rainfall in **: Barrackpore I**

(as in the district) for the period 2009 -13 (in mm)

Block	Normal	Actual (Annual)				
		2009	2010	2011	2012	2013
Barrackpore I	1579	1410	1180	1669	1208	1658

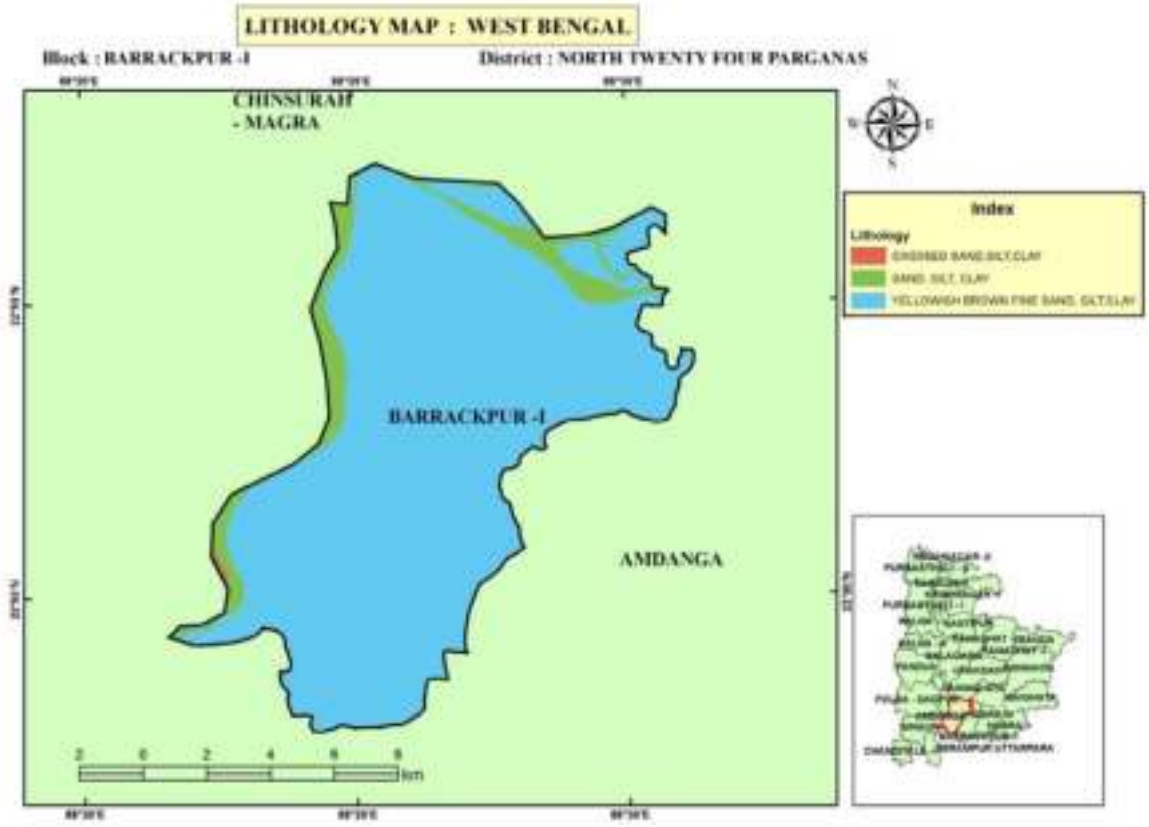
Aquifer Wise Ground Water Resource Availability & Extraction:

(in MCM)

Resource Availability	Aquifer I	Aquifer II	Extraction (for Aquifer I)
Dynamic Resource	9066.31	-	0.261612
Static Resource	3754.13	-	-

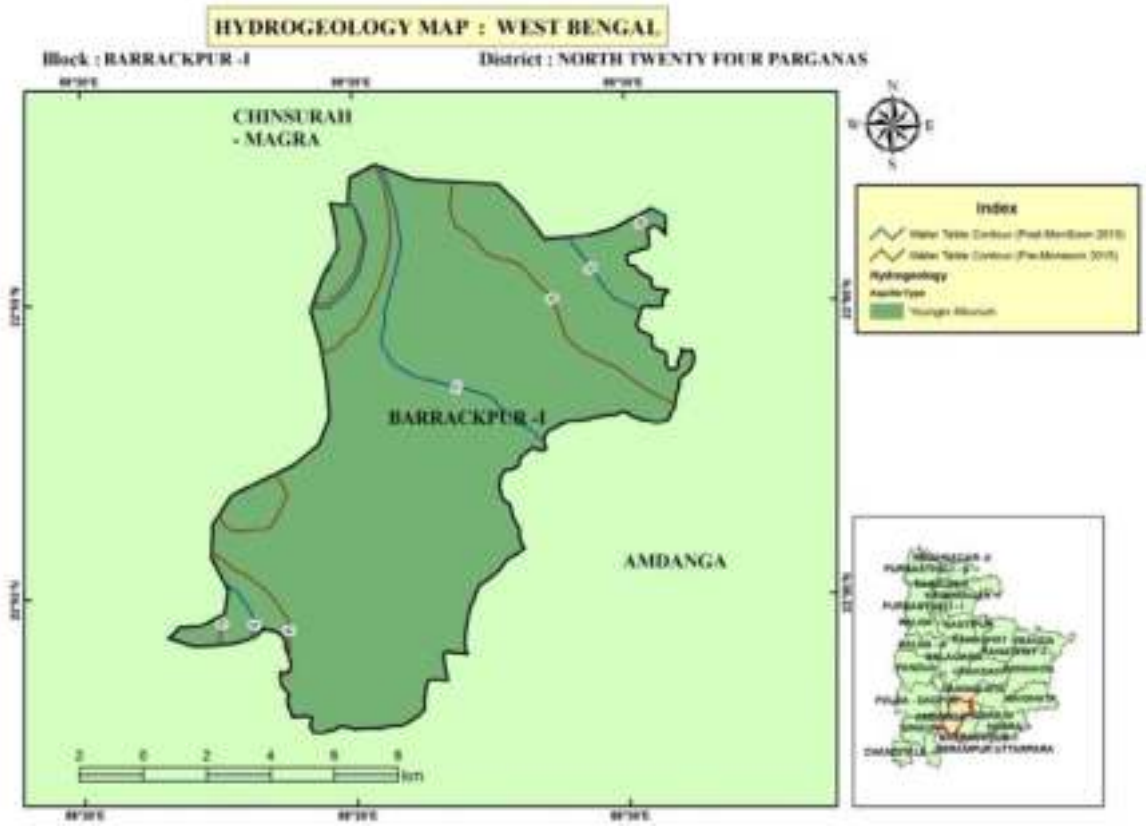
2)Disposition of Aquifer:

Block	Depth range of Aquifer in m bgl	
Barrackpore I	**1st Aquifer**	**2nd aquifer**
	50-140	170-200, 220-245



Aquifer Wise Water Level Ranges & Pre-monsoon and Post-monsoon long term water level trends (1995 to 2011)

Sl. No.	Block	Aquifer	Pre-monsoon Trend		Post-monsoon Trend	
			Water Level Range(mbgl)	Pre trend (- rising & + Falling)	Water Level Range(mbgl)	Post trend (- rising & + Falling)
1.	**Barrackpore I**	1	**0.8-11.89**	**13.32**	**3.09-9.67**	**18.64**
2.	**Barrackpore I**	2	-	-	-	-

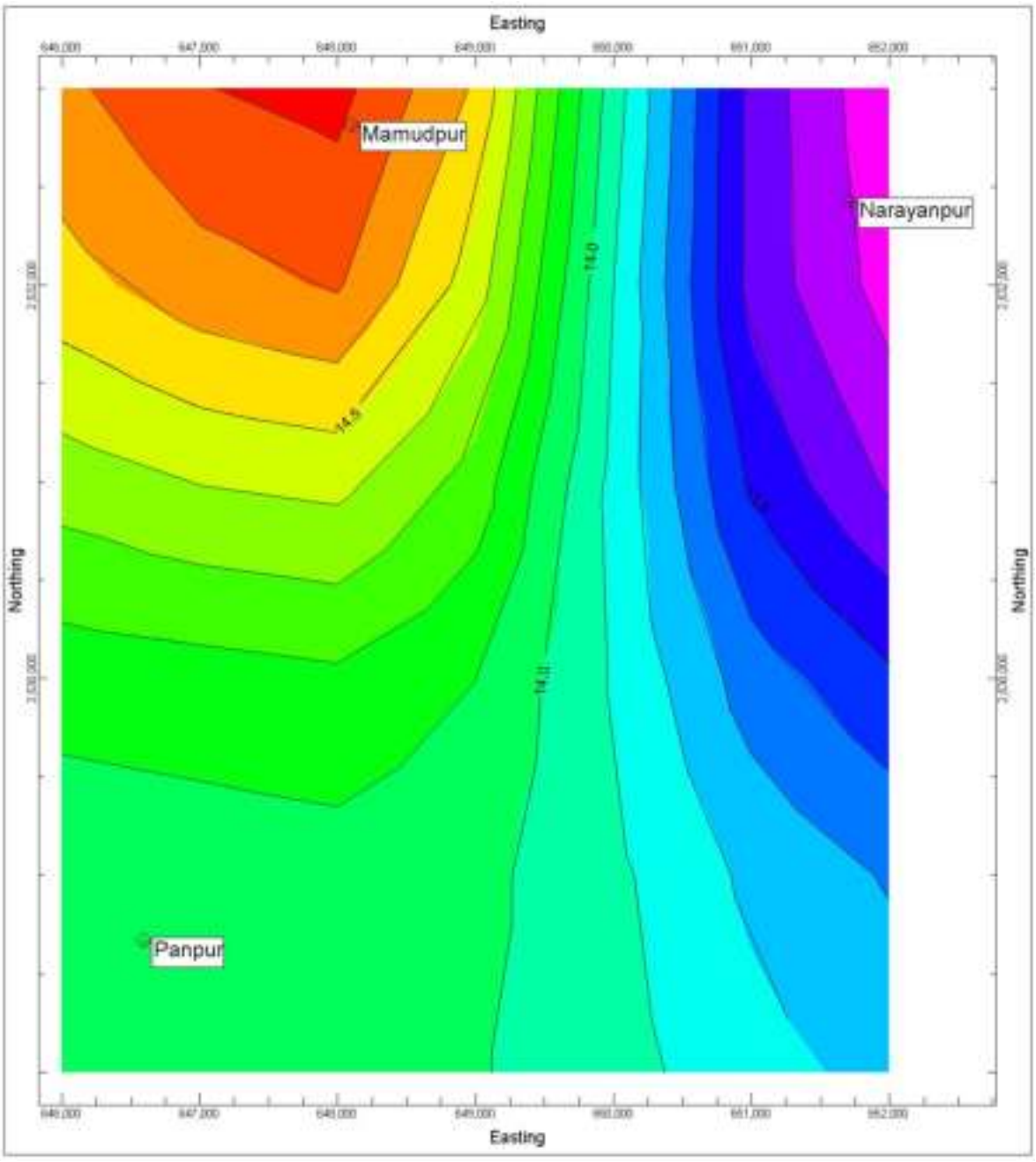


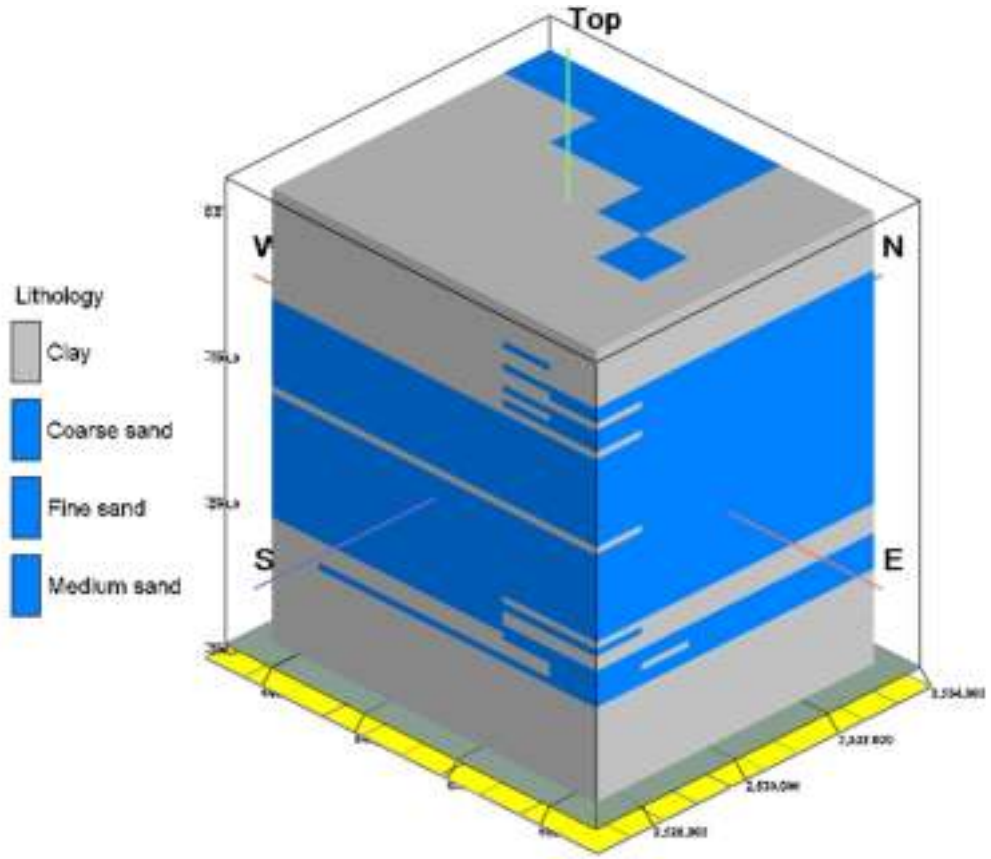
Thickness of Aquifer(Average):

Block	Geographic Area (sq km)	Thickness of the Granular Zone in 1st aquifer (m)	Thickness of the Granular Zone /Productive Zone below pre-monsoon WL (m)
Barrackpore I	145.34	140	129.15

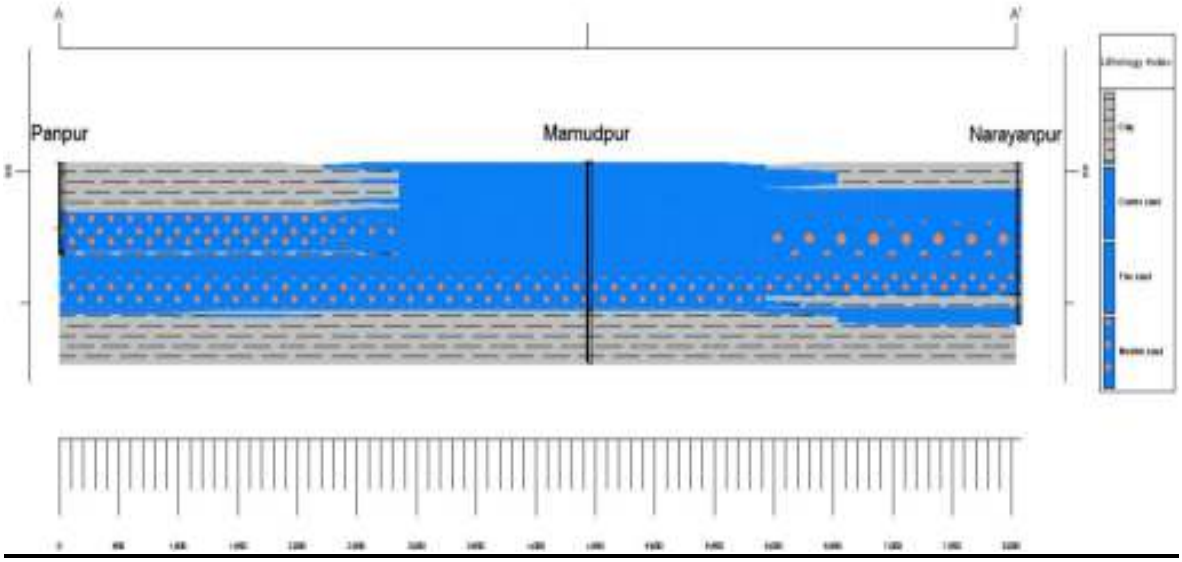
Aquifer-wise Statement

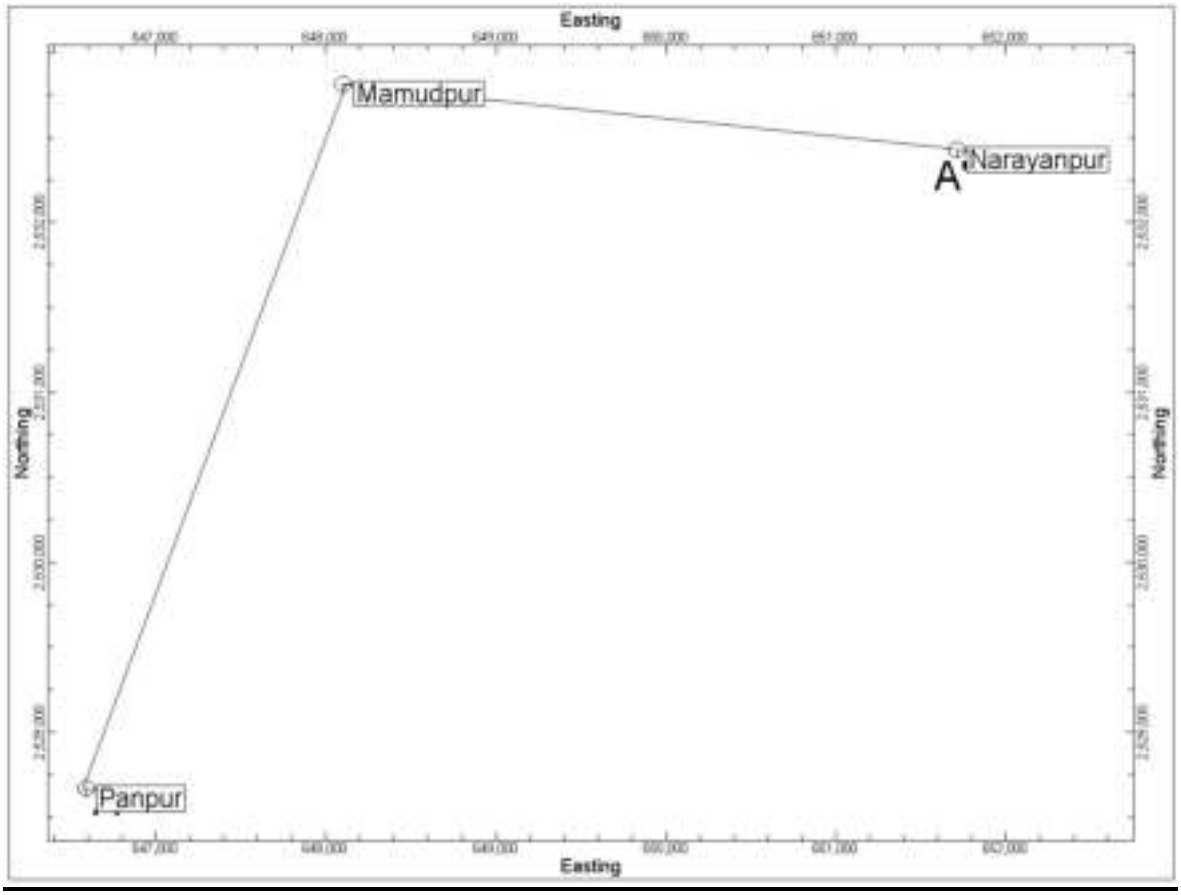
Sl. No.	Name of Block	1st Aquifer			2nd Aquifer		Remarks
		Depth Range (mbgl)	Discharge (m^3/hr)	T (m^2/day)	Depth Range	Discharge (m^3/hr)	
		1st			2nd		
13	Barrackpore I	50-140	8.39-65.99	530	170-245	36.97	774


Easting
Mamudpur
Narayanpur
Panpur
14.5
14.0
13.5
Northing
Easting


Top
W
N
S
E
Lithology
Clay
Coarse sand
Fine sand
Medium sand

Cross-Section A-A'





3)Ground Water Resource,Extraction,Contamination & Other Issues:

Aquifer Wise Resource Availability & Extraction:

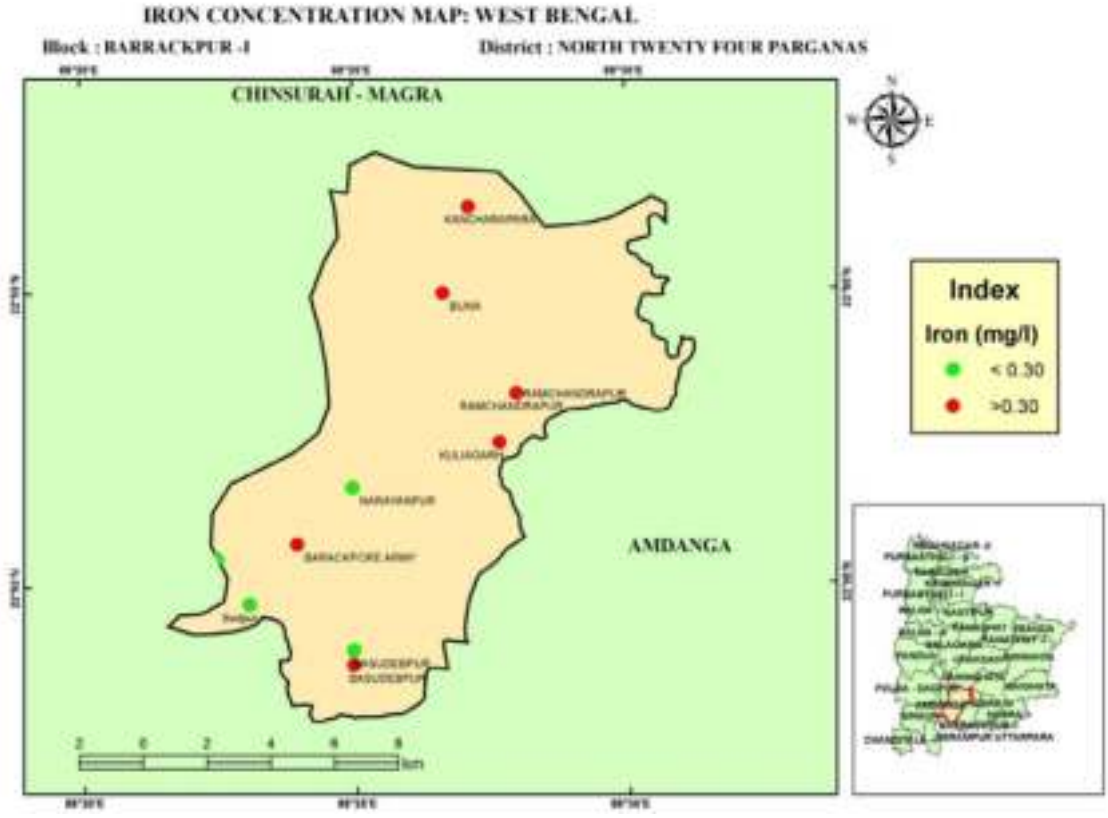
Block	Net ground water availability (MCM)	Gross ground water draft (MCM)	Stage of development (%)	Category
Barrackpore I	9066.31	3417.73	37.70	Safe

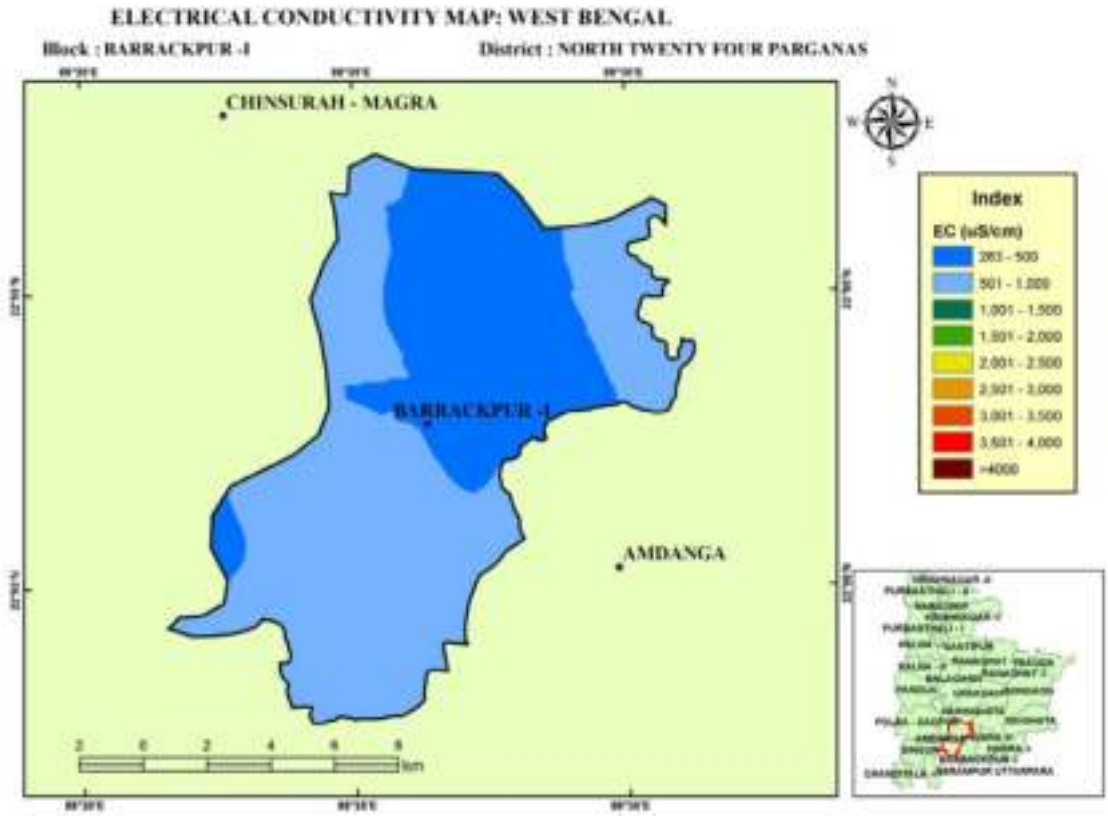
Chemical Quality Of GroundWater & Contamination:

Range Of Chemical Pollutants:

Block	As(mg/l)	Fe(mg/l)	Ec(µS/cm)	F(mg/l)	No_3(mg/l)
Barrackpore I	-	bdl	886	0.67	9.4


ARSENIC CONCENTRATION MAP: WEST BENGAL
Block : BARRACKPUR -I
District : NORTH TWENTY FOUR PARGANAS
CHINSURAH - MAGRA
BARRACKPUR -I
AMDANGA
Index
Arsenic (ug/l)
(within 100m Depth)
< 10.00
10.00 - 50.00
>50.00
2 0 2 4 6 8
km


IRON CONCENTRATION MAP: WEST BENGAL
Block : BARRACKPUR -I
District : NORTH TWENTY FOUR PARGANAS
CHINSURAH - MAGRA
AMDANGA
Index
Iron (mg/l)
< 0.30
>0.30



Percentage of tube wells having arsenic content in the **block:**

SI.No.	Blocks	Arsenic (<0.01 ing/1)	Arsenic (>0.01-<0.05 mg/1)	Arsenic (> 0.05 mg/1)	Total Tube well
1	Barrackpore I	40..71	51.71	7.58	963

4)Ground Water Resource Enhancement& Management Plan:

Ground Water Management Plan for Drinking purpose.

Suggestions on supply of ground water to the risk population For drinking purpose.

District	Block (As affected)	No. of habitations in the risk zone where As concentration >0.05 mg/L	No. of habitations in the risk zone where As concentration 0.01 to 0.05 mg/L	Risk Population (2011) where As concentration >0.05 mg/L
N 24 PGS	BARRACKPUR - I	35	75	94278

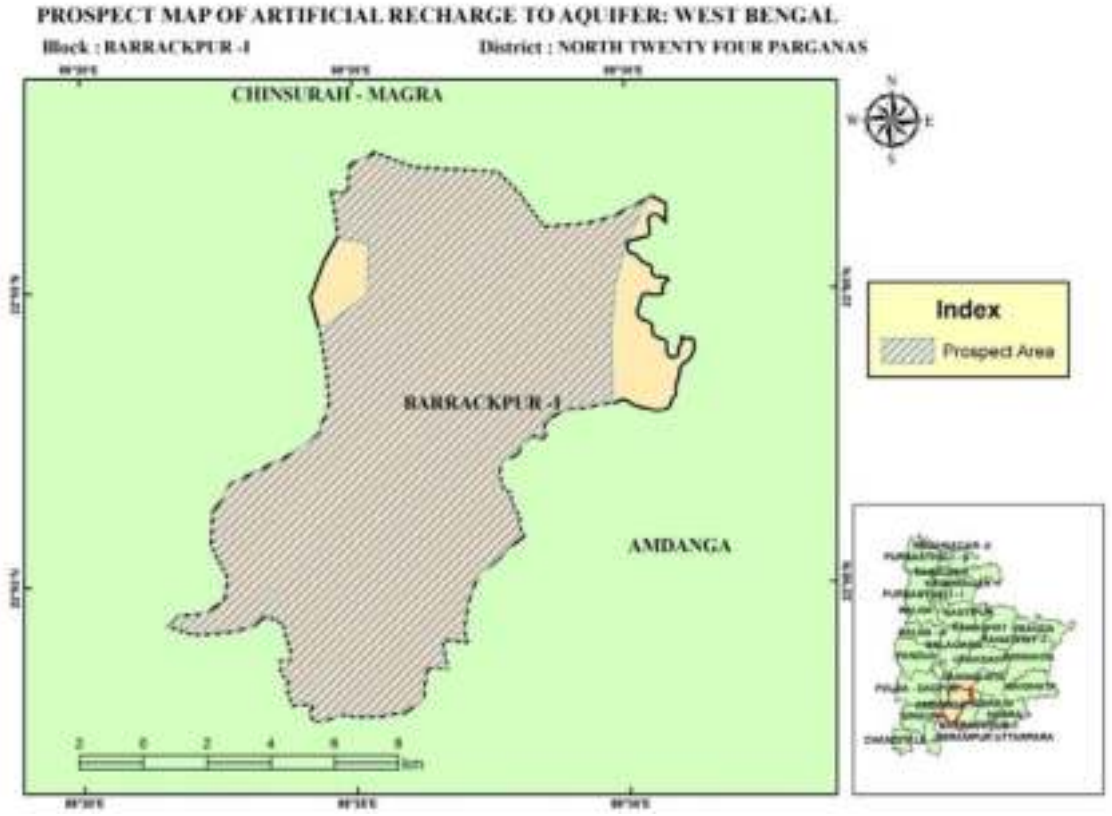
Aquifer Wise Space Available For Recharge and Proposed Interventions:

Area suitable for recharge in the study area:

District	Block Name	Area (in sq. km)	Total Area suitable for recharge (sq km.)
NORTH 24 PARGANAS	Barakpur-I	145.34	132.74

Proposed Artificial Recharge Structures in the area in :

District	Block	Total Surface water available in MCM for recharge	Source Water Allocation (MCM)			Number of Structures feasible			Structure-wise Cost Estimate in lakh Rs.			Total cost in lakh Rs
			Percolation Tanks	REET with RS	Injection Well	Percolation Tanks	RET with RS	Injection Well	Percolation Tanks	REET with RS	Injection Well	
NORTH 24 PARGANAS	Barakpur-I	28.62	13	8	8	27	76	25	540	608	100	1248



Area in sq, km.

Sr No.	Name of Block	Cultivable area in ha	Net irrigated area in ha	Area to be irrigated in ha	SOD in %	Category
1	Barrackpore I	5485	1844	3641.00	37.70	Safe

1)Salient Information

Block Name: Gaighata

Area(in Km^2): 248.80

District: North 24 Parganas

State:West Bengal

Population(as on 2011):

Name of the Block	Population of CD Block (2011 census)
Gaighata	265526

Approximate Decadal Growth Rate from 2001-2011:

Rainfall:

Average annual rainfall in **: Gaighata**

(as in the district) for the period 2009 -13 (in mm)

Block	Normal	Actual (Annual)				
		2009	2010	2011	2012	2013
Gaighata	1579	1410	1180	1669	1208	1658

Agriculture & Irrigation:

Area in sq, km.

Sr No.	Name of Block	Cultivable area in ha	Net irrigated area in ha	Area to be irrigated in ha	SOD in %	Category
1	Gaighata	17676	9332	8344.00	74.39	Safe

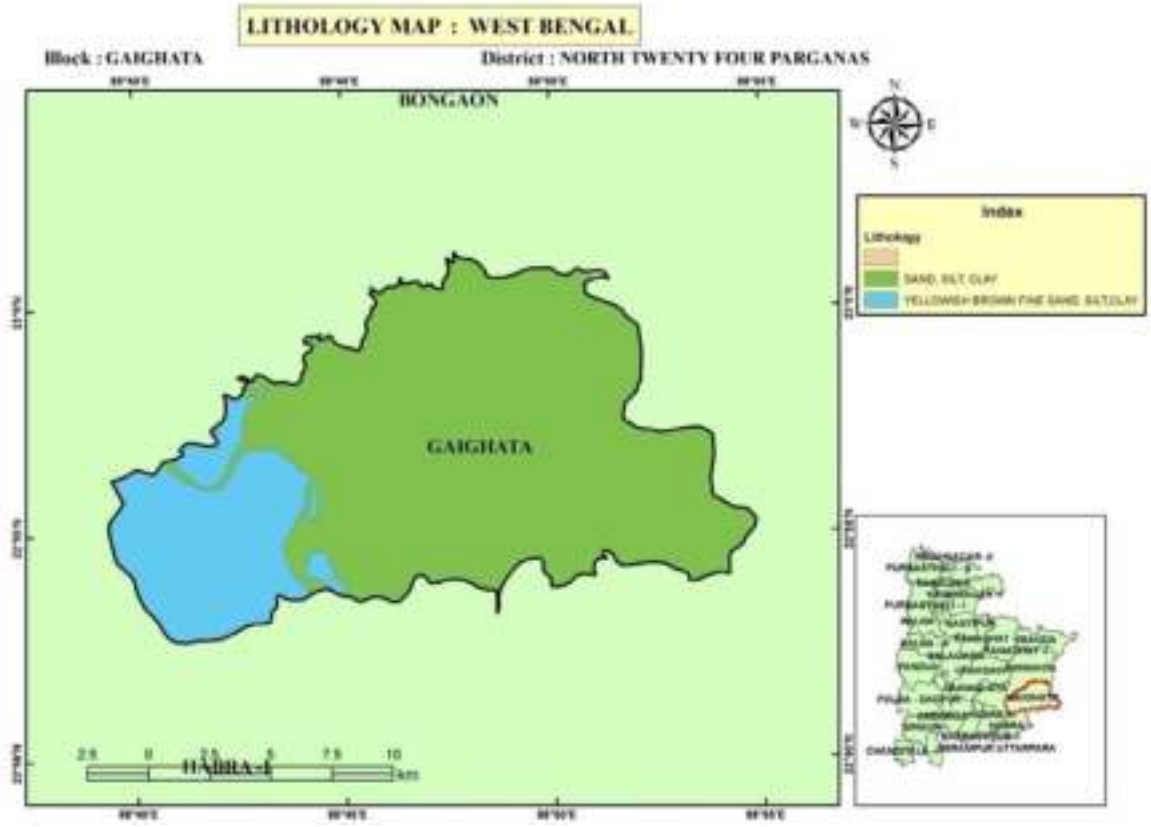
Aquifer Wise Ground Water Resource Availability & Extraction:

(in MCM)

Resource Availability	Aquifer I	Aquifer II	Extraction (for Aquifer I)
Dynamic Resource	13062.50	-	0.44784
Static Resource	7340.10	-	-

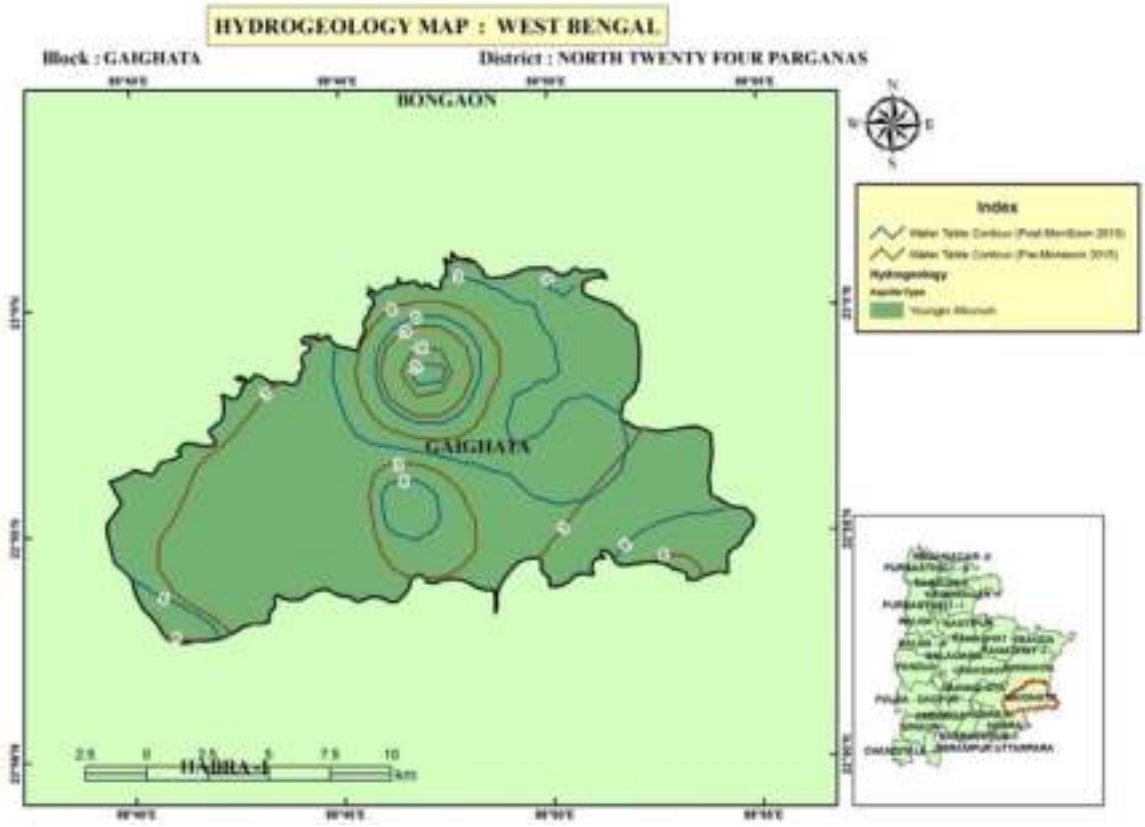
2)Disposition of Aquifer:

Block	Depth range of Aquifer in m bgl	
Gaighata	**1st Aquifer**	**2nd aquifer**
	28-153	180-247



Aquifer Wise Water Level Ranges & Pre-monsoon and Post-monsoon long term water level trends (1995 to 2011)

Sl. No.	Block	Aquifer	Pre-monsoon Trend		Post-monsoon Trend	
			Water Level Range(mbgl)	**Pre trend (- rising & + Falling)**	Water Level Range(mbgl)	**Post trend (- rising & + Falling)**
1.	Gaighata	1		5.63		6.02
2.	Gaighata	2				

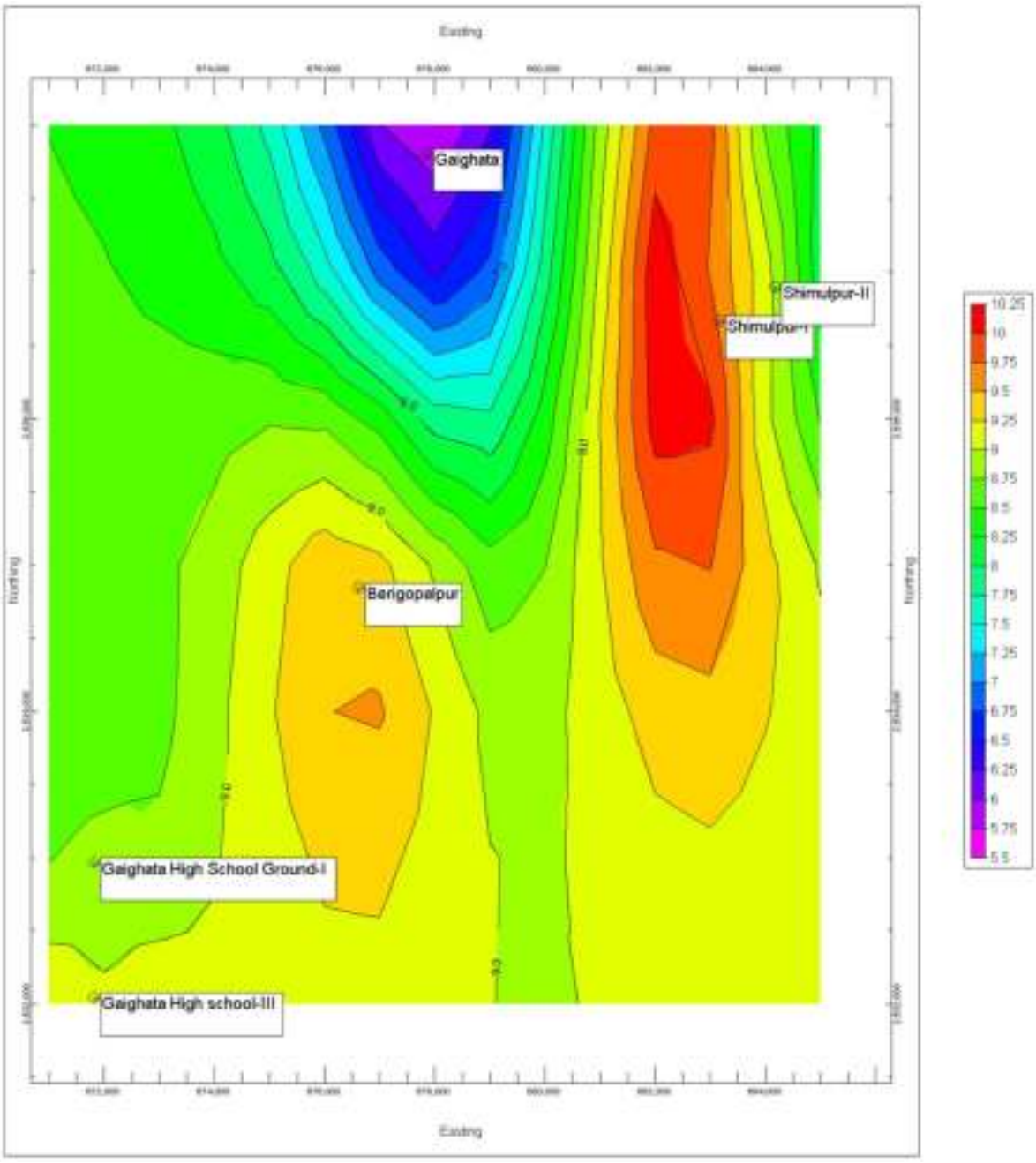


Thickness of Aquifer(Average):

Block	Geographic Area (sq km)	Thickness of the Granular Zone in 1st aquifer (m)	Thickness of the Granular Zone /Productive Zone below pre-monsoon WL (m)
Gaighata	248.8	153	147.51

Aquifer-wise Statement

Sl. No.	Name of Block	1st Aquifer			2nd Aquifer		Remarks T (m^2/day)
		Depth Range (mbgl)	Discharge (m^3/hr)	T (m^2/day)	Depth Range	Discharge (m^3/hr)	
		1st			2nd		
13	Gaighata	28-153	19.98-218.66	7035.5	180-247	44.93	4662.74


Easting
Northing
Gaighata
Shimulpur-II
Shimulpur-I
Berigopalpur
Gaighata High School Ground-I
Gaighata High school-III
10.25
10
9.75
9.5
9.25
9
8.75
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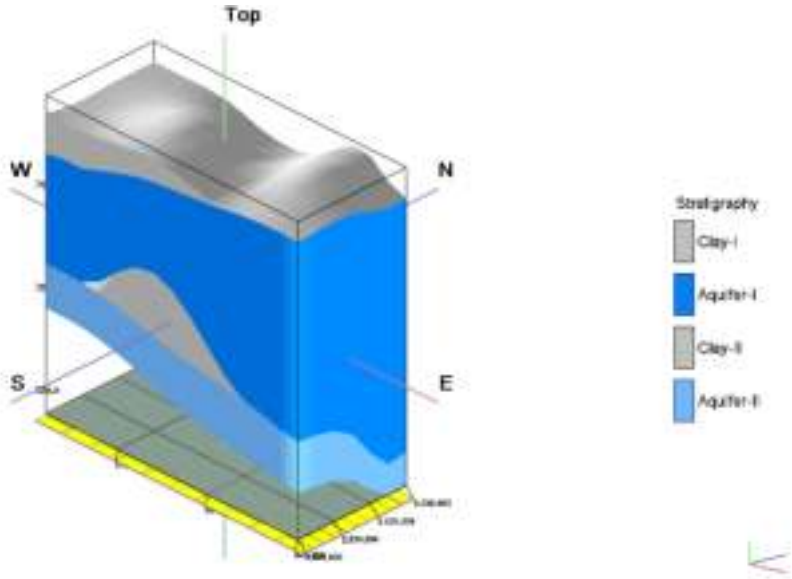
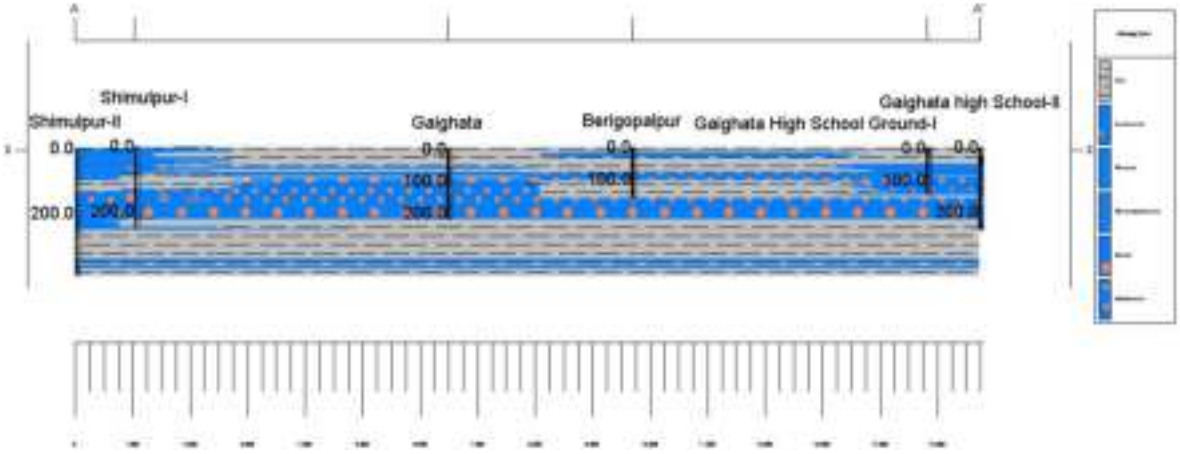
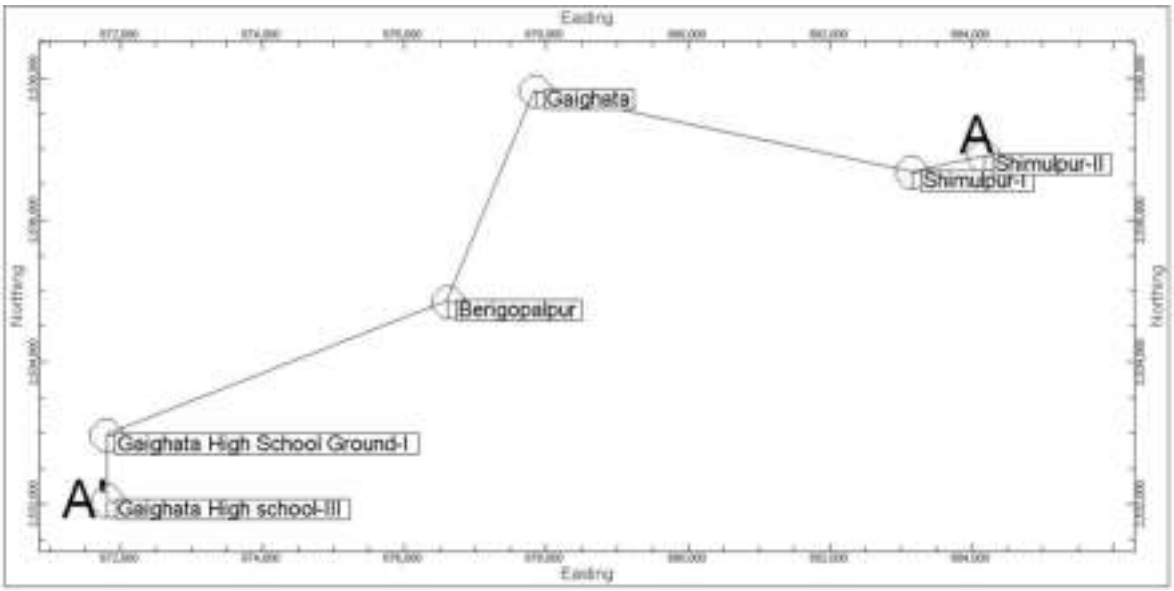
6.25
6
5.75
5.5



Cross-Section A-A'





3)Ground Water Resource,Extraction,Contamination & Other Issues:

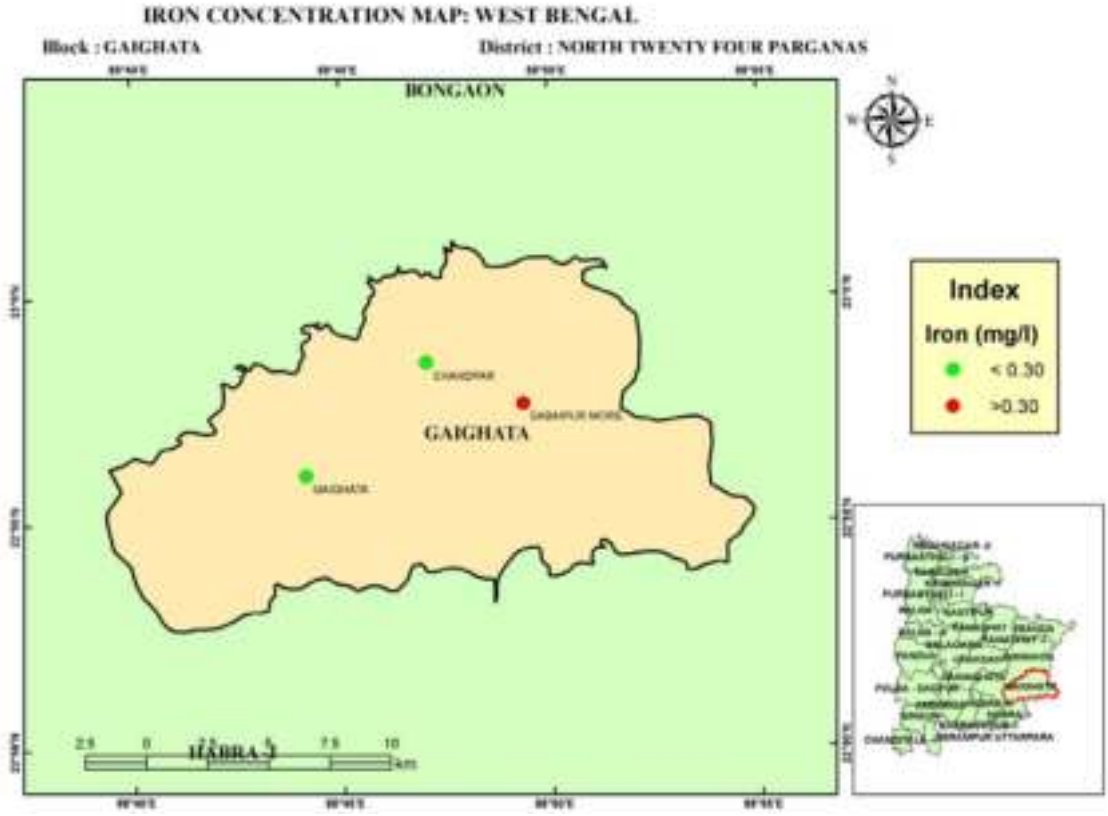
Aquifer Wise Resource Availability & Extraction:

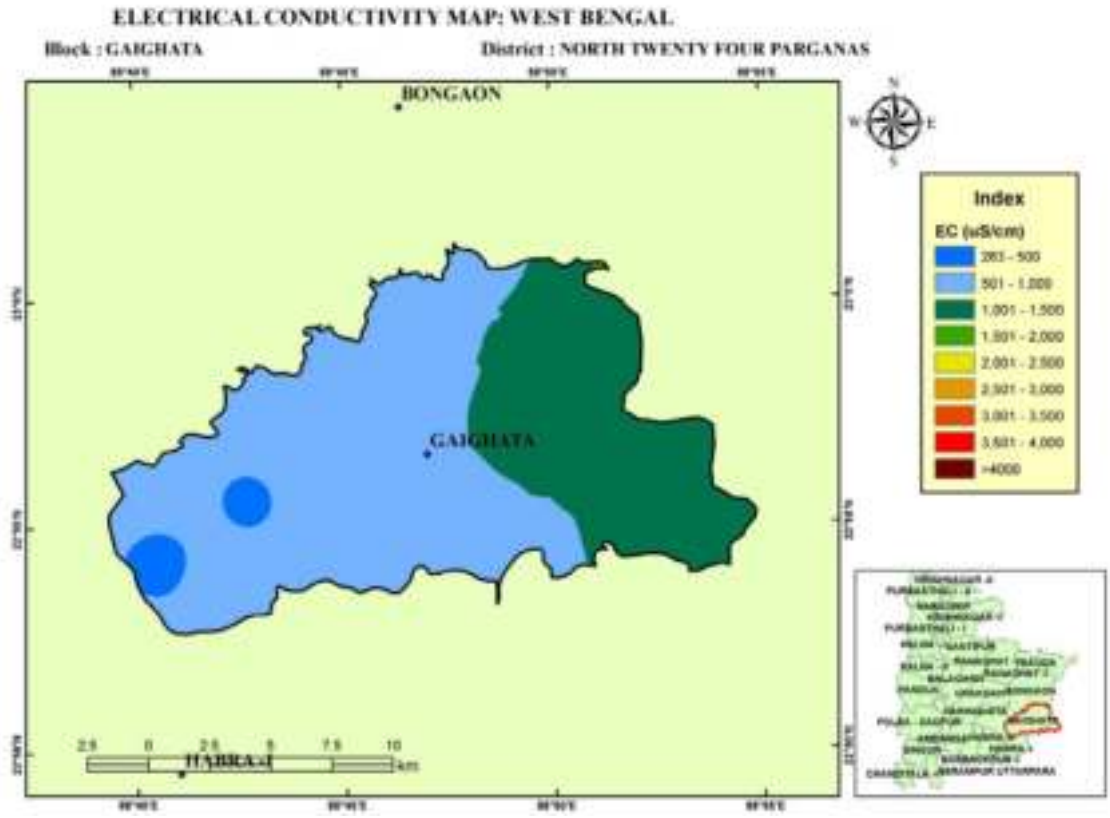
Block	Net ground water availability (MCM)	Gross ground water draft (MCM)	Stage of development (%)	Category
Gaighata	13062.50	9717.44	74.39	Safe

Chemical Quality Of GroundWater & Contamination:

Range Of Chemical Pollutants:

Block	As(mg/l)	Fe(mg/l)	Ec(µS/cm)	F(mg/l)	No_3(mg/l)
Gaighata	-	Bdl/0.15-1.84	364-1440	Bdl/0.09-0.57	-


IRON CONCENTRATION MAP: WEST BENGAL
Block : GARGHATA
District : NORTH TWENTY FOUR PARGANAS
BONGAON
GARGHATA
CHANDPAR
GARGHATA
HABRA
Index
Iron (mg/l)
< 0.30
>0.30



Percentage of tube wells having arsenic content in the **block:**

SI.No.	Blocks	Arsenic (<0.01 ing/1)	Arsenic (>0.01-<0.05 mg/1)	Arsenic (> 0.05 mg/1)	Total Tube well
1	Gaighata	18.88	28.93	52.19	1483

4)Ground Water Resource Enhancement& Management Plan:

Ground Water Management Plan for Drinking purpose.

Suggestions on supply of ground water to the risk population For drinking purpose.

District	Block (As affected)	No. of habitations in the risk zone where As concentration >0.05 mg/L	No. of habitations in the risk zone where As concentration 0.01 to 0.05 mg/L	Risk Population (2011) where As concentration >0.05 mg/L
N 24 PGS	GAIGHATA	178	23	265526

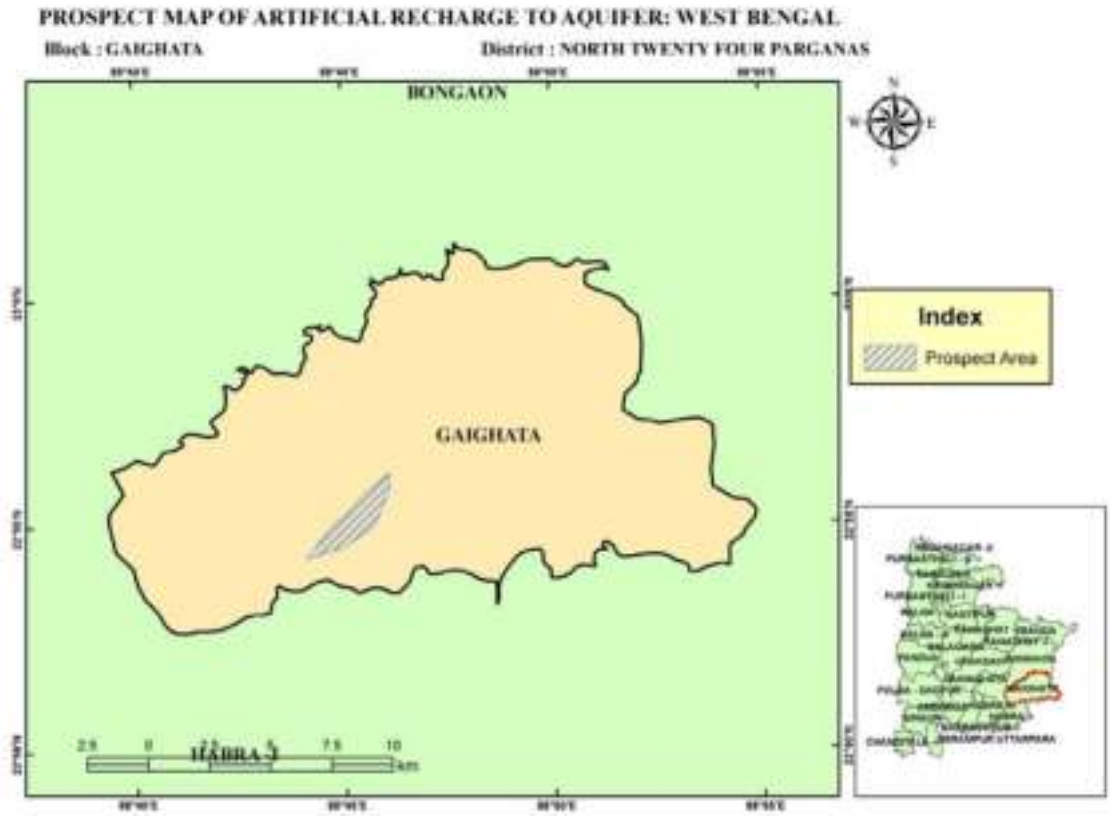
Aquifer Wise Space Available For Recharge and Proposed Interventions:

Area suitable for recharge in the study area:

District	Block Name	Area (in sq. km)	Total Area suitable for recharge (sq km.)
NORTH 24 PARGANAS	Gaighata	248.80	3.65

Proposed Artificial Recharge Structures in the area in :

District	Block	Total Surface water available in MCM for recharge	Source Water Allocation (MCM)			Number of Structures feasible			Structure-wise Cost Estimate in lakh Rs.			Total cost in lakh Rs
			Percolation Tanks	REET with RS	Injection Well	Percolation Tanks	RET with RS	Injection Well	Percolation Tanks	REET with RS	Injection Well	
NORTH 24 PARGANAS	Gaighata	32.05	15	9	9	30	85	28	600	680	112	1392



Ground Water Management Plan For Irrigation Purpose.

Area in sq, km.

Sr No.	Name of Block	Cultivable area in ha	Net irrigated area in ha	Area to be irrigated in ha	SOD in %	Category
1	Gaighata	17676	9332	8344.00	74.39	Safe

1)Salient Information

Block Name: Habra I

Area(in Km^2): 146.16

District: North 24 Parganas

State:West Bengal

Population(as on 2011):

Name of the Block	Population of CD Block (2011 census)
Habra I	175651

Approximate Decadal Growth Rate from 2001-2011:

Rainfall:

Average annual rainfall in **: Habra I**

(as in the district) for the period 2009 -13 (in mm)

Block	Normal	Actual (Annual)				
		2009	2010	2011	2012	2013
Habra I	1579	1410	1180	1669	1208	1658

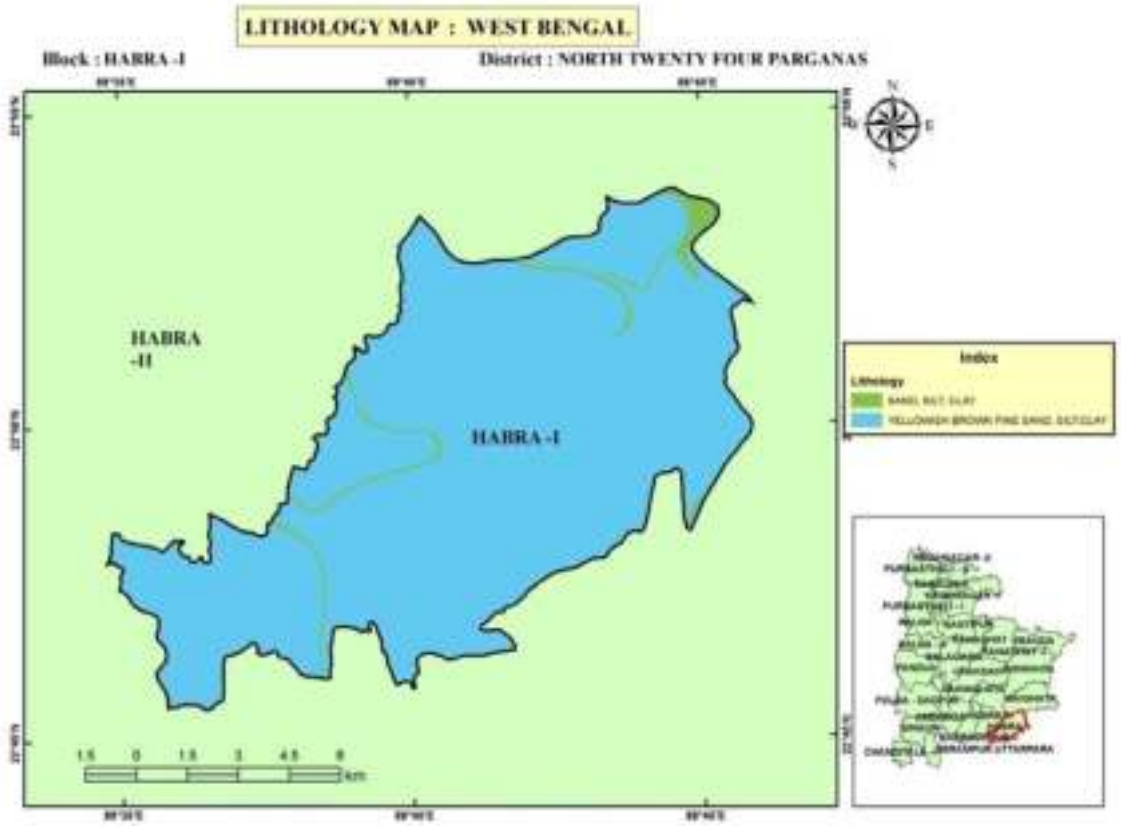
Aquifer Wise Ground Water Resource Availability & Extraction:

(in MCM)

Resource Availability	Aquifer I	Aquifer II	Extraction (for Aquifer I)
Dynamic Resource	8257.52	-	0.263088
Static Resource	4343.88	-	-

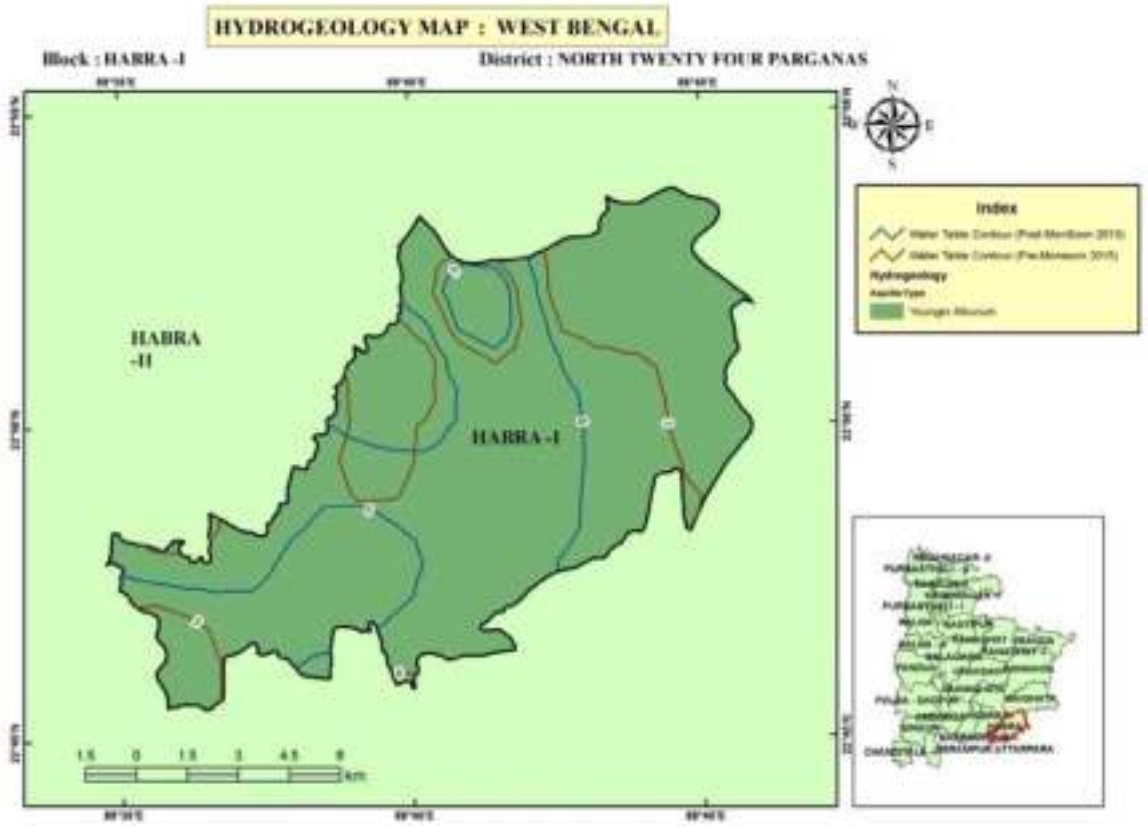
2)Disposition of Aquifer:

Block	Depth range of Aquifer in m bgl	
Habra I	1st Aquifer	2nd aquifer
	3-155	161-172, 185-219, 223-260



Aquifer Wise Water Level Ranges & Pre-monsoon and Post-monsoon long term water level trends (1995 to 2011)

Sl. No.	Block	Aquifer	Pre-monsoon Trend		Post-monsoon Trend	
			Water Level Range(mbgl)	**Pre trend (- rising & + Falling)**	Water Level Range(mbgl)	**Post trend (- rising & + Falling)**
1.	**Habra I**	1		2.19		9.01
2.	**Habra I**	2				

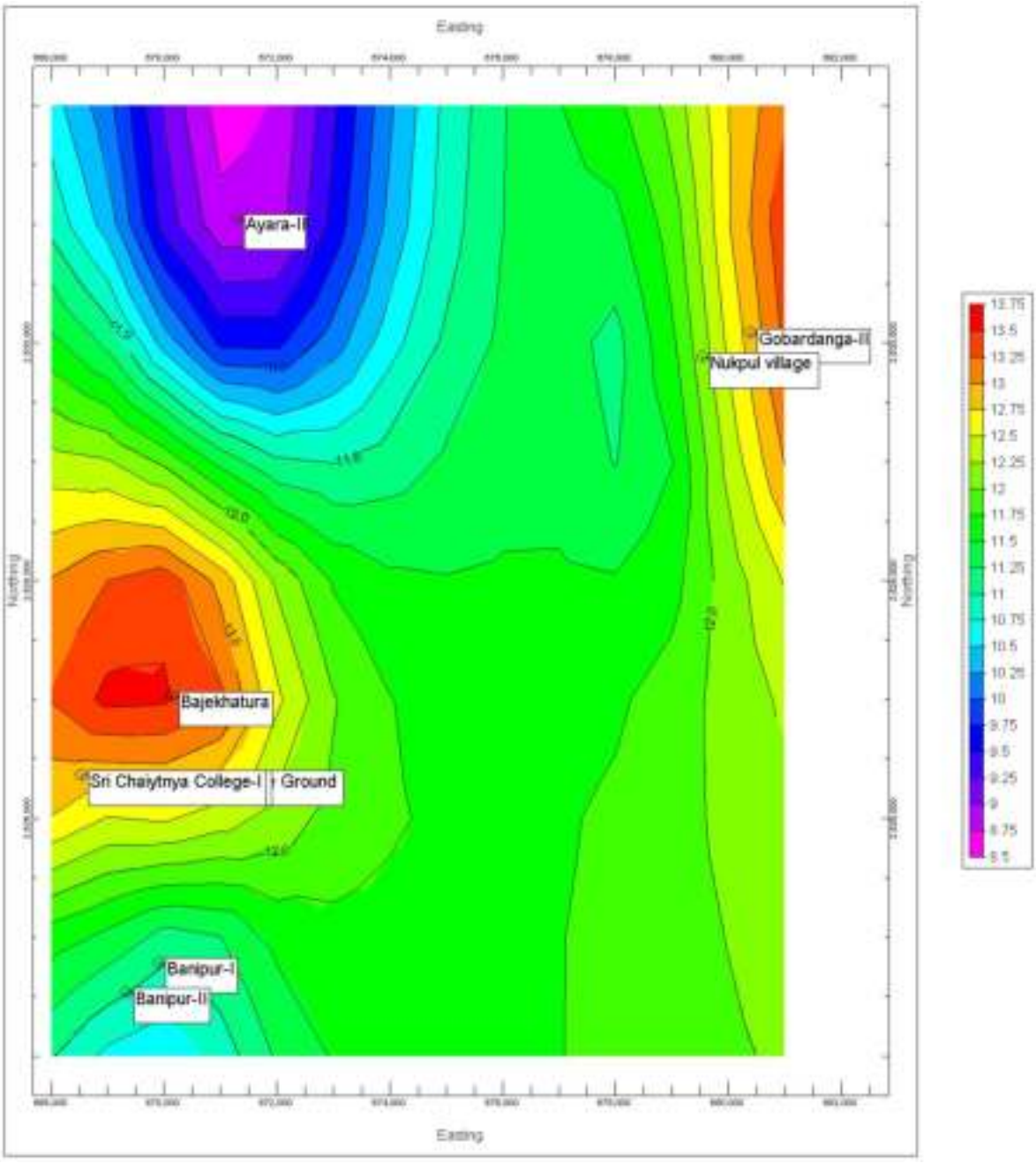


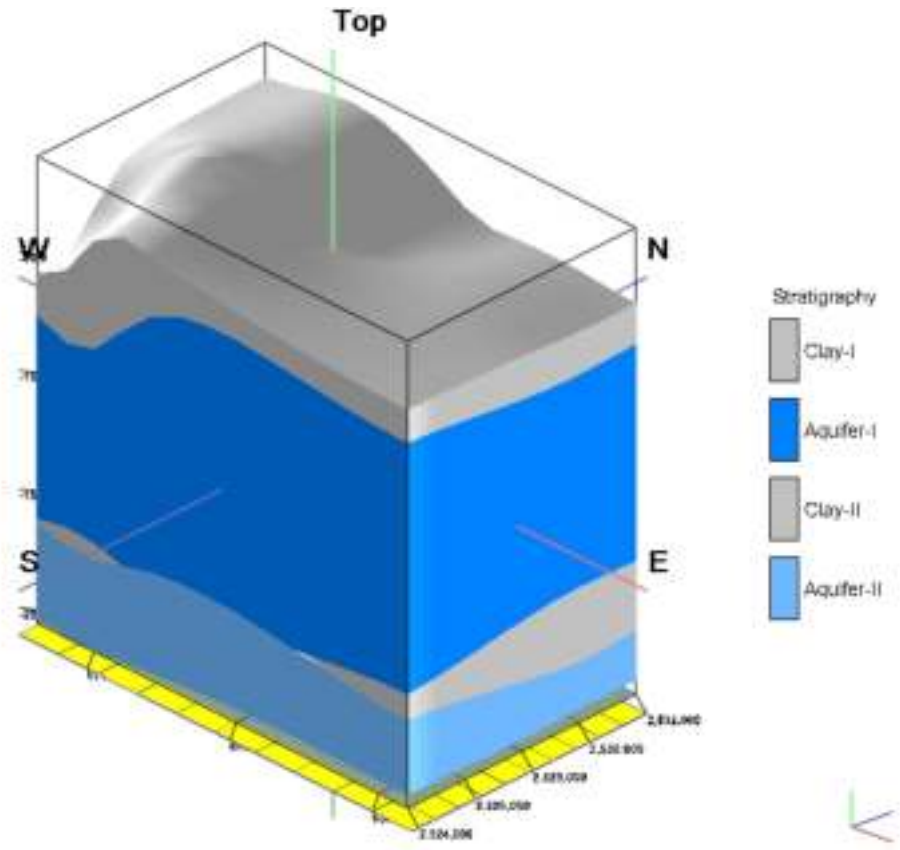
Thickness of Aquifer(Average):

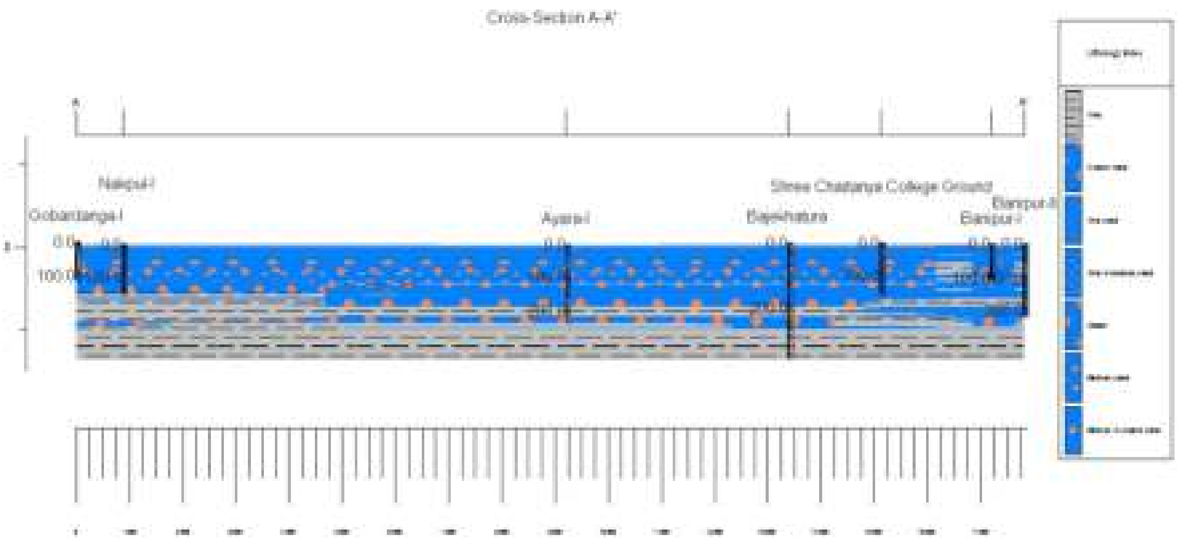
Block	Geographic Area (sq km)	Thickness of the Granular Zone in 1st aquifer (m)	Thickness of the Granular Zone /Productive Zone below pre-monsoon WL (m)
Habra I	146.16	155	148.6

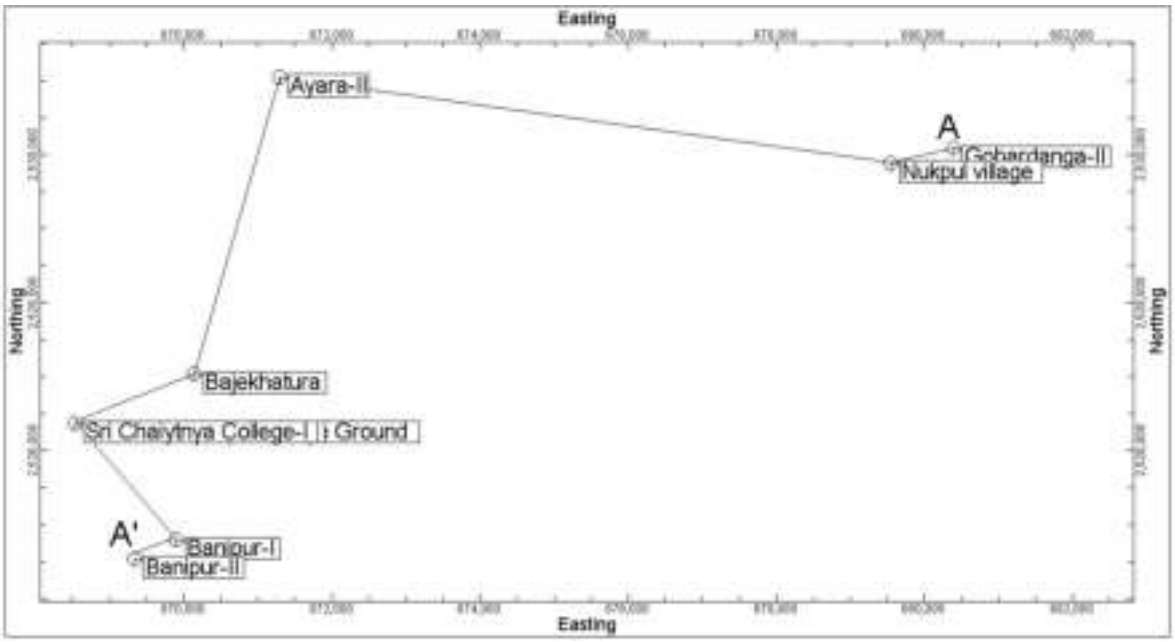
Aquifer-wise Statement

Sl. No.	Name of Block	1st Aquifer			2nd Aquifer		Remarks T (m^2/day)
		Depth Range (mbgl)	Discharge (m^3/hr)	T (m^2/day)	Depth Range	Discharge (m^3/hr)	
		1st			2nd		
13	**Habra I**	3-155	28.8		161-260	28.8-79.2	4119.2


Easting
Northing
Ayara-II
Goboardanga-II
Nukpul village
Bajekhatura
Sri Chaiytnya College-I
Ground
Banipur-I
Banipur-II
13.75
13.5
13.25
13
12.75
12.5
12.25
12
11.75
11.5
11.25
11
10.75
10.5
10.25
10
9.75
9.5
9.25
9
8.75
8.5


Top
W
N
S
E
Stratigraphy
Clay-I
Aquifer-I
Clay-II
Aquifer-II


Cross-Section A-A'
Naikpul-I
Gobardanga-I
Ayara-I
Bajekhatura
Stree Chaitanya College Ground
Banpur-II
Banpur-I



3)Ground Water Resource,Extraction,Contamination & Other Issues:

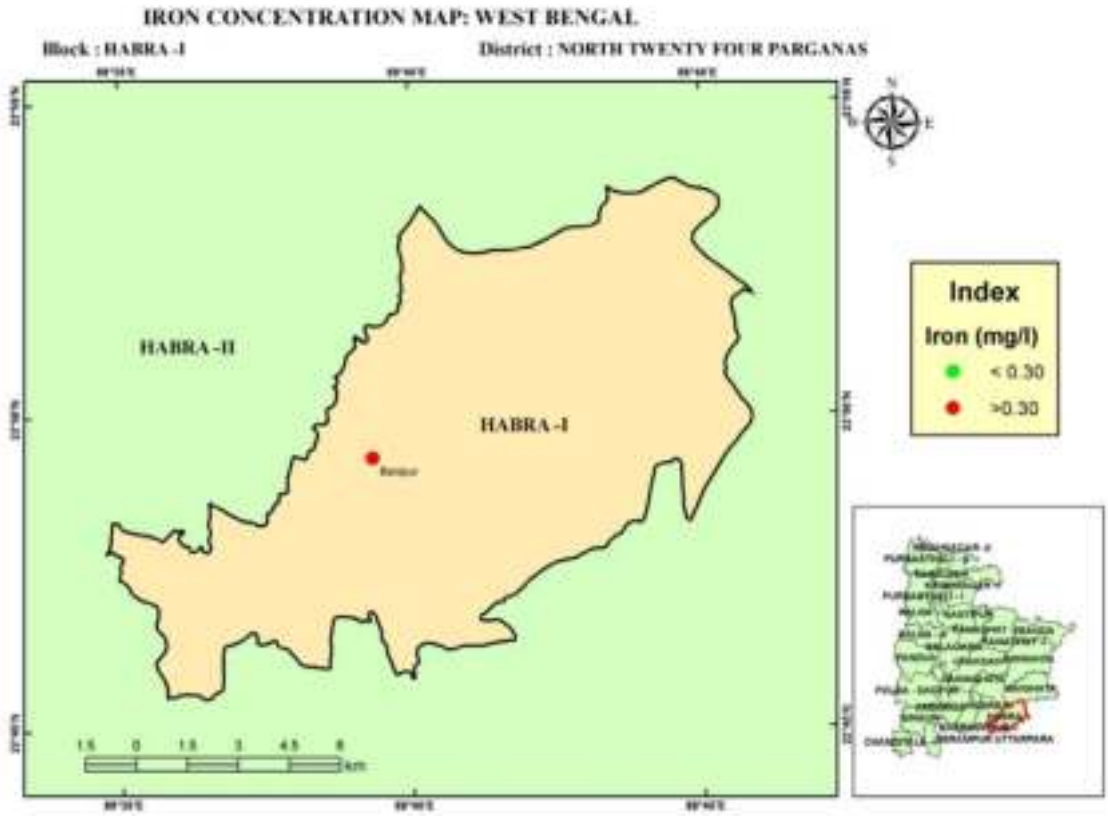
Aquifer Wise Resource Availability & Extraction:

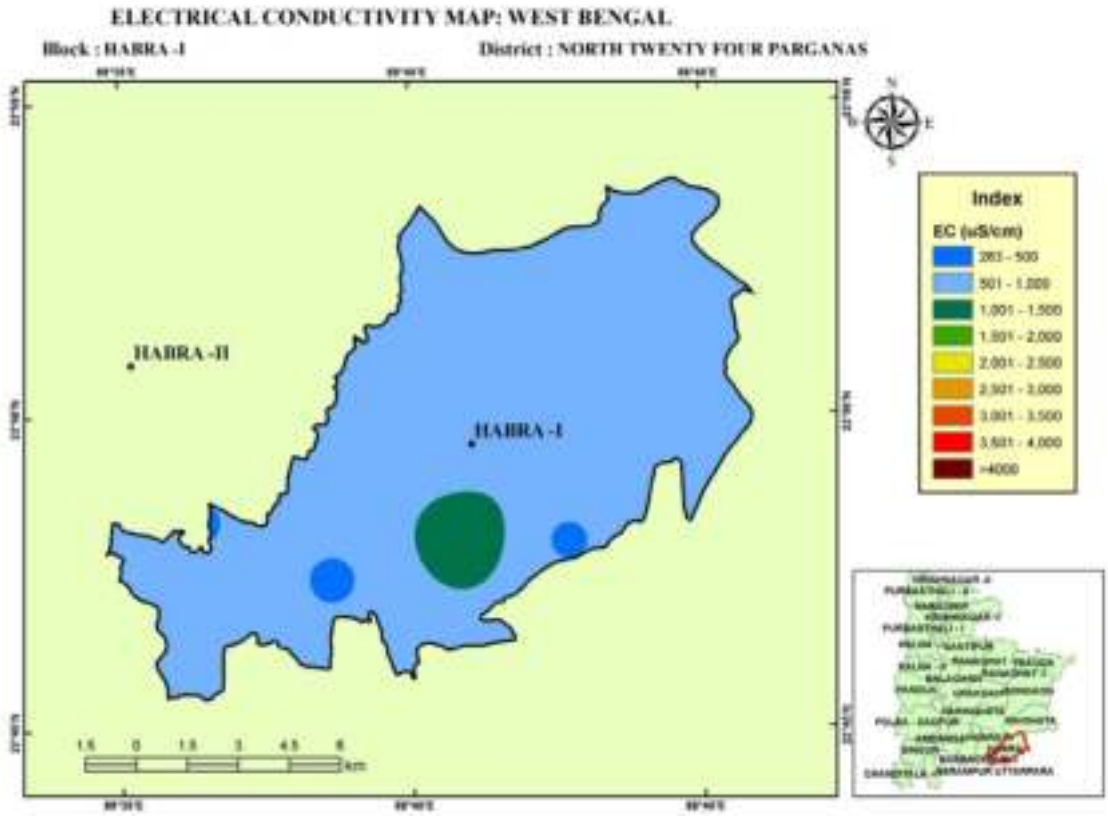
Block	Net ground water availability (MCM)	Gross ground water draft (MCM)	Stage of development (%)	Category
Habra I	8257.52	5771.02	69.89	Safe

Chemical Quality Of GroundWater & Contamination:

Range Of Chemical Pollutants:

Block	As(mg/l)	Fe(mg/l)	Ec(µS/cm)	F(mg/l)	No_3(mg/l)
Habra I	-	0-1.3	458-1460	0.15-0.53	-


IRON CONCENTRATION MAP: WEST BENGAL
Block : HABRA -I
District : NORTH TWENTY FOUR PARGANAS
HABRA -II
HABRA -I
Index
Iron (mg/l)
< 0.30
>0.30



Percentage of tube wells having arsenic content in the **block:**

SI.No.	Blocks	Arsenic (<0.01 ing/1)	Arsenic (>0.01-<0.05 mg/1)	Arsenic (> 0.05 mg/1)	Total Tube well
1	**Habra I**	31.71	23.49	44.79	1277

4)Ground Water Resource Enhancement& Management Plan:

Ground Water Management Plan for Drinking purpose.

Suggestions on supply of ground water to the risk population For drinking purpose.

District	Block (As affected)	No. of habitations in the risk zone where As concentration >0.05 mg/L	No. of habitations in the risk zone where As concentration 0.01 to 0.05 mg/L	Risk Population (2011) where As concentration >0.05 mg/L
N 24 PGS	HABRA – I	161	24	175651

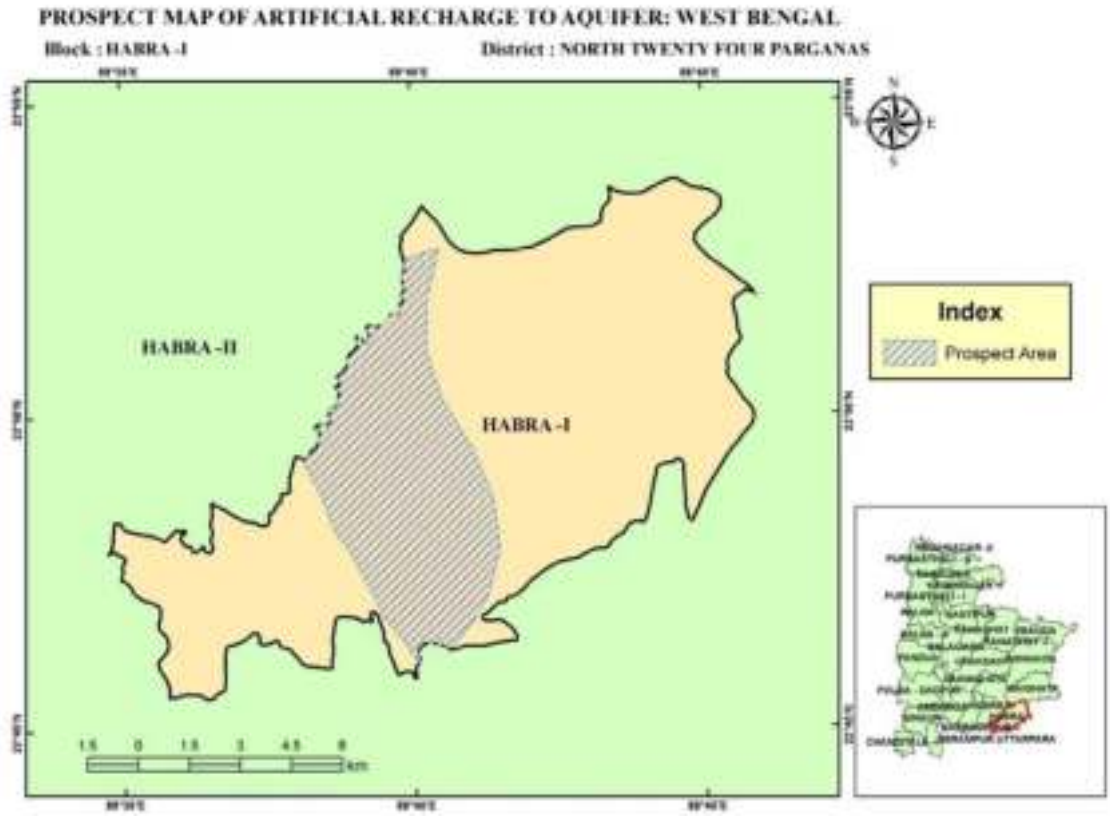
Aquifer Wise Space Available For Recharge and Proposed Interventions:

Area suitable for recharge in the study area:

District	Block Name	Area (in sq. km)	Total Area suitable for recharge (sq km.)
NORTH 24 PARGANAS	Habra-I	146.16	36.91

Proposed Artificial Recharge Structures in the area in :

District	Block	Total Surface water available in MCM for recharge	Source Water Allocation (MCM)			Number of Structures feasible			Structure-wise Cost Estimate in lakh Rs.			Total cost in lakh Rs
			Percolation Tanks	REET with RS	Injection Well	Percolation Tanks	REET with RS	Injection Well	Percolation Tanks	REET with RS	Injection Well	
NORTH 24 PARGANAS	Habra-I	22.24	10	6	6	21	59	20	420	472	80	972



Ground Water Management Plan For Irrigation Purpose.

Area in sq, km.

Sr No.	Name of Block	Cultivable area in ha	Net irrigated area in ha	Area to be irrigated in ha	SOD in %	Category
1	Habra I	10231	4323	5908.00	69.89	Safe

1)Salient Information

Block Name: Habra II

Area(in Km^2): 130.79

District: North 24 Parganas

State:West Bengal

Population(as on 2011):

Name of the Block	Population of CD Block (2011 census)
Habra II	140675

Approximate Decadal Growth Rate from 2001-2011:

Rainfall:

Average annual rainfall in **: Habra II**

(as in the district) for the period 2009 -13 (in mm)

Block	Normal	Actual (Annual)				
		2009	2010	2011	2012	2013
Habra II	1579	1410	1180	1669	1208	1658

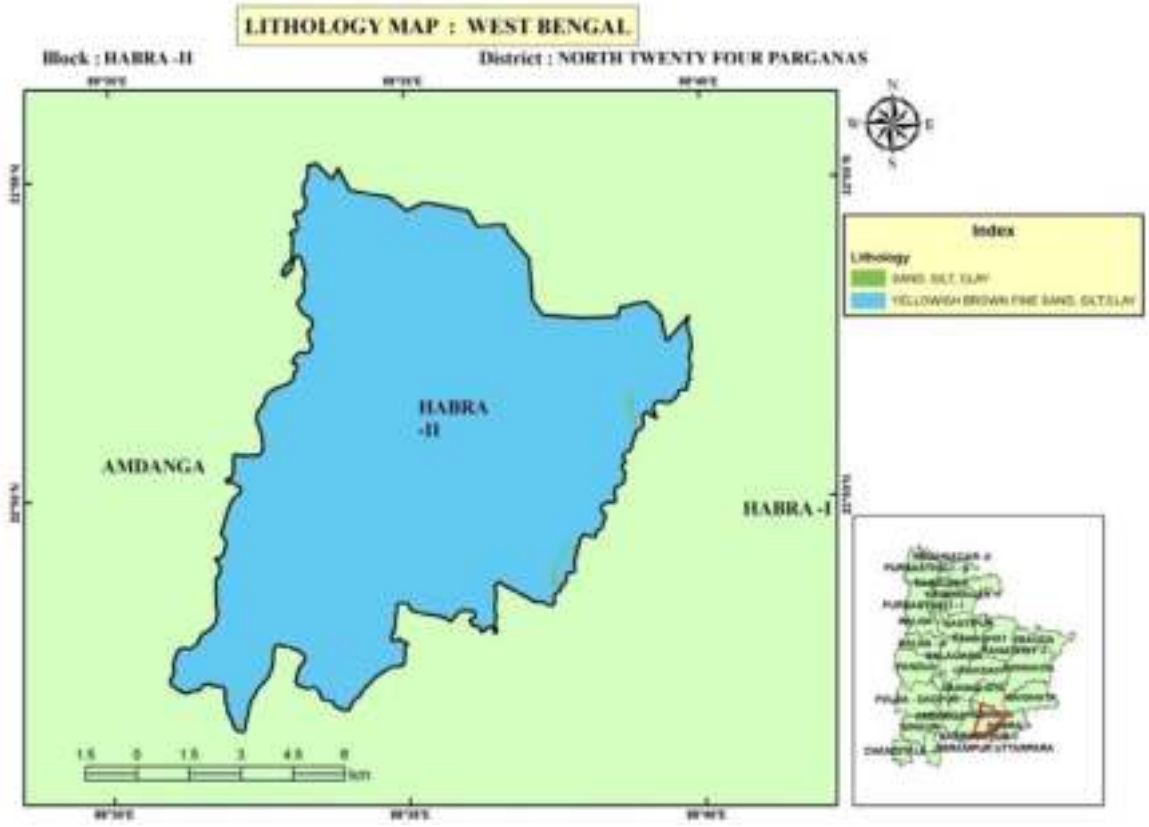
Aquifer Wise Ground Water Resource Availability & Extraction:

(in MCM)

Resource Availability	Aquifer I	Aquifer II	Extraction (for Aquifer I)
Dynamic Resource	5272.49	-	0.235422
Static Resource	3236.53	-	-

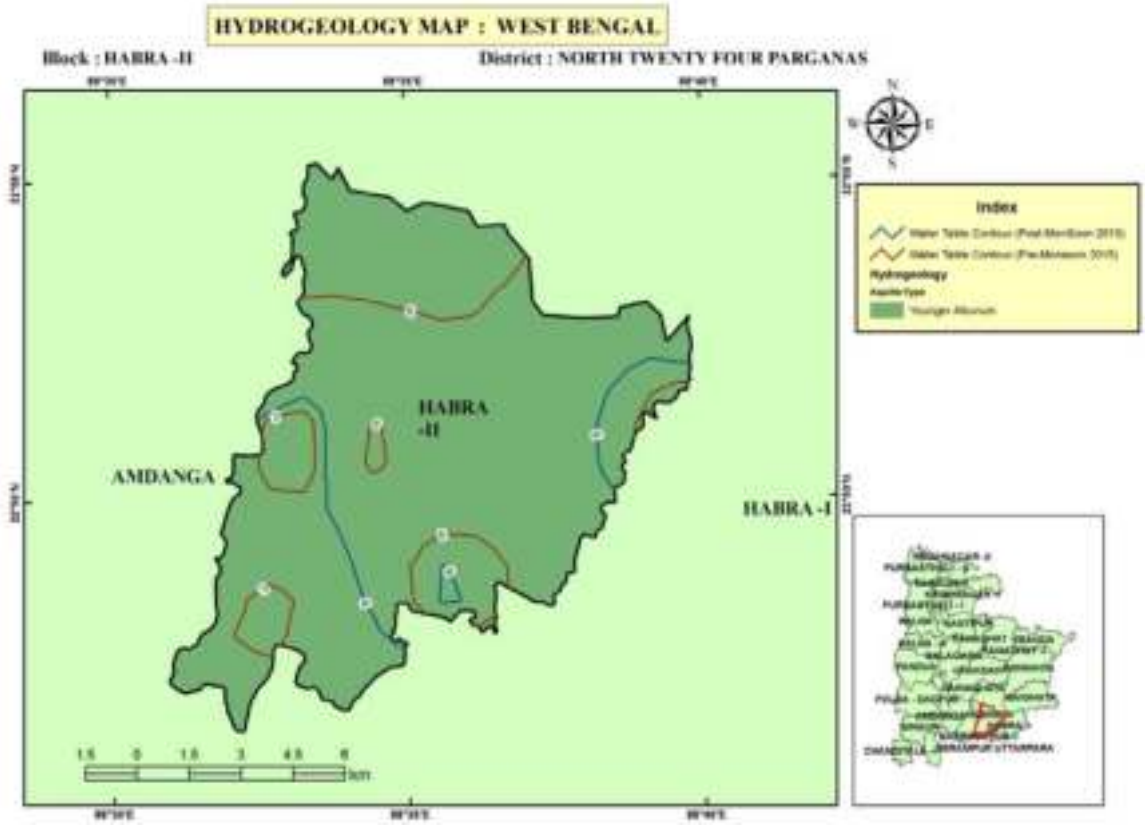
2)Disposition of Aquifer:

Block	Depth range of Aquifer in m bgl	
Habra II	**1st Aquifer**	**2nd aquifer**
	2-70, 92-104, 110-132	141-160, 185-191, 198-225


LITHOLOGY MAP : WEST BENGAL
Block : HABRA -II
District : NORTH TWENTY FOUR PARGANAS
Index
Lithology
HABRA
-II
AMDANGA
HABRA -I

Aquifer Wise Water Level Ranges & Pre-monsoon and Post-monsoon long term water level trends (1995 to 2011)

Sl. No.	Block	Aquifer	Pre-monsoon Trend		Post-monsoon Trend	
			Water Level Range(mbgl)	**Pre trend (- rising & + Falling)**	Water Level Range(mbgl)	**Post trend (- rising & + Falling)**
1.	**Habra II**	1		9.12		17.02
2.	**Habra II**	2				



Thickness of Aquifer(Average):

Block	Geographic Area (sq km)	Thickness of the Granular Zone in 1st aquifer (m)	Thickness of the Granular Zone /Productive Zone below pre-monsoon WL (m)
Habra II	130.79	132	123.73

Aquifer-wise Statement

Sl. No.	Name of Block	1st Aquifer			2nd Aquifer		T (m^2/day)
		Depth Range (mbgl)	Discharge (m^3/hr)	T (m^2/day)	Depth Range	Discharge (m^3/hr)	
		1st			2nd		
13	Habra II	2-132			141-225	18	881

3)Ground Water Resource,Extraction,Contamination & Other Issues:

Aquifer Wise Resource Availability & Extraction:

Block	Net ground water availability (MCM)	Gross ground water draft (MCM)	Stage of development (%)	Category
Habra II	5272.49	2822.43	53.53	Safe

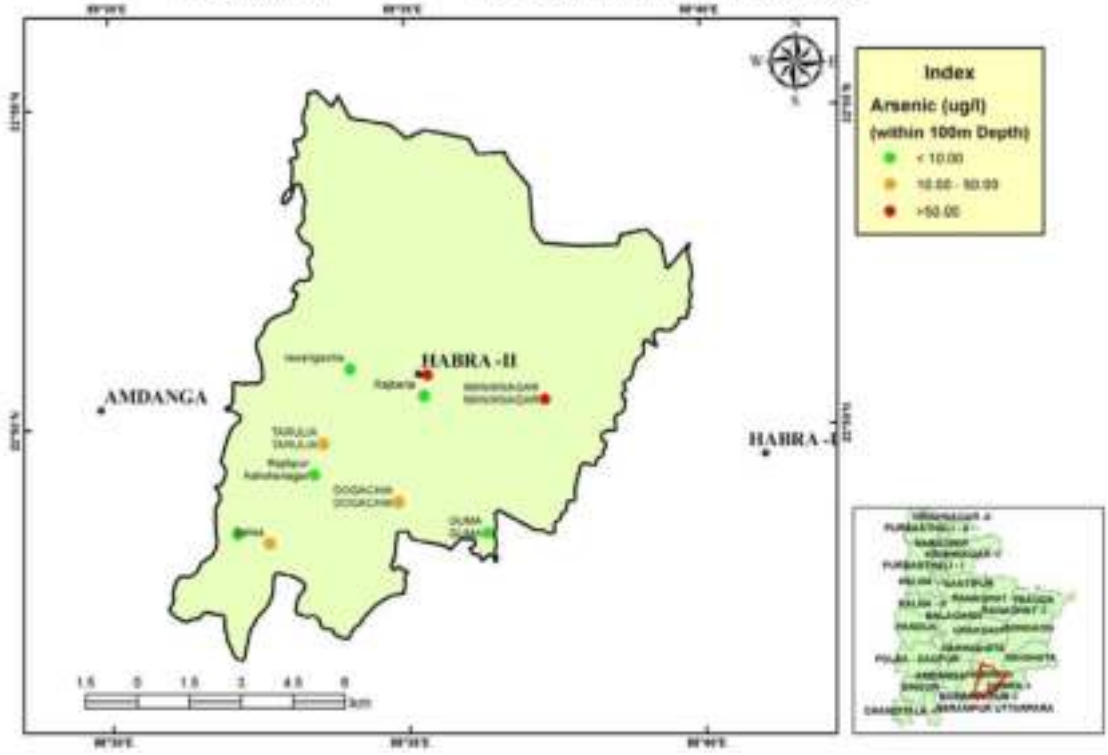
Chemical Quality Of GroundWater & Contamination:

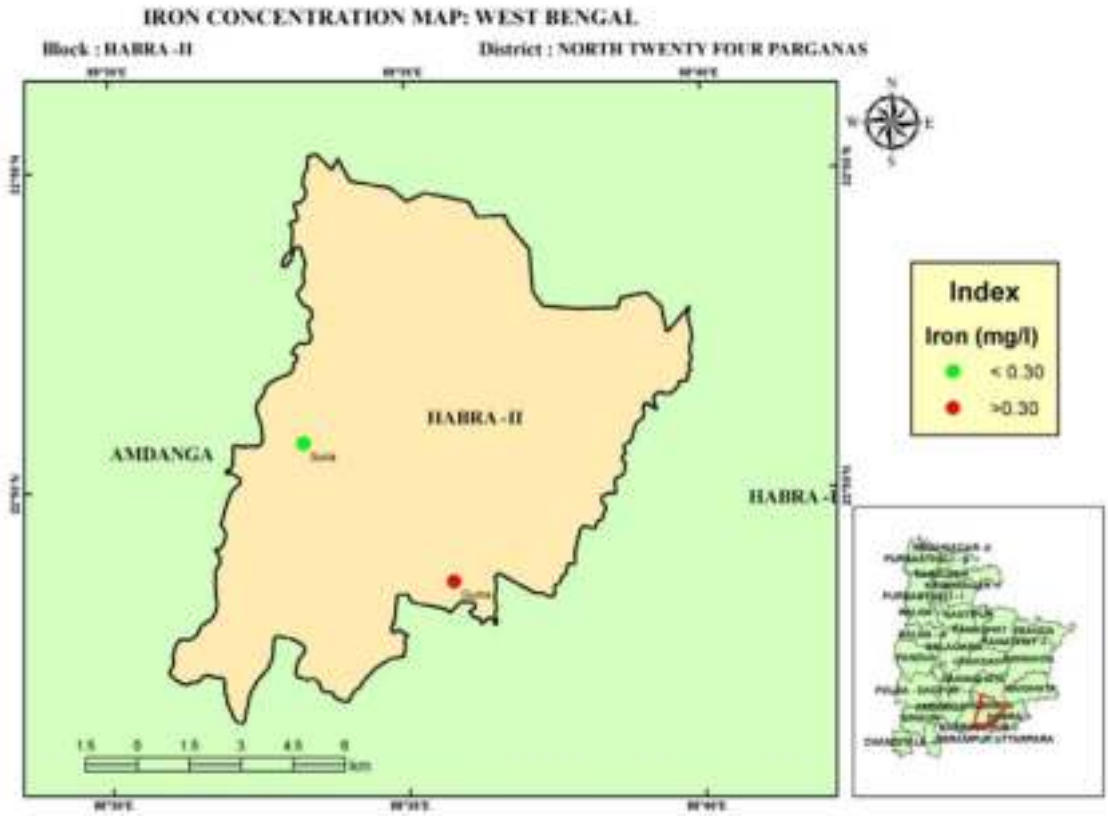
Range Of Chemical Pollutants:

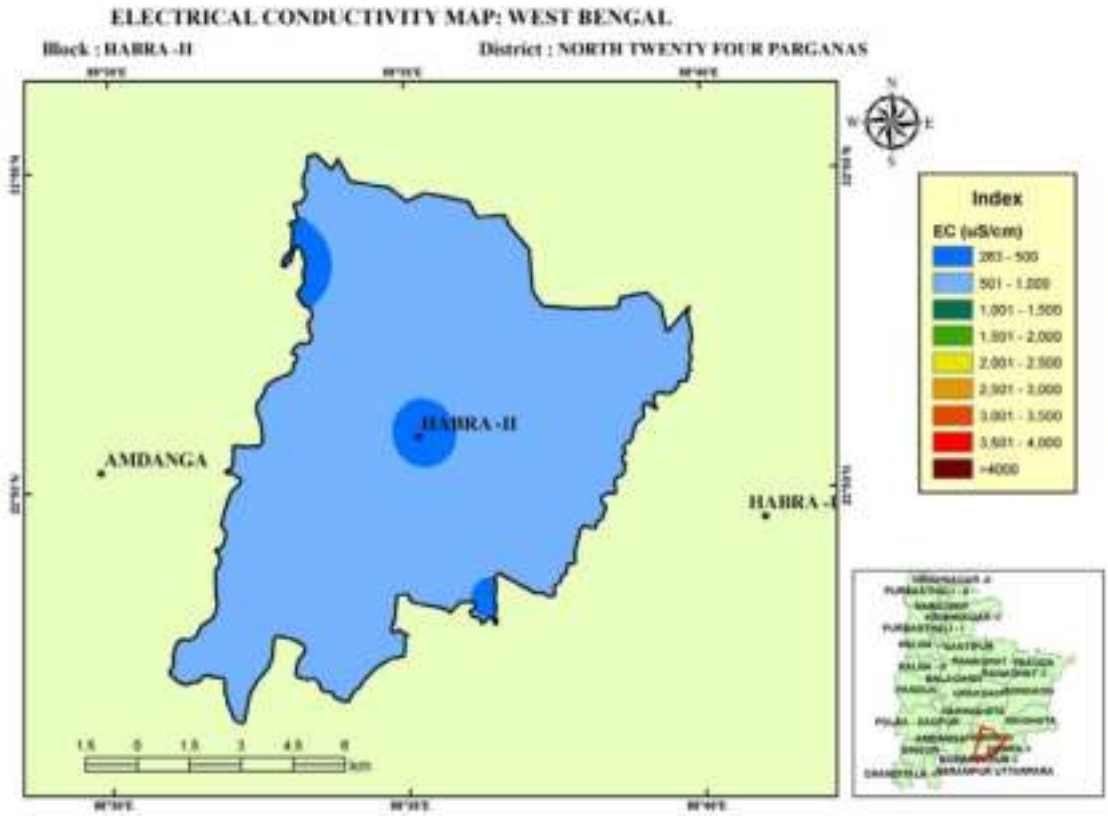
Block	As(mg/l)	Fe(mg/l)	Ec(µS/cm)	F(mg/l)	No_3(mg/l)
Habra II	-	Bdl-1.3	432-838	Bdl-0.64	0-7.6

ARSENIC CONCENTRATION MAP: WEST BENGAL

Block : HABRA -II District : NORTH TWENTY FOUR PARGANAS




IRON CONCENTRATION MAP: WEST BENGAL
Block : HABRA -II
District : NORTH TWENTY FOUR PARGANAS
HABRA -II
AMDANGA
HABRA -I
Index
Iron (mg/l)
< 0.30
>0.30



Percentage of tube wells having arsenic content in the **block:**

SI.No.	Blocks	Arsenic (<0.01 ing/1)	Arsenic (>0.01-<0.05 mg/1)	Arsenic (> 0.05 mg/1)	Total Tube well
1	Habra II	64.61	11.76	23.53	1054

4)Ground Water Resource Enhancement& Management Plan:

Ground Water Management Plan for Drinking purpose.

Suggestions on supply of ground water to the risk population For drinking purpose.

District	Block (As affected)	No. of habitations in the risk zone where As concentration >0.05 mg/L	No. of habitations in the risk zone where As concentration 0.01 to 0.05 mg/L	Risk Population (2011) where As concentration >0.05 mg/L
N 24 PGS	HABRA - II	107	26	140675

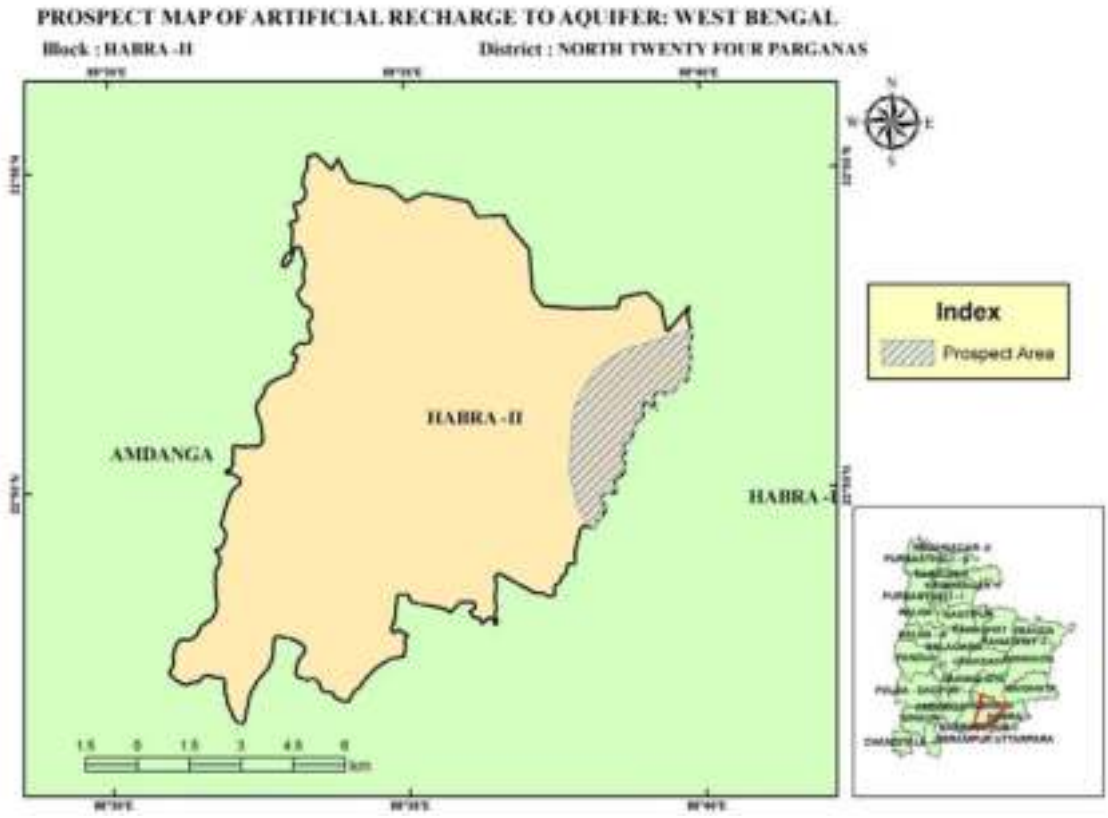
Aquifer Wise Space Available For Recharge and Proposed Interventions:

Area suitable for recharge in the study area:

District	Block Name	Area (in sq. km)	Total Area suitable for recharge (sq km.)
NORTH 24 PARGANAS	Habra-II	130.79	9.64

Proposed Artificial Recharge Structures in the area in :

District	Block	Total Surface water available in MCM for recharge	Source Water Allocation (MCM)			Number of Structures feasible			Structure-wise Cost Estimate in lakh Rs.			Total cost in lakh Rs
			Percolation Tanks	REET with RS	Injection Well	Percolation Tanks	REET with RS	Injection Well	Percolation Tanks	REET with RS	Injection Well	
NORTH 24 PARGANAS	Habra-II	14.84	7	4	4	14	39	13	280	312	52	644



Ground Water Management Plan For Irrigation Purpose

Area in sq, km.

Sr No.	Name of Block	Cultivable area in ha	Net irrigated area in ha	Area to be irrigated in ha	SOD in %	Category
1	Habra II	8261	5257	3004.00	53.53	Safe