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Hydrogeological study of Mandu block of Ramgarh district of Jharkhand with emphasis on the quality of ground water

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Abstract : A study of the geohydrological parameters was undertaken in Mandu Block of Ramgarh District Jharkhand. Ground water Samples collected from various spots were analysed. The pH of water varied from mild acidic to mild alkaline range. Among the heavy metals Pb (Lead) was found to be above the prescribed limit recommended for drinking.

Key words : Hydrogeological, ground water.

INTRODUCTION

The present work deals with Mandu block of Ramgarh district of Jharkhand. It is a plateau region which is surrounded by ridges and valley. The area has got a hilly topography and mostly represents hard rock topography. Coal is taken out extensively by open cast mining methods at many places in the study area. Bokaro River flows through this area, which is a tributary of Damodar River.

MATERIALS AND METHODS

For analytical study of ground water quality systematic sampling was carried out. The ground water samples were collected from different coal mining and non coal mining areas of the study area.

For heavy metal analysis, 100ml samples were acidified with HNO₃ and preserved separately. Electrical conductivity (EC) and pH values were measured in the

field using portable conductivity and pH meter. Titration method was used to determine the concentration of bicarbonate (APHA,1992)¹, major anions mainly fluoride were estimated through ion chromatography. Major cations (Ca, Mg, Na, K) were measured by Ion chromatography.

Geology of the Area.

Mandu Block is a coal mining area of Ramgarh district, where the group of rocks exposed are biotite-granite, hornblende- granite gneiss of Pre-Cambrian age. Sandstone and shale of lower gondwana formation with coal seams are also found in this area. (CGWB,1990)², at few places crystalline limestone and calcium-silicate rocks are exposed. Joints and fissures are also found in Pre-Cambrian rocks.

Hydrogeology

Mandu area Consists of two type of formations, consolidated and semi –consolidated. Consolidated part of the study area has got hard crystalline rocks and in semi-consolidated part occur soft rocks of lower gondwana formation, where huge coal deposits are located. Groundwater occurs in porous, material and weathered mantle as well as the joints, fissures and fractures.

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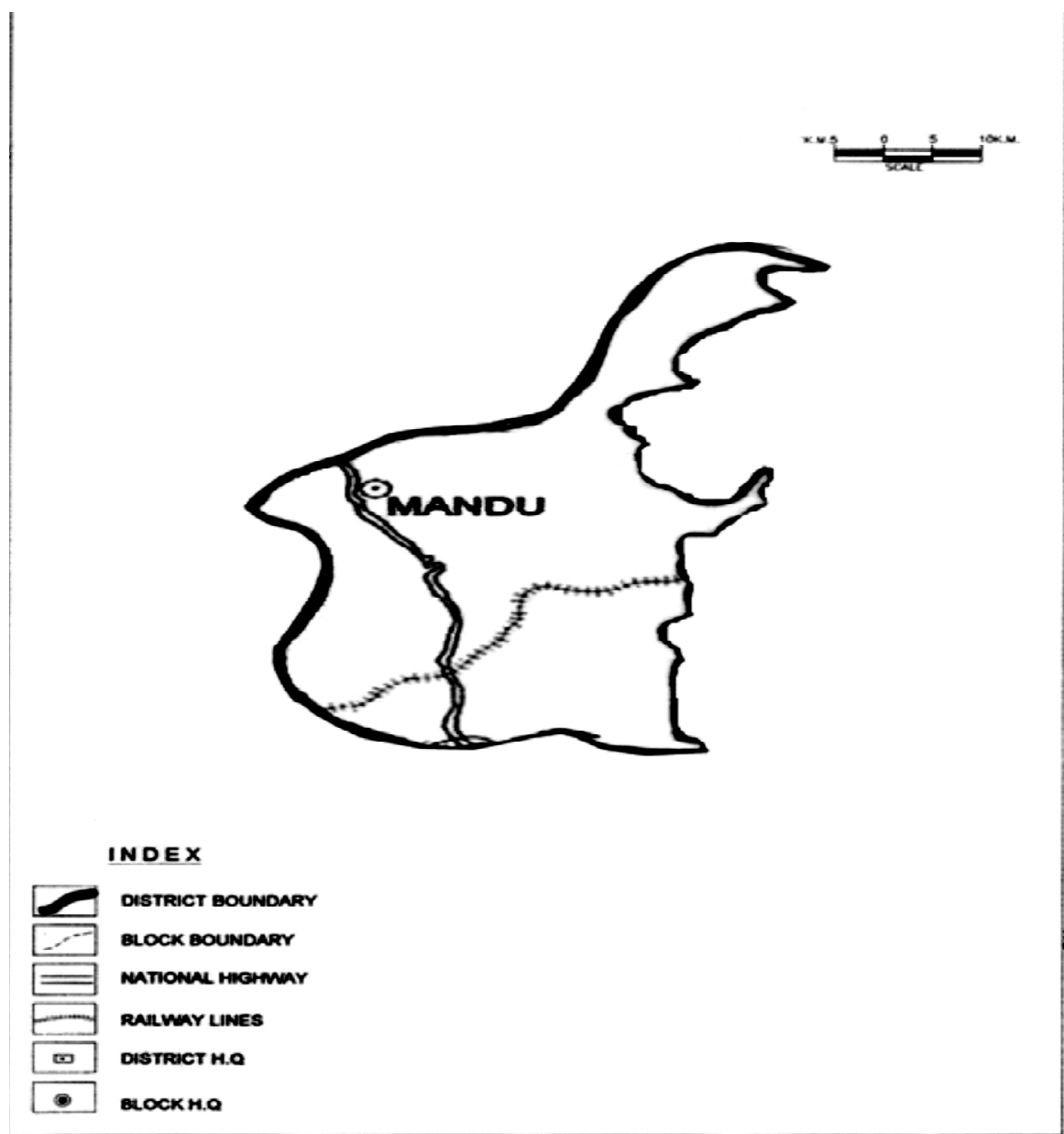


Fig.1. Administrative map of Mandu block of Ramgarh district, Jharkhand

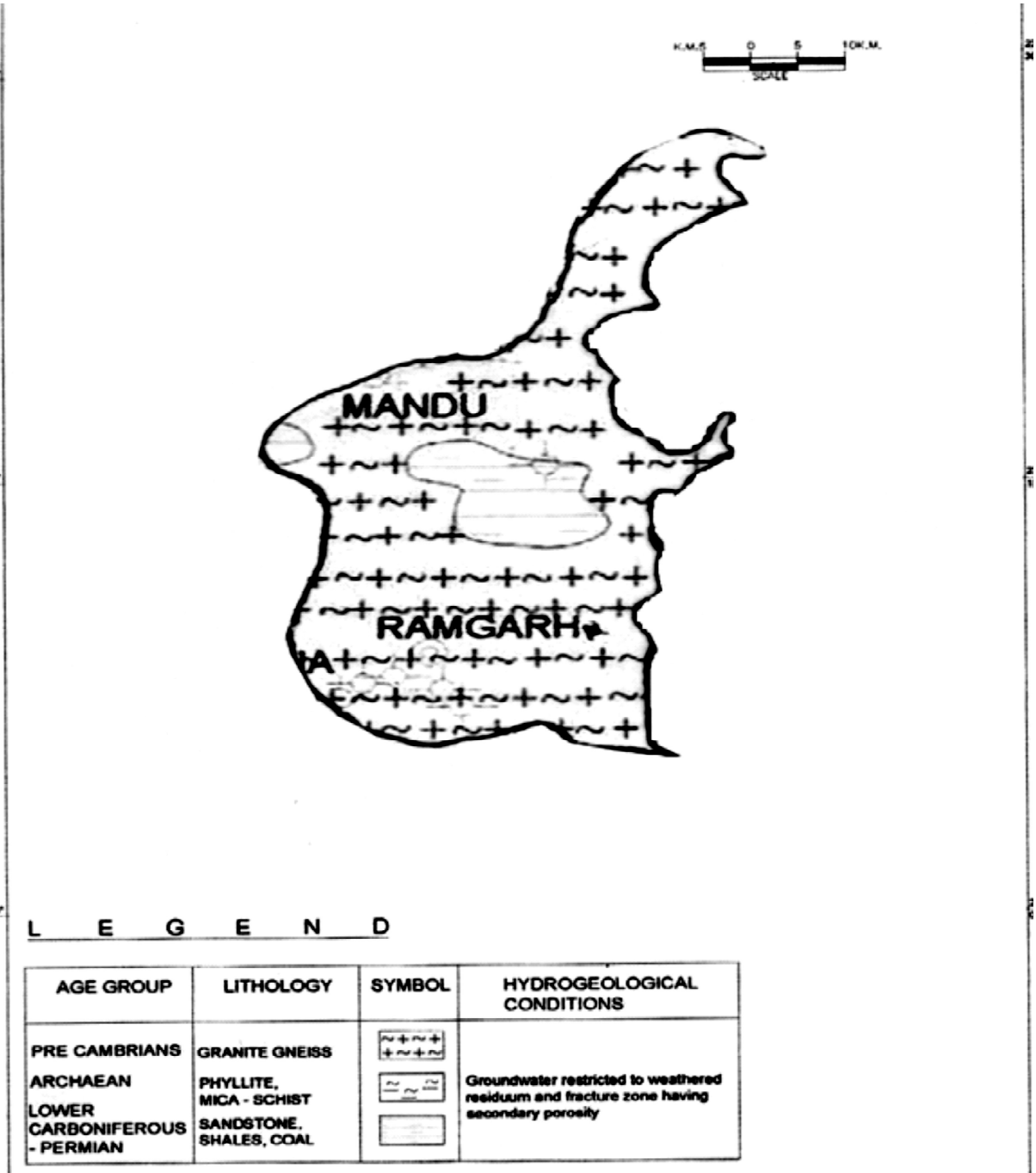


Fig.2. Geological map of Mandu Block of Ramgarh, District, Jharkhand

Table 1. Analytical result of ground water samples of Mandu Block of Ramgarh District

Sam ples	pH	Total Hardnes s mg/l	EC in micro Siemen /cm at 25°C	TDS mg/l	HCO ₃ mg/l	Ca++ mg/l	Mg++ mg/l	Na+ mg/l	K + mg/l	Cl mg/l	F mg/l	SO ₄ mg/l	NO ₃ mg/l	Fe mg/l	Mn mg/ l	As mg/l	Pb++ mg/l
Parej1	7.6	232	912.28	615	60	65.00	28.02	31.01	2.65	96.56	0.03	32.00	1.19	0.03	0.02	BDL	0.1
Parej2	7.8	284	1012.07	703	60	71.25	30.58	29.05	1.09	62.48	0.12	26.00	0.05	0.21		BDL	0.05
Parej3	6.4	424	1210.12	715	60	110.41	34.82	21.12	3.62	48.45	0.10	30.80	3.05	0.10	0.01	BDL	0.01
Parej4	7.9	276	871.42	559	100	65.60	31.01	24.00	2.00	27.80	0.02	21.00	6.71	0.02		BDL	0.09
Banjil	6.4	272	912.28	549	160	64.43	30.58	45.08	2.41	198.9	0.03	29.15	0.44	0.00		BDL	0.01
Banjil2	6.5	328	1143.07	641	140	85.19	42.50	25.15	3.01	107.92	0.14	41.25	1.31	0.01	0.00	BDL	0.04
Banjil3	8.4	276	938.92	563	180	64.50	30.43	21.45	4.05	88.04	0.32	39.75	7.47	0.03		BDL	0.07
Banjil4	8.3	240	870.76	589	80	62.02	27.65	26.35	4.00	42.60	0.62	26.16	1.29	0.06	0.02	BDL	00.09
Ghato1	8.4	270	1014.39	6.2	100	61.37	25.60	37.08	3.00	31.64	0.222	33.29	12.00	0.02		BDL	
Ghato2	6.5	260	921.82	616	160	110.22	26.09	47.15	5.65	179.52	1.01	41.00	11.23	0.00		BDL	0.05
Ghato3	7.8	420	1236.92	701	60	113.08	34.19	51.06	2.94	42.60	1.00	43.25	4.07	0.01		BDL	0.04
Kedla 1	7.9	416	1184.39	708	60	114.03	32.08	53.15	3.61	19.88	0.00	39.10	6.39	0.01		BDL	0.07
Kedla2	7.7	424	1218.43	705	60	114.21	34.86	42.25	5.72	22.72	0.19	47.21	1.24	0.01	0.00	BDL	0.09
Kedla3	8.0	428	1193.38	701	60	116.58	36.23	31.12	7.01	17.04	1.09	26.21	4.50	0.01		BDL	0.04
Charhil	8.1	424	1210.06	704	80	116.09	36.54	25.16	3.09	22.72	0.10	29.16	1.40	0.32		BDL	0.05
Charhi2	7.8	228	916.42	600	40	62.58	26.09	53.05	2.85	96.56	0.10	37.12	0.67	0.04	-	BDL	0.09
Kuju1	6.7	188	531.61	311	60	43.21	16.41	25.06	1.81	95.55	0.02	34.00	3.20	0.02	0.01	BDL	0.01
Kuju2	7.8	412	1271.23	692	60	11.09	31.13	48.55	3.62	45.40	0.12	21.38	11.13	0.15		BDL	0.05
Gidil	8.1	364	1153.58	685	280	8343	41365	41.95	4.51	21.08	0.10	37.12	3.70	0.10	0.02	BDL	0.09
Gidil2	8.6	276	628.13	271	140	65.21	31.82	47.75	3.91	19.71	0.11	25.10	1.58	0.11		BDL	0.01

Analytical Study (Table - 1)

From the analytical study it is found that the pH of ground water sample of the study area is slightly low (6.4) in some parts of the mining area. The Concentration of Calcium, Mg^{++} , Na^+ and K^+ in ground water is caused due to the presence of Biotite granite gneiss and Hornblende granite gneiss in this area. Concentration of Anions like Cl , SO_4 , present in ground water is due to coal beds, during the calcification these Anions separated from the stratified decaying vegetation dissolved in ground water. The concentration of Calcium and Magnesium is caused due to crystalline limestone and calcium silicate rocks which are exposed at few places, the higher concentration of heavy metals mainly Pb^{++} (Lead) is found at few places in the study area. Higher concentration of lead is found in Parej coal mining area, Banji coal mining site near ghato coal mining zone, parts of kedla coal mining area, and charhi area which are close to tapin open cast mining zone of the mandu block of Ramgarh district.

Higher concentration of lead can cause various problems to the residents of the area like mental deficiency, chronic kidney infection, abnormal behavioral etc. this can be attributed to coal, local industries, mining, plumbing (Environmental chemistry By Dey, 1986)³.

CONCLUSIONS

The chemistry of ground water is dominated by

Hydrochemical facies in coal mining area of mandu block of Ramgarh District. (Tewary, 2009)⁶. Weathering of rock forming minerals and anthropogenic contributions related to mining are the major factors affecting water chemistry. (Kumar 1992)⁵. The quality assessment shows slightly high value of Pb in a number of samples which make them unsafe for drinking purposes as such this water can only be used after proper treatment.

REFERENCES

1. **A P H A. 1992** . Standard methods for the examination of water and waste water 16th edition Washington. D.C, APHA.
2. **C.G.W.B. 1990**. A report on Hydrogeology and Groundwater Resources of Hazaribagh.
3. **Dey. A.K. 1986**. Environmental Chemistry (Third edition)
- *4. **Karantk .K.R. 1987**. Ground water Assessment Development and Management Tata MC. Graw hill.
5. **Kumar Anil. 1992**. Geo hydrological investigation in Dhanbad District , Bihar with special reference to the pollution of ground water sources due to mining (Ph.D. Thesis)
6. **Tewary B.K. 2009**. Major ion chemistry, solute acquisition processes and Quality Assessment of mine water in Damodar valley coal fields India. Abstracts of the International mine water conference, 19-23rd oct.2009, Pretoria, South Africa.

*Additional references consulted.

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