

भारत कोकिंग कोल लिमिटेड

एक मिनी रत्न कंपनी

(महाराष्ट्र कंपनी कोल इंडिया का एक उपक्रम)

पंजीकृत कार्यालय कोयला भवन, कोयला नगर,

धनबाद-826005

सी.आइ.एन. : U10101JH1972GO1000918

परियोजना पदाधिकारी का कार्यालय
महुदा गुप

पोस्ट / थाना: महुदा, जिला: धनबाद (झारखण्ड)-828305

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Bharat Coking Coal Limited

A Mini Ratna Company

(A Subsidiary of Coal India Limited: A Maharatna Company)

Regd. OH. : Koyla Bhawan, Koyla Nagar

Dhanbad - 826005

CIN : U10101JH1972GO1000918

OFFICE OF THE PROJECT OFFICER
MAHUDA GROUP

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"For uploading on MOEF&CC 'parivesh portal' and send e-mail"

Ref: BCCL/WJA/ENV/2023/ 60 (D)

Date: 30/05/2023

To,
The Director,
Ministry of Environment & Forest and Climate Change
Regional Office (ECZ), Bungalow No. A-2,
Shyamali Colony, Ranchi – 834002.

Sub:- Submission of six-monthly reports on compliance of Environment Clearance for the period from **October'2022 to March' 2023** with respect to **Cluster-XII** of Kapuria UG project, M/s Bharat Coking coal Limited.

Ref: EC Order No. – J-11015/184/2012-IA.II (M) Dated:- 10.12.2014.

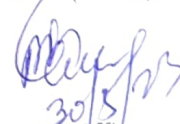
Dear Sir,

Please find enclosed herewith the six-monthly reports on compliance of Environment Clearance for the period from **October'2022 to March'2023** in respect of **Cluster XII of Kapuria UG of M/s Bharat Coking Coal Limited** for your kind perusal and further needful action please. It is also to bring to your kind notice that the project has been delayed due to the delay in physical possession of land. The work has not started yet.

Thanking you,

Encl:- As Above

Yours faithfully,


30/5/23
Project Officer
Kapuria Project

CC to:-

1. The Director, 1A Monitoring Cell, Paryavaran Bhawan, CGO Complex, New Delhi – 110003.
2. The Member Secretary, Jharkhand State Pollution Control Board, TA – Division Building, Dhuwa– Ranchi – 834004.
3. HoD (Env.), BCCL, Koyla Bhawan Dhanbad.
4. GM, W.J. Area.
5. Nodal Officer (Env.), WJ Area.

**ENVIRONMENTAL CLEARANCE COMPLIANCE OF CLUSTER-XII
GRANTED VIDE LETTER NO. J-11015/184/2012-IA.II (M) DATED
10.12.2014**

(October '22 - March '23)

Sl. No	A. Specific Conditions by MOEF:	Compliance
i.	The maximum production from the mine at any given time shall not exceed the limit as prescribed in the EC	Project has not started yet. Project is under tendering process.
ii	A separate team for subsidence monitoring and surface mitigation measures be constituted and continuous monitoring and mitigation measures be carried out.	Shall be complied. Project is under construction phase.
iii.	The validity of the EC is for the life of the Mine or as specified in the EIA Notification, 2006, whichever is earlier.	Agreed.
iv.	The coal transportation from the mine to the siding shall be by conveyor belt and coal transportation from to the washery shall be by rail.	Shall be complied.
v.	Piezometers be installed upto the depth of mining to facilitate monitoring of ground water.	The work of monitoring of ground water is being carried out by CMPDI.
Vi.	Water sprinkler be used for coal dust suppression along the haul roads.	Shall be complied.
vii.	Thick green belt shall be developed around proposed washery within the Cluster-XII lease area and plantation shall be undertaken along NR-32.	Shall be complied.
Viii	Subsidence study shall be taken up with reputed scientific agency as per stipulation of DGMS	Shall be complied.
ix.	Various CSR works that will be carried out shall include education, healthcare water supply etc.	Shall be complied.
x.	The project should have ecologist/social scientists to monitor the project.	BCCL is following the roadmap prepared by FRI, Dehradun to restore ecology in the region and conducting the work of ecological restoration in the mined out areas.
xi.	Coal produced from the mine will be directly loaded into a CHP at the incline top. From the CHP at incline top, coal will be transported to the proposed Kapuria Coal Washery linked to the mine by covered conveyor system of length of 250m. Washed coal from the washer will be transported by conveyor to the railway siding and loaded	Shall be complied.

	into the wagons by CHP.	
xii.	The production shall be within the same Mining Lease area	Shall be complied.
xiii.	Regular monitoring of subsidence movement on the surface over and around the working area and impact on natural drainage pattern, water bodies, vegetation, structure, roads, and surroundings shall be continued till movement ceases completely. In case of observation of any high rate of subsidence movement, appropriate effective corrective measures shall be taken to avoid loss of life and material. Cracks shall be effectively plugged with ballast and clay soilsuitable material.	Shall be complied.
xiv.	If subsidence is found exceeding the permitted limits, then the land owners shall be adequately compensated with mutual agreement of the landowners.	Shall be complied.
xv.	Mining shall be carried out as per statuette at a safe distance from river/nalla following within adjacent to the lease boundary at the time of depillaring, protective bunds and garland drains shall be provided so that no water from the surface enters the subsidence area and the shaft.	Mining shall be done as per DGMS statute.
xvi.	Sufficient coal pillars shall be left unextracted around the air shaft (within the subsidence influence area) to protect from any damage from subsidence, if any.	Shall be complied.
xvii.	Solid barriers shall be left below the roads falling within the blocks to avoid any damage to the roads.	Shall be complied.
xviii.	Diversion of Land shall be done with approval of the Competent Authorities.	Shall be complied.
xix.	Coal Extraction shall be optimised in areas where agricultural production is continuing. Some pillars shall be left below the agricultural land. No depillaring & coal extraction should be carried out below habitation, H.T. Lines & beneath road,	It will be done as per the statute and DGMS Guidelines.

	water bodies, railway track.	
xx.	The mined out land should be used for agriculture purpose.	Shall be complied
xxi.	Safety measures and health issues need to be addressed for workers and surrounding villagers.	Shall be complied.
xxii.	Proponent shall implement all the lated safety measures with safety equipment.	It will be done as per the statute and DGMS guidelines.
xxiii.	At the time of establishing the CRP, it is proposed to establish mist spray arrangements and also enclosing the ground level bunkers up to the level of gantry	Shall be complied.
Xxiv.	An afforestation plan to be prepared for implementation after stabilization of subsidence	Shall be complied.
Xxv.	Water spraying arrangements at loading points and mist spray arrangements are to be provided.	Shall be complied.
xxvi.	No additional land, manpower and equipment and water shall be used for the expansion project.	Shall be complied.
xxvii.	Mine closures activities include sealing of incline mouth dismantling of haulage system, clearing and afforestation of coal stock area, plantation on barren land and old abandoned mine.	Mine closure plan will be formulated as per the guidelines of ministry of coal GoI.
xxviii.	3-tier plantation should be developed 2 km stretch of road from the mine using native species	Shall be complied.
.xxix.	Garland drains (size, gradient and length) around the safety areas such as mine shaft and low lying areas and sump capacity shall be designed keeping 50% safety margin over and above the peak sudden rainfall and maximum discharge in the area adjoining the mine sites. Sump capacity shall also provide adequate retention period to allow proper settling of silt material.	It will be done as per EMP.

Xxx.	Water sprinkling system shall be provided to check fugitive emissions from loading operations, conveyor system, haulage roads, transfer points, etc. Major approach roads shall be black topped and properly maintained.	Shall be complied .
.Xxxi.	A progressive afforestation plan shall be prepared and implemented over the mine lease area acquired and shall include areas under green belt development, areas along roads, infrastructure, along ML boundary and township etc., by planting native species in consultation with the local DFO/Agriculture Department,	Shall be done. EMP and mine closure plan will be followed.
xxxii.	Regular monitoring of groundwater level and quality shall be carried out by establishing a network of existing wells and construction of new peizometers, The monitoring for quantity shall be done four times a year in pre-monsoon (May), monsoon (August), post-monsoon (November) and winter (January) seasons and for quality in May. Data thus collected shall be submitted to the Ministry of Environment, Forests & Climate Change and to the Central Pollution Control Board quarterly within one month of monitoring.	It will be complied. At present CMPDI is working to establish a network of piezometer well.
xxxiii.	Acid Water Treatment Plant, volume of water to be treated and disposal of brine should be provided.	Shall be provided if acid water treatment is required.
xxxiv.	High root density tree species shall be selected and planted over areas likely to be affected by subsidence.	Shall be provided.
xxxv.	Monitoring of drinking water should be carried out regularly.	Environmental parameters are being monitored by CMPDI, as per the MoEF&CC standards.
Xxxvi.	Sewage treatment plant shall be installed in the township. ETP shall also be provided for treating workshop	Shall be complied .
xxxvii.	For monitoring land use pattern and for post mining land use, a time series of land use maps, based on satellite imagery (on a scale of 1:5000) of the core zone and buffer zone, from the start of the project until end of mine life shall be prepared once in 3 years (for anyone particular season which is consistent in the time series), and the report	Presently a time series map of vegetation cover in the Jharia coal field is being carried out through CMPDI Ranchi using satellite imagery for every 3 years and is being uploaded on the official website of company. Further CMPDI has been requested to prepare time series of land use maps based on satellite imagery of the core zone and buffer zone in the scale 1:5000.

	submitted to MOEF&CC and its Regional office at Bangalore.	
xxxviii	If the water quality parameters such as F, pH, heavy metals, etc. exceed the prescribed limits, suitable measures by the proponent be taken to ensure that the local communities are provided alternate source of water for their livelihood	Shall be complied.
xxxix	Medical camps should be organized in the area for regular check-up of workers/villagers/population. Detailed prevalent disease pattern in the area should be documented and details of medical facilities provided for the same be made available to the MoEF&CC	It is being done.
xl.	Mine discharge water outside the ML shall be monitored, particularly for TDS and treated to conform to prescribed levels before discharge into the natural environment.	Environmental parameters are being monitored by CMPDI, as per the MoEF&CC standard.
xli.	The Company shall put up artificial groundwater recharge measures for augmentation of groundwater resource, in case water table shows a declining trend. The project authorities shall meet water requirement of nearby villagers) in case the village wells go dry due to dewatering of mine.	It will be provided and regular monitoring shall be done
xlii.	Besides carrying out regular periodic health check-up of their workers, 10% of the workers identified from Workforce engaged in active mining operations shall be subjected to health check-up for occupational diseases and hearing impairment, if any, through an agency such as NIOH, Ahmadabad within a period of one year and the results reported to this Ministry and to DGMS.	It will be complied, however BCCL has engaged NIOH for other cluster of BCCL to health checkup for occupational disease and hearing impairment.
xliii.	The mining in the existing mines should be phased out after expiry of the current mining lease and after reclamation of mined over area. The operating mines may be analysed and monitored for compliance of conditions, bearing with movement of wildlife and until such time they are closed/phased out.	Agree, Shall be complied
xliv.	Project specific CSR for an amount of Rs5/Tonne of coal production, as adjusted as per the annual inflation, should be provided for the CSR activities	It will be done as per the CSR policy of organization.

	undertaken and the progress made thereon shall be uploaded annually on the company website. Monitoring of the impacts of activities under CSR shall be carried out periodically.	
xliv.	A Final Mine Closure Plan along with details of Corpus Fund shall be submitted to the Ministry of Environment, Forests & Climate Change 5 years in advance of final mine closure for approval.	shall be complied
xlvi.	Corporate Environment Responsibility: a) The Company shall have a well laid down Environment Policy approved by the Board of Directors. b) The Environment Policy shall prescribe for standard operating process/procedures to bring into focus any infringements/deviation/violation of the environmental or forest norms/conditions. c) The hierarchical system or Administrative Order of the company to deal with environmental issues and for ensuring compliance with the environmental clearance conditions shall be furnished. d) To have proper checks and balances, the company shall have a well laid down system of reporting of non-compliances/violations of environmental norms to the Board of Directors of the company and/or shareholders or stakeholders at large.	Bharat Coking Coal Ltd is a subsidiary of Coal India Ltd which is having a well laid down Environmental Policy It is being complied It already exists within the company. It will be done, if any.
Sl. No	B. General Conditions Conditions by MOEF:	Compliance
i.	No change in mining technology and scope of working shall be made without prior approval of the Ministry of Environment, Forests & Climate Change.	Shall be complied
ii.	No change in the calendar plan of production for quantum of mineral coal shall be made.	Shall be complied when coal production will start.
iii.	Four ambient air quality monitoring stations shall be established in the core zone as well as in the buffer zone for PM10, PM2.5, SO2 and NOx monitoring. Location of the stations shall be decided based on the meteorological data, topographical features and environmentally and ecologically	Being complied. Monitoring is being done by CMPDI. Monitoring report enclosed.

	sensitive targets in consultation with the State Pollution Control Board. Monitoring of heavy metals such as Hg, As, Ni, Cd, Cr, etc carried out at least once in six months,	
iv.	Data on ambient air quality (PM ₁₀ , PM 2.5, SO ₂ and NO _x) and heavy metals such as Hg, As, Ni, Cd, Cr and other monitoring data shall be regularly submitted to the Ministry including its concerned Regional Office and to the State Pollution Control Board and the Central Pollution Control Board once in six months. Random verification of samples through analysis from independent laboratories recognized under the EPA rules, 1986 shall be furnished as part of compliance report.	Being complied
v.	Adequate measures shall be taken for control of noise levels below 85 dBA in the work environment. Workers engaged in blasting and drilling operations, operation of HEMM, etc shall be provided with ear plugs/muffs.	Shall be complied
vi.	Industrial wastewater (workshop and wastewater from the mine) shall be properly collected, treated so as to conform to the standards prescribed under GSR 422 (E) dated 19 th May 1993 and 31 st December 1993 or as amended from time to time before discharge. Oil and grease trap shall be installed before discharge of workshop effluents.	Shall be complied
vii.	Vehicular emissions shall be kept under control and regularly monitored. Vehicles used for transporting the mineral shall be covered with tarpaulins and optimally loaded.	Shall be complied
viii.	Monitoring of environmental quality parameters shall be carried out through establishment of adequate number and type of pollution monitoring and analysis equipment in consultation with the State Pollution Control Board and data got analyzed through a laboratory recognized under EPA Rules, 1986.	Environmental parameters are being monitored as per NAAQS standards. Monitoring stations have been finalized with Jharkhand State Pollution Control Board, Ranchi.
ix.	Personnel working in dusty areas shall wear protective respiratory devices and they shall also be provided with adequate training and information on safety and health aspects.	Shall be complied

x.	Occupational health surveillance programme of the workers shall be undertaken periodically to observe any contractions due to exposure to dust and to take corrective measures, if needed and records maintained thereof. The quality of environment due to outsourcing and the health and safety issues of the outsourced manpower should be addressed by the company while outsourcing.	Shall be complied
xi.	A separate environmental management cell with suitable qualified personnel shall be set up under the control of a Senior Executive, who will report directly to the Head of the company.	A full-fledged environment department headed by HoD (Environment) along with a suitable qualified multidisciplinary team with of executive has been established in the headquarters. They are trained in ecological restoration, sustainable development, rainwater harvesting methods etc.
xii.	The funds earmarked for environmental protection measures shall be kept in separate account and shall not be diverted for other purpose. Year-wise expenditure shall be reported to this Ministry and its concerned Regional Office.	Shall be complied
xiii.	http://envfor.nic.in. The Project authorities shall advertise at least in two local newspapers widely circulated around the project, one of which shall be in the vernacular language of the locality concerned within seven days of the clearance letter informing that the project has been accorded environmental clearance and a copy of the clearance letter is available with the State Pollution control Board and may also be seen at the website of the Ministry of Environment, Forests & Climate Change at http://envfor.nic.in.	It is complied
xiv.	A copy of the environmental clearance letter shall be marked to concern Panchayat/Zila Parishad, Municipal Corporation or Urban local body and local NGO, if any, from whom any suggestion/representation has been received while processing the proposal. A copy of the clearance letter shall also be displayed on company's website.	It is complied
xv.	A copy of the environmental clearance letter shall be shall also be displayed on the website of the concerned State Pollution Control Board. The EC letter shall also be displayed at the Regional Office, District Industry Sector and Collector's Office/Tehsildar's Office for 30 days	It is complied

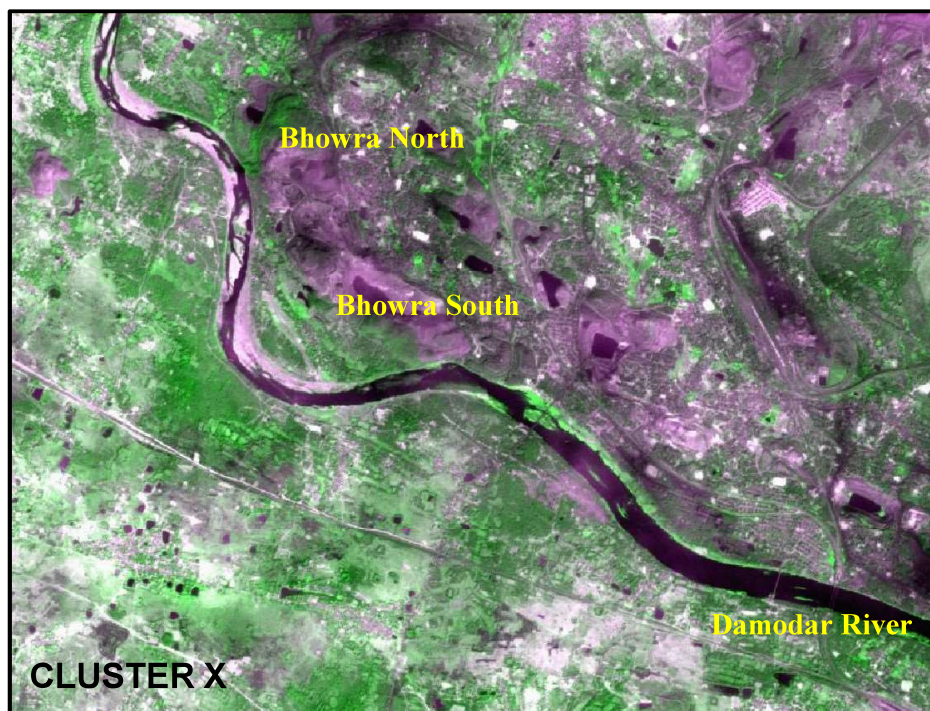
xvi.	The clearance letter shall be uploaded on the company's website. The compliance status of the stipulated environmental clearance conditions shall also be uploaded by the project authorities on their website and updated at least once every six months so as to bring the same in public domain. The monitoring data of environmental quality parameter (air, water, noise and soil) and critical pollutant such as PM₁₀, PM_{2.5}, SO₂ and NO_x (ambient) and critical sectoral parameters shall also be displayed at the entrance of the project premises and mine office and in corporate office and on company's website.	It is being complied The monitoring data of environment parameters to be display at project premises shall be complied once the project starts.
xvii.	The project proponent shall submit six monthly compliance reports on status of compliance of the stipulated environmental clearance conditions (both in hard copy and in e-mail) to the respective Regional Office of the Ministry, respective Zonal Office s of CPCB and the SPCB.	It is being complied
xviii.	The Regional Office of this Ministry located in the Region shall monitor compliance of the stipulated conditions. The Project authorities shall extend full cooperation to the officers) of the Regional Office by furnishing the requisite data information/monitoring reports,	It is being complied
xix.	The Environmental statement for each financial year ending 31 March in Form -V is mandated to be submitted by the project proponent for the concerned State Pollution Control Board as prescribed under the Environment (Protection) Rules, 1986, as amended subsequently, shall also be uploaded on the company's website along with the status of compliance of EC conditions and shall be sent to the respective Regional Offices of the MoEFCC by e-mail.	It is being complied

	C. Other Conditions by MoEF&CC	
4	The proponent shall abide by all the commitments and recommendations made in the ETA/EMP report so along during their presentation to the EAC.	Agreed
5	The commitment made by the Proponent to the issue raised during Public Hearing shall be implemented by the Proponent	Shall be implemented
6	The proponent is required to obtain all necessary clearances/approvals that may be required before the start of the project. The Ministry or any other competent authority may stipulate any further condition for environmental protection	Agreed
7	The Ministry or any other competent authority may stipulate any further condition for environmental protection.	Agreed
8	The Proponent shall setup an Environment Audit cell with responsibility and accountability to ensure implementation of all the EC Conditions.	It will be done
9	Concealing factual data or submission of false/fabricated data and failure to comply with any of the conditions mentioned above may result in withdrawal of this clearance and attract action under the provisions of Environment (Protection) Act, 1986.	Agreed
10	The above conditions will be enforced inter-alia, under the provisions of the Water (Prevention & Control of Pollution) Act, 1974, the Air (Prevention & Control of Pollution) Act, 1981, the Environment (Protection) Act, 1986 and the Public Liability Insurance Act, 1991 along with their amendments and Rules and any other orders passed by the Hon'ble Supreme Court of India and High Courts and any other Court of Law relating to the subject matter. The proponent shall ensure to undertake and provide for the costs incurred for taking	Shall be complied

	up remedial measures in case of soil contamination, contamination of groundwater and surface water, and occupational and other diseases due to the mining operations.	
11	Any appeal against this environmental clearance shall lie with the National Green Tribunal, if preferred, within a period of 30 days as prescribed under Section 16 of the National Green Tribunal Act, 2010.	Agreed


 29/5/23
 Project officer
 Kapuria Mine
 KAPURIA PROJECT
 W.J. Area

**Land Reclamation/ Restoration Monitoring of Five Clusters of
(Opencast + Underground) Coal Mines of Bharat Coking Coal
Limited based on Satellite Data of the Year 2021**



Submitted to
Bharat Coking Coal Limited



cmpdi
A Mini-Ratna Company

**Land Reclamation/ Restoration Monitoring of Five Clusters
of (Opencast + Underground) Coal Mines of Bharat Coking
Coal Limited based on Satellite Data of the Year 2021**

March - 2022



**Remote Sensing Cell
Geomatics Division
CMPDI, Ranchi**

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Executive Summary

1. **Project** Land reclamation/ restoration monitoring of five clusters of (Opencast + Underground) coal mines of Bharat Coking Coal Ltd. (BCCL) based on satellite data on every three-year basis.
2. **Objective** Objective of land reclamation/ restoration monitoring is to assess the area of backfilled, plantation, social forestry, active mining area, water bodies, distribution of wasteland, agricultural land and forest in the leasehold area of the project. This will help in assessing the progressive status of mined land reclamation and to take up remedial measures, if any, required for environmental protection.
3. **Salient Findings**
 - Out of 5 Clusters of mines viz. I, IV, VII, X and XI considered for land reclamation monitoring during the year 2021-22; cluster XI group of mines is added during the year 2021-22. These clusters consist of mainly opencast mines.
 - Out of the total mine leasehold area of 9411.54 Ha. of the 05 clusters considered for monitoring during the year 2021-22; total excavated area is 1218.18 Ha. out of which 61.92 Ha. area (5.08%) has been planted on backfill (Biological Reclamation) and 712.90 Ha. area (58.52%) is under backfilling (Technical Reclamation) and 443.36 Ha. area (36.40%) is under active mining. Cluster wise details of land reclamation of the above Clusters is given in Table-1.
 - Total area under plantation (green cover) covers an area of 968.94 Ha. which is 10.30% of total leasehold area.
 - This report and the findings will be considered as basis for further monitoring and reclamation related activities.

Table 1
Land Reclamation Status in five Clusters (Underground + Opencast Mines) of BCCL based on
Satellite Data of the Year 2021

(Area in Hectare)

Sl. No.	Cluster No.	Total Leasehold Area			Technical Reclamation		Plantation							Area under Active Mining	Total Excavated Area		Total Area under Plantation (% Green Cover Generated in Leasehold)	Total Area under Reclamation
							Biological Reclamation	Other Plantations										
								Plantation on Excavated / Backfilled Area	Plantation on External OB Dumps	Social Forestry, Avaneue Plantation Etc.								
1	2	3	4	5	6	7	8			9 (=4+5+8)	10 (=5+6+7)	11(=4+5)						
			2018	2021	2018	2021	2018	2021	2018	2021	2018	2021	2018	2021	2018	2021	2018	2021
1	Cluster I		575.00	575.00	10.11	11.10	7.29	7.29	25.53	25.53	25.53	25.53	46.00	46.00	80.81	78.03	17.40	18.39
					22.08%	24.13%	15.92%	15.85%							62.00%	60.02%	14.05%	13.57%
2	Cluster IV		1123.79	1123.79	147.22	176.03	0.00	0.00	27.11	27.11	165.09	165.09	328.32	328.32	192.20	192.20	147.22	176.03
					46.90%	53.62%	0.00%	0.00%			53.10%	46.38%			17.10%	17.10%	46.90%	53.62%
3	Cluster VII		2127.70	2127.70	351.54	351.68	37.47	25.47	11.43	11.43	238.67	238.67	560.57	560.57	291.66	275.57	389.01	377.15
					68.76%	62.74%	7.33%	4.54%			23.91%	32.72%			13.71%	12.95%	76.09%	67.28%
4	Cluster X		2057.47	2057.47	116.28	143.64	29.16	29.16	66.09	66.09	140.75	140.75	218.51	218.51	236.00	236.00	145.44	172.80
					56.76%	65.74%	14.23%	13.34%							11.47%	11.47%	71.00%	79.08%
5	Cluster XI		-	3527.58	-	30.45	-	0.00	-	0.00	-	187.14	64.78	64.78	-	187.14	-	30.45
						47.01%		0.00%								5.31%		47.01%
	TOTAL		5883.96	9411.54	625.15	712.90	73.92	61.92	156.71	149.84	570.04	757.18	1075.77	1218.18	800.67	968.94	699.07	774.82
					58.11%	58.52%	6.87%	5.08%							13.61%	10.30%	64.98%	63.60%
(% is calculated with respect to Excavated Area as applicable)																		

Note: In reference of the above Table, different parameters are classified as follows: (Cluster XI started from current year)

1. Area under Biological Reclamation includes Areas under Plantation done on Backfilled Area Only.
2. Area under Technical Reclamation includes Areas under Barren Backfilling only.
3. Area under Active Mining includes Coal Quarry, Advance Quarry Site and Quarry filled with water etc., if any.
4. Social Forestry and Plantation on External OB Dumps are not included in Biological Reclamation and are put under separate categories as shown in the above Table.
5. (%) calculated in the above Table is in respect to Total Excavated Area except for "Total Area under Plantation" where % is in terms of "Leasehold Area".

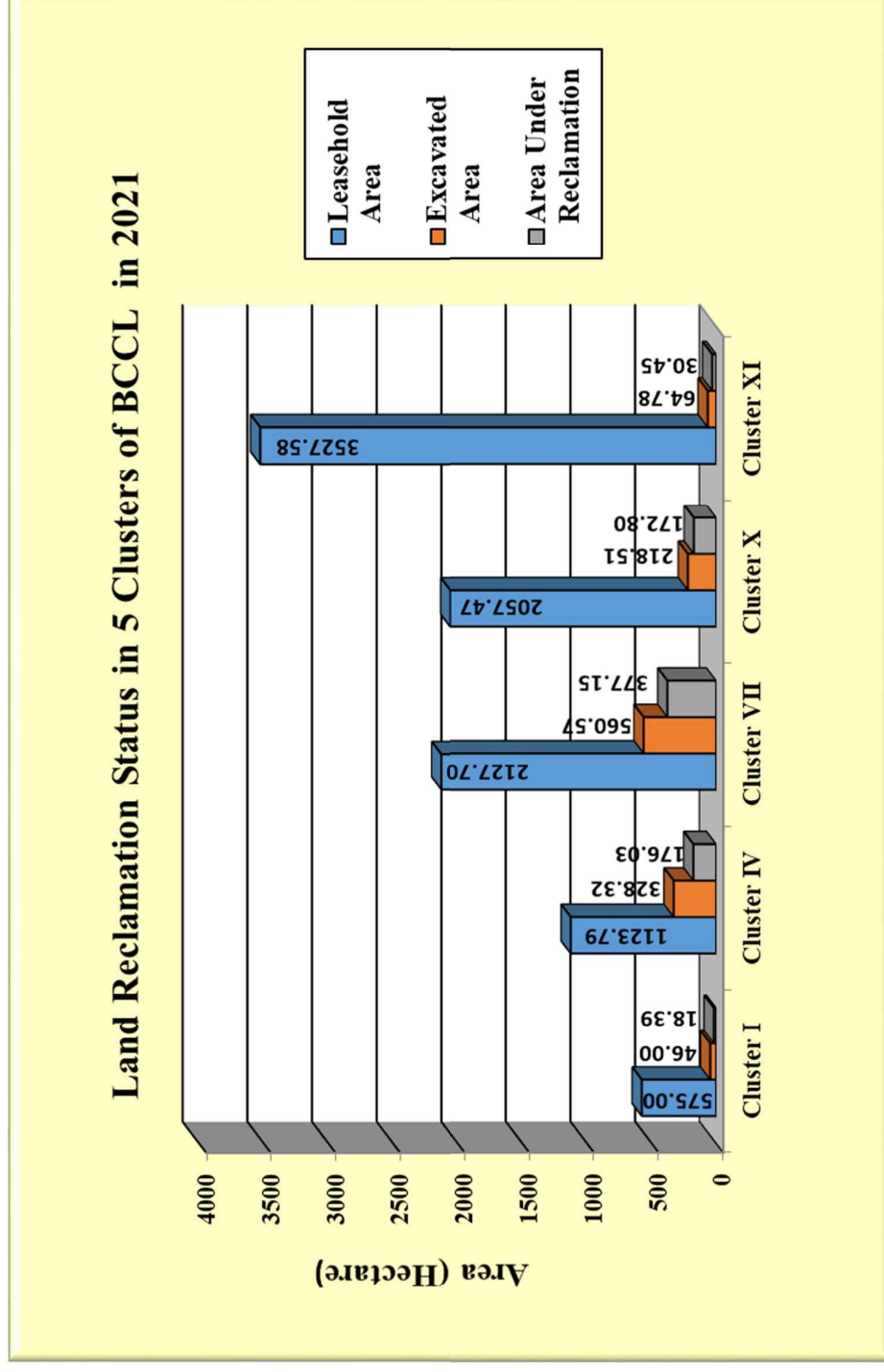


Fig. 1: Cluster wise Land Reclamation Status in five Clusters - 2021 (BCCL)

1. Background

- 1.1** Land is the most important natural resource which embodies soil, water, flora, fauna and total ecosystem. All human activities are based on the land which is the scarcest natural resource in our country. Mining is a site specific industry and it could not be shifted anywhere else from the location where mineral occurs. It is a fact that surface mining activities do affect the land environment due to ground breaking. Therefore, there is an urgent need to reclaim and restore the mined out land for its productive use for sustainable development of mining. This will not only mitigate environmental degradation, but would also help in creating a more congenial environment for land acquisition by coal companies in future.
- 1.2** Keeping above in view, Coal India Ltd. (CIL) issued a work order vide letter no. CIL/WBP/ENV/2017/DP/8391 dated 22.06.2017 to Central Mine Planning & Design Institute (CMPDI), Ranchi, for monitoring of clusters with coal mines (both underground and open cast projects) having less than 5 million m³ per annum capacity (Coal +OB) at an interval of three years based on remote sensing satellite data for sustainable development of mining. Earlier, CMPDI used to carry out land reclamation monitoring for individual projects of less than 5 million capacity, but from 2017 the same was carried out cluster wise for mines of BCCL. For operational reasons and convenience, underground and opencast mines (often with multiple overlapping seams), have now been clustered together. The result of land reclamation status of all such mines are hosted on the website of CIL, (www.coalindia.in), CMPDI (www.cmpdi.co.in) and the concerned coal companies in public domain. Detailed report is submitted to Coal India and respective subsidiaries.

- 1.3** Land reclamation monitoring of all cluster coal mining projects would also comply the statutory requirements of Ministry of Environment, Forest & Climate Change (**MoEF&CC**). Such monitoring would not only facilitate in taking timely mitigation measures against environmental degradation, but would also enable coal companies to utilize the reclaimed land for larger socio-economic benefits in a planned way.
- 1.4** Present report is embodying the finding of the study based on satellite data of the year 2021 carried out for five clusters of mines comprising both underground and OC projects for Bharat Coking Coal Ltd.

2. Objective

Objective of the land reclamation/restoration monitoring is to assess the area of backfilled, plantation, OB dumps, social forestry, active mining area, settlements and water bodies, distribution of wasteland, agricultural land and forest land in the leasehold area of the project. This is an important step taken up for assessing the progressive status of mined land reclamation and for taking up remedial measures, if any, required for environmental protection.

3. Methodology

There are number of steps involved between raw satellite data procurement and preparation of final map. National Remote Sensing Centre (NRSC) Hyderabad, being the nodal agency for satellite data supply in India, provides only raw digital satellite data, which needs further digital image processing for extracting the information and map preparation before uploading the same in the website. Methodology for land reclamation monitoring is given in fig 2. Following steps are involved in land reclamation/restoration monitoring:

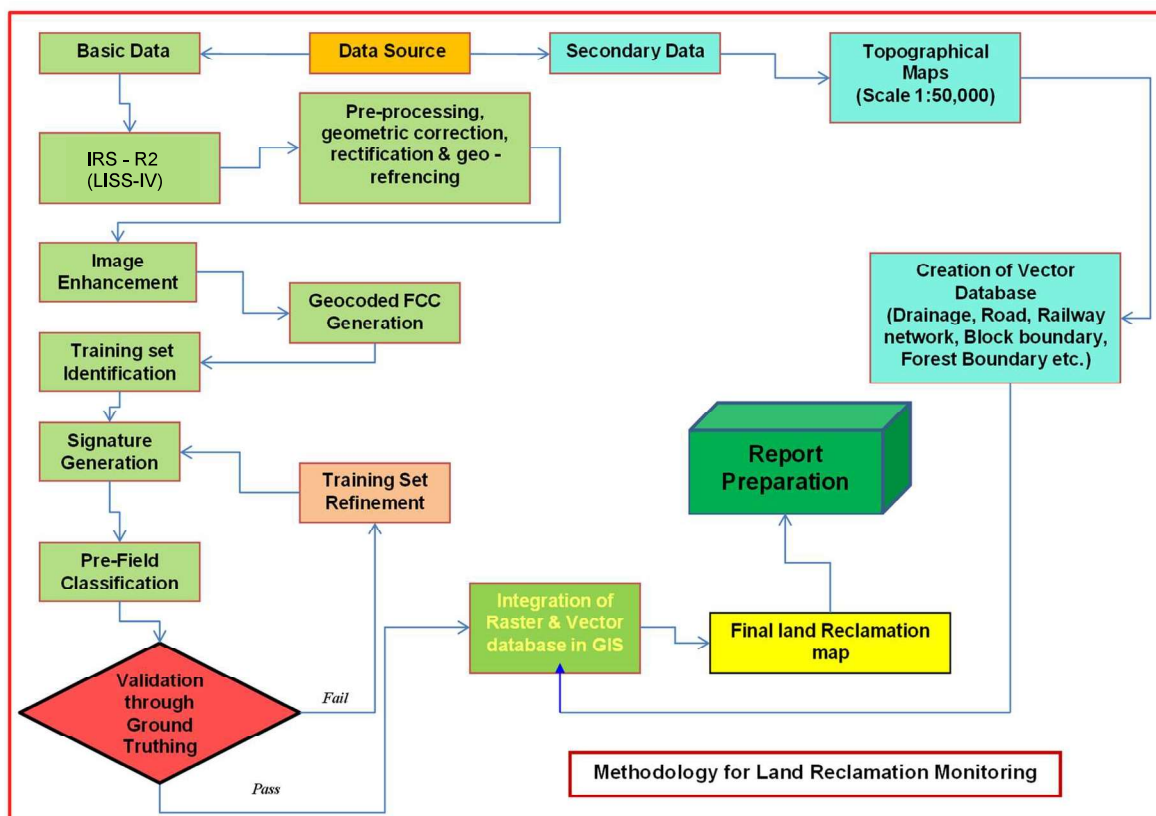


Fig. 2: Methodology of Land Reclamation Monitoring

3.1 Data Procurement: After browsing the data quality and date of pass on internet, supply order for data is placed to NRSC. Secondary data like leasehold boundary, toposheet are procured for creation of vector database.

3.2 Satellite Data Processing: Satellite data are processed using ERDAS IMAGINE digital image processing s/w. Methodology involves the following major steps:

- **Rectification & Geo-referencing:** Inaccuracies in digital imagery may occur due to 'systematic errors' attributed to earth curvature and rotation as well as 'non-systematic errors' attributed to satellite receiving station itself. Raw digital images may contain geometric distortions, which make

them unusable as maps. Therefore, geo-referencing is required for correction of image data using ground control points (GCP) to make it compatible with the new series WGS-84 compatible Sol toposheet.

- **Image enhancement:**

To improve the interpretability of the raw data, image enhancement is necessary. Local operations modify the value of each pixel based on brightness value of neighbouring pixels using ERDAS IMAGINE 14.0 s/w. and enhance the image quality for interpretation.

- **Training set selection**

Training set requires to be selected, so that software can classify the image data accurately. The image data are analysed based on the interpretation keys. These keys are evolved from certain fundamental image-elements such as tone/colour, size, shape, texture, pattern, location, association and shadow. Based on the image-elements and other geo-technical elements like land form, drainage pattern and physiography; training sets were selected/identified for each land use/cover class. Field survey was carried out by taking selective traverses in order to collect the ground information (or reference data) so that training sets are selected accurately in the image. This was intended to serve as an aid for classification.

- **Classification and Accuracy assessment**

Image classification is carried out using the maximum likelihood algorithm. The classification proceeds through the following steps: (a) calculation of statistics [i.e. signature generation] for the identified training areas, and (b) the decision boundary of maximum probability based on the mean vector, variance, covariance and correlation matrix of the pixels. After evaluating the statistical parameters of the training sets, reliability test of training sets is conducted by measuring the statistical separation between

the classes that resulted from computing divergence matrix. The overall accuracy of the classification was finally assessed with reference to ground truth data.

- **Area calculation**

The area of each land use class in the leasehold is determined using ERDAS IMAGINE v. 14.0 s/w.

- **Overlay of Vector data base**

Vector data base is created based on secondary data. Vector layer like drainage, railway line, leasehold boundary, forest boundary etc. are superimposed on the image as vector layer in the Arc GIS database.

- **Pre-field map preparation**

Pre-field map is prepared for validation of the classification result.

3.3 Ground Truthing:

Selective ground verification of the land use classes are carried out in the field and necessary corrections if required, are incorporated before map finalization.

3.4 Land reclamation database on GIS:

Land reclamation database is created on GIS platform to identify the temporal changes identified from satellite data of different cut - of dates. The database boundary shape files (.shp), kml files and the maps thus prepared confirm to the WGS-84 datum and UTM projected co-ordinate system.

4. Land Reclamation Status in Bharat Coking Coal Ltd.

4.1 Following 5 clusters of mines comprising both underground and opencast projects of Bharat Coking Coal Ltd. have been taken up for land reclamation monitoring during the year 2021-22:

- **Cluster I** (Damoda OCP)
- **Cluster IV** (Salanpur Colliery, Amalgamated Keshalpur West Mudidih Colliery, Amalgamated Gaslitand Katras Choitudih Colliery)
- **Cluster VII** (Kusunda OCP, Kustore OCP, Alkusa OCP, Dhansar OCP, Industry, Ena OCP, Rajapur OCP, Amalgamated East Bhuggatdih Simlabahal Colliery)
- **Cluster X** (Bhowra North Colliery, Bhowra South Colliery, Patherdih Colliery, Sudamdih Shaft, Sudamdih INC, Amlabad Colliery)
- **Cluster XI** (Gopalichuck, Pootkee, Kendwadih)

4.2 Cluster wise Land Reclamation status of above mentioned clusters in BCCL is given in Table 1 and also shown graphically in Fig 1. Area statistics of different land use classes present in the mine leasehold of the above clusters for the year 2021 are shown in Table 2. Land use maps derived from the satellite data are shown in Plate 1 - 5. Different land use classes based on satellite data are depicted in bar charts in Fig. 3 - 7.

4.3 Study reveals that out of total mine leasehold area of 9411.54 Ha. of the 5 clusters of mines (Underground + Opencast) of BCCL mentioned above taken for this study in 2021-22, total excavated area is 1218.18 Ha. out of which 61.92 Ha. (5.08%) has been planted (*Biologically Reclaimed*), 712.90 Ha. (58.52%) is under backfilling (*Technically Reclaimed*) and balance 443.36 Ha. (36.40%) is under active mining.

- 4.4** Land reclamation monitoring for cluster XI of BCCL is taken up for the first time in the year 2021-22. Hence comparison of this cluster in year 2021 has not been made with respect to year 2018. The data thus generated in the year 2021 will be considered as base data for comparison of land reclamation of this cluster of mines at the interval of every three years.
- 4.5** Study indicates that overall all the projects of BCCL considered for this study in the year 2021-22 indicate increase or static trend in Technical reclamation (area under backfill) with respect to the year 2018.
- 4.6** After analyzing the satellite data of the year 2018 vs 2021, it reveals that area under total plantation (Green cover) carried out on backfilled area, OB dumps as well as under social forestry in all the clusters of BCCL has increased from 800.67 Ha. (13.61%) to 968.94 Ha. (10.30%) in span of last three years. This significant increase of 168.27 Ha. area under total plantation (Green Cover) in the leasehold boundary during three years is due to addition of cluster-XI.
- 4.7** On comparing the status of land reclamation for the year 2021 with respect to the year 2018 in all cluster of mines of BCCL considered for land reclamation in the year 2021-22, it is evident from the analysis that area under total land reclamation has increased from 699.07 Ha. (Yr 2018) to 774.82 Ha. (Yr 2021). This increase of 75.75 Ha. area under total land reclamation in the period of three years is the result of sincere effort made by BCCL towards land reclamation.
- 4.8** In Cluster VII, it is seen that area under plantation on backfill (Biological Reclamation) has decreased from 37.47 Ha. in the year 2018 to 25.47 Ha. in the year 2021. This decrease of 12 Ha. area in Biological reclamation is due to rehandling of backfill and also there is effect of mine fire in this

cluster. Hence total area under plantation on backfill has decreased from 73.92 Ha. (Yr 2018) to 61.92 Ha. (Yr 2021).

4.9 Out of the 5 Clusters in BCCL considered for satellite data based land reclamation monitoring in 2021, Cluster X tops with 79.08% reclamation followed by Cluster VII with 67.28%, Cluster IV with 53.62%, Cluster XI with 47.01% and Cluster I with 39.98%.

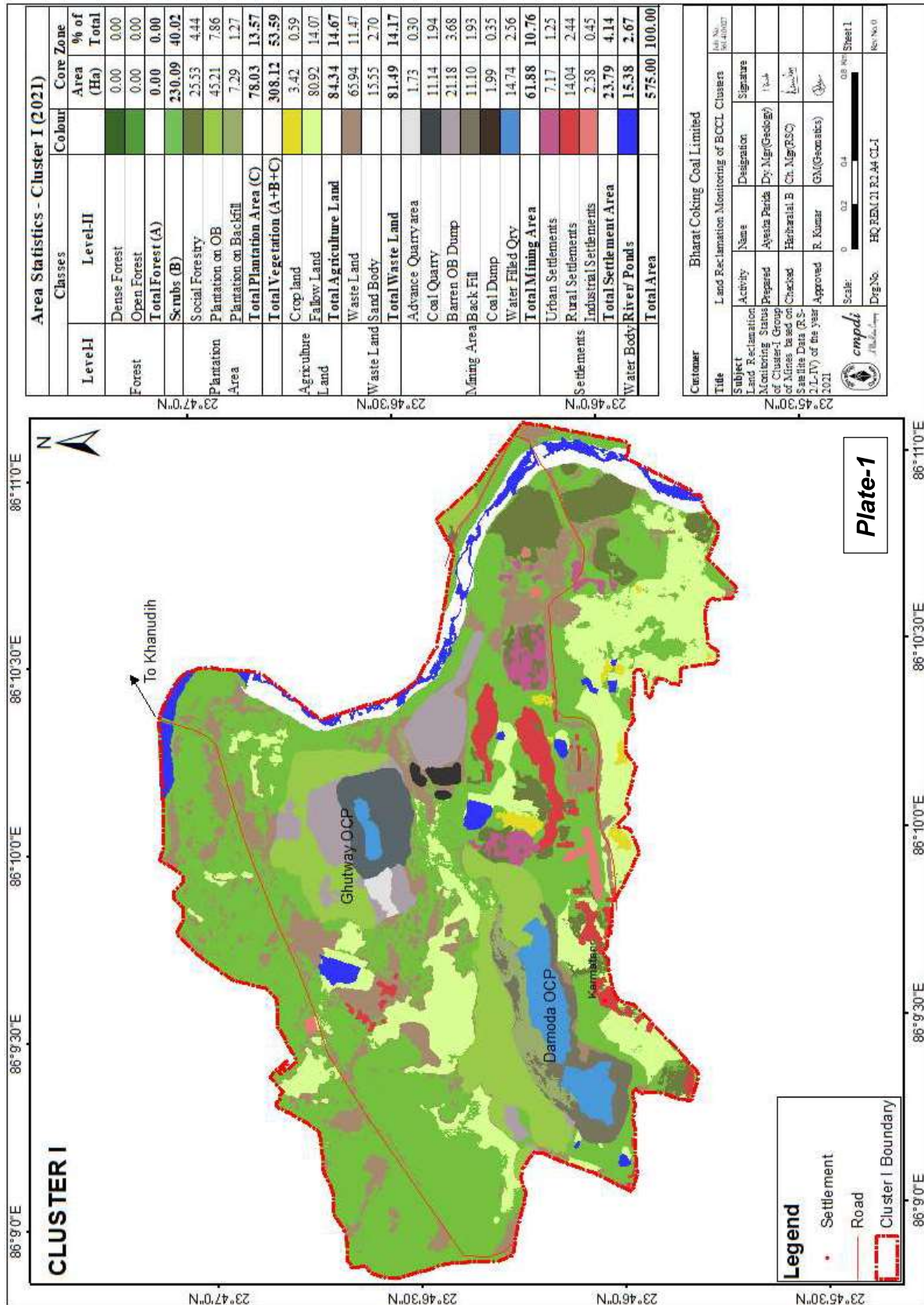
4.10 The area under total plantation (Green Cover) is maximum in Cluster IV (17.10%) followed by Cluster I with (13.57%), Cluster VII with (12.95%), Cluster X with (11.47%) and Cluster XI with (5.31%).

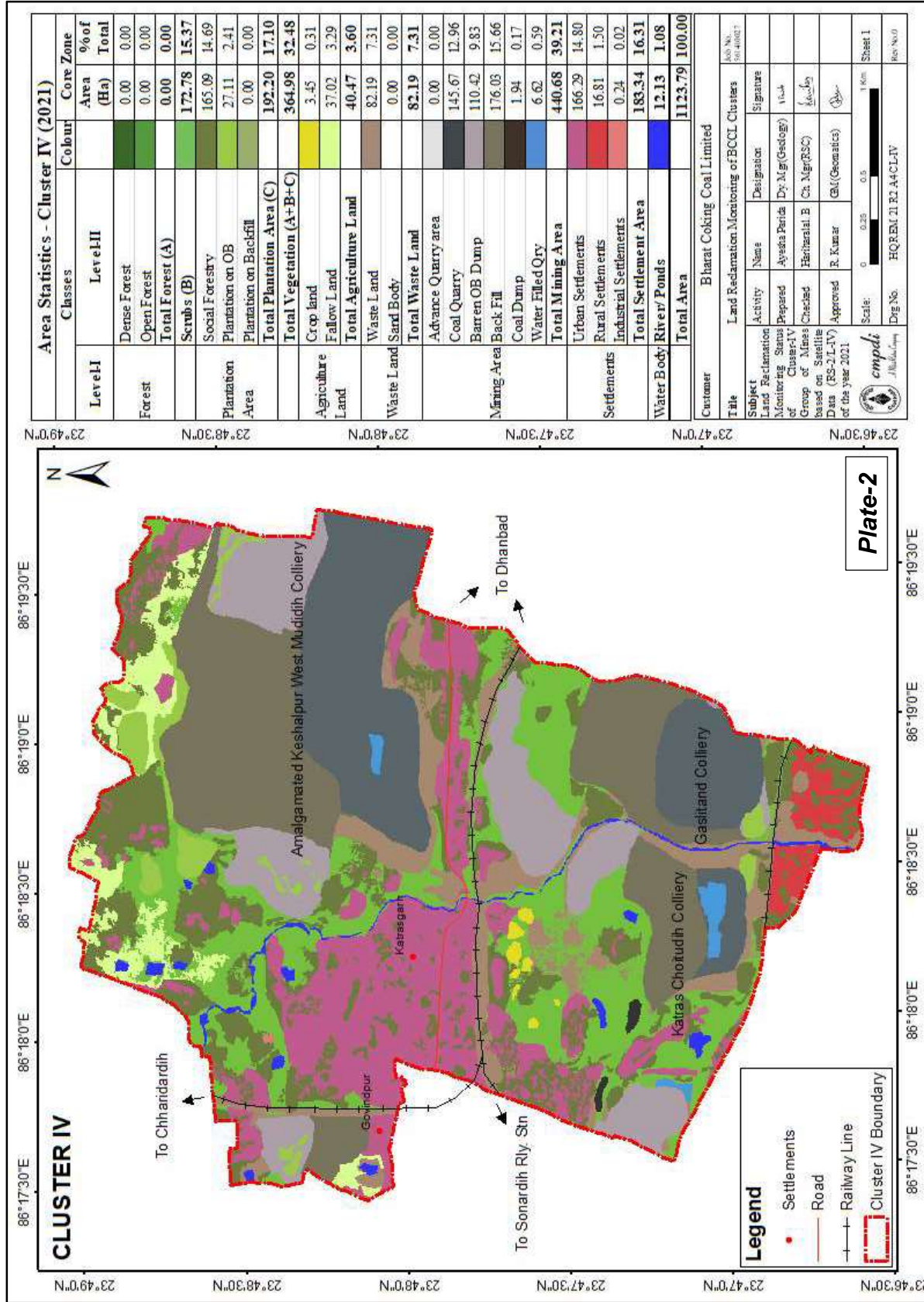
4.11 This study will again will be carried out after an interval of three years to assess the land reclamation status in the above projects.

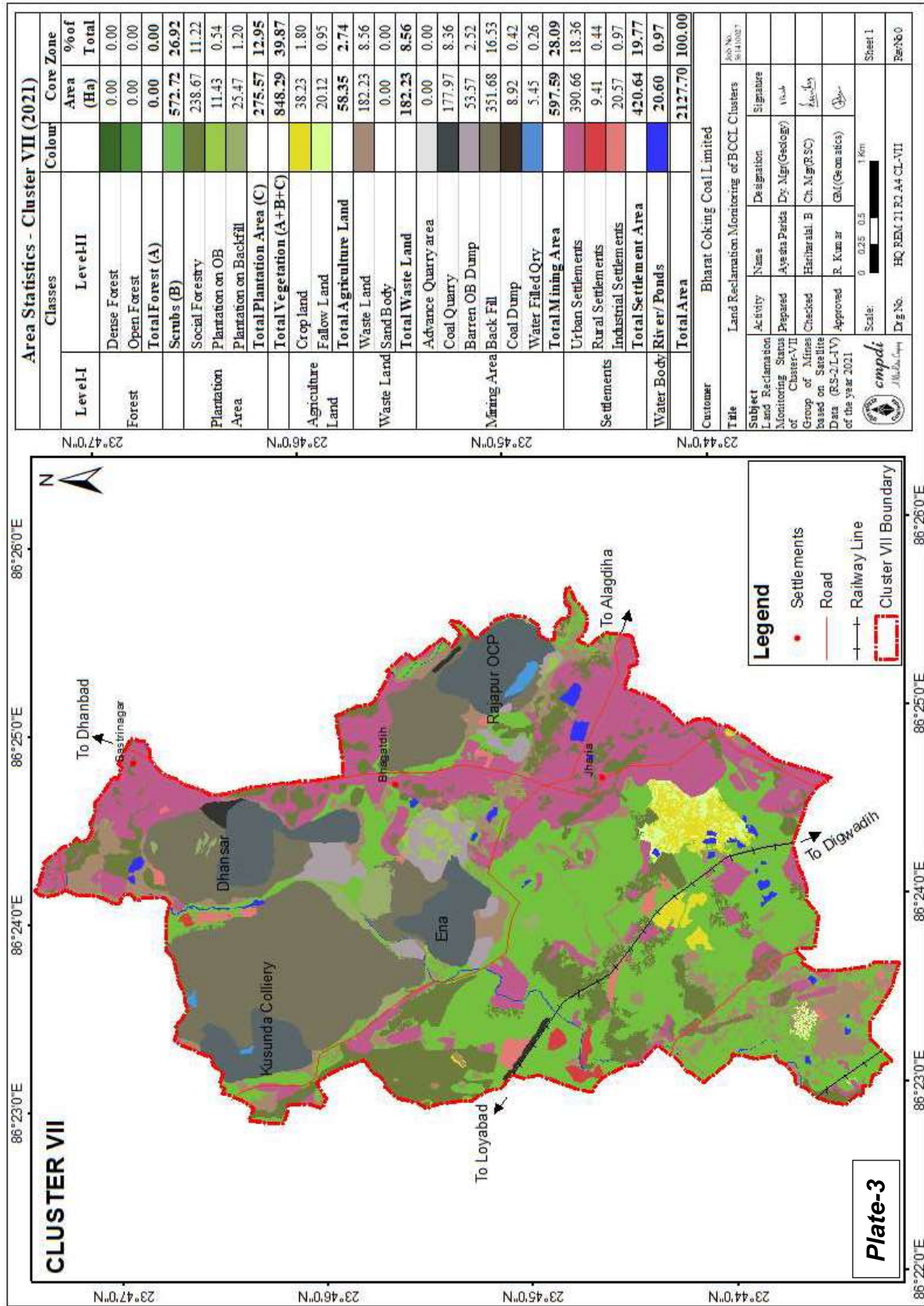
Table 2

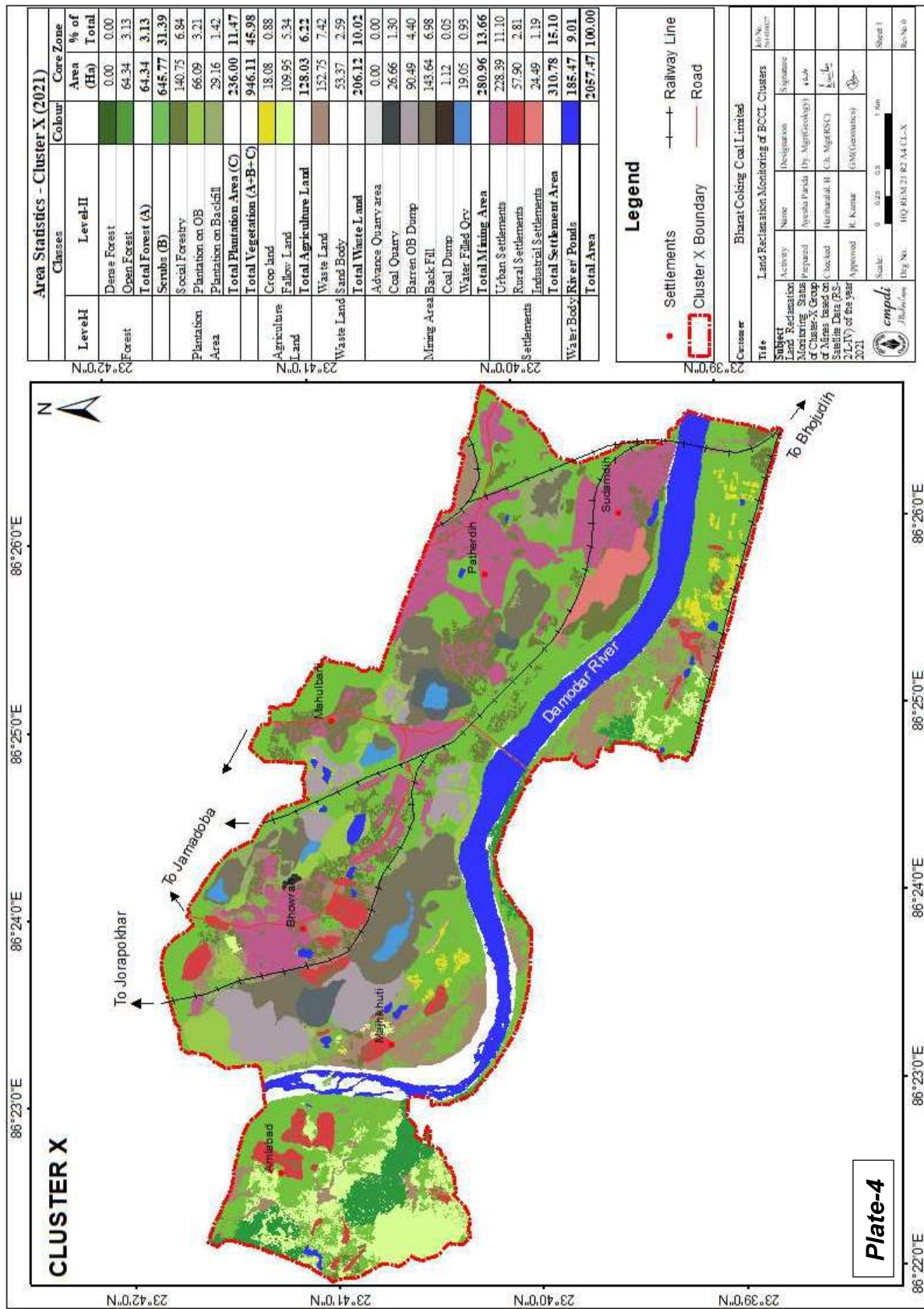
Cluster wise Area Statistics of Land Use/ Cover classes in five Clusters of (OC+UG) mines of BCCL based on Satellite Data of the year 2021

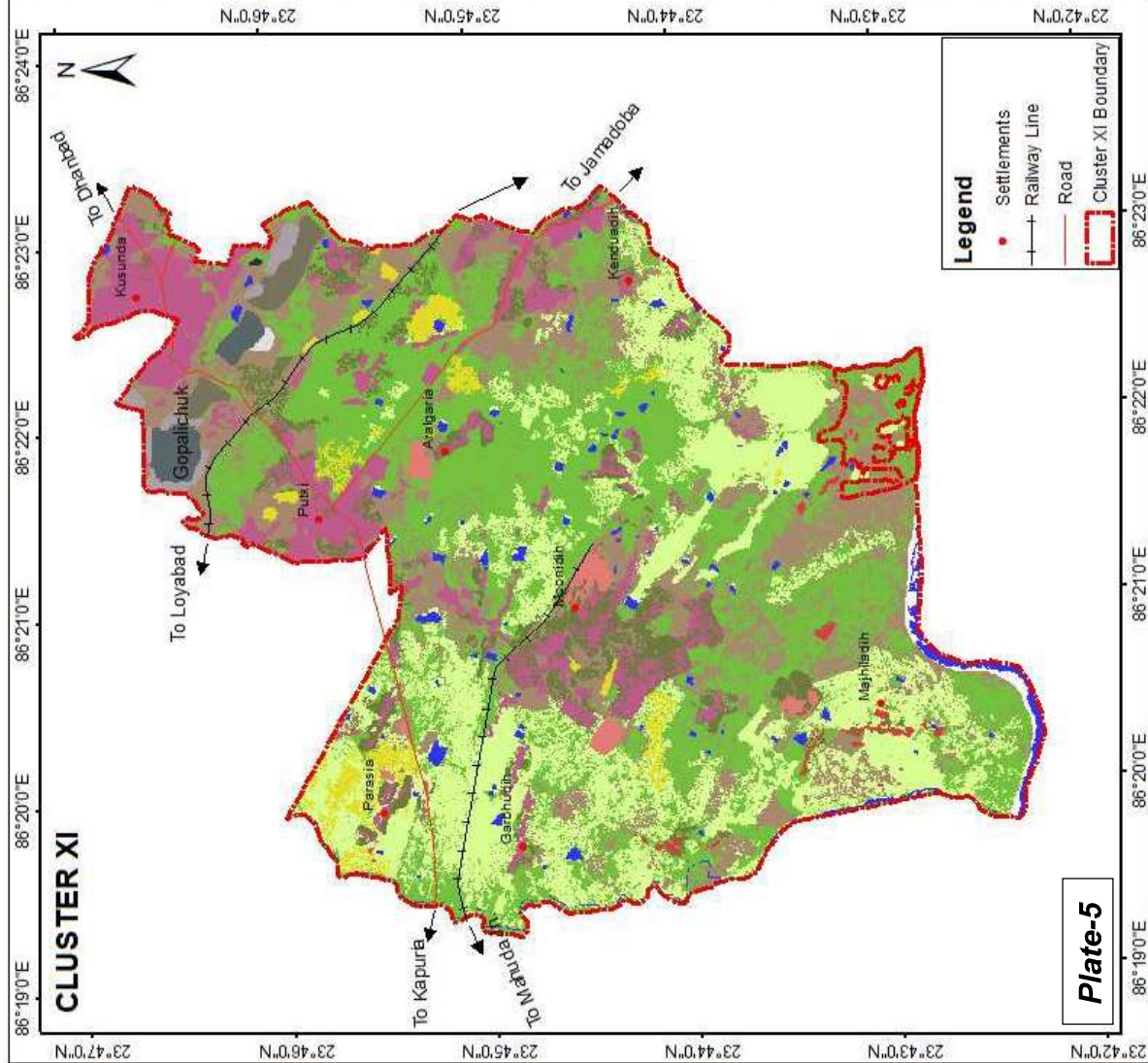
Status of Land Reclamation in 5 Clusters of (UG+OC) mines of Bharat Coking Coal Ltd. based on Satellite data of the Year 2021														
(Area in Hectare)														
			CLUSTER I		CLUSTER IV		CLUSTER VII		CLUSTER X		CLUSTER XI		TOTAL	
			Area	%	Area	%	Area	%	Area	%	Area	%	Area	%
FORESTS	Dense Forest		0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Open Forest		0.00	0.00	0.00	0.00	0.00	0.00	64.34	3.13	0.00	0.00	64.34	0.68
	Total Forest (A)		0.00	0.00	0.00	0.00	0.00	0.00	64.34	3.13	0.00	0.00	64.34	0.68
SCRUBS	Scrubs (B)		230.09	40.02	172.78	15.37	572.72	26.92	645.77	31.39	1177.06	33.37	2798.42	29.73
PLANTATION	Social Forestry/Avenue Plantation		25.53	4.44	165.09	14.69	238.67	11.22	140.75	6.84	187.14	5.31	757.18	8.05
	Plantation on OB Dump		45.21	7.86	27.11	2.41	11.43	0.54	66.09	3.21	0.00	0.00	149.84	1.59
	Plantation on Backfill (Biological Reclamation)		7.29	1.27	0.00	0.00	25.47	1.20	29.16	1.42	0.00	0.00	61.92	0.66
	Total Plantation (C)		78.03	13.57	192.20	17.10	275.57	12.95	236.00	11.47	187.14	5.31	968.94	10.30
	Total Vegetation (A+B+C)		308.12	53.59	364.98	32.48	848.29	39.87	946.11	45.98	1364.20	38.67	3831.70	40.71
ACTIVE MINING	Coal Dump		1.99	0.35	1.94	0.17	8.92	0.42	1.12	0.05	0.73	0.02	14.70	0.16
	Coal Quarry		11.14	1.94	145.67	12.96	177.97	8.36	26.66	1.30	31.66	0.90	393.10	4.18
	Advance Quarry Site		1.73	0.30	0.00	0.00	0.00	0.00	0.00	0.00	2.67	0.08	4.40	0.05
	Quarry Filled With Water		14.74	2.56	6.62	0.59	5.45	0.26	19.05	0.93	0.00	0.00	45.86	0.49
	Total Area under Active Mining		27.61	4.80	152.29	13.55	183.42	8.62	45.71	2.22	34.33	0.97	443.36	4.71
	Barren OB Dump		21.18	3.68	110.42	9.83	53.57	2.52	90.49	4.40	22.66	0.64	298.32	3.17
RECLAIMED	Area Under Backfilling (Technical Reclamation)		11.10	1.93	176.03	15.66	351.68	16.53	143.64	6.98	30.45	0.86	712.90	7.57
	Total Area under Mine Operation		61.88	10.76	440.68	39.21	597.59	28.09	280.96	13.66	88.17	2.50	1469.28	15.61
WASTELAND	Waste Lands		65.94	11.47	82.19	7.31	182.23	8.56	152.75	7.42	708.59	20.09	1191.70	12.66
	Fly Ash Pond / Sand Body		15.55	2.70	0.00	0.00	0.00	0.00	53.37	2.59	15.83	0.45	84.75	0.90
	Total Wasteland		81.49	14.17	82.19	7.31	182.23	8.56	206.12	10.02	724.42	20.54	1276.45	13.56
WATERBODIES	Reservoir, Nallah, Ponds		15.38	2.67	12.13	1.08	20.60	0.97	185.47	9.01	63.67	1.80	297.25	3.16
	Total Waterbodies		15.38	2.67	12.13	1.08	20.60	0.97	185.47	9.01	63.67	1.80	297.25	3.16
AGRICULTURE	Crop Lands		3.42	0.59	3.45	0.31	38.23	1.80	18.08	0.88	81.78	2.32	144.96	1.54
	Fallow Lands		80.92	14.07	37.02	3.29	20.12	0.95	109.95	5.34	822.67	23.32	1070.68	11.38
	Total Agriculture		84.34	14.67	40.47	3.60	58.35	2.74	128.03	6.22	904.45	25.64	1215.64	12.92
SETTLEMENTS	Urban Settlement		7.17	1.25	166.29	14.80	390.66	18.36	228.39	11.10	336.58	9.54	1129.09	12.00
	Rural Settlement		14.04	2.44	16.81	1.50	9.41	0.44	57.90	2.81	14.68	0.42	112.84	1.20
	Industrial Settlement		2.58	0.45	0.24	0.02	20.57	0.97	24.49	1.19	31.41	0.89	79.29	0.84
	Total Settlements		23.79	4.14	183.34	16.31	420.64	19.77	310.78	15.10	382.67	10.85	1321.22	14.04
	Grand Total		575.00	100.00	1123.79	100.00	2127.70	100.00	2057.47	100.00	3527.58	100.00	9411.54	100.00











Area Statistics - Cluster XI (2021)				
Classes		Colour	Core Zone	
Level-I	Level-II		Area (Ha)	% of Total
Forest	Dense Forest		0.00	0.00
	Open Forest		0.00	0.00
	Total Forest (A)		0.00	0.00
Plantation Area	Scrubs (B)		1177.06	33.37
	Social Forestry		187.14	5.31
	Plantation on OB		0.00	0.00
	Plantation on Backfill		0.00	0.00
	Total Plantation Area (C)		187.14	5.31
Total Vegetation (A+B+C)			1364.20	38.67
Agriculture Land	Crop land		81.78	2.32
	Fallow Land		822.67	23.32
Total Agriculture Land			904.45	25.64
Waste Land	Waste Land		708.59	20.09
	Sand Body		15.83	0.45
	Total Waste Land		724.42	20.54
Mining Area	Advance Quarry area		2.67	0.08
	Coal Quarry		31.66	0.90
	Barren OB Dump		22.66	0.64
	Coal Dump		30.45	0.86
	Water Filled Qry		0.73	0.02
Total Mining Area			88.17	2.50
Settlements	Urban Settlements		336.58	9.54
	Rural Settlements		14.68	0.42
	Industrial Settlements		31.41	0.89
Total Settlement Area			382.67	10.85
Water Body	River/Ponds		63.67	1.80
Total Area			3527.58	100.00

Customer: Bharat Coking Coal Limited				
Title: Land Reclamation Monitoring of BCCL Clusters				
Subject: Land Reclamation	Activity: Prepared	Name: Aye da Perda	Designation: Dy. Mgr(Geology)	Signature: /s/
Monitoring Status: Group of Mines based on Satellite Data (RS-2.L-IV) of the year 2021	Activity: Checked	Name: Harharlal B	Designation: Ch. Mgr(RSC)	Signature: /s/
	Activity: Approved	Name: R. Kumar	Designation: GM(Geomatics)	Signature: /s/
Scale: 0 0.5 1 2 Km		Drwg No. HQ REM.21 R2.A4 CL-XI		Sheet 1
Job No. 561410027		Rev No. 0		

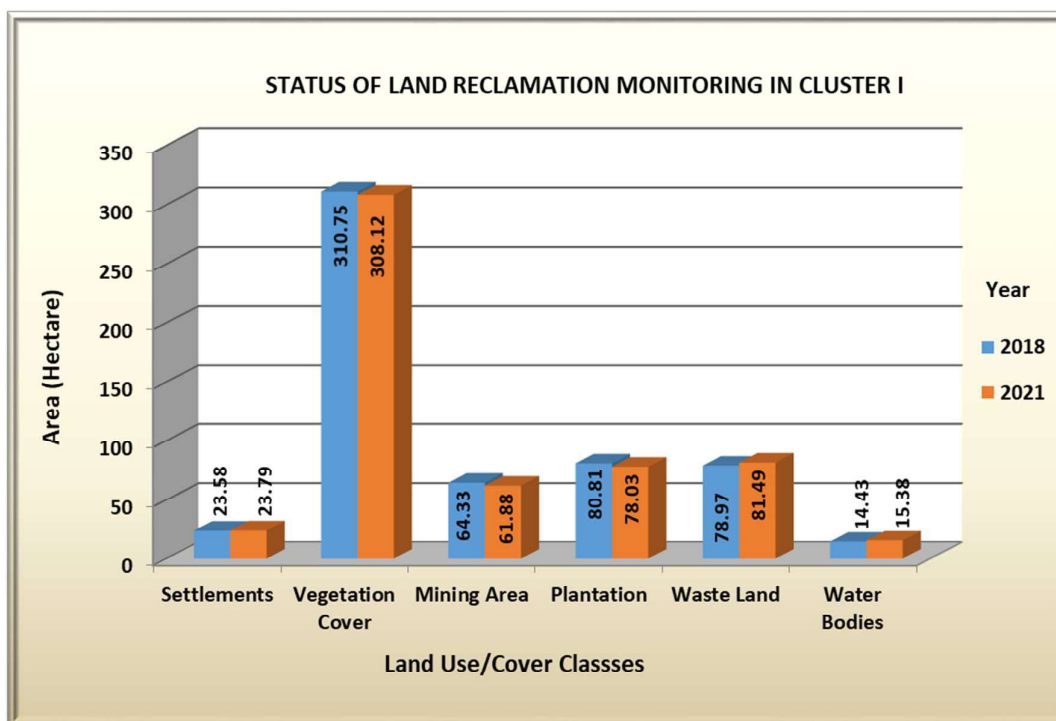


Fig. 3: Land Reclamation Status of Cluster I

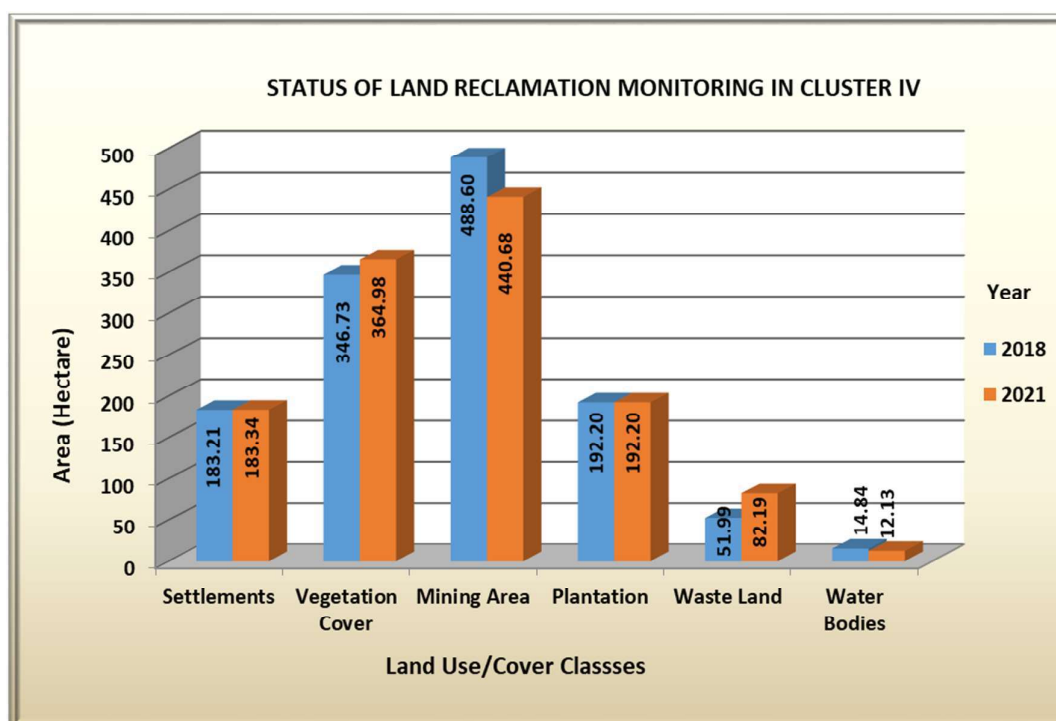


Fig. 4: Land Reclamation Status of Cluster IV

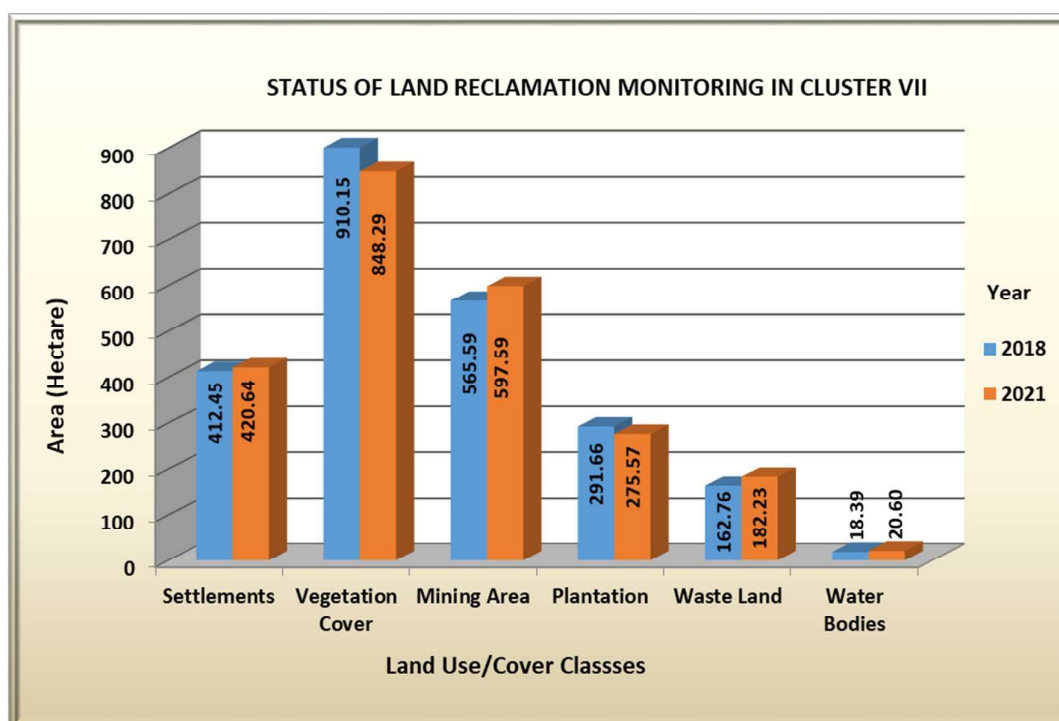


Fig. 5: Land Reclamation Status of Cluster VII

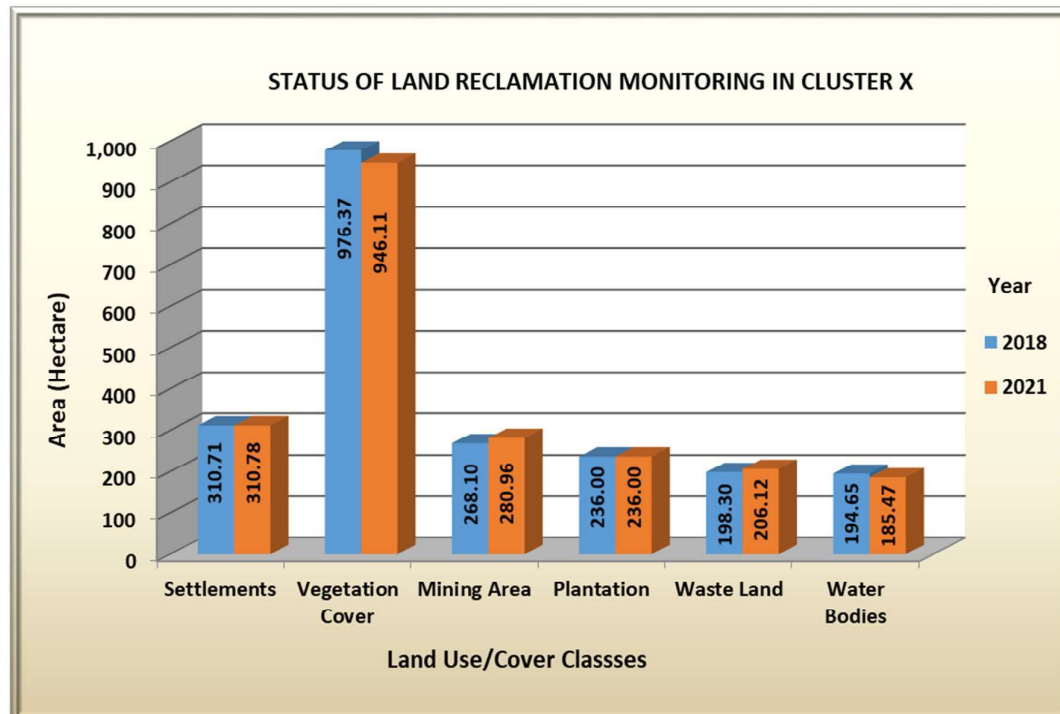


Fig. 6: Land Reclamation Status of Cluster X

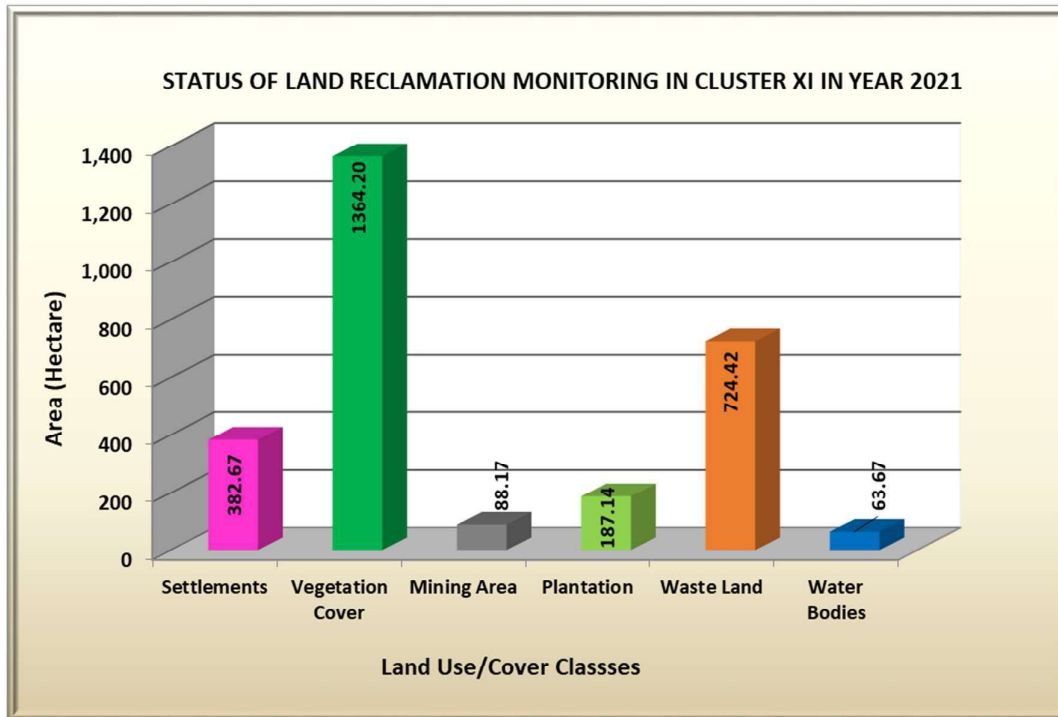


Fig. 7: Land Reclamation Status of Cluster XI



Photo 1: Social Forestry Plantation in Cluster XI



Photo 2: Ecological Restoration Site in Cluster I



Photo 3: Plantation on OB Dump in Cluster I



Photo 4: Plantation on OB Dump in Cluster IV



Photo 5: Parasnath Udyaan in Cluster IV



Photo 6: Road side Plantation in Cluster VII



Photo 7: Plantation on OB Dump in Cluster X



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**ENVIRONMENTAL MONITORING REPORT
OF
BHARAT COKING COAL LIMITED,
CLUSTER – XII**

(FOR THE MONTH OCTOBER, 2022)

E. C. no. J-11015/184/2012-IA.II (M) dated 10.12.2014.



CMPDI

ISO 9001 Company
**Regional Institute-II
Dhanbad, Jharkhand**

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EXECUTIVE SUMMARY

1.0 Introduction

The purpose of environmental monitoring is to assess the quality of various attributes that affects the fauna and flora. In accordance with the quality of these attributes appropriate strategy is to be developed to control the pollution level within the permissible limits. The three major attributes are air, water and noise level.

Bharat Coking Coal Limited (BCCL), a Subsidiary company of Coal India Limited is operating Underground and Opencast Mines in Jharia Coalfield (JCF) is a part of Gondwana Coalfields located in Dhanbad district of Jharkhand, the JCF is bounded by 23°37' N to 23°52' N latitudes and 86°09' E to 86°30' E longitude occupying an area of 450 Sq.km. BCCL has awarded Environmental monitoring work of Jharia Coalfield (JCF) to Central Mine Planning & Design Institute Limited (CMPDIL). The environmental monitoring has been carried out as per the conditions laid down by the MoEF&CC while granting environmental clearance of project, consent letter issued by the respective SPCB, and other statutory requirements.

2.0 Sampling location and rationale

2.1 Ambient air sampling locations

The ambient air quality monitoring stations were selected to represent core, buffer zone area. The rationale has been based on the guidelines stipulated by MoEF&CC, consent letter of SPCB, as well as other statutory requirements.

2.2 Water sampling stations

The Water sampling stations were selected for mine sump water.

2.3 Noise level monitoring locations

Noise levels vary depending on the various activities in mining areas. The monitoring of noise level in different locations will be helpful to take appropriate mitigating measures. The rationale has been based on the guidelines stipulated by MoEF&CC, consent letter of SPCB, as well as other statutory requirements.

3.0 Methodology of sampling and analysis

3.1 Ambient air quality

Parameters chosen for assessment of ambient air quality were Particulate Matter (PM₁₀), Fine Particulate Matter (PM_{2.5}), Sulphur Di-oxide (SO₂)

and Nitrogen Oxides (NO_x). Respirable Dust Samplers (RDS) and Fine Dust Sampler (PM_{2.5} sampler) were used for sampling of PM₁₀, SO₂, & NO_x and Fine Dust Sampler (PM_{2.5} sampler) were used for sampling of PM_{2.5} at 24 hours interval once in a fortnight and the same for the gaseous pollutants. The samples were analysed in Environmental Laboratory of CMPDI, RI-II, Dhanbad.

3.2 Water quality

Water samples were collected as per standard practice. The Mine effluent samples were collected and analyzed for four parameters on fortnightly basis. Thereafter the samples were preserved and analyzed at the Environmental Laboratory of CMPDI, RI- II, Dhanbad.

3.3 Noise level monitoring

Noise level measurements in form of 'LEQ' were taken using Integrated Data Logging Sound Level Meter. Noise levels were measured in Decibels, 'A' weighted average, i.e. dB(A).

4.0 Results and interpretations

4.1 Air quality

It has been seen from the analysis results that the 24 hours average concentration parameters like PM₁₀, PM_{2.5}, SO₂ and NO_x are mostly within the permissible limits in all sampling locations as per MoEF&CC Gazette Notification No. GSR 742(E) dt 25.09.2000 Standards for Coal Mines and National Ambient Air Quality Standard -2009. Sometimes the concentration of PM₁₀& PM_{2.5} exceeds the limits due to heavy public traffic, poor road condition, coke oven plants, burning of coal by surrounding habitants, brick making, municipal waste dumps and industries like Steel Plant, thermal Plants including their fly ash etc.

The following preventive and suppressive mitigative measures can be undertaken to contain the pollution level within prescribed level:-

- Wet drilling and controlled blasting should be practice.
- Explosive used should be optimised to restrict the dust generation.
- Transportation roads should be permanently asphalted free of ruts, potholes etc.
- Water should be sprayed on coal transportation road, service road more frequently and at regular interval.
- Dust from roads should be removed physically or mechanically.
- Greenbelts around industrial sites, service building area besides Avenue plantation along roads should be created.
- Coal dust should be suppressed by using fixed sprinklers.
- Regular maintenance of plant and machinery should be undertaken.

4.2 Water quality

The test results indicate that the major parameters compared with MoEF&CC Gazette Notification No. GSR 742(E) dt 25.09.2000

4.3 Noise Level

During the noise level survey it has been observed that the noise level in the sampling locations is within the permissible limits prescribed as per MoEF&CC Gazette Notification No. GSR 742(E) dt 25.09.2000 Standards for Coal Mines for Industrial Area and Noise pollution (Regulation and Control) Rules, 2000.

INTRODUCTION

1.0 Any industry and development activities including coal mining is bound to affect environmental attributes. There are positive as well as negative impacts of such operations. For controlling the adverse impacts a regular monitoring is essential. The environmental monitoring is being done as per the guide-lines stipulated by Ministry of Environment, Forest and Climate Change (MoEF&CC), Govt. of India.

The very purpose of environmental monitoring is to assess the quality of various attributes which affects the environment. As per quality of these attributes appropriate strategy is to be developed to control the pollution level within the permissible limits. The three major attributes are air, water and noise level.

Bharat Coking Coal has awarded Environmental Monitoring work of all Projects, Cluster wise, to Central Mine Planning & Design Institute Limited (CMPDIL). The environmental monitoring has been carried out as per conditions laid down by MoEF&CC while granting environmental clearance to different projects. CMPDI has trained manpower and well equipped laboratory to carry out monitoring, analysis and R&D work in the field of environment.

1.1 The Cluster XII is in the Central part of the Jharia coalfield. It includes Kapuria UG Mine. The cluster – XII is situated about 30 - 35 kms from Dhanbad Railway Station. The mines of this cluster - XII are operating since pre nationalization period (prior to 1972-73). It is connected by both Railway and Road. The drainage of the area is governed by Katri River.

1.2 The cluster XII is designed to produce 2.4 Mtpa (normative) and 3.12 Mtpa peak capacity of coal. The average grade of coal W-II to W-IV.

The Project has Environmental Clearance from Ministry of Environment, Forests and Climate Change (MoEF&CC) for a rated capacity of 2.4 MTPA (normative) and 3.12 MTPA peak capacity of coal production vide letter no E.C. no. J-11015/184/2012-IA.II (M) dated 10.12.2014.

Ministry of Environment, Forest and Climate Change while granting environmental clearance has given one of the General conditions that “ Four ambient air quality monitoring stations should be established in the core zone as well as in the buffer zone for PM₁₀, PM_{2.5}, SO₂, NO_x monitoring. Location of the stations should be decided based on the meteorological data, topographical features and environmentally and ecologically sensitive targets, other conditions regarding water / effluent and noise level monitoring in consultation with the State Pollution Control Board.”

In compliance of these conditions the Environmental Monitoring has been carried out & report prepared for submission to MoEF&CC & JSPCB and other statutory authorities.

AMBIENT AIR QUALITY MONITORING

2.1 Location of sampling station and their rationale:

(As per G.S.R. 742 (E) dt. 25th December, 2000)

2.1.1 Ambient Air Quality Sampling Locations

I. CORE ZONE Monitoring Location

i) Rudhi basti (A18): Industrial Area

The location of the sampling station is 23° 45' 26.60" N & 86° 18' 39.90" E. The samplers were placed at a height of approx. 1.5m above ground level at Rudhi basti.

II. BUFFER ZONE Monitoring Location

i) Block IV (A6) : Industrial area

The location of the sampling station is 23° 47' 54.00" N & 86° 16' 20.00" E. The samplers were placed at a height of approx. 1.5m above ground level at Safety Office.

ii) Moonidih UGP (A17) : Industrial area

The location of the sampling station is 23° 44' 30.00" N & 86° 20' 56.00" E. The samplers were placed at a height of approx. 1.5m above ground level at project office.

iii) Murlidih 20/21 Pit(A19): Industrial Area

The location of the sampling station is 23° 43' 51.82" N & 86° 16' 21.87" E. The samplers were placed at a height of approx. 1.5m above ground level at project office.

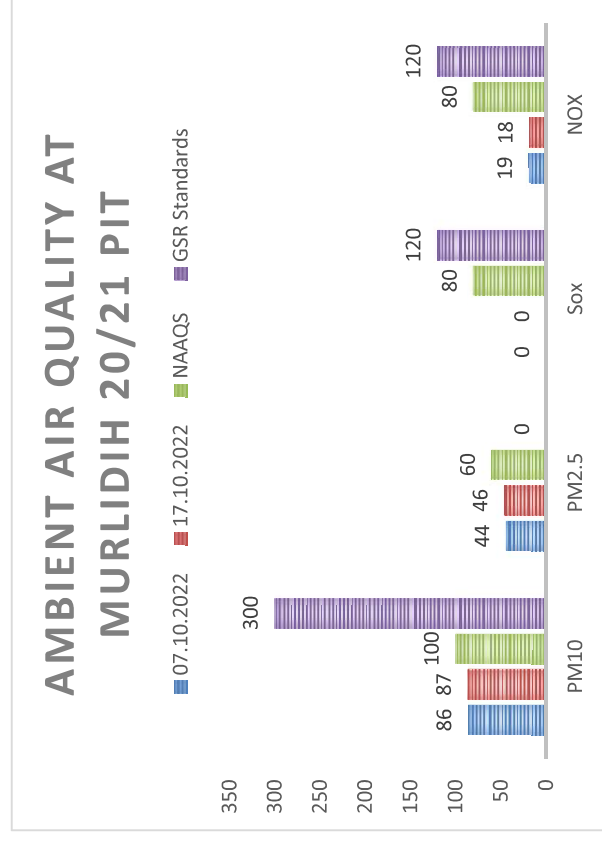
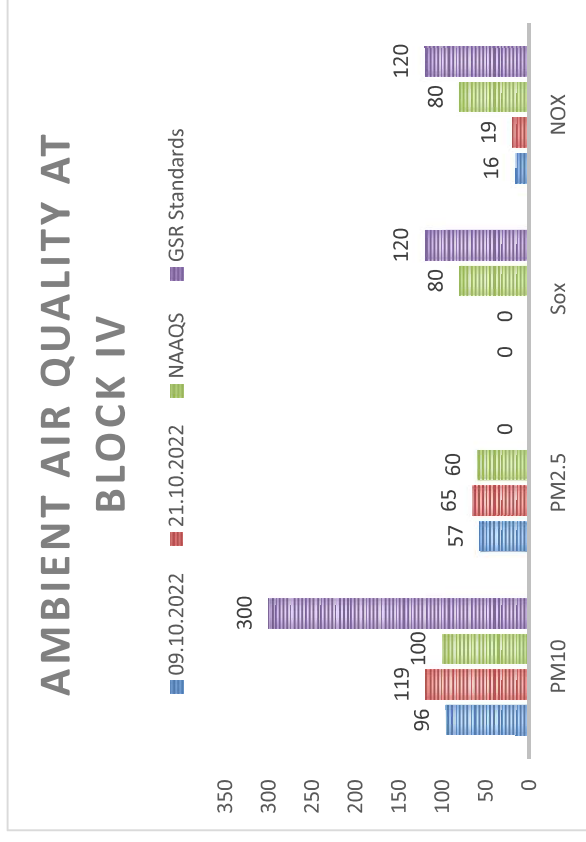
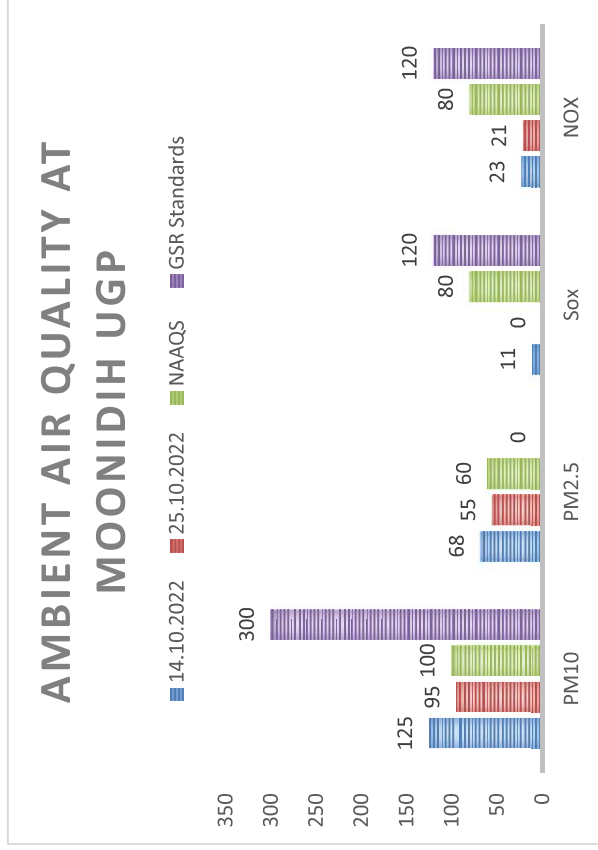
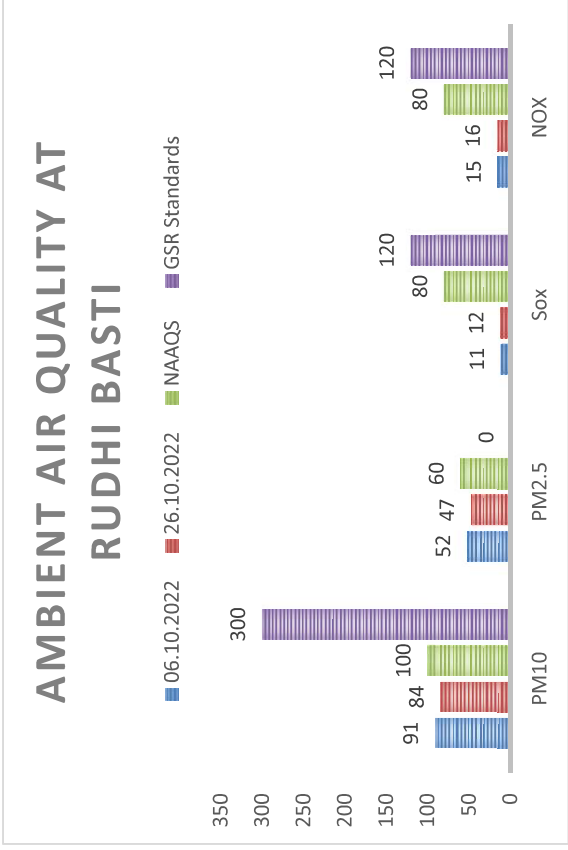
AMBIENT AIR QUALITY DATA

  CENTRAL MINE PLANNING AND DESIGN INSTITUTE LIMITED Environment Laboratory, Regional Institute-II Ambient Air Quality Test Report		CMPDI, RI-II KOYLA BHAWAN COMPLEX DHANBAD - 826005 Phone: 0326-223-850 email: rdri2cmpdi@coalindia.in	
Test Report for Ambient Air Samples			
Month & Year	10/2022	Cluster	Cluster XII
Customer	Environment Department, Bharat Coking Coal Limited (BCCL), Koyla Bhawan, Dhanbad (E-mail: gmenv.bccl@coalindia.in)		
Project	Sample Ref. No.	REM/BCCL/2022/10/18	Sampling Method
Sampling Stations	i	Rudhi Basti	Date of Sampling
Sl. No.	Method Analysis	Observed Values (in $\mu\text{g}/\text{m}^3$)	
		1st FN	2nd FN
1	PM ₁₀	IS -5182(Part 23):2006, R-2017	91
2	PM _{2.5}	IS -5182(Part 24):2019	52
3	SO ₂	IS-5182(Part-2): 2001, R-2017	11
4	NO ₂	IS-5182 (Part-6): 2006, R-2017	15
		Range Of Testing	LDL
		MoEF Standards Notification dated 25th September, 2000 (GSR 742 E)	NAAQS, 2009
		10 $\mu\text{g}/\text{m}^3$ - 1000 $\mu\text{g}/\text{m}^3$	10 $\mu\text{g}/\text{m}^3$
		10 $\mu\text{g}/\text{m}^3$ - 400 $\mu\text{g}/\text{m}^3$	10 $\mu\text{g}/\text{m}^3$
		10 $\mu\text{g}/\text{m}^3$ - 1050 $\mu\text{g}/\text{m}^3$	10 $\mu\text{g}/\text{m}^3$
		06 $\mu\text{g}/\text{m}^3$ - 420 $\mu\text{g}/\text{m}^3$	06 $\mu\text{g}/\text{m}^3$
		300	100
		Not Specified	60
		120	80
		120	80
* LDL indicates Lower Detection Limit, ** All units are in $\mu\text{g}/\text{m}^3$, 24 hourly Average,			
ANALYSED BY <i>(Signature)</i> (Gaurav Kant) CHECKED BY		<i>(Signature)</i> (Amit Raj Mishra) HOD's Signature	
Note: The results above relate to the samples tested as received. This report can not be reproduced in part or full without the written permission of the HOD(Env), CMPDI, RI-II.			
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  		CENTRAL MINE PLANNING AND DESIGN INSTITUTE LIMITED Environment Laboratory, Regional Institute-II Ambient Air Quality Test Report		CMPDIL, RI-II KOYLA BHAWAN COMPLEX DHANBAD. - 826005 Phone:0326-223-850 email: rdri2cmpdi@coalindia.in	
Test Report for Ambient Air Samples					
Month & Year	10/2022	Cluster	Cluster XII	Report No.	RI-II/AIR/2022-23/07
Customer	Environment Department, Bharat Coking Coal Limited (BCCL), Koyla Bhawan, Dhanbad (E-mail: gmenv.bccl@coalindia.in)			Date of Issue	26.12.2022
Project		Sample Ref. No.	REM/BCCL/2022/10/06	Sampling Method	CMPDI/RI-II/LPM 13, (IS 5182)
Sampling Stations	i	Block IV	Date of Sampling	09.10.22	21.10.22
Sl. No.	Parameter	Method of Analysis	Observed Values (in $\mu\text{g}/\text{m}^3$)	Range Of Testing	LDL
			1st FN	2nd FN	MoEF Standards Notification dated 25th September, 2000 (GSR 742 E)
1	PM ₁₀	IS -5182(Part 23):2006, R-2017	96	119	10 $\mu\text{g}/\text{m}^3$ - 1000 $\mu\text{g}/\text{m}^3$
2	PM _{2.5}	IS -5182(Part 24):2019	57	65	10 $\mu\text{g}/\text{m}^3$ - 400 $\mu\text{g}/\text{m}^3$
3	SO ₂	IS-5182(Part-2): 2001, R-2017	<10	<10	10 $\mu\text{g}/\text{m}^3$ - 1050 $\mu\text{g}/\text{m}^3$
4	NO ₂	IS-5182 (Part-6): 2006, R-2017	16	19	06 $\mu\text{g}/\text{m}^3$ - 420 $\mu\text{g}/\text{m}^3$
* LDL indicates Lower Detection Limit, ** All units are in $\mu\text{g}/\text{m}^3$, 24 hourly Average,					
 ANALYSED BY (Gaurav Kant) CHECKED BY		 (Amit Raj Mishra) HOD's Signature			
Note: The results above relate to the samples tested as received. This report can not be reproduced in part or full without the written permission of the HOD(Env) , CMPDI, RI-II.					
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JOB NO. 200316028		Cluster – XII, BCCL Environmental Monitoring Report			

  		CENTRAL MINE PLANNING AND DESIGN INSTITUTE LIMITED Environment Laboratory, Regional Institute-II Ambient Air Quality Test Report		CMPDIL, RI-II KOYLA BHAWAN COMPLEX DHANBAD. - 826005 Phone:0326-223-850 email: rdri2cmpdi@coalindia.in	
Test Report for Ambient Air Samples					
Month & Year	10/2022	Cluster	Cluster XII	Report No.	RI-II/AIR/2022-23/07
Customer	Environment Department, Bharat Coking Coal Limited (BCCL), Koyla Bhawan, Dhanbad (E-mail: gmenv.bccl@coalindia.in)			Date of Issue	26.12.2022
Project		Sample Ref. No.	REM/BCCL/2022/10/17	CMPDI/RI-II/LPM 13, (IS 5182)	
Sampling Stations	i	Moonidih UGP	Date of Sampling	14.10.22	25.10.22
SL. No.	Method of Analysis	Observed Values (in $\mu\text{g}/\text{m}^3$)		Range Of Testing	LDL
		1st FN	2nd FN		
1	IS -5182(Part 23):2006, R-2017	125	95	10 $\mu\text{g}/\text{m}^3$ - 1000 $\mu\text{g}/\text{m}^3$	10 $\mu\text{g}/\text{m}^3$
2	IS -5182(Part 24):2019	68	55	10 $\mu\text{g}/\text{m}^3$ - 400 $\mu\text{g}/\text{m}^3$	10 $\mu\text{g}/\text{m}^3$
3	IS-5182(Part-2): 2001, R-2017	11	<10	10 $\mu\text{g}/\text{m}^3$ - 1050 $\mu\text{g}/\text{m}^3$	10 $\mu\text{g}/\text{m}^3$
4	IS-5182 (Part-6): 2006 , R-2017	23	21	06 $\mu\text{g}/\text{m}^3$ - 420 $\mu\text{g}/\text{m}^3$	06 $\mu\text{g}/\text{m}^3$
* LDL indicates Lower Detection Limit, ** All units are in $\mu\text{g}/\text{m}^3$, 24 hourly Average,					
 ANALYSED BY (Gaurav Kant)		 CHECKED BY (Amit Raj Mishra) HOD's Signature			
Note: The results above relate to the samples tested as received. This report can not be reproduced in part or full without the written permission of the HOD(Env) , CMPDI, RI-II.					
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  		CENTRAL MINE PLANNING AND DESIGN INSTITUTE LIMITED Environment Laboratory, Regional Institute-II Ambient Air Quality Test Report		CMPDIL, RI-II KOYLA BHAWAN COMPLEX DHANBAD. - 826005 Phone: 0326-223-850 email: rdri2cmpdi@coalindia.in	
Test Report for Ambient Air Samples					
Month & Year	10/2022	Cluster	Cluster XII	Report No.	RI-II/AIR/2022-23/07
Customer	Environment Department, Bharat Coking Coal Limited (BCCL), Koyla Bhawan, Dhanbad (E-mail: gmenv.bccl@coalindia.in)			Date of Issue	26.12.2022
Project	Sample Ref. No.			CMPDI/RI-II/LPM 13, (IS 5182)	
Sampling Stations	i	Murlidih 20/21 Pit	Date of Sampling	07.10.22	Zone of Station: Buffer Zone
SL. No.	Method of Analysis	Observed Values (in $\mu\text{g}/\text{m}^3$)	Range Of Testing	LDL	MoEF Standards Notification dated 25th September, 2000 (GSR 742 E)
		1st FN	2nd FN		NAAQS, 2009
1	IS -5182(Part 23):2006, R-2017	86	87	10 $\mu\text{g}/\text{m}^3$ - 1000 $\mu\text{g}/\text{m}^3$	300
2	IS -5182(Part 24):2019	44	46	10 $\mu\text{g}/\text{m}^3$ - 400 $\mu\text{g}/\text{m}^3$	Not Specified
3	IS-5182(Part-2): 2001, R-2017	<10	<10	10 $\mu\text{g}/\text{m}^3$ - 1050 $\mu\text{g}/\text{m}^3$	120
4	IS-5182 (Part-6): 2006, R-2017	19	18	06 $\mu\text{g}/\text{m}^3$ - 420 $\mu\text{g}/\text{m}^3$	120
* LDL indicates Lower Detection Limit, ** All units are in $\mu\text{g}/\text{m}^3$, 24 hourly Average,					
 ANALYSED BY (Gaurav Kant)		 (Amit Raj Mishra) HOD's Signature			
Note: The results above relate to the samples tested as received. This report can not be reproduced in part or full without the written permission of the HOD(Env), CMPDI, RI-II.					
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NOISE LEVEL QUALITY MONITORING

4.1 Location of sampling sites

- i) **Rudhi basti (N18)**
- ii) **Block IV(N6)**
- iii) **Moonidih UGP(N17)**
- iv) **Murlidih 20/21 (N19)**

4.2 Methodology of sampling and analysis

Noise level measurements in form of ' L_{EQ} ' were taken using Integrated Data Logging Sound Level Meter (NL-52 OF RION CO. Ltd. Make) during day time. Noise levels were measured for about one hour time in day time. Noise levels were measured in Decibels, 'A' weighted average, i.e. dB (A).

4.3 Results & Interpretations

Ambient noise levels were recorded during day time and the observed values were compared with standards prescribed by MoEFCC. The results of Noise levels recorded during day time on fortnightly basis are presented in tabular form along with the applicable standard permissible limits. The observed values in terms of L_{EQ} are presented. The observed values at all the monitoring locations are found to be within permissible limits.

 central mine planning and design institute limited Environment Laboratory, Regional Institute-II Ambient Noise Level Test Report CMPDI, RI-II KOYLA BHAWAN COMPLEX DHANBAD - 826005 Phone: 0326-223-850 email: rrii2-mndi@coalindia.in									
Month & Year	10/2022	Cluster	Cluster XII	Report No.	RI-II/WATER/2022-23/07				
Customer	Environment Department, Bharat Coking Coal Limited (BCCL), Koyla Bhawan, Dhanbad (E-mail: gmenv.bcd@coalindia.in)			Date of Issue	26.12.2022				
Project				CMPDI/RI-II/LPM 13					
Sampling Stations	i	Rudhi Basti	Sample Ref. No.	REM/BCCL/NOISE/2022/10/18	Sampling Method				
Sl. No.	Parameter	Hour / Time of day	Observed Values (in Leq dB(A))	Date of Sampling	Method of Analysis				
			First Fortnight	Observed Values (in Leq dB(A))	Range Of Testing				
			Second Fortnight		LDL				
1	Noise Level dB(A) Leq - Day	06:00 - 07:00	46.7	41.2	CPCB, Protocol for Ambient Level Noise Monitoring - 2015	35 dB-135 dB	35 dB(A)	Industrial Commercial Residential Silence	75 65 55 50
2		07:00 - 08:00	49.2	43.2					
3		08:00 - 09:00	51.6	44.5					
4		09:00 - 10:00	57.2	46.5					
5		10:00 - 11:00	58.6	51.5					
6		11:00 - 12:00	57.2	56.6					
7		12:00 - 13:00	60.0	53.4					
8		13:00 - 14:00	61.3	54.5					
9		14:00 - 15:00	55.9	56.6					
10		15:00 - 16:00	55.0	57.8					
11		16:00 - 17:00	54.5	58.5					
12		17:00 - 18:00	54.0	50.4					
13		18:00 - 19:00	50.1	48.2					
14		19:00 - 20:00	43.5	42.3					
15		20:00 - 21:00	43.5	41.5					
16		21:00 - 22:00	40.2	40.1					
		Leq Day	55.6	53.0					
1	Noise Level dB(A) Leq - Night	22:00 - 23:00	44.3	44.9	CPCB, Protocol for Ambient Level Noise Monitoring - 2015	35 dB-135 dB	35 dB(A)	Industrial Commercial Residential Silence	70 55 45 50
2		23:00 - 00:00	43.2	43.2					
3		00:00 - 01:00	41.9	42.7					
4		01:00 - 02:00	42.5	42.9					
5		02:00 - 03:00	43.0	42.0					
6		03:00 - 04:00	39.5	39.2					
7		04:00 - 05:00	39.0	39.0					
		Leq Night	42.0	42.2					

****All noise measurements are integrated for a 01 hour period, All units in dB(A) *LDL indicates Lower Detection Limit**

Sampling Assistants

ANALYSED BY

CHECKED BY

(Gaurav Kant)

Raj Mishra

HOD's Signature

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		CENTRAL MINE PLANNING AND DESIGN INSTITUTE LIMITED Environment Laboratory, Regional Institute-II Ambient Noise Level Test Report		CMPDIL, RI-II KOYLA BHAWAN COMPLEX DHANBAD - 826005 Phone:0326-223-850	
Month & Year	10/2022	Cluster	Cluster XII	Report No.	RI-II/NOISE/2022-23/07
Customer	Environment Department, Bharat Coking Coal Limited (BCCL), Koyla Bhawan, Dhanbad (E-mail: gmenv.bccd@coalindia.in)			Date of Issue	26.12.2022
Project	Sample Ref. No.			CMPDI/RI-II/LPM 13	
Sampling Stations	i	Block IV	Date of Sampling	09.10.22	21.10.22
Sl. No.	Parameter	Hour / Time of day	Observed Values (in Leq dB(A))	Method of Analysis	Range Of Testing
1	Noise Level dB(A)Leq - Day	06:00 - 07:00	51.9	CPCB, Protocol for Ambient Level Noise Monitoring - 2015	35 dB-135 dB
2		07:00 - 08:00	54.6		
3		08:00 - 09:00	57.2		
4		09:00 - 10:00	64.2		
5		10:00 - 11:00	65.1		
6		11:00 - 12:00	63.6		
7		12:00 - 13:00	66.6		
8		13:00 - 14:00	62.7		
9		14:00 - 15:00	65.8		
10		15:00 - 16:00	68.2		
11		16:00 - 17:00	60.5		
12		17:00 - 18:00	62.3		
13		18:00 - 19:00	59.1		
14		19:00 - 20:00	58.0		
15		20:00 - 21:00	56.4		
16		21:00 - 22:00	57.5		
1	Noise Level dB(A)Leq -Night	Leq Day	62.9	CPCB, Protocol for Ambient Level Noise Monitoring - 2015	35 dB-135 dB
2		22:00-23:00	46.1		
3		23:00- 00:00	45.4		
4		00:00- 01:00	45.6		
5		01:00-02:00	48.5		
6		02:00-03:00	45.4		
7		03:00-04:00	44.0		
8		04:00-05:00	38.7		
		05:00-06:00	38.4		
		Leq Night	45.1		
			42.9		
**All noise measurements are integrated for a 01 hour period, All units in dB(A) *LDL indicates Lower Detection Limit.					
Sampling Assistants ANALYSED BY  (Gaurav Kant)			CHECKED BY  (Amit Raj Mishra) HOD's Signature		
Note: The results above relate to the samples tested as received. This report can not be reproduced in part or full without the written permission of the HOD(Env), CMPDI, RI-II.					
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Page -1 of 1					
JOB NO. 200316028		Cluster – XII, BCCL		Environmental Monitoring Report	

Month & Year		10/2022		Cluster XII		REM/BCCL/NOISE/2022/10/17		Report No.		Date of Issue	
Customer		Environment Department, Bharat Coking Coal Limited (BCCL), Koyla Bhawan, Dhanbad (E-mail: gmenv.bcl@coalindia.in)		Sample Ref. No.		SAMPLING METHOD		CMPDI/RI-II/LPM 13		26.12.2022	
Project											
Sampling Stations		i		Moonidih UGP		Date of Sampling		Zone Category of Station:		Buffer Zone	
Sl. No.	Parameter	Hour / Time of day	Observed Values (in Leq dB(A))	Observed Values (in Leq dB(A))	Method of Analysis	Range Of Testing	LDL	NOISE POLLUTION (REGULATION AND CONTROL) RULES, 2000 Standards	Limits in dB		
1	Noise Level dB(A)Leq - Day	06:00 - 07:00	46.6	45.3	CPCB, Protocol for Ambient Level Noise Monitoring - 2015	35 dB-135 dB	35 dB(A)	Industrial Commercial Residential Silence	75 65 55 50		
2		07:00 - 08:00	48.3	47.7							
3		08:00 - 09:00	51.4	48.6							
4		09:00 - 10:00	57.0	55.5							
5		10:00 - 11:00	58.4	56.8							
6		11:00 - 12:00	59.0	61.0							
7		12:00 - 13:00	57.1	58.2							
8		13:00 - 14:00	58.8	57.8							
9		14:00 - 15:00	55.0	56.1							
10		15:00 - 16:00	54.5	53.0							
11		16:00 - 17:00	53.6	59.0							
12		17:00 - 18:00	52.5	51.2							
13		18:00 - 19:00	52.8	47.7							
14		19:00 - 20:00	52.0	52.1							
15		20:00 - 21:00	52.3	50.6							
16		21:00 - 22:00	51.6	50.1							
1	Noise Level dB(A)Leq - Night	Leq Day	55.1	55.4	CPCB, Protocol for Ambient Level Noise Monitoring - 2015	35 dB-135 dB	35 dB(A)	Industrial Commercial Residential Silence	70 55 45 50		
2		22:00-23:00	54.9	53.6							
3		23:00- 00:00	54.9	53.8							
4		00:00- 01:00	42.8	42.6							
5		01:00-02:00	40.8	42.0							
6		02:00-03:00	41.0	40.8							
7		03:00-04:00	40.5	40.2							
8		04:00-05:00	44.2	45.1							
		05:00-06:00	45.2	46.0							
		Leq Night	49.6	48.7							
Sampling Assistants ANALYSED BY <i>Gaurav Kant</i> (Gaurav Kant) CHECKED BY <i>Amit Raj Mishra</i> (Amit Raj Mishra) Note: The results above relate to the samples tested as received. This report can not be reproduced in part or full without the written permission of the HOD(Env), CMPDI, RI-II. **** End of Report ****											

 		CENTRAL MINE PLANNING AND DESIGN INSTITUTE LIMITED Environment Laboratory, Regional Institute-II Ambient Noise Level Test Report				CMPDIL, RI-II KOYLA BHAWAN COMPLEX DHANBAD - 826005 Phone: 0326-223-850 e-mail: rdt@cmpdi.coalindia.in			
Month & Year	10/2022	Cluster	Cluster XII		Report No.	RI-II/NOISE/2022-23/07			
Customer	Environment Department, Bharat Coking Coal Limited (BCCL), Koyla Bhawan, Dhanbad (E-mail: gmenv.bcl@coalindia.in)				Date of Issue	26.12.2022			
Project		Sample Ref. No.	REM/BCCL/NOISE/2022/10/19		CMPDI/RI-II/LPM 13				
Sampling Stations	i	Murlidih(20/21)	Date of Sampling	07.10.22	17.10.22	Zone Category of Station:			
Sl. No.	Parameter	Hour / Time of day	Observed Values (in Leq dB(A))	Method of Analysis	Range Of Testing	LDL	NOISE POLLUTION (REGULATION AND CONTROL) RULES, 2000 Standards		
1	Noise Level dB(A)Leq - Day	06:00 - 07:00	51.4	CPCB, Protocol for Ambient Level Noise Monitoring - 2015	35 dB-135 dB	35 dB(A)	Industrial Commercial Residential Silence		
2		07:00 - 08:00	55.1						
3		08:00 - 09:00	56.7						
4		09:00 - 10:00	62.9						
5		10:00 - 11:00	63.4						
6		11:00 - 12:00	62.9						
7		12:00 - 13:00	66.0						
8		13:00 - 14:00	66.2						
9		14:00 - 15:00	67.4						
10		15:00 - 16:00	60.4						
11		16:00 - 17:00	59.9						
12		17:00 - 18:00	59.4						
13		18:00 - 19:00	57.5						
14		19:00 - 20:00	57.4						
15		20:00 - 21:00	57.1						
16		21:00 - 22:00	56.9						
1	Noise Level dB(A)Leq - Night	Leq Day	62.1	CPCB, Protocol for Ambient Level Noise Monitoring - 2015	35 dB-135 dB	35 dB(A)	Industrial Commercial Residential Silence		
2		22:00-23:00	39.8						
3		23:00- 00:00	38.8						
4		00:00- 01:00	40.7						
5		01:00-02:00	35.1						
6		02:00-03:00	42.0						
7		03:00-04:00	40.8						
8		04:00-05:00	41.5						
		Leq Night	40.7						
Sampling Assistants ANALYSED BY  (Gaurav Kant) CHECKED BY  (Amit Raj Mishra) HOD's Signature									
Note: The results above relate to the samples tested as received. This report can not be reproduced in part or full without the written permission of the HOD(Env), CMPDI, RI-II.									
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Ambient Air Quality Standards for Jharia Coal Field
As per the Environment (Protection) Amendment Rules, 2000 notified vide notification G.S.R.
742(E), dated 25.9.2000.

Category	Pollutant	Time weighted average	Concentration in Ambient Air	Method of Measurement
1	2	3	4	5
III Coal mines located in the coal fields of • Jharia • Raniganj • Bokaro	Suspended Particulate Matter (SPM)	Annual Average * 24 hours **	500 $\mu\text{g}/\text{m}^3$ 700 $\mu\text{g}/\text{m}^3$	- High Volume Sampling (Average flow rate not less than 1.1
	Respirable Particulate Matter (size less than 10 μm) (RPM)	Annual Average * 24 hours **	250 $\mu\text{g}/\text{m}^3$ 300 $\mu\text{g}/\text{m}^3$	Respirable Particulate Matter sampling and analysis
	Sulphur Dioxide (SO_2)	Annual Average * 24 hours **	80 $\mu\text{g}/\text{m}^3$ 120 $\mu\text{g}/\text{m}^3$	1.Improvedwest and Gaeke method 2.Ultraviolet fluorescene
	Oxide of Nitrogen as NO_2	Annual Average * 24 hours **	80 $\mu\text{g}/\text{m}^3$ 120 $\mu\text{g}/\text{m}^3$	1. Jacob & Hochheiser Modified (Na-Arsenic) Method 2. Gas phase Chemilumine-scence

Note:

* Annual Arithmetic mean for the measurements taken in a year, following the guidelines for frequency of sampling laid down in clause 2.

** 24 hourly/8 hourly values shall be met 92% of the time in a year. However, 8% of the time it may exceed but not on two consecutive days.

NATIONAL AMBIENT AIR QUALITY STANDARDS

New Delhi the 18th November 2009

In exercise of the powers conferred by Sub-section (2) (h) of section 16 of the Air (Prevention and Control of Pollution) Act, 1981 (Act No. 14 of 1981), and in supersession of the notification No(s).S.O.384(E), dated 11th April 1994 and S.O.935(E), dated 14th NOVEMBER 1998, the Central Pollution Control Board hereby notify the National Ambient Air Quality Standards with immediate effect.

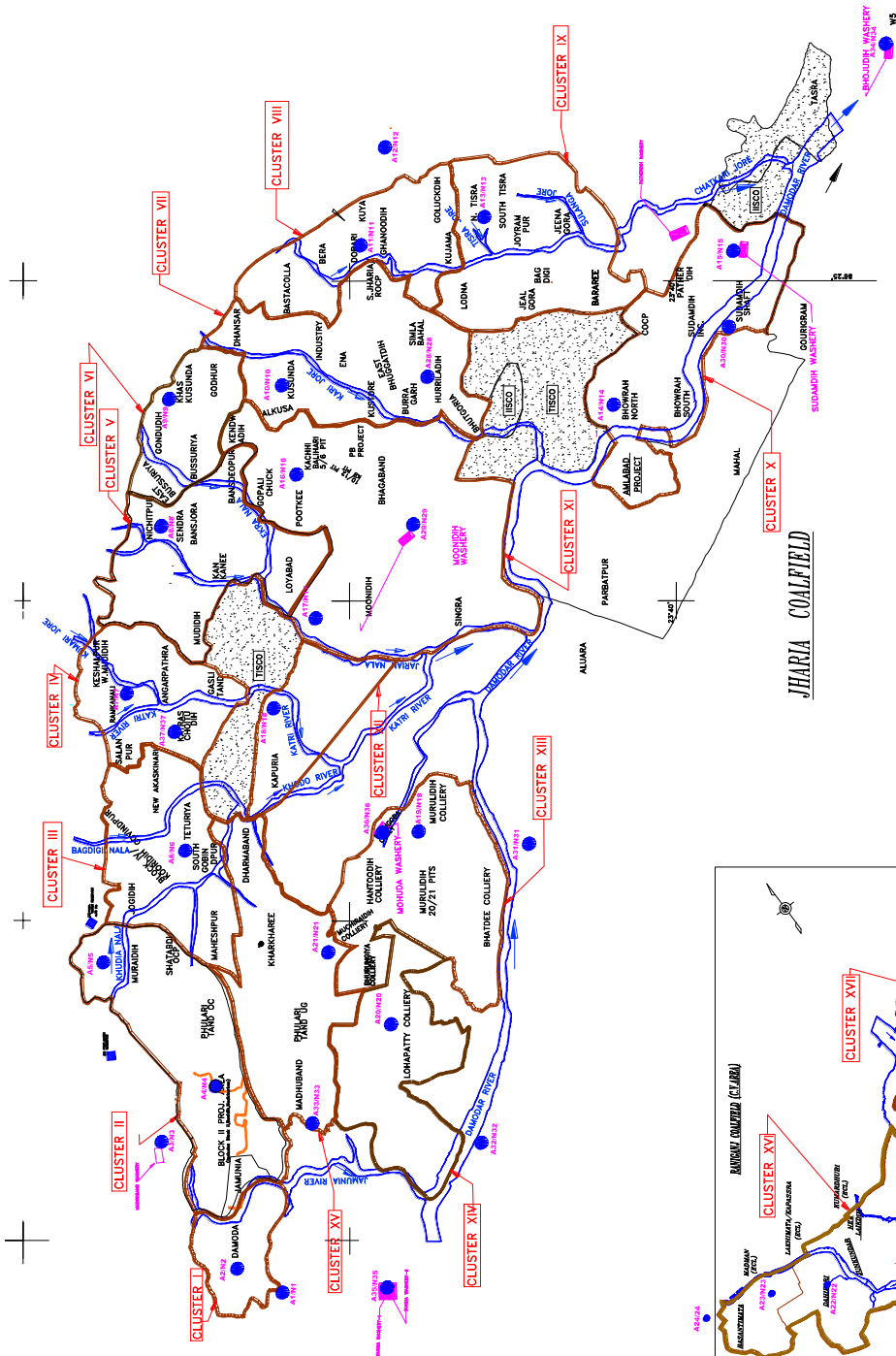
Pollutant	Time Weighted Average	Concentration in Ambient Air		Methods of Measurement
		Industrial, Residential, Rural and other Areas	Ecologically Sensitive Area (Notified by Central Government)	
Sulphur Dioxide (SO₂), µg/m³	Annual * 24 Hours **	50 80	20 80	-Improved West and Gaeke Method -Ultraviolet Fluorescence
Nitrogendioxide (NO₂), µg/m³	Annual * 24 Hours **	40 80	30 80	-Jacob &Hochheiser modified (NaOH-NaAsO ₂) Method -Gas Phase Chemiluminescence
Particulate Matter (Size less than 10µm) or PM₁₀, µg/m³	Annual * 24 Hours **	60 100	60 100	-Gravimetric -TEOM -Beta attenuation
Particulate Matter (Size less than 2.5µm) or PM_{2.5}, µg/m³	Annual * 24 Hours **	40 60	40 60	-Gravimetric -TEOM -Beta attenuation
Ozone (O₃) , µg/m³	8 Hours * 1 Hour **	100 180	100 180	-UV Photometric -Chemiluminescence -Chemical Method
Lead (Pb) , µg/m³	Annual * 24 Hours **	0.50 1.0	0.50 1.0	-AAS/ICP Method after sampling on EPM 2000 or equivalent filter paper -ED-XRF using Teflon filter
Carbon Monoxide (CO), mg/m³	8 Hours ** 1 Hour **	02 04	02 04	-Non dispersive Infrared (NDIR) Spectroscopy
Ammonia (NH₃), µg/m³	Annual * 24 Hours **	100 400	100 400	-Chemiluminescence -Indophenol blue method
Benzene (C₆H₆), µg/m³	Annual *	05	05	-Gas Chromatography (GC) based continuous analyzer -Adsorption and desorption followed by GC analysis
Benzo(a)Pyrene (BaP) Particulate phase only, ng/m³	Annual *	01	01	-Solvent extraction followed byHPLC/GC analysis
Arsenic (As), ng/m³	Annual *	06	06	-AAS/ICP Method after sampling on EPM 2000 or equivalent filter paper
Nickel (Ni), ng/m³	Annual *	20	20	-AAS/ICP Method after sampling on EPM 2000 or equivalent filter paper

* Annual Arithmetic mean of minimum 104 measurements in a year at a particular site taken twice a week 24 hourly at uniform intervals.

** 24 hourly or 8 hourly or 1 hourly monitored values, as applicable, shall be complied with 98% of the time in a year. 2% of the time, they JUNE exceed the limits but not on two consecutive days of monitoring.

NOTE:Whenever and wherever monitoring results on two consecutive days of monitoring exceed the limits specified above for the respective category, it shall be considered adequate reason to institute regular or continuous monitoring and further investigations.

Location of Air & Noise Monitoring Stations in BCCL



Sl. No.	Name of Station (Monitoring)
1	CLUSTER I
2	CLUSTER II
3	CLUSTER III
4	CLUSTER IV
5	CLUSTER V
6	CLUSTER VI
7	CLUSTER VII
8	CLUSTER VIII
9	CLUSTER IX
10	CLUSTER X
11	CLUSTER XI
12	CLUSTER XII
13	CLUSTER XIII
14	CLUSTER XIV
15	CLUSTER XV
16	CLUSTER XVI
17	CLUSTER XVII

Legend

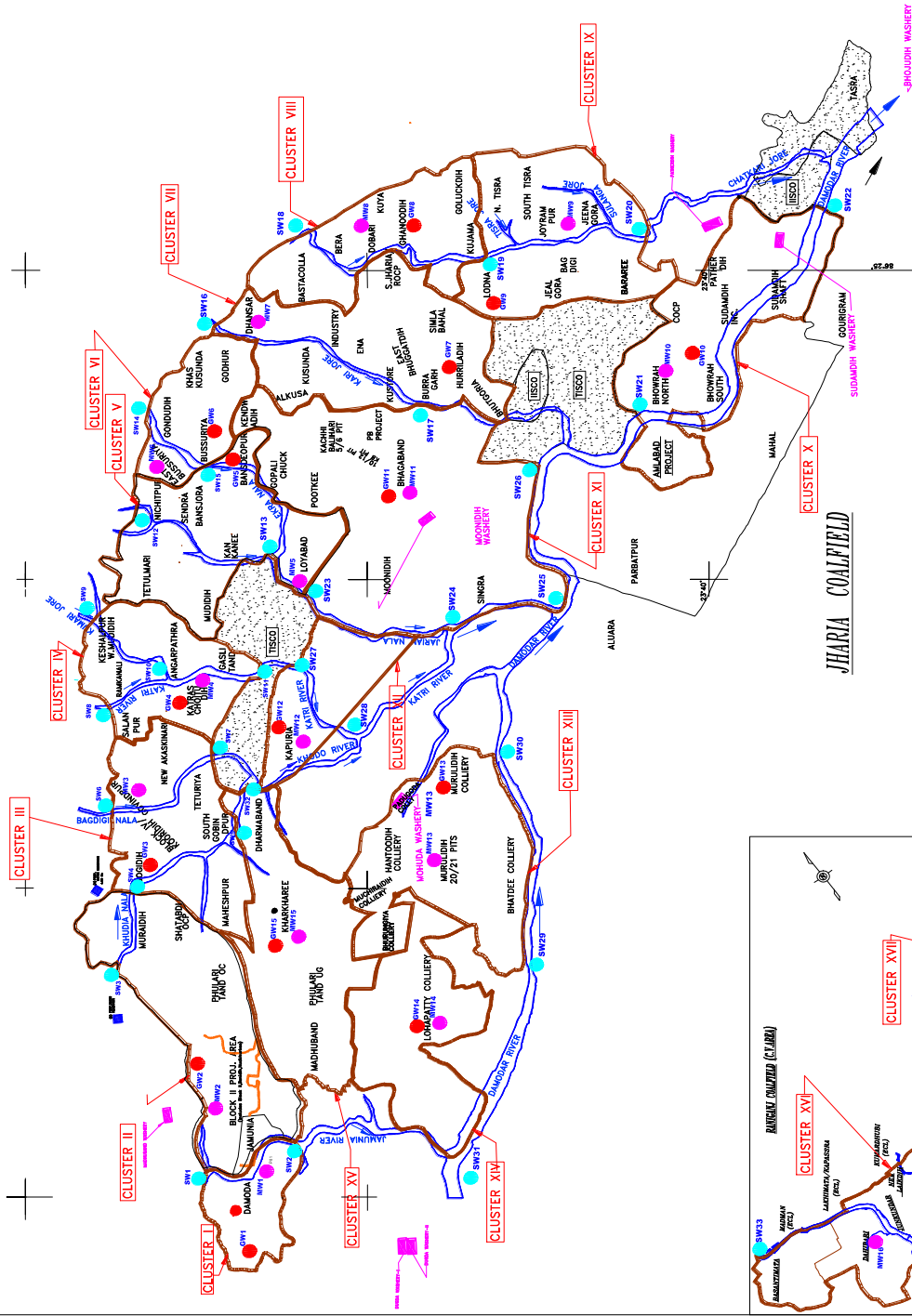
● Air/Noise Monitoring Station

Regional Office, Bhadrachalam
Jharkhand State Pollution Control Board
(Signature)

NAD (E-64)
Bharat Coalfield Co. Limited
(Signature)

Sl. No.	Name of Station (Monitoring)
1	CLUSTER I
2	CLUSTER II
3	CLUSTER III
4	CLUSTER IV
5	CLUSTER V
6	CLUSTER VI
7	CLUSTER VII
8	CLUSTER VIII
9	CLUSTER IX
10	CLUSTER X
11	CLUSTER XI
12	CLUSTER XII
13	CLUSTER XIII
14	CLUSTER XIV
15	CLUSTER XV
16	CLUSTER XVI
17	CLUSTER XVII

Water Sampling Locations in BCCL



INDEX

Cluster	Surface Water	Name of River/Inlet	Name of Colliery	Name of Sampling Location	Ground Water	Name of Sampling Location
I	SW1, SW2	Kunda River	Bara	SW1	Bara	Bara
II	SW3, SW4	Kunda River	Bara	SW2	Bara	Bara
III	SW5, SW6	Kunda River	Bara	SW3	Bara	Bara
IV	SW7, SW8	Kunda River	Bara	SW4	Bara	Bara
V	SW9, SW10	Kunda River	Bara	SW5	Bara	Bara
VI	SW11, SW12	Kunda River	Bara	SW6	Bara	Bara
VII	SW13, SW14	Kunda River	Bara	SW7	Bara	Bara
VIII	SW15, SW16	Kunda River	Bara	SW8	Bara	Bara
IX	SW17, SW18	Kunda River	Bara	SW9	Bara	Bara
X	SW19, SW20	Kunda River	Bara	SW10	Bara	Bara
XI	SW21, SW22	Kunda River	Bara	SW11	Bara	Bara
XII	SW23, SW24	Kunda River	Bara	SW12	Bara	Bara
XIII	SW25, SW26	Kunda River	Bara	SW13	Bara	Bara
XIV	SW27, SW28	Kunda River	Bara	SW14	Bara	Bara
XV	SW29, SW30	Kunda River	Bara	SW15	Bara	Bara
XVI	SW31, SW32	Kunda River	Bara	SW16	Bara	Bara
XVII	SW33, SW34	Kunda River	Bara	SW17	Bara	Bara

- Legend
- Sampling Locations of Surface Water (Upstream/ Downstream)
 - Sampling Locations of Mine Water
 - Sampling Locations of Ground/ Drinking Water

Regional Officer, Dhanbad
Jharkhand State Pollution Control Board
(Signature)

Head (Envt.)
Bharat Coking Coal Limited
(Signature)

Signature

Signature

Signature

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The information given in this report is not to be communicated either directly or indirectly to the press or to any person not holding an official position in the CIL /GOVERNMENT.

**ENVIRONMENTAL MONITORING REPORT
OF
BHARAT COKING COAL LIMITED,
CLUSTER – XII**

(FOR THE MONTH NOVEMBER, 2022)

E. C. no. J-11015/184/2012-IA.II (M) dated 10.12.2014.



CMPDI

ISO 9001 Company
**Regional Institute-II
Dhanbad, Jharkhand**

CONTENTS

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EXECUTIVE SUMMARY

1.0 Introduction

The purpose of environmental monitoring is to assess the quality of various attributes that affects the fauna and flora. In accordance with the quality of these attributes appropriate strategy is to be developed to control the pollution level within the permissible limits. The three major attributes are air, water and noise level.

Bharat Coking Coal Limited (BCCL), a Subsidiary company of Coal India Limited is operating Underground and Opencast Mines in Jharia Coalfield (JCF) is a part of Gondwana Coalfields located in Dhanbad district of Jharkhand, the JCF is bounded by 23°37' N to 23°52' N latitudes and 86°09' E to 86°30' E longitude occupying an area of 450 Sq.km. BCCL has awarded Environmental monitoring work of Jharia Coalfield (JCF) to Central Mine Planning & Design Institute Limited (CMPDIL). The environmental monitoring has been carried out as per the conditions laid down by the MoEF&CC while granting environmental clearance of project, consent letter issued by the respective SPCB, and other statutory requirements.

2.0 Sampling location and rationale

2.1 Ambient air sampling locations

The ambient air quality monitoring stations were selected to represent core, buffer zone area. The rationale has been based on the guidelines stipulated by MoEF&CC, consent letter of SPCB, as well as other statutory requirements.

2.2 Water sampling stations

The Water sampling stations were selected for mine sump water.

2.3 Noise level monitoring locations

Noise levels vary depending on the various activities in mining areas. The monitoring of noise level in different locations will be helpful to take appropriate mitigating measures. The rationale has been based on the guidelines stipulated by MoEF&CC, consent letter of SPCB, as well as other statutory requirements.

3.0 Methodology of sampling and analysis

3.1 Ambient air quality

Parameters chosen for assessment of ambient air quality were Particulate Matter (PM₁₀), Fine Particulate Matter (PM_{2.5}), Sulphur Di-oxide (SO₂)

and Nitrogen Oxides (NO_x). Respirable Dust Samplers (RDS) and Fine Dust Sampler (PM_{2.5} sampler) were used for sampling of PM₁₀, SO₂, & NO_x and Fine Dust Sampler (PM_{2.5} sampler) were used for sampling of PM_{2.5} at 24 hours interval once in a fortnight and the same for the gaseous pollutants. The samples were analysed in Environmental Laboratory of CMPDI, RI-II, Dhanbad.

3.2 Water quality

Water samples were collected as per standard practice. The Mine effluent samples were collected and analyzed for four parameters on fortnightly basis. Thereafter the samples were preserved and analyzed at the Environmental Laboratory of CMPDI, RI- II, Dhanbad.

3.3 Noise level monitoring

Noise level measurements in form of 'LEQ' were taken using Integrated Data Logging Sound Level Meter. Noise levels were measured in Decibels, 'A' weighted average, i.e. dB(A).

4.0 Results and interpretations

4.1 Air quality

It has been seen from the analysis results that the 24 hours average concentration parameters like PM₁₀, PM_{2.5}, SO₂ and NO_x are mostly within the permissible limits in all sampling locations as per MoEF&CC Gazette Notification No. GSR 742(E) dt 25.09.2000 Standards for Coal Mines and National Ambient Air Quality Standard -2009. Sometimes the concentration of PM₁₀& PM_{2.5} exceeds the limits due to heavy public traffic, poor road condition, coke oven plants, burning of coal by surrounding habitants, brick making, municipal waste dumps and industries like Steel Plant, thermal Plants including their fly ash etc.

The following preventive and suppressive mitigative measures can be undertaken to contain the pollution level within prescribed level:-

- Wet drilling and controlled blasting should be practice.
- Explosive used should be optimised to restrict the dust generation.
- Transportation roads should be permanently asphalted free of ruts, potholes etc.
- Water should be sprayed on coal transportation road, service road more frequently and at regular interval.
- Dust from roads should be removed physically or mechanically.
- Greenbelts around industrial sites, service building area besides Avenue plantation along roads should be created.
- Coal dust should be suppressed by using fixed sprinklers.
- Regular maintenance of plant and machinery should be undertaken.

4.2 Water quality

The test results indicate that the major parameters compared with MoEF&CC Gazette Notification No. GSR 742(E) dt 25.09.2000

4.3 Noise Level

During the noise level survey it has been observed that the noise level in the sampling locations is within the permissible limits prescribed as per MoEF&CC Gazette Notification No. GSR 742(E) dt 25.09.2000 Standards for Coal Mines for Industrial Area and Noise pollution (Regulation and Control) Rules, 2000.

INTRODUCTION

1.0 Any industry and development activities including coal mining is bound to affect environmental attributes. There are positive as well as negative impacts of such operations. For controlling the adverse impacts a regular monitoring is essential. The environmental monitoring is being done as per the guide-lines stipulated by Ministry of Environment, Forest and Climate Change (MoEF&CC), Govt. of India.

The very purpose of environmental monitoring is to assess the quality of various attributes which affects the environment. As per quality of these attributes appropriate strategy is to be developed to control the pollution level within the permissible limits. The three major attributes are air, water and noise level.

Bharat Coking Coal has awarded Environmental Monitoring work of all Projects, Cluster wise, to Central Mine Planning & Design Institute Limited (CMPDIL). The environmental monitoring has been carried out as per conditions laid down by MoEF&CC while granting environmental clearance to different projects. CMPDI has trained manpower and well equipped laboratory to carry out monitoring, analysis and R&D work in the field of environment.

1.1 The Cluster XII is in the Central part of the Jharia coalfield. It includes Kapuria UG Mine. The cluster – XII is situated about 30 - 35 kms from Dhanbad Railway Station. The mines of this cluster - XII are operating since pre nationalization period (prior to 1972-73). It is connected by both Railway and Road. The drainage of the area is governed by Katri River.

1.2 The cluster XII is designed to produce 2.4 Mtpa (normative) and 3.12 Mtpa peak capacity of coal. The average grade of coal W-II to W-IV.

The Project has Environmental Clearance from Ministry of Environment, Forests and Climate Change (MoEF&CC) for a rated capacity of 2.4 MTPA (normative) and 3.12 MTPA peak capacity of coal production vide letter no E.C. no. J-11015/184/2012-IA.II (M) dated 10.12.2014.

Ministry of Environment, Forest and Climate Change while granting environmental clearance has given one of the General conditions that “ Four ambient air quality monitoring stations should be established in the core zone as well as in the buffer zone for PM₁₀, PM_{2.5}, SO₂, NO_x monitoring. Location of the stations should be decided based on the meteorological data, topographical features and environmentally and ecologically sensitive targets, other conditions regarding water / effluent and noise level monitoring in consultation with the State Pollution Control Board.”

In compliance of these conditions the Environmental Monitoring has been carried out & report prepared for submission to MoEF&CC & JSPCB and other statutory authorities.

AMBIENT AIR QUALITY MONITORING

2.1 Location of sampling station and their rationale:

(As per G.S.R. 742 (E) dt. 25th December, 2000)

2.1.1 Ambient Air Quality Sampling Locations

I. CORE ZONE Monitoring Location

i) Rudhi basti (A18): Industrial Area

The location of the sampling station is 23° 45' 26.60" N & 86° 18' 39.90" E. The samplers were placed at a height of approx. 1.5m above ground level at Rudhi basti.

II. BUFFER ZONE Monitoring Location

i) Block IV (A6) : Industrial area

The location of the sampling station is 23° 47' 54.00" N & 86° 16' 20.00" E. The samplers were placed at a height of approx. 1.5m above ground level at Safety Office.

ii) Moonidih UGP (A17) : Industrial area

The location of the sampling station is 23° 44' 30.00" N & 86° 20' 56.00" E. The samplers were placed at a height of approx. 1.5m above ground level at project office.

iii) Murlidih 20/21 Pit(A19): Industrial Area

The location of the sampling station is 23° 43' 51.82" N & 86° 16' 21.87" E. The samplers were placed at a height of approx. 1.5m above ground level at project office.

AMBIENT AIR QUALITY DATA



cmpdi
A Mini Ratna Company

CENTRAL MINE PLANNING AND DESIGN INSTITUTE LIMITED
Environment Laboratory, Regional Institute-II
Ambient Air Quality Test Report

CMPDIL, RI-II
KOYLA BHAWAN COMPLEX
DHANBAD. - 826005
Phone:0326-223-850
email: rdri2cmpdi@coalindia.in

Test Report for Ambient Air Samples

Month & Year	11/2022	Cluster	Cluster XII	Report No.	RI-II/AIR/2022-23/08
Customer	Environment Department, Bharat Coking Coal Limited (BCCL), Koyla Bhawan, Dhanbad (E-mail: gmenv.bccl@coalindia.in)			Date of Issue	22.02.2023
Project	Sample Ref. No.			CMPDI/RI-II/LPM 13.1 (IS 5182)	
Sampling Stations	i	Rudhi Basti	Date of Sampling	Zone of Station:	Core Zone
Sl. No.	Method Analysis	Observed Values (in $\mu\text{g}/\text{m}^3$)		MoEF Standards Notification dated 25th September, 2000 (GSR 742 E)	NAAQS, 2009
		1st FN	2nd FN		
1	PM ₁₀	94	96	10 $\mu\text{g}/\text{m}^3$ - 1000 $\mu\text{g}/\text{m}^3$	300
2	PM _{2.5}	51	52	10 $\mu\text{g}/\text{m}^3$ - 400 $\mu\text{g}/\text{m}^3$	Not Specified
3	SO ₂	12	10	10 $\mu\text{g}/\text{m}^3$ - 1050 $\mu\text{g}/\text{m}^3$	120
4	NO ₂	13	16	06 $\mu\text{g}/\text{m}^3$ - 420 $\mu\text{g}/\text{m}^3$	120

* LDL indicates Lower Detection Limit,
** All units are in $\mu\text{g}/\text{m}^3$, 24 hourly Average,

[Signature]
ANALYSED BY

[Signature]
(Gaurav Kant)
CHECKED BY

[Signature]
(Amit Raj Mishra)
HOD's Signature

Note: The results above relate to the samples tested as received. This report can not be reproduced in part or full without the written permission of the HOD(Env) , CMPDI, RI-II.

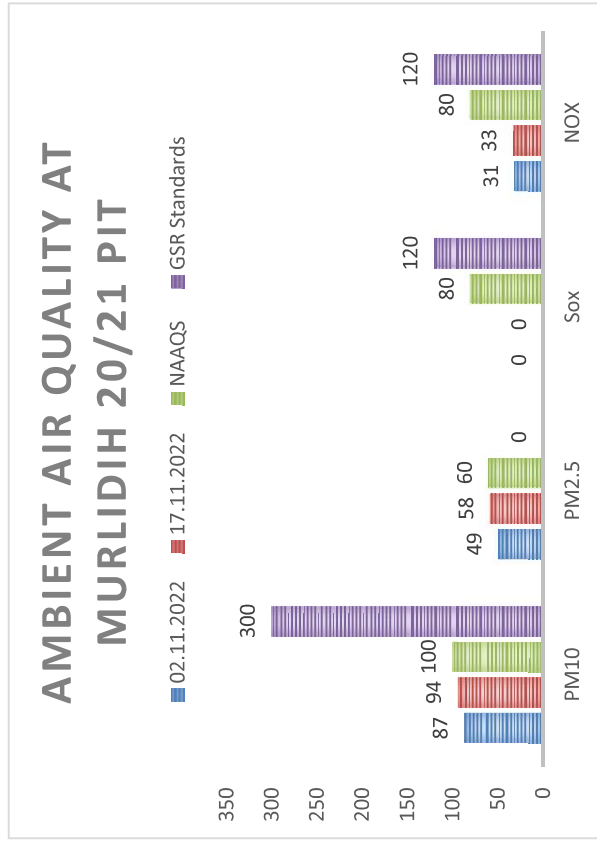
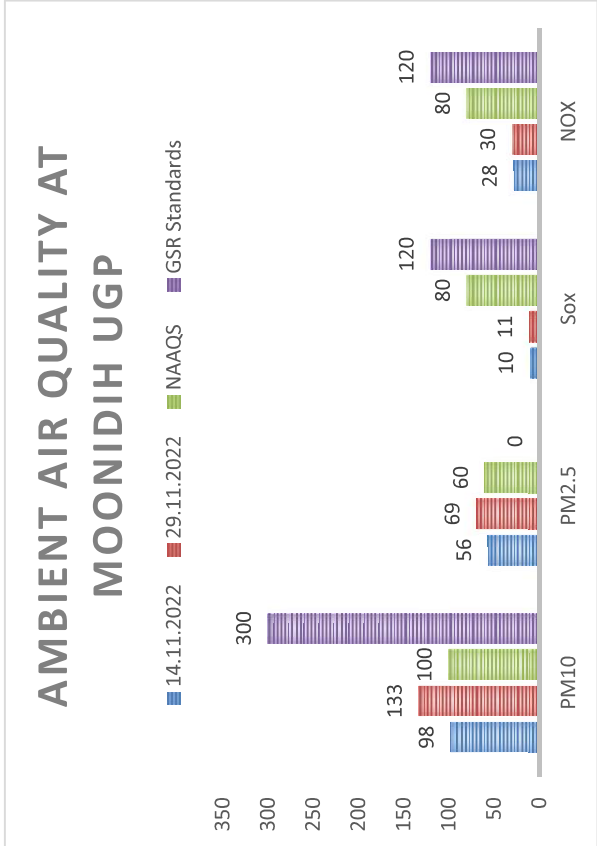
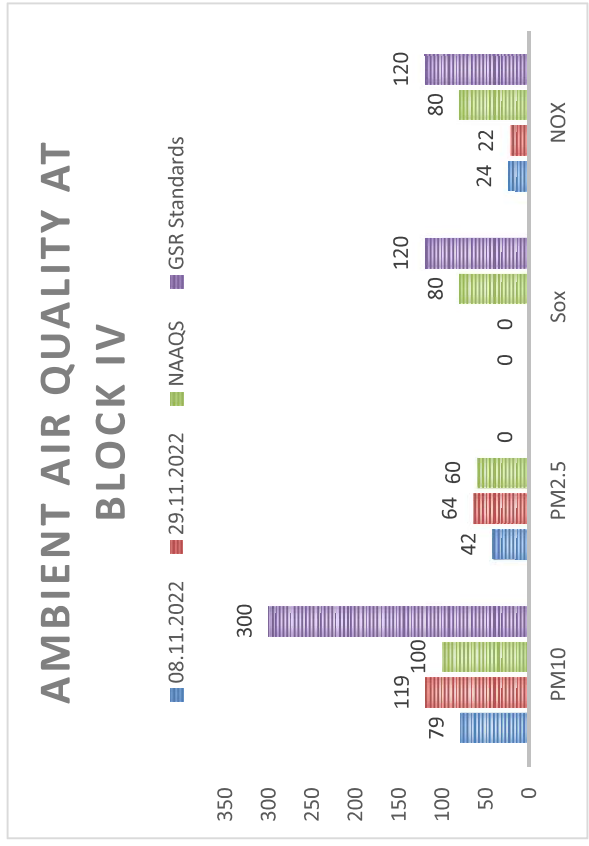
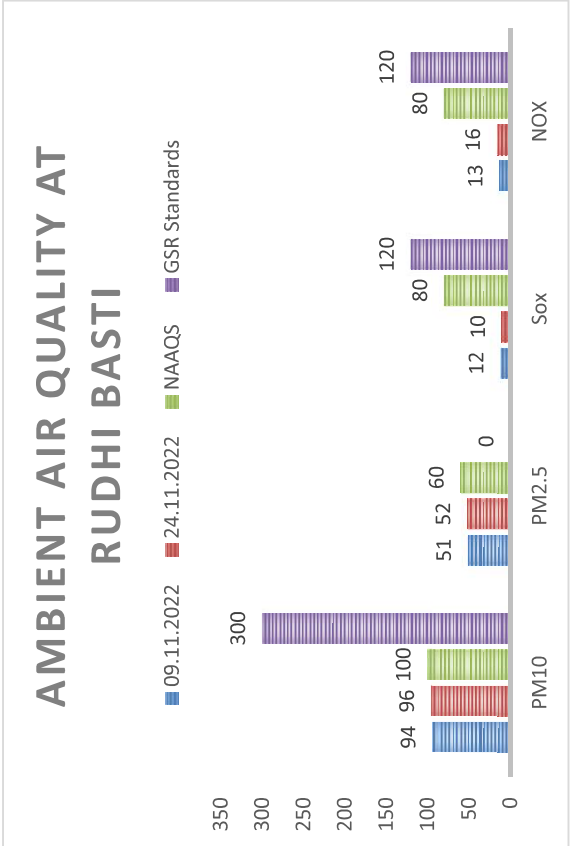
----- End of Report -----

Page -1 of 1

  		CENTRAL MINE PLANNING AND DESIGN INSTITUTE LIMITED Environment Laboratory, Regional Institute-II Ambient Air Quality Test Report		CMPDIL, RI-II KOYLA BHAWAN COMPLEX DHANBAD. - 826005 Phone:0326-223-850 email: rdri2cmpdi@coalindia.in	
Test Report for Ambient Air Samples					
Month & Year	11/2022	Cluster	Cluster XII	Report No.	RI-II/AIR/2022-23/08
Customer	Environment Department, Bharat Coking Coal Limited (BCCL), Koyla Bhawan, Dhanbad (E-mail: gmenv.bccl@coalindia.in)			Date of Issue	22.02.2023
Project	Sample Ref. No.	REM/BCCL/2022/06	Sampling Method	CMPDI/RI-II/LPM 13, (IS 5182)	
Sampling Stations	i	Block IV	Date of Sampling	Zone of Station: Buffer Zone	
Sl. No.	Method of Analysis	Observed Values (in µg/m³)		MoEF Standards Notification dated 25th September, 2000 (GSR 742 E)	NAAQS, 2009
		1st FN	2nd FN		
1	IS -5182(Part 23):2006, R-2017	79	119	10 µg/m³ - 1000 µg/m³	100
2	IS -5182(Part 24):2019	42	64	10 µg/m³ - 400 µg/m³	60
3	IS-5182(Part-2): 2001, R-2017	<10	<10	10 µg/m³ - 1050 µg/m³	80
4	IS-5182 (Part-6): 2006, R-2017	24	22	06 µg/m³ - 420 µg/m³	80
* LDl indicates Lower Detection Limit,					
**All units are in µg/m³, 24 hourly Average,					
 ANALYSED BY (Gaurav Kant) CHECKED BY		 (Amit Raj Mishra) HOD's Signature			
Note: The results above relate to the samples tested as received. This report can not be reproduced in part or full without the written permission of the HOD(Env) , CMPDI, RI-II.					
---- End of Report ---- Page -1 of 1					
JOB NO. 200316028		Cluster – XII, BCCL Environmental Monitoring Report			

  		CENTRAL MINE PLANNING AND DESIGN INSTITUTE LIMITED Environment Laboratory, Regional Institute-II Ambient Air Quality Test Report		CMPDIL, RI-II KOYLA BHAWAN COMPLEX DHANBAD. - 826005 Phone: 0326-223-850 email: rdri2cmpdi@coalindia.in	
Test Report for Ambient Air Samples					
Month & Year	11/2022	Cluster	Cluster XII	Report No.	RI-II/AIR/2022-23/08
Customer	Environment Department, Bharat Coking Coal Limited (BCCL), Koyla Bhawan, Dhanbad (E-mail: gmenv.bccl@coalindia.in)			Date of Issue	22.02.2023
Project		Sample Ref. No.	REM/BCCL/2022/17	CMPDI/RI-II/LPM 13, (IS 5182)	
Sampling Stations	i	Moonidih UGP	Date of Sampling	29.11.22	Zone of Station: Buffer Zone
Sl. No.	Method of Analysis	Observed Values (in $\mu\text{g}/\text{m}^3$)		Range Of Testing	MoEF Standards Notification dated 25th September, 2000 (GSR 742 E)
		1st FN	2nd FN		NAAQS, 2009
1	IS -5182(Part 23):2006, R-2017	98	133	10 $\mu\text{g}/\text{m}^3$ - 1000 $\mu\text{g}/\text{m}^3$	300
2	IS -5182(Part 24):2019	56	69	10 $\mu\text{g}/\text{m}^3$ - 400 $\mu\text{g}/\text{m}^3$	Not Specified
3	IS-5182(Part-2): 2001, R-2017	10	11	10 $\mu\text{g}/\text{m}^3$ - 1050 $\mu\text{g}/\text{m}^3$	120
4	IS-5182 (Part-6): 2006, R-2017	28	30	06 $\mu\text{g}/\text{m}^3$ - 420 $\mu\text{g}/\text{m}^3$	120
* LDL indicates Lower Detection Limit, ** All units are in $\mu\text{g}/\text{m}^3$, 24 hourly Average,					
 ANALYSED BY (Gaurav Kant) CHECKED BY		 (Amit Raj Mishra) HOD's Signature			
Note: The results above relate to the samples tested as received. This report can not be reproduced in part or full without the written permission of the HOD(Env), CMPDI, RI-II.					
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Page -1 of 1					

  		CENTRAL MINE PLANNING AND DESIGN INSTITUTE LIMITED Environment Laboratory, Regional Institute-II Ambient Air Quality Test Report		CMPDIL, RI-II KOYLA BHAWAN COMPLEX DHANBAD. - 826005 Phone:0326-223-850 email: rdri2cmpdi@coalindia.in	
Test Report for Ambient Air Samples					
Month & Year	11/2022	Cluster	Cluster XII	Report No.	RI-II/AIR/2022-23/08
Customer	Environment Department, Bharat Coking Coal Limited (BCCL), Koyla Bhawan, Dhanbad (E-mail: gmenv.bccl@coalindia.in)			Date of Issue	22.02.2023
Project		Sample Ref. No.	REM/BCCL/2022/19	CMPDIL/RI-II/LPM 13, (IS 5182)	
Sampling Stations	i	Murlidih 20/21 Pit	Date of Sampling	02.11.22	17.11.22
SL. No.	Method of Analysis	Observed Values (in $\mu\text{g}/\text{m}^3$)		Range Of Testing	LDL
		1st FN	2nd FN		
1	IS -5182(Part 23):2006, R-2017	87	94	10 $\mu\text{g}/\text{m}^3$ - 1000 $\mu\text{g}/\text{m}^3$	10 $\mu\text{g}/\text{m}^3$
2	IS -5182(Part 24):2019	49	58	10 $\mu\text{g}/\text{m}^3$ - 400 $\mu\text{g}/\text{m}^3$	10 $\mu\text{g}/\text{m}^3$
3	IS-5182(Part-2): 2001, R-2017	<10	<10	10 $\mu\text{g}/\text{m}^3$ - 1050 $\mu\text{g}/\text{m}^3$	120
4	IS-5182 (Part-6): 2006 , R-2017	31	33	06 $\mu\text{g}/\text{m}^3$ - 420 $\mu\text{g}/\text{m}^3$	120
* LDL indicates Lower Detection Limit, ** All units are in $\mu\text{g}/\text{m}^3$, 24 hourly Average,					
 ANALYSED BY (Gaurav Kant) CHECKED BY		 (Amit Raj Mishra) HOD's Signature			
Note: The results above relate to the samples tested as received. This report can not be reproduced in part or full without the written permission of the HOD(Env) , CMPDIL, RI-II.					
----- End of Report -----					
Page -1 of 1					



NOISE LEVEL QUALITY MONITORING

4.1 Location of sampling sites

- i) **Rudhi basti (N18)**
- ii) **Block IV(N6)**
- iii) **Moonidih UGP(N17)**
- iv) **Murlidih 20/21 (N19)**

4.2 Methodology of sampling and analysis

Noise level measurements in form of ' L_{EQ} ' were taken using Integrated Data Logging Sound Level Meter (NL-52 OF RION CO. Ltd. Make) during day time. Noise levels were measured for about one hour time in day time. Noise levels were measured in Decibels, 'A' weighted average, i.e. dB (A).

4.3 Results & Interpretations

Ambient noise levels were recorded during day time and the observed values were compared with standards prescribed by MoEFCC. The results of Noise levels recorded during day time on fortnightly basis are presented in tabular form along with the applicable standard permissible limits. The observed values in terms of L_{EQ} are presented. The observed values at all the monitoring locations are found to be within permissible limits.

TC-10122									
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 		CENTRAL MINE PLANNING AND DESIGN INSTITUTE LIMITED Environment Laboratory, Regional Institute-II Ambient Noise Level Test Report				CMPDI, RI-II KOYLA BHAWAN COMPLEX DHANBAD - 826005 Phone: 0326-223-850 email: rdri2cmpdi@coalindia.in			
Month & Year	11/2022	Cluster	Cluster XII		Report No.	RI-II/NOISE/2022-23/08		22.02.2023	
Customer	Environment Department, Bharat Coking Coal Limited (BCCL), Koyla Bhawan, Dhanbad (E-mail: gmenv.bcl@coalindia.in)				Date of Issue	CMPDI/RI-II/LPM 13			
Project	Sample Ref. No.				Sampling Method	REM/BCCL/2022/17			
Sampling Stations	i	Moonidih UGP	Date of Sampling		14.11.22	29.11.22	Zone Category of Station:	Buffer Zone	
Sl. No.	Parameter	Hour / Time of day	Observed Values (in Leq dB(A))	Observed Values (in Leq dB(A))	Method of Analysis	Range Of Testing	LDL	NOISE POLLUTION (REGULATION AND CONTROL) RULES, 2000 Standards	
			First Fortnight	Second Fortnight				Zones	
								Limits in dB	
1	Noise Level dB(A)Leq - Day	06:00 - 07:00	51.2	52.0	CPCB, Protocol for Ambient Level Noise Monitoring - 2015	35 dB-135 dB	35 dB(A)	Industrial Commercial Residential Silence	
2		07:00 - 08:00	46.8	47.7					
3		08:00 - 09:00	54.5	56.1					
4		09:00 - 10:00	52.5	50.0					
5		10:00 - 11:00	55.6	54.6					
6		11:00 - 12:00	59.0	59.8					
7		12:00 - 13:00	57.1	56.8					
8		13:00 - 14:00	58.8	57.8					
9		14:00 - 15:00	55.0	54.6					
10		15:00 - 16:00	53.3	52.6					
11		16:00 - 17:00	52.8	53					
12		17:00 - 18:00	52.3	53					
13		18:00 - 19:00	51.6	52					
14		19:00 - 20:00	52.1	51.9					
15		20:00 - 21:00	50.6	50.4					
16		21:00 - 22:00	50.1	50.3					
1	Noise Level dB(A)Leq - Night	Leq Day	54.5	54.4	CPCB, Protocol for Ambient Level Noise Monitoring - 2015	35 dB-135 dB	35 dB(A)	Industrial Commercial Residential Silence	
2		22:00-23:00	51.9	52.3					
3		23:00- 00:00	52.5	52.0					
4		00:00- 01:00	52.3	51.8					
5		01:00-02:00	51.9	51.2					
6		02:00-03:00	50.9	51.0					
7		03:00-04:00	51.5	52.6					
8		04:00-05:00	52.6	52.9					
		Leq Night	49.1	49.2					
Sampling Assistants ANALYSED BY  (Gaurav Kant) CHECKED BY  (Amit Raj Mishra) HOD's Signature Note: The results above relate to the samples tested as received. This report can not be reproduced in part or full without the written permission of the HOD(Env), CMPDI, RI-II. **All noise measurements are integrated for a 01 hour period, All units in dB(A) *LDL indicates Lower Detection Limit									
JOB NO. 200316028 Cluster – XII, BCCL Environmental Monitoring Report Page -1 of 1									

 		CENTRAL MINE PLANNING AND DESIGN INSTITUTE LIMITED Environment Laboratory, Regional Institute-II Ambient Noise Level Test Report				CMPDIL, RI-II KOYLA BHAWAN COMPLEX DHANBAD - 826005 Phone: 0326-223-850 e-mail: rdt@cmpdi.coalindia.in			
Month & Year	11/2022	Cluster	Cluster XII		Report No.	RI-II/NOISE/2022-23/08			
Customer	Environment Department, Bharat Coking Coal Limited (BCCL), Koyla Bhawan, Dhanbad (E-mail: gmenv.bcl@coalindia.in)				Date of Issue	22.02.2023			
Project	Sample Ref. No.				CMPDI/RI-II/LPM 13				
Sampling Stations	i	Murlidih(20/21)	Date of Sampling	02.11.22	17.11.22	Zone Category of Station:	Buffer Zone		
								Method of Analysis	Range Of Testing
Sl. No.	Parameter	Hour / Time of day	Observed Values (in Leq dB(A))	Observed Values (in Leq dB(A))	Second Fortnight	Method of Analysis	Range Of Testing		
1	Noise Level dB(A)Leq - Day	06:00 - 07:00	55.6	56.6	CPCB, Protocol for Ambient Level Noise Monitoring - 2015	35 dB-135 dB	35 dB(A)		
2		07:00 - 08:00	58.4	59.0					
3		08:00 - 09:00	39.8	37.2					
4		09:00 - 10:00	42.0	39.3					
5		10:00 - 11:00	41.4	40.7					
6		11:00 - 12:00	37.8	36.1					
7		12:00 - 13:00	42.0	41.8					
8		13:00 - 14:00	44.5	46.5					
9		14:00 - 15:00	52.6	53.1					
10		15:00 - 16:00	64.5	67.1					
11		16:00 - 17:00	43.9	44.0					
12		17:00 - 18:00	43.1	43.7					
13		18:00 - 19:00	53.2	53.8					
14		19:00 - 20:00	68.1	67.9					
15		20:00 - 21:00	50.1	50.7					
16		21:00 - 22:00	50.2	50.1					
1	Noise Level dB(A)Leq - Night	Leq Day	58.4	59.2	CPCB, Protocol for Ambient Level Noise Monitoring - 2015	35 dB-135 dB	35 dB(A)		
2		22:00-23:00	38.9	39.1					
3		23:00- 00:00	38.5	39.0					
4		00:00- 01:00	38.2	38.7					
5		01:00-02:00	38.1	38.6					
6		02:00-03:00	38.0	38.2					
7		03:00-04:00	38.5	38.0					
8		04:00-05:00	38.7	38.5					
		Leq Night	35.5	35.6					
Sampling Assistants ANALYSED BY  (Gaurav Kant) CHECKED BY  (Amit Raj Mishra) HOD's Signature									
Note: The results above relate to the samples tested as received. This report can not be reproduced in part or full without the written permission of the HOD(Env), CMPDI, RI-II.									
---- End of Report ---- Page - 1 of 1									

Ambient Air Quality Standards for Jharia Coal Field
As per the Environment (Protection) Amendment Rules, 2000 notified vide notification G.S.R.
742(E), dated 25.9.2000.

Category	Pollutant	Time weighted average	Concentration in Ambient Air	Method of Measurement
1	2	3	4	5
III Coal mines located in the coal fields of • Jharia • Raniganj • Bokaro	Suspended Particulate Matter (SPM)	Annual Average * 24 hours **	500 $\mu\text{g}/\text{m}^3$ 700 $\mu\text{g}/\text{m}^3$	- High Volume Sampling (Average flow rate not less than 1.1
	Respirable Particulate Matter (size less than 10 μm) (RPM)	Annual Average * 24 hours **	250 $\mu\text{g}/\text{m}^3$ 300 $\mu\text{g}/\text{m}^3$	Respirable Particulate Matter sampling and analysis
	Sulphur Dioxide (SO_2)	Annual Average * 24 hours **	80 $\mu\text{g}/\text{m}^3$ 120 $\mu\text{g}/\text{m}^3$	1.Improvedwest and Gaeke method 2.Ultraviolet fluorescene
	Oxide of Nitrogen as NO_2	Annual Average * 24 hours **	80 $\mu\text{g}/\text{m}^3$ 120 $\mu\text{g}/\text{m}^3$	1. Jacob & Hochheiser Modified (Na-Arsenic) Method 2. Gas phase Chemilumine-scence

Note:

* Annual Arithmetic mean for the measurements taken in a year, following the guidelines for frequency of sampling laid down in clause2.

** 24hourly/8hourlyvaluesshallbemet 92%ofthetimeinayear.However,8% of the time it may exceed but not on two consecutive days.

NATIONAL AMBIENT AIR QUALITY STANDARDS

New Delhi the 18th November 2009

In exercise of the powers conferred by Sub-section (2) (h) of section 16 of the Air (Prevention and Control of Pollution) Act, 1981 (Act No. 14 of 1981), and in supersession of the notification No(s).S.O.384(E), dated 11th April 1994 and S.O.935(E), dated 14th NOVEMBER 1998, the Central Pollution Control Board hereby notify the National Ambient Air Quality Standards with immediate effect.

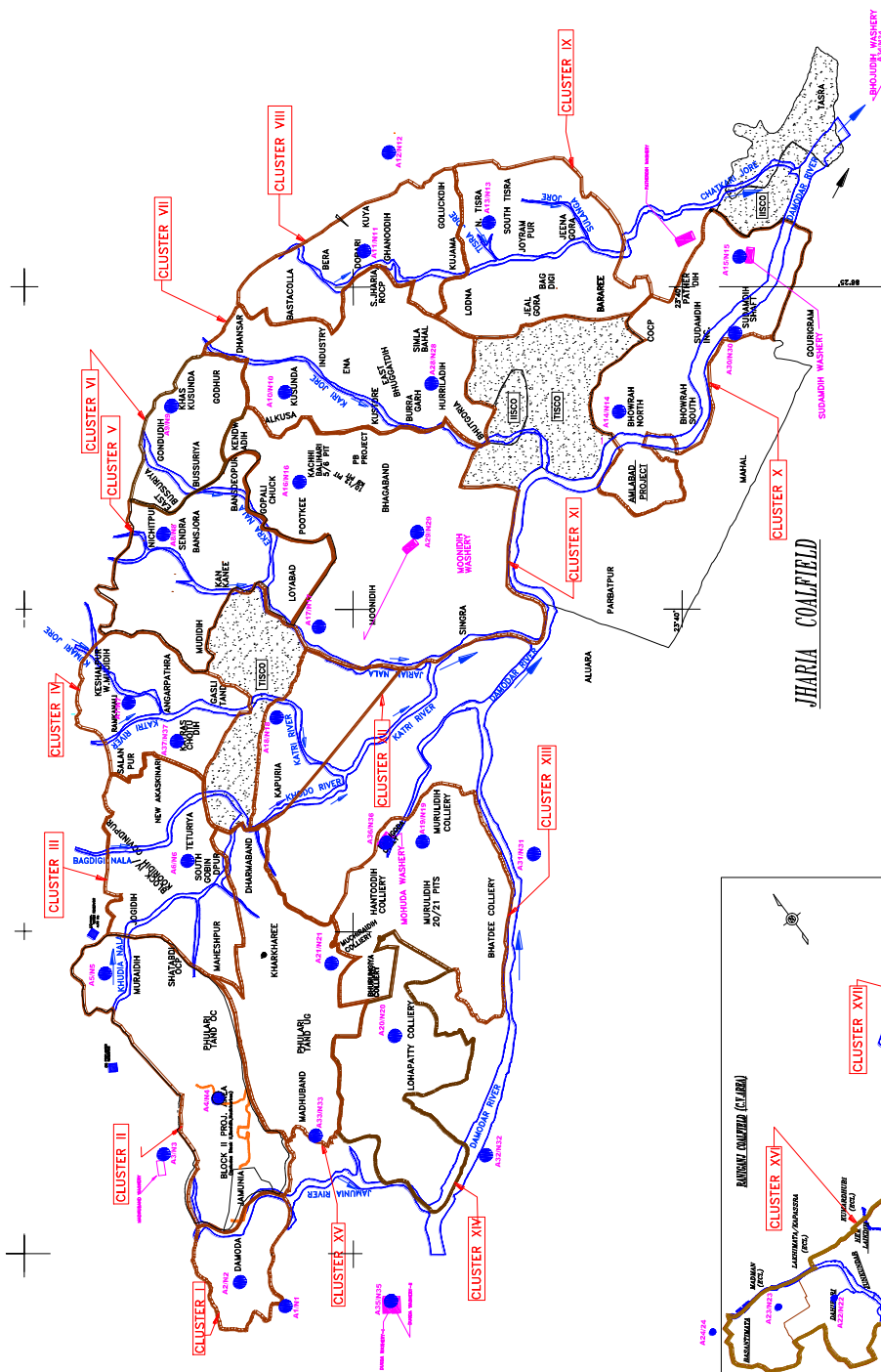
Pollutant	Time Weighted Average	Concentration in Ambient Air		Methods of Measurement
		Industrial, Residential, Rural and other Areas	Ecologically Sensitive Area (Notified by Central Government)	
Sulphur Dioxide (SO₂), µg/m³	Annual * 24 Hours **	50 80	20 80	-Improved West and Gaeke Method -Ultraviolet Fluorescence
Nitrogendioxide (NO₂), µg/m³	Annual * 24 Hours **	40 80	30 80	-Jacob &Hochheiser modified (NaOH-NaAsO ₂) Method -Gas Phase Chemiluminescence
Particulate Matter (Size less than 10µm) or PM₁₀, µg/m³	Annual * 24 Hours **	60 100	60 100	-Gravimetric -TEOM -Beta attenuation
Particulate Matter (Size less than 2.5µm) or PM_{2.5}, µg/m³	Annual * 24 Hours **	40 60	40 60	-Gravimetric -TEOM -Beta attenuation
Ozone (O₃) , µg/m³	8 Hours * 1 Hour **	100 180	100 180	-UV Photometric -Chemiluminescence -Chemical Method
Lead (Pb) , µg/m³	Annual * 24 Hours **	0.50 1.0	0.50 1.0	-AAS/ICP Method after sampling on EPM 2000 or equivalent filter paper -ED-XRF using Teflon filter
Carbon Monoxide (CO), mg/m³	8 Hours ** 1 Hour **	02 04	02 04	-Non dispersive Infrared (NDIR) Spectroscopy
Ammonia (NH₃), µg/m³	Annual * 24 Hours **	100 400	100 400	-Chemiluminescence -Indophenol blue method
Benzene (C₆H₆), µg/m³	Annual *	05	05	-Gas Chromatography (GC) based continuous analyzer -Adsorption and desorption followed by GC analysis
Benzo(a)Pyrene (BaP) Particulate phase only, ng/m³	Annual *	01	01	-Solvent extraction followed byHPLC/GC analysis
Arsenic (As), ng/m³	Annual *	06	06	-AAS/ICP Method after sampling on EPM 2000 or equivalent filter paper
Nickel (Ni), ng/m³	Annual *	20	20	-AAS/ICP Method after sampling on EPM 2000 or equivalent filter paper

* Annual Arithmetic mean of minimum 104 measurements in a year at a particular site taken twice a week 24 hourly at uniform intervals.

** 24 hourly or 8 hourly or 1 hourly monitored values, as applicable, shall be complied with 98% of the time in a year. 2% of the time, they JUNE exceed the limits but not on two consecutive days of monitoring.

NOTE:Whenever and wherever monitoring results on two consecutive days of monitoring exceed the limits specified above for the respective category, it shall be considered adequate reason to institute regular or continuous monitoring and further investigations.

Location of Air & Noise Monitoring Stations in BCCL



Sl. No.	Name of Station (Monitoring)
1	AS242
2	AS243
3	AS244
4	AS245
5	AS246
6	AS247
7	AS248
8	AS249
9	AS250
10	AS251
11	AS252
12	AS253
13	AS254
14	AS255
15	AS256
16	AS257
17	AS258

Sl. No.	Name of Station (Monitoring)
1	AS259
2	AS260
3	AS261
4	AS262
5	AS263
6	AS264
7	AS265
8	AS266
9	AS267
10	AS268
11	AS269
12	AS270
13	AS271
14	AS272
15	AS273
16	AS274
17	AS275

Sl. No.	Name of Station (Monitoring)
1	AS276
2	AS277
3	AS278
4	AS279
5	AS280
6	AS281
7	AS282
8	AS283
9	AS284
10	AS285
11	AS286
12	AS287
13	AS288
14	AS289
15	AS290
16	AS291
17	AS292

Sl. No.	Name of Station (Monitoring)
1	AS293
2	AS294
3	AS295
4	AS296
5	AS297
6	AS298
7	AS299
8	AS300
9	AS301
10	AS302
11	AS303
12	AS304
13	AS305
14	AS306
15	AS307
16	AS308
17	AS309

Sl. No.	Name of Station (Monitoring)
1	AS310
2	AS311
3	AS312
4	AS313
5	AS314
6	AS315
7	AS316
8	AS317
9	AS318
10	AS319
11	AS320
12	AS321
13	AS322
14	AS323
15	AS324
16	AS325
17	AS326

Sl. No.	Name of Station (Monitoring)
1	AS327
2	AS328
3	AS329
4	AS330
5	AS331
6	AS332
7	AS333
8	AS334
9	AS335
10	AS336
11	AS337
12	AS338
13	AS339
14	AS340
15	AS341
16	AS342
17	AS343

Sl. No.	Name of Station (Monitoring)
1	AS344
2	AS345
3	AS346
4	AS347
5	AS348
6	AS349
7	AS350
8	AS351
9	AS352
10	AS353
11	AS354
12	AS355
13	AS356
14	AS357
15	AS358
16	AS359
17	AS360

Sl. No.	Name of Station (Monitoring)
1	AS361
2	AS362
3	AS363
4	AS364
5	AS365
6	AS366
7	AS367
8	AS368
9	AS369
10	AS370
11	AS371
12	AS372
13	AS373
14	AS374
15	AS375
16	AS376
17	AS377

Sl. No.	Name of Station (Monitoring)
1	AS378
2	AS379
3	AS380
4	AS381
5	AS382
6	AS383
7	AS384
8	AS385
9	AS386
10	AS387
11	AS388
12	AS389
13	AS390
14	AS391
15	AS392
16	AS393
17	AS394

Sl. No.	Name of Station (Monitoring)
1	AS395
2	AS396
3	AS397
4	AS398
5	AS399
6	AS400
7	AS401
8	AS402
9	AS403
10	AS404
11	AS405
12	AS406
13	AS407
14	AS408
15	AS409
16	AS410
17	AS411

Sl. No.	Name of Station (Monitoring)
1	AS412
2	AS413
3	AS414
4	AS415
5	AS416
6	AS417
7	AS418
8	AS419
9	AS420
10	AS421
11	AS422
12	AS423
13	AS424
14	AS425
15	AS426
16	AS427
17	AS428

Sl. No.	Name of Station (Monitoring)
1	AS429
2	AS430
3	AS431
4	AS432
5	AS433
6	AS434
7	AS435
8	AS436
9	AS437
10	AS438
11	AS439
12	AS440
13	AS441
14	AS442
15	AS443
16	AS444
17	AS445

Sl. No.	Name of Station (Monitoring)
1	AS446
2	AS447
3	AS448
4	AS449
5	AS450
6	AS451
7	AS452
8	AS453
9	AS454
10	AS455
11	AS456
12	AS457
13	AS458
14	AS459
15	AS460
16	AS461
17	AS462

Sl. No.	Name of Station (Monitoring)
1	AS463
2	AS464
3	AS465
4	AS466
5	AS467
6	AS468
7	AS469
8	AS470
9	AS471
10	AS472
11	AS473
12	AS474
13	AS475
14	AS476
15	AS477
16	AS478
17	AS479

Sl. No.	Name of Station (Monitoring)
1	AS480
2	AS481
3	AS482
4	AS483
5	AS484
6	AS485
7	AS486
8	AS487
9	AS488
10	AS489
11	AS490
12	AS491
13	AS492
14	AS493
15	AS494
16	AS495
17	AS496

Sl. No.	Name of Station (Monitoring)
1	AS497
2	AS498
3	AS499
4	AS500
5	AS501
6	AS502
7	AS503
8	AS504
9	AS505
10	AS506
11	AS507
12	AS508
13	AS509
14	AS510
15	AS511
16	AS512
17	AS513

Sl. No.	Name of Station (Monitoring)
1	AS514
2	AS515
3	AS516
4	AS517
5	AS518
6	AS519
7	AS520
8	AS521
9	AS522
10	AS523
11	AS524
12	AS525
13	AS526
14	AS527
15	AS528
16	AS529
17	AS530

Sl. No.	Name of Station (Monitoring)
1	AS531
2	AS532
3	AS533
4	AS534
5	AS535
6	AS536
7	AS537
8	AS538
9	AS539
10	AS540
11	AS541
12	AS542
13	AS543
14	AS544
15	AS545
16	AS546
17	AS547

Sl. No.	Name of Station (Monitoring)
1	AS548
2	AS549
3	AS550
4	AS551
5	AS552
6	AS553
7	AS554
8	AS555
9	AS556
10	AS557
11	AS558
12	AS559
13	AS560
14	AS561
15	AS562
16	AS563
17	AS564

Sl. No.	Name of Station (Monitoring)
1	AS565
2	AS566
3	AS567
4	AS568
5	AS569
6	AS570
7	AS571
8	AS572
9	AS573
10	AS574
11	AS575
12	AS576
13	AS577
14	AS578
15	AS579
16	AS580
17	AS581

Sl. No.	Name of Station (Monitoring)
1	AS582
2	AS583
3	AS584
4	AS585
5	AS586
6	AS587
7	AS588
8	AS589
9	AS590
10	AS591
11	AS592
12	AS593
13	AS594
14	AS595
15	AS596
16	AS597
17	AS598

Sl. No.	Name of Station (Monitoring)
1	AS599
2	AS600
3	AS601
4	AS602
5	AS603
6	AS604
7	AS605
8	AS606
9	AS607
10	AS608
11	AS609
12	AS610
13	AS611
14	AS612
15	AS613
16	AS614
17	AS615

Sl. No.	Name of Station (Monitoring)
1	AS616
2	AS617
3	AS618
4	AS619
5	AS620
6	AS621
7	AS622
8	AS623
9	AS624
10	AS625
11	AS626
12	AS627
13	AS628
14	AS629
15	AS630
16	AS631
17	AS632

Sl. No.	Name of Station (Monitoring)
1	AS633
2	AS634
3	AS635
4	AS636
5	AS637
6	AS638
7	AS639
8	AS640
9	AS641
10	AS642
11	AS643
12	AS644
13	AS645
14	AS646
15	AS647
16	AS648
17	AS649

Sl. No.	Name of Station (Monitoring)
1	AS650
2	AS651
3	AS652
4	AS653
5	AS654
6	AS655
7	AS656
8	AS657
9	AS658
10	AS659
11	AS660
12	AS661
13	AS662
14	AS663
15	AS664
16	AS665
17	AS666

Sl. No.	Name of Station (Monitoring)
1	AS667
2	AS668
3	AS669
4	AS670
5	AS671
6	AS672
7	AS673
8	AS674
9	AS675
10	AS676
11	AS677
12	AS678
13	AS679
14	AS680
15	AS681
16	AS682
17	AS683

Sl. No.	Name of Station (Monitoring)
1	AS684
2	AS685
3	AS686
4	AS687
5	AS688
6	AS689
7	AS690
8	AS691
9	AS692
10	AS693
11	AS694
12	AS695
13	AS696
14	AS697
15	AS698
16	AS699
17	AS700

Sl. No.	Name of Station (Monitoring)
1	AS701
2	AS702
3	AS703
4	AS704
5	AS705
6	AS706
7	AS707
8	AS708
9	AS709
10	AS710
11	AS711
12	AS712
13	AS713
14	AS714
15	AS715
16	AS716
17	AS717

Sl. No.	Name of Station (Monitoring)
1	AS718
2	AS719
3	AS720
4	AS721
5	AS722

Water Sampling Locations in BCCL

Legend

- Sampling Locations of Surface Water (Upstream/ Downstream)
- Sampling Locations of Mine Water
- Sampling Locations of Ground/ Drinking Water

INDEX

Cluster	Surface Water	Mine Water	Ground Water	Sampling Point	Location
I	SW1, SW2	SW1	SW1	SW1	Bara
II	SW3, SW4	SW2	SW2	SW2	Bara
III	SW5, SW6	SW3	SW3	SW3	Bara
IV	SW7, SW8	SW4	SW4	SW4	Bara
V	SW9, SW10	SW5	SW5	SW5	Bara
VI	SW11, SW12	SW6	SW6	SW6	Bara
VII	SW13, SW14	SW7	SW7	SW7	Bara
VIII	SW15, SW16	SW8	SW8	SW8	Bara
IX	SW17, SW18	SW9	SW9	SW9	Bara
X	SW19, SW20	SW10	SW10	SW10	Bara
XI	SW21, SW22	SW11	SW11	SW11	Bara
XII	SW23, SW24	SW12	SW12	SW12	Bara
XIII	SW25, SW26	SW13	SW13	SW13	Bara
XIV	SW27, SW28	SW14	SW14	SW14	Bara
XV	SW29, SW30	SW15	SW15	SW15	Bara
XVI	SW31, SW32	SW16	SW16	SW16	Bara
XVII	SW33, SW34	SW17	SW17	SW17	Bara

Cluster	Saline Water	Brackish Water	Non-saline Water	Sampling Location	Ground Water	Sampling Location
I	SW1, SW2	SW3, SW4	SW5	Arinara River	SW1	Chitkara Village
II	SW1, SW3, SW4	SW2	SW5	Arinara River	SW2	Arinara Village
III	SW4, SW5, SW6	SW1, SW2	SW3	Arinara River	SW3	Arinara Village
IV	SW5, SW6, SW7	SW1, SW2	SW3	Arinara River	SW4	Kulavara Village
V	SW2, SW3, SW4	SW1, SW5	SW6	Arinara River	SW5	Narapur
VI	SW1, SW2, SW3, SW4	SW5	SW6	Arinara River	SW6	Bansara Soudal Village
VII	SW1, SW2, SW3, SW4	SW5	SW6	Arinara River	SW7	Hathalga Village
VIII	SW1, SW2, SW3, SW4	SW5	SW6	Arinara River	SW8	Chandah Village
IX	SW1, SW2, SW3, SW4	SW5	SW6	Arinara River	SW9	Adra Village
X	SW1, SW2, SW3, SW4	SW5	SW6	Arinara River	SW10	Arinara North Village
XI	SW1, SW2, SW3, SW4	SW5	SW6	Arinara River	SW11	Arinara North Village
XII	SW1, SW2, SW3, SW4	SW5	SW6	Arinara River	SW12	Arinara North Village
XIII	SW1, SW2, SW3, SW4	SW5	SW6	Arinara River	SW13	Arinara North Village
XIV	SW1, SW2, SW3, SW4	SW5	SW6	Arinara River	SW14	Arinara North Village
XV	SW1, SW2, SW3, SW4	SW5	SW6	Arinara River	SW15	Arinara North Village
XVI	SW1, SW2, SW3, SW4	SW5	SW6	Arinara River	SW16	Arinara North Village
XVII	SW1, SW2, SW3, SW4	SW5	SW6	Arinara River	SW17	Arinara North Village



Legend

- Sampling Locations of Surface Water (Upstream/ Downstream)
- Sampling Locations of Mine Water
- Sampling Locations of Ground/ Drinking Water

HoD (Envnt.)
at Coking Coal Limited
(Signature)

STRICTLY RESTRICTED**FOR COMPANY USE ONLY RESTRICTED**

The information given in this report is not to be communicated either directly or indirectly to the press or to any person not holding an official position in the CIL /GOVERNMENT.

**ENVIRONMENTAL MONITORING REPORT
OF
BHARAT COKING COAL LIMITED,
CLUSTER – XII**

(FOR THE MONTH DECEMBER, 2022)

E. C. no. J-11015/184/2012-IA.II (M) dated 10.12.2014.



CMPDI

ISO 9001 Company
**Regional Institute-II
Dhanbad, Jharkhand**

CONTENTS

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EXECUTIVE SUMMARY

1.0 Introduction

The purpose of environmental monitoring is to assess the quality of various attributes that affects the fauna and flora. In accordance with the quality of these attributes appropriate strategy is to be developed to control the pollution level within the permissible limits. The three major attributes are air, water and noise level.

Bharat Coking Coal Limited (BCCL), a Subsidiary company of Coal India Limited is operating Underground and Opencast Mines in Jharia Coalfield (JCF) is a part of Gondwana Coalfields located in Dhanbad district of Jharkhand, the JCF is bounded by 23°37' N to 23°52' N latitudes and 86°09' E to 86°30' E longitude occupying an area of 450 Sq.km. BCCL has awarded Environmental monitoring work of Jharia Coalfield (JCF) to Central Mine Planning & Design Institute Limited (CMPDIL). The environmental monitoring has been carried out as per the conditions laid down by the MoEF&CC while granting environmental clearance of project, consent letter issued by the respective SPCB, and other statutory requirements.

2.0 Sampling location and rationale

2.1 Ambient air sampling locations

The ambient air quality monitoring stations were selected to represent core, buffer zone area. The rationale has been based on the guidelines stipulated by MoEF&CC, consent letter of SPCB, as well as other statutory requirements.

2.2 Water sampling stations

The Water sampling stations were selected for mine sump water.

2.3 Noise level monitoring locations

Noise levels vary depending on the various activities in mining areas. The monitoring of noise level in different locations will be helpful to take appropriate mitigating measures. The rationale has been based on the guidelines stipulated by MoEF&CC, consent letter of SPCB, as well as other statutory requirements.

3.0 Methodology of sampling and analysis

3.1 Ambient air quality

Parameters chosen for assessment of ambient air quality were Particulate Matter (PM₁₀), Fine Particulate Matter (PM_{2.5}), Sulphur Di-oxide (SO₂)

and Nitrogen Oxides (NO_x). Respirable Dust Samplers (RDS) and Fine Dust Sampler (PM_{2.5} sampler) were used for sampling of PM₁₀, SO₂, & NO_x and Fine Dust Sampler (PM_{2.5} sampler) were used for sampling of PM_{2.5} at 24 hours interval once in a fortnight and the same for the gaseous pollutants. The samples were analysed in Environmental Laboratory of CMPDI, RI-II, Dhanbad.

3.2 Water quality

Water samples were collected as per standard practice. The Mine effluent samples were collected and analyzed for four parameters on fortnightly basis. Thereafter the samples were preserved and analyzed at the Environmental Laboratory of CMPDI, RI- II, Dhanbad.

3.3 Noise level monitoring

Noise level measurements in form of 'LEQ' were taken using Integrated Data Logging Sound Level Meter. Noise levels were measured in Decibels, 'A' weighted average, i.e. dB(A).

4.0 Results and interpretations

4.1 Air quality

It has been seen from the analysis results that the 24 hours average concentration parameters like PM₁₀, PM_{2.5}, SO₂ and NO_x are mostly within the permissible limits in all sampling locations as per MoEF&CC Gazette Notification No. GSR 742(E) dt 25.09.2000 Standards for Coal Mines and National Ambient Air Quality Standard -2009. Sometimes the concentration of PM₁₀& PM_{2.5} exceeds the limits due to heavy public traffic, poor road condition, coke oven plants, burning of coal by surrounding habitants, brick making, municipal waste dumps and industries like Steel Plant, thermal Plants including their fly ash etc.

The following preventive and suppressive mitigative measures can be undertaken to contain the pollution level within prescribed level:-

- Wet drilling and controlled blasting should be practice.
- Explosive used should be optimised to restrict the dust generation.
- Transportation roads should be permanently asphalted free of ruts, potholes etc.
- Water should be sprayed on coal transportation road, service road more frequently and at regular interval.
- Dust from roads should be removed physically or mechanically.
- Greenbelts around industrial sites, service building area besides Avenue plantation along roads should be created.
- Coal dust should be suppressed by using fixed sprinklers.
- Regular maintenance of plant and machinery should be undertaken.

4.2 Water quality

The test results indicate that the major parameters compared with MoEF&CC Gazette Notification No. GSR 742(E) dt 25.09.2000

4.3 Noise Level

During the noise level survey it has been observed that the noise level in the sampling locations is within the permissible limits prescribed as per MoEF&CC Gazette Notification No. GSR 742(E) dt 25.09.2000 Standards for Coal Mines for Industrial Area and Noise pollution (Regulation and Control) Rules, 2000.

INTRODUCTION

1.0 Any industry and development activities including coal mining is bound to affect environmental attributes. There are positive as well as negative impacts of such operations. For controlling the adverse impacts a regular monitoring is essential. The environmental monitoring is being done as per the guide-lines stipulated by Ministry of Environment, Forest and Climate Change (MoEF&CC), Govt. of India.

The very purpose of environmental monitoring is to assess the quality of various attributes which affects the environment. As per quality of these attributes appropriate strategy is to be developed to control the pollution level within the permissible limits. The three major attributes are air, water and noise level.

Bharat Coking Coal has awarded Environmental Monitoring work of all Projects, Cluster wise, to Central Mine Planning & Design Institute Limited (CMPDIL). The environmental monitoring has been carried out as per conditions laid down by MoEF&CC while granting environmental clearance to different projects. CMPDI has trained manpower and well equipped laboratory to carry out monitoring, analysis and R&D work in the field of environment.

1.1 The Cluster XII is in the Central part of the Jharia coalfield. It includes Kapuria UG Mine. The cluster – XII is situated about 30 - 35 kms from Dhanbad Railway Station. The mines of this cluster - XII are operating since pre nationalization period (prior to 1972-73). It is connected by both Railway and Road. The drainage of the area is governed by Katri River.

1.2 The cluster XII is designed to produce 2.4 Mtpa (normative) and 3.12 Mtpa peak capacity of coal. The average grade of coal W-II to W-IV.

The Project has Environmental Clearance from Ministry of Environment, Forests and Climate Change (MoEF&CC) for a rated capacity of 2.4 MTPA (normative) and 3.12 MTPA peak capacity of coal production vide letter no E.C. no. J-11015/184/2012-IA.II (M) dated 10.12.2014.

Ministry of Environment, Forest and Climate Change while granting environmental clearance has given one of the General conditions that “ Four ambient air quality monitoring stations should be established in the core zone as well as in the buffer zone for PM₁₀, PM_{2.5}, SO₂, NO_x monitoring. Location of the stations should be decided based on the meteorological data, topographical features and environmentally and ecologically sensitive targets, other conditions regarding water / effluent and noise level monitoring in consultation with the State Pollution Control Board.”

In compliance of these conditions the Environmental Monitoring has been carried out & report prepared for submission to MoEF&CC & JSPCB and other statutory authorities.

AMBIENT AIR QUALITY MONITORING

2.1 Location of sampling station and their rationale:

(As per G.S.R. 742 (E) dt. 25th December, 2000)

2.1.1 Ambient Air Quality Sampling Locations

I. CORE ZONE Monitoring Location

i) Rudhi basti (A18): Industrial Area

The location of the sampling station is 23° 45' 26.60" N & 86° 18' 39.90" E. The samplers were placed at a height of approx. 1.5m above ground level at Rudhi basti.

II. BUFFER ZONE Monitoring Location

i) Block IV (A6) : Industrial area

The location of the sampling station is 23° 47' 54.00" N & 86° 16' 20.00" E. The samplers were placed at a height of approx. 1.5m above ground level at Safety Office.

ii) Moonidih UGP (A17) : Industrial area

The location of the sampling station is 23° 44' 30.00" N & 86° 20' 56.00" E. The samplers were placed at a height of approx. 1.5m above ground level at project office.

iii) Murlidih 20/21 Pit(A19): Industrial Area

The location of the sampling station is 23° 43' 51.82" N & 86° 16' 21.87" E. The samplers were placed at a height of approx. 1.5m above ground level at project office.

AMBIENT AIR QUALITY DATA



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CENTRAL MINE PLANNING AND DESIGN INSTITUTE LIMITED
Environment Laboratory, Regional Institute-II
Ambient Air Quality Test Report

CMPDIL, RI-II
KOYLA BHAWAN COMPLEX
DHANBAD. - 826005
Phone:0326-223-850
email: rdri2cmpdi@coalindia.in

Test Report for Ambient Air Samples

Month & Year	12/2022	Cluster	Cluster XII	Report No.	RI-II/AIR/2022-23/09
Customer	Environment Department, Bharat Coking Coal Limited (BCCL), Koyla Bhawan, Dhanbad (E-mail: gmenv.bccl@coalindia.in)				
Project	Sample Ref. No. REM/BCCL/2022/09				
Sampling Stations	i	Rudhi Basti	Date of Sampling	02.12.22	22.12.22
Sl. No.	Parameter	Method of Analysis	Observed Values (in $\mu\text{g}/\text{m}^3$)		LDL
			1st FN	2nd FN	
1	PM ₁₀	IS -5182(Part 23):2006, R-2017	95	98	10 $\mu\text{g}/\text{m}^3$ - 1000 $\mu\text{g}/\text{m}^3$
2	PM _{2.5}	IS -5182(Part 24):2019	59	52	10 $\mu\text{g}/\text{m}^3$ - 400 $\mu\text{g}/\text{m}^3$
3	SO ₂	IS-5182(Part-2): 2001, R-2017	<10	<10	10 $\mu\text{g}/\text{m}^3$ - 1050 $\mu\text{g}/\text{m}^3$
4	NO ₂	IS-5182 (Part-6): 2006, R-2017	21	22	06 $\mu\text{g}/\text{m}^3$ - 420 $\mu\text{g}/\text{m}^3$
* LDL indicates Lower Detection Limit, **All units are in $\mu\text{g}/\text{m}^3$, 24 hourly Average,					

[Signature]
ANALYSED BY

[Signature]
(Gaurav Kant)
CHECKED BY

[Signature]
(Amit Raj Mishra)
HOD's Signature

Note: The results above relate to the samples tested as received. This report can not be reproduced in part or full without the written permission of the HOD(Env) , CMPDI, RI-II.

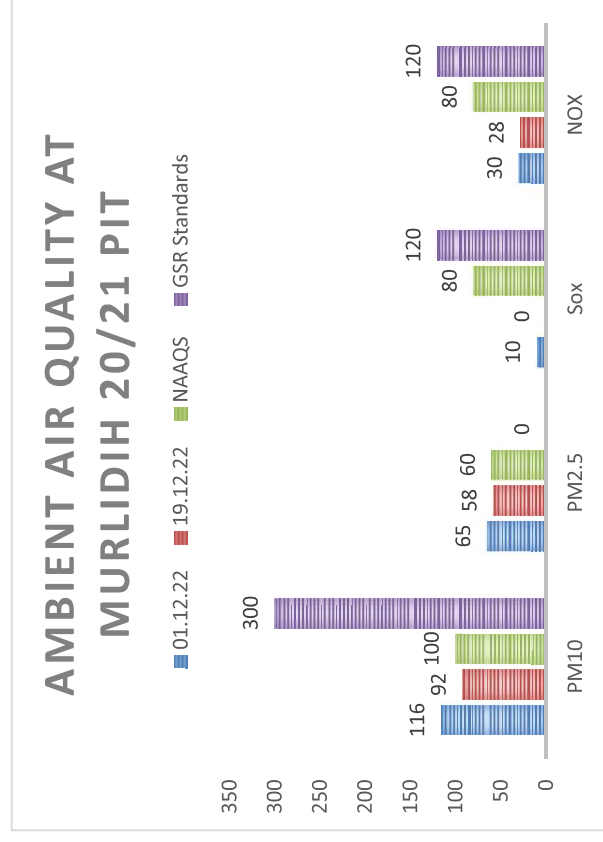
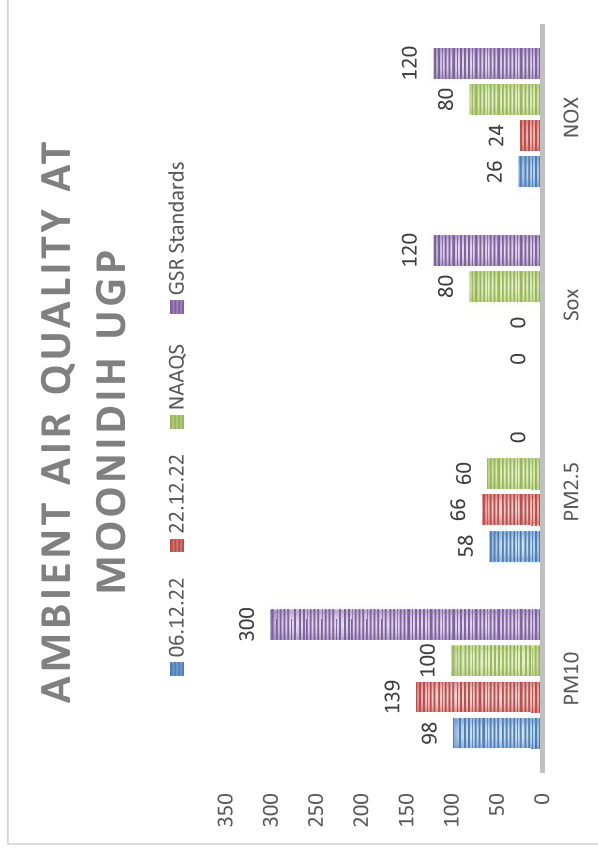
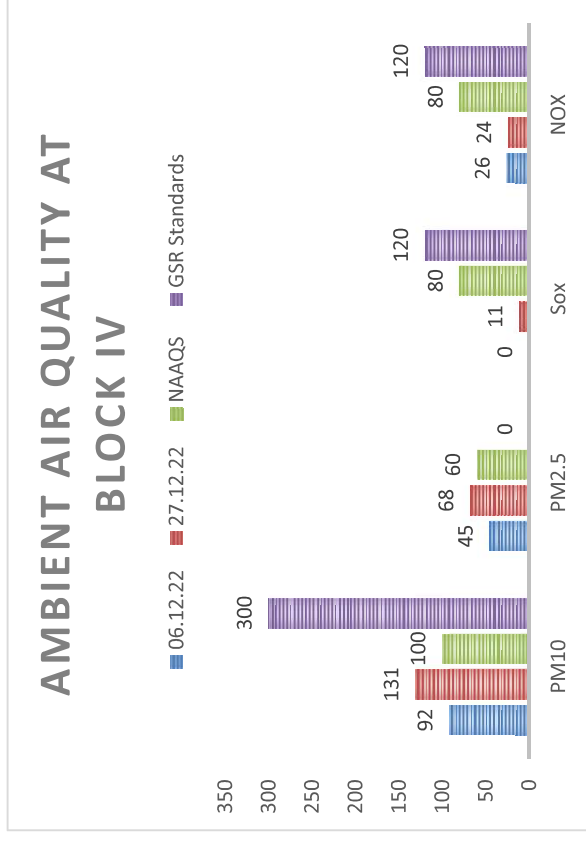
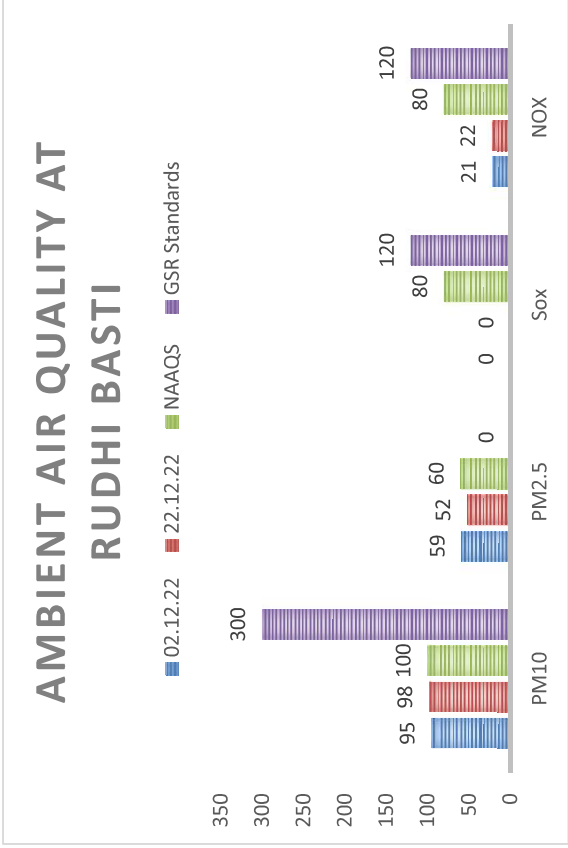
----- End of Report -----

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  		CENTRAL MINE PLANNING AND DESIGN INSTITUTE LIMITED Environment Laboratory, Regional Institute-II Ambient Air Quality Test Report		CMPDIL, RI-II KOYLA BHAWAN COMPLEX DHANBAD. - 826005 Phone:0326-223-850 email: rdri2cmpdi@coalindia.in	
Test Report for Ambient Air Samples					
Month & Year	12/2022	Cluster	Cluster XII	Report No.	RI-II/AIR/2022-23/09
Customer	Environment Department, Bharat Coking Coal Limited (BCCL), Koyla Bhawan, Dhanbad (E-mail: gmenv.bccl@coalindia.in)			Date of Issue	13.03.2023
Project		Sample Ref. No.	REM/BCCL/2022/09	Sampling Method	CMPDI/RI-II/LPM 13, (IS 5182)
Sampling Stations	i	Block IV	Date of Sampling	06.12.22	27.12.22
Sl. No.	Parameter	Method of Analysis	Observed Values (in $\mu\text{g}/\text{m}^3$)	Range Of Testing	LDL
			1st FN	2nd FN	MoEF Standards Notification dated 25th September, 2000 (GSR 742 E)
1	PM ₁₀	IS -5182(Part 23):2006, R-2017	92	131	10 $\mu\text{g}/\text{m}^3$ - 1000 $\mu\text{g}/\text{m}^3$
2	PM _{2.5}	IS -5182(Part 24):2019	45	68	10 $\mu\text{g}/\text{m}^3$ - 400 $\mu\text{g}/\text{m}^3$
3	SO ₂	IS-5182(Part-2): 2001, R-2017	<10	11	10 $\mu\text{g}/\text{m}^3$ - 1050 $\mu\text{g}/\text{m}^3$
4	NO ₂	IS-5182 (Part-6): 2006, R-2017	26	24	06 $\mu\text{g}/\text{m}^3$ - 420 $\mu\text{g}/\text{m}^3$
* LDL indicates Lower Detection Limit,					
**All units are in $\mu\text{g}/\text{m}^3$, 24 hourly Average,					
 ANALYSED BY (Gaurav Kant)		 CHECKED BY (Amit Raj Mishra) HOD's Signature			
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  		CENTRAL MINE PLANNING AND DESIGN INSTITUTE LIMITED Environment Laboratory, Regional Institute-II Ambient Air Quality Test Report		CMPDIL, RI-II KOYLA BHAWAN COMPLEX DHANBAD. - 826005 Phone:0326-223-850 email: rdri2cmpdi@coalindia.in	
Test Report for Ambient Air Samples					
Month & Year	12/2022	Cluster	Cluster XII	Report No.	RI-II/AIR/2022-23/09
Customer	Environment Department, Bharat Coking Coal Limited (BCCL), Koyla Bhawan, Dhanbad (E-mail: gmenv.bccl@coalindia.in)			Date of Issue	13.03.2023
Project		Sample Ref. No.	CMPDI/RI-II/LPM 13, (IS 5182)	Zone of Station:	Buffer Zone
Sampling Stations	i	Moonidih UGP		MoEF Standards Notification dated 25th September, 2000 (GSR 742 E)	NAAQS, 2009
Sl. No.	Method of Analysis	Observed Values (in $\mu\text{g}/\text{m}^3$)		Range Of Testing	LDL
		1st FN	2nd FN		
1	IS -5182(Part 23):2006, R-2017	98	139	10 $\mu\text{g}/\text{m}^3$ - 1000 $\mu\text{g}/\text{m}^3$	100
2	IS -5182(Part 24):2019	58	66	10 $\mu\text{g}/\text{m}^3$ - 400 $\mu\text{g}/\text{m}^3$	60
3	IS-5182(Part-2): 2001, R-2017	<10	<10	10 $\mu\text{g}/\text{m}^3$ - 1050 $\mu\text{g}/\text{m}^3$	80
4	IS-5182 (Part-6): 2006, R-2017	26	24	06 $\mu\text{g}/\text{m}^3$ - 420 $\mu\text{g}/\text{m}^3$	80
* LDL indicates Lower Detection Limit, ** All units are in $\mu\text{g}/\text{m}^3$, 24 hourly Average,					
 ANALYSED BY (Gaurav Kant) CHECKED BY		 (Amit Raj Mishra) HOD's Signature			
Note: The results above relate to the samples tested as received. This report can not be reproduced in part or full without the written permission of the HOD(Env) , CMPDI, RI-II.					
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  		CENTRAL MINE PLANNING AND DESIGN INSTITUTE LIMITED Environment Laboratory, Regional Institute-II Ambient Air Quality Test Report		CMPDIL, RI-II KOYLA BHAWAN COMPLEX DHANBAD. - 826005 Phone: 0326-223-850 email: rdri2cmpdi@coalindia.in	
Test Report for Ambient Air Samples					
Month & Year	12/2022	Cluster	Cluster XII	Report No.	RI-II/AIR/2022-23/09
Customer	Environment Department, Bharat Coking Coal Limited (BCCL), Koyla Bhawan, Dhanbad (E-mail: gmenv.bccl@coalindia.in)			Date of Issue	13.03.2023
Project	Sample Ref. No.			CMPDI/RI-II/LPM 13, (IS 5182)	
Sampling Stations	i	Murlidih 20/21 Pit	REM/BCCL/2022/09	Sampling Method	Buffer Zone
			Date of Sampling	19.12.22	
			01.12.22		
SL. No.	Method of Analysis	Observed Values (in $\mu\text{g}/\text{m}^3$)	Range Of Testing	LDL	MoEF Standards Notification dated 25th September, 2000 (GSR 742 E)
		1st FN	2nd FN		NAAQS, 2009
1	IS -5182(Part 23):2006, R-2017	116	92	10 $\mu\text{g}/\text{m}^3$	300
2	IS -5182(Part 24):2019	65	58	10 $\mu\text{g}/\text{m}^3$	Not Specified
3	IS-5182(Part-2): 2001, R-2017	10	<10	10 $\mu\text{g}/\text{m}^3$	120
4	IS-5182 (Part-6): 2006, R-2017	30	28	06 $\mu\text{g}/\text{m}^3$	120
* LDL indicates Lower Detection Limit, ** All units are in $\mu\text{g}/\text{m}^3$, 24 hourly Average,					
 ANALYSED BY (Gaurav Kant)		 (Amit Raj Mishra) HOD's Signature			
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----- End of Report -----					
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NOISE LEVEL QUALITY MONITORING

4.1 Location of sampling sites

- i) **Rudhi basti (N18)**
- ii) **Block IV(N6)**
- iii) **Moonidih UGP(N17)**
- iv) **Murlidih 20/21 (N19)**

4.2 Methodology of sampling and analysis

Noise level measurements in form of ' L_{EQ} ' were taken using Integrated Data Logging Sound Level Meter (NL-52 OF RION CO. Ltd. Make) during day time. Noise levels were measured for about one hour time in day time. Noise levels were measured in Decibels, 'A' weighted average, i.e. dB (A).

4.3 Results & Interpretations

Ambient noise levels were recorded during day time and the observed values were compared with standards prescribed by MoEFCC. The results of Noise levels recorded during day time on fortnightly basis are presented in tabular form along with the applicable standard permissible limits. The observed values in terms of L_{EQ} are presented. The observed values at all the monitoring locations are found to be within permissible limits.

  		CENTRAL MINE PLANNING AND DESIGN INSTITUTE LIMITED Environment Laboratory, Regional Institute-II Ambient Noise Level Test Report		CMPDI, RI-II KOYLA BHAWAN COMPLEX DHANBAD - 826005 Phone: 0326-223-850 Email: rrii2-mndi@coalindia.in	
Month & Year	12/2022	Cluster	Cluster XII	Report No.	RI-II/WATER/2022-23/09
Customer	Environment Department, Bharat Coking Coal Limited (BCCL), Koyla Bhawan, Dhanbad (E-mail: gmenv.bcd@coalindia.in)				Date of Issue
Project	REM/BCCL/2022/09				CMPDI/RI-II/LPM 13
Sampling Stations	i	Rudhi Basti	Date of Sampling	Zone Category of Station:	Core Zone
Sl. No.	Parameter	Hour / Time of day	Observed Values (in Leq dB(A)) First Fortnight	Observed Values (in Leq dB(A)) Second Fortnight	NOISE POLLUTION (REGULATION AND CONTROL) RULES, 2000 Standards Limits in dB
1	Noise Level dB(A)Leq - Day	06:00 - 07:00	43.2	44.3	CPCB, Protocol for Ambient Level Noise Monitoring - 2015
2		07:00 - 08:00	46.4	46.6	
3		08:00 - 09:00	47.5	48.8	
4		09:00 - 10:00	44.0	44.6	
5		10:00 - 11:00	48.8	49.2	
6		11:00 - 12:00	52.4	51.6	
7		12:00 - 13:00	50.4	50.8	
8		13:00 - 14:00	51.6	52.2	
9		14:00 - 15:00	53.6	52.8	
10		15:00 - 16:00	55.7	56.0	
11		16:00 - 17:00	51.3	51.1	
12		17:00 - 18:00	48.9	49.2	
13		18:00 - 19:00	43.2	44.3	
14		19:00 - 20:00	43.8	44.0	
15		20:00 - 21:00	40.7	41.2	
16		21:00 - 22:00	40.7	40.1	
1	Noise Level dB(A)Leq - Night	Leq Day	49.8	49.9	CPCB, Protocol for Ambient Level Noise Monitoring - 2015
2		22:00-23:00	44.0	43.9	
3		23:00- 00:00	43.6	43.8	
4		00:00- 01:00	43.3	43.6	
5		01:00-02:00	42.9	42.9	
6		02:00-03:00	42.5	42.5	
7		03:00-04:00	42.3	42.4	
8		04:00-05:00	42.4	42.3	
		Leq Night	42.5	41.9	Industrial Commercial Residential Silence
			43.0	43.0	

****All noise measurements are integrated for a 01 hour period, All units in dB(A) *LDL indicates Lower Detection Limit**

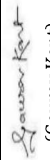
Gaurav Kant
 (Gaurav Kant)
CHECKED BY

Raj Mishra
 (Amit)
HOD's Signature

Analysed By
Sampling Assistants

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 		CENTRAL MINE PLANNING AND DESIGN INSTITUTE LIMITED Environment Laboratory, Regional Institute-II Ambient Noise Level Test Report				CMPDIL, RI-II KOYLA BHAWAN COMPLEX DHANBAD - 826005 Phone:0326-223-850 email: addi2emad@coalindia.in		
Month & Year	12/2022	Cluster	Cluster XII		Report No.	RI-II/NOISE/2022-23/09		
Customer	Environment Department, Bharat Coking Coal Limited (BCCL), Koyla Bhawan, Dhanbad (E-mail: gmenv.bcl@coalindia.in)				Date of Issue	13.03.2023		
Project	Sample Ref. No.				Sampling Method	CMPDI/RI-II/LPM 13		
Sampling Stations	i	Moonlidi UGP	Date of Sampling	06.12.22	22.12.22	Zone Category of Station:		
Sl. No.	Parameter	Hour / Time of day	Observed Values (in Leq dB(A))	Method of Analysis	Range Of Testing	LDL		
			First Fortnight	Second Fortnight		NOISE POLLUTION (REGULATION AND CONTROL) RULES, 2000 Standards		
						Zones		
						Limits in dB		
1	Noise Level dB(A)Leq - Day	06:00 - 07:00	48.5	49.2	35 dB-135 dB	35 dB(A)	Industrial Commercial Residential Silence	75 65 55 50
2		07:00 - 08:00	44.3	45.1				
3		08:00 - 09:00	51.6	53.1				
4		09:00 - 10:00	49.7	47.4				
5		10:00 - 11:00	52.7	51.7				
6		11:00 - 12:00	55.9	56.6				
7		12:00 - 13:00	54.1	53.8				
8		13:00 - 14:00	55.7	54.7				
9		14:00 - 15:00	52.1	51.7				
10		15:00 - 16:00	50.4	49.8				
11		16:00 - 17:00	50.0	50.2				
12		17:00 - 18:00	49.5	50.2				
13		18:00 - 19:00	48.8	49.2				
14		19:00 - 20:00	49.3	49.1				
15		20:00 - 21:00	47.9	47.7				
16		21:00 - 22:00	47.5	47.6				
1	Noise Level dB(A)Leq - Night	22:00-23:00	51.5	51.5	35 dB-135 dB	35 dB(A)	Industrial Commercial Residential Silence	70 55 45 50
2		23:00- 00:00	41.2	41.6				
3		00:00- 01:00	41.6	41.4				
4		01:00-02:00	41.5	41.2				
5		02:00-03:00	41.2	40.8				
6		03:00-04:00	40.4	40.6				
7		04:00-05:00	40.9	3.2				
8		05:00-06:00	41.7	42.1				
		Leq Night	42.0	42.3				
			41.3	40.9				

Analysed By

 (Gaurav Kant)
CHECKED BY

Sampling Assistants

 (Amit Raj Mishra)
HOD's Signature

*All noise measurements are integrated for a 01 hour period, All units in dB(A) *LDL indicates Lower Detection Limit

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 ----- End of Report -----
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JOB NO. 200316028

Cluster – XII, BCCL

Environmental Monitoring Report

 		CENTRAL MINE PLANNING AND DESIGN INSTITUTE LIMITED Environment Laboratory, Regional Institute-II Ambient Noise Level Test Report				CMPDIL, RI-II KOYLA BHAWAN COMPLEX DHANBAD - 826005 Phone: 0326-223-850 email: rdri2cmpdi@coalindia.in			
Month & Year	12/2022	Cluster	Cluster XII		Report No.	RI-II/NOISE/2022-23/09			
Customer	Environment Department, Bharat Coking Coal Limited (BCCL), Koyla Bhawan, Dhanbad (E-mail: gmenv.bcl@coalindia.in)				Date of Issue	13.03.2023			
Project	Sample Ref. No.				CMPDI/RI-II/LPM 13				
Sampling Stations		i	Murlidih(20/21)	Date of Sampling	19.12.22	Zone Category of Station:			
Sl. No.	Parameter	Hour / Time of day	Observed Values (in Leq dB(A))	Observed Values (in Leq dB(A))	Method of Analysis	Range Of Testing	LDL		
1	Noise Level dB(A) Leq - Day	06:00 - 07:00	52.7	53.6	CPCB, Protocol for Ambient Level Noise Monitoring - 2015	35 dB-135 dB	35 dB(A)		
2		07:00 - 08:00	55.3	55.9					
3		08:00 - 09:00	37.7	35.2					
4		09:00 - 10:00	39.8	37.2					
5		10:00 - 11:00	39.2	38.5					
6		11:00 - 12:00	35.8	34.2					
7		12:00 - 13:00	39.8	39.6					
8		13:00 - 14:00	42.1	44.0					
9		14:00 - 15:00	49.8	50.3					
10		15:00 - 16:00	61.1	63.5					
11		16:00 - 17:00	41.6	41.7					
12		17:00 - 18:00	40.8	41.4					
13		18:00 - 19:00	50.4	50.9					
14		19:00 - 20:00	64.5	64.3					
15		20:00 - 21:00	47.4	48.0					
16		21:00 - 22:00	47.5	47.4					
1	Noise Level dB(A) Leq - Night	Leq Day	55.0	55.7	CPCB, Protocol for Ambient Level Noise Monitoring - 2015	35 dB-135 dB	35 dB(A)		
2		22:00-23:00	39.3	39.5					
3		23:00- 00:00	38.9	39.4					
4		00:00- 01:00	38.6	39.1					
5		01:00-02:00	38.5	39.0					
6		02:00-03:00	38.4	38.6					
7		03:00-04:00	38.9	38.4					
8		04:00-05:00	39.1	38.9					
		Leq Night	39.3	39.0					
Sampling Assistants ANALYSED BY  (Gaurav Kant)									
CHECKED BY  (Amit Raj Mishra) HOD's Signature									
Note: The results above relate to the samples tested as received. This report can not be reproduced in part or full without the written permission of the HOD(Env), CMPDI, RI-II.									
***** End of Report ***** Page -1 of 1									
JOB NO. 200316028 Cluster – XII, BCCL Environmental Monitoring Report									

Ambient Air Quality Standards for Jharia Coal Field
As per the Environment (Protection) Amendment Rules, 2000 notified vide notification G.S.R.
742(E), dated 25.9.2000.

Category	Pollutant	Time weighted average	Concentration in Ambient Air	Method of Measurement
1	2	3	4	5
III Coal mines located in the coal fields of • Jharia • Raniganj • Bokaro	Suspended Particulate Matter (SPM)	Annual Average * 24 hours **	500 $\mu\text{g}/\text{m}^3$ 700 $\mu\text{g}/\text{m}^3$	- High Volume Sampling (Average flow rate not less than 1.1
	Respirable Particulate Matter (size less than 10 μm) (RPM)	Annual Average * 24 hours **	250 $\mu\text{g}/\text{m}^3$ 300 $\mu\text{g}/\text{m}^3$	Respirable Particulate Matter sampling and analysis
	Sulphur Dioxide (SO_2)	Annual Average * 24 hours **	80 $\mu\text{g}/\text{m}^3$ 120 $\mu\text{g}/\text{m}^3$	1.Improvedwest and Gaeke method 2.Ultraviolet fluorescene
	Oxide of Nitrogen as NO_2	Annual Average * 24 hours **	80 $\mu\text{g}/\text{m}^3$ 120 $\mu\text{g}/\text{m}^3$	1. Jacob & Hochheiser Modified (Na-Arsenic) Method 2. Gas phase Chemilumine-scence

Note:

* Annual Arithmetic mean for the measurements taken in a year, following the guidelines for frequency of sampling laid down in clause 2.

** 24 hourly/8 hourly values shall be met 92% of the time in a year. However, 8% of the time it may exceed but not on two consecutive days.

NATIONAL AMBIENT AIR QUALITY STANDARDS

New Delhi the 18th November 2009

In exercise of the powers conferred by Sub-section (2) (h) of section 16 of the Air (Prevention and Control of Pollution) Act, 1981 (Act No. 14 of 1981), and in supersession of the notification No(s).S.O.384(E), dated 11th April 1994 and S.O.935(E), dated 14th NOVEMBER 1998, the Central Pollution Control Board hereby notify the National Ambient Air Quality Standards with immediate effect.

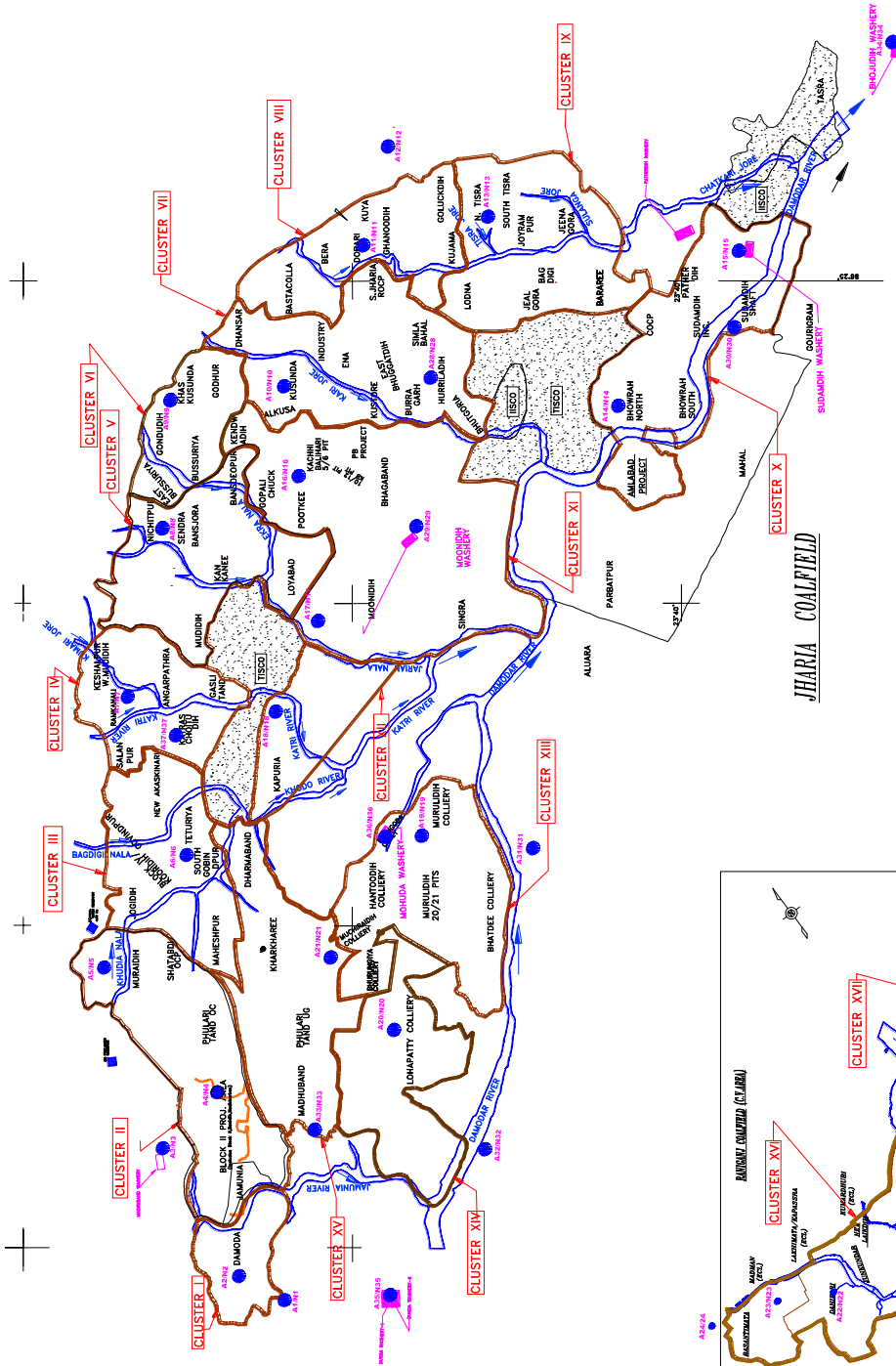
Pollutant	Time Weighted Average	Concentration in Ambient Air		Methods of Measurement
		Industrial, Residential, Rural and other Areas	Ecologically Sensitive Area (Notified by Central Government)	
Sulphur Dioxide (SO₂), µg/m³	Annual * 24 Hours **	50 80	20 80	-Improved West and Gaeke Method -Ultraviolet Fluorescence
Nitrogendioxide (NO₂), µg/m³	Annual * 24 Hours **	40 80	30 80	-Jacob &Hochheiser modified (NaOH-NaAsO ₂) Method -Gas Phase Chemiluminescence
Particulate Matter (Size less than 10µm) or PM₁₀, µg/m³	Annual * 24 Hours **	60 100	60 100	-Gravimetric -TEOM -Beta attenuation
Particulate Matter (Size less than 2.5µm) or PM_{2.5}, µg/m³	Annual * 24 Hours **	40 60	40 60	-Gravimetric -TEOM -Beta attenuation
Ozone (O₃) , µg/m³	8 Hours * 1 Hour **	100 180	100 180	-UV Photometric -Chemiluminescence -Chemical Method
Lead (Pb) , µg/m³	Annual * 24 Hours **	0.50 1.0	0.50 1.0	-AAS/ICP Method after sampling on EPM 2000 or equivalent filter paper -ED-XRF using Teflon filter
Carbon Monoxide (CO), mg/m³	8 Hours ** 1 Hour **	02 04	02 04	-Non dispersive Infrared (NDIR) Spectroscopy
Ammonia (NH₃), µg/m³	Annual * 24 Hours **	100 400	100 400	-Chemiluminescence -Indophenol blue method
Benzene (C₆H₆), µg/m³	Annual *	05	05	-Gas Chromatography (GC) based continuous analyzer -Adsorption and desorption followed by GC analysis
Benzo(a)Pyrene (BaP) Particulate phase only, ng/m³	Annual *	01	01	-Solvent extraction followed byHPLC/GC analysis
Arsenic (As), ng/m³	Annual *	06	06	-AAS/ICP Method after sampling on EPM 2000 or equivalent filter paper
Nickel (Ni), ng/m³	Annual *	20	20	-AAS/ICP Method after sampling on EPM 2000 or equivalent filter paper

* Annual Arithmetic mean of minimum 104 measurements in a year at a particular site taken twice a week 24 hourly at uniform intervals.

** 24 hourly or 8 hourly or 1 hourly monitored values, as applicable, shall be complied with 98% of the time in a year. 2% of the time, they JUNE exceed the limits but not on two consecutive days of monitoring.

NOTE:Whenever and wherever monitoring results on two consecutive days of monitoring exceed the limits specified above for the respective category, it shall be considered adequate reason to institute regular or continuous monitoring and further investigations.

Location of Air & Noise Monitoring Stations in BCCL



Sl. No.	Name of Station (Monitoring)
1	Cluster I
2	Cluster II
3	Cluster III
4	Cluster IV
5	Cluster V
6	Cluster VI
7	Cluster VII
8	Cluster VIII
9	Cluster IX
10	Cluster X
11	Cluster XI
12	Cluster XII
13	Cluster XIII
14	Cluster XIV
15	Cluster XV
16	Cluster XVI
17	Cluster XVII

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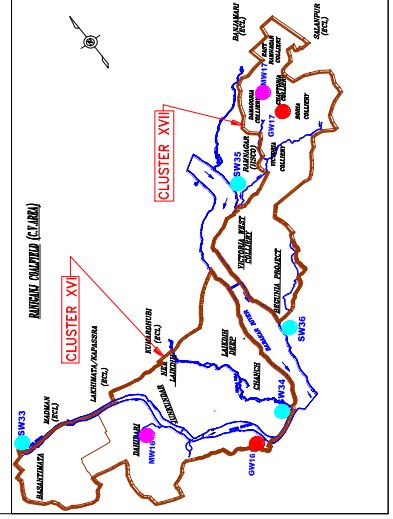
Water Sampling Locations in BCCL

Legend

- Sampling Locations of Surface Water (Upstream/ Downstream)
- Sampling Locations of Mine Water
- Sampling Locations of Ground/ Drinking Water

INDEX

Cluster	Surface Water	Mine Water	Ground Water	Sampling Point	Location
I	SW1, SW2	SW1	SW1	SW1	Bara
II	SW3, SW4	SW2	SW2	SW2	Bara
III	SW5, SW6	SW3	SW3	SW3	Bara
IV	SW7, SW8	SW4	SW4	SW4	Bara
V	SW9, SW10	SW5	SW5	SW5	Bara
VI	SW11, SW12	SW6	SW6	SW6	Bara
VII	SW13, SW14	SW7	SW7	SW7	Bara
VIII	SW15, SW16	SW8	SW8	SW8	Bara
IX	SW17, SW18	SW9	SW9	SW9	Bara
X	SW19, SW20	SW10	SW10	SW10	Bara
XI	SW21, SW22	SW11	SW11	SW11	Bara
XII	SW23, SW24	SW12	SW12	SW12	Bara
XIII	SW25, SW26	SW13	SW13	SW13	Bara
XIV	SW27, SW28	SW14	SW14	SW14	Bara
XV	SW29, SW30	SW15	SW15	SW15	Bara
XVI	SW31, SW32	SW16	SW16	SW16	Bara
XVII	SW33, SW34	SW17	SW17	SW17	Bara

[illegible]

HoD (Env.) Mining Co. Limited (Signature)	Registered Officer, District Jharkhand State Pollution Control Board (Signature)	Legend	Sampling Locations of Surface Water (Upstream/ Downstream)	Sampling Locations of Mine Water	Sampling Locations of Ground/ Drinking Water

STRICTLY RESTRICTED**FOR COMPANY USE ONLY RESTRICTED**

The information given in this report is not to be communicated either directly or indirectly to the press or to any person not holding an official position in the CIL /GOVERNMENT.

**ENVIRONMENTAL MONITORING REPORT
OF
BHARAT COKING COAL LIMITED,
CLUSTER – XII**

(FOR THE MONTH JANUARY, 2023)

E. C. no. J-11015/184/2012-IA.II (M) dated 10.12.2014.



CMPDI

ISO 9001 Company
**Regional Institute-II
Dhanbad, Jharkhand**

CONTENTS

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EXECUTIVE SUMMARY

1.0 Introduction

The purpose of environmental monitoring is to assess the quality of various attributes that affects the fauna and flora. In accordance with the quality of these attributes appropriate strategy is to be developed to control the pollution level within the permissible limits. The three major attributes are air, water and noise level.

Bharat Coking Coal Limited (BCCL), a Subsidiary company of Coal India Limited is operating Underground and Opencast Mines in Jharia Coalfield (JCF) is a part of Gondwana Coalfields located in Dhanbad district of Jharkhand, the JCF is bounded by 23°37' N to 23°52' N latitudes and 86°09' E to 86°30' E longitude occupying an area of 450 Sq.km. BCCL has awarded Environmental monitoring work of Jharia Coalfield (JCF) to Central Mine Planning & Design Institute Limited (CMPDIL). The environmental monitoring has been carried out as per the conditions laid down by the MoEF&CC while granting environmental clearance of project, consent letter issued by the respective SPCB, and other statutory requirements.

2.0 Sampling location and rationale

2.1 Ambient air sampling locations

The ambient air quality monitoring stations were selected to represent core, buffer zone area. The rationale has been based on the guidelines stipulated by MoEF&CC, consent letter of SPCB, as well as other statutory requirements.

2.2 Water sampling stations

The Water sampling stations were selected for mine sump water.

2.3 Noise level monitoring locations

Noise levels vary depending on the various activities in mining areas. The monitoring of noise level in different locations will be helpful to take appropriate mitigating measures. The rationale has been based on the guidelines stipulated by MoEF&CC, consent letter of SPCB, as well as other statutory requirements.

3.0 Methodology of sampling and analysis

3.1 Ambient air quality

Parameters chosen for assessment of ambient air quality were Particulate Matter (PM₁₀), Fine Particulate Matter (PM_{2.5}), Sulphur Di-oxide (SO₂)

and Nitrogen Oxides (NO_x). Respirable Dust Samplers (RDS) and Fine Dust Sampler (PM_{2.5} sampler) were used for sampling of PM₁₀, SO₂, & NO_x and Fine Dust Sampler (PM_{2.5} sampler) were used for sampling of PM_{2.5} at 24 hours interval once in a fortnight and the same for the gaseous pollutants. The samples were analysed in Environmental Laboratory of CMPDI, RI-II, Dhanbad.

3.2 Water quality

Water samples were collected as per standard practice. The Mine effluent samples were collected and analyzed for four parameters on fortnightly basis. Thereafter the samples were preserved and analyzed at the Environmental Laboratory of CMPDI, RI- II, Dhanbad.

3.3 Noise level monitoring

Noise level measurements in form of 'L_{EQ}' were taken using Integrated Data Logging Sound Level Meter. Noise levels were measured in Decibels, 'A' weighted average, i.e. dB(A).

4.0 Results and interpretations

4.1 Air quality

It has been seen from the analysis results that the 24 hours average concentration parameters like PM₁₀, PM_{2.5}, SO₂ and NO_x are mostly within the permissible limits in all sampling locations as per MoEF&CC Gazette Notification No. GSR 742(E) dt 25.09.2000 Standards for Coal Mines and National Ambient Air Quality Standard -2009. Sometimes the concentration of PM₁₀& PM_{2.5} exceeds the limits due to heavy public traffic, poor road condition, coke oven plants, burning of coal by surrounding habitants, brick making, municipal waste dumps and industries like Steel Plant, thermal Plants including their fly ash etc.

The following preventive and suppressive mitigative measures can be undertaken to contain the pollution level within prescribed level:-

- Wet drilling and controlled blasting should be practice.
- Explosive used should be optimised to restrict the dust generation.
- Transportation roads should be permanently asphalted free of ruts, potholes etc.
- Water should be sprayed on coal transportation road, service road more frequently and at regular interval.
- Dust from roads should be removed physically or mechanically.
- Greenbelts around industrial sites, service building area besides Avenue plantation along roads should be created.
- Coal dust should be suppressed by using fixed sprinklers.
- Regular maintenance of plant and machinery should be undertaken.

4.2 Water quality

The test results indicate that the major parameters compared with MoEF&CC Gazette Notification No. GSR 742(E) dt 25.09.2000

4.3 Noise Level

During the noise level survey it has been observed that the noise level in the sampling locations is within the permissible limits prescribed as per MoEF&CC Gazette Notification No. GSR 742(E) dt 25.09.2000 Standards for Coal Mines for Industrial Area and Noise pollution (Regulation and Control) Rules, 2000.

INTRODUCTION

1.0 Any industry and development activities including coal mining is bound to affect environmental attributes. There are positive as well as negative impacts of such operations. For controlling the adverse impacts a regular monitoring is essential. The environmental monitoring is being done as per the guide-lines stipulated by Ministry of Environment, Forest and Climate Change (MoEF&CC), Govt. of India.

The very purpose of environmental monitoring is to assess the quality of various attributes which affects the environment. As per quality of these attributes appropriate strategy is to be developed to control the pollution level within the permissible limits. The three major attributes are air, water and noise level.

Bharat Coking Coal has awarded Environmental Monitoring work of all Projects, Cluster wise, to Central Mine Planning & Design Institute Limited (CMPDIL). The environmental monitoring has been carried out as per conditions laid down by MoEF&CC while granting environmental clearance to different projects. CMPDI has trained manpower and well equipped laboratory to carry out monitoring, analysis and R&D work in the field of environment.

1.1 The Cluster XII is in the Central part of the Jharia coalfield. It includes Kapuria UG Mine. The cluster – XII is situated about 30 - 35 kms from Dhanbad Railway Station. The mines of this cluster - XII are operating since pre nationalization period (prior to 1972-73). It is connected by both Railway and Road. The drainage of the area is governed by Katri River.

1.2 The cluster XII is designed to produce 2.4 Mtpa (normative) and 3.12 Mtpa peak capacity of coal. The average grade of coal W-II to W-IV.

The Project has Environmental Clearance from Ministry of Environment, Forests and Climate Change (MoEF&CC) for a rated capacity of 2.4 MTPA (normative) and 3.12 MTPA peak capacity of coal production vide letter no E.C. no. J-11015/184/2012-IA.II (M) dated 10.12.2014.

Ministry of Environment, Forest and Climate Change while granting environmental clearance has given one of the General conditions that “ Four ambient air quality monitoring stations should be established in the core zone as well as in the buffer zone for PM₁₀, PM_{2.5}, SO₂, NO_x monitoring. Location of the stations should be decided based on the meteorological data, topographical features and environmentally and ecologically sensitive targets, other conditions regarding water / effluent and noise level monitoring in consultation with the State Pollution Control Board.”

In compliance of these conditions the Environmental Monitoring has been carried out & report prepared for submission to MoEF&CC & JSPCB and other statutory authorities.

AMBIENT AIR QUALITY MONITORING

2.1 Location of sampling station and their rationale:

(As per G.S.R. 742 (E) dt. 25th December, 2000)

2.1.1 Ambient Air Quality Sampling Locations

I. CORE ZONE Monitoring Location

i) Rudhi basti (A18): Industrial Area

The location of the sampling station is 23° 45' 26.60" N & 86° 18' 39.90" E. The samplers were placed at a height of approx. 1.5m above ground level at Rudhi basti.

II. BUFFER ZONE Monitoring Location

i) Block IV (A6) : Industrial area

The location of the sampling station is 23° 47' 54.00" N & 86° 16' 20.00" E. The samplers were placed at a height of approx. 1.5m above ground level at Safety Office.

ii) Moonidih UGP (A17) : Industrial area

The location of the sampling station is 23° 44' 30.00" N & 86° 20' 56.00" E. The samplers were placed at a height of approx. 1.5m above ground level at project office.

iii) Murlidih 20/21 Pit(A19): Industrial Area

The location of the sampling station is 23° 43' 51.82" N & 86° 16' 21.87" E. The samplers were placed at a height of approx. 1.5m above ground level at project office.

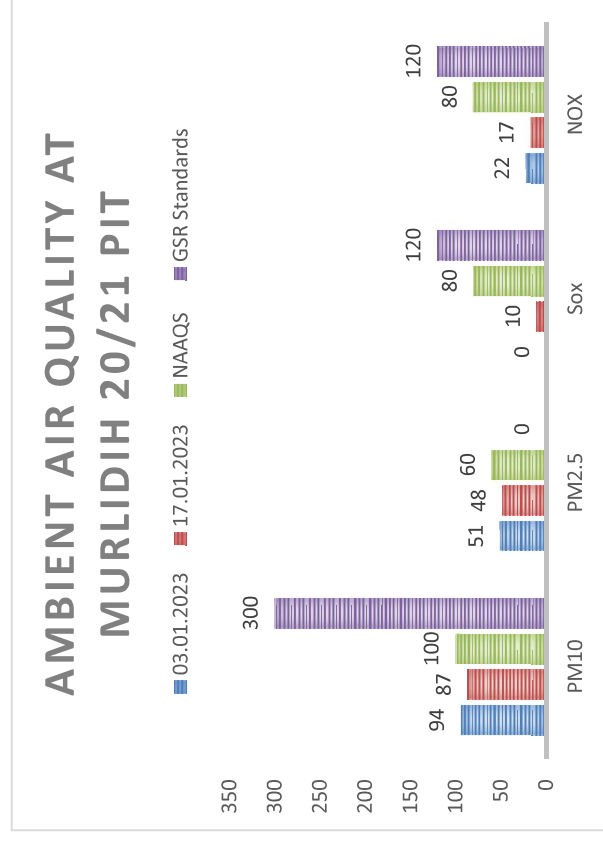
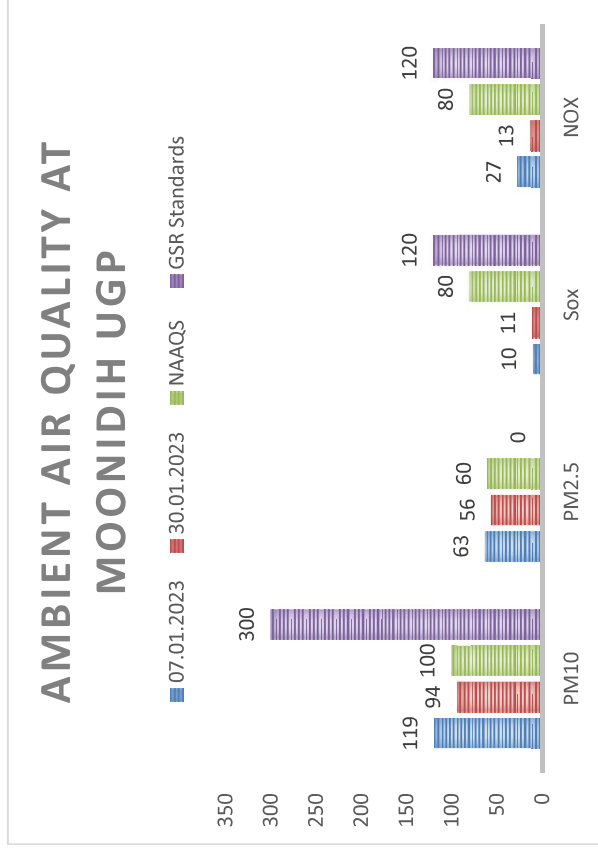
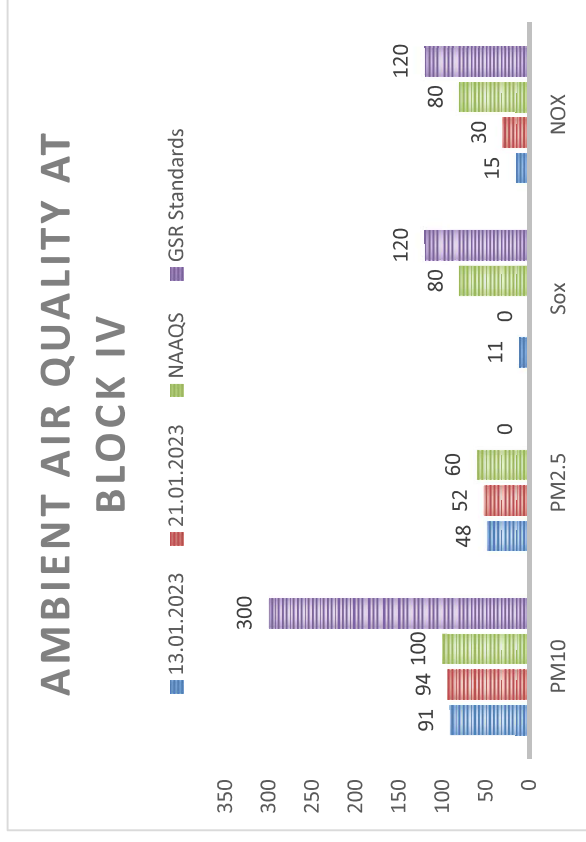
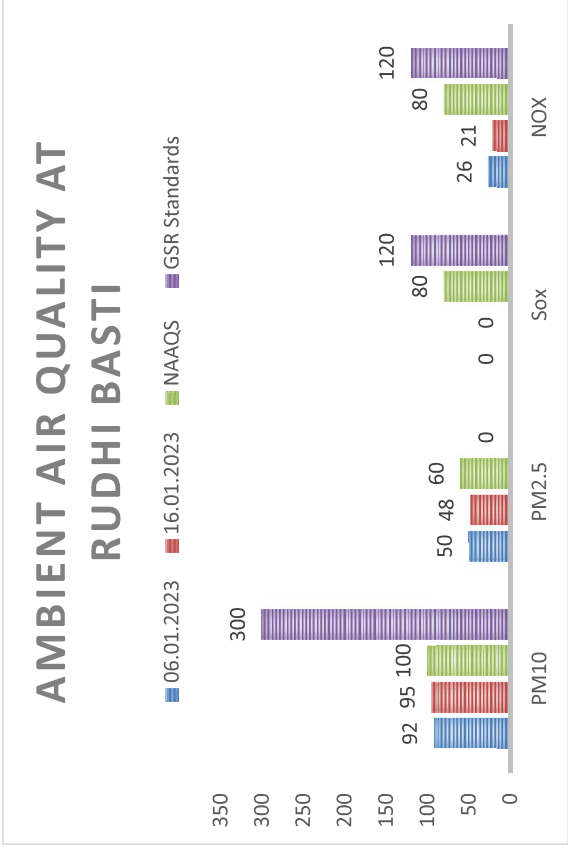
AMBIENT AIR QUALITY DATA

  		CENTRAL MINE PLANNING AND DESIGN INSTITUTE LIMITED Environment Laboratory, Regional Institute-II Ambient Air Quality Test Report		CMPDIL, RI-II KOYLA BHAWAN COMPLEX DHANBAD. -826005 Phone:0326-223-850 email: rdri2cmpdi@coalindia.in	
Test Report for Ambient Air Samples					
Month & Year		Cluster		Cluster XII	
Customer		Environment Department, Bharat Coking Coal Limited (BCCL), Koyla Bhawan, Dhanbad (E-mail: gmenv.bccl@coalindia.in)			
Project		Sample Ref. No.		REM/BCCL/2023/10	
Sampling Stations		Date of Sampling		16.01.2023	
Sl. No.		Method of Analysis		Range Of Testing	
1		PM₁₀		10 µg/m³ - 1000 µg/m³	
2		PM_{2.5}		10 µg/m³ - 400 µg/m³	
3		SO₂		10 µg/m³ - 1050 µg/m³	
4		NO₂		06 µg/m³ - 420 µg/m³	
Report No.		Date of Issue		Core Zone	
RI-II/AIR/2022-23/10		23.03.23		CMPDI/RI-II/LPM 13. (IS 5182)	
Zone of Station:		MoEF Standards Notification dated 25th September, 2000 (GSR 742 E)		NAAQS, 2009	
1		PM₁₀		300	
2		PM_{2.5}		Not Specified	
3		SO₂		120	
4		NO₂		120	
* LDL indicates Lower Detection Limit, **All units are in µg/m³, 24 hourly Average,					
 ANALYSED BY (Gaurav Kant) CHECKED BY		 (Amit Raj Mishra) HOD's Signature			
Note: The results above relate to the samples tested as received. This report can not be reproduced in part or full without the written permission of the HOD(Env) , CMPDI, RI-II.					
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Page -1 of 1					

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Test Report for Ambient Air Samples					
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Customer	Environment Department, Bharat Coking Coal Limited (BCCL), Koyla Bhawan, Dhanbad (E-mail: gmenv.bccl@coalindia.in)				Date of Issue
Project			Sample Ref. No.	REM/BCCL/2023/10	CMPDI/RI-II/LPM 13, (IS 5182)
Sampling Stations	i	Block IV	Date of Sampling	13.01.2023	Zone of Station:
Sl. No.	Method of Analysis	Observed Values (in $\mu\text{g}/\text{m}^3$)		Range Of Testing	MoEF Standards Notification dated 25th September, 2000 (GSR 742 E)
		1st FN	2nd FN		NAAQS, 2009
1	IS -5182(Part 23):2006, R-2017	91	94	10 $\mu\text{g}/\text{m}^3$ - 1000 $\mu\text{g}/\text{m}^3$	300
2	IS -5182(Part 24):2019	48	52	10 $\mu\text{g}/\text{m}^3$ - 400 $\mu\text{g}/\text{m}^3$	Not Specified
3	IS-5182(Part-2): 2001, R-2017	11	<10	10 $\mu\text{g}/\text{m}^3$ - 1050 $\mu\text{g}/\text{m}^3$	120
4	IS-5182 (Part-6): 2006, R-2017	15	30	06 $\mu\text{g}/\text{m}^3$ - 420 $\mu\text{g}/\text{m}^3$	120
* LDl indicates Lower Detection Limit,					
**All units are in $\mu\text{g}/\text{m}^3$, 24 hourly Average,					
 ANALYSED BY (Gaurav Kant) CHECKED BY		 (Amit Raj Mishra) HOD's Signature			
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Test Report for Ambient Air Samples																													
Month & Year		01/2023		Cluster		Cluster XII		Report No.		RI-II/AIR/2022-23/10																			
Customer		Environment Department, Bharat Coking Coal Limited (BCCL), Koyla Bhawan, Dhanbad (E-mail: gmenv.bccl@coalindia.in)								Date of Issue		23.03.23																	
Project				Sample Ref. No.		REM/BCCL/2023/10		Sampling Method		CMPDI/RI-II/LPM 13. (IS 5182)																			
Sampling Stations		i		Moonidih UGP		Date of Sampling		07.01.2023		30.01.2023		Zone of Station: Buffer Zone																	
Sl. No.		Method of Analysis		Observed Values (in $\mu\text{g}/\text{m}^3$)		Range Of Testing		LDL		MoEF Standards Notification dated 25th September, 2000 (GSR 742 E)		NAAQS, 2009																	
				1st FN		2nd FN																							
1	PM ₁₀	IS -5182(Part 23):2006, R-2017		119		94		10 $\mu\text{g}/\text{m}^3$ - 1000 $\mu\text{g}/\text{m}^3$		10 $\mu\text{g}/\text{m}^3$		300		100															
2	PM _{2.5}	IS -5182(Part 24):2019		63		56		10 $\mu\text{g}/\text{m}^3$ - 400 $\mu\text{g}/\text{m}^3$		10 $\mu\text{g}/\text{m}^3$		Not Specified		60															
3	SO ₂	IS-5182(Part-2): 2001, R-2017		10		11		10 $\mu\text{g}/\text{m}^3$ - 1050 $\mu\text{g}/\text{m}^3$		10 $\mu\text{g}/\text{m}^3$		120		80															
4	NO ₂	IS-5182 (Part-6): 2006 , R-2017		27		13		06 $\mu\text{g}/\text{m}^3$ - 420 $\mu\text{g}/\text{m}^3$		06 $\mu\text{g}/\text{m}^3$		120		80															
* LDL indicates Lower Detection Limit, **All units are in $\mu\text{g}/\text{m}^3$, 24 hourly Average,																													
ANALYSED BY				(Gaurav Kant)		CHECKED BY				(Amit Raj Mishra)		HOD's Signature																	
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Page -1 of 1																													

  										CENTRAL MINE PLANNING AND DESIGN INSTITUTE LIMITED Environment Laboratory, Regional Institute-II Ambient Air Quality Test Report										CMPDIL, RI-II KOYLA BHAWAN COMPLEX DHANBAD. - 826005 Phone:0326-223-850 email: rdri2cmpdi@coalindia.in									
Test Report for Ambient Air Samples																													
Month & Year		01/2023		Cluster		Cluster XII		Report No.		RI-II/AIR/2022-23/10																			
Customer		Environment Department, Bharat Coking Coal Limited (BCCL), Koyla Bhawan, Dhanbad (E-mail: gmenv.bccl@coalindia.in)								Date of Issue		23.03.23																	
Project				Sample Ref. No.		REM/BCCL/2023/10		Sampling Method		CMPDI/RI-II/LPM 13. (IS 5182)																			
Sampling Stations		i		Murlidih 20/21 Pit		Date of Sampling		03.01.2023		17.01.2023		Zone of Station: Buffer Zone																	
Sl. No.		Method of Analysis		Observed Values (in $\mu\text{g}/\text{m}^3$)		Range Of Testing		LDL		MoEF Standards Notification dated 25th September, 2000 (GSR 742 E)		NAAQS, 2009																	
				1st FN		2nd FN																							
1	PM ₁₀	IS -5182(Part 23):2006, R-2017		94		87		10 $\mu\text{g}/\text{m}^3$ - 1000 $\mu\text{g}/\text{m}^3$		10 $\mu\text{g}/\text{m}^3$		300		100															
2	PM _{2.5}	IS -5182(Part 24):2019		51		48		10 $\mu\text{g}/\text{m}^3$ - 400 $\mu\text{g}/\text{m}^3$		10 $\mu\text{g}/\text{m}^3$		Not Specified		60															
3	SO ₂	IS-5182(Part-2): 2001, R-2017		<10		10		10 $\mu\text{g}/\text{m}^3$ - 1050 $\mu\text{g}/\text{m}^3$		10 $\mu\text{g}/\text{m}^3$		120		80															
4	NO ₂	IS-5182 (Part-6): 2006 , R-2017		22		17		06 $\mu\text{g}/\text{m}^3$ - 420 $\mu\text{g}/\text{m}^3$		06 $\mu\text{g}/\text{m}^3$		120		80															
* LDL indicates Lower Detection Limit, **All units are in $\mu\text{g}/\text{m}^3$, 24 hourly Average,																													
ANALYSED BY				(Gaurav Kant)		CHECKED BY				(Amit Raj Mishra)		HOD's Signature																	
Note: The results above relate to the samples tested as received. This report can not be reproduced in part or full without the written permission of the HOD(Env) , CMPDI, RI-II.																													
----- End of Report -----																													
Page -1 of 1																													



NOISE LEVEL QUALITY MONITORING

4.1 Location of sampling sites

- i) **Rudhi basti (N18)**
- ii) **Block IV(N6)**
- iii) **Moonidih UGP(N17)**
- iv) **Murlidih 20/21 (N19)**

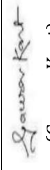
4.2 Methodology of sampling and analysis

Noise level measurements in form of ' L_{EQ} ' were taken using Integrated Data Logging Sound Level Meter (NL-52 OF RION CO. Ltd. Make) during day time. Noise levels were measured for about one hour time in day time. Noise levels were measured in Decibels, 'A' weighted average, i.e. dB (A).

4.3 Results & Interpretations

Ambient noise levels were recorded during day time and the observed values were compared with standards prescribed by MoEFCC. The results of Noise levels recorded during day time on fortnightly basis are presented in tabular form along with the applicable standard permissible limits. The observed values in terms of L_{EQ} are presented. The observed values at all the monitoring locations are found to be within permissible limits.

 CMPDI, RI-II KOYLA BHAWAN COMPLEX DHANBAD - 826005 Phone:0326-223-850 email: rrii7rmdm@coalindia.in  CMPDI A Mini Kisan Company CENTRAL MINE PLANNING AND DESIGN INSTITUTE LIMITED Environment Laboratory, Regional Institute-II Ambient Noise Level Test Report									
Month & Year	01/2023	Cluster	Cluster XII			Report No.	RI-II/WATER/2022-23/10		
Customer	Environment Department, Bharat Coking Coal Limited (BCCL), Koyla Bhawan, Dhanbad (E-mail: gmenv.bcc@coalindia.in)								
Project			Sample Ref. No.		REM/BCCL/2023/10		Sampling Method		CMPDI/RI-II/LPM 13
Sampling Stations	i	Rudhi Basti			Date of Sampling		Zone Category of Station:		Core Zone
Sl. No.	Parameter	Hour / Time of day	Observed Values (in Leq dB(A))		06.01.2023	16.01.2023	Range Of Testing	LDL	NOISE POLLUTION (REGULATION AND CONTROL) RULES, 2000 Standards
1	Noise Level dB(A)Leq - Day	06:00 - 07:00	45.1		CPCB, Protocol for Ambient Level Noise Monitoring - 2015	35 dB-135 dB	35 dB(A)	Industrial Commercial Residential Silence	75 65 55 50
2		07:00 - 08:00	48.5						
3		08:00 - 09:00	49.6						
4		09:00 - 10:00	45.9						
5		10:00 - 11:00	51.0						
6		11:00 - 12:00	54.7						
7		12:00 - 13:00	52.6						
8		13:00 - 14:00	53.9						
9		14:00 - 15:00	56.0						
10		15:00 - 16:00	58.2						
11		16:00 - 17:00	53.6						
12		17:00 - 18:00	51.1						
13		18:00 - 19:00	45.1						
14		19:00 - 20:00	45.7						
15		20:00 - 21:00	43.2						
16		21:00 - 22:00	43.1						
	Leq Day		52.1						
1	Noise Level dB(A)Leq -Night	22:00-23:00	43.0		CPCB, Protocol for Ambient Level Noise Monitoring - 2015	35 dB-135 dB	35 dB(A)	Industrial Commercial Residential Silence	70 55 45 50
2		23:00-00:00	43.1						
3		00:00-01:00	42.5						
4		01:00-02:00	42.5						
5		02:00-03:00	42.1						
6		03:00-04:00	42.3						
7		04:00-05:00	42.4						
8		05:00-06:00	42.5						
	Leq Night		42.6						
**All noise measurements are integrated for a 01 hour period, All units in dB(A) *LDL indicates Lower Detection Limit									

		CENTRAL MINE PLANNING AND DESIGN INSTITUTE LIMITED Environment Laboratory, Regional Institute-II Ambient Noise Level Test Report		KOYLA BHAWAN COMPLEX DHANBAD - 826005 Phone:0326-223-850		CMPDIL, RI-II	
Month & Year	01/2023	Cluster	Cluster XII	Report No.	RI-II/NOISE/2022-23/10	Date of Issue	23.03.23
Customer	Environment Department, Bharat Coking Coal Limited (BCCL), Koyla Bhawan, Dhanbad (E-mail: gmenv.bcccl@coalindia.in)			Sampling Method	CMPDI/RI-II/LPM 13		
Project	Sample Ref. No.			REM/BCCL/2023/10			
Sampling Stations	i	Block IV	Date of Sampling	13.01.2023	21.01.2023	Zone Category of Station:	Buffer Zone
Sl. No.	Parameter	Hour / Time of day	Observed Values (in Leq dB(A))	Method of Analysis	Range Of Testing	LDL	NOISE POLLUTION (REGULATION AND CONTROL) RULES, 2000 Standards
1	Noise Level dB(A)Leq - Day	06:00 - 07:00	53.9	CPCB, Protocol for Ambient Level Noise Monitoring - 2015	35 dB-135 dB	35 dB(A)	Industrial Commercial Residential Silence
2		07:00 - 08:00	52.6				
3		08:00 - 09:00	57.0				
4		09:00 - 10:00	57.9				
5		10:00 - 11:00	61.5				
6		11:00 - 12:00	60.9				
7		12:00 - 13:00	62.3				
8		13:00 - 14:00	61.5				
9		14:00 - 15:00	63.8				
10		15:00 - 16:00	62.5				
11		16:00 - 17:00	64.6				
12		17:00 - 18:00	66.9				
13		18:00 - 19:00	67.8				
14		19:00 - 20:00	64.6				
15		20:00 - 21:00	65.6				
16		21:00 - 22:00	58.8				
1	Noise Level dB(A)Leq - Night	22:00-23:00	51.4	CPCB, Protocol for Ambient Level Noise Monitoring - 2015	35 dB-135 dB	35 dB(A)	Industrial Commercial Residential Silence
2		23:00-00:00	63.1				
3		00:00-01:00	50.1				
4		01:00-02:00	48.5				
5		02:00-03:00	47.9				
6		03:00-04:00	44.1				
7		04:00-05:00	43.6				
8		05:00-06:00	44.9				
			47.8				
			46.7				
**All noise measurements are integrated for a 01 hour period. All units in dB(A) *LDL indicates Lower Detection Limit							
Sampling Assistants ANALYSED BY  (Gaurav Kant)				CHECKED BY  (Amit Raj Mishra) HOD's Signature			
Note: The results above relate to the samples tested as received. This report can not be reproduced in part or full without the written permission of the HOD(Env), CMPDI, RI-II.							
.... End of Report Page - 1 of 1							

 CENTRAL MINE PLANNING AND DESIGN INSTITUTE LIMITED Environment Laboratory, Regional Institute-II Ambient Noise Level Test Report										CMPDIL RI-II KOYLA BHAWAN COMPLEX DHANBAD - 826005 Phone: 0326-223-850 email: rdri2cmpdi@coalindia.in			
Month & Year	01/2023	Cluster	Cluster XII			Environment Department, Bharat Coking Coal Limited (BCCL), Koyla Bhawan, Dhanbad (E-mail: gmenv.bcl@coalindia.in)		Report No.	RI-II/NOISE/2022-23/10				
Customer Project	Environment Department, Bharat Coking Coal Limited (BCCL), Koyla Bhawan, Dhanbad		Sample Ref. No.	REM/BCCL/2023/10			Sampling Method	Date of Issue	23.03.23				
Sampling Stations	i	Moondih UGP	Date of Sampling		07.01.2023	30.01.2023	Zone Category of Station:	Buffer Zone					
Sl. No.	Parameter	Hour / Time of day	Observed Values (in Leq dB(A))	Observed Values (in Leq dB(A))	Method of Analysis	Range Of Testing	LDL	NOISE POLLUTION (REGULATION AND CONTROL) RULES, 2000 Standards					
			First Fortnight	Second Fortnight				Zones	Limits in dB				
1	Noise Level dB(A) Leq - Day	06:00 - 07:00	50.7	51.4	CPCB, Protocol for Ambient Level Noise Monitoring - 2015	35 dB-135 dB	35 dB(A)	Industrial Commercial Residential Silence	75 65 55 50				
2		07:00 - 08:00	46.3	47.1									
3		08:00 - 09:00	53.9	55.5									
4		09:00 - 10:00	52.0	49.5									
5		10:00 - 11:00	55.1	54.0									
6		11:00 - 12:00	58.4	59.2									
7		12:00 - 13:00	56.5	56.2									
8		13:00 - 14:00	58.2	57.2									
9		14:00 - 15:00	54.4	54.0									
10		15:00 - 16:00	52.6	52.0									
11		16:00 - 17:00	52.2	52.4									
12		17:00 - 18:00	51.8	52.4									
13		18:00 - 19:00	51.0	51.4									
14		19:00 - 20:00	51.6	51.3									
15		20:00 - 21:00	50.1	49.9									
16		21:00 - 22:00	49.6	49.8									
	Leq Day		53.9	53.8									
1	Noise Level dB(A) Leq - Night	22:00-23:00	46.5	46.5	CPCB, Protocol for Ambient Level Noise Monitoring - 2015	35 dB-135 dB	35 dB(A)	Industrial Commercial Residential Silence	70 55 45 50				
2		23:00- 00:00	45.9	46.1									
3		00:00- 01:00	45.1	46.1									
4		01:00-02:00	44.2	44.9									
5		02:00-03:00	44.0	44.1									
6		03:00-04:00	44.0	44.2									
7		04:00-05:00	45.5	45.6									
8		05:00-06:00	45.9	46.1									
	Leq Night		45.2	45.5									
Sampling Assistants ANALYSED BY  (Gaurav Kant) CHECKED BY (Amit Raj Mishra) HOD's Signature										**All noise measurements are integrated for a 01 hour period. All units in dB(A) *LDL indicates Lower Detection Limit			
Note: The results above relate to the samples tested as received. This report can not be reproduced in part or full without the written permission of the HOD(Env), CMPDI, RI-II. Page - 1 of 1													

 CENTRAL MINE PLANNING AND DESIGN INSTITUTE LIMITED Environment Laboratory, Regional Institute-II Ambient Noise Level Test Report		CMPDIL, RI-II KOYLA BHAWAN COMPLEX DHANBAD - 826005 Phone:0326-223-850 e-mail: rdi2coindia@coindia.in	
Month & Year	01/2023	Cluster	Cluster XII
Customer	Environment Department, Bharat Coking Coal Limited (BCCL), Koyla Bhawan, Dhanbad (E-mail: gmenv.bccl@coindia.in)		
Project	REM/BCCL/2023/10		
Sampling Stations	i	Murlidih(20/21)	Sample Ref. No.
Sl. No.	Parameter	Hour / Time of day	Date of Sampling
			Observed Values (in Leq dB(A))
			First Fortnight
			Second Fortnight
1	Noise Level dB(A)Leq - Day	06:00 - 07:00	48.8
2		07:00 - 08:00	48.9
3		08:00 - 09:00	51.0
4		09:00 - 10:00	50.2
5		10:00 - 11:00	53.1
6		11:00 - 12:00	53.2
7		12:00 - 13:00	55.1
8		13:00 - 14:00	55.5
9		14:00 - 15:00	55.9
10		15:00 - 16:00	57.1
11		16:00 - 17:00	56.9
12		17:00 - 18:00	54.5
13		18:00 - 19:00	51.2
14		19:00 - 20:00	50.9
15		20:00 - 21:00	49.8
16		21:00 - 22:00	49.6
		Leq Day	53.5
1	Noise Level dB(A)Leq - Night	22:00-23:00	39.3
2		23:00- 00:00	38.9
3		00:00- 01:00	38.6
4		01:00-02:00	38.5
5		02:00-03:00	38.4
6		03:00-04:00	38.9
7		04:00-05:00	39.1
8		05:00-06:00	39.3
		Leq Night	38.9
Sampling Assistants ANALYSED BY  (Gaurav Kant) CHECKED BY  (Amit Raj Mishra)			
Note: The results above relate to the samples tested as received. This report can not be reproduced in part or full without the written permission of the HOD(Env) , CMPDI, RI-II.			
***** End of Report *****			
Page -1 of 1			
JOB NO. 200316028		Cluster – XII, BCCL Environmental Monitoring Report	

****All noise measurements are integrated for a 01 hour period. All units in dB(A) *LDL indicates Lower Detection Limit**

Ambient Air Quality Standards for Jharia Coal Field
As per the Environment (Protection) Amendment Rules, 2000 notified vide notification G.S.R.
742(E), dated 25.9.2000.

Category	Pollutant	Time weighted average	Concentration in Ambient Air	Method of Measurement
1	2	3	4	5
III Coal mines located in the coal fields of • Jharia • Raniganj • Bokaro	Suspended Particulate Matter (SPM)	Annual Average * 24 hours **	500 $\mu\text{g}/\text{m}^3$ 700 $\mu\text{g}/\text{m}^3$	- High Volume Sampling (Average flow rate not less than 1.1 m^3/min)
	Respirable Particulate Matter (size less than 10 μm) (RPM)	Annual Average * 24 hours **	250 $\mu\text{g}/\text{m}^3$ 300 $\mu\text{g}/\text{m}^3$	Respirable Particulate Matter sampling and analysis
	Sulphur Dioxide (SO_2)	Annual Average * 24 hours **	80 $\mu\text{g}/\text{m}^3$ 120 $\mu\text{g}/\text{m}^3$	1. Improved west and Gaeke method 2. Ultraviolet fluorescence
	Oxide of Nitrogen as NO_2	Annual Average * 24 hours **	80 $\mu\text{g}/\text{m}^3$ 120 $\mu\text{g}/\text{m}^3$	1. Jacob & Hochheiser Modified (Na-Arsenic) Method 2. Gas phase Chemiluminescence

Note:

* Annual Arithmetic mean for the measurements taken in a year, following the guidelines for frequency of sampling laid down in clause 2.

** 24 hourly/8 hourly values shall be met 92% of the time in a year. However, 8% of the time it may exceed but not on two consecutive days.

NATIONAL AMBIENT AIR QUALITY STANDARDS

New Delhi the 18th November 2009

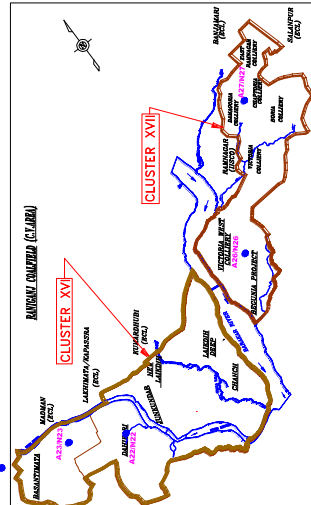
In exercise of the powers conferred by Sub-section (2) (h) of section 16 of the Air (Prevention and Control of Pollution) Act, 1981 (Act No. 14 of 1981), and in supersession of the notification No(s).S.O.384(E), dated 11th April 1994 and S.O.935(E), dated 14th NOVEMBER 1998, the Central Pollution Control Board hereby notify the National Ambient Air Quality Standards with immediate effect.

Pollutant	Time Weighted Average	Concentration in Ambient Air		Methods of Measurement
		Industrial, Residential, Rural and other Areas	Ecologically Sensitive Area (Notified by Central Government)	
Sulphur Dioxide (SO₂), µg/m³	Annual * 24 Hours **	50 80	20 80	-Improved West and Gaeke Method -Ultraviolet Fluorescence
Nitrogendioxide (NO₂), µg/m³	Annual * 24 Hours **	40 80	30 80	-Jacob &Hochheiser modified (NaOH-NaAsO ₂) Method -Gas Phase Chemiluminescence
Particulate Matter (Size less than 10µm) or PM₁₀, µg/m³	Annual * 24 Hours **	60 100	60 100	-Gravimetric -TEOM -Beta attenuation
Particulate Matter (Size less than 2.5µm) or PM_{2.5}, µg/m³	Annual * 24 Hours **	40 60	40 60	-Gravimetric -TEOM -Beta attenuation
Ozone (O₃) , µg/m³	8 Hours * 1 Hour **	100 180	100 180	-UV Photometric -Chemiluminescence -Chemical Method
Lead (Pb) , µg/m³	Annual * 24 Hours **	0.50 1.0	0.50 1.0	-AAS/ICP Method after sampling on EPM 2000 or equivalent filter paper -ED-XRF using Teflon filter
Carbon Monoxide (CO), mg/m³	8 Hours ** 1 Hour **	02 04	02 04	-Non dispersive Infrared (NDIR) Spectroscopy
Ammonia (NH₃), µg/m³	Annual * 24 Hours **	100 400	100 400	-Chemiluminescence -Indophenol blue method
Benzene (C₆H₆), µg/m³	Annual *	05	05	-Gas Chromatography (GC) based continuous analyzer -Adsorption and desorption followed by GC analysis
Benzo(a)Pyrene (BaP) Particulate phase only, ng/m³	Annual *	01	01	-Solvent extraction followed byHPLC/GC analysis
Arsenic (As), ng/m³	Annual *	06	06	-AAS/ICP Method after sampling on EPM 2000 or equivalent filter paper
Nickel (Ni), ng/m³	Annual *	20	20	-AAS/ICP Method after sampling on EPM 2000 or equivalent filter paper

* Annual Arithmetic mean of minimum 104 measurements in a year at a particular site taken twice a week 24 hourly at uniform intervals.

** 24 hourly or 8 hourly or 1 hourly monitored values, as applicable, shall be complied with 98% of the time in a year. 2% of the time, they JUNE exceed the limits but not on two consecutive days of monitoring.

NOTE:Whenever and wherever monitoring results on two consecutive days of monitoring exceed the limits specified above for the respective category, it shall be considered adequate reason to institute regular or continuous monitoring and further investigations.



HoD (Env't.)
Bharat Coking Coal Limited
(Signature)

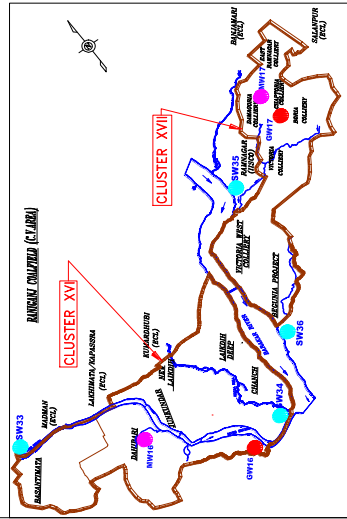
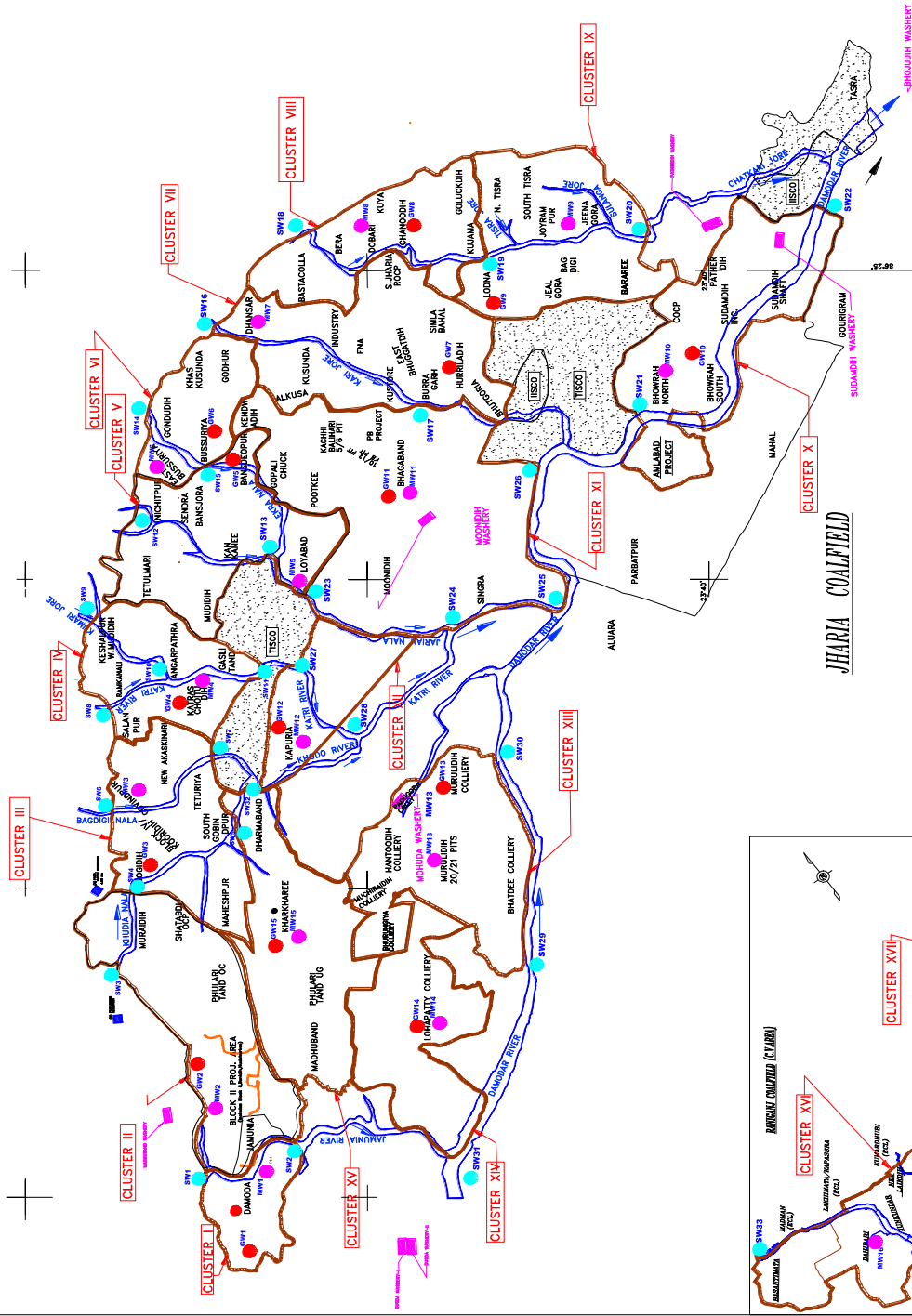
Regional Officer, Dhambad
Jharkhand State Pollution Control Board
(Signature)

Legend

Blue circle: Air / Rain Monitoring Station

Legend

Water Sampling Locations in BCCL



INDEX

Cluster	Surface Water	Name of River/Abutment Location	Name of Sampling Location	Name of Ground Water Location
I	SW1, SW2	Jharkhand River	SW1	SW1
II	SW3, SW4	Jharkhand River	SW2	SW2
III	SW5, SW6	Jharkhand River	SW3	SW3
IV	SW7, SW8	Jharkhand River	SW4	SW4
V	SW9, SW10	Jharkhand River	SW5	SW5
VI	SW11, SW12	Jharkhand River	SW6	SW6
VII	SW13, SW14	Jharkhand River	SW7	SW7
VIII	SW15, SW16	Jharkhand River	SW8	SW8
IX	SW17, SW18	Jharkhand River	SW9	SW9
X	SW19, SW20	Jharkhand River	SW10	SW10
XI	SW21, SW22	Jharkhand River	SW11	SW11
XII	SW23, SW24	Jharkhand River	SW12	SW12
XIII	SW25, SW26	Jharkhand River	SW13	SW13
XIV	SW27, SW28	Jharkhand River	SW14	SW14
XV	SW29, SW30	Jharkhand River	SW15	SW15
XVI	SW31, SW32	Jharkhand River	SW16	SW16
XVII	SW33, SW34	Jharkhand River	SW17	SW17

- Legend**
- Sampling Locations of Surface Water (Upstream/ Downstream)
 - Sampling Locations of Mine Water
 - Sampling Locations of Ground/ Drinking Water

Regional Officer, Jharkhand
Jharkhand State Pollution Control Board
(Signature)

Head (Envt.)
Bharat Coking Coal Limited
(Signature)

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The information given in this report is not to be communicated either directly or indirectly to the press or to any person not holding an official position in the CIL /GOVERNMENT.

**ENVIRONMENTAL MONITORING REPORT
OF
BHARAT COKING COAL LIMITED,
CLUSTER – XII**

(FOR THE MONTH FEBRUARY, 2023)

E. C. no. J-11015/184/2012-IA.II (M) dated 10.12.2014.



CMPDI

ISO 9001 Company
**Regional Institute-II
Dhanbad, Jharkhand**

CONTENTS

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2.	CHAPTER-II	INTRODUCTION	6
3.	CHAPTER-III	RESULTS	7-18
4.	CHAPTER-IV	STANDARDS AND PLANS	19-20

EXECUTIVE SUMMARY

1.0 Introduction

The purpose of environmental monitoring is to assess the quality of various attributes that affects the fauna and flora. In accordance with the quality of these attributes appropriate strategy is to be developed to control the pollution level within the permissible limits. The three major attributes are air, water and noise level.

Bharat Coking Coal Limited (BCCL), a Subsidiary company of Coal India Limited is operating Underground and Opencast Mines in Jharia Coalfield (JCF) is a part of Gondwana Coalfields located in Dhanbad district of Jharkhand, the JCF is bounded by 23°37' N to 23°52' N latitudes and 86°09' E to 86°30' E longitude occupying an area of 450 Sq.km. BCCL has awarded Environmental monitoring work of Jharia Coalfield (JCF) to Central Mine Planning & Design Institute Limited (CMPDIL). The environmental monitoring has been carried out as per the conditions laid down by the MoEF&CC while granting environmental clearance of project, consent letter issued by the respective SPCB, and other statutory requirements.

2.0 Sampling location and rationale

2.1 Ambient air sampling locations

The ambient air quality monitoring stations were selected to represent core, buffer zone area. The rationale has been based on the guidelines stipulated by MoEF&CC, consent letter of SPCB, as well as other statutory requirements.

2.2 Water sampling stations

The Water sampling stations were selected for mine sump water.

2.3 Noise level monitoring locations

Noise levels vary depending on the various activities in mining areas. The monitoring of noise level in different locations will be helpful to take appropriate mitigating measures. The rationale has been based on the guidelines stipulated by MoEF&CC, consent letter of SPCB, as well as other statutory requirements.

3.0 Methodology of sampling and analysis

3.1 Ambient air quality

Parameters chosen for assessment of ambient air quality were Particulate Matter (PM₁₀), Fine Particulate Matter (PM_{2.5}), Sulphur Di-oxide (SO₂)

and Nitrogen Oxides (NO_x). Respirable Dust Samplers (RDS) and Fine Dust Sampler (PM_{2.5} sampler) were used for sampling of PM₁₀, SO₂, & NO_x and Fine Dust Sampler (PM_{2.5} sampler) were used for sampling of PM_{2.5} at 24 hours interval once in a fortnight and the same for the gaseous pollutants. The samples were analysed in Environmental Laboratory of CMPDI, RI-II, Dhanbad.

3.2 Water quality

Water samples were collected as per standard practice. The Mine effluent samples were collected and analyzed for four parameters on fortnightly basis. Thereafter the samples were preserved and analyzed at the Environmental Laboratory of CMPDI, RI- II, Dhanbad.

3.3 Noise level monitoring

Noise level measurements in form of 'L_{EQ}' were taken using Integrated Data Logging Sound Level Meter. Noise levels were measured in Decibels, 'A' weighted average, i.e. dB(A).

4.0 Results and interpretations

4.1 Air quality

It has been seen from the analysis results that the 24 hours average concentration parameters like PM₁₀, PM_{2.5}, SO₂ and NO_x are mostly within the permissible limits in all sampling locations as per MoEF&CC Gazette Notification No. GSR 742(E) dt 25.09.2000 Standards for Coal Mines and National Ambient Air Quality Standard -2009. Sometimes the concentration of PM₁₀& PM_{2.5} exceeds the limits due to heavy public traffic, poor road condition, coke oven plants, burning of coal by surrounding habitants, brick making, municipal waste dumps and industries like Steel Plant, thermal Plants including their fly ash etc.

The following preventive and suppressive mitigative measures can be undertaken to contain the pollution level within prescribed level:-

- Wet drilling and controlled blasting should be practice.
- Explosive used should be optimised to restrict the dust generation.
- Transportation roads should be permanently asphalted free of ruts, potholes etc.
- Water should be sprayed on coal transportation road, service road more frequently and at regular interval.
- Dust from roads should be removed physically or mechanically.
- Greenbelts around industrial sites, service building area besides Avenue plantation along roads should be created.
- Coal dust should be suppressed by using fixed sprinklers.
- Regular maintenance of plant and machinery should be undertaken.

4.2 Water quality

The test results indicate that the major parameters compared with MoEF&CC Gazette Notification No. GSR 742(E) dt 25.09.2000

4.3 Noise Level

During the noise level survey it has been observed that the noise level in the sampling locations is within the permissible limits prescribed as per MoEF&CC Gazette Notification No. GSR 742(E) dt 25.09.2000 Standards for Coal Mines for Industrial Area and Noise pollution (Regulation and Control) Rules, 2000.

INTRODUCTION

1.0 Any industry and development activities including coal mining is bound to affect environmental attributes. There are positive as well as negative impacts of such operations. For controlling the adverse impacts a regular monitoring is essential. The environmental monitoring is being done as per the guide-lines stipulated by Ministry of Environment, Forest and Climate Change (MoEF&CC), Govt. of India.

The very purpose of environmental monitoring is to assess the quality of various attributes which affects the environment. As per quality of these attributes appropriate strategy is to be developed to control the pollution level within the permissible limits. The three major attributes are air, water and noise level.

Bharat Coking Coal has awarded Environmental Monitoring work of all Projects, Cluster wise, to Central Mine Planning & Design Institute Limited (CMPDIL). The environmental monitoring has been carried out as per conditions laid down by MoEF&CC while granting environmental clearance to different projects. CMPDI has trained manpower and well equipped laboratory to carry out monitoring, analysis and R&D work in the field of environment.

1.1 The Cluster XII is in the Central part of the Jharia coalfield. It includes Kapuria UG Mine. The cluster – XII is situated about 30 - 35 kms from Dhanbad Railway Station. The mines of this cluster - XII are operating since pre nationalization period (prior to 1972-73). It is connected by both Railway and Road. The drainage of the area is governed by Katri River.

1.2 The cluster XII is designed to produce 2.4 Mtpa (normative) and 3.12 Mtpa peak capacity of coal. The average grade of coal W-II to W-IV.

The Project has Environmental Clearance from Ministry of Environment, Forests and Climate Change (MoEF&CC) for a rated capacity of 2.4 MTPA (normative) and 3.12 MTPA peak capacity of coal production vide letter no E.C. no. J-11015/184/2012-IA.II (M) dated 10.12.2014.

Ministry of Environment, Forest and Climate Change while granting environmental clearance has given one of the General conditions that “ Four ambient air quality monitoring stations should be established in the core zone as well as in the buffer zone for PM₁₀, PM_{2.5}, SO₂, NO_x monitoring. Location of the stations should be decided based on the meteorological data, topographical features and environmentally and ecologically sensitive targets, other conditions regarding water / effluent and noise level monitoring in consultation with the State Pollution Control Board.”

In compliance of these conditions the Environmental Monitoring has been carried out & report prepared for submission to MoEF&CC & JSPCB and other statutory authorities.

AMBIENT AIR QUALITY MONITORING

2.1 Location of sampling station and their rationale:

(As per G.S.R. 742 (E) dt. 25th December, 2000)

2.1.1 Ambient Air Quality Sampling Locations

I. CORE ZONE Monitoring Location

i) Rudhi basti (A18): Industrial Area

The location of the sampling station is 23° 45' 26.60" N & 86° 18' 39.90" E. The samplers were placed at a height of approx. 1.5m above ground level at Rudhi basti.

II. BUFFER ZONE Monitoring Location

i) Block IV (A6) : Industrial area

The location of the sampling station is 23° 47' 54.00" N & 86° 16' 20.00" E. The samplers were placed at a height of approx. 1.5m above ground level at Safety Office.

ii) Moonidih UGP (A17) : Industrial area

The location of the sampling station is 23° 44' 30.00" N & 86° 20' 56.00" E. The samplers were placed at a height of approx. 1.5m above ground level at project office.

iii) Murlidih 20/21 Pit(A19): Industrial Area

The location of the sampling station is 23° 43' 51.82" N & 86° 16' 21.87" E. The samplers were placed at a height of approx. 1.5m above ground level at project office.

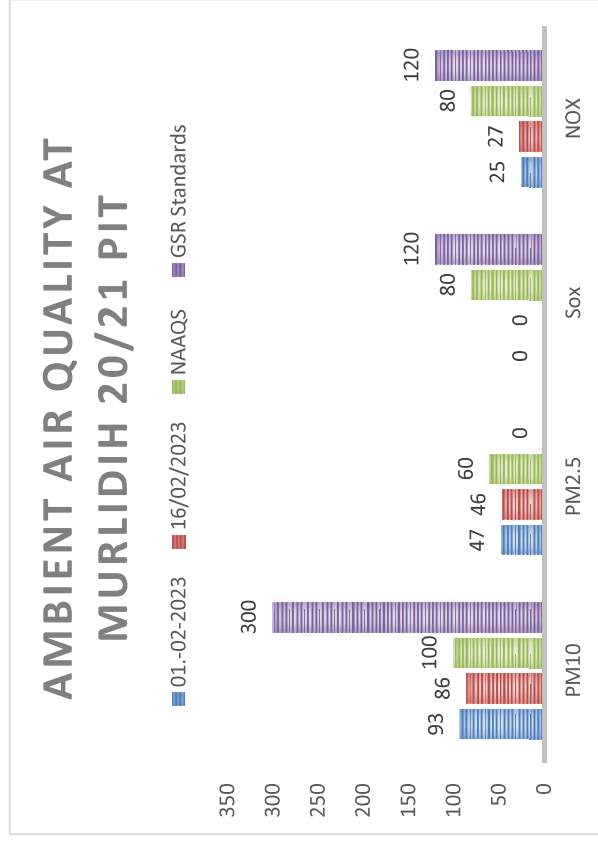
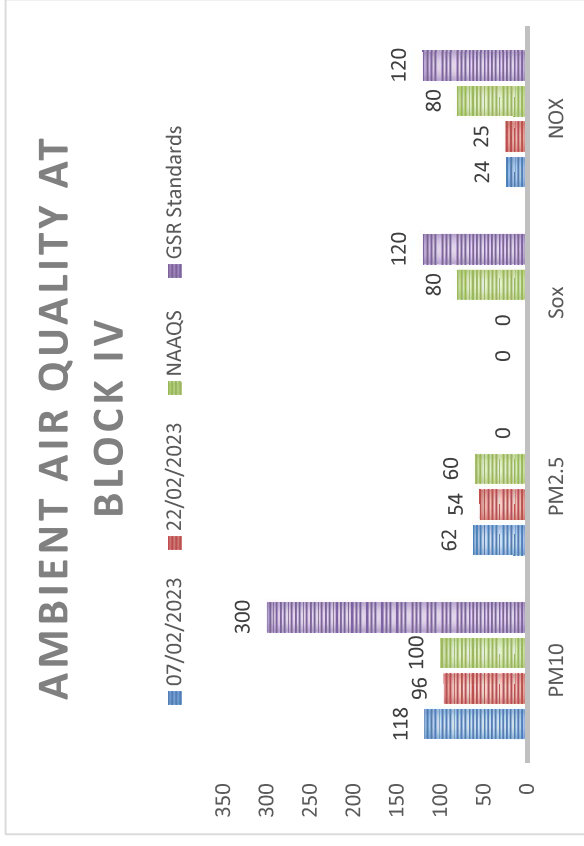
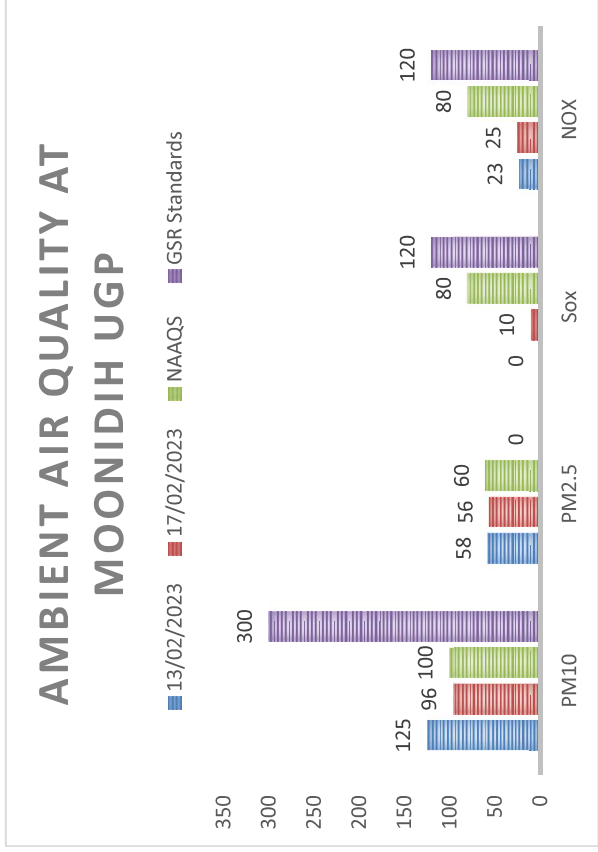
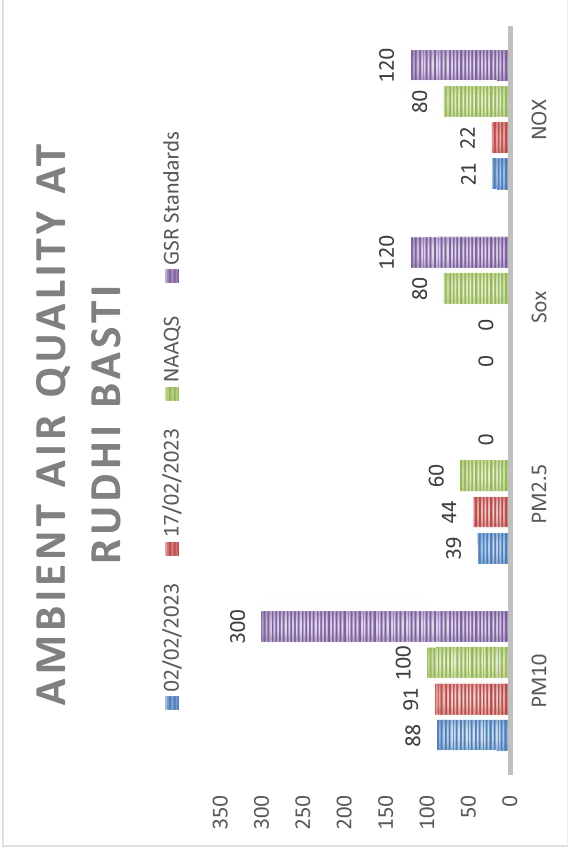
AMBIENT AIR QUALITY DATA

  		CENTRAL MINE PLANNING AND DESIGN INSTITUTE LIMITED Environment Laboratory, Regional Institute-II Ambient Air Quality Test Report		CMPDIL, RI-II KOYLA BHAWAN COMPLEX DHANBAD. - 826005 Phone: 0326-223-850 email: rdri2cmpdi@coalindia.in				
Test Report for Ambient Air Samples								
Month & Year	02/2023	Cluster	Cluster XII		Report No.			
Customer	Environment Department, Bharat Coking Coal Limited (BCCL), Koyla Bhawan, Dhanbad (E-mail: gmenv.bccl@coalindia.in)				Date of Issue			
Project	Rudhi Basti	Sample Ref. No.	REM/BCCL/2023/11	Sampling Method	CMPDI/RI-II/LPM 13.1 (IS 5182)			
Date of Sampling	02/02/2023	Period of Analysis	01.03.2023	15.03.2023	Zone of Station: Core Zone			
Sl. No.	Parameter	Method of Analysis	Observed Values (in $\mu\text{g}/\text{m}^3$)		Range Of Testing	LDL	MoEF Standards Notification dated 25th September, 2000 (GSR 742 E)	NAAQS, 2009
			1st FN	2nd FN				
1	PM ₁₀	IS -5182(Part 23):2006, R-2017	88	91	10 $\mu\text{g}/\text{m}^3$ - 1000 $\mu\text{g}/\text{m}^3$	10 $\mu\text{g}/\text{m}^3$	300	100
2	PM _{2.5}	IS -5182(Part 24):2019	39	44	10 $\mu\text{g}/\text{m}^3$ - 400 $\mu\text{g}/\text{m}^3$	10 $\mu\text{g}/\text{m}^3$	Not Specified	60
3	SO ₂	IS-5182(Part-2): 2001, R-2017	<10	<10	10 $\mu\text{g}/\text{m}^3$ - 1050 $\mu\text{g}/\text{m}^3$	10 $\mu\text{g}/\text{m}^3$	120	80
4	NO ₂	IS-5182 (Part-6): 2006, R-2017	21	22	06 $\mu\text{g}/\text{m}^3$ - 420 $\mu\text{g}/\text{m}^3$	06 $\mu\text{g}/\text{m}^3$	120	80
* LDL indicates Lower Detection Limit, **All units are in $\mu\text{g}/\text{m}^3$, 24 hourly Average,								
 ANALYSED BY (Gaurav Kant)			 REVIEWED BY (Amit Raj Mishra)			Authorised Signature		
Note: The results above relate to the samples tested as received. This report can not be reproduced in part or full without the written permission of the HOD(Env), CMPDI, RI-II.								
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Page -1 of 1								

  		CENTRAL MINE PLANNING AND DESIGN INSTITUTE LIMITED Environment Laboratory, Regional Institute-II Ambient Air Quality Test Report		CMPDIL, RI-II KOYLA BHAWAN COMPLEX DHANBAD. - 826005 Phone:0326-223-850 email: rdri2cmpdi@coalindia.in	
Test Report for Ambient Air Samples					
Month & Year	02/2023	Cluster	Cluster XII	Report No.	RI-II/AIR/2022-23/11
Customer	Environment Department, Bharat Coking Coal Limited (BCCL), Koyla Bhawan, Dhanbad (E-mail: gmenv.bccl@coalindia.in)			Date of Issue	31.03.2023
Project	Block IV	Sample Ref. No.	22/02/2023	Zone of Station:	CMPDI/RI-II/LPM 13, (IS 5182)
Date of Sampling	07/02/2023	REM/BCCL/2023/11	01.03.2023	Sampling Method	15.03.2023
Sl. No.	Parameter	Method of Analysis	Observed Values (in µg/m³)	Range Of Testing	LDL
			1st FN	2nd FN	MoEF Standards Notification dated 25th September, 2000 (GSR 742 E)
1	PM ₁₀	IS -5182(Part 23):2006, R-2017	118	96	300
2	PM _{2.5}	IS -5182(Part 24):2019	62	54	Not Specified
3	SO ₂	IS-5182(Part-2): 2001, R-2017	<10	<10	120
4	NO ₂	IS-5182 (Part-6): 2006, R-2017	24	25	120
* LDL indicates Lower Detection Limit,					
**All units are in µg/m³, 24 hourly Average,					
 ANALYSED BY (Gaurav Kant)		 REVIEWED BY (Amit Raj Mishra) Authorised Signature			
Note: The results above relate to the samples tested as received. This report can not be reproduced in part or full without the written permission of the HOD(Env), CMPDI, RI-II.					
---- End of Report ---- Page -1 of 1					
JOB NO. 200316028		Cluster – XII, BCCL Environmental Monitoring Report			

  		CENTRAL MINE PLANNING AND DESIGN INSTITUTE LIMITED Environment Laboratory, Regional Institute-II Ambient Air Quality Test Report		CMPDIL, RI-II KOYLA BHAWAN COMPLEX DHANBAD. - 826005 Phone:0326-223-850 email: rdri2cmpdi@coalindia.in	
Test Report for Ambient Air Samples					
Month & Year	02/2023	Cluster	Cluster XII	Report No.	RI-II/AIR/2022-23/11
Customer	Environment Department, Bharat Coking Coal Limited (BCCL), Koyla Bhawan, Dhanbad (E-mail: gmenv.bccl@coalindia.in)			Date of Issue	31.03.2023
Project	Moonidih UGP	Sample Ref. No.	REM/BCCL/2023/11	CMPDIL/RI-II/LPM 13. (IS 5182)	
Date of Sampling	13/02/2023	Period of Analysis	01.03.2023	15.03.2023	Zone of Station: Buffer Zone
Sl. No.	Method of Analysis	Observed Values (in $\mu\text{g}/\text{m}^3$)		Range Of Testing	MoEF Standards Notification dated 25th September, 2000 (GSR 742 E)
		1st FN	2nd FN		NAAQS, 2009
1	IS -5182(Part 23):2006, R-2017	125	96	10 $\mu\text{g}/\text{m}^3$ - 1000 $\mu\text{g}/\text{m}^3$	300
2	IS -5182(Part 24):2019	58	56	10 $\mu\text{g}/\text{m}^3$ - 400 $\mu\text{g}/\text{m}^3$	Not Specified
3	IS-5182(Part-2): 2001, R-2017	<10	10	10 $\mu\text{g}/\text{m}^3$ - 1050 $\mu\text{g}/\text{m}^3$	120
4	IS-5182 (Part-6): 2006 , R-2017	23	25	06 $\mu\text{g}/\text{m}^3$ - 420 $\mu\text{g}/\text{m}^3$	120
* LDL indicates Lower Detection Limit, **All units are in $\mu\text{g}/\text{m}^3$, 24 hourly Average,					
 ANALYSED BY (Gaurav Kant)		 REVIEWED BY (Amit Raj Mishra) Authorised Signature			
Note: The results above relate to the samples tested as received. This report can not be reproduced in part or full without the written permission of the HOD(Env) , CMPDIL, RI-II.					
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  		CENTRAL MINE PLANNING AND DESIGN INSTITUTE LIMITED Environment Laboratory, Regional Institute-II Ambient Air Quality Test Report		CMPDIL, RI-II KOYLA BHAWAN COMPLEX DHANBAD. - 826005 Phone:0326-223-850 email: rdri2cmpdi@coalindia.in	
Test Report for Ambient Air Samples					
Month & Year	02/2023	Cluster	Cluster XII	Report No.	RI-II/AIR/2022-23/11
Customer	Environment Department, Bharat Coking Coal Limited (BCCL), Koyla Bhawan, Dhanbad (E-mail: gmenv.bccl@coalindia.in)			Date of Issue	31.03.2023
Project	Murliidh 20/21 Pit	Sample Ref. No.	REM/BCCL/2023/11	CMPDI/RI-II/LPM 13. (IS 5182)	
Date of Sampling	01.-02-2023	Period of Analysis	01.03.2023	15.03.2023	Zone of Station: Buffer Zone
Sl. No.	Method of Analysis	Observed Values (in µg/m³)		Range Of Testing	MoEF Standards Notification dated 25th September, 2000 (GSR 742 E)
		1st FN	2nd FN		NAAQS, 2009
1	PM ₁₀ IS -5182(Part 23):2006, R-2017	93	86	10 µg/m³ - 1000 µg/m³	300
2	PM _{2.5} IS -5182(Part 24):2019	47	46	10 µg/m³ - 400 µg/m³	Not Specified
3	SO ₂ IS-5182(Part-2): 2001, R-2017	<10	<10	10 µg/m³ - 1050 µg/m³	120
4	NO ₂ IS-5182 (Part-6): 2006 , R-2017	25	27	06 µg/m³ - 420 µg/m³	120
* LDL indicates Lower Detection Limit, **All units are in µg/m³, 24 hourly Average,					
 ANALYSED BY (Gaurav Kant)		 REVIEWED BY (Amit Raj Mishra) Authorised Signature			
Note: The results above relate to the samples tested as received. This report can not be reproduced in part or full without the written permission of the HOD(Env) , CMPDI, RI-II.					
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NOISE LEVEL QUALITY MONITORING

4.1 Location of sampling sites

- i) **Rudhi basti (N18)**
- ii) **Block IV(N6)**
- iii) **Moonidih UGP(N17)**
- iv) **Murlidih 20/21 (N19)**

4.2 Methodology of sampling and analysis

Noise level measurements in form of ' L_{EQ} ' were taken using Integrated Data Logging Sound Level Meter during day time & night time. Noise levels were measured for the complete day & night time, the Intergration time taken was one hour or 3600 seconds. Noise levels were measured in Decibels, 'A' weighted average, i.e. dB (A).

4.3 Results & Interpretations

Ambient noise levels were recorded during day time & night time and the observed values were compared with standards prescribed by MoEF&CC. The results of Noise levels recorded during day & night time on fortnightly basis are presented in tabular form along with the applicable standard permissible limits. The observed values in terms of L_{EQ} are presented. The observed values at all the monitoring locations are found to be within permissible limits.

  		CENTRAL MINE PLANNING AND DESIGN INSTITUTE LIMITED Environment Laboratory, Regional Institute-II Ambient Noise Level Test Report				CMPDI, RI-II KOYLA BHAWAN COMPLEX DHANBAD. -826005 Phone:0326-223-850 email: rdri2cmpdi@coalindia.in				
Month & Year	02/2023	Cluster	Cluster XII		Report No.	RI-II/WATER/2022-23/11		Date of Issue	31.03.2023	
Customer	Environment Department, Bharat Coking Coal Limited (BCCL), Koyla Bhawan, Dhanbad (E-mail: gmenv.bccl@coalindia.in)									
Project	REM/BCCL/2023/11									
Sampling Stations	i	Rudhi Basti	Sample Ref. No.	Date of Sampling	02/02/2023	17/02/2023	Sampling Method	Zone Category of Station:	Core Zone	
Sl. No.	Parameter	Hour / Time of day	Observed Values (in Leq dB(A)) First Fortnight	Observed Values (in Leq dB(A)) Second Fortnight	Method of Analysis	Range Of Testing	LDL	NOISE POLLUTION (REGULATION AND CONTROL) RULES, 2000 Standards	Zones	Limits in dB
1	Noise Level dB(A)Leq - Day	06:00 - 07:00	44.6	45.8	CPCB, Protocol for Ambient Level Noise Monitoring - 2015	35 dB-135 dB	35 dB(A)	Industrial Commercial Residential Silence	75 65 55 50	
2		07:00 - 08:00	48	48.2						
3		08:00 - 09:00	49.1	50.5						
4		09:00 - 10:00	45.4	46.1						
5		10:00 - 11:00	50.5	50.9						
6		11:00 - 12:00	54.1	53.3						
7		12:00 - 13:00	52.1	52.5						
8		13:00 - 14:00	53.3	53.9						
9		14:00 - 15:00	55.4	54.6						
10		15:00 - 16:00	57.6	57.9						
11		16:00 - 17:00	53	52.8						
12		17:00 - 18:00	50.6	50.9						
13		18:00 - 19:00	44.6	45.8						
14		19:00 - 20:00	45.2	45.4						
15		20:00 - 21:00	42.8	43.5						
16		21:00 - 22:00	42.7	43.6						
1	Noise Level dB(A)Leq -Night	Leq Day	51.6	51.7	CPCB, Protocol for Ambient Level Noise Monitoring - 2015	35 dB-135 dB	35 dB(A)	Industrial Commercial Residential Silence	70 55 45 50	
2		22:00-23:00	42.9	43.8						
3		23:00-00:00	43	43.7						
4		00:00-01:00	42.4	42.5						
5		01:00-02:00	42.4	42						
6		02:00-03:00	42	41.8						
7		03:00-04:00	42.2	43.5						
8		04:00-05:00	42.3	43.4						
8		Leq Night	42.5	43.1						

*All noise measurements are integrated for a 01 hour period, All units in dB(A) *LDL indicates Lower Detection Limit

Sampling Assistants

ANALYSED BY

REVIEWED BY

(Gaurav Kant)

Raj Mishra

Authorised Signature

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 		CENTRAL MINE PLANNING AND DESIGN INSTITUTE LIMITED Environment Laboratory, Regional Institute-II Ambient Noise Level Test Report				CMPDIL, RI-II KOYLA BHAWAN COMPLEX DHANBAD. -826005 Phone:0326-223-850 e-mail: rdi2emndi@coalindia.in			
Month & Year	02/2023	Cluster	Cluster XII		Report No.	RI-II/NOISE/2022-23/11			
Customer	Environment Department, Bharat Coking Coal Limited (BCCL), Koyla Bhawan, Dhanbad (E-mail: gmenv.bcl@coalindia.in)				Date of Issue	31.03.2023			
Project		Sample Ref. No.	REM/BCCL/2023/11		Sampling Method		CMPDI/RI-II/LPM 13		
Sampling Stations	i	Murlidih(20/21)	Date of Sampling		01.-02-2023	16/02/2023	Zone Category of Station:		
Sl. No.	Parameter	Hour / Time of day	Observed Values (in Leq dB(A))	Observed Values (in Leq dB(A))	Method of Analysis	Range Of Testing	LDL	NOISE POLLUTION (REGULATION AND CONTROL) RULES, 2000 Standards	Buffer Zone
1	Noise Level dB(A)Leq - Day	06:00 - 07:00	48.3	48.2	CPCB, Protocol for Ambient Level Noise Monitoring - 2015	35 dB-135 dB	35 dB(A)	Industrial Commercial Residential Silence	75 65 55 50
2		07:00 - 08:00	48.4	48.6					
3		08:00 - 09:00	50.5	51.5					
4		09:00 - 10:00	49.7	50.7					
5		10:00 - 11:00	52.6	52.6					
6		11:00 - 12:00	52.9	52.7					
7		12:00 - 13:00	54.5	55.5					
8		13:00 - 14:00	54.9	55					
9		14:00 - 15:00	55.3	55.5					
10		15:00 - 16:00	56.5	57.5					
11		16:00 - 17:00	56.3	55.8					
12		17:00 - 18:00	53.9	53.9					
13		18:00 - 19:00	50.7	51.5					
14		19:00 - 20:00	50.4	50.7					
15		20:00 - 21:00	49.3	49.3					
16		21:00 - 22:00	49.1	49					
1	Noise Level dB(A)Leq - Night	Leq Day	53.0	53.3					
2		22:00-23:00	39.3	39.5					
3		23:00- 00:00	38.9	39.4					
4		00:00- 01:00	38.6	39.1					
5		01:00-02:00	38.5	39					
6		02:00-03:00	38.4	38.6					
7		03:00-04:00	38.9	38.4					
8		04:00-05:00	39.1	38.9					
		Leq Night	38.9	39.0					
**All noise measurements are integrated for a 01 hour period, All units in dB(A) *LDL indicates Lower Detection Limit									
Analysed By  (Gaurav Kant)					Reviewed By  (Amit Raj Mishra)				
Sampling Assistants Authorised Signature									
Note: The results above relate to the samples tested as received. This report can not be reproduced in part or full without the written permission of the HOD(Env), CMPDI, RI-II.									
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Ambient Air Quality Standards for Jharia Coal Field
As per the Environment (Protection) Amendment Rules, 2000 notified vide notification G.S.R.
742(E), dated 25.9.2000.

Category	Pollutant	Time weighted average	Concentration in Ambient Air	Method of Measurement
1	2	3	4	5
III Coal mines located in the coal fields of • Jharia • Raniganj • Bokaro	Suspended Particulate Matter (SPM)	Annual Average * 24 hours **	500 $\mu\text{g}/\text{m}^3$ 700 $\mu\text{g}/\text{m}^3$	- High Volume Sampling (Average flow rate not less than 1.1
	Respirable Particulate Matter (size less than 10 μm) (RPM)	Annual Average * 24 hours **	250 $\mu\text{g}/\text{m}^3$ 300 $\mu\text{g}/\text{m}^3$	Respirable Particulate Matter sampling and analysis
	Sulphur Dioxide (SO_2)	Annual Average * 24 hours **	80 $\mu\text{g}/\text{m}^3$ 120 $\mu\text{g}/\text{m}^3$	1.Improvedwest and Gaeke method 2.Ultraviolet fluorescene
	Oxide of Nitrogen as NO_2	Annual Average * 24 hours **	80 $\mu\text{g}/\text{m}^3$ 120 $\mu\text{g}/\text{m}^3$	1. Jacob & Hochheiser Modified (Na-Arsenic) Method 2. Gas phase Chemilumine-scence

Note:

* Annual Arithmetic mean for the measurements taken in a year, following the guidelines for frequency of sampling laid down in clause2.

** 24hourly/8hourlyvalues shall be met 92% of the time in a year. However, 8% of the time it may exceed but not on two consecutive days.

NATIONAL AMBIENT AIR QUALITY STANDARDS

New Delhi the 18th November 2009

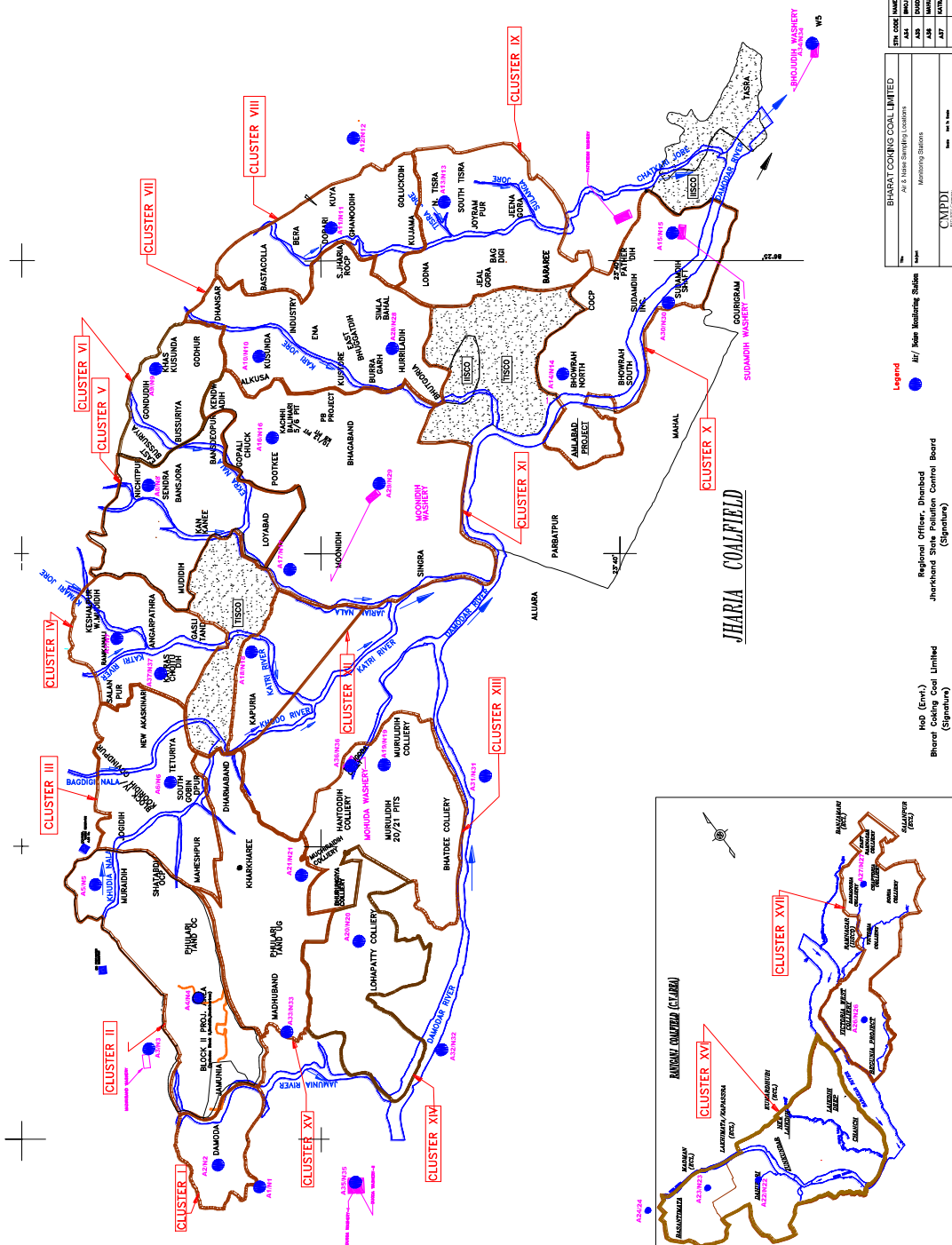
In exercise of the powers conferred by Sub-section (2) (h) of section 16 of the Air (Prevention and Control of Pollution) Act, 1981 (Act No. 14 of 1981), and in supersession of the notification No(s).S.O.384(E), dated 11th April 1994 and S.O.935(E), dated 14th NOVEMBER 1998, the Central Pollution Control Board hereby notify the National Ambient Air Quality Standards with immediate effect.

Pollutant	Time Weighted Average	Concentration in Ambient Air		Methods of Measurement
		Industrial, Residential, Rural and other Areas	Ecologically Sensitive Area (Notified by Central Government)	
Sulphur Dioxide (SO₂), µg/m³	Annual * 24 Hours **	50 80	20 80	-Improved West and Gaeke Method -Ultraviolet Fluorescence
Nitrogendioxide (NO₂), µg/m³	Annual * 24 Hours **	40 80	30 80	-Jacob &Hochheiser modified (NaOH-NaAsO ₂) Method -Gas Phase Chemiluminescence
Particulate Matter (Size less than 10µm) or PM₁₀, µg/m³	Annual * 24 Hours **	60 100	60 100	-Gravimetric -TEOM -Beta attenuation
Particulate Matter (Size less than 2.5µm) or PM_{2.5}, µg/m³	Annual * 24 Hours **	40 60	40 60	-Gravimetric -TEOM -Beta attenuation
Ozone (O₃) , µg/m³	8 Hours * 1 Hour **	100 180	100 180	-UV Photometric -Chemiluminescence -Chemical Method
Lead (Pb) , µg/m³	Annual * 24 Hours **	0.50 1.0	0.50 1.0	-AAS/ICP Method after sampling on EPM 2000 or equivalent filter paper -ED-XRF using Teflon filter
Carbon Monoxide (CO), mg/m³	8 Hours ** 1 Hour **	02 04	02 04	-Non dispersive Infrared (NDIR) Spectroscopy
Ammonia (NH₃), µg/m³	Annual * 24 Hours **	100 400	100 400	-Chemiluminescence -Indophenol blue method
Benzene (C₆H₆), µg/m³	Annual *	05	05	-Gas Chromatography (GC) based continuous analyzer -Adsorption and desorption followed by GC analysis
Benzo(a)Pyrene (BaP) Particulate phase only, ng/m³	Annual *	01	01	-Solvent extraction followed byHPLC/GC analysis
Arsenic (As), ng/m³	Annual *	06	06	-AAS/ICP Method after sampling on EPM 2000 or equivalent filter paper
Nickel (Ni), ng/m³	Annual *	20	20	-AAS/ICP Method after sampling on EPM 2000 or equivalent filter paper

* Annual Arithmetic mean of minimum 104 measurements in a year at a particular site taken twice a week 24 hourly at uniform intervals.

** 24 hourly or 8 hourly or 1 hourly monitored values, as applicable, shall be complied with 98% of the time in a year. 2% of the time, they JUNE exceed the limits but not on two consecutive days of monitoring.

NOTE:Whenever and wherever monitoring results on two consecutive days of monitoring exceed the limits specified above for the respective category, it shall be considered adequate reason to institute regular or continuous monitoring and further investigations.



BHARAT COKING COAL LIMITED		S/N	STN CODE	NAME OF STATIONS (AIR/NOISE)
Air & Noise Sampling Locations				
Monitoring Stations		AAS	AAS	BRIGHUWAL COAL WAREHOUSE
		AAS	AAS	DUGDA WAREHOUSE
		AAS	AAS	MARUDA WAREHOUSE
		AAT	AAT	KATRAVA CHINTOON COLLETRY
CNPDI		Score	Not to Score	

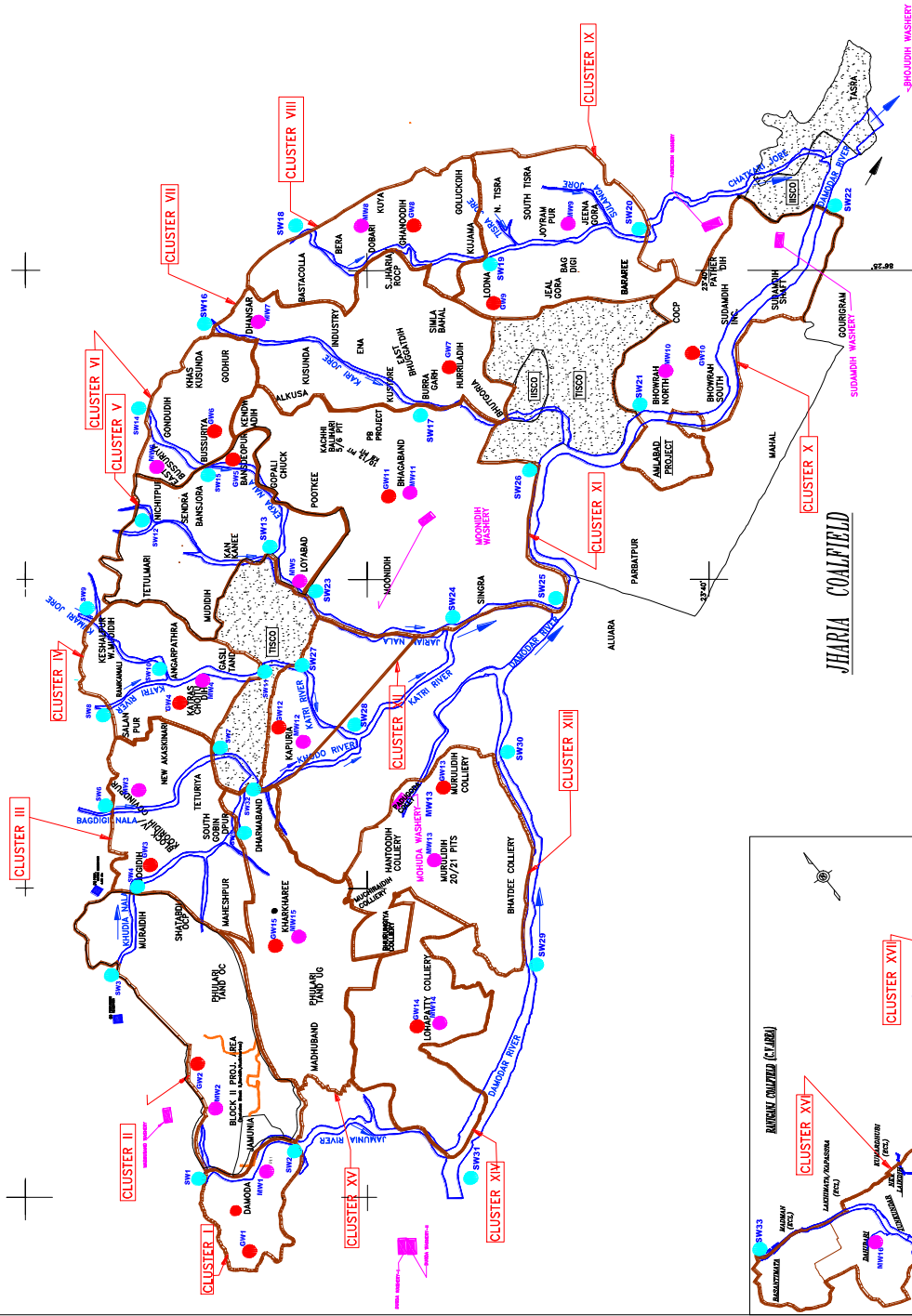
HoD (Env't.)
 Bharat Coking Coal Limited
 (Signature)

Regional Officer, Dhambad
 Jharkhand State Pollution Control Board
 (Signature)

Legend
 Air / Main Ventilation Station

A map of the Kertou River and its tributaries. The Kertou River is shown in blue, flowing from the north towards the south. The Kertou River is shown in brown, flowing from the east towards the west. The map includes labels for 'KERTOU RIVER' and 'KERTOU RIVER'.

Water Sampling Locations in BCCL



INDEX

Cluster	Surface Water	Name of River	Sampling Location	Ground Water	Location
I	SW1, SW2	Jharia River	SW1	SW1	Chitwan Village
II	SW3, SW4	Jharia River	SW2	SW2	Chitwan Village
III	SW5, SW6	Jharia River	SW3	SW3	Chitwan Village
IV	SW7, SW8	Jharia River	SW4	SW4	Chitwan Village
V	SW9, SW10	Jharia River	SW5	SW5	Chitwan Village
VI	SW11, SW12	Jharia River	SW6	SW6	Chitwan Village
VII	SW13, SW14	Jharia River	SW7	SW7	Chitwan Village
VIII	SW15, SW16	Jharia River	SW8	SW8	Chitwan Village
IX	SW17, SW18	Jharia River	SW9	SW9	Chitwan Village
X	SW19, SW20	Jharia River	SW10	SW10	Chitwan Village
XI	SW21, SW22	Jharia River	SW11	SW11	Chitwan Village
XII	SW23, SW24	Jharia River	SW12	SW12	Chitwan Village
XIII	SW25, SW26	Jharia River	SW13	SW13	Chitwan Village
XIV	SW27, SW28	Jharia River	SW14	SW14	Chitwan Village
XV	SW29, SW30	Jharia River	SW15	SW15	Chitwan Village
XVI	SW31, SW32	Jharia River	SW16	SW16	Chitwan Village
XVII	SW33, SW34	Jharia River	SW17	SW17	Chitwan Village

- Legend**
- Sampling Locations of Surface Water (Upstream/ Downstream)
 - Sampling Locations of Mine Water
 - Sampling Locations of Ground/ Drinking Water

Regional Officer, Dhanbad
Jharkhand State Pollution Control Board
(Signature)

Head (Env.),
Bharat Coking Coal Limited
(Signature)

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**ENVIRONMENTAL MONITORING REPORT
OF
BHARAT COKING COAL LIMITED,
CLUSTER – XII**

(FOR THE MONTH MARCH, 2023)

E. C. no. J-11015/184/2012-IA.II (M) dated 10.12.2014.



CMPDI

ISO 9001 Company
**Regional Institute-II
Dhanbad, Jharkhand**

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EXECUTIVE SUMMARY

1.0 Introduction

The purpose of environmental monitoring is to assess the quality of various attributes that affects the fauna and flora. In accordance with the quality of these attributes appropriate strategy is to be developed to control the pollution level within the permissible limits. The three major attributes are air, water and noise level.

Bharat Coking Coal Limited (BCCL), a Subsidiary company of Coal India Limited is operating Underground and Opencast Mines in Jharia Coalfield (JCF) is a part of Gondwana Coalfields located in Dhanbad district of Jharkhand, the JCF is bounded by 23°37' N to 23°52' N latitudes and 86°09' E to 86°30' E longitude occupying an area of 450 Sq.km. BCCL has awarded Environmental monitoring work of Jharia Coalfield (JCF) to Central Mine Planning & Design Institute Limited (CMPDIL). The environmental monitoring has been carried out as per the conditions laid down by the MoEF&CC while granting environmental clearance of project, consent letter issued by the respective SPCB, and other statutory requirements.

2.0 Sampling location and rationale

2.1 Ambient air sampling locations

The ambient air quality monitoring stations were selected to represent core, buffer zone area. The rationale has been based on the guidelines stipulated by MoEF&CC, consent letter of SPCB, as well as other statutory requirements.

2.2 Water sampling stations

The Water sampling stations were selected for mine sump water.

2.3 Noise level monitoring locations

Noise levels vary depending on the various activities in mining areas. The monitoring of noise level in different locations will be helpful to take appropriate mitigating measures. The rationale has been based on the guidelines stipulated by MoEF&CC, consent letter of SPCB, as well as other statutory requirements.

3.0 Methodology of sampling and analysis

3.1 Ambient air quality

Parameters chosen for assessment of ambient air quality were Particulate Matter (PM₁₀), Fine Particulate Matter (PM_{2.5}), Sulphur Di-oxide (SO₂)

and Nitrogen Oxides (NO_x). Respirable Dust Samplers (RDS) and Fine Dust Sampler (PM_{2.5} sampler) were used for sampling of PM₁₀, SO₂, & NO_x and Fine Dust Sampler (PM_{2.5} sampler) were used for sampling of PM_{2.5} at 24 hours interval once in a fortnight and the same for the gaseous pollutants. The samples were analysed in Environmental Laboratory of CMPDI, RI-II, Dhanbad.

3.2 Water quality

Water samples were collected as per standard practice. The Mine effluent samples were collected and analyzed for four parameters on fortnightly basis. Thereafter the samples were preserved and analyzed at the Environmental Laboratory of CMPDI, RI- II, Dhanbad.

3.3 Noise level monitoring

Noise level measurements in form of 'L_{EQ}' were taken using Integrated Data Logging Sound Level Meter. Noise levels were measured in Decibels, 'A' weighted average, i.e. dB(A).

4.0 Results and interpretations

4.1 Air quality

It has been seen from the analysis results that the 24 hours average concentration parameters like PM₁₀, PM_{2.5}, SO₂ and NO_x are mostly within the permissible limits in all sampling locations as per MoEF&CC Gazette Notification No. GSR 742(E) dt 25.09.2000 Standards for Coal Mines and National Ambient Air Quality Standard -2009. Sometimes the concentration of PM₁₀& PM_{2.5} exceeds the limits due to heavy public traffic, poor road condition, coke oven plants, burning of coal by surrounding habitants, brick making, municipal waste dumps and industries like Steel Plant, thermal Plants including their fly ash etc.

The following preventive and suppressive mitigative measures can be undertaken to contain the pollution level within prescribed level:-

- Wet drilling and controlled blasting should be practice.
- Explosive used should be optimised to restrict the dust generation.
- Transportation roads should be permanently asphalted free of ruts, potholes etc.
- Water should be sprayed on coal transportation road, service road more frequently and at regular interval.
- Dust from roads should be removed physically or mechanically.
- Greenbelts around industrial sites, service building area besides Avenue plantation along roads should be created.
- Coal dust should be suppressed by using fixed sprinklers.
- Regular maintenance of plant and machinery should be undertaken.

4.2 Water quality

The test results indicate that the major parameters compared with MoEF&CC Gazette Notification No. GSR 742(E) dt 25.09.2000

4.3 Noise Level

During the noise level survey it has been observed that the noise level in the sampling locations is within the permissible limits prescribed as per MoEF&CC Gazette Notification No. GSR 742(E) dt 25.09.2000 Standards for Coal Mines for Industrial Area and Noise pollution (Regulation and Control) Rules, 2000.

INTRODUCTION

1.0 Any industry and development activities including coal mining is bound to affect environmental attributes. There are positive as well as negative impacts of such operations. For controlling the adverse impacts a regular monitoring is essential. The environmental monitoring is being done as per the guide-lines stipulated by Ministry of Environment, Forest and Climate Change (MoEF&CC), Govt. of India.

The very purpose of environmental monitoring is to assess the quality of various attributes which affects the environment. As per quality of these attributes appropriate strategy is to be developed to control the pollution level within the permissible limits. The three major attributes are air, water and noise level.

Bharat Coking Coal has awarded Environmental Monitoring work of all Projects, Cluster wise, to Central Mine Planning & Design Institute Limited (CMPDIL). The environmental monitoring has been carried out as per conditions laid down by MoEF&CC while granting environmental clearance to different projects. CMPDI has trained manpower and well equipped laboratory to carry out monitoring, analysis and R&D work in the field of environment.

1.1 The Cluster XII is in the Central part of the Jharia coalfield. It includes Kapuria UG Mine. The cluster – XII is situated about 30 - 35 kms from Dhanbad Railway Station. The mines of this cluster - XII are operating since pre nationalization period (prior to 1972-73). It is connected by both Railway and Road. The drainage of the area is governed by Katri River.

1.2 The cluster XII is designed to produce 2.4 Mtpa (normative) and 3.12 Mtpa peak capacity of coal. The average grade of coal W-II to W-IV.

The Project has Environmental Clearance from Ministry of Environment, Forests and Climate Change (MoEF&CC) for a rated capacity of 2.4 MTPA (normative) and 3.12 MTPA peak capacity of coal production vide letter no E.C. no. J-11015/184/2012-IA.II (M) dated 10.12.2014.

Ministry of Environment, Forest and Climate Change while granting environmental clearance has given one of the General conditions that “ Four ambient air quality monitoring stations should be established in the core zone as well as in the buffer zone for PM₁₀, PM_{2.5}, SO₂, NO_x monitoring. Location of the stations should be decided based on the meteorological data, topographical features and environmentally and ecologically sensitive targets, other conditions regarding water / effluent and noise level monitoring in consultation with the State Pollution Control Board.”

In compliance of these conditions the Environmental Monitoring has been carried out & report prepared for submission to MoEF&CC & JSPCB and other statutory authorities.

AMBIENT AIR QUALITY MONITORING

2.1 Location of sampling station and their rationale:

(As per G.S.R. 742 (E) dt. 25th December, 2000)

2.1.1 Ambient Air Quality Sampling Locations

I. CORE ZONE Monitoring Location

i) Rudhi basti (A18): Industrial Area

The location of the sampling station is 23° 45' 26.60" N & 86° 18' 39.90" E. The samplers were placed at a height of approx. 1.5m above ground level at Rudhi basti.

II. BUFFER ZONE Monitoring Location

i) Block IV (A6) : Industrial area

The location of the sampling station is 23° 47' 54.00" N & 86° 16' 20.00" E. The samplers were placed at a height of approx. 1.5m above ground level at Safety Office.

ii) Moonidih UGP (A17) : Industrial area

The location of the sampling station is 23° 44' 30.00" N & 86° 20' 56.00" E. The samplers were placed at a height of approx. 1.5m above ground level at project office.

iii) Murlidih 20/21 Pit(A19): Industrial Area

The location of the sampling station is 23° 43' 51.82" N & 86° 16' 21.87" E. The samplers were placed at a height of approx. 1.5m above ground level at project office.

AMBIENT AIR QUALITY DATA



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CENTRAL MINE PLANNING AND DESIGN INSTITUTE LIMITED
Environment Laboratory, Regional Institute-II
Ambient Air Quality Test Report

CMPDIL, RI-II
KOYLA BHAWAN COMPLEX
DHANBAD. - 826005
Phone:0326-223-850
email: rdri2cmpdi@coalindia.in

Test Report for Ambient Air Samples

Month & Year	03/2023	Cluster	Cluster XII	Report No.	RI-II/AIR/2022-23/12
Customer	Environment Department, Bharat Coking Coal Limited (BCCL), Koyla Bhawan, Dhanbad (E-mail: gmenv.bccl@coalindia.in)			Date of Issue	29.04.2023
Project	Rudhi Basti			CMPDI/RI-II/LPM 13.1 (IS 5182)	
Date of Sampling	01.03.23	Sample Ref. No.	20.03.23	REM/BCCL/2023/12	Sampling Method
Sl. No.	Method of Analysis	Period of Analysis		Range Of Testing	LDL
		Observed Values (in $\mu\text{g}/\text{m}^3$)			
		1st FN	2nd FN		
1	PM ₁₀	IS -5182(Part 23):2006, R-2017	86	10 $\mu\text{g}/\text{m}^3$ - 1000 $\mu\text{g}/\text{m}^3$	10 $\mu\text{g}/\text{m}^3$
2	PM _{2.5}	IS -5182(Part 24):2019	33	10 $\mu\text{g}/\text{m}^3$ - 400 $\mu\text{g}/\text{m}^3$	10 $\mu\text{g}/\text{m}^3$
3	SO ₂	IS-5182(Part-2): 2001, R-2017	12	10 $\mu\text{g}/\text{m}^3$ - 1050 $\mu\text{g}/\text{m}^3$	10 $\mu\text{g}/\text{m}^3$
4	NO ₂	IS-5182 (Part-6): 2006, R-2017	18	06 $\mu\text{g}/\text{m}^3$ - 420 $\mu\text{g}/\text{m}^3$	06 $\mu\text{g}/\text{m}^3$
				MoEF Standards Notification dated 25th September, 2000 (GSR 742 E)	NAAQS, 2009
				300	100
				Not Specified	60
				120	80
				120	80

* LDL indicates Lower Detection Limit,

**All units are in $\mu\text{g}/\text{m}^3$, 24 hourly Average,

[Signature]
ANALYSED BY

[Signature]
(Gaurav Kant)
REVIEWED BY

[Signature]
(Amit Raj Mishra)
Authorised Signature

Note: The results above relate to the samples tested as received. This report can not be reproduced in part or full without the written permission of the HOD(Env) , CMPDI, RI-II.

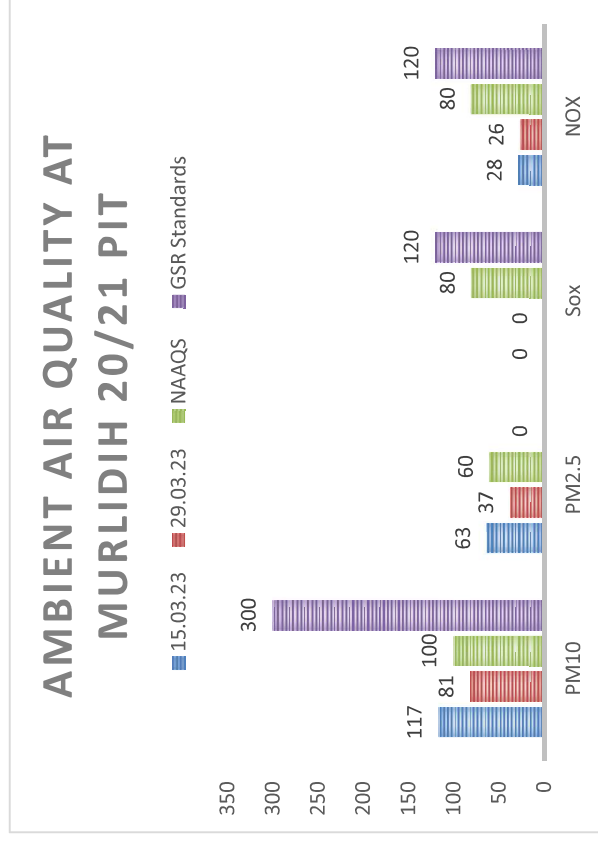
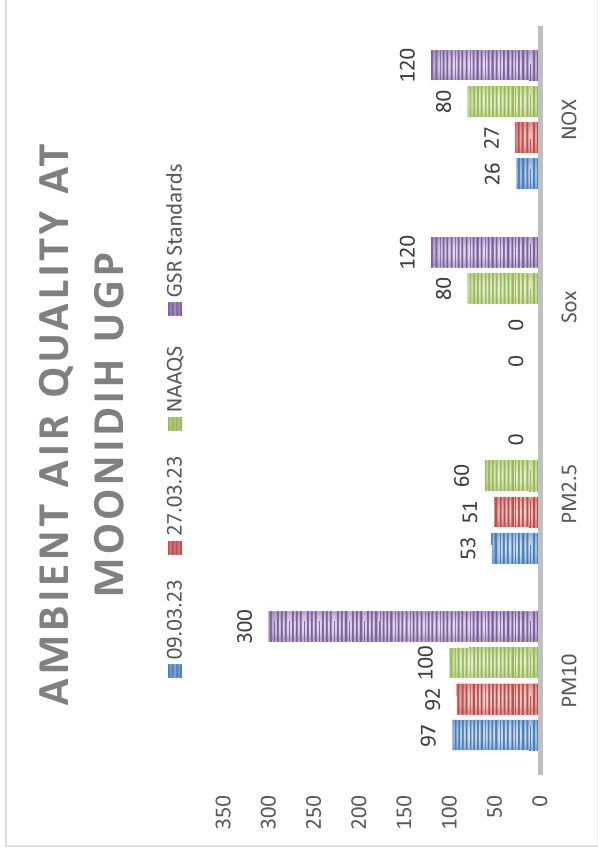
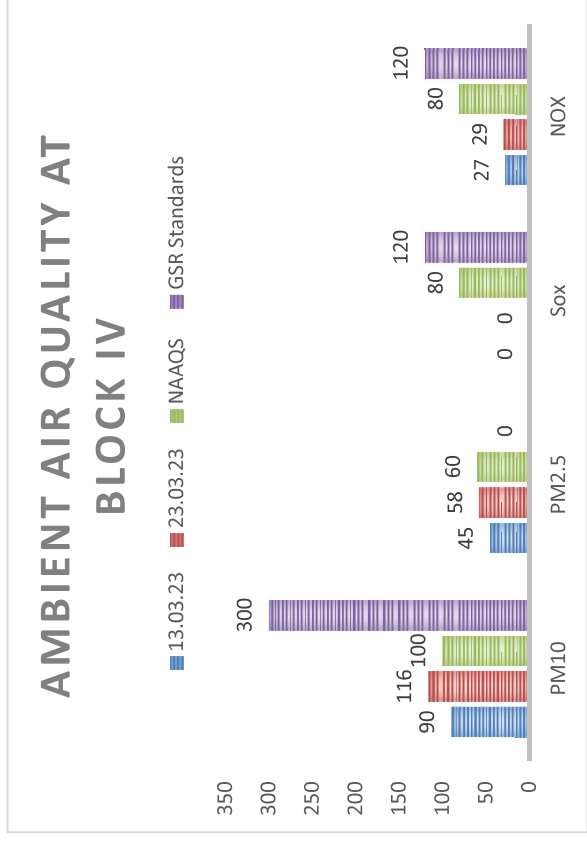
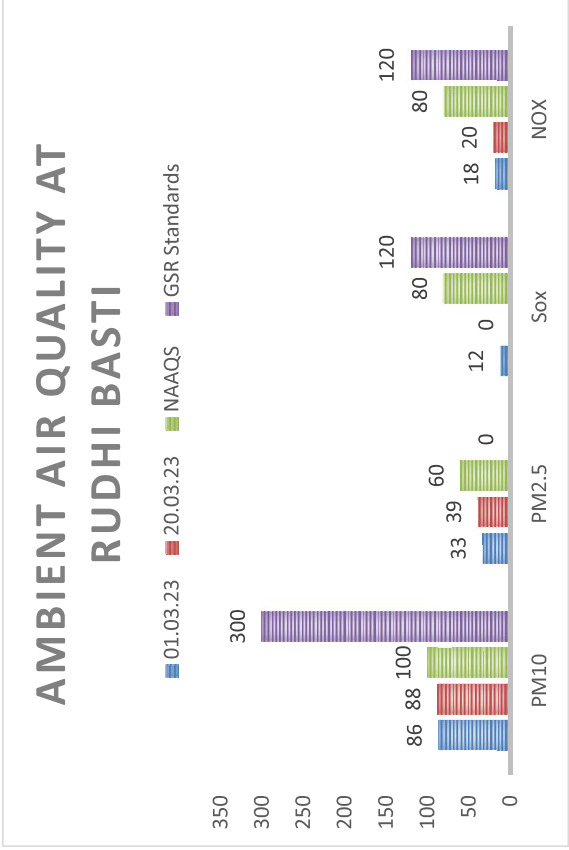
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  		CENTRAL MINE PLANNING AND DESIGN INSTITUTE LIMITED Environment Laboratory, Regional Institute-II Ambient Air Quality Test Report		CMPDI, RI-II KOYLA BHAWAN COMPLEX DHANBAD. - 826005 Phone:0326-223-850 email: rdri2cmpdi@coalindia.in	
Test Report for Ambient Air Samples					
Month & Year	03/2023	Cluster	Cluster XII	Report No.	RI-II/AIR/2022-23/12
Customer	Environment Department, Bharat Coking Coal Limited (BCCL), Koyla Bhawan, Dhanbad (E-mail: gmenv.bccl@coalindia.in)			Date of Issue	29.04.2023
Project	Block IV	Sample Ref. No.	REM/BCCL/2023/12	Sampling Method	CMPDI/RI-II/LPM 13, (IS 5182)
Date of Sampling	01.03.2023	Period of Analysis	01.03.2023	Zone of Station:	Buffer Zone
Sl. No.	Method of Analysis	Observed Values (in µg/m³)	Range Of Testing	MoEF Standards Notification dated 25th September, 2000 (GSR 742 E)	NAAQS, 2009
		1st FN	2nd FN		
1	PM ₁₀	90	116	10 µg/m³ - 1000 µg/m³	100
2	PM _{2.5}	45	58	10 µg/m³ - 400 µg/m³	60
3	SO ₂	<10	<10	10 µg/m³ - 1050 µg/m³	80
4	NO ₂	27	29	06 µg/m³ - 420 µg/m³	80
* LDl indicates Lower Detection Limit,					
**All units are in µg/m³, 24 hourly Average,					
 ANALYSED BY (Gaurav Kant) REVIEWED BY		 (Amit Raj Mishra) Authorised Signature			
Note: The results above relate to the samples tested as received. This report can not be reproduced in part or full without the written permission of the HOD(Env), CMPDI, RI-II.					
---- End of Report ---- Page - 1 of 1					
JOB NO. 200316028		Cluster – XII, BCCL Environmental Monitoring Report			

  		CENTRAL MINE PLANNING AND DESIGN INSTITUTE LIMITED Environment Laboratory, Regional Institute-II Ambient Air Quality Test Report		CMPDIL, RI-II KOYLA BHAWAN COMPLEX DHANBAD. - 826005 Phone: 0326-223-850 email: rdri2cmpdi@coalindia.in	
Test Report for Ambient Air Samples					
Month & Year	03/2023	Cluster	Cluster XII	Report No.	RI-II/AIR/2022-23/12
Customer	Environment Department, Bharat Coking Coal Limited (BCCL), Koyla Bhawan, Dhanbad (E-mail: gmenv.bccl@coalindia.in)			Date of Issue	29.04.2023
Project	Moonidih UGP			CMPDI/RI-II/LPM 13. (IS 5182)	
Date of Sampling	01.03.2023		Sample Ref. No.	REM/BCCL/2023/12	Zone of Station: Buffer Zone
Sl. No.	Parameter	Method of Analysis	Observed Values (in $\mu\text{g}/\text{m}^3$)		MoEF Standards Notification dated 25th September, 2000 (GSR 742 E)
			1st FN	2nd FN	
1	PM ₁₀	IS -5182(Part 23):2006, R-2017	97	92	300
2	PM _{2.5}	IS -5182(Part 24):2019	53	51	Not Specified
3	SO ₂	IS-5182(Part-2): 2001, R-2017	<10	<10	120
4	NO ₂	IS-5182 (Part-6): 2006, R-2017	26	27	120
* LDL indicates Lower Detection Limit, ** All units are in $\mu\text{g}/\text{m}^3$, 24 hourly Average,					
 ANALYSED BY (Gaurav Kant)		 (Amit Raj Mishra) Authorised Signature			
Note: The results above relate to the samples tested as received. This report can not be reproduced in part or full without the written permission of the HOD(Env), CMPDI, RI-II.					
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Page -1 of 1					

  		CENTRAL MINE PLANNING AND DESIGN INSTITUTE LIMITED Environment Laboratory, Regional Institute-II Ambient Air Quality Test Report		CMPDIL, RI-II KOYLA BHAWAN COMPLEX DHANBAD. - 826005 Phone:0326-223-850 email: rdri2cmpdi@coalindia.in	
Test Report for Ambient Air Samples					
Month & Year	03/2023	Cluster	Cluster XII	Report No.	RI-II/AIR/2022-23/12
Customer	Environment Department, Bharat Coking Coal Limited (BCCL), Koyla Bhawan, Dhanbad (E-mail: gmenv.bccl@coalindia.in)			Date of Issue	29.04.2023
Project	Murliidh 20/21 Pit	Sample Ref. No.	REM/BCCL/2023/12	CMPDI/RI-II/LPM 13. (IS 5182)	
Date of Sampling	01.03.2023	Period of Analysis	01.03.2023	Sampling Method	Buffer Zone
Sl. No.	Method of Analysis	Observed Values (in µg/m³)		Range Of Testing	MoEF Standards Notification dated 25th September, 2000 (GSR 742 E)
		1st FN	2nd FN		NAAQS, 2009
1	PM ₁₀ IS -5182(Part 23):2006, R-2017	117	81	10 µg/m³ - 1000 µg/m³	300
2	PM _{2.5} IS -5182(Part 24):2019	63	37	10 µg/m³ - 400 µg/m³	Not Specified
3	SO ₂ IS-5182(Part-2): 2001, R-2017	<10	<10	10 µg/m³ - 1050 µg/m³	120
4	NO ₂ IS-5182 (Part-6): 2006 , R-2017	28	26	06 µg/m³ - 420 µg/m³	120
* LDL indicates Lower Detection Limit, **All units are in µg/m³, 24 hourly Average,					
 ANALYSED BY (Gaurav Kant)		 REVIEWED BY (Amit Raj Mishra) Authorised Signature			
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----- End of Report ----- Page -1 of 1					



NOISE LEVEL QUALITY MONITORING

4.1 Location of sampling sites

- i) **Rudhi basti (N18)**
- ii) **Block IV(N6)**
- iii) **Moonidih UGP(N17)**
- iv) **Murlidih 20/21 (N19)**

4.2 Methodology of sampling and analysis

Noise level measurements in form of ' L_{EQ} ' were taken using Integrated Data Logging Sound Level Meter during day time & night time. Noise levels were measured for the complete day & night time, the Intergration time taken was one hour or 3600 seconds. Noise levels were measured in Decibels, 'A' weighted average, i.e. dB (A).

4.3 Results & Interpretations

Ambient noise levels were recorded during day time & night time and the observed values were compared with standards prescribed by MoEF&CC. The results of Noise levels recorded during day & night time on fortnightly basis are presented in tabular form along with the applicable standard permissible limits. The observed values in terms of L_{EQ} are presented. The observed values at all the monitoring locations are found to be within permissible limits.

 		CENTRAL MINE PLANNING AND DESIGN INSTITUTE LIMITED Environment Laboratory, Regional Institute-II Ambient Noise Level Test Report		CMPDI, RI-II KOYLA BHAWAN COMPLEX DHANBAD. -826005 Phone:0326-223-850 email: rdri2cmpdi@coalindia.in			
Month & Year	03/2023	Cluster	Cluster XII		Report No.	RI-II/WATER/2022-23/12	
Customer	Environment Department, Bharat Coking Coal Limited (BCCL), Koyla Bhawan, Dhanbad (E-mail: gmenv.bcl@coalindia.in)					Date of Issue	29.04.2023
Project						Sampling Method	CMPDI/RI-II/LPM 13
Sampling Stations	i	Rudhi Basti	Sample Ref. No.	REM/BCCL/2023/12		Zone Category of Station:	Core Zone
Sl. No.	Parameter	Hour / Time of day	Observed Values (in Leq dB(A))	Observed Values (in Leq dB(A))	Method of Analysis	Range Of Testing	NOISE POLLUTION (REGULATION AND CONTROL) RULES, 2000 Standards
1	Noise Level dB(A) Leq - Day	06:00 - 07:00	47.7	49	CPCB, Protocol for Ambient Level Noise Monitoring - 2015	35 dB-135 dB	Industrial Commercial Residential Silence
2		07:00 - 08:00	51.3	51.6			
3		08:00 - 09:00	52.5	54			
4		09:00 - 10:00	48.6	49.3			
5		10:00 - 11:00	54	54.4			
6		11:00 - 12:00	57.9	57.1			
7		12:00 - 13:00	55.7	56.1			
8		13:00 - 14:00	57.1	57.7			
9		14:00 - 15:00	59.3	58.4			
10		15:00 - 16:00	61.6	61.9			
11		16:00 - 17:00	56.7	56.5			
12		17:00 - 18:00	54.1	54.4			
13		18:00 - 19:00	47.7	49			
14		19:00 - 20:00	48.4	48.6			
15		20:00 - 21:00	45.7	46.6			
16		21:00 - 22:00	45.6	46.7			
1	Noise Level dB(A) Leq - Night	Leq Day	55.3	55.4	CPCB, Protocol for Ambient Level Noise Monitoring - 2015	35 dB(A)	Industrial Commercial Residential Silence
2		22:00-23:00	41.2	42.1			
3		23:00-00:00	41.3	42			
4		00:00-01:00	40.8	40.8			
5		01:00-02:00	40.8	40.4			
6		02:00-03:00	40.4	40.2			
7		03:00-04:00	40.6	41.8			
8		04:00-05:00	40.7	41.7			
		Leq Night	40.8	41.4			
**All noise measurements are integrated for a 01 hour period, All units in dB(A) *LDL indicates Lower Detection Limit							
Sampling Assistants ANALYSED BY		(Gaurav Kant) REVIEWED BY		Raj Mishra Authorised Signature			
Note: The results above relate to the samples tested as received. This report can not be reproduced in part or full without the written permission of the HOD (Env), CMPDI, RI-II.							
----- End of Report -----							
Page - I of 1							



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CENTRAL MINE PLANNING AND DESIGN INSTITUTE LIMITED
Environment Laboratory, Regional Institute-II
Ambient Noise Level Test Report

15
CMPDIL, RI-II
KOYLA BHAWAN COMPLEX
DHANBAD - 826005
Phone-0326-223-850
email: rdri2cmpdi@coalindia.in

Month & Year	Cluster	Cluster XII	Report No.	RI-II/NOISE/2022-23/12				
Customer	Environment Department, Bharat Coking Coal Limited (BCCL), Koyla Bhawan, Dhanbad (E-mail: gmenv.bcccl@coalindia.in)		Date of Issue	29.04.2023				
Project	Sample Ref. No.		CMPDI/RI-II/LPM 13					
Sampling Stations		Block IV	13.03.23	Zone Category of Station: Buffer Zone				
Sl. No.	Parameter	Hour / Time of day	Method of Analysis	LDL				
			Observed Values (in Leq dB(A))	NOISE POLLUTION (REGULATION AND CONTROL) RULES, 2000 Standards				
			First Fortnight	Zones				
			Second Fortnight	Limits in dB				
1	Noise Level dB(A)Leq - Day	06:00 – 07:00	57.1	CPCB, Protocol for Ambient Level Noise Monitoring - 2015	35 dB-135 dB	35 dB(A)	Industrial Commercial Residential Silence	75 65 55 50
2		07:00 – 08:00	58.9					
3		08:00 – 09:00	62.4					
4		09:00 – 10:00	66					
5		10:00 – 11:00	65.5					
6		11:00 – 12:00	66.9					
7		12:00 – 13:00	62.1					
8		13:00 – 14:00	66.8					
9		14:00 – 15:00	67.2					
10		15:00 – 16:00	70.3					
11		16:00 – 17:00	71					
12		17:00 – 18:00	72					
13		18:00 – 19:00	70.6					
14		19:00 – 20:00	70.2					
15		20:00 – 21:00	63.3					
16		21:00 – 22:00	56					
		Leq Day	67.5					
1	Noise Level dB(A)Leq -Night	22:00-23:00	49.4	CPCB, Protocol for Ambient Level Noise Monitoring - 2015	35 dB-135 dB	35 dB(A)	Industrial Commercial Residential Silence	70 55 45 50
2		23:00- 00:00	48.6					
3		00:00- 01:00	46.9					
4		01:00-02:00	42					
5		02:00-03:00	41.6					
6		03:00-04:00	44.6					
7		04:00-05:00	42.8					
8		05:00-06:00	43.1					
		Leq Night	45.8					
			44.8					
**All noise measurements are integrated for a 01 hour period, All units in dB(A) *LDL indicates Lower Detection Limit								
Sampling Assistants			Gaurav Kant (Gaurav Kant)					
ANALYSED BY			REVIEWED BY					
Note: The results above relate to the samples tested as received. This report can not be reproduced in part or full without the written permission of the HOD(Env) , CMPDI, RI-II.								
----- End of Report -----								
Page -1 of 1								
			(Amit Raj Mishra) Authorised Signature					

Month & Year	03/2023	Cluster	Cluster XII	REM/BCCL/2023/12				Report No.	RI-II/NOISE/2022-23/12
Customer	Environment Department, Bharat Coking Coal Limited (BCCL), Koyla Bhawan, Dhanbad (E-mail: gmenv.bcl@coalindia.in)			Date of Issue				29.04.2023	
Project	Sample Ref. No.			Sampling Method				CMPDI/RI-II/LPM 13	
Sampling Stations	i	Parameter	MoonlidiH UGP	Hour / Time of day	Date of Sampling		27.03.23	Zone Category of Station:	Buffer Zone
					Observed Values (in Leq dB(A))	Method of Analysis			
Sl. No.					First Fortnight	Second Fortnight	Range Of Testing	LDL	NOISE POLLUTION (REGULATION AND CONTROL) RULES, 2000 Standards
1	Noise Level dB(A)Leq - Day			06:00 - 07:00	53.7	54.4	35 dB-135 dB	35 dB(A)	Industrial Commercial Residential Silence
2				07:00 - 08:00	49	49.9			
3				08:00 - 09:00	57.1	58.8			
4				09:00 - 10:00	55.1	52.4			
5				10:00 - 11:00	58.3	57.2			
6				11:00 - 12:00	61.8	62.7			
7				12:00 - 13:00	59.8	59.5			
8				13:00 - 14:00	61.6	60.6			
9				14:00 - 15:00	57.6	57.2			
10				15:00 - 16:00	55.7	55.1			
11				16:00 - 17:00	55.3	55.5			
12				17:00 - 18:00	54.8	55.5			
13				18:00 - 19:00	54	54.4			
14				19:00 - 20:00	54.6	54.3			
15				20:00 - 21:00	53	52.8			
16				21:00 - 22:00	52.5	52.7			
1	Noise Level dB(A)Leq -Night			Leq Day	57.1	57.1	35 dB-135 dB	35 dB(A)	Industrial Commercial Residential Silence
2				22:00-23:00	44.6	44.6			
3				23:00- 00:00	44	44.2			
4				00:00- 01:00	43.2	44.2			
5				01:00-02:00	42.4	43.1			
6				02:00-03:00	42.2	42.3			
7				03:00-04:00	42.2	42.4			
8				04:00-05:00	43.6	43.7			
			05:00-06:00	44	44.2				
			Leq Night	43.4	43.7				
**All noise measurements are integrated for a 01 hour period. All units in dB(A) *LDL indicates Lower Detection Limit									
Sampling Assistants Gaurav Kant (Gaurav Kant) ANALYSED BY REVIEWED BY (Amit Raj Mishra) Authorised Signature									
Note: The results above relate to the samples tested as received. This report can not be reproduced in part or full without the written permission of the HOD(Env), CMPDI, RI-II. ---- End of Report ---- Page-1 of 1									

 		CENTRAL MINE PLANNING AND DESIGN INSTITUTE LIMITED Environment Laboratory, Regional Institute-II Ambient Noise Level Test Report		CMPDIL, RI-II KOYLA BHAWAN COMPLEX DHANBAD - 826005 Phone:0326-223-850 email: rdiri2cmpdi@coalindia.in	
Month & Year	03/2023	Cluster	Cluster XII		Report No.
Customer	Environment Department, Bharat Coking Coal Limited (BCCL), Koyla Bhawan, Dhanbad (E-mail: gmenv.bcci@coalindia.in)		REM/BCCL/2023/12		Date of Issue
Project	Sample Ref. No.		Sampling Method		CMPDI/RI-II/LPM 13
Sampling Stations	i	Murldih(20/21)	Date of Sampling	15.03.23	29.03.23
Sl No.	Parameter	Hour / Time of day	Observed Values (in Leq dB(A)) First Fortnight	Method of Analysis	Range Of Testing
1	Noise Level dB(A) Leq - Day	06:00 - 07:00	51.7	CPCB, Protocol for Ambient Level Noise Monitoring -2015	35 dB- 135 dB
2		07:00 - 08:00	51.8		
3		08:00 - 09:00	54		
4		09:00 - 10:00	53.1		
5		10:00 - 11:00	56.2		
6		11:00 - 12:00	56.6		
7		12:00 - 13:00	58.3		
8		13:00 - 14:00	58.8		
9		14:00 - 15:00	59.2		
10		15:00 - 16:00	60.5		
11		16:00 - 17:00	60.2		
12		17:00 - 18:00	57.7		
13		18:00 - 19:00	54.2		
14		19:00 - 20:00	53.9		
15		20:00 - 21:00	52.7		
16		21:00 - 22:00	52.5		
1	Noise Level dB(A) Leq - Night	Leq Day	56.7	CPCB, Protocol for Ambient Level Noise Monitoring -2015	35 dB- 135 dB
2		22:00-23:00	37.7		
3		23:00-00:00	37.3		
4		00:00-01:00	37		
5		01:00-02:00	36.9		
6		02:00-03:00	37		
7		03:00-04:00	36.8		
8		04:00-05:00	37.5		
		05:00-06:00	37.7		
		Leq Night	37.3		
**All noise measurements are integrated for a 01 hour period, All units in dB(A) *LDL indicates Lower Detection Limit					
Sampling Assistants ANALYSED BY  (Gaurav Kant) REVIEWED BY  (Amit Raj Mishra) Authorised Signature					
Note: The results above relate to the samples tested as received. This report can not be reproduced in part or full without the written permission of the HOD(Env), CMPDI, RI-II.					
---- End of Report ---- Page -1 of 1					

Ambient Air Quality Standards for Jharia Coal Field
As per the Environment (Protection) Amendment Rules, 2000 notified vide notification G.S.R.
742(E), dated 25.9.2000.

Category	Pollutant	Time weighted average	Concentration in Ambient Air	Method of Measurement
1	2	3	4	5
III Coal mines located in the coal fields of • Jharia • Raniganj • Bokaro	Suspended Particulate Matter (SPM)	Annual Average * 24 hours **	500 $\mu\text{g}/\text{m}^3$ 700 $\mu\text{g}/\text{m}^3$	- High Volume Sampling (Average flow rate not less than 1.1
	Respirable Particulate Matter (size less than 10 μm) (RPM)	Annual Average * 24 hours **	250 $\mu\text{g}/\text{m}^3$ 300 $\mu\text{g}/\text{m}^3$	Respirable Particulate Matter sampling and analysis
	Sulphur Dioxide (SO_2)	Annual Average * 24 hours **	80 $\mu\text{g}/\text{m}^3$ 120 $\mu\text{g}/\text{m}^3$	1.Improvedwest and Gaeke method 2.Ultraviolet fluorescene
	Oxide of Nitrogen as NO_2	Annual Average * 24 hours **	80 $\mu\text{g}/\text{m}^3$ 120 $\mu\text{g}/\text{m}^3$	1. Jacob & Hochheiser Modified (Na-Arsenic) Method 2. Gas phase Chemilumine-scence

Note:

* Annual Arithmetic mean for the measurements taken in a year, following the guidelines for frequency of sampling laid down in clause 2.

** 24 hourly/8 hourly values shall be met 92% of the time in a year. However, 8% of the time it may exceed but not on two consecutive days.

NATIONAL AMBIENT AIR QUALITY STANDARDS

New Delhi the 18th November 2009

In exercise of the powers conferred by Sub-section (2) (h) of section 16 of the Air (Prevention and Control of Pollution) Act, 1981 (Act No. 14 of 1981), and in supersession of the notification No(s).S.O.384(E), dated 11th April 1994 and S.O.935(E), dated 14th NOVEMBER 1998, the Central Pollution Control Board hereby notify the National Ambient Air Quality Standards with immediate effect.

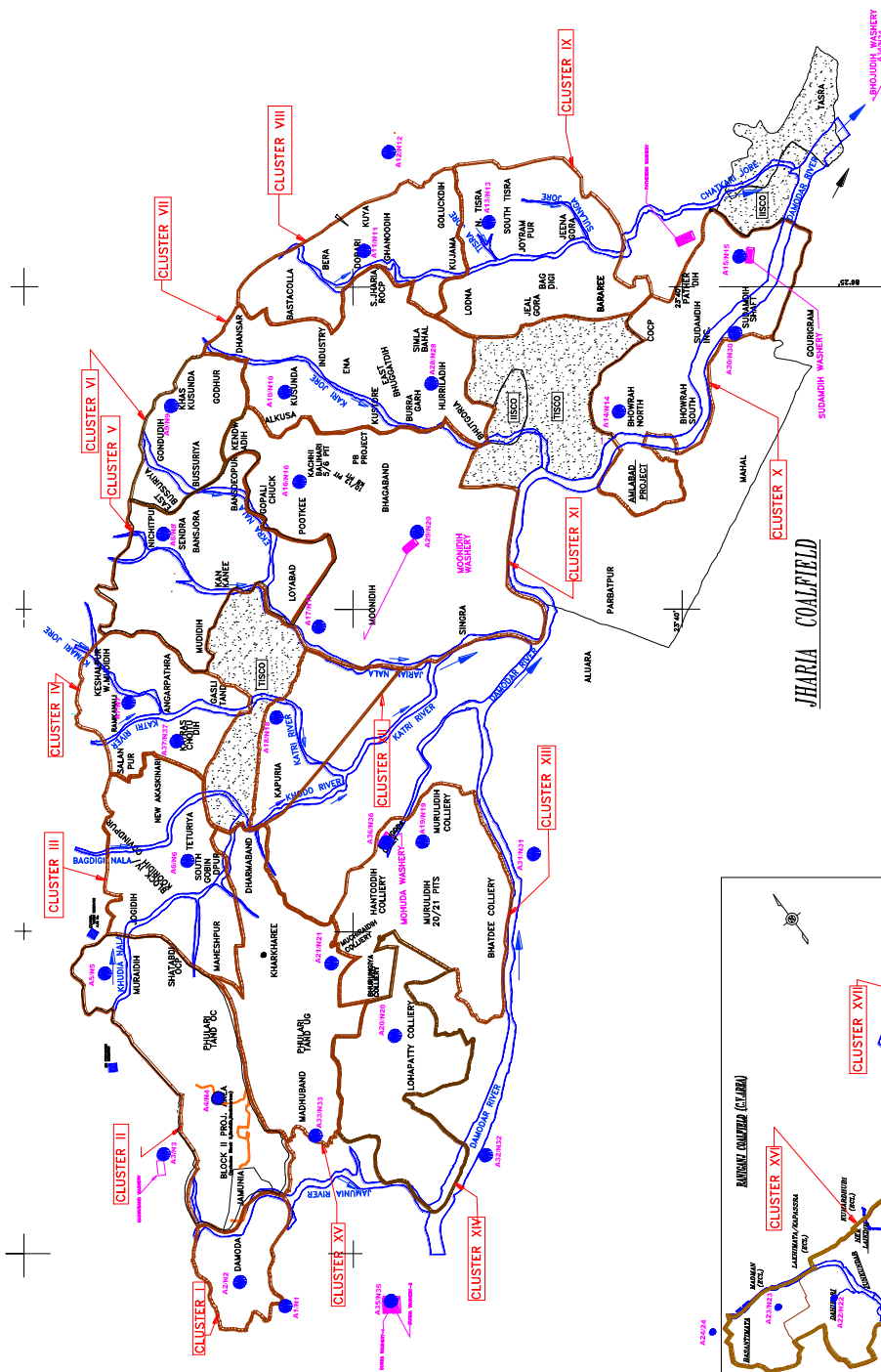
Pollutant	Time Weighted Average	Concentration in Ambient Air		Methods of Measurement
		Industrial, Residential, Rural and other Areas	Ecologically Sensitive Area (Notified by Central Government)	
Sulphur Dioxide (SO₂), µg/m³	Annual * 24 Hours **	50 80	20 80	-Improved West and Gaeke Method -Ultraviolet Fluorescence
Nitrogendioxide (NO₂), µg/m³	Annual * 24 Hours **	40 80	30 80	-Jacob &Hochheiser modified (NaOH-NaAsO ₂) Method -Gas Phase Chemiluminescence
Particulate Matter (Size less than 10µm) or PM₁₀, µg/m³	Annual * 24 Hours **	60 100	60 100	-Gravimetric -TEOM -Beta attenuation
Particulate Matter (Size less than 2.5µm) or PM_{2.5}, µg/m³	Annual * 24 Hours **	40 60	40 60	-Gravimetric -TEOM -Beta attenuation
Ozone (O₃) , µg/m³	8 Hours * 1 Hour **	100 180	100 180	-UV Photometric -Chemiluminescence -Chemical Method
Lead (Pb) , µg/m³	Annual * 24 Hours **	0.50 1.0	0.50 1.0	-AAS/ICP Method after sampling on EPM 2000 or equivalent filter paper -ED-XRF using Teflon filter
Carbon Monoxide (CO), mg/m³	8 Hours ** 1 Hour **	02 04	02 04	-Non dispersive Infrared (NDIR) Spectroscopy
Ammonia (NH₃), µg/m³	Annual * 24 Hours **	100 400	100 400	-Chemiluminescence -Indophenol blue method
Benzene (C₆H₆), µg/m³	Annual *	05	05	-Gas Chromatography (GC) based continuous analyzer -Adsorption and desorption followed by GC analysis
Benzo(a)Pyrene (BaP) Particulate phase only, ng/m³	Annual *	01	01	-Solvent extraction followed byHPLC/GC analysis
Arsenic (As), ng/m³	Annual *	06	06	-AAS/ICP Method after sampling on EPM 2000 or equivalent filter paper
Nickel (Ni), ng/m³	Annual *	20	20	-AAS/ICP Method after sampling on EPM 2000 or equivalent filter paper

* Annual Arithmetic mean of minimum 104 measurements in a year at a particular site taken twice a week 24 hourly at uniform intervals.

** 24 hourly or 8 hourly or 1 hourly monitored values, as applicable, shall be complied with 98% of the time in a year. 2% of the time, they JUNE exceed the limits but not on two consecutive days of monitoring.

NOTE:Whenever and wherever monitoring results on two consecutive days of monitoring exceed the limits specified above for the respective category, it shall be considered adequate reason to institute regular or continuous monitoring and further investigations.

Location of Air & Noise Monitoring Stations in BCCL



Sl. No.	Name of Station (Monitoring)
1	Cluster I
2	Cluster II
3	Cluster III
4	Cluster IV
5	Cluster V
6	Cluster VI
7	Cluster VII
8	Cluster VIII
9	Cluster IX
10	Cluster X
11	Cluster XI
12	Cluster XII
13	Cluster XIII
14	Cluster XIV
15	Cluster XV
16	Cluster XVI
17	Cluster XVII

Sl. No.	Name of Station (Monitoring)
1	Cluster I
2	Cluster II
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16	Cluster XVI
17	Cluster XVII

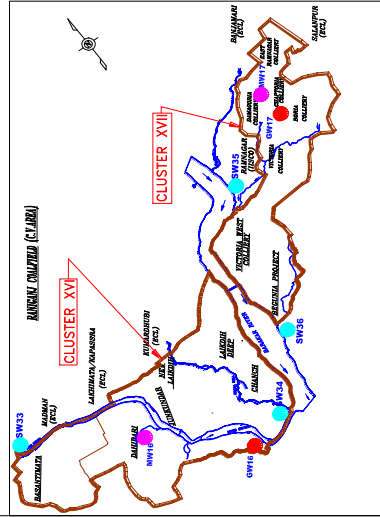
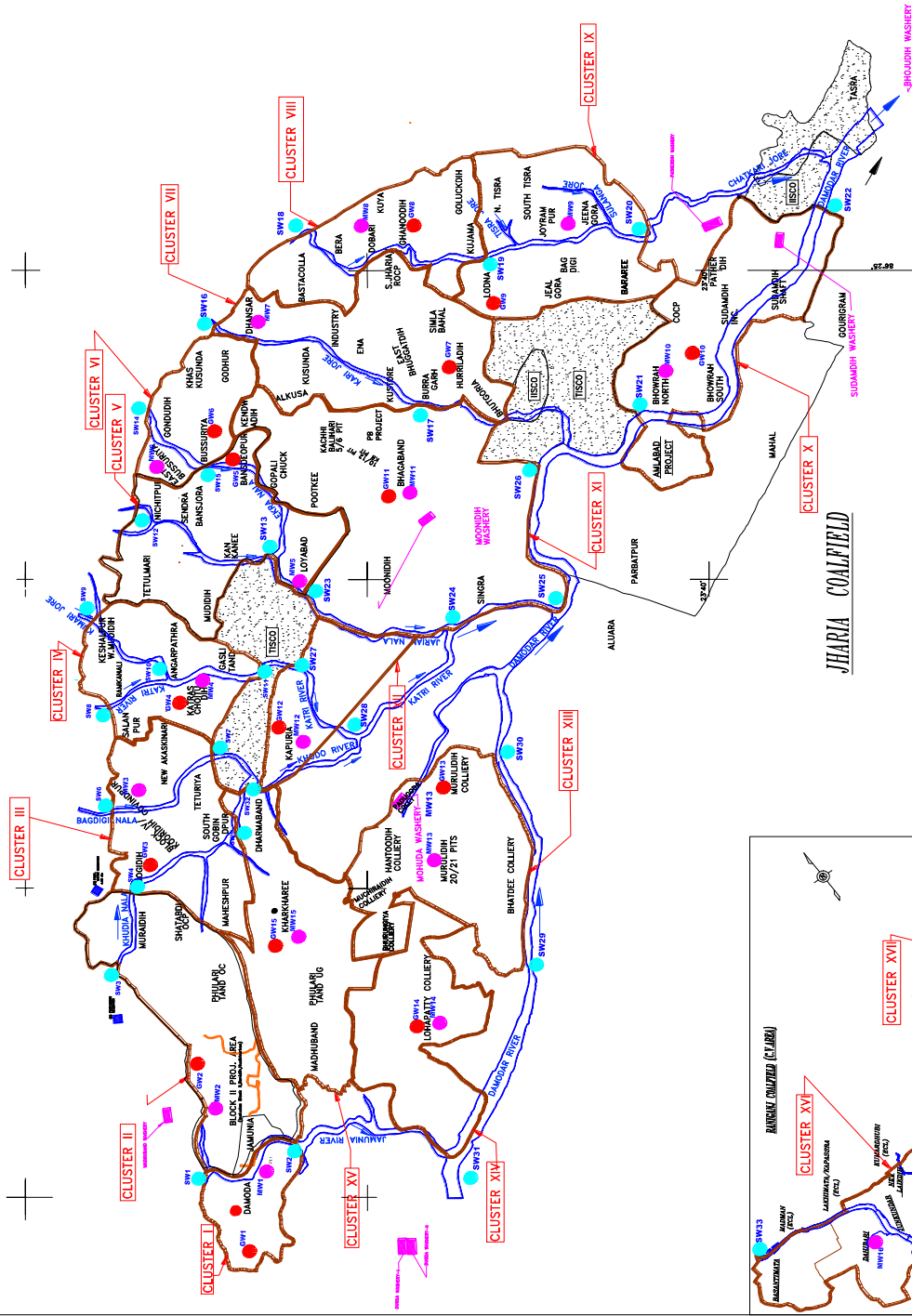
Sl. No.	Name of Station (Monitoring)
1	Cluster I
2	Cluster II
3	Cluster III
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17	Cluster XVII

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8	Cluster VIII
9	Cluster IX
10	Cluster X
11	Cluster XI
12	Cluster XII
13	Cluster XIII
14	Cluster XIV
15	Cluster XV
16	Cluster XVI
17	Cluster XVII

Water Sampling Locations in BCCL



INDEX

Cluster	Surface Water	Name of River/tribe	Name of Sampling Location	Name of Water	Sampling Location
I	SW1, SW2	Jharkhand	Jharkhand	SW1	Jharkhand
II	SW3, SW4	Jharkhand	Jharkhand	SW2	Jharkhand
III	SW5, SW6	Jharkhand	Jharkhand	SW3	Jharkhand
IV	SW7, SW8	Jharkhand	Jharkhand	SW4	Jharkhand
V	SW9, SW10	Jharkhand	Jharkhand	SW5	Jharkhand
VI	SW11, SW12	Jharkhand	Jharkhand	SW6	Jharkhand
VII	SW13, SW14	Jharkhand	Jharkhand	SW7	Jharkhand
VIII	SW15, SW16	Jharkhand	Jharkhand	SW8	Jharkhand
IX	SW17, SW18	Jharkhand	Jharkhand	SW9	Jharkhand
X	SW19, SW20	Jharkhand	Jharkhand	SW10	Jharkhand
XI	SW21, SW22	Jharkhand	Jharkhand	SW11	Jharkhand
XII	SW23, SW24	Jharkhand	Jharkhand	SW12	Jharkhand
XIII	SW25, SW26	Jharkhand	Jharkhand	SW13	Jharkhand
XIV	SW27, SW28	Jharkhand	Jharkhand	SW14	Jharkhand
XV	SW29, SW30	Jharkhand	Jharkhand	SW15	Jharkhand
XVI	SW31, SW32	Jharkhand	Jharkhand	SW16	Jharkhand
XVII	SW33, SW34	Jharkhand	Jharkhand	SW17	Jharkhand

Legend

- Sampling Locations of Surface Water (Upstream/ Downstream)
- Sampling Locations of Mine Water
- Sampling Locations of Ground/ Drinking Water

Regional Officer, Jharkhand
Jharkhand State Pollution Control Board
(Signature)

Head (Env.),
Bharat Coking Coal Limited
(Signature)

Signature

Signature

Signature

Signature

Signature

Signature



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GROUNDWATER LEVEL & QUALITY REPORT FOR CLUSTER OF MINES, BCCL

(Assessment year – 2022-23)

[CLUSTER – I, II, III, IV, V, VI, VII, VIII, IX, X, XI, XIII, XIV, XV & XVI of Mines, BCCL]

JHARIA COALFIELD AND RANIGANJ COALFIELD (PART)

For
(BHARAT COKING COAL LIMITED)

(A Subsidiary of Coal India Limited)

KOYLA BHAWAN (DHANBAD)

Prepared by
Hydrogeology Department
Exploration Division
CMPDI (HQ), Ranchi

MARCH – 2023

Job no - 200422005



**GROUNDWATER LEVEL & QUALITY REPORT
FOR CLUSTER OF MINES, BCCL**

(Assessment year – 2022-23)

[CLUSTER – I, II, III, IV, V, VI, VII, VIII, IX, X, XI, XIII, XIV, XV & XVI of Mines, BCCL]

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**Prepared by
Hydrogeology Department
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MARCH – 2023

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GONDWANA PLACE, KANKE ROAD, RANCHI, JHARKHAND– 834031

[\(Accredited Groundwater Professional Institutions by CGWA\)](#)

[\(Accredited as a GWCO by QCI-NABET\)](#)

[\(Accredited by NABL, CMPDI, RI-II, Lab\)](#)

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DETAILS OF THE REPORT

SI No.	ITEMS	INFORMATIONS
1	Geographical Area	Jharia Coalfield (JCF): 453 sq. km. Raniganj Coalfield (RCF part): 19.64 sq. km. (Cluster-XVI area only)
2	Major Physiographic Units	Dissected Pediplain with surface Reduced Level (RL) varies from 160 m to 220 m above mean sea level (AMSL) in JCF and 100 m to 140 m AMSL in RCF.
3	Drainage System	Damodar River is the master drainage flowing along western boundary of the JCF. Jamunia River, Khudia River, Katri River, Jarian Nala, Ekra Jore, Kari Jore, Kashi Jore, Chatkari Jore and their tributaries are flowing through the JCF area. Damodar River, Barakar River is the master drainage of the part of RCF area (CV Area).
4	Annual Rainfall (IMD-report)	Jharkhand State: 1264.10 mm Rainfall data given in Annexure-IV .
5	Geological Formations	Gondwana Formation (Talchir Formation, Barakar Formation, Barren Measure Formation & Raniganj Formation)
6	Aquifer System	Unconfined/Phreatic Aquifer – thickness 25 m (Avg.) Semi-confined to confined Aquifer – thickness from 25 m upto 650 m
7	Hydrogeological properties (Aquifer Pump Test)	Unconfined Aquifer (Damoda BJ Section & Block-II): Hydraulic Conductivity – upto 0.50 m/day Transmissivity – 10 - 42 m ² /day Semi-confined to confined Aquifer (Sitamala & Kumari Block): Hydraulic Conductivity – 0.0006-1.44 & 0.05-0.0027 m/day Transmissivity – 0.06 – 0.573 m ² /day
8	Groundwater Level Monitoring Network	Out of total 252 nos. of monitoring stations 64 nos located within core mining area and rest comes within Buffers zone. 60 Nos. of Groundwater monitoring well (Dug Wells) network established by CMPDI to record groundwater level data in and around the Core Zone of JCF and 4 Nos. of Groundwater monitoring well (Dug Wells) in RCF (CV Area).
9	Groundwater Levels Below Ground Level (bgl)	JCF area: Pre-monsoon – 0.42 to 11.90 m (Avg. 5.12 m bgl) in '2022-23 Post-monsoon – 0.29 to 11.12 m (Avg. 3.32 m bgl) in '2022-23 RCF area (part): Pre-monsoon – 1.73 to 2.68 m (Avg. 2.20 m bgl) in '2022-23 Post-monsoon – 1.63 to 2.20 m (Avg. 1.90 m bgl) in '2022-23
10	Groundwater Quality	Potable as per GEC-2015 Norms (Annexure- VIII)
11	Proposed Piezometers	Piezometers (23 nos.) to monitor impact of coal mining on groundwater regime within the coalfield area (JCF & part of RCF)
12	Stage of Groundwater Development (CGWB)	Dhanbad District-Safe to Over-exploited category (GWRA-2022)

GROUNDWATER LEVEL & QUALITY REPORT FOR CLUSTER OF MINES OF BCCL

1.0 INTRODUCTION

1.1 LOCATION DETAILS AND BRIEF ABOUT THE PROJECT

The 15 nos. Cluster of mines (Cluster-I, II, III, IV, V, VI, VII, VIII, IX, X, XI, XIII, XIV, XV and XVI) of BCCL is located in the Jharia coalfield in Bokaro and Dhanbad districts of Jharkhand and part of Raniganj coalfield in Dhanbad district of Jharkhand.

The area of Jharia Coalfield (JCF) is 453 sq. km. and Raniganj Coalfield (RCF part) is 19.64 sq. km. (Cluster-XVI area only). Located about 3.0 km south-west of Dhanbad town and 10.0 km north-east of Bokaro town. The coalfield bounded by Jamunia River in the west, Damodar river in the south, and Metamorphics (hard rock) in the north and east side. **(Plate-I).**

1.2 OBJECTIVE OF THE STUDY:

The objective of the report is to conduct hydrogeological study by quarterly monitoring of groundwater level and quality of the Jharia coalfield and Raniganj coalfield (part) within BCCL command area for 15 Cluster of mines. The data collected shall be submitted to the MoEF&CC, CPCB & SPCB within stipulated timeframe. The work is being done yearly and required to be continued as per the specific condition mentioned invariably in Environmental Condition (EC) for all of the Clusters of BCCL.

1.3 SCOPE OF THE STUDY:

The following scope has been taken into account for hydro-geological investigation of the study area.

- i) To monitor the groundwater levels four times/year during (May, August, Nov and Jan).
- ii) To monitor the groundwater quality during May including Arsenic and Fluoride.
- iii) To evaluate the status of ground water level condition in the area.
- iv) To study the ground water flow direction in the mining areas.
- v) To study the depth to ground water level condition in the mining areas.
- vi) To study the ground water quality data and interpretation in the mining areas.

File No. 08HBDD/JRRI/BCCL/ENV/0003/2018-BD Divn.-CMPDI (Computer No. 68378)
Receipt No : 188686/2018/O/p HEAD OF BUSINESS DEVELOPMENT, CMPDI HQ
भारत कोकिंग कोल लिमिटेड

एक मिनी रत्न कंपनी
(कोल इंडिया लिमिटेड का एक अंग)
कोयलाभवन, कोयलानगर, धनबाद -826005



Bharat Coking Coal Limited

A Mini Ratna Company
(A Subsidiary of Coal India Limited)
Regd.Off: Koyla Bhawan, Koyla Nagar

CIN: U10101JH1972GOI000918
Environment Department

पत्र संख्या भाकोकोलि/उप महाप्रबंधक(पर्या0)/संचिका-118/1086- दिनांक : 14.06.2018
1088/14

सेवा में,
महाप्रबंधक
व्यापार विकास
सीएमपीडीआई - कांके रोड रांची ८३४०३१-

Sub: For work of Ground water level and quality monitoring

महोदय,

This is with reference to earlier letter ref no. BCCL/HOD(Env)/F-Env/13/161 dated 11.02.2014 regarding conducting hydrological study by quarterly monitoring of groundwater level and quality of the study to be carried out by establishing a network of existing wells. The monitoring for quantity shall be done four times a year in pre-monsoon (May), monsoon (August), post-monsoon (November) and winter (January) season and for quality including Arsenic and Fluoride during month of May. Data thus collected shall be submitted to the Ministry of Environment & Forest and to Central Pollution Control Board/SPCB quarterly within one month of monitoring.

The above work is being done yearly and required to be continued as per the specific condition mentioned invariably in Environment Clearance order of all clusters of BCCL.

This is for your kind information and further necessary action

भवदीय

14/6/18
उप-महाप्रबंधक (पर्यावरण)

Copy To:

१ महाप्रबंधक (गवेषण), कांके रोड रांची ८३४०३१-

1.4 TOPOGRAPHY AND DRAINAGE

Northern part of the JCF area covered with hills and thin forest. In general, the altitude varies from 220 m above mean sea level (AMSL) in Barora area (Cluster-I) to 160 m AMSL in Sudamdih area (Cluster-X). Pediplains developed over sedimentary rocks or Gondwana formation consisting of Sandstone, Shale, coal, etc. Dissected pediplains developed over Gondwana formations found in Jharia, Baghmara, Katras areas etc. However, in RCF (part) area, the altitude varies from 100 m to 140 m AMSL (Cluster-XVI). The general slope of the topography is towards south, i.e. Damodar River.

The drainage pattern of the area is dendritic in nature. The drainage system of the area is the part of Damodar sub-basin. All the rivers that originate or flow through the coalfield area have an easterly or southeasterly course and ultimately joins Damodar River - the master drainage. The drainage of the JCF is mainly controlled by Jamuniya River (5th order), Khudia nala (3rd order), Katri River (4th) and Chatkari nala (3rd order) flowing from north to south and joins Damodar River. Whereas, Barakar River and Khudia River are controlling the drainage pattern of RCF (part) and joins Damodar River in the south. Damodar River is the main drainage channel and flows from west to east along the southern boundary of JCF and RCF.

The drainage map of the JCF and part of RCF has been prepared on topographic map of scale 1:50,000 (**Plate-I**). The watershed of all tributary rivers (Jamuniya River to Barakar River) falls within the north-western part of Damodar sub-basin which comes under Lower Ganga Basin.

Besides, a large number of ponds/tanks distributed in and around JCF, out of which one prominent lake is located at Topchanchi in the north-west part. Two reservoirs, Maithon dam on Barakar River and Panchet dam on Damodar River near to Chanch Victoria Area of BCCL (part of RCF), are the main source of water supply to the nearby area. Jharia Water Board, Damodar Water Supply Scheme and Mineral Area Development Authority (MADA) are supplying water.

1.5 DETAILS REGARDING WETLANDS

A **wetland** is a distinct ecosystem that gets flooded by water, either permanently or seasonally. The primary factor that distinguishes **wetlands** from other landforms or water bodies is its characteristic vegetation (aquatic plants). Wetland are protective ecosystem as per new guidelines of CGWA & MoEF&CC. There are no Wetlands in and around the area (Jharia coalfield and Raniganj coalfield) as per the list available on official website of MoEF&CC, Govt. of India. The list enclosed as **Annexure-III**.

1.6 CLIMATE & RAINFALL

The Jharia Coalfield (JCF) and part of Raniganj Coalfield (RCF) area in Dhanbad District belongs to sub-humid tropical climatic region. The maximum temperature during summer shoots up to 45° C and falls between 10° C to 5° C in winter. The maximum rainfall occurs during the period between June and September. Rainfall data of IMD Dhanbad and Mine Rescue Station Dhanbad given in **Annexure-IV**.

In Jharkhand state, Daily Rainfall data from 1989 to 2018 considered for analysis of trend variability and mean rainfall patterns. From the daily rainfall data, monthly rainfall series of each station is computed and then monthly district rainfall series is constructed by considering arithmetic average of all the station rainfall values within the district. The monthly rainfall series of the state is computed by using area weighted rainfall values of all the districts within the state. The objective of the analysis is to:

1. Identify the spatial pattern of the mean rainfall
2. Understand district wise observed rainfall trend and variability in annual and SW monsoon season (June, July, August and September).

Daily station rainfall data is utilized for identification of the mean spatial patterns and rainfall intensity trends. From mean and standard deviation (SD), the coefficient of variation (CV) is calculated using following equation:

$$\text{Coefficient of variation (CV)} = [\text{Standard Deviation} / \text{Mean}] \times 100$$

The analysis has done in two parts. For identification of the spatial pattern mean rainfall and variability and observed trends we have used district rainfall series and results have been brought out for four southwest monsoon months viz. June, July, August, September, for the southwest monsoon season and also for annual.

Table shows the mean rainfall (mm) and coefficient of variation of the state for the monsoon months, southwest monsoon season and annual during the period 1989-2018. It can be seen that the state gets highest rainfall (31%) of southwest monsoon rainfall in July month while the August month get 28% of the southwest monsoon rainfall. June and September receive 19% and 22% of southwest monsoon rainfall. Also more than 84% of annual rainfall receives during the southwest monsoon season only. The variability of monsoon or annual rainfall is also very less.

Jharkhand State

	June	July	August	September	Sub-total	Annual
Mean	190.3	313.9	289.2	225.7	1019.1	1211.4
CV	44.4	29.0	24.8	37.0	18.7	16.9

Dhanbad District

	June	July	August	September	Sub-total	Annual
Mean	203.9	327.7	302.5	271.5	1105.6	1332.2
CV	41.0	35.0	33.5	48.7	20.8	19.4

Fig. 1 and 2 show the time series of rainfall in mm for the months of June, July, August and September along with southwest monsoon season and annual rainfall. The trend lines are displayed for each of the series. Neither monthly rainfall nor seasonal rainfall shows any significant increasing/decreasing trend while annual rainfall shows significant decreasing trend. The monthly rainfall during June, July, August and September as well as seasonal rainfall show decreasing trend. During the last 30 years, highest rainfall of 390.3 mm was received in June in the year 1994, 492.1 mm was received in July in the year 2017, 431.5 mm was received in August in the year 1997, while highest rainfall of 395.2 in September was received in the year 1995. Highest annual rainfall of 1587.9 mm was received in the year 1999 and highest southwest monsoon rainfall of 1364.6 mm was received in the year 1994 (Climate Research and Services, IMD, Ministry of Earth Sciences, Pune, Jan'2020).

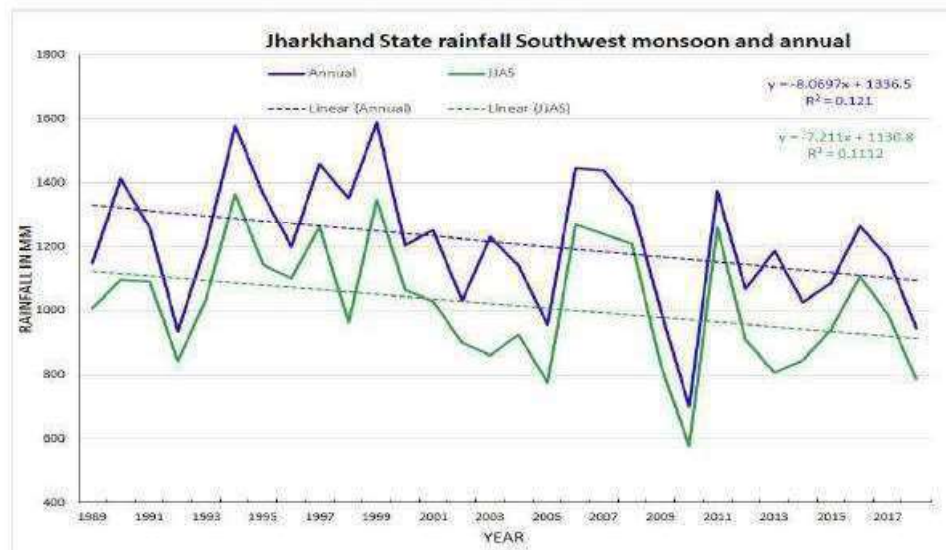


Fig-1.

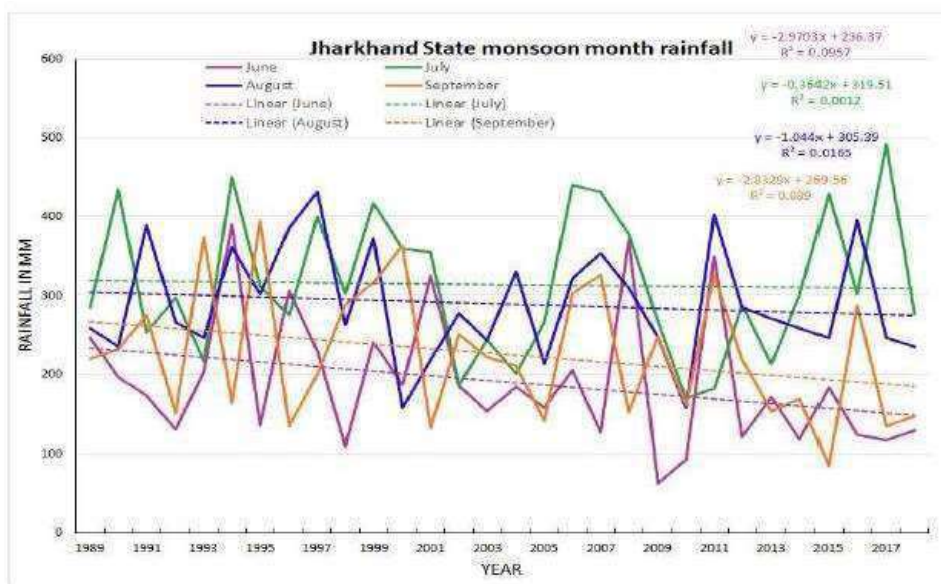


Fig-2.

2.0 GEOLOGY AND HYDROGEOLOGICAL SETUP OF THE AREA

2.1 REGIONAL GEOLOGY

The Jharia Coalfield covering an area of 453 sq. km. is located in Dhanbad District, Jharkhand. The non-coal bearing Talchir Formation is exposed in patches along the northern fringe of the Coalfield. The Barakar Formation (Coal Bearing horizon) overlies the Talchir and covers the most part of the Jharia Coalfield and have an area of 218 sq. km. This is successively overlain by the non-coal bearing Barren Measures Formation which is mainly exposed in the central part of the Coalfield. This, in turn, is overlain by the Raniganj Formation (Coal Bearing horizon) in the south-west part of the Coalfield and covers an area of 54 sq. km.

Chanch-Victoria Area is located in the western part of Raniganj Coalfield. The Raniganj coalfield represents the eastern most coal basin in the Damodar Valley Region, located at the border of Dhanbad District of Jharkhand and Bardhaman District of West Bengal. The Coalfield is almost elliptical in shape and covers an area of about 1530 sq. km. Out of this, only 35 sq. km. comes under leasehold area of BCCL within which 19.64 sq. km is the study area (Cluster-XVI only). The coal bearing formations of the area belongs to Barakar Formation of the Lower Gondwana in **Table-1**.

Table – 1: Regional Geological Succession of Jharia Coalfield

Geological Formations		Age
Quaternary/Recent	Soil cover/Weathered mantle	Recent
Post-Gondwana	Dolerite	Upper Cretaceous
	Lamprophyres	Jurassic
Damoda Group	Raniganj Formation	Upper Permian
	Barren Measures Formation	Middle Permian
	Barakar Formation	Lower Permian
	Karharbari	
	Talchir Formation	Upper Carboniferous
-----Unconformity-----		
Metamorphics		Proterozoic

2.2 HYDROGEOLOGICAL SET- UP

The permeable formations, mainly composed of sandstone, behave as aquifer units. The coal seam and shales developed in the area act as impermeable beds i.e. aquiclude. The aquifer materials of Gondwana Formation constitute of fine to coarse grain sandstone having primary porosity of inter-granular void space. The secondary porosity formed due to presence of faults, fracture, joints, etc. Sandstones of Gondwana formation in JCF and RCF are very hard, compact and cemented and form less potential aquifer, particularly in deeper aquifer system. The secondary porosity along with primary porosity forms a conduit system making these formations good aquifers for movement and storage of ground water.

2.3 AQUIFERS DESCRIPTION

The aquifer system for shallow and deeper aquifer has been established through hydrogeological studies, exploration, surface and subsurface geophysical studies in the JCF and RCF (part) covering all geological formations. The aquifer can be divided into two zones – Un-confined/Phreatic (shallow) and Semi-confined to confined (deeper) aquifer.

PHREATIC/UN-CONFINED AQUIFER

The top aquifer occurred above the top most coal seam/shale bed is called un-confined or water table aquifer and it consists of relatively permeable formation such as weathered sandstone and loose soil. The thickness of the un-confined aquifer is varying from few meters to 50 m. This un-confined aquifer is more potential than semi-confined to confined aquifer.

SEMI-CONFINED TO CONFINED AQUIFER

The semi-confined to confined aquifer consisting of sandstone bed is sandwiched between coal seams/shale beds and thus, multiple aquifer system developed due to presence of multiple number of coal seams/shale beds. With the presence of intercalated shale and carbonaceous shale beds and reduction in permeability with depth, the lower aquifers are poor in potentiality.

Table –2 Generalized Hydrogeological Units developed in the study Area

Sl. No.	Type of Aquifer	Depth range (m)	Core zone (within 2 km)	Buffer zone (within 10 km)
1.	Unconfined	0 – 50 (Avg. 25)	Alluvium, weathered sandstone	Alluvium, weathered sandstone
2.	Semiconfined/ confined	Beyond 25 upto 650 m	Multiple Sandstone horizons in Barakar formation	Multiple Barakar sandstone, Barren Measure, Raniganj sandstone, Talchir shale and Metamorphics

2.4 GENERAL AQUIFER PARAMETERS

PHREATIC/UN-CONFINED AQUIFER

The wells tested by CMPDI for determination of aquifer parameters in Damuda (BJ Section) and Block-III area of JCF. The hydraulic conductivity of the un-confined aquifer is 0.50 m/day as computed from pumping tests on the wells. The transmissivity of the unconfined aquifer ranges from 10.68 m²/day to 41.48 m²/day.

SEMI-CONFINED TO CONFINED AQUIFER

The sandstone partings in-between impervious layers of shale and coal seams is designated as semi-confined / confined aquifers. The sandstones in these aquifers are fine to coarse grained, hard and compact with very low porosity. Mostly groundwater occurs in the weak zones formed due to weathering, fracture, faults, which create the secondary porosity. The hydrogeological parameter has determined by CMPDI in Sitanala Block by conducting aquifer performance test (APT). The hydraulic conductivity (K) of semi-confined aquifer in Barakar Formation ranges from 0.0006 m/day to 1.44 m/day. The hydrogeological parameter has also been determined at Kumari OCP Block in the central JCF by conducting aquifer performance test. The hydraulic conductivity (K) of semi-confined aquifer in Barakar Formation in this area ranges from 0.0027 m/day to 0.05 m/day.

Table – 3: Aquifer parameters considered for the study Area

Hydraulic Parameter	Unconfined aquifer Site: Damuda (BJ Section) and Block-III area	Semi-confined aquifer Site: (1): Sitanala Block (2): Kumari Block
Transmissivity (m ² /d)	10.68 – 41.48	0.0621 – 0.573
Hydraulic conductivity (m/d)	0.5	0.05 – 0.0027
Specific yield	0.03 to 0.04 (as per GEC recommended values)	

3.0 GROUND WATER LEVEL MONITORING

To collect the representative groundwater levels in the study area, CMPDI has established a monitoring network of total 252 monitoring stations out of which 64 located within core zone and rest falls in Buffer zone. Total 60 nos. dug well within JCF and 04 nos. dug well within RCF (part) area (Details of the Hydrograph stations & water level given in **Annexure-V, VA & VB**) spread over the entire BCCL leasehold area, **Plate-I**. Water level data collection in all monitoring stations has been done in pre-monsoon as well as in post monsoon whereas in 64 monitoring stations the data collection has been done on quarterly basis (May'22, Aug'22, Nov'22 and Jan'23).

Depth to water level of the water table depict the inequalities in the position of water table with respect to ground surface and is useful in delineating recharge / discharge areas, planning of artificial recharge structure and shows the overall status of the groundwater level in the area. Historical groundwater level

(GWL) of entire JCF and part of RCF with fluctuation, GWL of Non-mining / Mining areas and GWL of the Cluster of Mines of BCCL are shown in this report to assess the effect of Coal mining activity on the groundwater regime in and around the Coalfield area.

Mining is a dynamic phenomenon. The mining activity creates dis-equilibrium in environmental scenario of the area and disturbs the groundwater conditions/regime in particular. The impact on shallow water regime due to mining activity can be broadly viewed as under:

- Historical GWL with annual fluctuation over the years
- GWL scenario in Non-mining and Mining area (OC/UG mines)
- GWL scenario of Cluster of mines of BCCL

3.1 HISTORICAL GROUNDWATER LEVEL (GWL)

Historical GWL of JCF and part of RCF of CMPDI monitoring stations given from 2005 to 2021 (total 64 stations within Coalfield area). Pre-monsoon and Post-monsoon GWL with Fluctuation has been mentioned below in the table.

Table – 4: Historical Groundwater Level

Period		(Water level in metre below ground level)								
		Pre-Monsoon (April/May)			Post-Monsoon (Nov/Dec)			Fluctuation		
		From	To	Average	From	To	Average	From	To	Average
JCF	2005	0.07	19.08	6.29	0.84	12.13	3.20	0.12	12.45	3.21
	2007	0.40	19.27	5.66	0.35	8.21	2.87	0.02	16.15	2.96
	2008	0.45	18.35	5.42	0.35	14.20	3.62	0.03	9.22	2.45
	2010	0.85	14.47	5.24	0.10	15.88	4.48	0.02	5.55	1.54
	2012	1.27	18.68	5.58	0.15	7.80	2.72	0.08	13.45	2.96
	2013	0.70	19.20	5.65	0.45	8.35	2.77	0.29	15.88	3.17
	2014	0.70	16.28	4.92	0.75	14.98	3.27	0.25	10.15	2.17
	2015	1.38	17.20	6.00	0.45	14.58	3.92	0.28	7.62	2.15
	2016	0.78	16.73	5.64	0.30	12.43	3.19	0.23	6.35	2.88
	2017	0.67	16.28	5.61	0.15	6.97	2.41	0.10	12.10	3.25
	2018	1.20	14.58	5.55	0.40	7.17	2.83	0.20	9.45	2.68
	2019	0.95	15.88	5.46	0.45	5.95	2.34	0.20	13.40	3.05
	2020	0.80	16.25	4.95	0.75	10.10	3.26	0.25	11.05	2.15
	2021	0.62	11.26	5.23	0.05	7.62	2.28	0.15	9.03	2.94
	2022	0.42	11.90	5.12	0.29	11.12	3.32	0.03	7.2	1.80
RCF (part)	2008	5.02	10.50	7.59	2.85	4.90	3.71	1.82	6.60	3.87
	2010	2.20	8.85	4.74	2.78	9.58	4.63	0.68	1.10	0.89
	2011	3.57	8.02	4.98	2.50	6.21	3.75	0.55	1.90	1.23
	2012	3.10	7.34	4.59	1.55	7.00	3.66	0.05	2.78	0.94
	2013	1.70	9.87	6.54	2.90	8.85	4.71	1.02	5.54	2.84
	2014	3.27	6.48	4.57	2.13	3.03	2.63	0.54	3.45	1.94
	2015	3.38	9.52	5.33	2.68	8.20	5.11	1.06	1.32	1.81
	2016	3.61	10.65	6.24	0.90	6.50	3.18	1.63	4.40	3.06
	2017	1.93	5.80	3.25	1.63	3.78	2.47	1.63	3.78	0.78
	2018	2.34	8.70	4.35	1.75	5.70	2.75	0.41	2.55	1.59
	2019	1.60	9.35	5.29	0.80	3.88	2.10	0.80	5.47	3.20
	2020	2.30	9.70	4.30	1.75	5.50	2.70	0.40	2.75	1.60
	2021	2.00	6.20	3.34	1.10	5.25	2.44	0.80	0.95	0.90
	2022	1.73	2.68	2.20	1.63	2.2	1.91	0.10	0.48	0.29

3.2 DEPTH TO WATER LEVEL & HYDRAULIC GRADIENT

Depth to water level (DTW) range in different formations with respect to mining and non-mining areas is summarized in the Table-5.

Table – 5: Depth to water table

<i>Formation</i>	<i>Area</i>	<i>DTW (bgl, m) [Year-2022-23]</i>	
		<i>Pre-monsoon (Apr/May)</i>	<i>Post-monsoon (Nov/Dec)</i>
Sedimentary (Gondwana Formation / Core Zone)	Non-mining	2.0-10.0	1.0-10.0
	Mining	1.0-12.0	0.50-11.0
Metamorphics (Hard rock)	Peripheral part of the Coalfield	<2.0-7.0	1.0-7.0

The study revealed that water table is in shallow depth and there is no significant stress in the water table due to coal mining activity. Mining and Non-mining areas shows barely any difference in water table condition in JCF and RCF (part) area. The average hydraulic gradient of the water table within mining and non-mining areas is given in Table-6. No significant change in hydraulic gradient is observed. Relatively steep gradient near active opencast mining areas w.r.t., non-mining, underground mines and Metamorphics areas is observed.

Table – 6: Average hydraulic gradient

<i>Sl. No</i>	<i>Formation</i>	<i>Area</i>	<i>Average hydraulic gradient</i>
1	Sedimentary (Gondwana Formation / Core Zone)	Non-Mining	1.0×10^{-3} to 2.5×10^{-3}
		Mining	1.0×10^{-2} to 4.0×10^{-3}
2	Metamorphics (Buffer Zone)	Peripheral part of the Coalfield	1.0×10^{-3} to 3.5×10^{-3}

3.3 GROUND WATER LEVEL DATA OF THE CLUSTER OF MINES OF BCCL

A GROUND WATER LEVEL OF CLUSTER-I

Cluster-I (Damuda Group of Mines consisting of Damuda UG, Albion OCP, Proposed BJ Section OCP and Abandoned Gutway OCP) of Barora area, BCCL is located in the western most part of Jharia coalfield in Bokaro district of Jharkhand. The life of the project has been worked out to be up to 15 years considering annual target production of 1.17 MTPA. It is located in the extreme western part of JCF in Bokaro district of Jharkhand (Toposheet no – 73 I/1).

The present leasehold area of Cluster-I is 575.0 Ha. The Damuda block area marked by more or less flat and gently undulating topography. The RL varies from 179 m to 208 m AMSL and the general slope of topography is towards east. Jamuniya River, Kari Jore, Podo Jore and its tributaries are controlling the drainage system of the area. The area comes under the watershed of Jamuniya River.

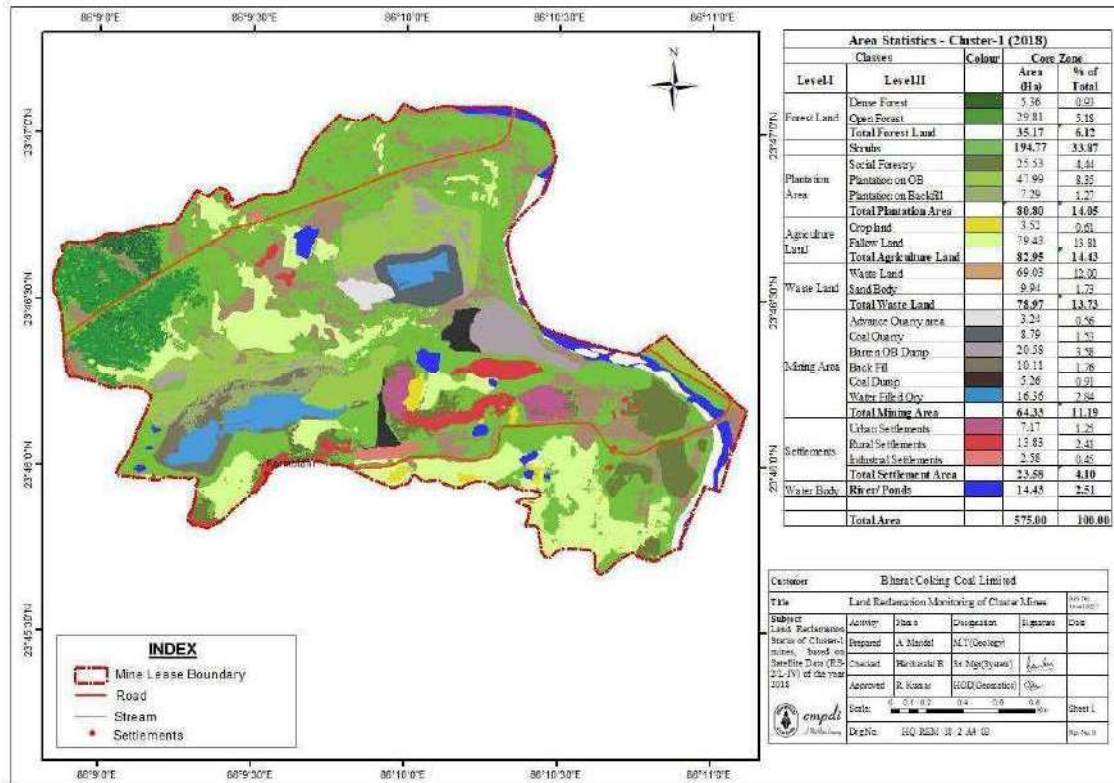
Monitoring stations (**B-15, B-21A, B51 and B-53**) are located in the core zone of the mine area. Water level monitoring in these monitoring stations has done in the months of May'22, August'22, and Nov'22 and January'23. The Ground water level data is presented in the table below:

Sl No.	Well No.	Location	Water level (bgl in meters)											
			2022-23				2021-22				2020-21			
			May	Aug	Nov	Jan	May	Aug	Nov	Jan	May	Aug	Nov	Jan
1	B-15	Bera Basti	3.67	0.45	1.02	2.30	1.46	0.25	0.35	1.01	3.70	0.15	1.47	1.70
2	B21A	Dugdha	9.65	5.55	4.35	Abn.	8.38	2.50			10.00	4.15	5.80	6.70
3	B-51	Taranga	5.06	0.00	4.57	2.87	5.70	0.90	1.00	4.88	5.00	0.88	2.10	3.00
4	B-53	Karmatanr	4.42	1.78	3.54	1.68	4.85	1.52	1.87	2.87	3.12	1.07	1.40	1.92
Average WL (bgl)			5.70	1.95	3.37	2.28	5.10	1.29	1.07	2.92	3.70	0.15	1.47	1.70

LAST THREE-YEAR ASSESSMENT:

Pre-monsoon GW Level (m): Min – 1.46 m Max – 10.00 m
Post-monsoon GW Level (m): Min – 0.35 m Max – 5.80 m

LAND USE / LAND COVER MAP OF THE CLUSTER-I MINES, BCCL



Sl no	Land Use Details	Existing (sq. meter)	Proposed (sq. meter)	Grand Total (sq. meter)
1	Green Belt Area	393.69 x 10 ⁴	0.0	393.69 x 10 ⁴
2	Open Land	204.89 x 10 ⁴	0.0	204.89 x 10 ⁴
3	Road/ Paved Area	09.0 x 10 ⁴	0.0	09.0 x 10 ⁴
4	Rooftop area of building/ sheds	14.58 x 10 ⁴	0.0	14.58 x 10 ⁴
5	Total	575.00 x 10 ⁴	0.0	575.00 x 10 ⁴

B. GROUND WATER LEVEL OF CLUSTER-II

Cluster-II consists of seven mines namely; Block II Mixed mines (OCP & UGP), Jamunia OCP, Shatabdi OCP, Muraidih Mixed mines (OCP & UGP), and Phularitand OCP of BCCL is located in the western most part of Jharia coalfield in Bokaro district and Dhanbad district of Jharkhand. The life of the project has been worked out to be up to 30 years considering annual target production of 20.215 MTPA. It is located in the extreme western part of Jharia Coalfield in Dhanbad district of Jharkhand (Toposheet no- 73 I/1 and I/5).

The present leasehold area of Cluster-II is 2260.54 Ha. The Damuda block area marked by more or less flat and gently undulating topography. The RL varies from 176 m to 235 m AMSL. Jamuniya River, Khudia River and its tributaries are controlling the drainage system of the area. The area comes under the watershed of Jamuniya River and Khudia River.

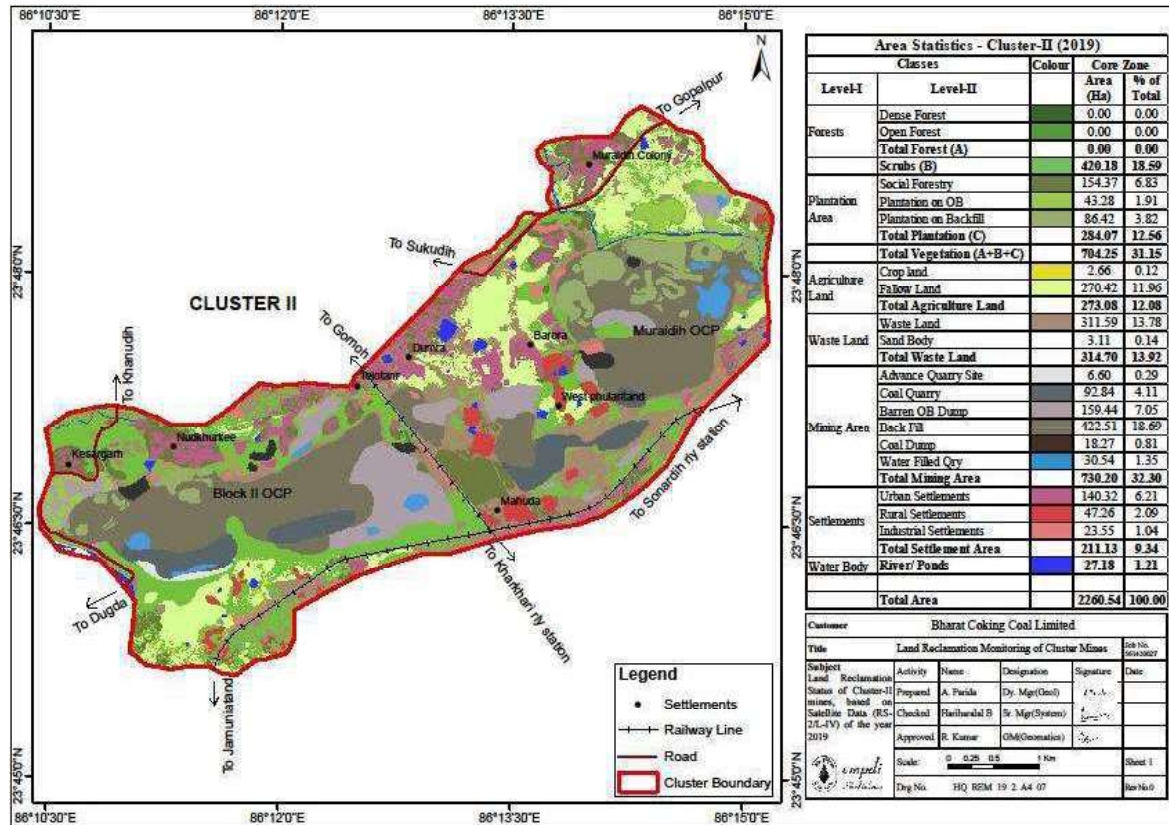
Monitoring stations (**B-1, B-59, B-60, B-61A and B-62A**) are located in the core zone of the mine area. Water level monitoring in these monitoring stations has done in the months of May'22, August'22, and Nov'22 and January'23. The Ground water level data is presented in the table below:

Sl No.	Well No.	Location	Water level (bgl in meters)											
			2022-23				2021-22				2020-21			
			May	Aug	Nov	Jan	May	Aug	Nov	Jan	May	Aug	Nov	Jan
1	B-1	Muraidih	2.10	1.65	1.81	2.73	2.58	0.58	1.91	2.03	3.28	0.73	1.63	1.73
2	B-59	Khodovaly	4.50	0.44	1.14	1.04	5.49	0.30	0.90	0.95	5.25	0.67	1.40	2.10
3	B-60	Bahiyardih	10.53	1.08	5.80	9.38	11.26	1.33	2.23	6.53	10.33	0.91	3.21	6.13
4	B61A	Kesargora	1.20	0.52	0.97	Abn	4.42	0.47	0.97	0.97	3.32	0.85	1.60	2.07
5	B62A	Sadiyardih	6.45	1.77	4.91	5.15	6.87	1.35	4.50	4.60	6.95	2.77	3.00	4.95
Average WL (bgl)			4.96	1.09	2.93	4.58	6.12	0.81	2.10	3.02	5.83	1.19	2.17	3.40

LAST THREE-YEAR ASSESSMENT:

Pre-monsoon GW Level (m): Min – 1.20m Max – 11.26 m
Post-monsoon GW Level (m): Min – 0.90 m Max – 5.80 m

LAND USE / LAND COVER MAP OF THE CLUSTER-II MINES, BCCL



Sl no	Land Use Details	Existing (sq. meter)	Proposed (sq. meter)	Grand Total (sq. meter)
1	Green Belt Area	977.33 x 10 ⁴	0.0	977.33 x 10 ⁴
2	Open Land	1072.08 x 10 ⁴	0.0	1072.08 x 10 ⁴
3	Road/ Paved Area	140.32 x 10 ⁴	0.0	140.32 x 10 ⁴
4	Rooftop area of building/ sheds	70.81 x 10 ⁴	0.0	70.81 x 10 ⁴
5	Total	2260.54 x 10 ⁴	0.0	2260.54 x 10 ⁴

C. GROUND WATER LEVEL OF CLUSTER-III

Cluster-III consists of nine mines namely, Jogidih UG, Govindpur UG, Maheshpur UG, Kooridih/Block-IV Mixed Mine, New Akashkinaree Mixed Mine, South Govindpur UG (closed), and Teturiya UG (closed) mines. The life of the project has been worked out to be up to 60 years considering annual production target of 3.60 MTPA. This Cluster of mines is located in western part of Jharia Coalfield in Dhanbad district of Jharkhand (Toposheet no – 73 I/5).

The present leasehold area of Cluster-III is 1552.53 Ha. The area is plain with gentle undulation with RL varying from 160 m to 208.80 m AMSL. The general slope of the area is towards south. Khudia River, Baghdigi Jore, Katri River and its tributaries are controlling the drainage system of the area. The area comes under the watershed of Khudia River.

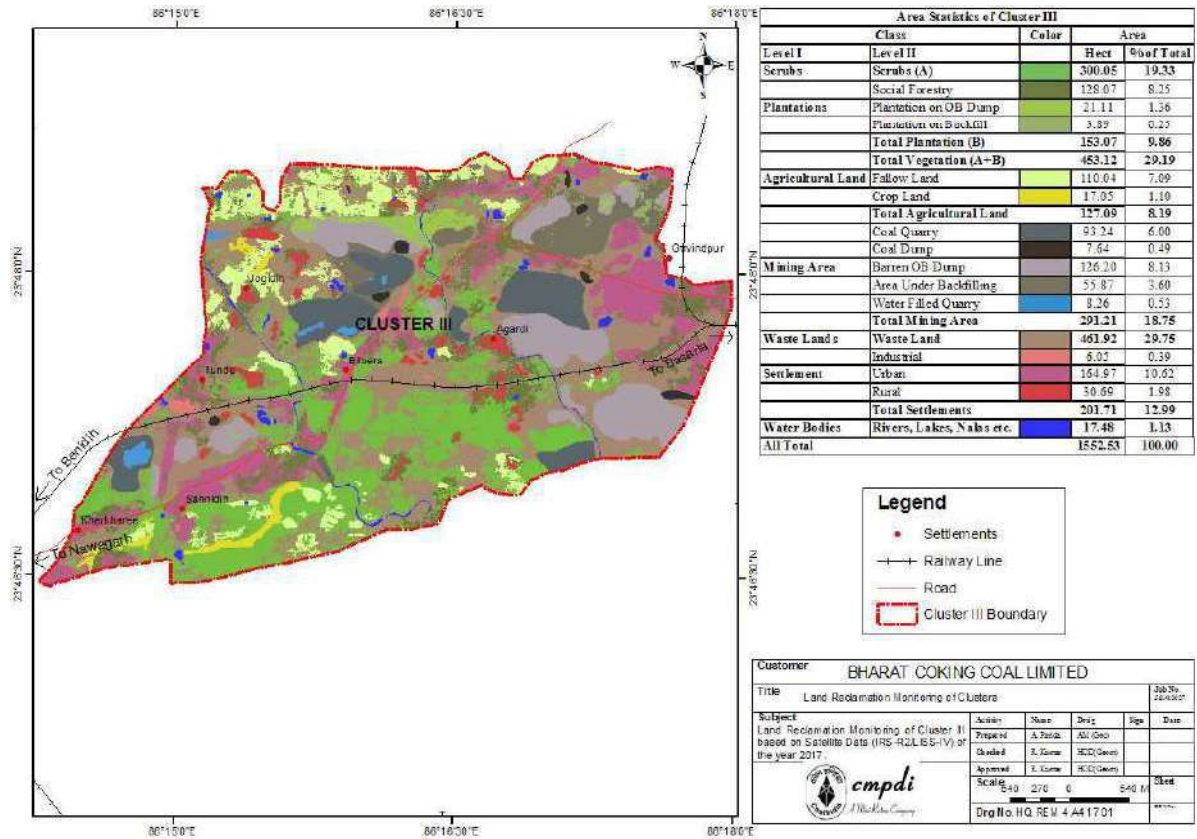
Monitoring stations (**A-12, A-25, A-29, B-14 and B-60**) are located in the core zone of the mine area. Water level monitoring in these monitoring stations has been done in the months of May'22, August'22, and Nov'22 and January'23. The Ground water level data is presented in the table below:

Sl No.	Well No.	Location	Water level (bgl in meters)											
			2022-23				2021-22				2020-21			
			May	Aug	Nov	Jan	May	Aug	Nov	Jan	May	Aug	Nov	Jan
1	A12	Jamua	1.50	0.30	0.67	0.70	1.92	0.50	1.10	1.72	2.60	0.32	0.50	1.20
2	A25	Sinidih	3.31	1.33	2.08	2.51	5.78	1.73	2.43	2.53	2.98	1.30	1.83	2.53
3	A29	Dharmaband	4.60	1.20	1.15	1.12	6.49	2.90	5.90	6.65	6.20	1.21	3.20	3.25
4	B14	Mathadih	3.24	0.09	2.60	2.55	2.84	0.24	2.04	2.10	2.44	0.32	1.04	1.69
5	B60	Sonardih	10.53	1.08	5.80	9.38	11.26	1.33	2.23	6.53	10.33	0.91	3.21	6.13
Average WL (bgl)			4.64	0.80	2.46	3.25	5.66	1.34	2.74	3.91	4.91	0.81	1.96	2.96

LAST THREE-YEAR ASSESSMENT:

Pre-monsoon GW Level (m): Min – 1.50 m Max – 11.26 m
Post-monsoon GW Level (m): Min – 0.50 m Max – 5.90 m

LAND USE / LAND COVER MAP OF THE CLUSTER-III MINES, BCCL



Sl no	Land Use Details	Existing (sq. meter)	Proposed (sq. meter)	Grand Total (sq. meter)
1	Green Belt Area	580.21 x 10 ⁴	0.0	580.21 x 10 ⁴
2	Open Land	770.61 x 10 ⁴	0.0	770.61 x 10 ⁴
3	Road/ Paved Area	164.97 x 10 ⁴	0.0	164.97 x 10 ⁴
4	Rooftop area of building/ sheds	36.74 x 10 ⁴	0.0	36.74 x 10 ⁴
5	Total	1552.53 x 10 ⁴	0.0	1552.53 x 10 ⁴

D. GROUND WATER LEVEL OF CLUSTER-IV

Cluster-IV consists of six mines namely, Amalgamated Keshalpur & West Mudidih colliery, Amalgamated Angarpathra & Ramkanali colliery, Katras-Choitudih Colliery, Salanpur colliery and Gaslitand colliery of Katras area, BCCL. It is located in the north-central part of Jharia Coalfield in Dhanbad district of Jharkhand. The life of the project has been worked out to be more than 30 years considering annual target production of 9.55 MTPA (Toposheet no – 73 I/5).

The present leasehold area of Cluster-IV is 1123.79 Ha. The area has a general undulating topography, with an overall gentle south-west slope. The RL varies from 182 m to 216 m AMSL. Katri River, Kumari Jore and their tributaries are controlling the drainage pattern of the area. The area comes under the watershed of Katri River.

Monitoring stations (**A-26, A28A, B-64 and B-65A**) are located in the core zone of the mine area. Water level monitoring in these monitoring stations has been done in the months of May'22, August'22, and Nov'22 and January'23. The Ground water level data is presented in the table below:

Sl No.	Well No.	Location	Water level (bgl in meters)											
			2022-23				2021-22				2020-21			
			May	Aug	Nov	Jan	May	Aug	Nov	Jan	May	Aug	Nov	Jan
1	A-26	Malkhera	6.42	2.83	4.31	3.62	6.70	2.10	2.73	3.63	6.98	2.69	3.18	4.78
2	A28A	Lakarka	4.23	2.85	3.30	3.57	6.23	0.53	3.75	4.47	4.00	1.33	3.03	3.35
3	B-64	Keshalpur	1.00	0.35	0.60	0.75	2.35	0.30	0.95	1.00	1.85	0.93	0.50	1.37
4	B65A	Jhinjipahari	7.45	0.50	2.27	3.45	9.03	0.45	1.42	2.80	9.25	0.03	2.30	4.10
Average WL (bgl)			4.78	1.63	2.62	2.85	6.08	0.85	2.21	2.98	5.52	1.25	2.25	3.40

LAST THREE-YEAR ASSESSMENT:

Pre-monsoon GW Level (m): Min – 1.00 m Max – 9.25 m
Post-monsoon GW Level (m): Min – 0.50 m Max – 4.31 m

INDEX

- Mine Lease Boundary
- Road
- Stream
- Settlements

Level I	Classes	Colour	Core Zone Area (Ha)	% of Total
Forest Land	Dense Forest	[Dark Green]	0.00	0.00
	Open Forest	[Light Green]	0.00	0.00
	Total Forest Land		0.00	0.00
Plantation Area	Scrubs	[Medium Green]	154.53	13.75
	Social Forestry	[Light Green]	165.09	14.69
	Plantation on OB	[Yellow-Green]	27.11	2.41
	Plantation on Backfill	[Brownish Green]	0.00	0.00
Total Plantation Area			192.20	17.10
Agriculture Land	Crop Land	[Yellow]	3.45	0.31
	Fallow Land	[Light Yellow]	24.97	2.11
	Total Agriculture Land		38.42	3.42
Waste Land	Waste Land	[Brown]	51.99	4.63
	Sand/Rocky	[Grey-Brown]	0.00	0.00
	Total Waste Land		51.99	4.63
Mining Area	Advance Quarry area	[Dark Grey]	0.00	0.00
	Coal Quarry	[Black]	158.87	14.14
	Bare OB Dump	[Dark Brown]	154.32	13.73
	Back Fill	[Dark Blue-Black]	147.22	13.10
	Coal Dump	[Dark Grey]	20.40	1.82
Total Mining Area			483.60	43.48
Settlements	Water Filled Qry	[Blue]	7.80	0.69
	Urban Settlements	[Pink]	150.79	14.29
	Rural Settlements	[Red-Pink]	22.63	2.01
Total Settlements Area			173.42	16.30
Water Body	River/Floods	[Blue]	14.84	1.32
Total Area			1123.79	100.00

Sl no	Land Use Details	Existing (sq. meter)	Proposed (sq. meter)	Grand Total (sq. meter)
1	Green Belt Area	385.15 x 10 ⁴	0.0	385.15 x 10 ⁴
2	Open Land	555.43 x 10 ⁴	0.0	555.43 x 10 ⁴
3	Road/ Paved Area	160.59 x 10 ⁴	0.0	160.59 x 10 ⁴
4	Rooftop area of building/ sheds	22.63 x 10 ⁴	0.0	22.63 x 10 ⁴
5	Total	1123.79 x 10 ⁴	0.0	1123.79 x 10 ⁴

E. GROUND WATER LEVEL OF CLUSTER-V

Cluster-V consists of twelve mines namely; Tetulmari OC & UG mines, Mudidih OC & UG mines, Nichitpur OC mine, Sendra Bansjora OC & UG mines, Bansdeopur OCP (proposed) & UG Mines, Kankanee OC & UG mines and Loyabad UG mine (closed) of Sijua area, BCCL. This Cluster of mines is located in northern part of Jharia Coalfield in Dhanbad district of Jharkhand. The life of the project has been worked out to be more than 30 years considering annual production target of 6.311 MTPA (Toposheet no – 73 I/6).

The present leasehold area of Cluster-V is 1724.52 Ha. The area has a general undulating topography, with an overall gentle south-west slope. The RL varies from 210 m to 170 m AMSL. Jarian Nala, Nagri Jore, Ekra Jore and their tributaries are controlling the drainage pattern of the area. The area comes under the watershed of Jarian Nala and Ekra Jore.

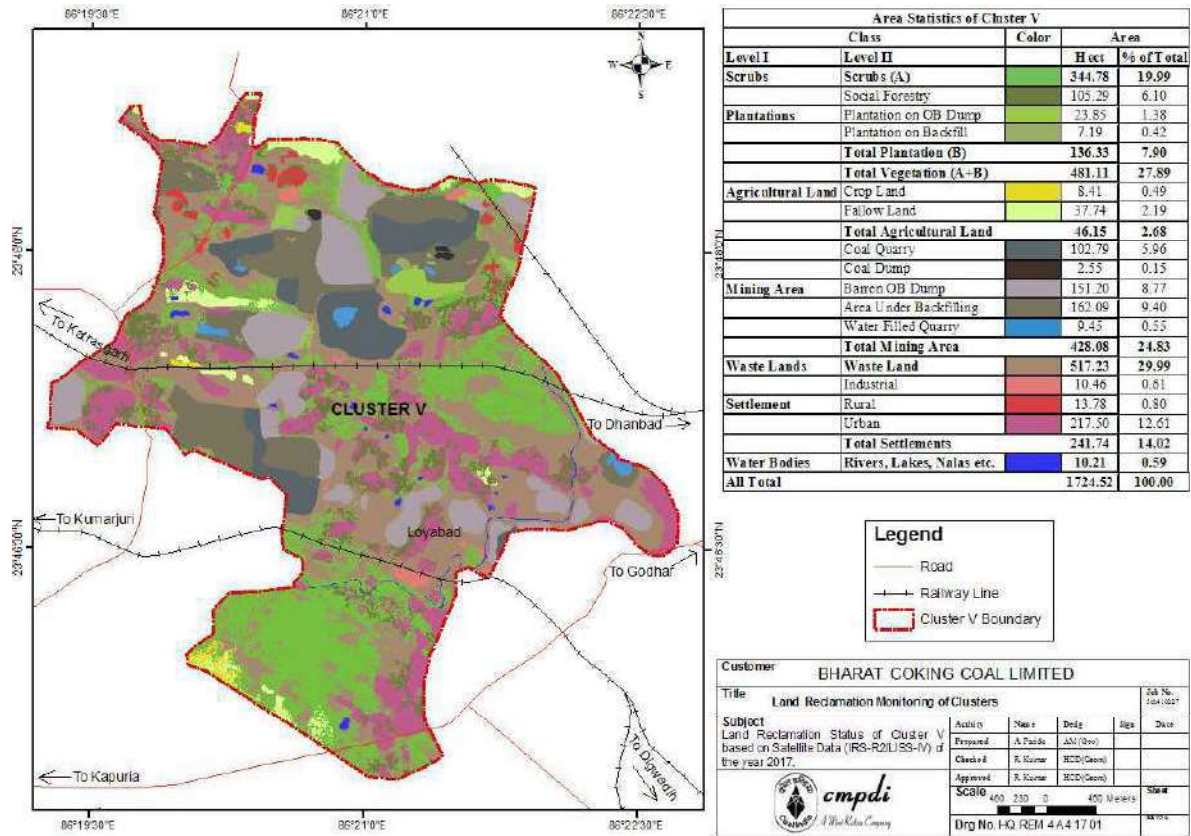
Monitoring stations (**A-3, A-16, A-27 and D-23**) are located in the core zone of the mine area. Water level monitoring in these monitoring stations has been done in the months of May'22, August'22, and Nov'22 and January'23. The Ground water level data is presented in the table below:

Sl No.	Well No.	Location	Water level (bgl in meters)											
			2022-23				2021-22				2020-21			
			May	Aug	Nov	Jan	May	Aug	Nov	Jan	May	Aug	Nov	Jan
1	A-3	Sijua	0.42	0.22	0.29	0.32	0.62	0.07	0.05	0.07	1.57	0.02	0.47	0.77
2	A-16	Ekra	5.80	1.35	3.08	2.99	3.45	1.90	2.00	3.00	7.15	1.34	1.75	3.20
3	A-27	Tetulmari	1.90	0.10	1.33	1.50	1.67	0.80	0.90	1.13	2.40	0.03	1.10	1.90
4	D-23	Jogta	1.85	0.45	1.57	1.85	5.43	1.87	1.60	1.65	5.60	1.69	3.35	3.70
Average WL (bgl)			2.49	0.53	1.57	1.67	2.79	1.16	1.14	1.46	4.18	0.77	1.67	2.39

LAST THREE-YEAR ASSESSMENT:

Pre-monsoon GW Level (m): Min – 0.42 m Max – 7.15 m
Post-monsoon GW Level (m): Min – 0.05 m Max – 3.35 m

LAND USE / LAND COVER MAP OF THE CLUSTER-V MINES, BCCL



Sl no	Land Use Details	Existing (sq. meter)	Proposed (sq. meter)	Grand Total (sq. meter)
1	Green Belt Area	527.26 x 10 ⁴	0.0	527.26 x 10 ⁴
2	Open Land	973.52 x 10 ⁴	0.0	973.52 x 10 ⁴
3	Road/ Paved Area	217.50 x 10 ⁴	0.0	217.50 x 10 ⁴
4	Rooftop area of building/ sheds	24.24 x 10 ⁴	0.0	24.24 x 10 ⁴
5	Total	1724.52 x 10 ⁴	0.0	1724.52 x 10 ⁴

F. GROUND WATER LEVEL OF CLUSTER-VI

Cluster-VI consists of four coal mines namely, East Bassuriya opencast (OC), Bassuriya underground (UG), Gondudih Khas-Kusunda OC and Godhur Mixed Mines (OC and UG) of BCCL. This Cluster of mines is located in central part of Jharia Coalfield in Dhanbad district of Jharkhand. The life of the project has been worked out to be more than 30 years considering annual production target of 7.631 MTPA (Toposheet no – 73 I/6).

The present leasehold area of Cluster-VI is 831.83 Ha. The area has a general undulating topography with general slope towards south. The RL varies from 180 m to 240 m AMSL. Ekra Jore, Kari Jore and their tributaries are controlling the drainage pattern of the area. The area comes under the watershed of Ekra Jore and Kari Jore.

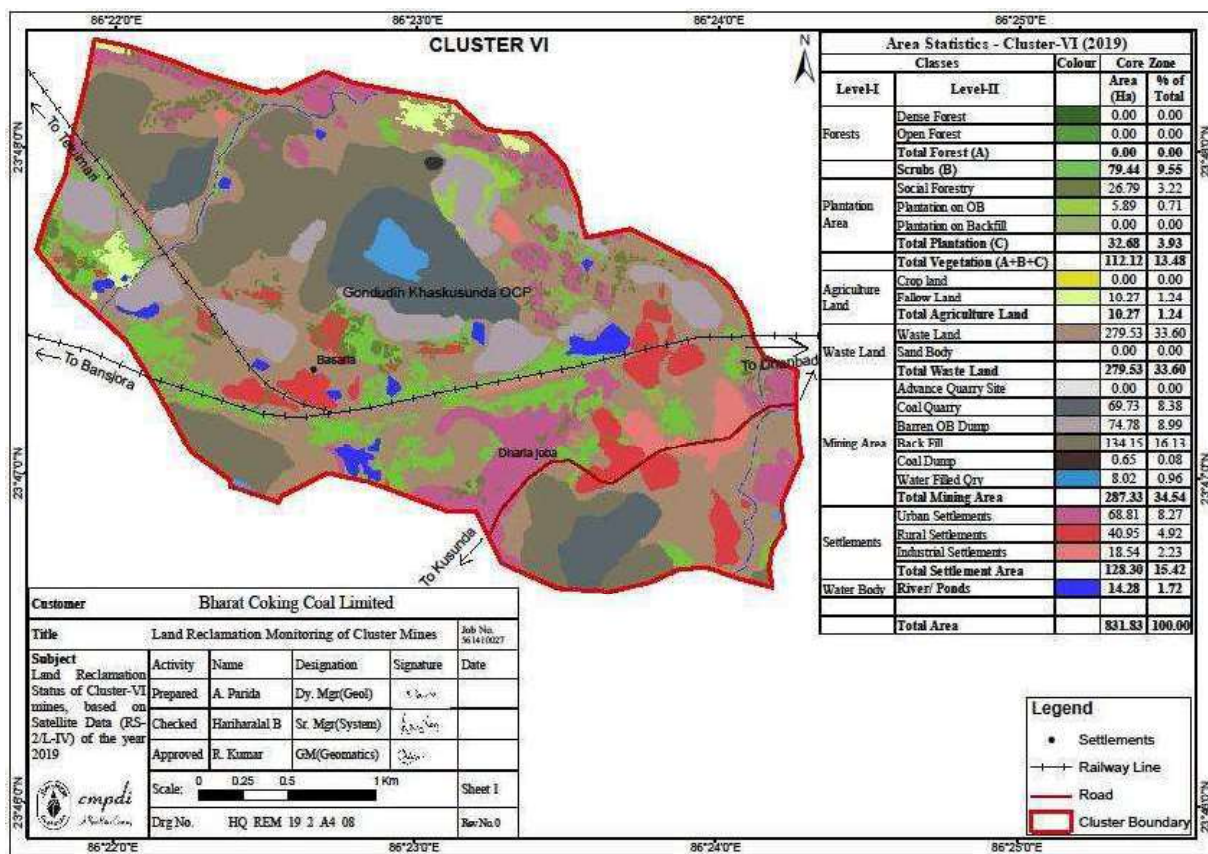
Monitoring stations (**D-25 and D-30**) are located in the core zone of the mine area. Water level monitoring in these monitoring stations has been done in the months of May'22, August'22, and Nov'22 and January'23. The Ground water level data is presented in the table below:

Sl No.	Well No.	Location	Water level (bgl in meters)											
			2022-23				2021-22				2020-21			
			May	Aug	Nov	Jan	May	Aug	Nov	Jan	May	Aug	Nov	Jan
1	D25	Godhur	11.9	2.58	4.70	5.30	10.50	2.90	3.80	4.40	10.50	2.28	5.62	6.40
2	D30	Borkiboa	4.37	1.80	2.29	4.15	4.23	0.60	0.84	1.80	4.50	1.65	1.35	2.40
Average WL (bgl)			8.14	2.19	3.50	4.73	7.37	1.75	2.32	3.10	7.50	1.97	3.49	4.40

LAST THREE-YEAR ASSESSMENT:

Pre-monsoon GW Level (m): Min – 4.23 m Max – 11.90 m
Post-monsoon GW Level (m): Min – 0.84m Max – 5.62 m

LAND USE / LAND COVER MAP OF THE CLUSTER-VI MINES, BCCL



Sl no	Land Use Details	Existing (sq. meter)	Proposed (sq. meter)	Grand Total (sq. meter)
1	Green Belt Area	122.39 X 10 ⁴	0.0	122.39 X 10 ⁴
2	Open Land	581.14 X 10 ⁴	0.0	581.14 X 10 ⁴
3	Road/ Paved Area	68.81 X 10 ⁴	0.0	68.81 X 10 ⁴
4	Rooftop area of building/ sheds	59.49 X 10 ⁴	0.0	59.49 X 10 ⁴
5	Total	831.83 X 10 ⁴	0.0	831.83 X 10 ⁴

G. GROUND WATER LEVEL OF CLUSTER-VII

Cluster-VII consists of fourteen mines within Kusunda Area, Bastacolla Area and PB Area, B.C.C.L, Jharia Coalfield. Coal mines namely Dhansar UG, Dhansar OCP, Kusunda OCP and Viswakarma OCP (proposed) are under the administrative control of Kusunda Area and Industry UG (closed), Alkusa UG, Ena OCP, S.Jharia/Rajapur OCP, Burragarh UG, Simlabahal UG, Huriladih UG, Bhutgoria UG (Re-opening), Kustore UG (closed) and E.Bhuggatdih UG (closed) are under Bastacolla and PB Area. This Cluster of mines is located in east central part of Jharia Coalfield in Dhanbad district of Jharkhand. The life of the project has been worked out to be more than 30 years considering annual production target of 8.226 MTPA (Toposheet no – 73 I/6).

The present leasehold area of Cluster-VII is 2127.70 Ha. The area has a general undulating topography with general slope towards south. The RL varies from 172 m to 221 m above M.S.L. Kari Jore, Chatkari Jore and their tributaries are controlling the drainage pattern of the area. The area comes under the watershed of Kari Jore and Chatkari Jore.

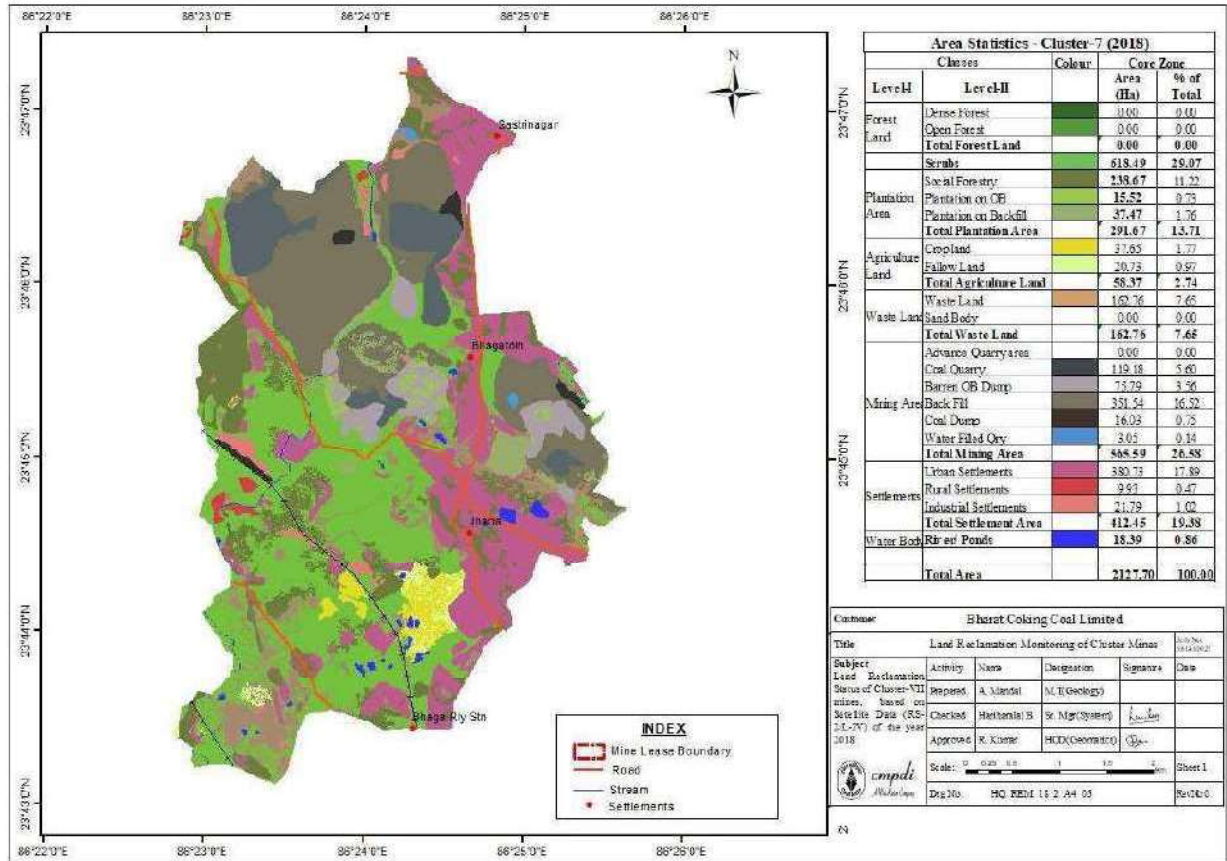
Monitoring stations (**D-3, D-4, D-33, D-34, D-47, D-55 and D-80**) are located in the core zone of the mine area. Water level monitoring in these monitoring stations has been done in the months of May'22, August'22, and Nov'22 and January'23. The Ground water level data is presented in the table below:

Sl No.	Well No.	Location	Water level (bgl in meters)											
			2022-23				2021-22				2020-21			
			May	Aug	Nov	Jan	May	Aug	Nov	Jan	May	Aug	Nov	Jan
1	D-3	Dhansar	5.96	0.55	1.32	1.34	3.41	0.80	0.85	1.30	1.75	1.05	1.30	1.45
2	D-4	Jharia	1.71	0.98	1.55	1.66	3.01	1.41	1.16	1.61	2.81	1.16	1.71	2.16
3	D33	Kustore	1.20	0.45	0.65	0.95	1.75	0.62	0.85	1.60	2.35	0.25	1.65	2.35
4	D34	Kusunda	5.00	2.15	3.15	3.22	3.78	2.05	2.90	2.95	4.75	2.10	2.40	2.55
5	D47	Parastanr	6.55	5.32	5.85	11.40	4.05	3.22	2.45	4.88	4.55	1.90	4.35	4.20
6	D55	Hariladih	11.32	9.46	11.12	Abn.	9.52	5.62	7.62	9.02	8.42	2.97	5.47	8.62
7	D80	Bastacolla	3.30	2.40	3.08	1.80	7.10	2.17	2.55	3.10	5.00	2.30	3.05	3.80
Average WL (bgl)			5.01	3.04	3.82	3.40	4.66	2.27	2.63	3.49	4.23	1.68	2.85	3.59

LAST THREE-YEAR ASSESSMENT:

Pre-monsoon GW Level (m): Min – 1.20 m Max – 11.32 m
Post-monsoon GW Level (m): Min – 0.65 m Max – 11.12 m

LAND USE / LAND COVER MAP OF THE CLUSTER-VII MINES, BCCL



Sl no	Land Use Details	Existing (sq. meter)	Proposed (sq. meter)	Grand Total (sq. meter)
1	Green Belt Area	968.53 x 10 ⁴	0.0	968.53 x 10 ⁴
2	Open Land	746.72 x 10 ⁴	0.0	746.72 x 10 ⁴
3	Road/ Paved Area	380.73 x 10 ⁴	0.0	380.73 x 10 ⁴
4	Rooftop area of building/ sheds	31.71 x 10 ⁴	0.0	31.71 x 10 ⁴
5	Total	2127.70 x 10 ⁴	0.0	2127.70 x 10 ⁴

H. GROUND WATER LEVEL OF CLUSTER-VIII

Cluster - VIII of B.C.C.L mines are under administrative control of Bastacolla Area, Jharia Coalfield. Cluster-VIII consists of ten mines namely Bastacolla mixed mines (OC & UG), Bera mixed mines (OC&UG), Dobari UG, Kuya mixed mines (OC&UG), Proposed Goluckdih (NC) OC mine, Ghanoodih OC mine and Kujama OC mine. This cluster is located in west part of Jharia Coalfield in Dhanbad district of Jharkhand. All the above mines are contiguous in nature and the environmental impact is overlapping in ambient environment due to cumulative effect of mining activities. The life of the project has been worked out to be up to 25 years considering annual production target of 6.383 MTPA (toposheet no. 73 I/5 and I/6).

The present leasehold area of Cluster-VIII is 1331.95 Ha. The area has a general undulating topography with general slope towards south and south-west. The ground elevation in the area ranges from 175 m to 221 m AMSL. Chatkari Jore, Tisra Jore and their tributaries are controlling the drainage pattern of the area. The area comes under the watershed of Chatkari Jore.

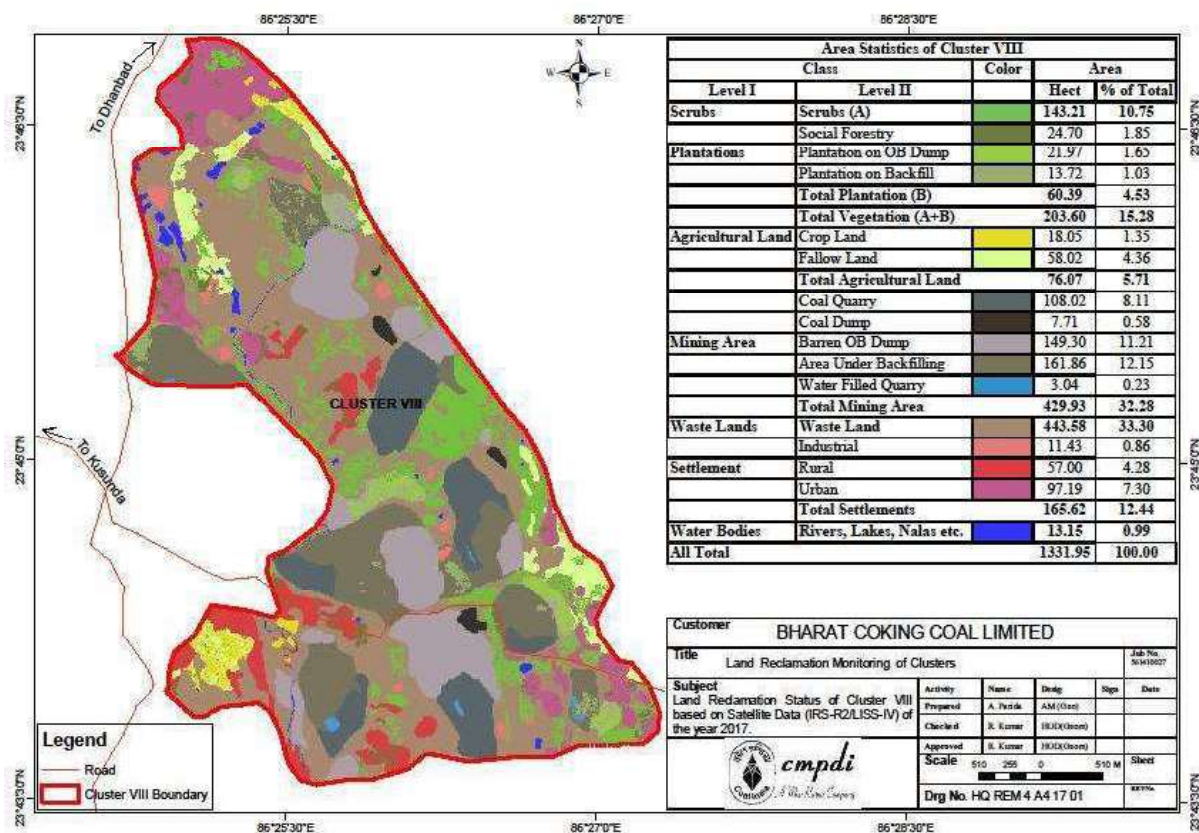
Monitoring stations (**D-8, D-43, D-49 and D-51**) are located in the core zone of the mine area. Water level monitoring in these monitoring stations has been done in the months of May'22, August'22, and Nov'22 and January'23. The Ground water level data is presented in the table below:

Sl No.	Well No.	Location	Water level (bgl in meters)											
			2022-23				2021-22				2020-21			
			May	Aug	Nov	Jan	May	Aug	Nov	Jan	May	Aug	Nov	Jan
1	D-8	Alokdiha	6.32	4.25	5.42	6.34	4.55	1.85	2.27	3.20	5.83	1.70	2.75	3.20
2	D43	Alagdih	5.35	3.11	4.71	5.65	4.65	2.40	2.60	3.35	6.60	2.31	2.55	3.05
3	D49	Galucdih	2.00	1.27	1.91	2.17	1.40	0.73	0.85	1.00	3.25	1.41	1.65	1.98
4	D51	Chankuiya	10.95	6.55	8.50	Abn.	9.43	5.65	5.65	7.50	8.45	6.03	5.70	7.35
Average WL (bgl)			6.16	3.80	5.14	4.72	5.01	2.66	2.84	3.76	6.03	2.86	3.16	3.90

LAST THREE-YEAR ASSESSMENT:

Pre-monsoon GW Level (m): Min – 1.40 m Max – 10.95 m
Post-monsoon GW Level (m): Min – 0.85 m Max – 8.50 m

LAND USE / LAND COVER MAP OF THE CLUSTER-VIII MINES, BCCL



Sl no	Land Use Details	Existing (sq. meter)	Proposed (sq. meter)	Grand Total (sq. meter)
1	Green Belt Area	279.69 x 10 ⁴	0.0	279.69 x 10 ⁴
2	Open Land	886.66 x 10 ⁴	0.0	886.66 x 10 ⁴
3	Road/ Paved Area	97.19 x 10 ⁴	0.0	97.19 x 10 ⁴
4	Rooftop area of building/ sheds	68.43 x 10 ⁴	0.0	68.43 x 10 ⁴
5	Total	1331.95 x 10 ⁴	0.0	1331.95 x 10 ⁴

I. GROUND WATER LEVEL OF CLUSTER-IX

Mines of cluster-IX are under administrative control of Lodna Area of B.C.C.L in western part of Jharia Coalfield which is located in Dhanbad district of Jharkhand. Cluster- IX consists of eight mines namely; North Tisra/South Tisra OCP, Jeenagora OCP, North Tisra UG, Lodna UG, Bagdigi UG, Bararee UG, Joyrampur UG and Jealgora UG (closed). Among them N. Tisra/S. Tisra OCP, Jeenagora OCP and N. Tisra UG mine will be amalgamated and will form North Tisra/South Tisra Expansion OCP. All above the mines are contiguous in nature and the environmental impact is overlapping in ambient environment due to cumulative effect of mining activities. The life of the project has been worked out to be up to 30 years considering annual production target of 8,513 MTPA (toposheet no. 73 I/6).

The present leasehold area of Cluster-IX is 1967.22 Ha. The topography of the area is undulating with gentle slope towards south. The RL varies from 221 m to 188.44 m AMSL. Chatkari Jore, Tisra Jore, Sulunga Jore and their tributaries are controlling the drainage pattern of the area. The area comes under the watershed of Chatkari Jore.

Monitoring stations (**D-5, D-7, D-39, D-40A, D-41 and D-74**) are located in the core zone of the mine area. Water level monitoring in these monitoring stations has been done in the months of May'22, August'22, and Nov'22 and January'23. The Ground water level data is presented in the table below:

Sl No.	Well No.	Location	Water level (bgl in meters)											
			2022-23				2021-22				2020-21			
			May	Aug	Nov	Jan	May	Aug	Nov	Jan	May	Aug	Nov	Jan
1	D-5	Jiyalgora	8.40	3.36	7.01	8.95	7.28	3.35	4.00	6.40	8.60	3.20	7.70	7.90
2	D-7	Golden Pahari	9.03	2.17	5.67	6.57	6.08	2.38	2.63	3.88	7.33	2.56	5.13	5.35
3	D-39	Tilaboni	7.50	1.85	3.05	1.75	10.70	4.60	5.10	8.15	9.40	3.35	6.05	6.78
4	D40A	Khapa Dhawra	2.35	1.60	1.80	Abn.	1.95	1.35	1.80	2.35	1.95	0.30	1.43	6.78
5	D-41	Joyrampur	1.55	0.90	0.88	0.92	1.95	1.34	1.38	1.45	3.30	1.43	1.45	1.60
6	D-74	BhulanBararee	6.17	3.20	5.77	7.90	6.93	3.20	2.90	3.70	4.30	2.58	3.93	4.00
Average WL (bgl)			5.83	2.18	4.03	5.22	5.82	2.70	2.97	4.32	5.81	2.24	4.28	4.54

LAST THREE-YEAR ASSESSMENT:

Pre-monsoon GW Level (m): Min – 1.55 m Max – 10.70 m
Post-monsoon GW Level (m): Min – 0.88 m Max – 7.70 m

Area Statistics of Cluster IX

Class		Color	Area	
Level I	Level II		Hect	% of Total
Scrubs	Scrubs (A)		339.86	17.28
	Social Forestry		188.58	8.57
	Plantations		41.79	2.12
Plantations	Plantation on OB Dump		8.80	0.35
	Plantation on Backfill		217.17	11.04
Agricultural Land	Total Plantation (B)		557.03	28.32
	Total Vegetation (A+B)		44.49	2.26
	Fallow Land		44.49	2.26
Mining Area	Total Agricultural Land		178.55	9.08
	Coal Quarry		172.19	8.75
	Barren OB Dump		77.53	3.94
Waste Lands	Area Under Backfilling		9.67	0.49
	Coal Dump		3.30	0.17
	Water Filled Quarry		441.24	22.43
Settlement	Total Mining Area		614.64	31.24
	Waste Land		9.13	0.46
	Industrial		47.79	2.43
Water Bodies	Rural		232.31	11.81
	Urban		280.23	14.70
	Total Settlements		20.59	1.05
All Total	Rivers, Lakes, Nalas etc.		1967.22	100.00

Legend

- ++ Railway Line
- Cluster IX Boundary

Customer BHARAT COKING COAL LIMITED

Title Land Reclamation Monitoring of Clusters

Subject Land Reclamation Status of Cluster IX based on Satellite Data (IRS-R2/LISS-IV) of the year 2017.

Activity	Name	Design	Sign	Date
Prepared	P. Kumar	Manager		
Checked	P. Kumar	Manager		
Approved	P. Kumar	Manager		
Scale	440	220	0	440 M
				Sheet
				REVISION

DRG No. HC-REV 4 A4 17 01

Sl no	Land Use Details	Existing (sq. meter)	Proposed (sq. meter)	Grand Total (sq. meter)
1	Green Belt Area	601.52 x 10 ⁴	0.0	601.52 x 10 ⁴
2	Open Land	1076.47 x 10 ⁴	0.0	1076.47 x 10 ⁴
3	Road/ Paved Area	232.31 x 10 ⁴	0.0	232.31 x 10 ⁴
4	Rooftop area of building/ sheds	56.92 x 10 ⁴	0.0	56.92 x 10 ⁴
5	Total	1967.22 x 10 ⁴	0.0	1967.22 x 10 ⁴

J. GROUND WATER LEVEL OF CLUSTER-X

Cluster-X consists of Bhowrah North OC & UG, Bhowrah South OC & UG, Amalgamated Sudamdih Patherdih, Sudamdih Shaft, Amlabad UG (Closed) and Sudamdih Coal Washery which comes under the administrative control of Eastern Jharia Area of Bharat Coking Coal Limited (B.C.C.L - A Subsidiary of Coal India Limited). This cluster of mines is located in eastern part of Jharia Coalfield in Dhanbad district of Jharkhand. The life of the project has been worked out to be more than 30 years considering annual production target of 2.289 MTY.

Cluster-X mine involves leasehold area of about 2057.47 Ha of land. It is covered in Survey of India toposheet no. 73 I/6. The area of Bhowrah North OC & UG, Bhowrah South OC & UG, Amalgamated Sudamdih Patherdih, Sudamdih Shaft, Amlabad UG (Closed) are 280.83 Ha, 571.58 Ha, 498.61 Ha, 391.50 Ha and 386.95 Ha respectively.

The present leasehold area of Cluster-X is 2057.47 Ha. The area has an undulating topography with gentle slope towards south and south-east. The RL varies from 185 m to 150.0 m AMSL. Gaurkuthi Nala and few seasonal streams are controlling the drainage pattern of the area. The area comes under the watershed of Damodar River.

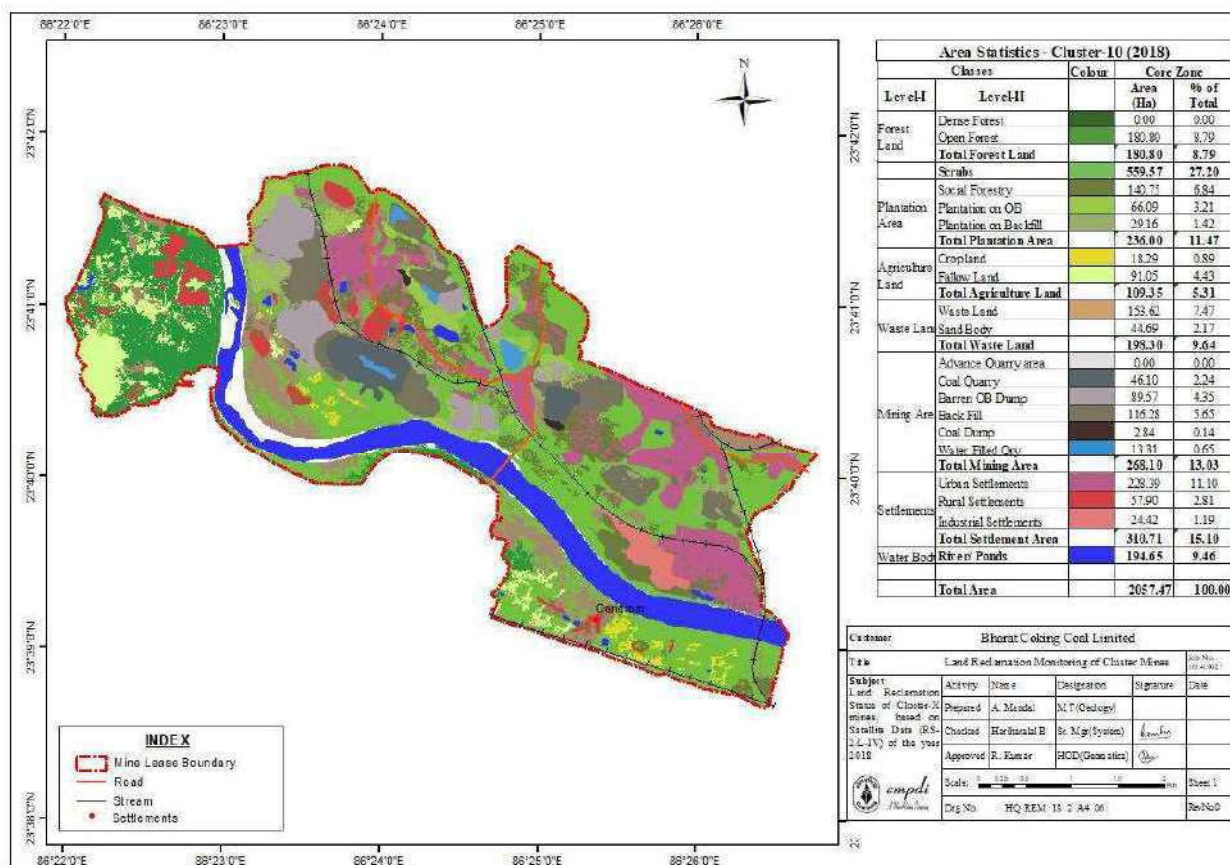
Monitoring stations (**A-19, D-35, D-36 and D-77**) are located in the core zone of the mine area. Water level monitoring in these monitoring stations has been done in the months of May'22, August'22, and Nov'22 and January'23, the Ground water level data is presented in the table below:

Sl No.	Well No.	Location	Water level (bgl in meters)											
			2022-23				2021-22				2020-21			
			May	Aug	Nov	Jan	May	Aug	Nov	Jan	May	Aug	Nov	Jan
1	A-19	Bhowrah	4.10	1.82	2.54	1.79	3.30	1.95	1.90	2.20	6.05	2.30	3.25	3.70
2	D-35	Patherdih	6.10	3.70	4.68	5.50	6.60	2.70	2.90	4.30	8.20	2.98	5.40	5.62
3	D-36	Sudamdih	3.25	0.15	0.60	1.44	2.02	0.45	0.55	0.55	2.10	0.06	1.00	1.15
4	D-77	Amlabad	6.50	3.40	4.70	6.00	5.98	2.60	4.69	5.60	6.40	5.90	3.50	4.25
Average WL (bgl)			4.99	2.27	3.13	3.68	4.48	1.93	2.51	3.16	5.69	2.81	3.29	3.68

LAST THREE-YEAR ASSESSMENT:

Pre-monsoon GW Level (m): Min – 2.02 m Max – 8.20 m
Post-monsoon GW Level (m): Min – 0.55 m Max – 5.40 m

LAND USE / LAND COVER MAP OF THE CLUSTER-X MINES, BCCL



Sl no	Land Use Details	Existing (sq. meter)	Proposed (sq. meter)	Grand Total (sq. meter)
1	Green Belt Area	1085.72 x 10 ⁴	0.0	1085.72 x 10 ⁴
2	Open Land	661.04 x 10 ⁴	0.0	661.04 x 10 ⁴
3	Road/ Paved Area	228.39 x 10 ⁴	0.0	228.39 x 10 ⁴
4	Rooftop area of building/ sheds	82.32 x 10 ⁴	0.0	82.32 x 10 ⁴
5	Total	2057.47 x 10 ⁴	0.0	2057.47 x 10 ⁴

K. GROUND WATER LEVEL OF CLUSTER-XI

Cluster–XI consists of eight coal mines; Moonidih UG, Gopalichak UG and Gopalichuck OC Project, Kachi Balihari 10/12 Pit UG, Bhagaband UG, Kendwadih OC, Pootkee UG (closed), Kachi Balihari 5/6 Pit UG (closed), PB Project (UG) which are under the administrative control of Western Jharia Area of Bharat Coking Coal Limited (B.C.C.L - A Subsidiary of Coal India Limited). The Cluster- XI is located in central part of Jharia Coalfield in Dhanbad district of Jharkhand. The life of the project has been worked out to be more than 30 years considering annual production target of 6.474 MTPA (toposheet no. no. 73 I/5 7 73 I/6).

The present leasehold area of Cluster-XI is 3447.03 Ha. The area has an undulating topography with gentle slope towards south. The RL varies from 201 m to 166 m AMSL. Katri River, Jarian Nala, Ekra Jore and Kari Jore are controlling the drainage of the area. The area comes under the watershed of Katri River and Kari Jore.

Monitoring stations (**A-17, A-18, A-20 and A-32**) are located in the core zone of the mine area. Water level monitoring in these monitoring stations has been done in the months of May'22, August'22, and Nov'22 and January'23. The Ground water level data is presented in the table below:

Sl N o.	Well No.	Location	Water level (bgl in meters)											
			2021-22				2020-21				2019-20			
			May	Aug	Nov	Jan	May	Aug	Nov	Jan	May	Aug	Nov	Jan
1	A-17	Kachi Balihari	2.62	2.06	2.59	2.64	3.36	1.62	2.37	2.54	2.14	0.64	1.69	1.79
2	A-18	Baghaband	0.62	0.49	0.56	Abn.	1.09	0.54	0.57	0.74	1.09	0.39	0.34	0.89
3	A-20	Gorbudih	5.59	3.18	3.54	5.27	5.47	1.47	2.02	3.07	8.47	1.44	3.87	4.42
4	A-32	Baludih	2.25	0.65	1.75	2.79	2.35	0.73	0.96	1.50	1.90	0.36	1.75	1.80
Average WL (bgl)			2.77	1.60	2.11	3.57	3.07	1.09	1.48	1.96	3.40	0.71	1.91	2.23

LAST THREE-YEAR ASSESSMENT:

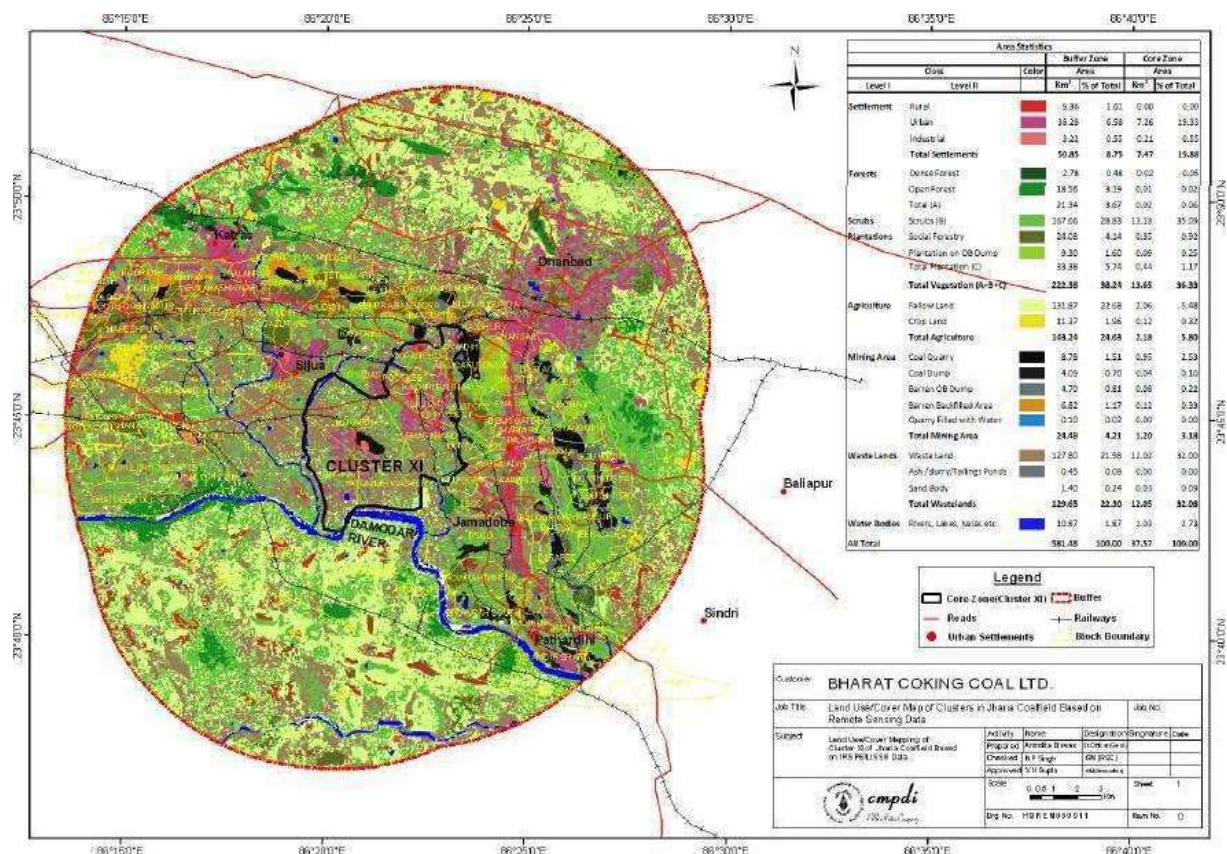
Pre-monsoon GW Level (m): Min – 0.62m

Max – 8.47 m

Post-monsoon GW Level (m): Min – 0.34 m

Max – 3.87 m

LAND USE / LAND COVER MAP OF THE CLUSTER-XI MINES, BCCL



L. GROUND WATER LEVEL OF CLUSTER-XIII

Cluster-XIII, consists of one running mine (Murulidih 20/21 pit UG mine) and six abandoned mines i.e. Bhurungiya colliery, Muchraidih colliery, Hantoodih colliery, Padugora colliery, Murulidih colliery and Bhatdee colliery of Western Jharia area, BCCL which is located in the south-western part of Jharia coal field in Dhanbad district of Jharkhand. The area is covered under Survey of India toposheet no. 73 I/6. The life of the project has been worked out to be about 15 years considering annual production target of 0.234 MTPA.

The present leasehold area of Cluster-XIII is 1898.62 Ha. The area has an undulating topography with gentle slope towards south-east. The maximum RL is 224 m AMSL in the north-western part of the area whereas the minimum RL is 179 m AMSL at southern part. The area comes under the watershed area of Jamunia River and Katri River.

Monitoring stations (**A-22, A-23, A-33, A-34, B-25 and B-48**) are located in the core zone of the mine area. Water level monitoring in these monitoring stations has been done in the months of May'22, August'22, Nov'22 and January'23. The Ground water level data is presented in the table below:

Sl No.	Well No.	Location	Water level (bgl in meters)											
			2022-23				2021-22				2020-21			
			May	Aug	Nov	Jan	May	Aug	Nov	Jan	May	Aug	Nov	Jan
1	A22A	Nagdah	6.35	1.90	2.10	Abn.	2.90	0.40	1.10	1.50	2.90	0.20	1.98	2.00
2	A-23	Machhayara	7.97	1.14	4.79	6.67	9.52	1.87	2.82	4.82	8.92	1.12	5.62	7.12
3	A-33	Mahuda Wa	3.50	0.50	2.05	2.95	2.85	0.80	0.85	1.33	4.55	0.38	1.85	2.85
4	A-34	Mahuda vil.	8.20	3.65	6.35	6.95	5.20	1.83	3.55		8.35	3.43	3.45	5.35
5	B-25	Mahuda more	6.40	2.90	3.52	Abn.	5.10	1.98	2.58	3.30	7.90	3.02	2.55	3.45
6	B-48	Mahuda	6.85	0.65	6.25	5.80	7.23	2.28	6.05	6.60	8.20	3.37	3.85	4.51
Average WL (bgl)			6.55	1.57	4.18	5.59	5.47	1.53	2.83	3.51	6.80	1.92	3.22	4.21

LAST THREE-YEAR ASSESSMENT:

Pre-monsoon GW Level (m): Min – 2.85 m Max – 8.35 m
Post-monsoon GW Level (m): Min – 0.85 m Max – 6.35 m

Area Statistics

Class	Color	Buffer Zone		Core Zone	
		Area	% of Total	Area	% of Total
Level I	Level II	Km²	% of Total	Km²	% of Total
Settlement	Rural	9.22	1.82	0.29	1.44
	Urban	26.91	5.31	0.23	1.15
	Industrial	3.20	0.63	0.37	1.84
	Total Settlements	39.34	7.76	0.90	4.43
Forests	Dense Forest	2.41	0.48	0.00	0.00
	Open Forest	13.37	2.64	2.48	12.23
	Total (A)	15.78	3.11	2.48	12.23
Scrubs	Scrubs (B)	148.26	29.23	7.35	36.29
	Social Forestry	22.95	4.53	1.03	5.09
Plantations	Plantation on OB Dump	6.69	1.32	0.00	0.00
	Total Plantation (C)	29.64	5.84	2.03	5.09
	Total Vegetation (A+B+C)	193.68	38.19	10.86	53.61
Agriculture	Fallow Land	114.52	22.58	3.86	9.17
	Crop Land	7.89	1.56	0.00	0.00
	Total Agriculture	122.42	24.14	3.86	9.17
Mining Area	Coal Quarry	3.63	0.72	0.00	0.00
	Coal Dump	1.44	0.28	0.08	0.42
	Barren OB Dump	4.54	0.90	0.00	0.00
	Barren Backfilled Area	6.68	1.32	0.00	0.00
	Quarry Filled with Water	0.44	0.09	0.00	0.00
	Total Mining Area	16.74	3.30	0.08	0.42
	Waste Lands	119.76	23.61	6.38	31.51
Waste Land	0.39	0.08	0.00	0.00	
Ash Slurry/Tailings Ponds	1.87	0.37	0.05	0.27	
Total Wastelands	122.02	24.06	6.44	31.78	
Water Bodies	Rivers, Lake, Nala etc.	13.01	2.56	0.12	0.59
	All Total	507.30	100.00	30.26	100.00

Legend

- Core Zone (Cluster X)
- Road
- Railways
- Urban Settlements
- Block Boundary

Customer: BHARAT COKING COAL LTD.

Job Title: Land Use/Cover Map of Clusters in Jharkhand Coalfield Based on Remote Sensing Data

Job No.:

Subject: Land Use/Cover Mapping of Cluster X in Jharkhand Coalfield Based on IRS P2/OLI Data.

Authority: Bureau of Survey and Mapping, Government of India

Approval: [Signature]

Scale: 1:50,000

Sheet: 1

Map No.: [Number]

Rev. No.: 0

Sl no	Land Use Details	Existing (sq. meter)	Proposed (sq. meter)	Grand Total (sq. meter)
1	Green Belt Area	1484.41 x 10 ⁴	0.0	1570.48 x 10 ⁴
2	Open Land	183.28 x 10 ⁴	0.0	97.22 x 10 ⁴
3	Road/ Paved Area	71.84 x 10 ⁴	0.0	71.83 x 10 ⁴
4	Rooftop area of building/ sheds	159.09 x 10 ⁴	0.0	159.09 x 10 ⁴
5	Total	1898.62 x 10 ⁴	0.0	1898.62 x 10 ⁴

M. GROUND WATER LEVEL OF CLUSTER-XIV

Mines of Cluster-XIV are under administrative control of Western Jharia Area of B.C.C.L (Jharia Coalfield) which is located in Dhanbad district of Jharkhand. This cluster consists of Lohapatty UG and Lohapatty OC patch (proposed). The life of the project has been worked out to be up to 08 years considering annual production target of 0.526 MTPA. It is covered in Survey of India toposheet no. 73 I/2.

The present leasehold area of Cluster-XIV is 1418.25 Ha. The topography of the area is undulating with slope towards south west. The maximum RL is 224 m in the north-eastern part whereas the minimum RL is 170 m above mean sea level on the south-western part of the area. Jamunia River and its tributaries are controlling the drainage of the area. The area comes under the watershed area of Jamunia River.

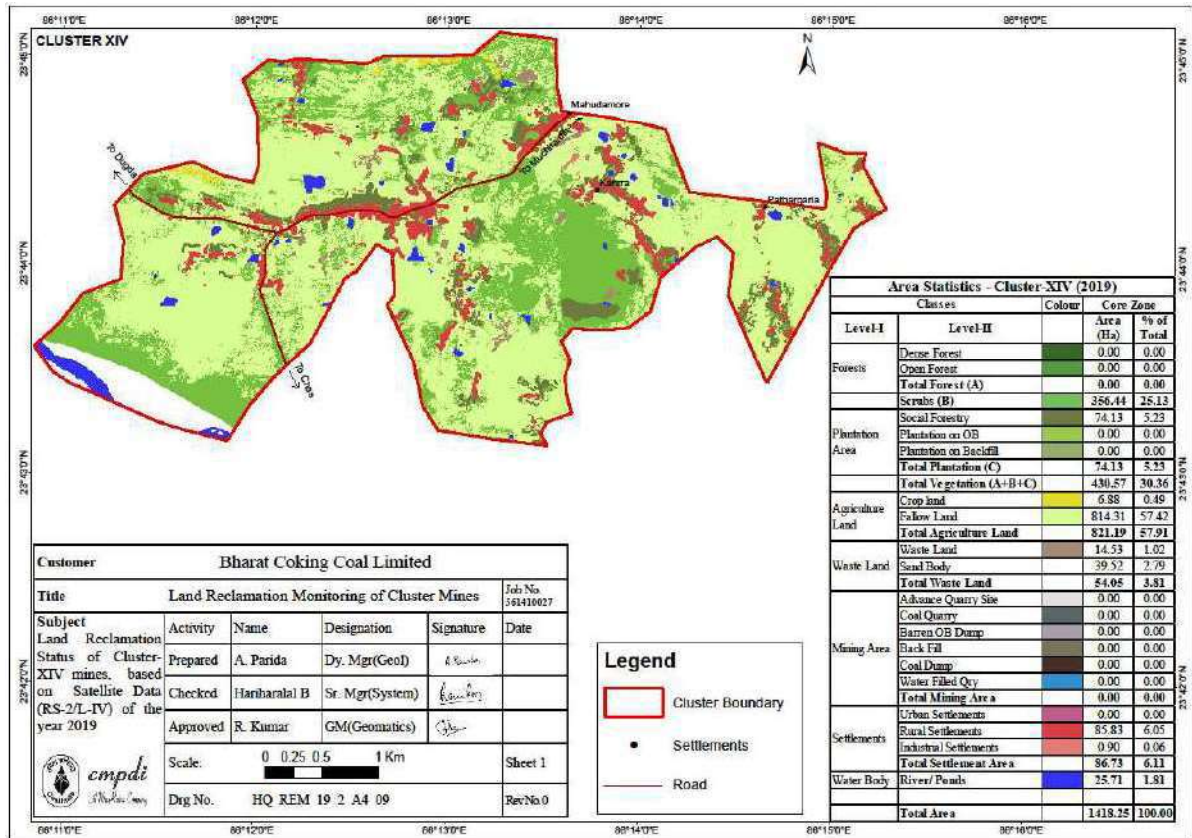
Monitoring stations (**B-23**, **B-24** and **B-67**) are located in the core zone of the mine area. Water level monitoring in these monitoring stations has been done in the months of May'22, August'22, and Nov'22 and January'23. The Ground water level data is presented in the table below:

SI No.	Well No.	Location	Water level (bgl in meters)											
			2022-23				2021-22				2020-21			
			May	Aug	Nov	Jan	May	Aug	Nov	Jan	May	Aug	Nov	Jan
1	B-23	Lohapatti	2.98	1.31	1.73	2.12	4.12	1.24	1.44	1.81	3.24	0.77	1.76	2.69
2	B-24	Telmuchu	5.53	1.34	3.46	4.23	5.68	1.55	2.08	3.07	5.48	1.13	3.53	4.38
3	B-67	Simatanr	8.50	3.55	6.30	7.35	8.95	2.45	2.95	3.65	7.55	1.83	3.95	5.90
Average WL (bgl)			5.67	2.07	3.83	4.57	6.25	1.75	2.16	2.84	5.42	1.24	3.08	4.32

LAST THREE-YEAR ASSESSMENT:

Pre-monsoon GW Level (m): Min – 2.98 m Max – 8.95 m
Post-monsoon GW Level (m): Min – 1.44 m Max – 6.30 m

LAND USE / LAND COVER MAP OF THE CLUSTER-XIV MINES, BCCL



Sl no	Land Use Details	Existing (sq. meter)	Proposed (sq. meter)	Grand Total (sq. meter)
1	Green Belt Area	1251.76 x 10 ⁴	0.0	1251.76 x 10 ⁴
2	Open Land	79.76 x 10 ⁴	0.0	79.76 x 10 ⁴
3	Road/ Paved Area	85.83 x 10 ⁴	0.0	85.83 x 10 ⁴
4	Rooftop area of building/ sheds	0.90 x 10 ⁴	0.0	0.90 x 10 ⁴
5	Total	1418.25 x 10 ⁴	0.0	1418.25 x 10 ⁴

N. GROUND WATER LEVEL OF CLUSTER-XV

Mines o Cluster - XV comes under administrative control of Govindpur Area and barora Area of B.C.C.L (Jharia Coalfield) which is located in Dhanbad district of Jharkhand. Cluster–XV consists of four coal mines; Kharkharee UG (underground mine) and Dharmaband UG which are under administrative control of Govindpur Area and Madhuband UG & Phularitand UG which are under the administrative control of Barora Area. The life of the project has been worked out to be up to 30 years considering annual production target of 0.423 MTPA. It is covered in Survey of India toposheet no. 73 I/1 and 73 I/5.

The present leasehold area of Cluster-XV is 1696.55 Ha. The topography of the area is undulating with slope towards south-west. The maximum RL is 235 m in the Kharkharee mine area whereas the minimum RL is 165 m AMSL on the eastern & western part of the Cluster. Jamunia River and Khudia River are controlling the drainage of the area. The area comes under the watershed area of both Jamunia River and Khudia River.

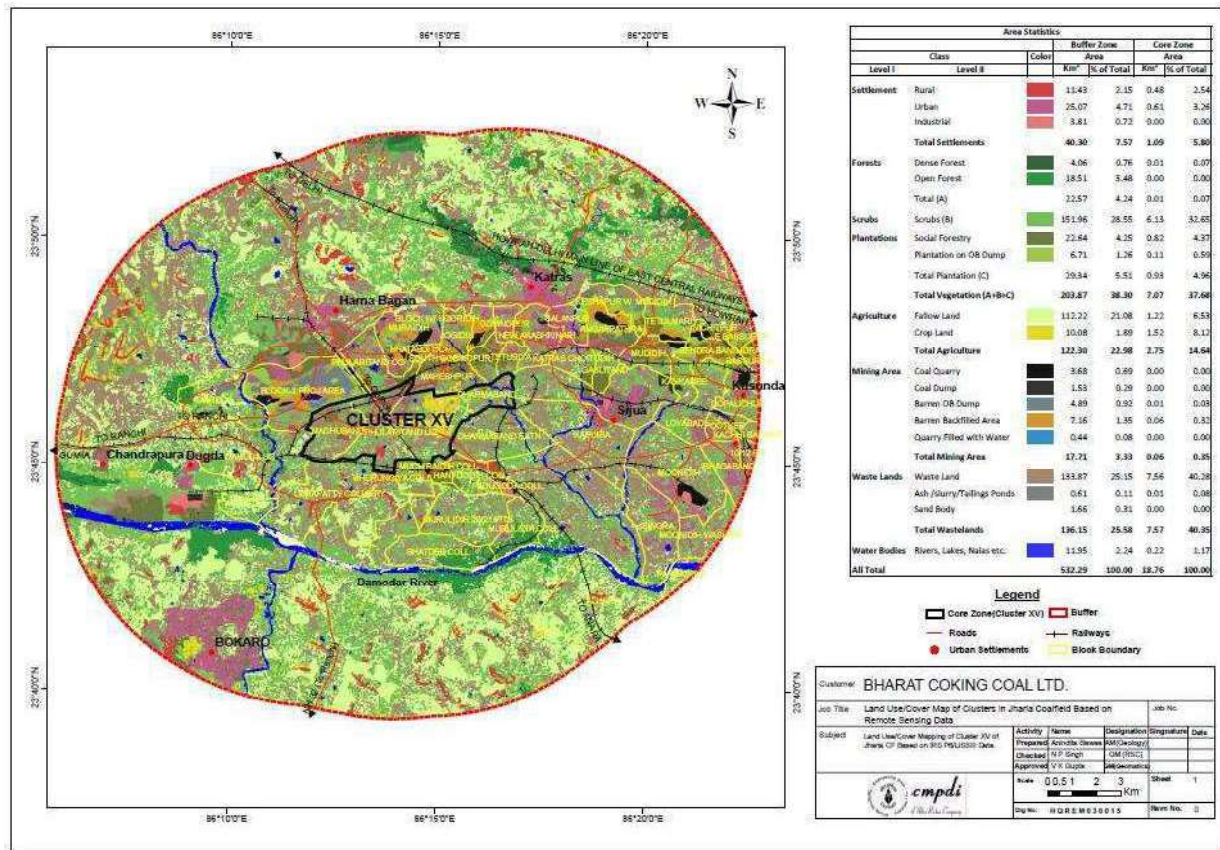
Monitoring stations (**A-24, B-32A and B-61A**) are located in the core zone of the mine area. Water level monitoring in these monitoring stations has been done in the months of May'22, August'22, and Nov'22 and January'23. The Ground water level data is presented in the table below:

SI No.	Well No.	Location	Water level (bgl in meters)											
			2022-23				2021-22				2020-21			
			May	Aug	Nov	Jan	May	Aug	Nov	Jan	May	Aug	Nov	Jan
1	A24	Pipratn	7.28	2.55	4.33	5.32	10.13		2.78	4.55	4.88	-	4.28	4.68
2	B32A	Madhuband	4.15	0.70	2.56	4.15	5.60	1.34	1.70	2.30	3.30	1.18	2.00	2.21
3	B61A	Kesargora	1.82	0.52	0.97	Abn.	4.42	0.47	0.97	0.97	3.32	0.85	1.60	2.07
4.	B62A	Sadiyardih	6.45	1.77	4.91	5.15	6.87	1.35	4.50	4.60	6.95	2.77	3.00	4.95
Average WL (bgl)			4.96	1.09	2.93	4.58	6.72	0.91	1.82	2.61	3.83	1.02	2.63	2.99

LAST THREE-YEAR ASSESSMENT:

Pre-monsoon GW Level (m): Min – 1.82 m Max – 10.13 m
 Post-monsoon GW Level (m): Min – 0.97 m Max – 4.91 m

LAND USE / LAND COVER MAP OF THE CLUSTER-XV MINES, BCCL



Sl no	Land Use Details	Existing (sq. meter)	Proposed (sq. meter)	Grand Total (sq. meter)
1	Green Belt Area	365.18 x 10 ⁴	0.0	957.34 x 10 ⁴
2	Open Land	1130.53 x 10 ⁴	0.0	538.37 x 10 ⁴
3	Road/ Paved Area	101.67 x 10 ⁴	0.0	101.67 x 10 ⁴
4	Rooftop area of building/ sheds	99.17 x 10 ⁴	0.0	99.17 x 10 ⁴
5	Total	1696.55 x 10 ⁴	0.0	1696.55 x 10 ⁴

O. GROUND WATER LEVEL OF CLUSTER-XVI

Mines of Cluster - XVI (Dahibari-Basantimata Group of mines) are under administrative control of Chanch Victoria Area of B.C.C.L (western part of Raniganj Coalfield) which is located in Dhanbad district of Jharkhand. There are total five collieries within this Cluster- XVI (Dahibari-Basantimata OC, Basantimata UG, New Laikdih OC, Laikdih Deep UG and Chanch UG Colliery). All the above mines are contiguous in nature and the environmental impact is overlapping in ambient environment due to cumulative effect of mining activities. Life of the project has been worked out to be up to 24 years considering annual production target of 1.963 MTPA. It is covered in Survey of India toposheet no. 73 I/14.

The present leasehold area of Cluster-XVI is 2008.40 Ha. The topography of the area is undulating with slope towards south-west. The area is plain with gently undulating with elevation varying from 100 m to 140 m AMSL. The general slope of the area is towards southeast. Barakar River and Khudia River are controlling the drainage of the area. The area comes under the watershed area of Barakar River.

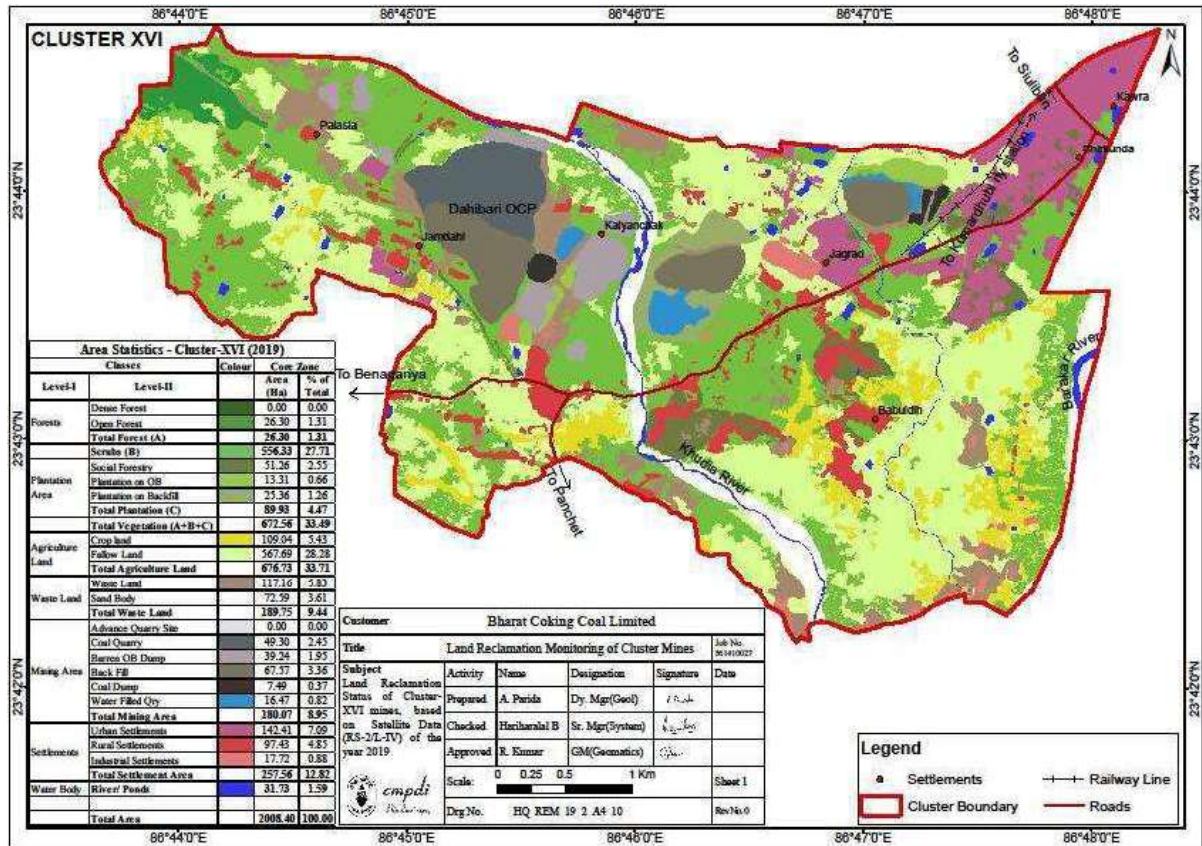
Monitoring stations (**DB-22, DB-23, DB-24 & DB-25**) are located in the core zone of the mine area. Water level monitoring in these monitoring stations has been done in the months of May'22, August'22, and Nov'22 and January'23. The Ground water level data is presented in the table below:

SI No.	Well No.	Location	Water level (bgl in meters)											
			2022-23				2021-22				2020-21			
			May	Aug	Nov	Jan	May	Aug	Nov	Jan	May	Aug	Nov	Jan
1	DB22	Dahibari, Basti	1.73	1.47	1.63	1.58	2.31	1.55	1.38	1.57	2.63	1.30	2.25	2.38
2	DB23	Dahibari OC	2.68	1.71	2.20	2.40	2.00	1.05	1.10	1.70	2.50	0.70	1.95	2.17
3	DB24	Dahibari	Abandoned				6.20	4.20	5.25	5.80	3.60	1.57	5.70	5.90
4	DB25	Basantimata	Abandoned				2.83	1.01	2.03	2.63	3.98	1.19	2.63	2.68
Average WL (bgl)			2.21	1.59	1.92	1.99	3.34	1.95	2.44	2.93	3.18	1.19	3.13	3.28

LAST THREE-YEAR ASSESSMENT:

Pre-monsoon GW Level (m): Min – 1.73 m Max – 6.20 m
Post-monsoon GW Level (m): Min – 1.10 m Max – 5.70 m

LAND USE / LAND COVER MAP OF THE CLUSTER-XVI MINES, BCCL



Sl no	Land Use Details	Existing (sq. meter)	Proposed (sq. meter)	Grand Total (sq. meter)
1	Green Belt Area	1349.29 x 10 ⁴	0.0	1349.29 x 10 ⁴
2	Open Land	401.55 x 10 ⁴	0.0	401.55 x 10 ⁴
3	Road/ Paved Area	142.41 x 10 ⁴	0.0	142.41 x 10 ⁴
4	Rooftop area of building/ sheds	115.15 x 10 ⁴	0.0	115.15 x 10 ⁴
5	Total	2008.40 x 10 ⁴	0.0	2008.40 x 10 ⁴

4.0 GROUND WATER LEVEL SCENARIO

The summarized water level data of all clusters given in **Table – 7**.

Table –7: Groundwater level data (Cluster-wise)

Sl. No.	Cluster of BCCL	No. of Monitoring Wells	Water level Below ground level (May, Aug, Nov'22 & Jan'23)	Avg. Fluctuation (in meters) during 2022-23	Geological Formation
1	I	4 nos.	0.45 to 9.65 m	2.33 m	Barakar
2	II	5 nos.	0.45 to 10.53 m	2.03 m	Barakar
3	III	5 nos.	0.30 to 10.53 m	2.18 m	Barakar
4	IV	4 nos.	0.35 to 7.45 m	2.16 m	Barakar
5	V	4 nos.	0.10 to 5.80 m	0.93 m	Barakar
6	VI	2 nos.	1.80 to 11.90 m	4.64 m	Barakar
7	VII	7 nos.	0.45 to 11.32 m	1.20 m	Barakar
8	VIII	4 nos.	1.27 to 10.95 m	1.02 m	Barakar
9	IX	6 nos.	0.90 to 9.03 m	1.80 m	Barakar
10	X	4 nos.	0.15 to 6.50 m	1.86 m	Barakar
11	XI	4 nos.	0.50 to 5.60 m	0.70 m	Barakar & Barren Measure
12	XIII	6 nos.	0.50 to 8.20 m	2.37 m	Raniganj
13	XIV	3 nos.	1.30 to 8.50 m	1.85 m	Raniganj
14	XV	4 nos.	0.50 to 7.30 m	1.80 m	Barakar & Barren Measure
15	XVI	4 nos.	1.50 to 2.70 m	0.30 m	Barakar

Depth to water level (in bgl) values describe that water level goes down to maximum 11.90 m during summer season and minimum up to 0.10 m during monsoon season of 2022. Un-confined aquifer is affected around 20 m to 30 m of maximum radius close to active opencast mining areas, showing steep gradient towards mine void. Other than that, there is no mining effect in the water level within JCF area and RCF area (part). Historical water level data and hydrograph of permanent observation stations from CGWB is shown in **Annexure–VI**. Water Table contour map and Depth to water level map both during pre & post-monsoon season is shown in **Plate-IV (A, B) & V (A, B)**.

Monitoring of groundwater (quantity & quality) to assess the present condition and resource has been done regularly in the coalfield area. Well hydrographs (**Annexure–VI**) are prepared and studied to identify long-term trends. Hydrograph trend analysis of CGWB monitoring wells and observation wells reveals

increasing groundwater level trends in most of the Cluster of mines. However, declining trends in both Pre and Post-monsoon GW level in Cluster-I, Cluster-V, Cluster-VI and Cluster-VII are recorded but no significant declining trend (>1.0 m/year) of water level is noticed in any particular area for the last 10 years within the coalfield area. Regarding quality monitoring, the water sample location map (**Plate-II**) with collection points details (dug wells) are given in **Annexure-V** and Quality is given in **Annexure-VII**.

5.0 GROUND WATER QUALITY

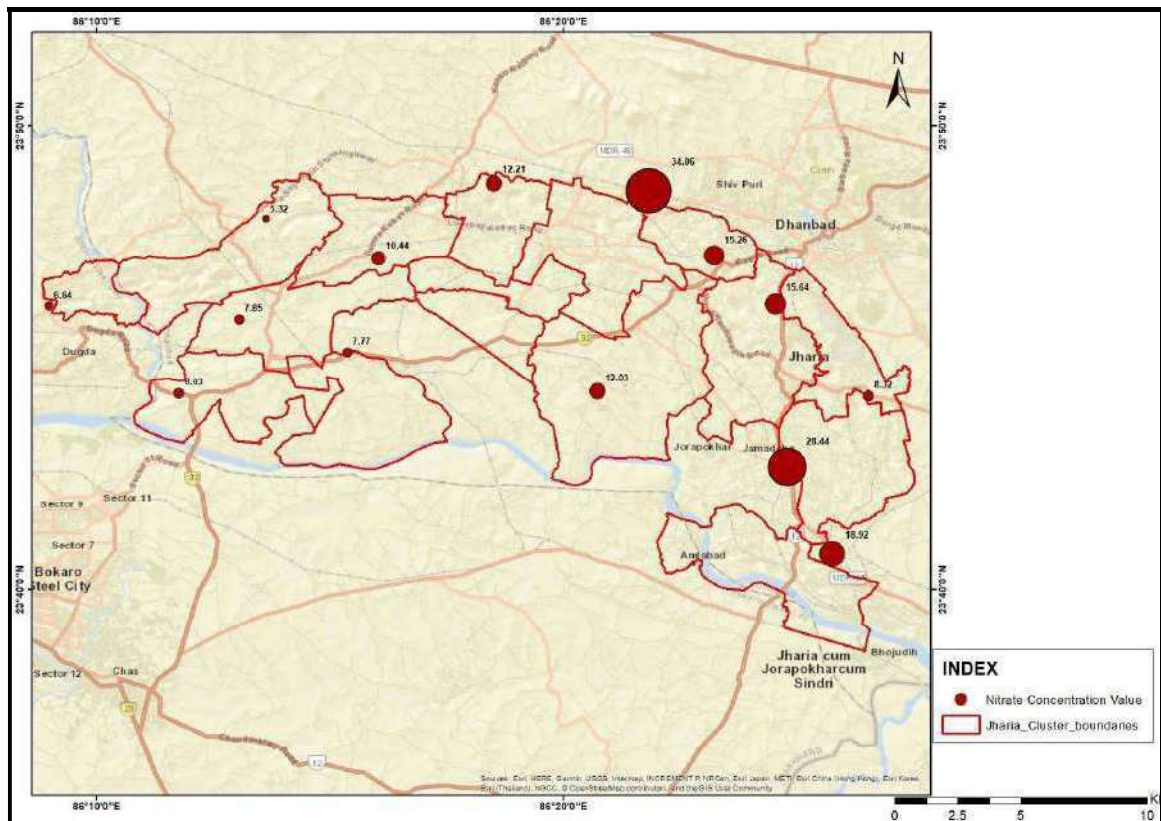
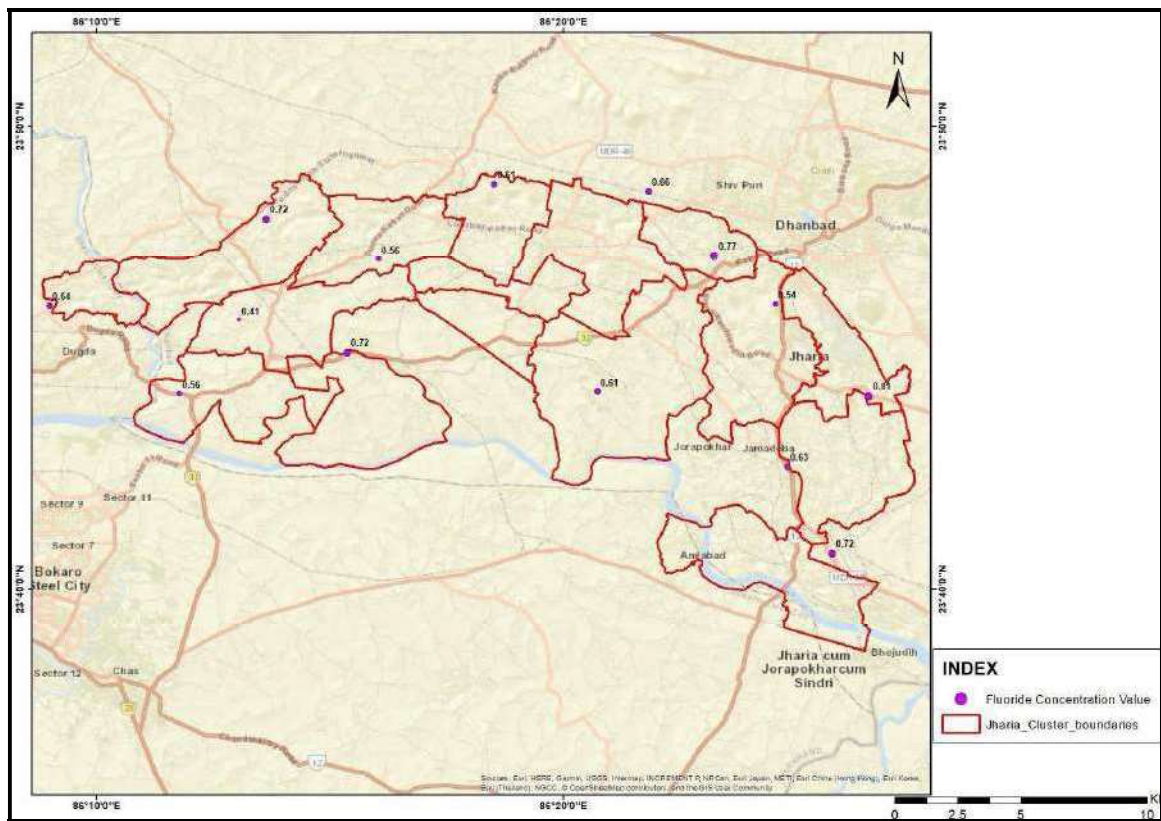
The ground water samples of the study area (15 nos. of Cluster of mines, BCCL) were collected from dug wells and analyzed. Fifteen ground water samples (GW-1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 13, 14, 15 & 16) analyzed during the month of June'2022 at CMPDI, RI-II, Dhanbad. The water sampling details is given in **Annexure-V** and Water sample locations are shown in **Plate-II**. The water quality data is presented in **Annexure-VII**.

The study of the variations in water quality parameters is described below:

The pH of the groundwater samples varies between 7.82 (GW-4) to 8.21 (GW-9), the pH is within the IS 10500:2012 limit of drinking water standard.

The mineral constituents dissolved in water constitute the dissolved solids. The total dissolved solids (TDS) vary from 192 (GW-11) to 764 mg/l (GW-9). The TDS values are ranging slightly above the IS 10500:2012 standards limit of drinking water.

The alkalinity of the water samples varies from 82 (GW-7) to 142 mg/l (GW-11) and are within the stipulated standard of (200 mg/l) drinking water. The concentration of calcium in the water samples varies from 38 (GW-1) to 172 mg/l (GW-13) and is **slightly above** the permissible limit (75 mg/l) of drinking water standards. The total hardness ranges between 152 (GW-8) to 666 mg/l (GW-5) and the value of total hardness in water samples are **above** the permissible limit (200 mg/l). The sulphate ranges between 42(GW-4) to 178 mg/l (GW-13) and the value of sulphate in water sample are within the permissible limit (200 mg/l). The Iron, Copper, Manganese, Lead, Zinc and Chromium concentration in the water samples found to be below the upper IS 10500:2012 limits for drinking water.



6.0 STAGE OF GROUNDWATER EXTRACTION

The groundwater is mainly utilized for domestic needs and irrigation purposes. The groundwater abstraction is mainly through dug wells and bore wells. The stage of groundwater development in Dhanbad District is 76.30% (as per 2017 GWRA). The highest stage of development is in Jharia Block (127.0%) & Dhanbad Block (107.50%) and lowest stage of development is in Chirkunda Block (35.5%) as per GWRA-2013. The Gondwana sandstones in general, known to constitute good aquifers at many places. However, the yield potential of the area adjoining to active mines in the coal belt is poor. The active mines often act as groundwater “sinks”. In contrast, the water logged abandoned mines and pits act as potential sources of groundwater. As per the assessment by Central Ground Water Board (CGWB), Patna in 2022, Block wise data of Dhanbad District given below:

Table–8A: Block wise Stage of Groundwater development

SI No.	Administrative Unit		Category (GWRA-2013)	Category (GWRA-2017)	Category (GWRA-2022)
	District	Block			
1	Bokaro	Bermo	Over- exploited	Over- exploited	Over- exploited
2	Dhanbad	Baghmara	Critical	Critical	Safe
3	Dhanbad	Baliapur	Semi- Critical	Semi- Critical	Over- exploited
4	Dhanbad	Dhanbad	Over- exploited	Over- exploited	Semi-critical
5	Dhanbad	Jharia / Dhanbad Urban	Over- exploited	Over- exploited	Critical
6	Dhanbad	Topchachi	Critical	Critical	Critical
7	Dhanbad	Chirkunda	Safe	Safe	Safe

- Dynamic Groundwater Resource Assessment, CGWB as per 2013, 2017 and 2022.

Table-8B: Cluster wise Groundwater development scenario

Cluster/ Area	Adminis- trative Blocks/Stage Of GW Extraction	Total Water demand (cum/day)				Avg. GW level (bgl in m) 2022-23		GW level declining trend 2005-2022		Remarks
		Mine Discharge + BH pumping	Surface Water Source	Total Use (Domestic + Industrial)	Excess Or other use	Pre- monsoon	Post- monsoon	Pre- monsoon	Post- monsoon	
Cluster-I	Bermo (SOD: Over- exploited)	2173 (2065+108)	NIL	2112 (1698+414)	61	5.70	3.37	YES	YES	Recharge structure needed
Cluster-II	Baghmara (SOD: Safe)	8350	Jamunia river	6737 (2755+3982)	1613	4.96	2.93	NO	NO	Excess mine water needed to be utilized
Cluster-III		12760 (10960+1800)	NIL	8946 (7849+1097)	3814	4.64	2.46	NO	NO	
Cluster-IV		5900	MADA	5100 (3605+1495)	800	4.78	2.62	NO	NO	
Cluster-V		12690 (11025+1665)	MADA	11063 (5710+5353)	1897	2.49	1.57	YES	YES	
Cluster-VI	Dhanbad	4150	MADA	4150 (1664+2486)	0.0	8.14	3.50	YES	NO	--
Cluster-VII	(SOD: Semi- critical)	21565	MADA	20826 (17596+3230)	739	5.01	3.82	YES	YES	Excess mine water needed to be utilized water
Cluster-VIII	Jharia / Dhanbad Urban (SOD: Critical)	9320	MADA	5294 (3730+1564)	4026	6.16	5.14	NO	NO	
Cluster-IX		12980	MADA	9358 (4549+4809)	3622	5.83	4.03	NO	NO	
Cluster-X		11825	Damodar river	6201 (4255+1946)	5624	4.99	3.13	YES	NO	
Cluster-XI	Dhanbad (SOD: Critical)	24960	MADA & DVC	19425 (14015+5410)	5535	2.77	2.11	NO	NO	
Cluster-XIII	Baghmara	750	Damodar river	692	58.0	6.55	4.18	NO	NO	--
Cluster-XIV	(SOD: Safe)	943	NA	668	275	5.67	3.83	NO	NO	--
Cluster-XV		6200	NA	5941 (4600+1341)	259	4.93	3.19	NO	NO	--
Cluster-XVI	Chirkunda (SOD: Safe)	1910	DVC (Barakar river)	1730 (1380+350)	180	2.21	1.92	NO	NO	--

MADA – Mineral Area Development Authority, Jharkhand, Dhanbad (payment basis).

DVC – Damodar Valley Corporation, Maithon/Panchet, Jharkhand (payment basis).

7.0 IMPACT OF MINING ON GROUND WATER REGIME

7.1 GENERAL CONSEQUENCES OF COAL MINES ON AMBIENT HYDROGEOLOGICAL REGIME

Mining of coal either by opencast or underground method is bound to incise one or more water bearing strata (aquifers) which, in turn, may result in depletion or draw down in water levels and a corresponding inflow of water into the mine workings. The potential effects of coal mining operations on the hydrogeological regime are as under:

- ❖ Creates disruption in formation/aquifer
- ❖ Dewatering of aquifers
- ❖ Change in hydraulic gradient
- ❖ Modification in recharge of aquifers
- ❖ Change in groundwater flow pattern

The general need in mine planning from the hydrogeological point of view is the estimation of ground water seepage into the mine, its rate, the mine pumping capacity to meet the storm rainwater accumulation, extent of depression of water surface and management of mine effluent (mine water). It is also desirable that the consequences of mining operation on groundwater regime be determined in advance. However, the mine pumping in most of the cases are passive dewatering for the safety of the mine pit, active mine dewatering is done in few cases for very high potential aquifers.

7.2 POTENTIAL CONSEQUENCES OF OPENCAST AND UNDERGROUND COAL MINES ON HYDROGEOLOGICAL REGIME IN JHARIA COALFIELD

Generally, in the opencast and underground mines of Jharia Coalfield, alluvium and overlying weathered mantle are the first to be excavated, followed by upper Barakar Formation / Aquifer. Since these formations vary in thickness, compaction and their constituents over the area, their aquifer properties also vary.

The porosity and the compactness in the sandstone controls the discharge from these aquifers. The alluvium and weathered Formation wherever loose and fragile possess more porosity and this has high groundwater potential. Due to the mine cut, a depression in the water table is created. The initial discharges due to this depression is large in amount because of concentration of flow to that region. In the top zones, water table condition prevails and semi-confined conditions exist in the stratified section (Gondwana Sedimentary basin). With progress of mine operations, there is an increase in the depth of incision, as a result which, the semi-confined aquifers are also gets punctured.

During mining, the hydraulic gradients generally steepens down near mine i.e. within the mine influence area. In the up-dip region, only un-confined aquifer is punctured through the mining process and thus only unconfined aquifer is affected whereas in the down-dip region both un-confined and semi-confined aquifers may be affected. The confined aquifers of lower Barakar Formation in the mining area are not punctured as it lies below the working coal seams and hence normally there is no noticeable effect in the aquifer related to this formation.

7.3 ESTIMATION OF RADIUS OF MINE INFLUENCE ZONE

Radius of Influence can be defined as the radial distance from the center of the borehole to the point where there is no lowering of groundwater table/potentiometric surface.

The radius of influence (R) for Opencast and UG Mines within Jharia CF is calculated by using Sichardt's formula based on present mining scenario.

$$R_0 = C \cdot (H-h) \cdot \sqrt{K}$$

Where, R_0 - Radius of influence (m), C - Constant =3000,

(H-h)- Drawdown (m), K – Hydraulic conductivity (m/s).

Here, K for Barakar Formations is 0.05 m/d or 5.7×10^{-7} m/sec.

Here, it may be appropriate to mention that the presence of prominent boundaries/water bodies, faults or inter-fringing of sandstone and shale beds may restrict the propagation of drawdown cone. With the presence of low permeable beds such as clay/shale and younger coal seams in the formation, laying above the working seams the water level in the phreatic aquifer is not directly affected. Both, the phreatic and semi-confined aquifers, get affected during the working by board and pillar method as subsidence takes place while extracting total coal (depillaring). Surface vigilance and filling up subsided zone, if any, has to be constantly under observation. The effect on groundwater level for most of the coalmine in Jharia coalfield has been observed in the down-dip side, generally within a distance up to 500 m from active mine zone and becomes milder/ negligible thereafter.

8.0 CONSERVATION MEASURES & FUTURE STRATEGY

- BCCL has installed 25 Pressure Filter Plant of total capacity of 4.16 MGD to meet drinking water requirement in nearby area. At present 63 Water Treatment Plants are operational having

capacity of 16.16 MGD within Jharia Coalfield area. Further, installation of 28 more Pressure Filter Plants having capacity of 5.84 MGD are in progress.

- BCCL has participated in development of low cost technology for drinking water in a CSIR project along with CIMFR, Dhanbad and a pilot plant of 4000 Liters/hour is functional at PB Project site of BCCL. Similar plants have been proposed at other sites of BCCL.
- A scheme titled 'Scheme for multi-purpose utilization of surplus mine water of Barora Area, Block II and Govindpur Area of BCCL' was prepared with a view to harness the excess water discharge to take care of the persistence problem of water scarcity in the nearby villages. In the scheme, two water reservoirs of capacity 27 MG and 17 MG have been proposed in the non-coal bearing area for storage of 3250 GPM and 2000 GPM surplus mine water which will be fed by mine discharge at mines of Barora, Block-II and Govindpur Area through pipe line.
- Rooftop rainwater harvesting (RWH) has been taken up in the project areas using the administrative buildings. 138 no. of quarters having roof-top area of about 14950 sq. m. is ready to harvest rainwater and around 13150 cum/annum of water is going to recharge the nearby groundwater system through RWH structures. Proposal has already been made to facilitate this kind of RWH structure at suitable locations i.e., Lodna Area, Kusunda Area (Jawahar Nagar, Matkuria, Coal Board Colony), Sijua Area (Nichitpur and Tetulmari Colony) within Jharia Coalfield to augment groundwater recharge.
- After cessation of mining, with plenty of rainfall and abundant ground water recharge, the water levels will recoup and attain normalcy. Thus, the impact of mining on groundwater system may be considered as a temporary phenomenon. The abandoned mine workings (UG) behave as water pool and improves the resources availability in the coalfield area.
- Utilization of treated mine water discharge by both, industry and local people, in the mine influence area. The excess mine water can be used to recharge groundwater system by connecting pipelines to abandoned dug wells. Utilization of mine water for irrigation will also enhance the ground water recharge potential through artificial recharge in the area.
- Increase vegetative cover by plantation in the mine area under land amelioration measures. This will contain the surface run-off and increase the groundwater recharge.
- Imparting awareness among workers and local peoples about Rainwater harvesting and artificial recharge will have priority. This aspect is usually covered during the Environmental Week celebrated every year (5 to 12 June).
- 23 nos. of Piezometers have been installed within JCF and RCF to monitor GW level (**Plate-III**).

Monitoring of water quality of mine water discharge, local River/nala and domestic water source (dug well/hand pump wells) will continue under routine monitoring (May, August, November & Jan). The groundwater level during the month of Jan'23 has been recorded in those piezometers and given below:

PZ NO.	LATITUDE	LONGITUDE	January 2023 Water level (m) BGL
PZ7A	23.770115	86.410951	110.4
PZ7B	23.740017	86.39971	-
PZ7C	23.734152	86.443317	76.7
PZ8A	23.755621	86.427106	70
PZ9A	23.730468	86.446387	41.55
PZ13A	23.713845	86.251622	32.85
PZ14A	23.741512	86.213866	7.6
PZ14B	23.741512	86.213866	11.82
PZ1B	23.769165	86.175347	29.75
PZ1A	23.769176	86.175446	12.15
PZ2A	23.767181	86.189037	29.41
PZ2B	23.790844	86.24701	4.85
PZ5A	23.781658	86.356924	5.15
PZ5B	23.79986	86.36189	-
PZ4A	23.776446	86.312329	29.7
PZ4B	23.776503	86.312519	107.5
PZ3A	23.779754	86.241757	19.1
PZ3B	23.80146	86.282446	85.82
PZ3C	23.801619	86.282436	-
PZ11A	23.726355	86.341936	60.6
PZ9B	23.696164	86.41592	66.8
PZ10A	23.687975	86.405108	5.92
PZ16A	23.730825	86.760491	35.2

However, as per revised proposal, from assessment year 2023-24 the groundwater level and quality monitoring work in the BCCL command area will be revised as per the guidelines of CGWA, New Delhi regarding NoC from CGWA for groundwater abstraction in Mining Sector. As per revised proposal, total 150 nos. of Dug well and 23 nos. of Piezometers will be monitored in quarterly basis and total 50 nos. of groundwater quality sampling will be conducted during the month of May in each assessment year onwards. 12 nos. of existing monitoring wells have been discarded for evenly distribution of key wells within the buffer zone, these are: A-18, A-22A, B-25, B-21A, B-61A, D-23, D-40A, D-43, D-51, D-55, DB-24 & DB-25.

9.0 EXISTING/PROPOSED RAINWATER HARVESTING STRUCTURES IN BCCL COAL MINES

Fig-3 to 4.



Proposed Rain Water Harvesting Site GVTC, Cluster-I, Barora Area



Proposed Rain Water Harvesting Site Nehru Balika Vidhalaya, Cluster-I, Barora Area

Fig-5 to 6.



Proposed Rain Water Harvesting Site Barora Area Guest House, Cluster-I, Barora Area



Proposed Rain Water Harvesting Site Regional Hospital Baghmara, Cluster-I, Barora Area

Fig-7 to 8.



Proposed Rain Water Harvesting Site – Barora Area Office, Cluster-I, Barora Area



RECHARGE POND / ABANDONED IN THE JCF MINE AREA

Fig-9 to 10.



RECHARGE POND / ABANDONED IN THE JCF MINE AREA



FILTER PLANT IN THE MINE AREA

Fig-11 to 12.



RECHARGE POND / ABANDONED IN THE JCF MINE AREA



RECHARGE POND / ABANDONED IN THE JCF MINE AREA

Fig-13 to 14.



RECHARGE POND / ABANDONED IN THE JCF MINE AREA



Government of India
Ministry of Environment, Forest and Climate Change
Wetlands Division

List of Ramsar Sites in India

S. No	Name of Ramsar site	State	Area in hectares	Date of designation	Coordinates
1.	Ashtamudi Wetland	Kerala	6,140	19/08/2002	08°57'N 076°34'E
2.	Beas Conservation Reserve	Punjab	6,429	26/09/2019	31°23'N 075°11'E
3.	Bhitarkanika Mangroves	Odisha	65,000	19/08/2002	20°39'N 086°54'E
4.	Bhoj Wetland	Madhya Pradesh	3,201	19/08/2002	23°13'N 077°19'E
5.	Chandertal Wetland	Himachal Pradesh	49	08/11/2005	32°28'N 077°36'E
6.	Chilika Lake	Odisha	116,500	01/10/1981	19°42'N 085°21'E
7.	Deepor Beel	Assam	4,000	19/08/2002	26°07'N 091°39'E
8.	East Calcutta Wetlands	West Bengal	12,500	19/08/2002	22°27'N 088°27'E
9.	Harke Lake	Punjab	4,100	23/03/1990	31°13'N 075°12'E
10.	Hokersa Wetland	Jammu & Kashmir	1,375	08/11/2005	34°04'N 074°42'E
11.	Kanjli	Punjab	183	22/01/2002	31°25'N 075°22'E
12.	Keoladeo National Park (MR)	Rajasthan	2,873	01/10/1981	27°13'N 077°31'E
13.	Keshopur-Miani Community Reserve	Punjab	344	26/09/2019	32°05'N 075°23'E
14.	Kolleru Lake	Andhra Pradesh	90,100	19/08/2002	16°37'N 081°12'E
15.	Loktak Lake (MR)	Manipur	26,600	23/03/1990	24°25'N 093°49'E
16.	Nalsarovar	Gujarat	12,000	24/09/2012	22°46'N 072°02'E
17.	Nandur Madhameshwar	Maharashtra	1,437	21/06/2019	20°01'N 074°06'E
18.	Nangal Wildlife Sanctuary	Punjab	116	26/09/2019	31°23'N 076°22'E
19.	Nawabganj Bird Sanctuary	Uttar Pradesh	225	19/09/2019	26°36'N 080°39'E
20.	Parvati Arga Bird Sanctuary	Uttar Pradesh	722	02/12/2019	26°56'N 082°09'E
21.	Point Calmère Wildlife and Bird Sanctuary	Tamil Nadu	38,500	19/08/2002	10°19'N 079°37'E
22.	Pong Dam Lake	Himachal Pradesh	15,662	19/08/2002	32°01'N 076°04'E
23.	Remuka Wetland	Himachal Pradesh	20	08/11/2005	31°37'N 077°27'E
24.	Ropar	Punjab	1,365	22/01/2002	31°01'N 076°30'E
25.	Rudrasagar Lake	Tripura	240	08/11/2005	23°28'N 091°16'E
26.	Saman Bird Sanctuary	Uttar Pradesh	526	02/12/2019	27°00'N 079°10'E
27.	Samaspur Bird Sanctuary	Uttar Pradesh	799	03/10/2019	25°59'N 081°23'E
28.	Sambhar Lake	Rajasthan	24,000	23/03/1990	27°00'N 075°00'E
29.	Sandi Bird Sanctuary	Uttar Pradesh	309	26/09/2019	27°18'N 079°58'E
30.	Sarsai Nawar Jheel	Uttar Pradesh	161	19/09/2019	26°58'N 079°15'E

Annexure – IV

Rainfall Data (in mm) At Dhanbad Observatory Station, IMD (Source: WRIS Website data)

Year	January	February	March	April	May	June	July	August	Sep	Oct	Nov	Dec	Annual
1994	26.5	20.0	3.3	23.5	4.5	289.5	245.5	240.0	134.0	40.5	0.0	0.0	1027.3
1995	15.0	18.3	20.0	0.0	34.5	122.0	140.1	257.0	446.0	0.0	34.0	5.5	1092.4
1996	12.5	12.5	5.2	0.0	0.0	210.5	138.5	400.0	214.0	24.0	0.0	0.0	1017.2
1997	10.5	17.5	2.8	63.5	41.5	231.5	599.3	621.1	196.8	16.5	34.0	16.0	1851.0
1998	20.5	21.0	160.0	18.0	40.0	80.0	347.0	409.0	123.0	120.5	11.0	0.0	1350.0
1999	0.0	0.0	0.0	0.0	64.0	150.0	511.0	336.0	510.5	124.0	0.0	0.0	1695.5
2000	2.0	15.0	0.0	20.0	68.0	452.5	270.5	89.0	234.5	-	0.0	0.0	1151.5
2001	0.0	0.0	34.0	13.0	104.0	448.7	552.5	121.0	107.0	126.5	0.0	0.0	1506.7
2002	12.0	10.0	26.0	0.0	32.5	185.0	150.0	125.5	310.0	64.0	0.0	0.0	915.0
2003	6.0	58.5	38.5	40.0	24.0	-	366.1	279.0	145.1	151.6	0.0	2.3	1111.1
2004	18.45	2.13	1.55	53.93	9.53	95.95	408.57	261.07	174.01	63.01	51.10	12.85	1152.15
2005	44.49	23.11	26.16	17.90	28.95	272.26	388.86	158.86	69.03	117.63	0.09	1.67	1149.01
2006	0.00	0.00	3.11	12.64	86.68	113.20	505.72	316.06	339.51	9.80	3.73	0.00	1390.45
2007	0.00	58.69	35.76	21.08	25.33	139.60	666.30	416.85	363.93	43.63	1.57	0.00	1772.74
2008	16.44	1.96	6.27	6.78	37.26	180.58	422.25	275.33	198.31	27.64	0.00	0.00	1172.82
2009	0.00	0.26	5.81	0.19	105.82	78.32	232.20	370.39	429.16	68.56	11.31	0.98	1303.00
2010	0.59	19.64	7.62	38.24	93.72	146.68	157.31	198.97	239.75	78.76	5.26	40.53	1027.07
2011	0.00	1.60	18.25	12.81	102.58	294.61	174.35	445.43	214.88	30.35	0.69	0.00	1295.55
2012	18.45	2.13	1.55	53.93	9.53	95.95	408.57	261.07	174.01	63.01	51.10	12.85	1152.15
2013	0.07	17.62	0.79	15.24	105.51	176.77	170.14	276.70	135.76	304.46	0.00	0.00	1203.06
2014	9.27	35.71	21.21	8.16	62.77	112.58	283.73	223.38	214.48	30.30	0.00	0.00	1001.59
2015	12.06	3.33	26.71	45.73	32.91	162.96	385.21	239.38	71.34	15.62	0.00	0.61	995.86
2016	6.16	17.59	1.73	1.33	73.90	197.34	248.86	395.33	424.81	30.45	0.00	0.00	1397.50
2017	5.12	0.00	34.96	59.89	81.01	141.66	502.58	168.84	111.95	274.18	0.64	4.12	1384.95
2018	0.00	0.06	2.90	159.52	31.22	202.84	344.59	211.91	153.63	16.31	0.04	20.99	1144.01
2019	0.00	25.18	7.24	46.99	109.43	109.11	292.02	234.65	327.95	199.63	0.10	5.13	1357.43
2020	21.14	5.94	74.96	27.94	71.32	218.12	187.01	258.74	196.87	52.23	1.23	0.00	1115.50

Annexure – IV

Rainfall Data (in mm) At Dhansar (Rescue station) Observatory Station State Sec Deptt of Coord, BCCL

Year	January	February	March	April	May	June	July	August	Sep	Oct	Nov	Dec	Annual
2005	34.20	22.80	41.80	32.20	33.00	193.00	542.00	107.80	185.60	39.20	0.00	2.00	1233.60
2006	0.00	0.00	34.40	33.80	87.60	214.20	477.70	246.30	172.00	0.00	1.00	0.00	1267.00
2007	0.00	22.00	37.80	0.00	78.70	167.20	545.00	426.40	351.40	52.00	0.00	0.00	1680.50
2008	5.80	4.80	17.80	18.40	18.00	216.10	433.48	183.80	297.80	85.80	0.00	0.00	1281.78
2009	0.00	0.00	1.60	2.20	112.00	72.80	269.20	192.80	333.00	98.20	10.20	0.00	1092.00
2010	0.00	12.20	7.60	9.20	64.30	206.20	199.40	212.60	230.10	45.30	3.4	----	991.90
2011	7.60	0.00	18.0	11.40	121.60	344.20	163.40	452.0	374.0	41.80	0.00	0.00	1534.20
2012	17.6	13.4	1.0	9.0	6.60	52.0	328.20	315.10	367.70	11.60	61.60	18.0	1201.80
2013	0.0	32.0	3.0	33.90	190.40	244.20	192.80	364.40	304.70	233.60	0.0	0.0	1599.0
2014	12.40	36.80	21.80	2.60	79.80	217.60	305.30	315.60	178.0	6.40	0.0	0.0	1176.0
2015	23.80	0.0	6.20	76.20	35.80	122.10	407.60	244.40	145.20	25.60	0.0	6.20	1093.10
2016	3.0	20.60	5.50	0.0	99.40	181.60	248.80	456.70	443.60	50.40	0.0	0.0	1509.60
2017	8.80	0.0	3.80	17.90	33.20	120.0	533.40	284.70	247.40	207.70	3.40	0.0	1460.30
2018	0.0	0.0	0.0	102.90	76.30	270.60	382.30	338.80	159.50	38.90	2.40	37.90	1346.60
2019	0.0	49.60	10.20	54.20	132.0	188.0	319.10	343.60	403.10	156.40	3.20	10.80	1667.00
2020	22.0	7.60	77.80	76.80	86.20	214.10	296.80	351.40	214.0	92.0	0.0	0.0	1438.70
2021	0.00	0.00	21.8	12	157.4	295	382.2	130.2	451.8	285	54.4	43	1832.8
2022	12.8	85.8	0	0	61.8	130.2	104.6	350.1	172.2	64.4	0	3	984.9

Location of Hydrograph Stations (Dug Wells)

Well No	Latitude	Longitude	Well No	Latitude	Longitude
A-3	23°47'53.35" N	86°19'55.14" E	B-62A	23°45'44.15" N	86°11'27.80" E
A-12	23°48'20.31" N	86°16'51.64" E	B-64	23°48'45.58" N	86°18'31.03" E
A-16	23°46'57.00" N	86°21'38.57" E	B-65A	23°49'5.12" N	86°18'15.77" E
A-17	23°45'09.44" N	86°22'16.35" E	B-67	23°43'30.70" N	86°14'01.45" E
A-18	23°44'37.65" N	86°22'58.90" E	D-3	23°46'46.31" N	86°24'49.30" E
A-19	23°40'50" N	86°24'14" E	D-4	23°44'29.37" N	86°24'42.88" E
A-20	23°45'26.63" N	86°20'42.86" E	D-5	23°42'39.06" N	86°24'47.95" E
A-21	23°44'58" N	86°18'38" E	D-7	23°43'12.08" N	86°27'11.89" E
A-22	23°43'06.65" N	86°14'48.53" E	D-8	23°44'06.13" N	86°27'20.72" E
A-23	23°45'6" N	86°15'22" E	D-23	23°47'20.89" N	86°20'09.96" E
A-24	23°45'20.44" N	86°13'45.12" E	D-25	23°47'12.03" N	86°23'14.08" E
A-25	23°47'06.20" N	86°15'27.79" E	D-30	23°48'36.10" N	86°21'50.07" E
A-26	23°46'49.24" N	86°18'12.12" E	D-33	23°45'34.62" N	86°23'18.50" E
A-27	23°48'42.55" N	86°20'21.80" E	D-34	23°47'1.88" N	86°23'39.62" E
A-28A	23°47'34.74" N	86°18'04.18" E	D-35	23°40'46.54" N	86°25'46.33" E
A-29	23°47'08.02" N	86°16'02.72" E	D-36	23°40'19.26" N	86°25'18.98" E
A-32	23°44'15.56" N	86°20'43.80" E	D-39	23°43'28.50" N	86°26'0.10" E
A-33	23°44'32.58" N	86°16'58.28" E	D-40A	23°43'20.18" N	86°25'45.70" E
A-34	23°42'58.63" N	86°15'19.31" E	D-41	23°42'40.00" N	86°26'17.20" E
B-1	23°48'48.06" N	86°14'16.87" E	D-43	23°43'55.06" N	86°27'24.98" E
B-14	23°48'00.81" N	86°16'25.88" E	D-47	23°45'20.59" N	86°24'34.86" E
B-15	23°46'06.92" N	86°08'59.30" E	D-49	23°44'08.96" N	86°26'32.71" E
B-21A	23°45'10.50" N	86°09'36.38" E	D-51	23°44'20.86" N	86°27'11.37" E
B-23	23°44'13.05" N	86°11'46.56" E	D-55	23°43'58.37" N	86°24'07.45" E
B-24	23°44'26.80" N	86°13'09.38" E	D-74	23°41'33.66" N	86°25'06.10" E
B-25	23°44'44.98" N	86°13'57.80" E	D-77	23°41'00.74" N	86°22'25.55" E
B-32A	23°45'49.18" N	86°13'03.64" E	D-80	23°46'09.46" N	86°24'33.08" E
B-48	23°43'35.04" N	86°16'38.78" E	DB-22	23°42'49.79" N	86°45'9.97" E
B-51	23°46'58.55" N	86°09'22.18" E	DB-23	23°43'43.03" N	86°45'04.97" E
B-53	23°45'55.25" N	86°09'35.44" E	DB-24	23°43'53.00" N	86°45'03.88" E
B-59	23°47'59.87" N	86°13'37.97" E	DB-25	23°44'10.75" N	86°44'35.84" E
B-60	23°48'7.87" N	86°15'37.12" E			
B-61A	23°45'59.85" N	86°11'40.80" E			

These wells (red color) will be excluded from next assessment year.

Details of Hydrograph Stations (Dug Wells)

Well No	Location	M.P. (agl) in m	Well Dia in m	Well Depth (m bmp)	Formation	Owner	Utility
A-3	Sijua	0.53	3.00	5.20	Barakar	Govt.	Domestic
A-12	Jamua	0.80	1.90	3.30	Barakar	Govt.	Domestic
A-16	Ekra, Kalali	0.45	3.10	6.50	Barakar	Govt.	Domestic
A-17	Kachi Balihari	0.56	1.60	5.30	Barakar	Govt.	Domestic
A-18	Bhagabandh	0.61	1.45	3.37	Barakar	Govt.	Domestic
A-19	Bhaura	0.54	3.15	11.65	Barakar	Govt.	Domestic
A-20	Gorbhudih	0.43	3.30	8.30	BM	Govt.	Domestic
A-22	Nagdah, Niche	0.00	1.40	9.50	Raniganj	Govt	Irrigation
A-23	Machhyara	0.43	1.85	12.40	Raniganj	Govt	Domestic
A-24	Pipra Tanr	0.22	1.80	19.55	Raniganj	Govt	Domestic
A-25	Sinidih	0.22	2.00	11.30	Barakar	Govt	Domestic
A-26	Pasitanr	0.32	1.80	9.65	Barakar	Govt	Domestic
A-27	Chandor	0.60	2.50	5.50	Barakar	Govt	Domestic
A-28A	Lakarka 6 no.	0.65	1.30	5.25	Barakar	BCCL	Domestic
A-29	Aambagan	0.10	2.60	9.15	Barakar	Govt	Domestic
A-32	Baludih	0.55	2.30	6.85	BM	Govt	Domestic
A-33	Mahuda	0.75	2.00	10.80	BM	BCCL	Domestic
A-34	Bhatdih	0.55	3.50	24.50	Raniganj	BCCL	Domestic
B-1	Muraidih	0.47	1.80	5.35	Talchir	Govt	Domestic
B-14	Mathadih	0.76	2.15	3.75	Barakar	Govt	Domestic
B-15	Bera Basti	0.55	1.60	2.50	Talchir	Dhanu Roy	Domestic
B-21A	Dugdha	0.55	2.10	10.35	Metamorphics	Govt	Domestic
B-23	Lohapati	0.26	3.60	10.85	Raniganj	Govt	Domestic
B-24	Telmuchu	0.67	4.35	10.83	Raniganj	Govt	Domestic
B-25	Mahuda More	0.10	2.45	8.45	Raniganj	Govt	Domestic
B-32A	Madhuband	0.80	4.30	8.60	Barakar	BCCL	Domestic
B-48	Mahuda	0.65	2.10	11.50	Raniganj	Mosque	Domestic
B-51	Taranga	0.00	2.50	5.75	Metamorphics	Bisun	Irrigation
B-53	Karmatanr	0.58	2.70	13.25	Barakar	Govt	Domestic
B-59	Khodovaly	0.60	2.40	9.30	Barakar	BCCL	Domestic
B-60	Bahiyadih	0.77	3.00	15.60	Barakar	BCCL	Domestic
B-61A	Kesargora	0.48	2.00	11.20	Barakar	BCCL	Domestic
B-62A	Sadariyadih	0.15	3.10	9.50	Barakar	Govt	Domestic

Details of Hydrograph Stations (Dug Wells)

Well No	Location	M.P. (agl) in m	Well Dia in m	Well Depth (m bmp)	Formation	Owner	Utility
B-64	Keshalpur	0.65	1.10	3.40	Barakar	BCCL	Domestic
B-65A	Jhinjipahari	0.95	2.20	12.40	Barakar	Shiv Temple	Domestic
B-67	Simatanr	0.55	2.20	11.80	Raniganj	Govt	Domestic
D-3	Dhansar	0.60	1.70	8.70	Barakar	Govt	Domestic
D-4	Jharia	0.59	1.90	5.73	Barakar	Govt	Domestic
D-5	Jiyalgora	0.70	2.80	10.55	Barakar	Govt	Domestic
D-7	Golden Pahari	0.67	2.85	10.05	Barakar	BCCL	Domestic
D-8	Alokdiha	0.35	1.75	7.57	Metamorphics	BCCL	Domestic
D-23	Jogta (Sindra)	0.40	3.10	7.25	Barakar	BCCL	Domestic
D-25	Godhar More	0.60	2.75	5.60	Barakar	Govt	Domestic
D-30	Borkiboa	0.70	2.00	5.60	Talchir	H.Kumbhakar	Domestic
D-33	Kustore-4	0.55	1.85	3.45	Barakar	BCCL	Domestic
D-34	Kusunda-7	0.60	1.50	3.45	Barakar	BCCL	Domestic
D-35	Patherdih	0.40	2.00	11.20	Barakar	BCCL	Domestic
D-36	Sudamdih	0.90	2.00	6.20	Barakar	BCCL	Domestic
D-39	Tilabani	0.85	2.00	5.90	Barakar	BCCL	Domestic
D-40A	Khapra Dhaora	0.55	1.95	3.70	Barakar	Panchayat	Domestic
D-41	Joyrampur	0.50	1.80	4.00	Barakar	BCCL	Domestic
D-43	Alagdih	0.45	2.20	8.90	Metamorphics	Govt	Domestic
D-47	Parastanr	0.45	3.20	23.80	Barakar	BCCL	Domestic
D-49	Goluckdih	0.55	1.80	6.15	Barakar	BCCL	Domestic
D-51	Chankuiya	0.55	3.70	11.90	Barakar	BCCL	Domestic
D-55	Hariladih	0.48	2.80	11.80	Barakar	Govt	Domestic
D-74	Bhulan Barari	0.10	1.60	12.80	Barakar	Govt	Domestic
D-77	Rohoniatanr	0.40	3.15	6.70	Barakar	Govt	Domestic
D-80	Bastacolla	0.70	2.50	24.95	Barakar	Govt	Domestic
DB-22	Nichebasti	0.67	2.40	10.65	Barakar	Govt	Domestic
DB-23	Dahibari OC	0.70	2.30	8.00	Barakar	BCCL	Domestic
DB-24	Dahibari	0.60	3.60	13.70	Barakar	BCCL	Domestic
DB-25	Palasya	0.37	1.55	5.25	Barakar	Govt	Domestic

These wells (red color) will be excluded from next assessment year.

MP: Measuring Point
Abn.: Abandoned
G.L.: Ground Level

R.L.: Reduced Level
b.g.l.: Below Ground Level
W.L.: Water Level m: Meter
a.g.l.: Above Ground Level
bmp: Below Measuring Point
BM: Barren Measure

Historical Water Level data of Hydrograph Stations

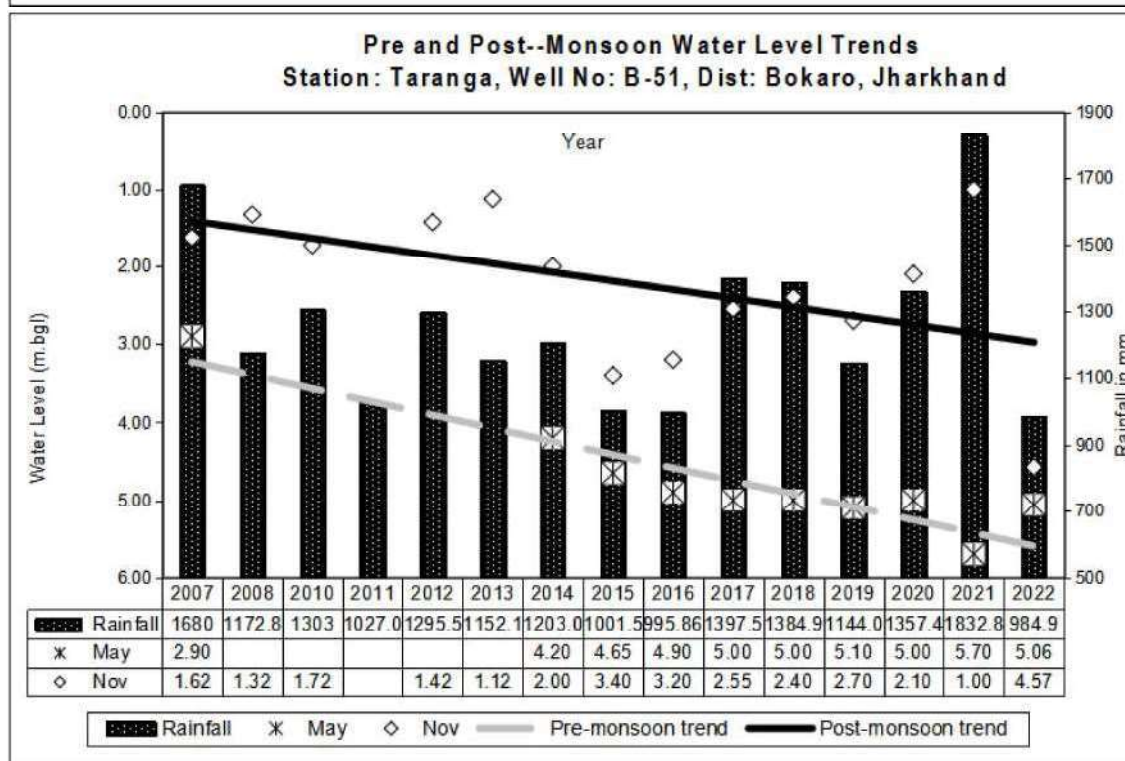
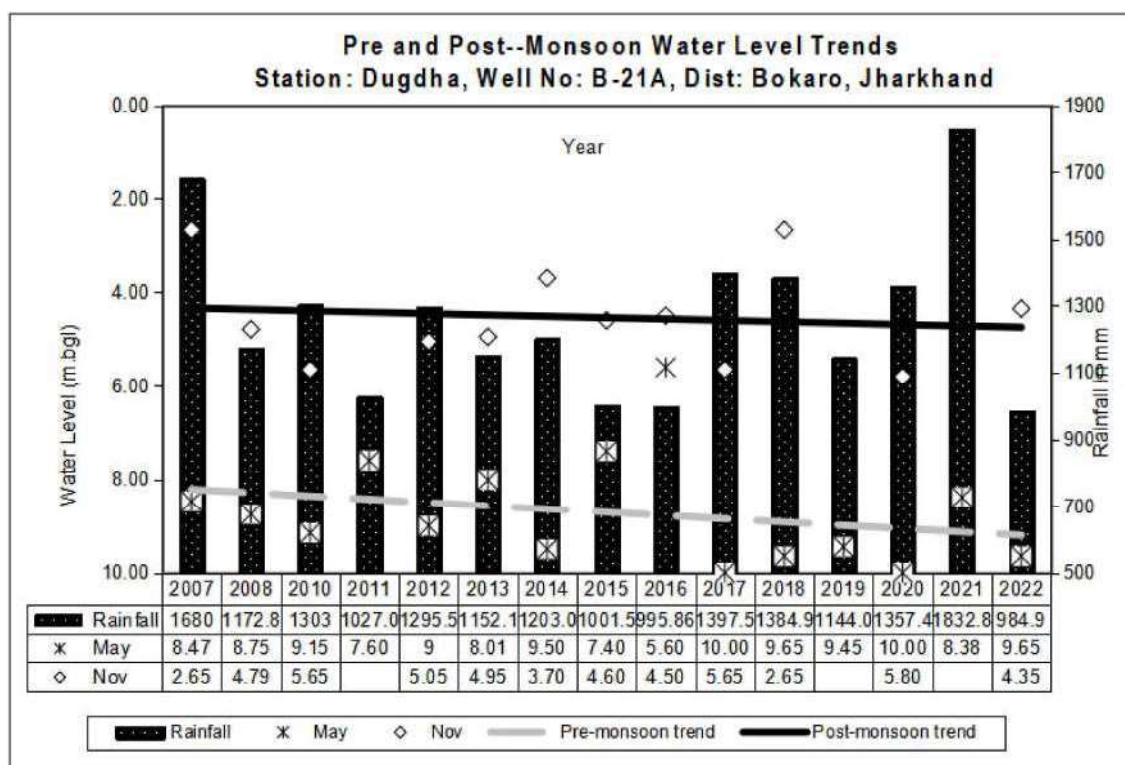
Well No	Water level below ground level (bgl) in meters															
	May 15	Nov 15	May 16	Nov 16	May 17	Nov 17	May 18	Nov 18	May 19	Nov 19	May 20	Nov 20	May 21	Nov 21	May 22	Nov 22
A-3	3.70	3.42	4.87	0.47	0.67	0.77	1.27	0.47	3.47	0.47	1.57	0.47	0.62	0.05	0.42	0.29
A-12	3.00	2.68	2.50	0.70	2.55	0.85	2.80	1.0	2.10	0.45	2.60	0.50	1.92	1.10	1.5	0.67
A-16	5.55	4.17	5.85	3.15	3.65	2.20	4.30	3.65	5.45	1.95	7.15	1.75	3.45	2.00	5.8	3.08
A-17	3.79	2.64	2.44	2.69	2.44	2.24	3.34	2.84	2.94	2.24	2.14	1.69	3.36	2.37	2.62	2.59
A-18	2.84	1.29	1.14	0.89	1.29	0.99	1.24	0.99	2.29	0.69	1.09	0.34	1.09	0.57	0.62	0.56
A-19	3.05	2.75	7.81	4.11	6.37	2.45	5.55	2.45	4.85	3.43	6.05	3.25	3.30	1.90	4.1	2.54
A-20	4.59	2.93	7.49	3.50	4.27	1.77	4.57	2.57	4.57	1.82	8.47	3.87	5.47	2.02	5.59	3.54
A22A	3.20	1.96	3.25	1.75	4.27	1.77	3.35	1.30	2.60	2.00	2.90	1.98	2.90	1.10	6.35	2.1
A-23	11.3	9.37	11.87	8.13	6.40	1.50	11.15	7.17	11.97	3.77	8.92	5.62	9.52	2.82	7.97	4.79
A-24	17.2	14.5	16.62	12.43	11.87	6.97	14.58	6.88	15.88	2.48	*4.88	4.28	10.13	2.78	7.28	4.33
A-25	7.78	5.85	7.43	4.58	6.38	2.88	6.63	3.13	6.08	1.93	2.98	1.83	5.78	2.43	3.31	2.08
A-26	7.73	3.18	8.93	4.48	5.28	2.53	6.23	3.88	6.58	3.33	6.98	3.18	6.70	2.73	6.42	4.31
A-27	4.40	3.95	4.85	1.80	2.90	1.25	2.90	1.0	2.40	0.92	2.40	1.10	1.67	0.90	1.90	1.33
A28A	4.35	3.60	3.35	1.47	4.30	1.55	4.15	2.51	2.45	3.15	4.00	3.03	6.23	3.75	4.23	3.30
A-29	4.55	4.60	5.92	6.96	4.40	1.30	6.45	2.10	4.85	3.40	6.20	3.20	6.49	5.90	4.60	1.15
A-32	4.41	2.13	4.75	2.10	3.15	1.55	2.80	0.70	2.75	0.95	1.90	1.75	2.35	0.96	2.25	1.75
A-33	4.91	1.97	5.75	2.60	6.45	1.55	4.07	2.35	3.65	1.25	4.55	1.85	2.85	0.85	3.50	2.05
A-34	8.40	4.81	4.75	4.45	12.45	4.45	5.90	3.70	6.35	3.95	8.35	3.45	5.20	3.55	8.20	6.35
B-1	3.28	2.75	3.58	1.93	2.33	0.85	2.88	2.08	3.18	1.73	3.28	1.63	2.58	1.91	2.10	1.81
B-14	2.94	2.29	2.44	0.47	2.94	1.84	3.64	2.84	2.24	0.94	2.44	1.04	2.84	2.04	3.24	2.60
B-15	1.50	0.45	1.85	0.55	4.85	0.15	1.85	0.85	1.90	1.65	3.70	1.47	1.46	0.35	3.67	1.02
B21A	7.37	4.65	5.55	4.50	8.85	5.65	9.65	2.65	9.45	-	10.00	5.80	8.38	-	9.65	4.35
B-23	7.86	4.29	6.81	2.41	7.74	2.14	6.64	2.14	2.84	1.34	3.24	1.76	4.12	1.44	2.98	1.73
B-24	10.0	5.78	10.63	4.28	10.03	4.03	9.28	4.33	4.58	2.33	5.48	3.53	5.68	2.08	5.53	3.46
B-25	6.88	-	7.05	1.70	6.70	1.40	5.90	3.70	4.80	1.40	7.90	2.55	5.10	2.58	6.40	3.52
B32A	7.55	3.32	6.95	3.07	6.95	2.80	6.75	3.90	5.55	1.70	3.30	2.00	7.23	6.05	4.15	2.56
B-48	7.90	5.42	9.35	4.60	7.70	4.15	7.33	3.97	7.05	4.35	8.20	3.85	7.23	6.05	6.85	6.25
B-51	4.65	3.40	4.90	3.18	4.98	2.55	5.02	2.42	5.10	2.70	5.00	2.10	5.70	1.0	5.06	4.57
B-53	5.58	2.82	4.70	1.45	4.02	1.92	3.92	1.42	3.22	1.42	3.12	1.40	4.85	1.87	4.42	3.54
B-59	4.12	1.60	4.40	0.50	5.40	0.60	5.47	1.10	6.20	0.90	5.25	1.40	5.49	0.90	4.50	1.14
B-60	9.21	5.28	10.33	5.03	13.23	3.18	13.68	4.23	8.13	3.23	10.33	3.21	11.26	2.23	10.53	5.80
B61A	6.15	4.52	6.58	3.87	2.57	0.82	2.57	2.02	3.32	0.52	3.32	1.60	4.42	0.97	1.20	0.97
B62A	9.10	5.21	9.30	4.95	8.15	4.35	8.27	4.78	7.55	3.25	6.95	3.00	6.87	4.50	6.45	4.91

Historical Water Level data of Hydrograph Stations

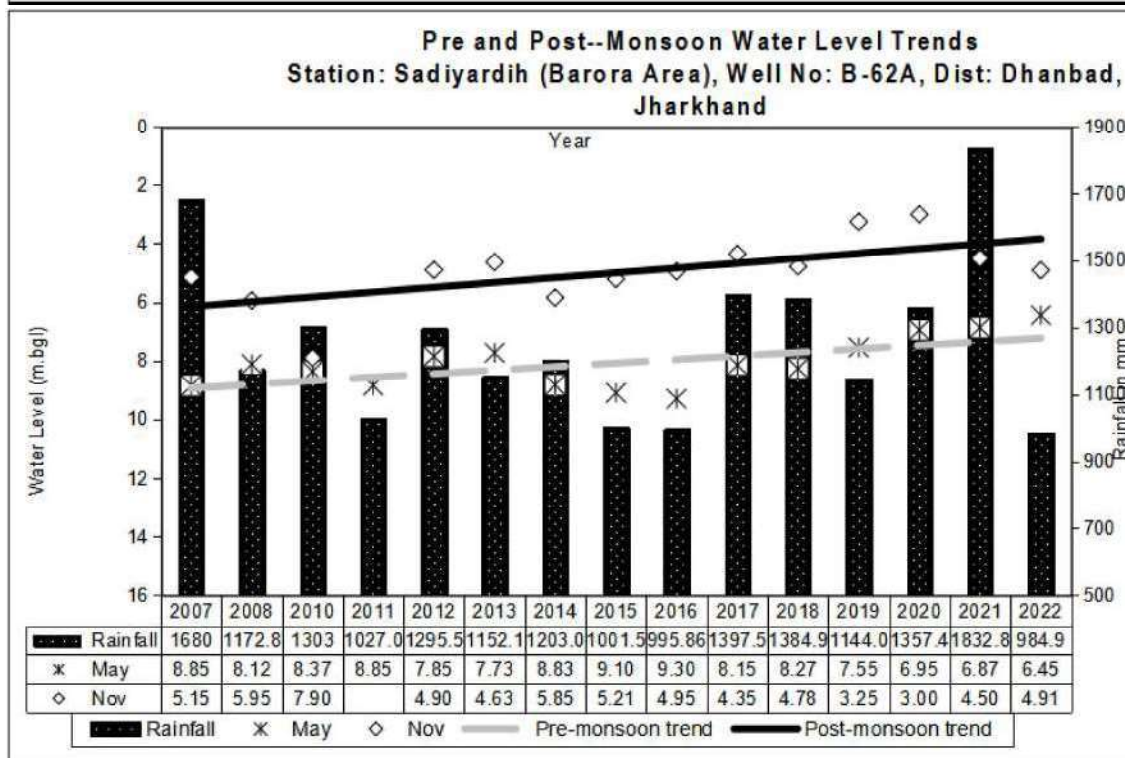
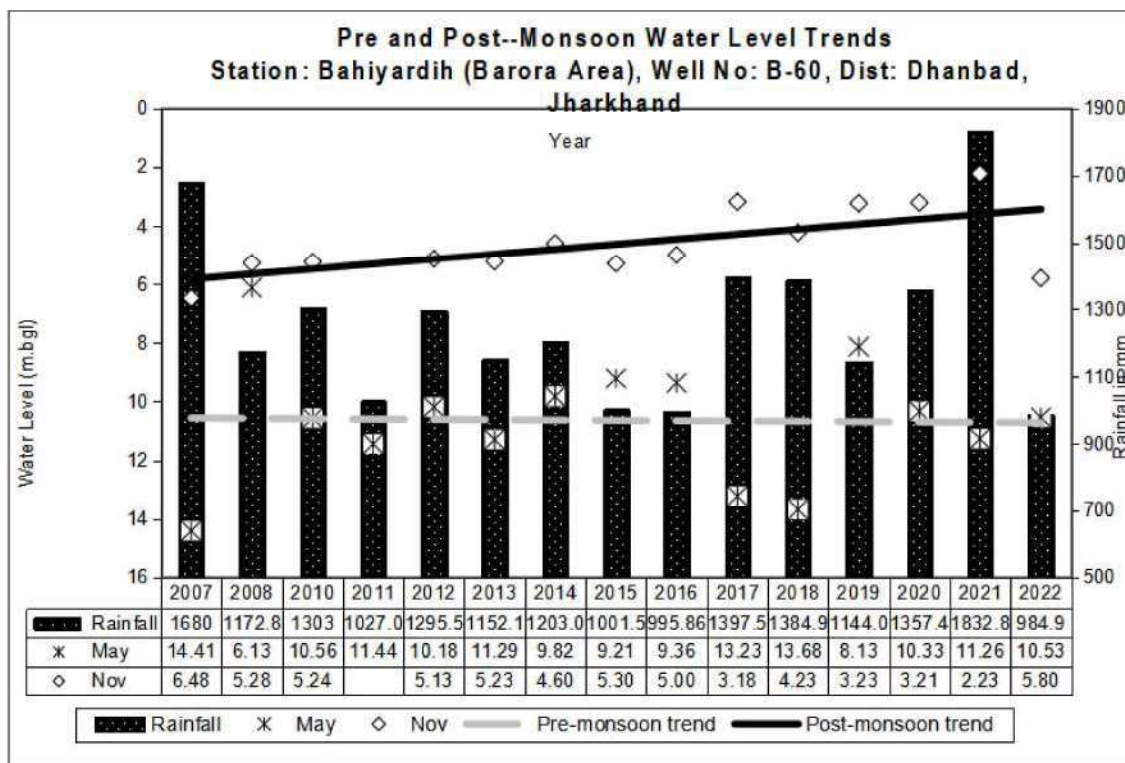
Well No	Water level below ground level (bgl) in meters															
	May 15	Nov 15	May 16	Nov 16	May 17	Nov 17	May 18	Nov 18	May 19	Nov 19	May 20	Nov 20	May 21	Nov 21	May 22	Nov 22
B-64	1.38	0.95	2.35	0.55	1.25	0.85	2.15	1.85	0.95	0.45	1.85	0.50	2.35	0.95	1.00	0.60
B65A	7.82	5.87	7.15	2.68	9.05	1.25	10.03	2.40	11.05	0.95	9.25	2.30	9.03	1.42	7.45	2.27
B-67	9.23	5.53	9.53	4.30	10.00	2.15	9.55	4.0	8.57	4.35	7.55	3.95	8.95	2.95	8.50	6.30
D-3	4.25	2.25	2.35	1.90	2.15	2.30	3.43	2.45	1.75	1.30	5.40	1.38	3.41	0.85	5.96	1.32
D-4	2.41	1.27	1.21	1.36	1.21	1.46	1.91	1.56	2.81	1.71	3.41	1.41	3.01	1.16	1.71	1.55
D-5	9.37	8.33	9.40	6.40	7.90	5.20	7.80	5.30	8.25	4.85	8.60	7.70	7.28	4.00	8.40	7.01
D-7	8.25	5.61	7.53	4.03	7.33	2.88	7.53	2.83	8.23	3.28	7.33	5.13	6.08	2.63	9.03	5.67
D-8	6.24	4.38	8.00	3.43	5.15	1.85	5.65	1.85	4.80	2.85	5.83	2.75	4.55	2.27	6.32	5.42
D-23	6.55	3.48	5.70	1.63	2.80	2.98	4.40	3.40	4.70	1.40	5.60	3.35	5.43	1.60	1.85	1.57
D-25	4.48	2.45	2.40	1.90	2.40	1.20	2.60	2.40	*9.90	*5.38	10.50	5.62	10.50	3.80	11.90	4.70
D-30	4.55	3.15	4.45	3.20	4.40	1.25	4.58	1.10	4.60	0.75	4.50	1.35	4.23	0.84	4.37	2.29
D-33	2.25	1.10	2.50	1.95	0.75	0.75	2.85	0.95	2.35	1.65	3.65	1.45	1.75	0.85	1.20	0.65
D-34	2.55	1.45	2.30	0.30	0.80	0.55	2.80	0.45	4.75	2.40	3.30	2.80	3.78	2.90	5.00	3.15
D-35	9.80	7.90	9.52	6.45	8.80	3.60	8.40	4.45	8.00	3.80	8.20	5.40	6.60	2.90	6.10	4.68
D-36	1.66	1.13	0.78	0.95	1.30	0.70	1.20	0.60	1.20	0.55	2.10	1.00	2.02	0.55	3.25	0.6
D-39	5.00	2.61	2.18	2.65	6.17	4.75	4.95	4.35	*12.60	*5.95	9.40	6.05	10.70	5.10	7.50	3.05
D40A	3.07	2.45	1.40	0.85	1.45	1.35	2.10	1.40	1.85	1.45	1.95	1.43	1.95	1.80	2.35	1.80
D-41	2.65	2.32	1.30	1.52	1.40	1.20	1.59	1.32	2.30	1.25	3.30	1.45	1.95	1.38	1.55	0.88
D-43	6.61	5.05	8.20	3.35	7.50	3.60	7.15	3.45	7.35	2.70	6.60	2.55	4.65	2.60	5.35	4.71
D-47	9.60	3.60	3.18	2.95	3.15	2.85	5.33	2.55	4.55	4.35	9.45	5.45	4.05	2.45	6.55	5.85
D-49	3.55	2.35	2.45	1.72	2.70	2.05	3.45	2.45	1.75	1.50	3.25	1.65	1.40	0.85	2.00	1.91
D-51	10.48	9.15	11.15	6.45	10.45	5.43	10.93	7.10	9.95	5.75	8.45	5.70	9.43	5.65	10.95	8.50
D-55	6.15	1.57	2.52	3.62	6.42	2.37	8.42	1.57	8.42	5.47	9.42	8.60	9.52	7.62	11.32	11.12
D-74	10.05	7.20	7.73	5.00	9.25	3.85	8.60	4.80	5.80	3.57	4.30	3.93	6.93	2.90	6.17	5.77
D-77	6.44	5.60	4.60	2.90	6.50	4.90	6.30	5.20	6.40	3.20	6.40	3.50	5.98	4.69	6.50	4.70
D-80	10.97	3.35	6.55	4.15	8.65	3.70	9.35	4.20	5.00	3.05	4.30	4.90	7.10	2.55	3.30	3.08
RCF (part)	May 15	Nov 15	May 16	Nov 16	May 17	Nov 17	May 18	Nov 18	May 19	Nov 19	May 20	Nov 20	May 21	Nov 21	May 22	Nov 22
DB22	4.59	3.53	5.38	3.33	1.93	1.63	2.34	1.93	4.93	1.63	2.63	2.25	2.31	1.38	1.73	1.63
DB23	3.38	6.04	5.30	0.90	2.05	1.90	2.85	1.75	1.60	0.80	2.50	1.95	2.00	1.10	2.68	2.20
DB24	9.52	8.20	10.65	6.50	5.80	3.78	8.25	5.70	9.35	3.88	5.70	3.60	6.20	5.25	-	-
DB25	3.83	2.68	3.61	1.98	3.23	2.58	3.93	1.63	-	-	3.98	2.63	2.83	2.03	-	-

These wells (red color) will be excluded from next assessment year.

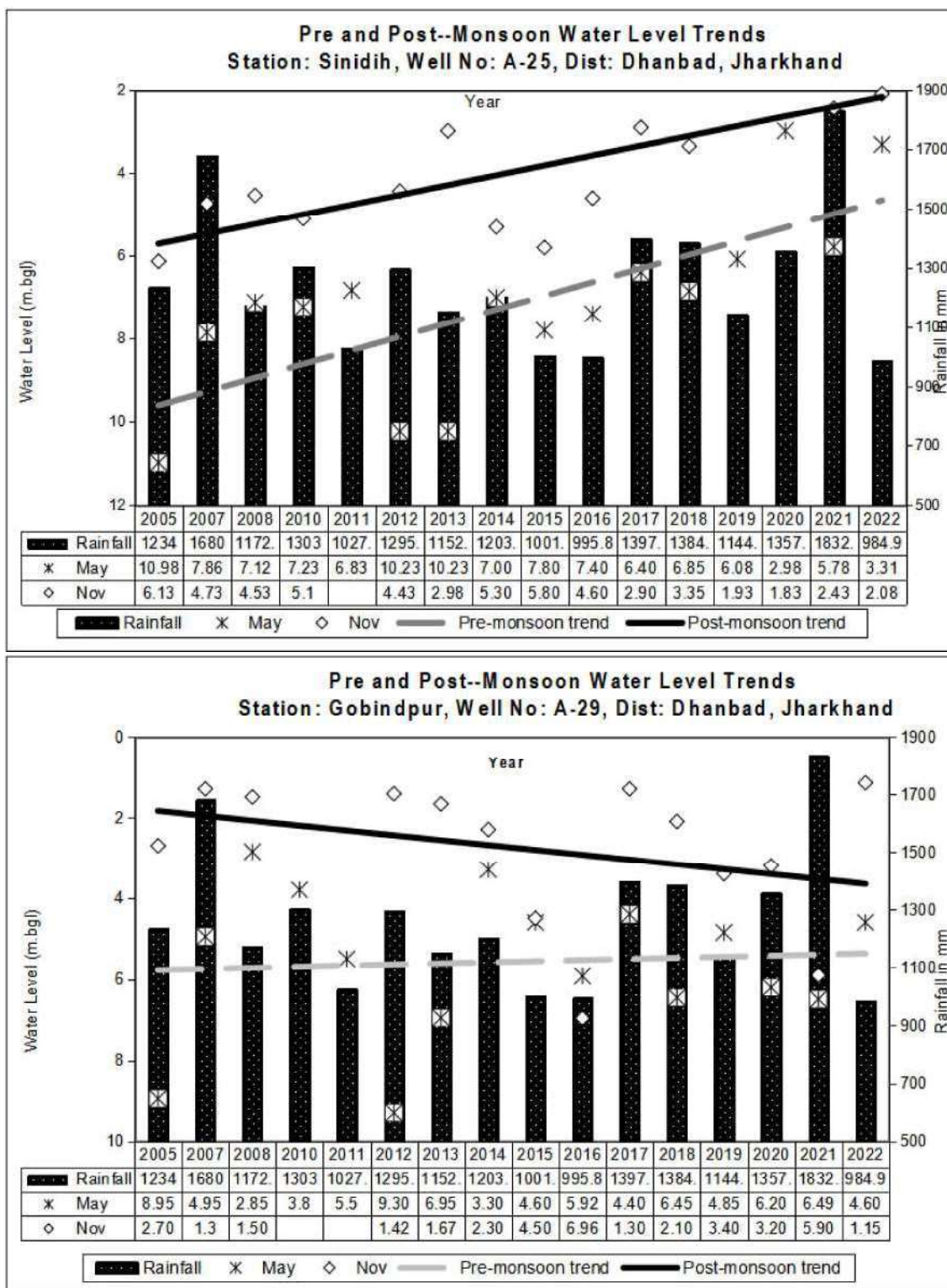
HYDROGRAPHS OF CLUSTER-I



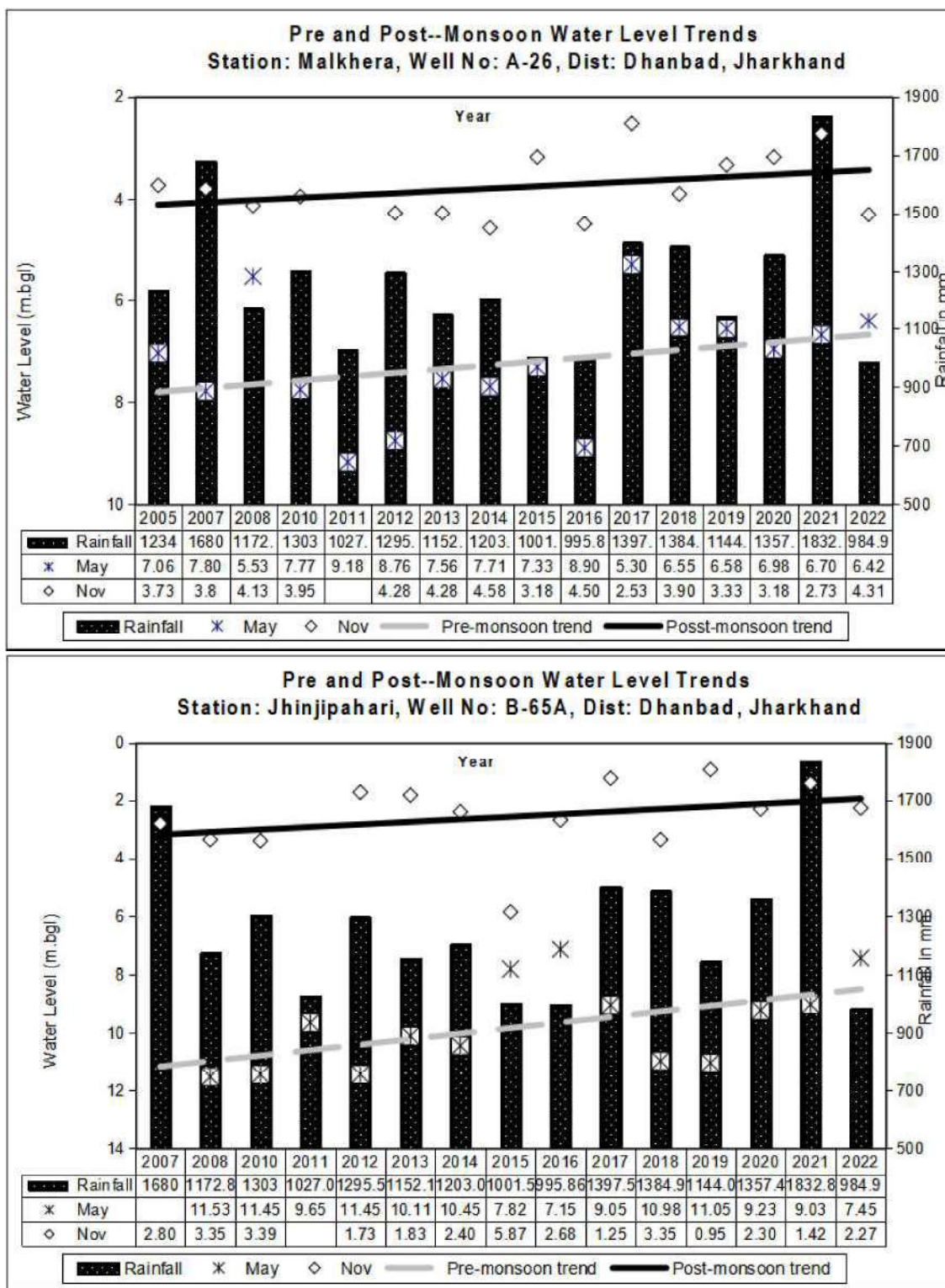
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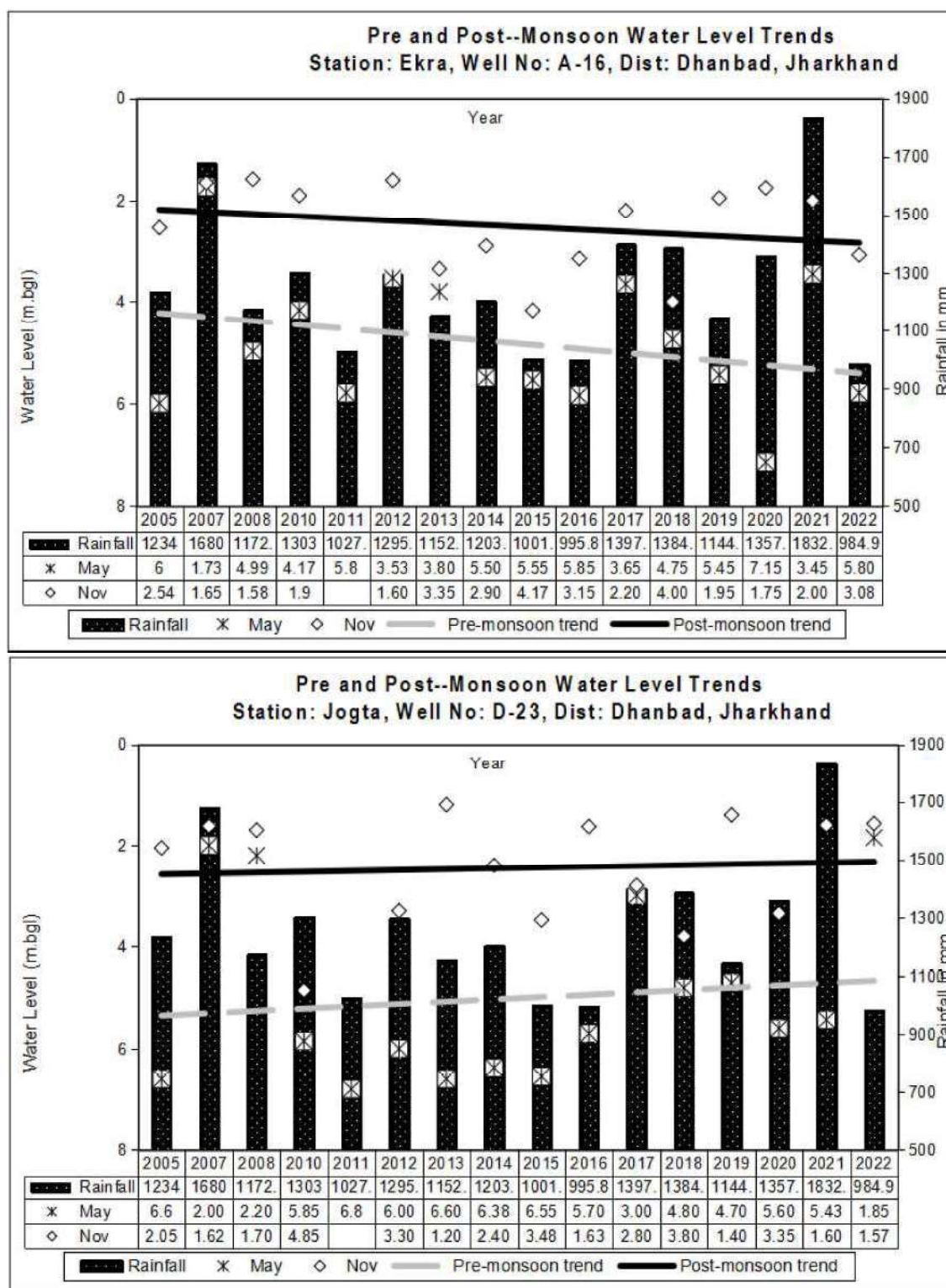
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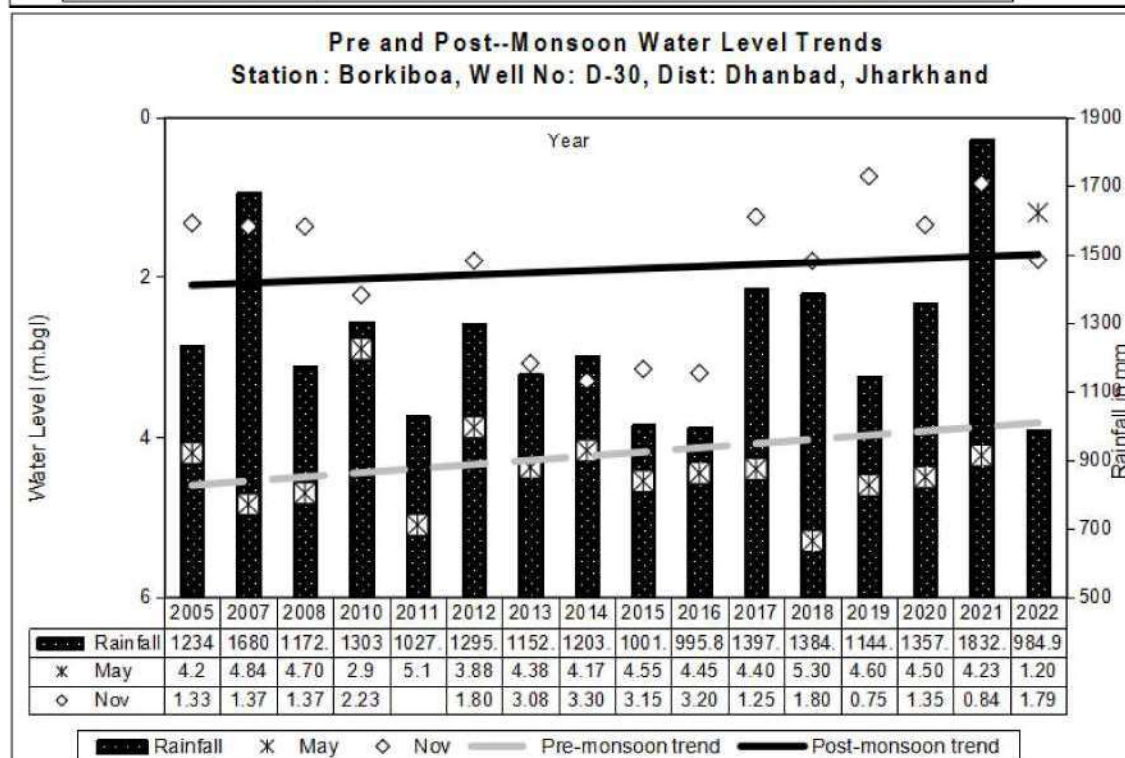
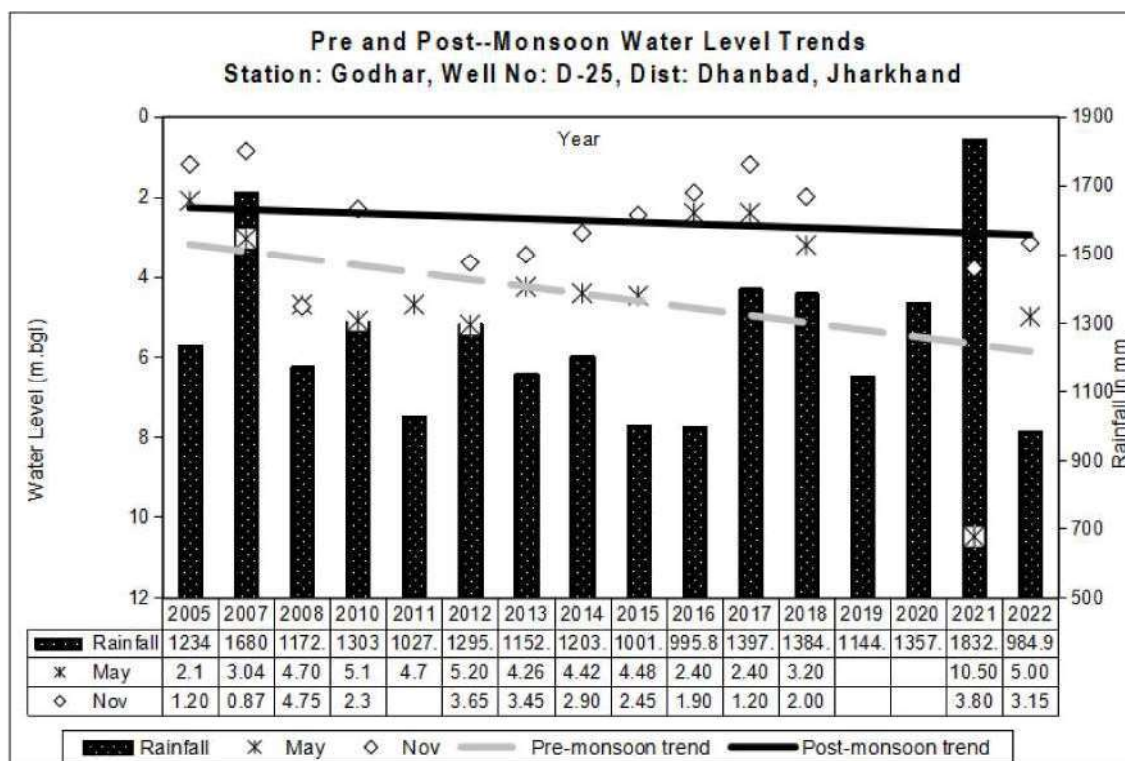
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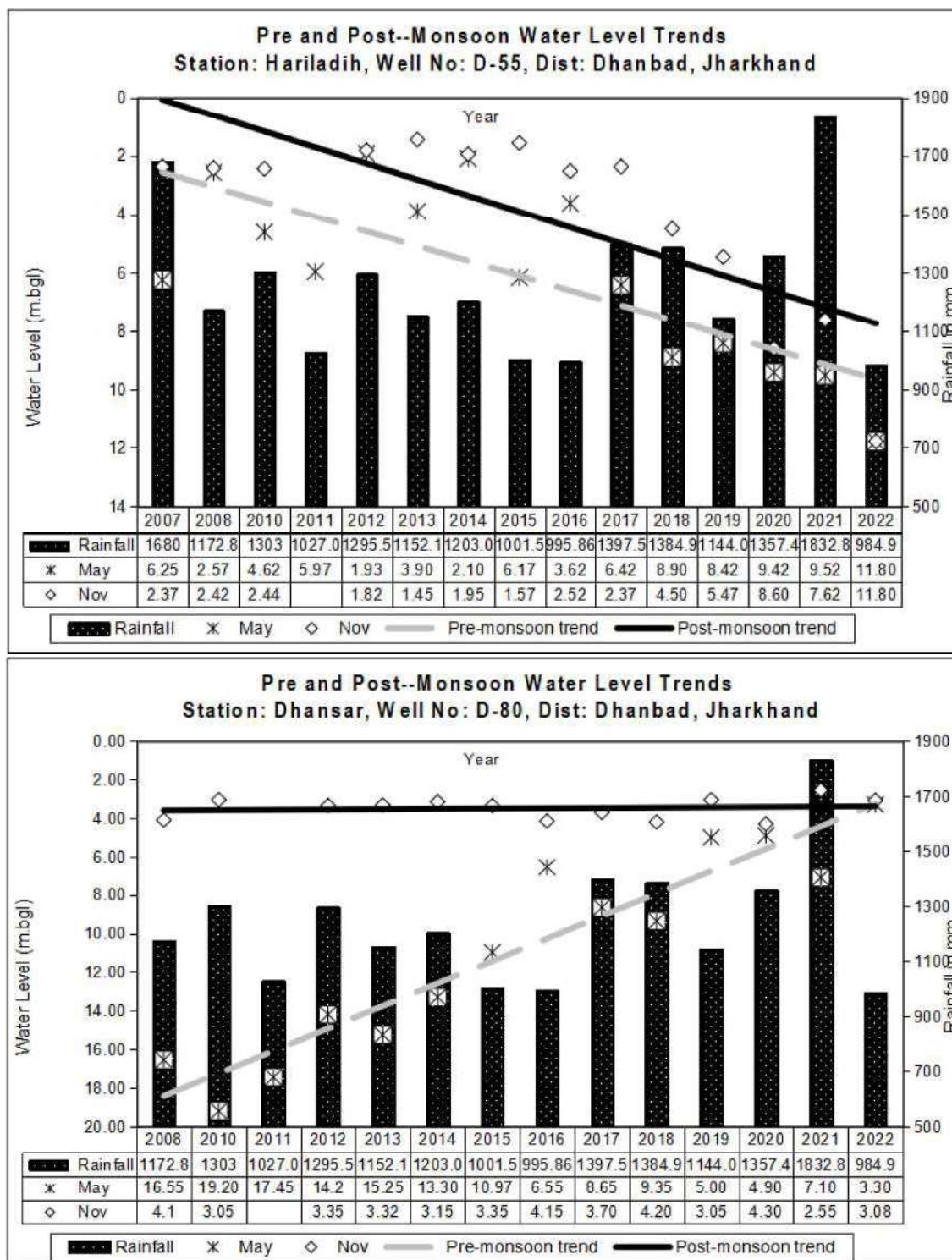
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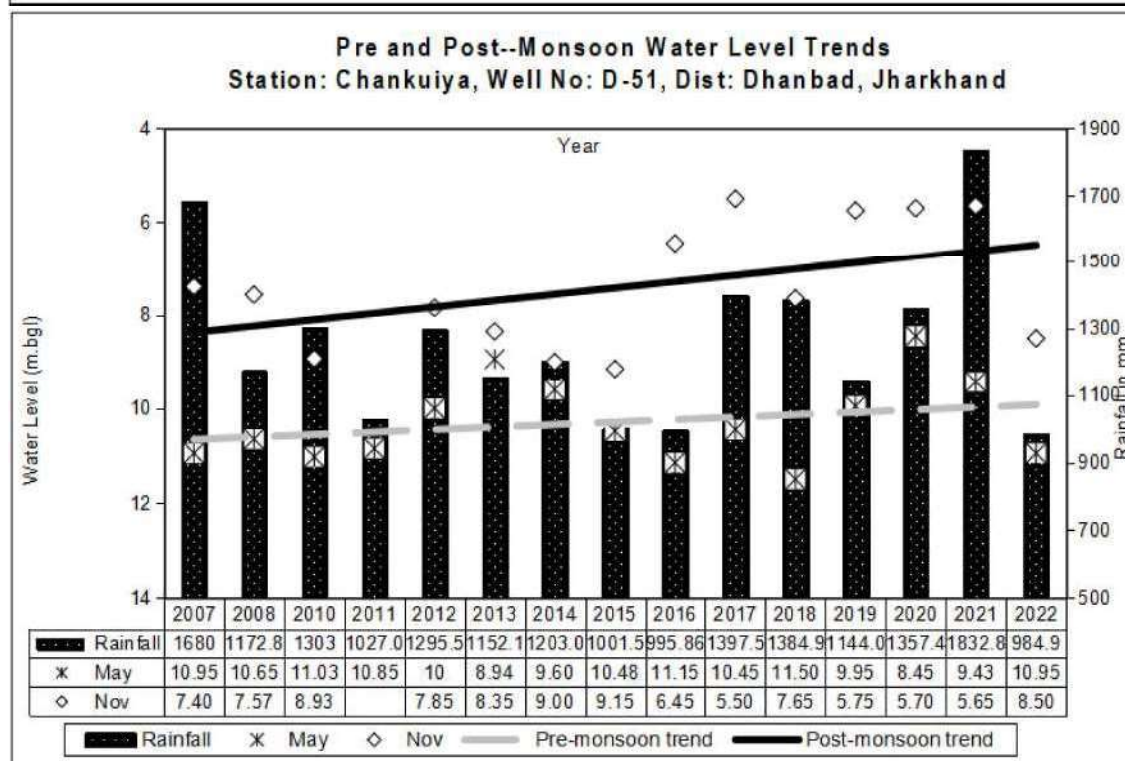
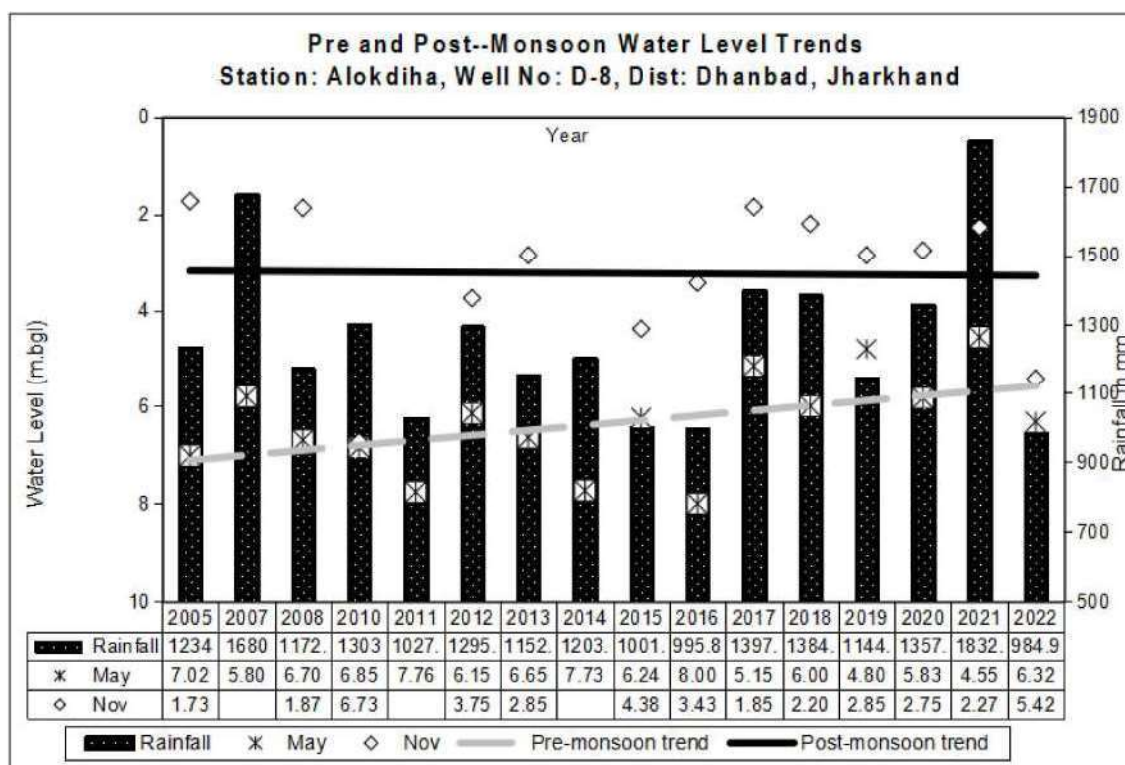
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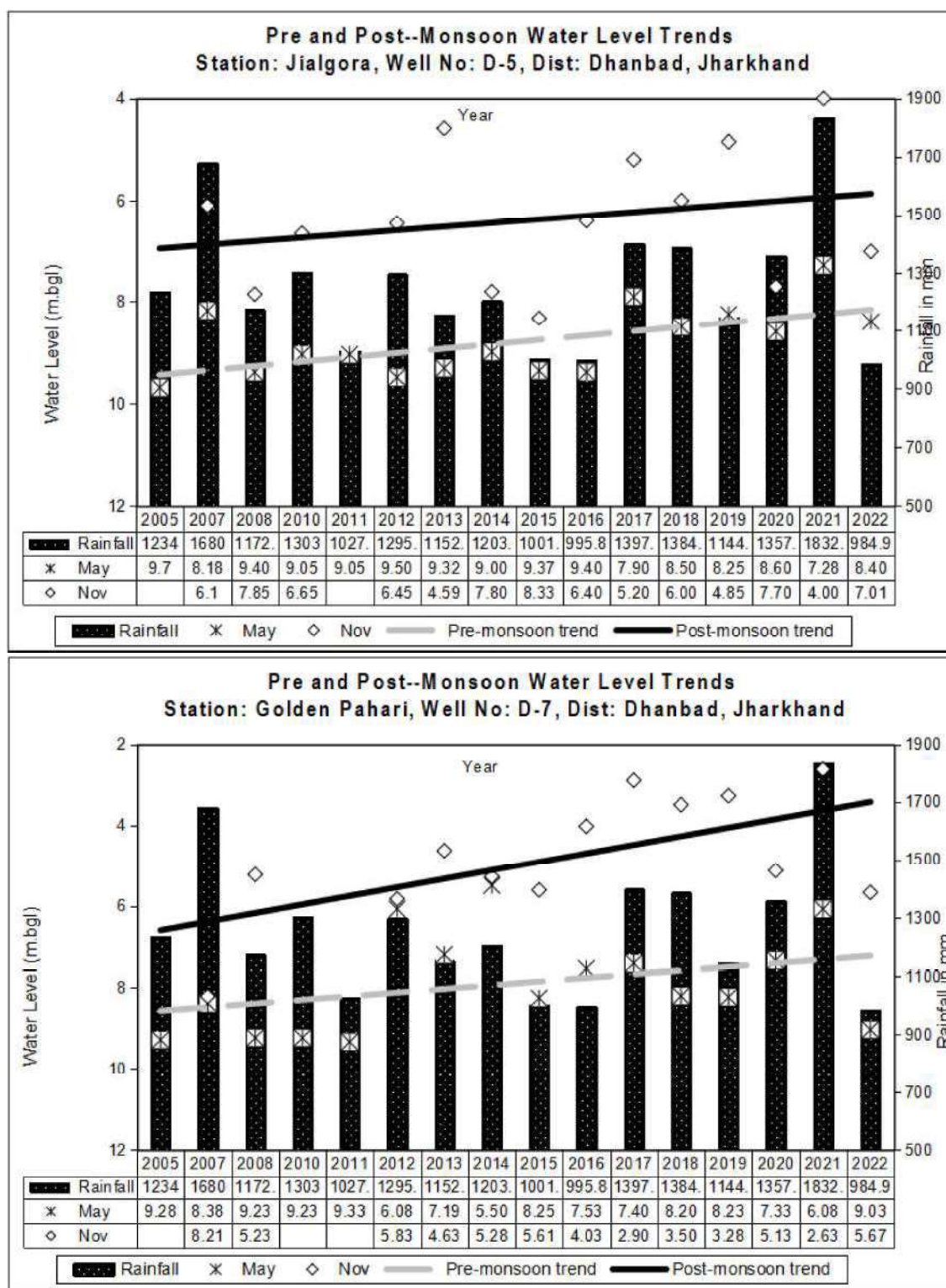
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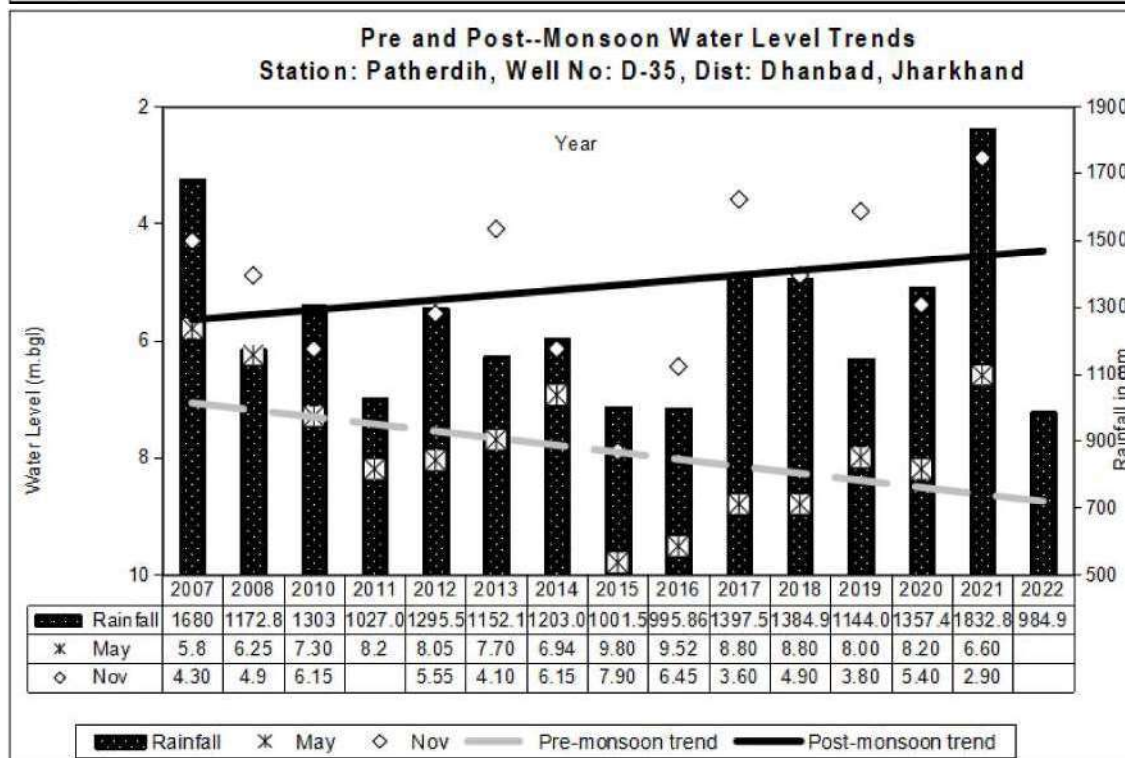
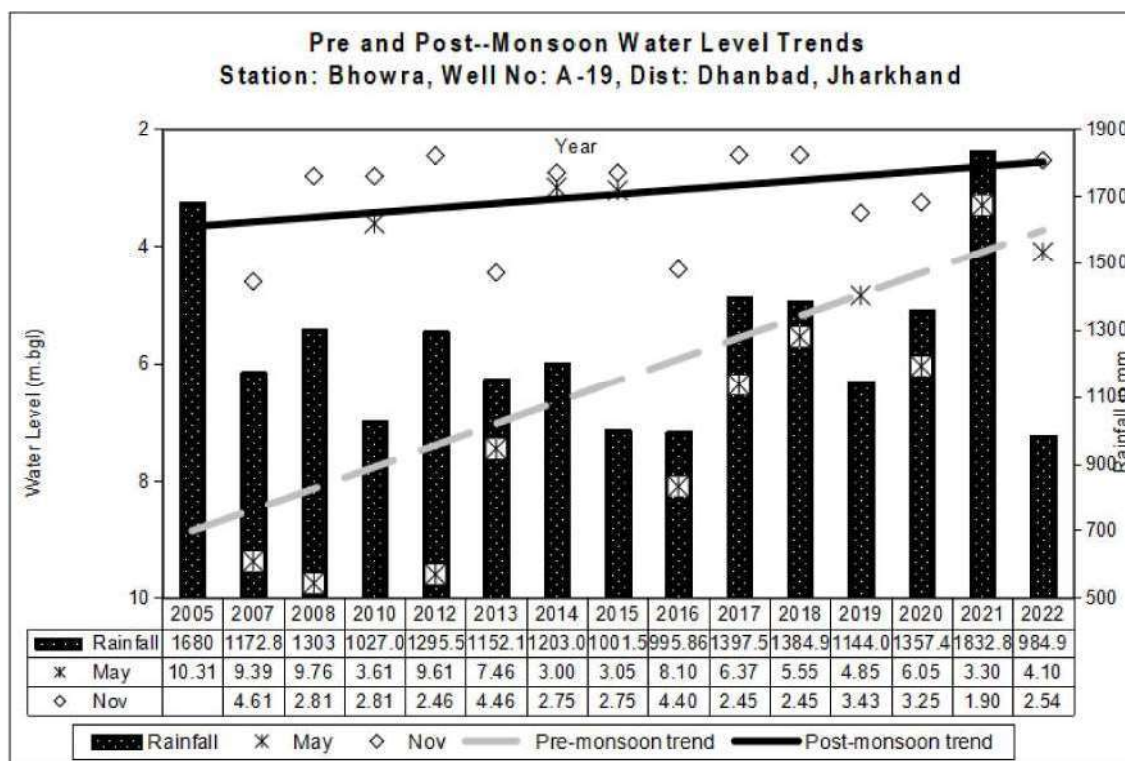
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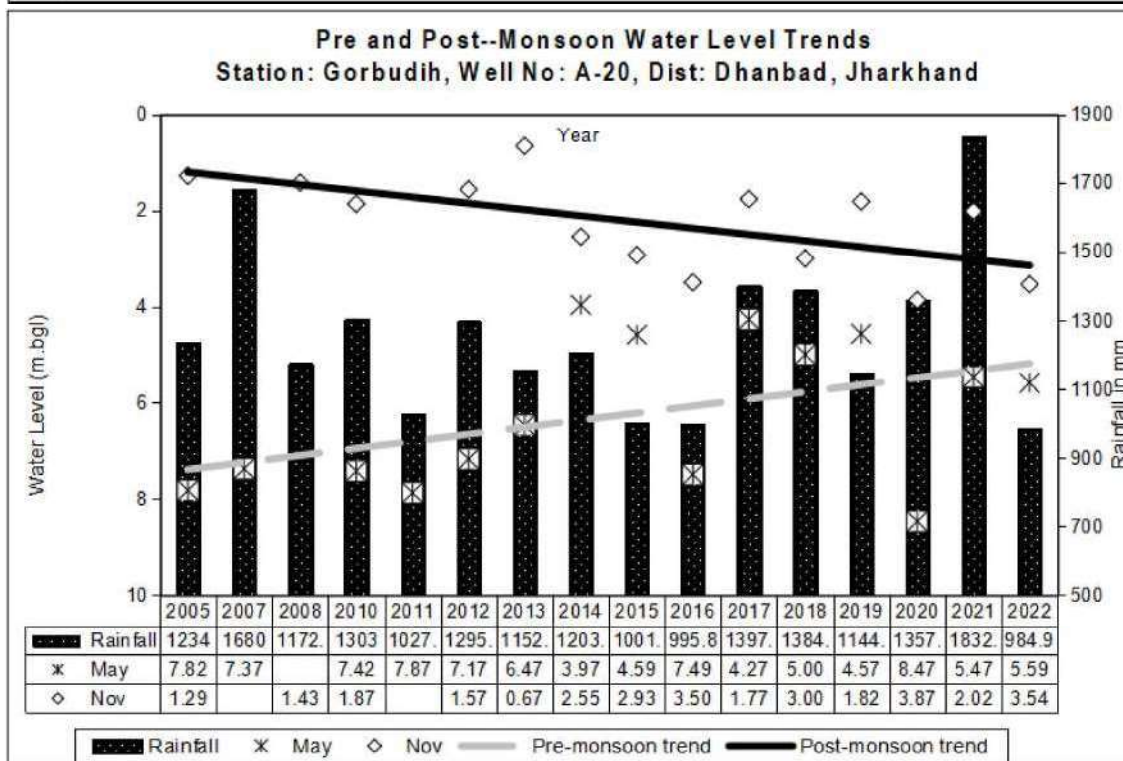
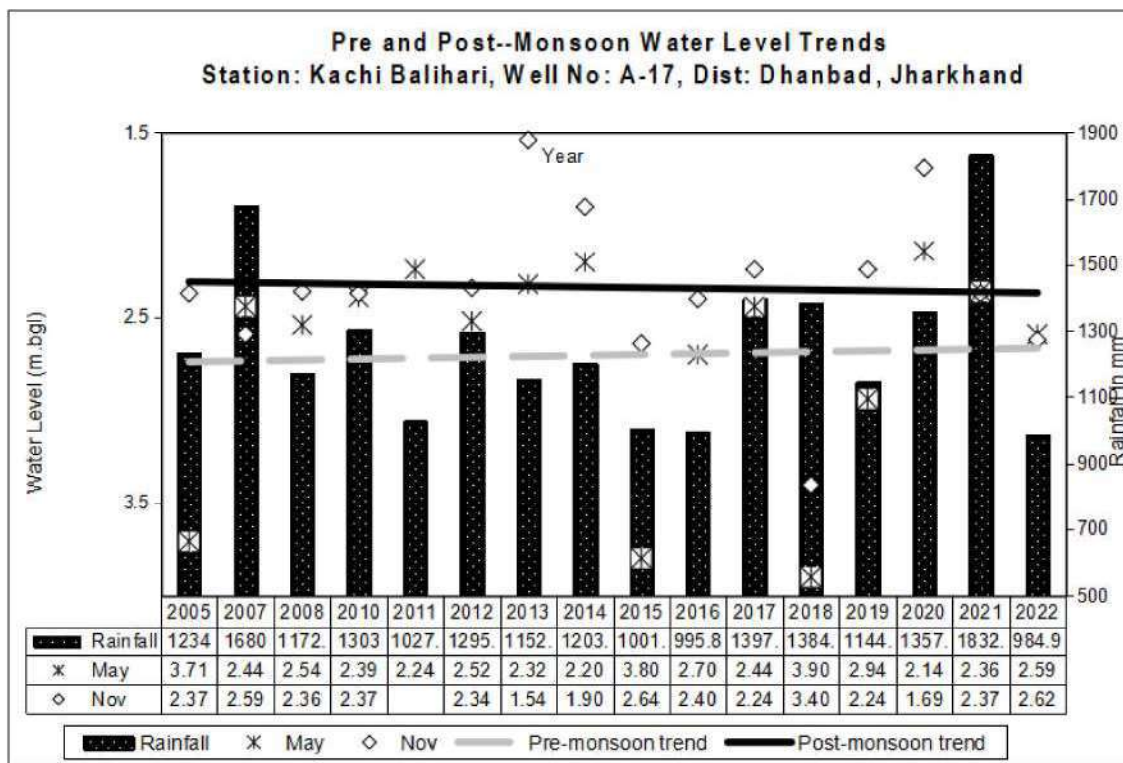
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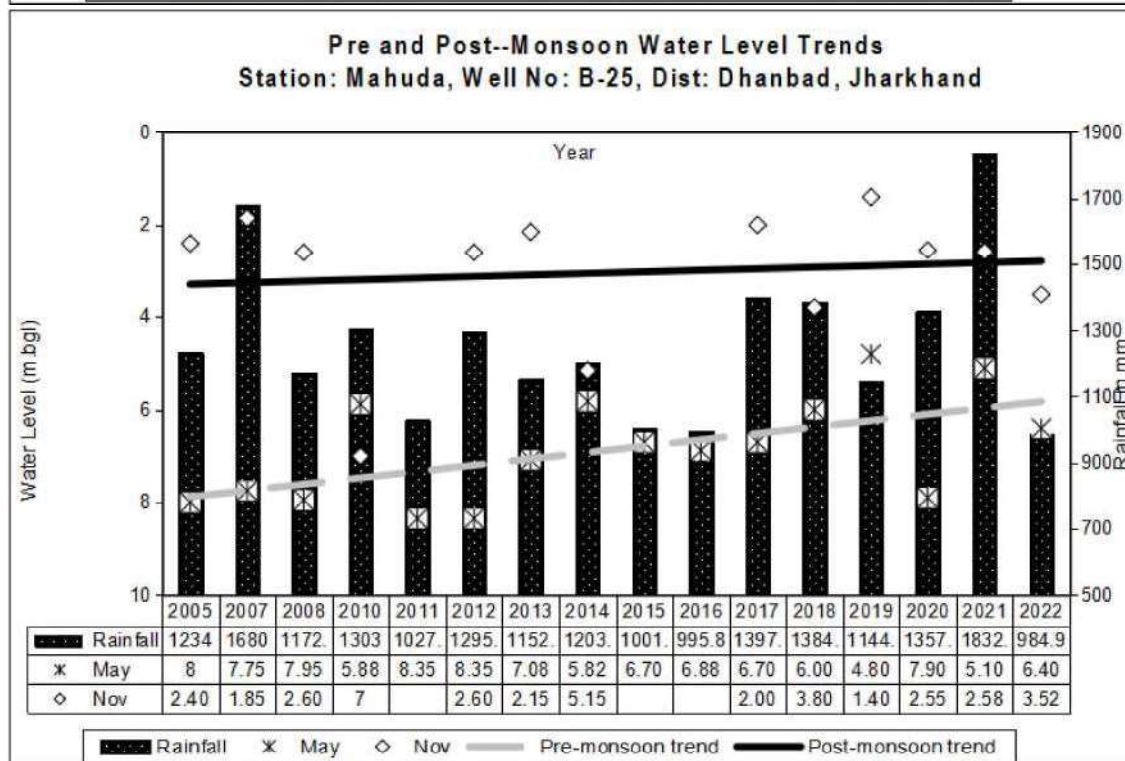
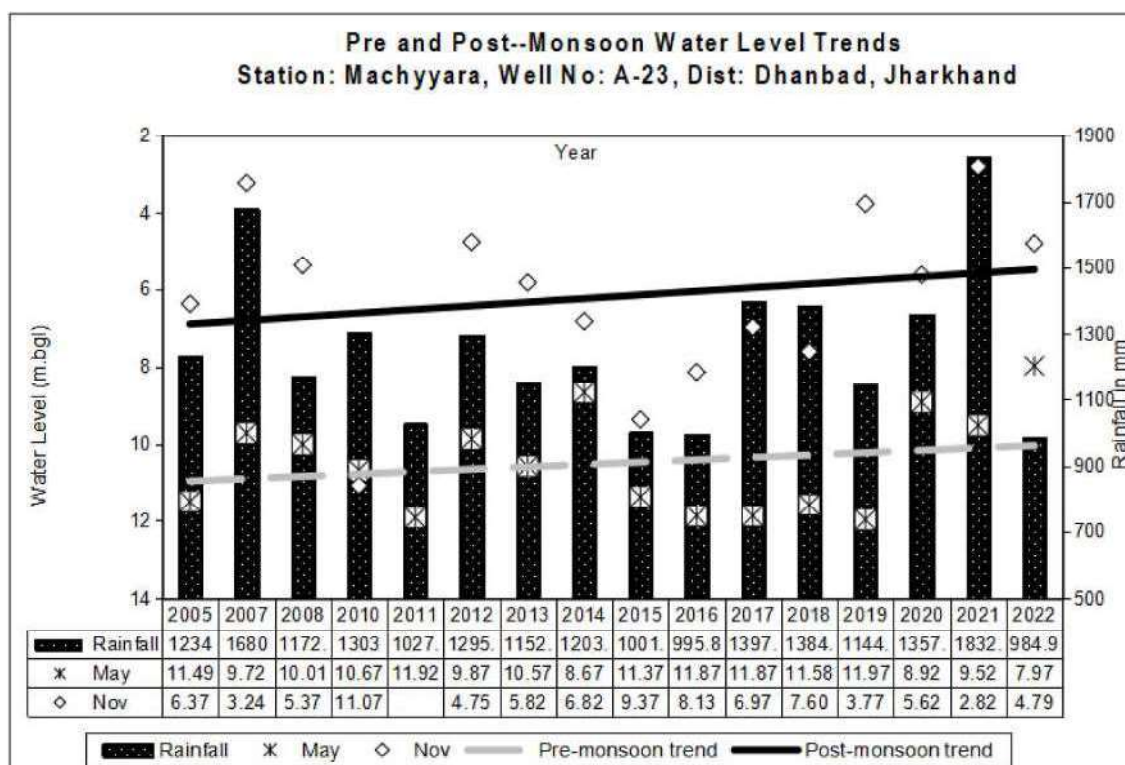
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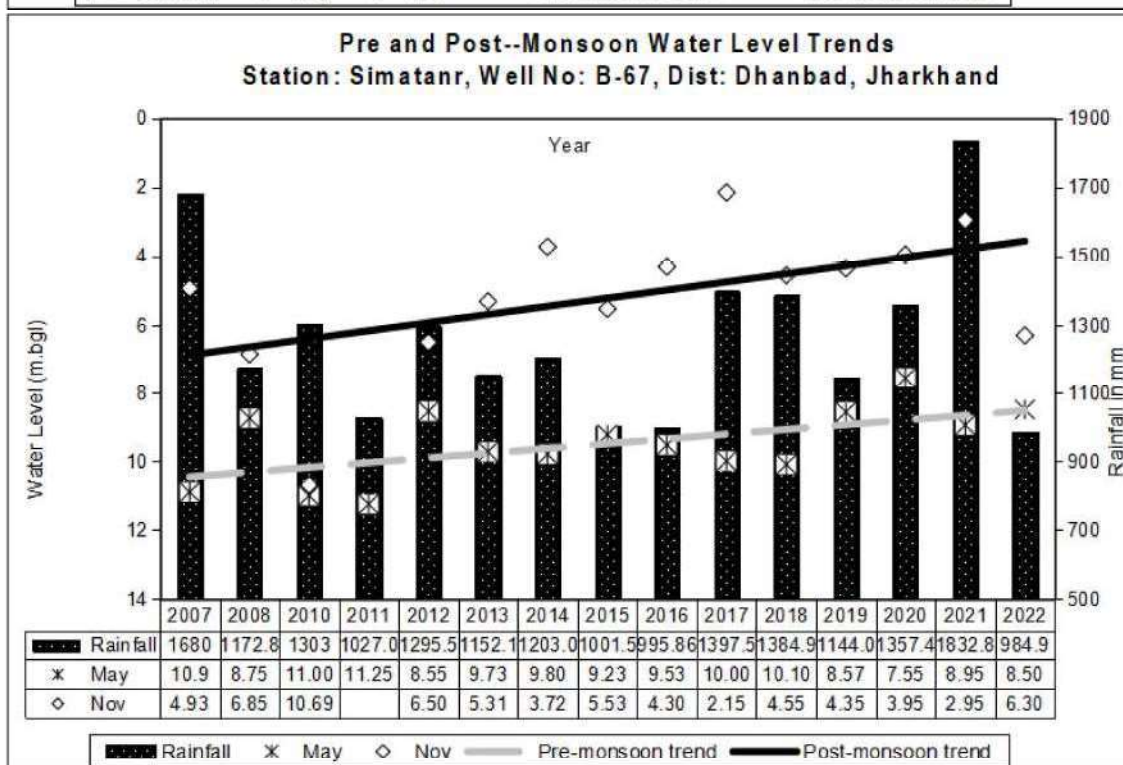
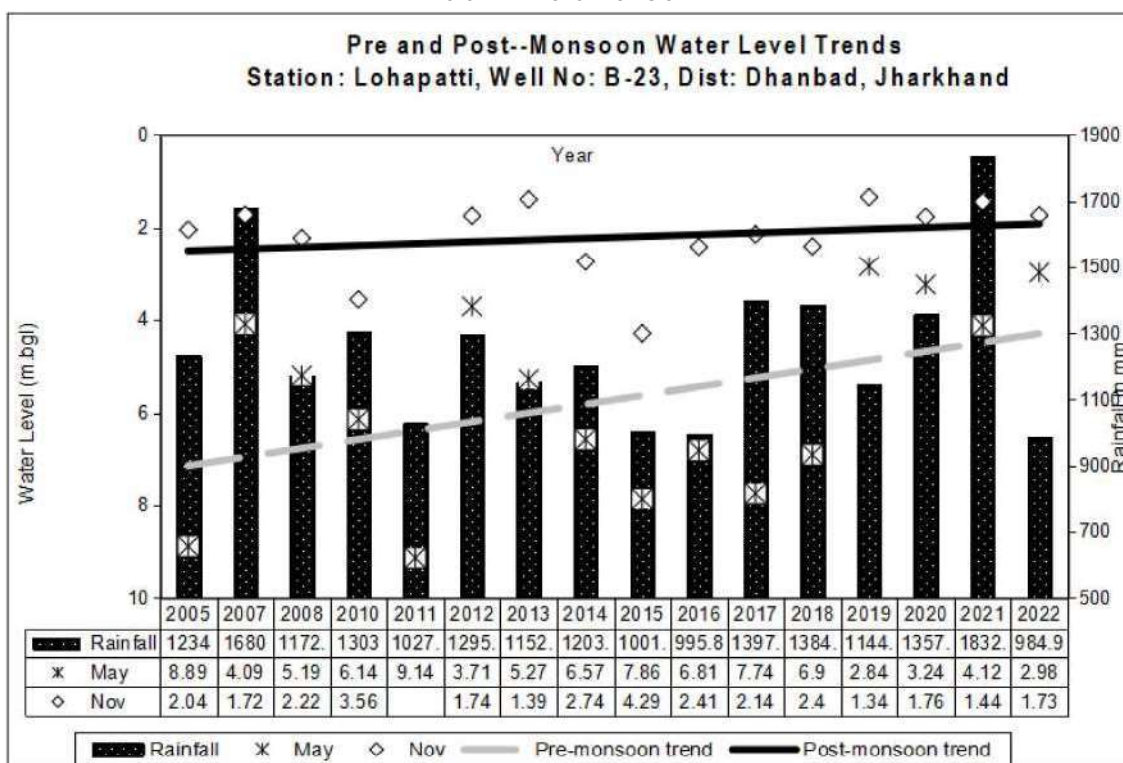
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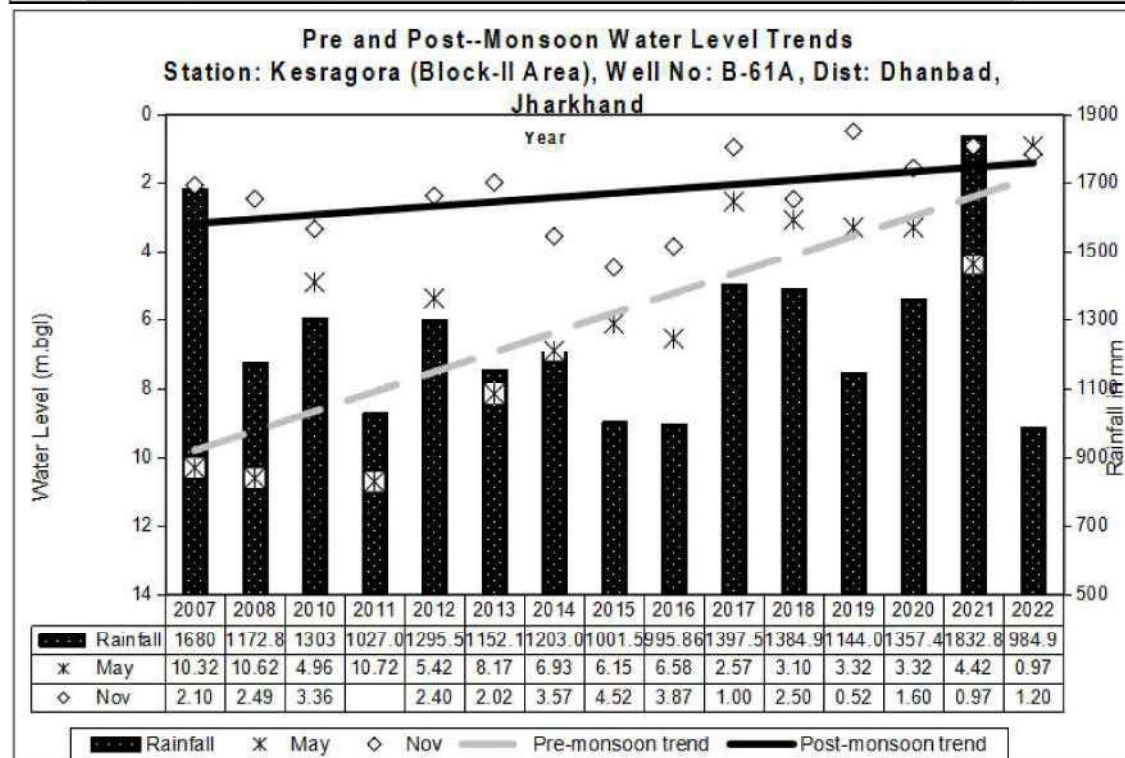
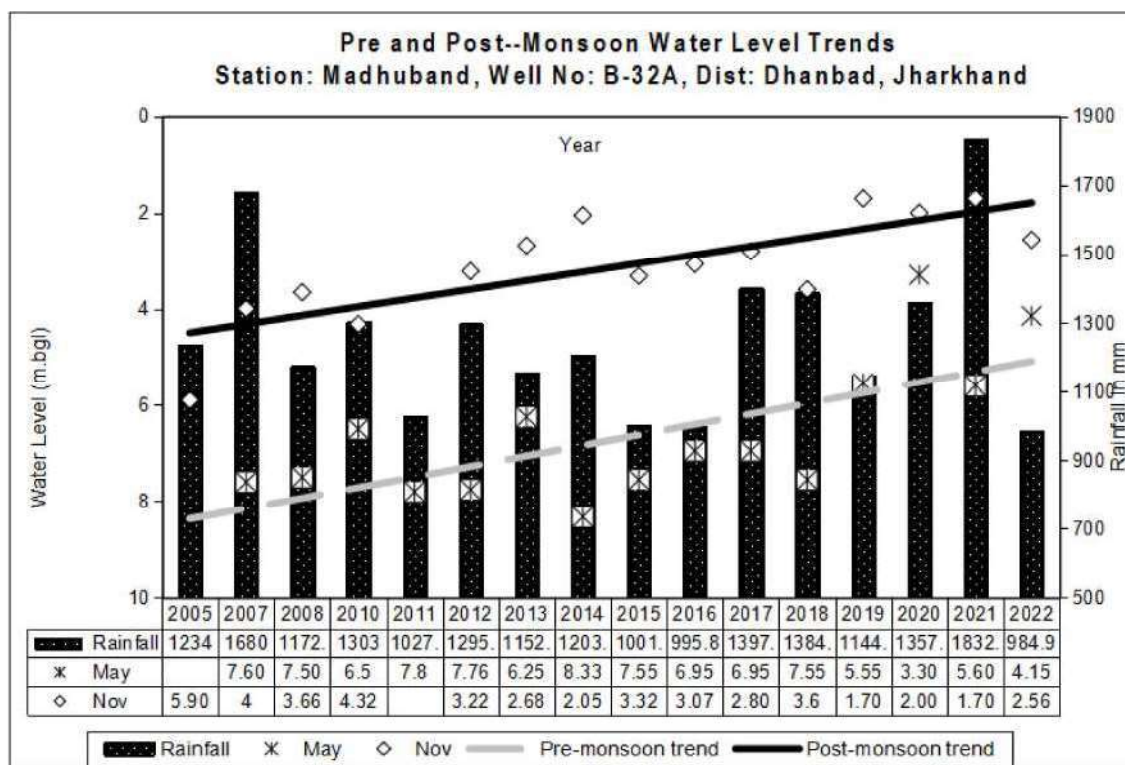
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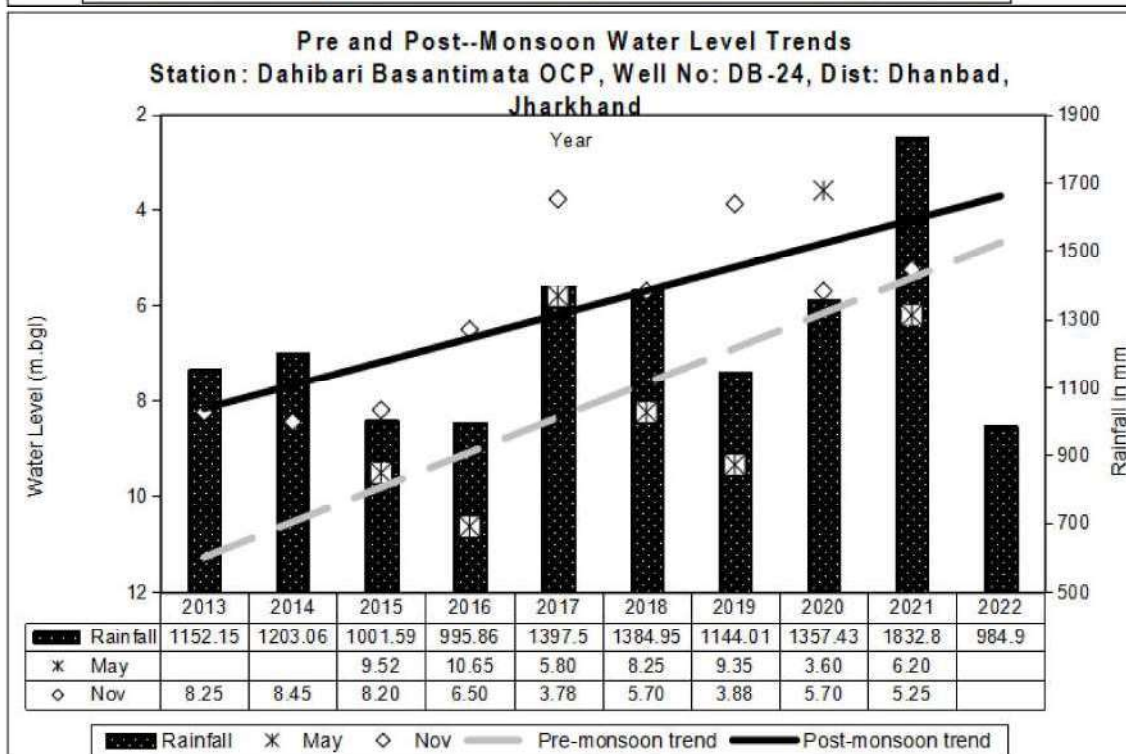
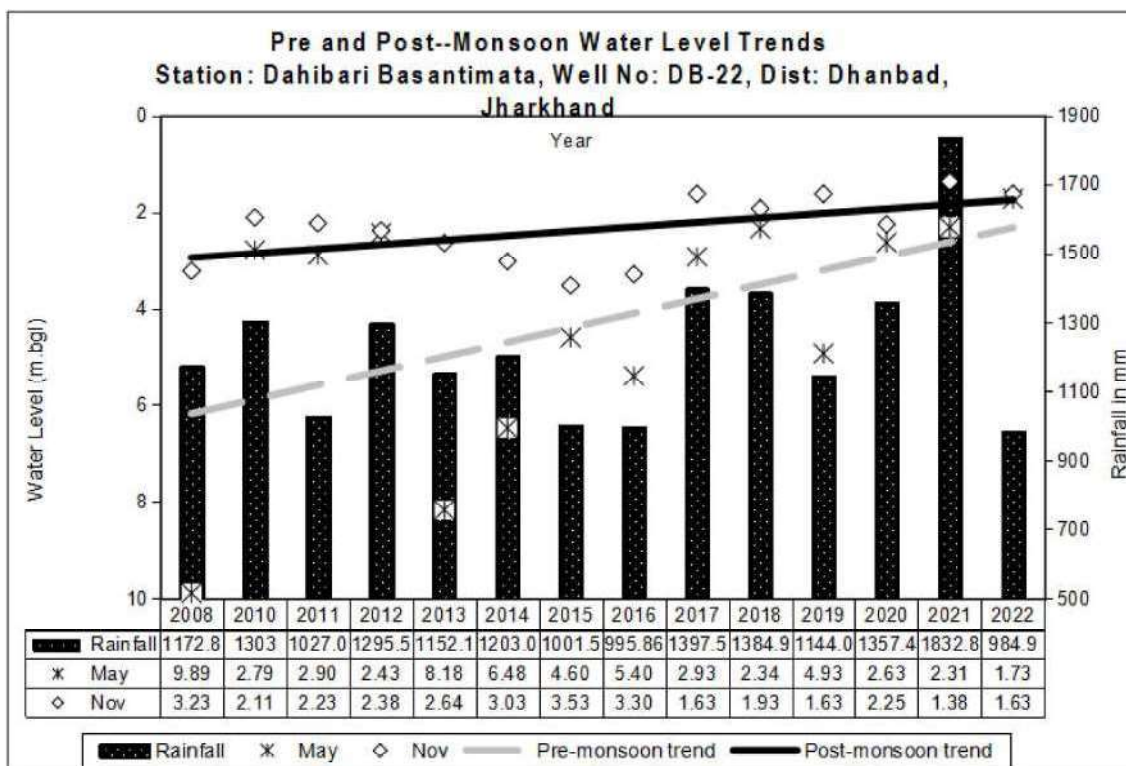
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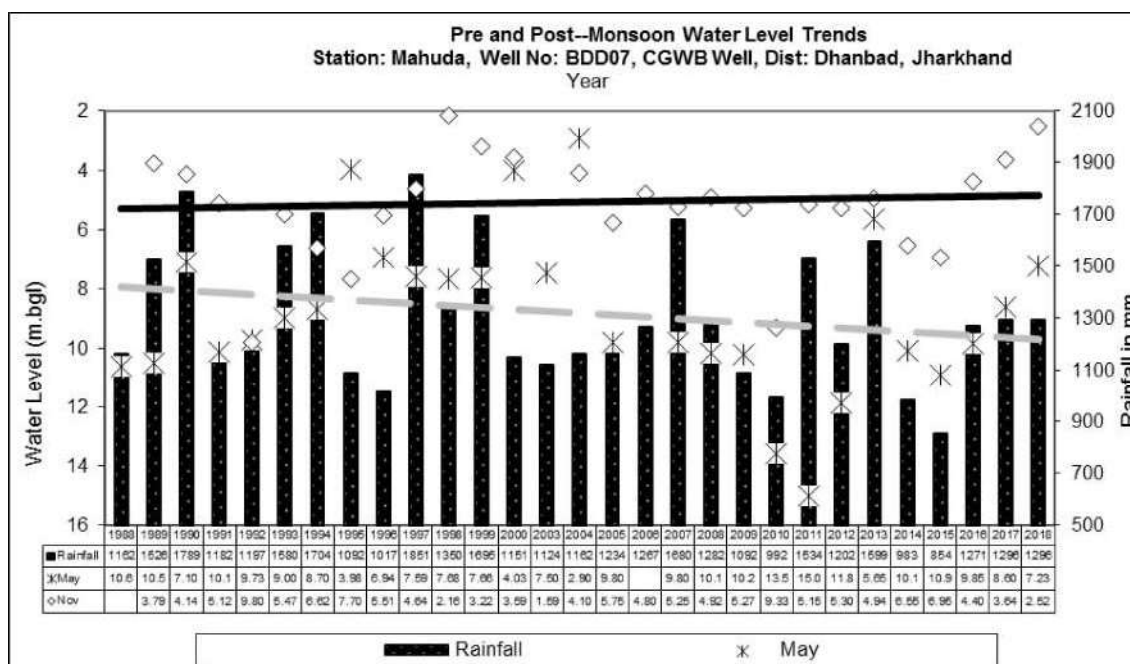
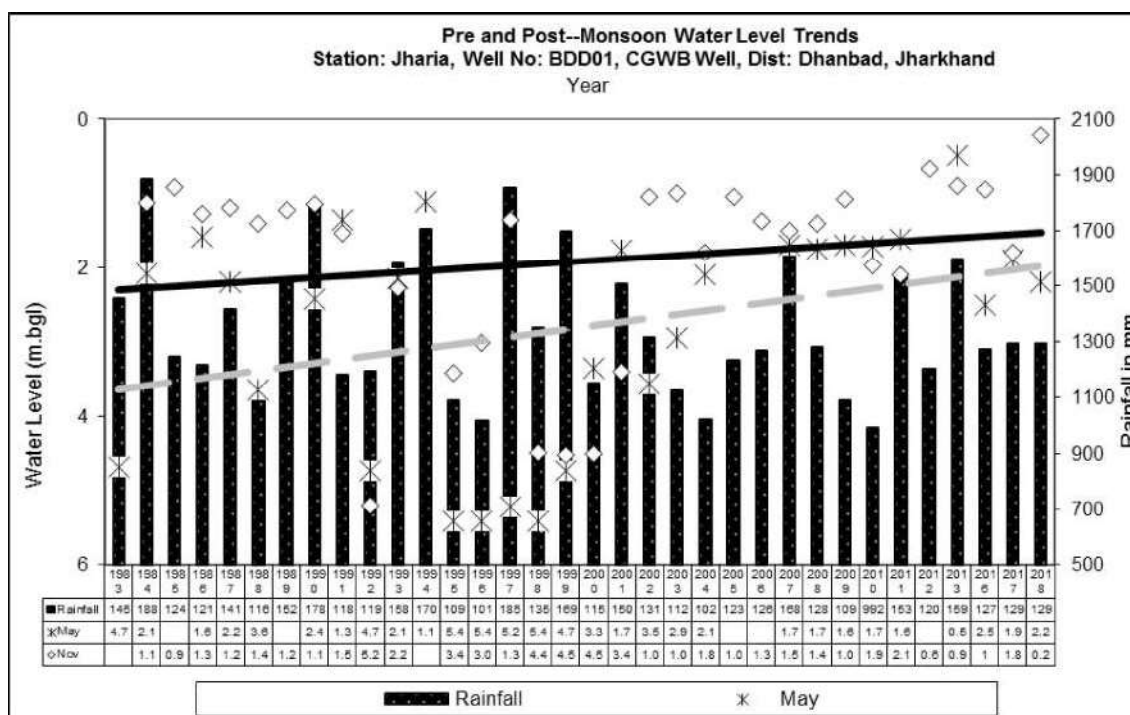
HYDROGRAPHS OF CLUSTER-XV



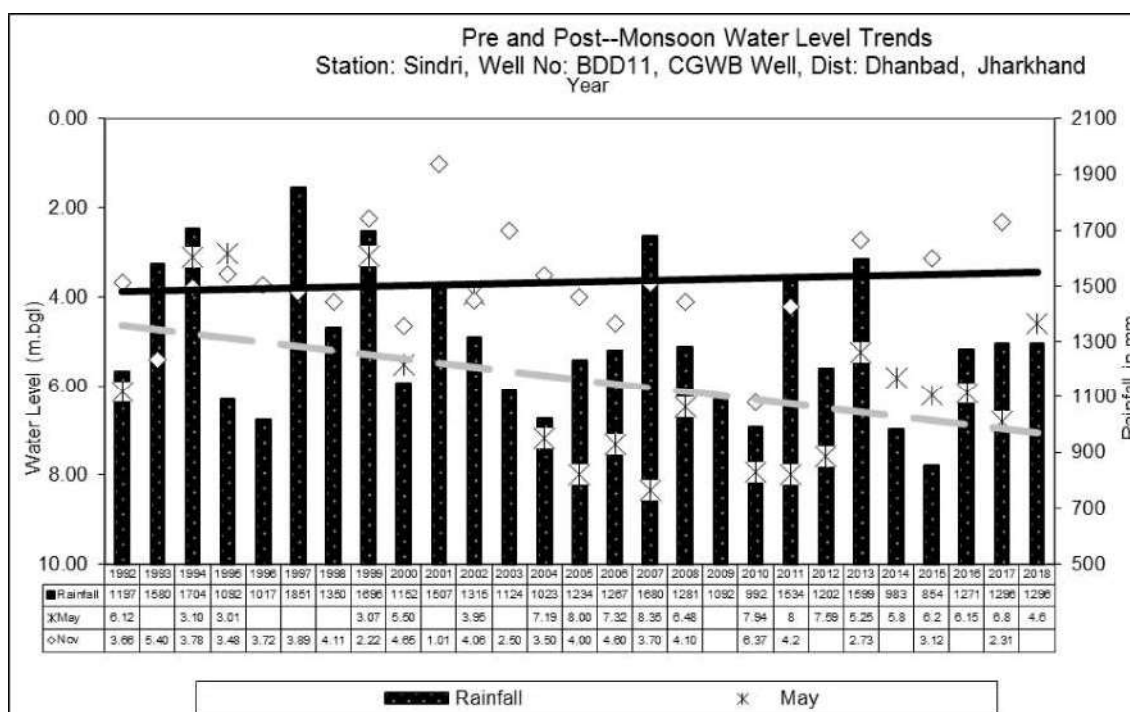
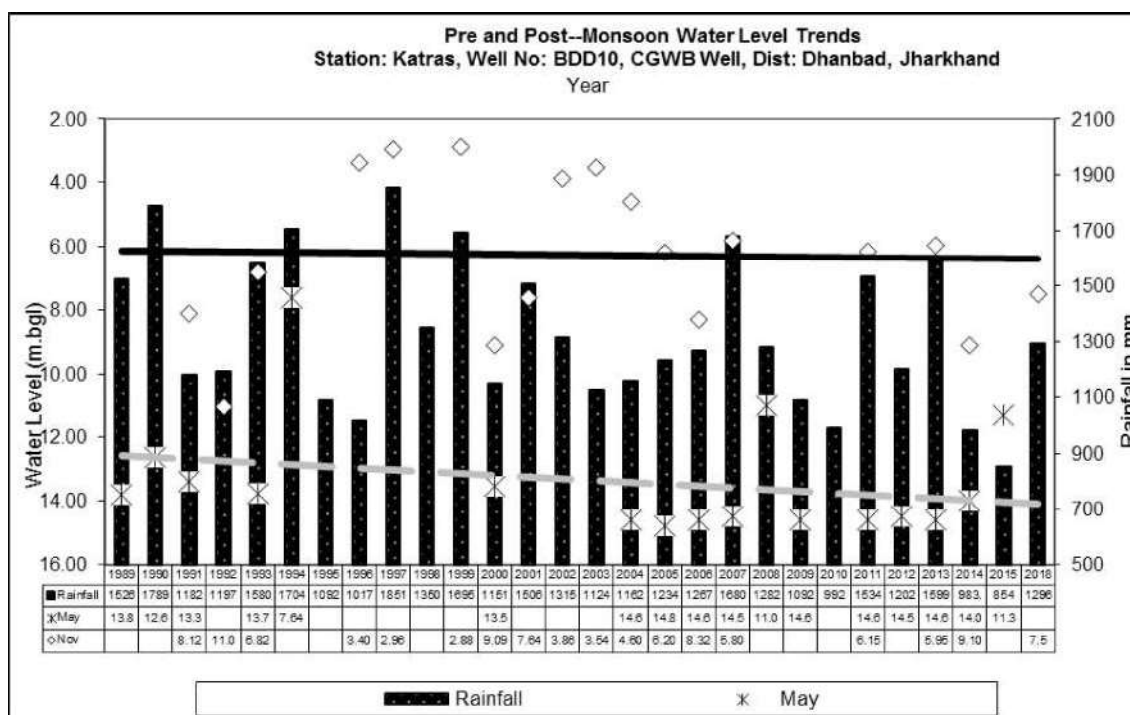
Annexure – VI **HYDROGRAPHS OF CLUSTER-XVI**



HYDROGRAPHS OF CGWB PERMANENT OBSERVATION STATIONS



HYDROGRAPHS OF CGWB PERMANENT OBSERVATION STATIONS



GROUNDWATER SAMPLE LOCATION DETAILS

Sampling month: June month of the assessment year of 2021-22

SI No	Name of Cluster	Ground Water Sample	Dug well (CMPDI)	Location	Sampling Date
					May-June'2022
1	CLUSTER-I	GW-1	B-15	BERA VILLAGE	25.05.2022
2	CLUSTER-II	GW-2	B-59	KHODOVALY VILLAGE	25.05.2022
3	CLUSTER-III	GW-3	A-29	GOVINDPUR,AMBAGAN VILLAGE	26.05.2022
4	CLUSTER-IV	GW-4	B-64	KESHALPUR, BATIGHAR	26.05.2022
5	CLUSTER-V	GW-5	D-30	BORKIBOA VILLAGE	26.05.2022
6	CLUSTER-VI	GW-6	D-25	GODHUR MORE	27.05.2022
7	CLUSTER-VII	GW-7	D-80	DHANSAR MINE RESCUE STN.	27.05.2022
8	CLUSTER-VIII	GW-8	D-49	NEAR GHANOODIH OC	27.05.2022
9	CLUSTER-IX	GW-9	D-5	JEALGORA, NEAR P.O.	28.05.2022
10	CLUSTER-X	GW-10	D-35	PATHERDIH RLY. COLONY	28.05.2022
11	CLUSTER-XI	GW-11	A-32	MONNIDIH BAZAR	28.05.2022
12	CLUSTER-XIII	GW-13	A-23	MACHHAYARA	28.05.2022
13	CLUSTER-XIV	GW-14	B-23	LOHAPATTI VILLAGE	28.05.2022
14	CLUSTER-XV	GW-15	B-32A	MADHUBAND VILLAGE	25.05.2022
15	CLUSTER-XVI	GW-16	DB-22	DAHIBARI,NICHE BASTI	17.06.2022

WATER QUALITY **(GROUND WATER- ALL PARAMETERS)**

Sl. No	Parameter	Sampling Stations			Detection Limit	IS:10500 Drinking Water Standards	Standard / Test Method
		GW1 25.05.2022	GW2 25.05.2022	GW3 26.05.2022			
1	Colour, Hazen unit	2	2	1	1	5	APHA, 23 rd Edition ,2120-c-Spectrophotometric Single Wavelength Method,2017
2	Calcium, mg/l	38	52	50	2	75	IS 3025, (Part 40): 1991 R:2019,AAS-Flame Method & EDTA Method
3	Chlorides, mg/l	24	28	26	5	250	IS-3025(Part 32):1988, R-2019 , Argentometric Method
4	Fluoride, mg/l	0.64	0.72	0.56	0.2	1	APHA, 23rd Edition, SPADNS Method
5	Iron, mg/l	<0.2	<0.2	<0.2	0.2	1	IS 3025 (Part 53) : 2003, R : 2019 , AAS-Flame Method
6	Manganese	<0.02	<0.02	<0.02	0.02	0.1	IS 3025 (Part 59) : 2006, R : 2019 , AAS-Flame Method
7	Nitrate , mg/l	6.64	5.32	10.44	0.5	45	APHA, 23rd Edition, UV-Spectrophotometric Method
8	Odour	Agreeable	Agreeable	Agreeable	Qualitative	Agreeable	APHA, 23rd Edition, , 2150-C
9	pH value	8.13	8.07	8.20	0.1	6.5-8.5	IS 3025, Part 11 : 1983 R 2017 Electrometric(pH Meter) Method
10	Sulphate, mg/l	48	52	42	10	200	APHA -23rd Edition, 4500 S , Turbidity Method
11	Taste	Acceptable	Acceptable	Acceptable	Qualitative	Acceptable	APHA,23rd Edition, 2160-C
12	Total Alkalinity (CaCO ₃), mg/l, Max	108	136	141	4	200	IS 3025, Part 23: 1986 R 2019 Titration Method
13	Total Dissolved Solids, mg/l	250	262	244	25	500	IS 3025, Part 16: 1984 R 2017 Gravimetric method
14	Total Hardness, mg/l	206	215	204	4	200	IS 3025, (Part 21): 2019 EDTA Method
15	Turbidity, NTU	1	1	1	0.1	1	IS 3025, (Part 10):1984, R-2017 Nephelometric/Turbidimetric Method
16	Zinc, mg/l	<0.1	<0.1	<0.1	0.1	5	IS 3025(Part 49) : 1994,R:2019, AAS-Flame Method
17	Boron (as B), mg/l, Max	<0.2	<0.2	<0.2	0.2	0.5	APHA, 23rd Edition ,Carmine
18	Copper (as Cu), mg/l, Max	<0.03	<0.03	<0.03	0.01	0.05	IS 3025 Part 42 : 1992 R : 2019, AAS-Flame APHA, 23rd Edition, AAS-GTA
19	Free Residual Chlorine, mg/l, Min	<0.04	<0.04	<0.04	0.04	0.2	APHA, 23rd Edition, , 4500-Cl- B, (Iodometric Method-I)
20	Lead (as Pb), mg/l, Max	<0.005	<0.005	<0.005	0.005	0.01	IS:3025(Part 47):1994 (Reaffirmed 2019) APHA, 23rd Edition, AAS-GTA
21	Phenolic compounds (as C ₆ H ₅ OH), mg/l, Max	<0.001	<0.001	<0.001	0.001	0.002	APHA, 22nd Edition,4-Amino Antipyrine
22	Selenium, mg/l, Max	<0.007	<0.007	<0.007	0.007	0.01	APHA 23rd Edition IS-3025,part 56:2003, R-2019/, AAS-VGA
23	Total Arsenic (as As), mg/l, Max	<0.006	<0.006	<0.006	0.006	0.01	IS-3025,part 37:1988, R-2019/ APHA 23rd Edition AAS-VGA
24	Total Chromium (as Cr), mg/l, Max	<0.04	<0.04	<0.04	0.01	0.05	IS-3025 Part 52:2003, R:2019,AAS-Flame APHA, 23rd Edition, AAS-GTA
25	Nickel as Ni, mg/l Max	<0.01	<0.01	<0.01	0.005	0.02	IS 3025 Part 54 : 2003,R : 2019, AAS-Flame APHA, 23rd Edition, AAS-GTA

WATER QUALITY

(GROUND WATER- ALL PARAMETERS)

Sl. No	Parameter	Sampling Stations			Detection Limit	IS:10500 Drinking Water Standards	Standard / Test Method
		GW4 26.05.2022	GW5 26.05.2022	GW6 27.05.2022			
1	Colour, Hazen unit	4	1	2	1	5	APHA, 23 rd Edition ,2120-c-Spectrophotometric Single Wavelength Method,2017
2	Calcium, mg/l	38	152	60	2	75	IS 3025, (Part 40): 1991 R:2019,AAS-Flame Method & EDTA Method
3	Chlorides, mg/l	22	92	36	5	250	IS-3025(Part 32):1988, R-2019 , Argentometric Method
4	Fluoride, mg/l	0.61	0.66	0.77	0.2	1	APHA, 23 rd Edition, SPADNS Method
5	Iron, mg/l	<0.2	<0.2	<0.2	0.2	1	IS 3025 (Part 53) : 2003, R : 2019 , AAS-Flame Method
6	Manganese	<0.02	<0.02	<0.02	0.02	0.1	IS 3025 (Part 59) : 2006, R : 2019 , AAS-Flame Method
7	Nitrate , mg/l	12.21	34.06	15.26	0.5	45	APHA, 23 rd Edition, UV-Spectrophotometric Method
8	Odour	Agreeable	Agreeable	Agreeable	Qualitative	Agreeable	APHA, 23 rd Edition, , 2150-C
9	pH value	7.82	8.06	7.84	0.1	6.5-8.5	IS 3025, Part 11 : 1983 R 2017 Electrometric(pH Meter) Method
10	Sulphate, mg/l	42	134	58	10	200	APHA -23 rd Edition, 4500 S , Turbidity Method
11	Taste	Acceptable	Acceptable	Acceptable	Qualitative	Acceptable	APHA,23 rd Edition, 2160-C
12	Total Alkalinity (CaCO ₃), mg/l, Max	114	92	110	4	200	IS 3025, Part 23: 1986 R 2019 Titration Method
13	Total Dissolved Solids, mg/l	204	750	246	25	500	IS 3025, Part 16: 1984 R 2017 Gravimetric method
14	Total Hardness, mg/l	162	666	220	4	200	IS 3025, (Part 21): 2019 EDTA Method
15	Turbidity, NTU	3	1	1	0.1	1	IS 3025, (Part 10):1984, R-2017 Nephelometric/Turbiditometric Method
16	Zinc, mg/l	<0.1	<0.1	<0.1	0.1	5	IS 3025(Part 49) : 1994,R:2019, AAS-Flame Method
17	Boron (as B), mg/l, Max	<0.2	<0.2	<0.2	0.2	0.5	APHA, 23 rd Edition ,Carmine
18	Copper (as Cu), mg/l, Max	<0.03	<0.03	<0.03	0.01	0.05	IS 3025 Part 42 : 1992 R : 2019, AAS-Flame APHA, 23 rd Edition, AAS-GTA
19	Free Residual Chlorine, mg/l, Min	<0.04	<0.04	<0.04	0.04	0.2	APHA, 23 rd Edition, , 4500-Cl- B. (Iodometric Method-I)
20	Lead (as Pb), mg/l, Max	<0.005	<0.005	<0.005	0.005	0.01	IS:3025(Part 47):1994 (Reaffirmed 2019) APHA, 23 rd Edition, AAS-GTA
21	Phenolic compounds (as C ₆ H ₅ OH), mg/l, Max	<0.001	<0.001	<0.001	0.001	0.002	APHA, 22 nd Edition,4-Amino Autipyrine
22	Selenium, mg/l, Max	<0.007	<0.007	<0.007	0.007	0.01	APHA 23 rd Edition IS-3025,part 56:2003, R-2019/, AAS-VGA
23	Total Arsenic (as As), mg/l, Max	<0.006	<0.006	<0.006	0.006	0.01	IS-3025,part 37:1988, R-2019/ APHA 23 rd Edition AAS-VGA
24	Total Chromium (as Cr), mg/l, Max	<0.04	<0.04	<0.04	0.01	0.05	IS-3025 Part 52:2003, R:2019,AAS-Flame APHA, 23 rd Edition, AAS-GTA
25	Nickel as Ni, mg/l Max	<0.01	<0.01	<0.01	0.005	0.02	IS 3025 Part 54 : 2003,R : 2019, AAS-Flame APHA, 23 rd Edition, AAS-GTA

WATER QUALITY

(GROUND WATER- ALL PARAMETERS)

Sl. No	Parameter	Sampling Stations			Detection Limit	IS:10500 Drinking Water Standards	Standard / Test Method
		GW7 27.05.2022	GW8 27.05.2022	GW9 28.05.2022			
1	Colour, Hazen unit	3	2	1	1	5	APHA, 23 rd Edition ,2120-c-Spectrophotometric Single Wavelength Method,2017
2	Calcium, mg/l	56	58	132	2	75	IS 3025, (Part 40): 1991 R:2019,AAS-Flame Method & EDTA Method
3	Chlorides, mg/l	32	28	62	5	250	IS-3025(Part 32):1988, R-2019 , Argentometric Method
4	Fluoride, mg/l	0.54	0.81	0.63	0.2	1	APHA, 23 rd Edition, SPADNS Method
5	Iron, mg/l	<0.2	<0.2	<0.2	0.2	1	IS 3025 (Part 53) : 2003, R : 2019 , AAS-Flame Method
6	Manganese	<0.02	<0.02	<0.02	0.02	0.1	IS 3025 (Part 59) : 2006, R : 2019 , AAS-Flame Method
7	Nitrate , mg/l	15.64	8.32	28.44	0.5	45	APHA, 23 rd Edition, UV-Spectrophotometric Method
8	Odour	Agreeable	Agreeable	Agreeable	Qualitative	Agreeable	APHA, 23 rd Edition, , 2150-C
9	pH value	7.92	8.06	8.21	0.1	6.5-8.5	IS 3025, Part 11 : 1983 R 2017 Electrometric(pH Meter) Method
10	Sulphate, mg/l	66	42	164	10	200	APHA -23 rd Edition, 4500 S , Turbidity Method
11	Taste	Acceptable	Acceptable	Acceptable	Qualitative	Acceptable	APHA,23 rd Edition, 2160-C
12	Total Alkalinity (CaCO ₃), mg/l, Max	82	126	92	4	200	IS 3025, Part 23: 1986 R 2019 Titration Method
13	Total Dissolved Solids, mg/l	262	198	764	25	500	IS 3025, Part 16: 1984 R 2017 Gravimetric method
14	Total Hardness, mg/l	176	152	648	4	200	IS 3025, (Part 21): 2019 EDTA Method
15	Turbidity, NTU	2	1	2	0.1	1	IS 3025, (Part 10):1984, R-2017 Nephelometric/Turbiditometric Method
16	Zinc, mg/l	<0.1	<0.1	<0.1	0.1	5	IS 3025(Part 49) : 1994,R:2019, AAS-Flame Method
17	Boron (as B), mg/l, Max	<0.2	<0.2	<0.2	0.2	0.5	APHA, 23 rd Edition ,Carmine
18	Copper (as Cu), mg/l, Max	<0.03	<0.03	<0.03	0.01	0.05	IS 3025 Part 42 : 1992 R : 2019, AAS-Flame APHA, 23 rd Edition, AAS-GTA
19	Free Residual Chlorine, mg/l, Min	<0.04	<0.04	<0.04	0.04	0.2	APHA, 23 rd Edition, , 4500-Cl- B. (Iodometric Method-I)
20	Lead (as Pb), mg/l, Max	<0.005	<0.005	<0.005	0.005	0.01	IS:3025(Part 47):1994 (Reaffirmed 2019) APHA, 23 rd Edition, AAS-GTA
21	Phenolic compounds (as C ₆ H ₅ OH), mg/l, Max	<0.001	<0.001	<0.001	0.001	0.002	APHA, 22 nd Edition,4-Amino Autipyrine
22	Selenium, mg/l, Max	<0.007	<0.007	<0.007	0.007	0.01	APHA 23 rd Edition IS-3025,part 56:2003, R-2019/, AAS-VGA
23	Total Arsenic (as As), mg/l, Max	<0.006	<0.006	<0.006	0.006	0.01	IS-3025,part 37:1988, R-2019/ APHA 23 rd Edition AAS-VGA
24	Total Chromium (as Cr), mg/l, Max	<0.04	<0.04	<0.04	0.01	0.05	IS-3025 Part 52:2003, R:2019,AAS-Flame APHA, 23 rd Edition, AAS-GTA
25	Nickel as Ni, mg/l Max	<0.01	<0.01	<0.01	0.005	0.02	IS 3025 Part 54 : 2003,R : 2019, AAS-Flame APHA, 23 rd Edition, AAS-GTA

WATER QUALITY

(GROUND WATER- ALL PARAMETERS)

Sl. No	Parameter	Sampling Stations			Detection Limit	IS:10500 Drinking Water Standards	Standard / Test Method
		GW10 28.05.2022	GW11 28.05.2022	GW13 28.05.2022			
1	Colour, Hazen unit	3	1	1	1	5	APHA, 23 rd Edition, 2120-c-Spectrophotometric Single Wavelength Method, 2017
2	Calcium, mg/l	48	38	172	2	75	IS 3025, (Part 40): 1991 R:2019, AAS-Flame Method & EDTA Method
3	Chlorides, mg/l	40	28	106	5	250	IS-3025(Part 32):1988, R-2019, Argentometric Method
4	Fluoride, mg/l	0.72	0.61	0.72	0.2	1	APHA, 23 rd Edition, SPADNS Method
5	Iron, mg/l	<0.2	<0.2	<0.2	0.2	1	IS 3025 (Part 53) : 2003, R : 2019, AAS-Flame Method
6	Manganese	<0.02	<0.02	<0.02	0.02	0.1	IS 3025 (Part 59) : 2006, R : 2019, AAS-Flame Method
7	Nitrate, mg/l	18.92	12.03	7.77	0.5	45	APHA, 23 rd Edition, UV-Spectrophotometric Method
8	Odour	Agreeable	Agreeable	Agreeable	Qualitative	Agreeable	APHA, 23 rd Edition, 2150-C
9	pH value	8.02	7.98	8.02	0.1	6.5-8.5	IS 3025, Part 11 : 1983 R 2017 Electrometric (pH Meter) Method
10	Sulphate, mg/l	82	46	178	10	200	APHA -23 rd Edition, 4500 S, Turbidity Method
11	Taste	Acceptable	Acceptable	Acceptable	Qualitative	Acceptable	APHA, 23 rd Edition, 2160-C
12	Total Alkalinity (CaCO ₃), mg/l, Max	102	142	94	4	200	IS 3025, Part 23: 1986 R 2019 Titration Method
13	Total Dissolved Solids, mg/l	264	194	764	25	500	IS 3025, Part 16: 1984 R 2017 Gravimetric method
14	Total Hardness, mg/l	188	154	656	4	200	IS 3025, (Part 21): 2019 EDTA Method
15	Turbidity, NTU	3	3	1	0.1	1	IS 3025, (Part 10):1984, R-2017 Nephelometric/Turbidimetric Method
16	Zinc, mg/l	<0.1	<0.1	<0.1	0.1	5	IS 3025(Part 49) : 1994, R:2019, AAS-Flame Method
17	Boron (as B), mg/l, Max	<0.2	<0.2	<0.2	0.2	0.5	APHA, 23 rd Edition, Carmine
18	Copper (as Cu), mg/l, Max	<0.03	<0.03	<0.03	0.01	0.05	IS 3025 Part 42 : 1992 R : 2019, AAS-Flame APHA, 23 rd Edition, AAS-GTA
19	Free Residual Chlorine, mg/l, Min	<0.04	<0.04	<0.04	0.04	0.2	APHA, 23 rd Edition, 4500-Cl- B. (Iodometric Method-I)
20	Lead (as Pb), mg/l, Max	<0.005	<0.005	<0.005	0.005	0.01	IS:3025(Part 47):1994 (Reaffirmed 2019) APHA, 23 rd Edition, AAS-GTA
21	Phenolic compounds (as C ₆ H ₅ OH), mg/l, Max	<0.001	<0.001	<0.001	0.001	0.002	APHA, 22 nd Edition, 4-Amino Autipyrine
22	Selenium, mg/l, Max	<0.007	<0.007	<0.007	0.007	0.01	APHA 23 rd Edition IS-3025, part 56:2003, R-2019/, AAS-VGA
23	Total Arsenic (as As), mg/l, Max	<0.006	<0.006	<0.006	0.006	0.01	IS-3025, part 37:1988, R-2019/ APHA 23 rd Edition AAS-VGA
24	Total Chromium (as Cr), mg/l, Max	<0.04	<0.04	<0.04	0.01	0.05	IS-3025 Part 52:2003, R:2019, AAS-Flame APHA, 23 rd Edition, AAS-GTA
25	Nickel as Ni, mg/l Max	<0.01	<0.01	<0.01	0.005	0.02	IS 3025 Part 54 : 2003, R : 2019, AAS-Flame APHA, 23 rd Edition, AAS-GTA

WATER QUALITY **(GROUND WATER- ALL PARAMETERS)**

Sl. No	Parameter	Sampling Stations			Detection Limit	IS:10500 Drinking Water Standards	Standard / Test Method
		GW14 28.05.2022	GW15 25.05.2022	GW16 17.06.2022			
1	Colour, Hazen unit	2	2	2	1	5	APHA, 23 rd Edition, 2120-c-Spectrophotometric Single Wavelength Method, 2017
2	Calcium, mg/l	40	172	103	2	75	IS 3025, (Part 40): 1991 R:2019, AAS-Flame Method & EDTA Method
3	Chlorides, mg/l	54	102	54	5	250	IS-3025(Part 32):1988, R-2019, Argentometric Method
4	Fluoride, mg/l	0.56	0.41	0.61	0.2	1	APHA, 23 rd Edition, SPADNS Method
5	Iron, mg/l	<0.2	<0.2	<0.2	0.2	1	IS 3025 (Part 53) : 2003, R : 2019, AAS-Flame Method
6	Manganese	<0.02	<0.02	<0.02	0.02	0.1	IS 3025 (Part 59) : 2006, R : 2019, AAS-Flame Method
7	Nitrate, mg/l	8.03	7.85	14.61	0.5	45	APHA, 23 rd Edition, UV-Spectrophotometric Method
8	Odour	Agreeable	Agreeable	Agreeable	Qualitative	Agreeable	APHA, 23 rd Edition, 2150-C
9	pH value	8.12	8.11	7.92	0.1	6.5-8.5	IS 3025, Part 11 : 1983 R 2017 Electrometric (pH Meter) Method
10	Sulphate, mg/l	48	144	132	10	200	APHA -23 rd Edition, 4500 S, Turbidity Method
11	Taste	Acceptable	Acceptable	Acceptable	Qualitative	Acceptable	APHA, 23 rd Edition, 2160-C
12	Total Alkalinity (CaCO ₃), mg/l, Max	92	122	110	4	200	IS 3025, Part 23: 1986 R 2019 Titration Method
13	Total Dissolved Solids, mg/l	296	752	520	25	500	IS 3025, Part 16: 1984 R 2017 Gravimetric method
14	Total Hardness, mg/l	218	613	440	4	200	IS 3025, (Part 21): 2019 EDTA Method
15	Turbidity, NTU	1	2	1	0.1	1	IS 3025, (Part 10):1984, R-2017 Nephelometric/Turbidimetric Method
16	Zinc, mg/l	<0.1	<0.1	<0.1	0.1	5	IS 3025(Part 49) : 1994, R:2019, AAS-Flame Method
17	Boron (as B), mg/l, Max	<0.2	<0.2	<0.2	0.2	0.5	APHA, 23 rd Edition, Carmine
18	Copper (as Cu), mg/l, Max	<0.03	<0.03	<0.03	0.01	0.05	IS 3025 Part 42 : 1992 R : 2019, AAS-Flame APHA, 23 rd Edition, AAS-GTA
19	Free Residual Chlorine, mg/l, Min	<0.04	<0.04	<0.04	0.04	0.2	APHA, 23 rd Edition, 4500-Cl- B. (Iodometric Method-I)
20	Lead (as Pb), mg/l, Max	<0.005	<0.005	<0.005	0.005	0.01	IS:3025(Part 47):1994 (Reaffirmed 2019) APHA, 23 rd Edition, AAS-GTA
21	Phenolic compounds (as C ₆ H ₅ OH), mg/l, Max	<0.001	<0.001	<0.001	0.001	0.002	APHA, 22 nd Edition, 4-Amino Autipyrine
22	Selenium, mg/l, Max	<0.007	<0.007	<0.007	0.007	0.01	APHA 23 rd Edition IS-3025, part 56:2003, R-2019, AAS-VGA
23	Total Arsenic (as As), mg/l, Max	<0.006	<0.006	<0.006	0.006	0.01	IS-3025, part 37:1988, R-2019/ APHA 23 rd Edition AAS-VGA
24	Total Chromium (as Cr), mg/l, Max	<0.04	<0.04	<0.04	0.01	0.05	IS-3025 Part 52:2003, R:2019, AAS-Flame APHA, 23 rd Edition, AAS-GTA
25	Nickel as Ni, mg/l Max	<0.01	<0.01	<0.01	0.005	0.02	IS 3025 Part 54 : 2003, R : 2019, AAS-Flame APHA, 23 rd Edition, AAS-GTA

Abbreviations

Abn.: Abandoned

AMSL: Above mean sea level

Avg.: Average

APT: Aquifer Pumping Test

BCCL: Bharat Coking Coal Ltd.

bgl: Below Ground Level

Buffer zone: periphery of the 10 km radius from the project boundary

Core zone: Project / mine / colliery boundary (leasehold area)

CMPDI: Central Mine Plan & Design Institute

DVC: Damodar Valley Corporation

DTW: Depth to water level

GW: Groundwater

IMD: Indian Meteorological Division

JCF: Jharia Coalfield

RCF: Raniganj Coalfield

MADA: Mineral Area Development Authority

MCM: Million Cubic Meter

MGD: Million Gallon per day

NTU: Nephelometric Turbidity unit

OC / UG: Opencast / Underground

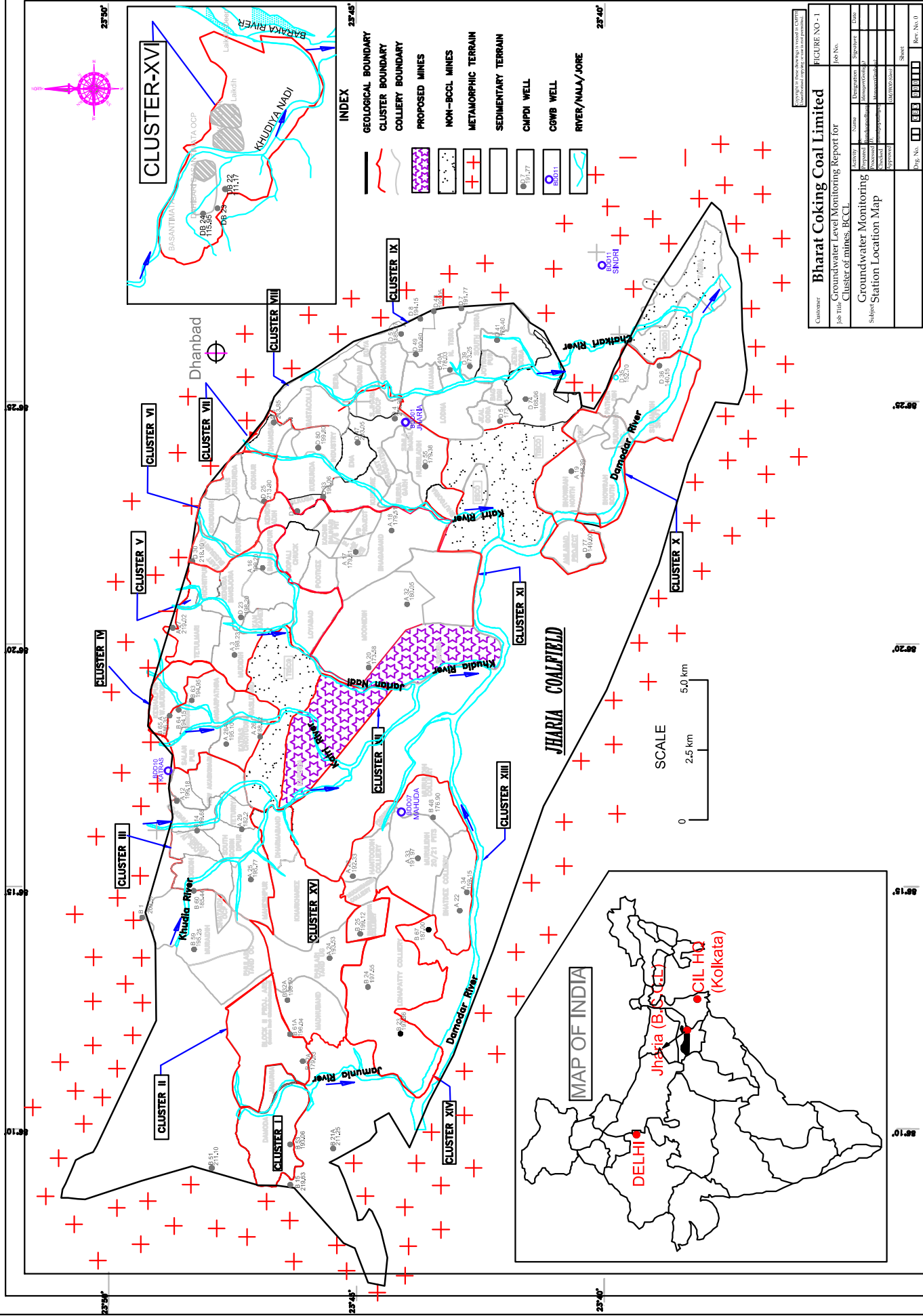
OCP / UGP: Opencast Project / Underground Project

RL: Reduced Level

RWH: Rainwater Harvesting

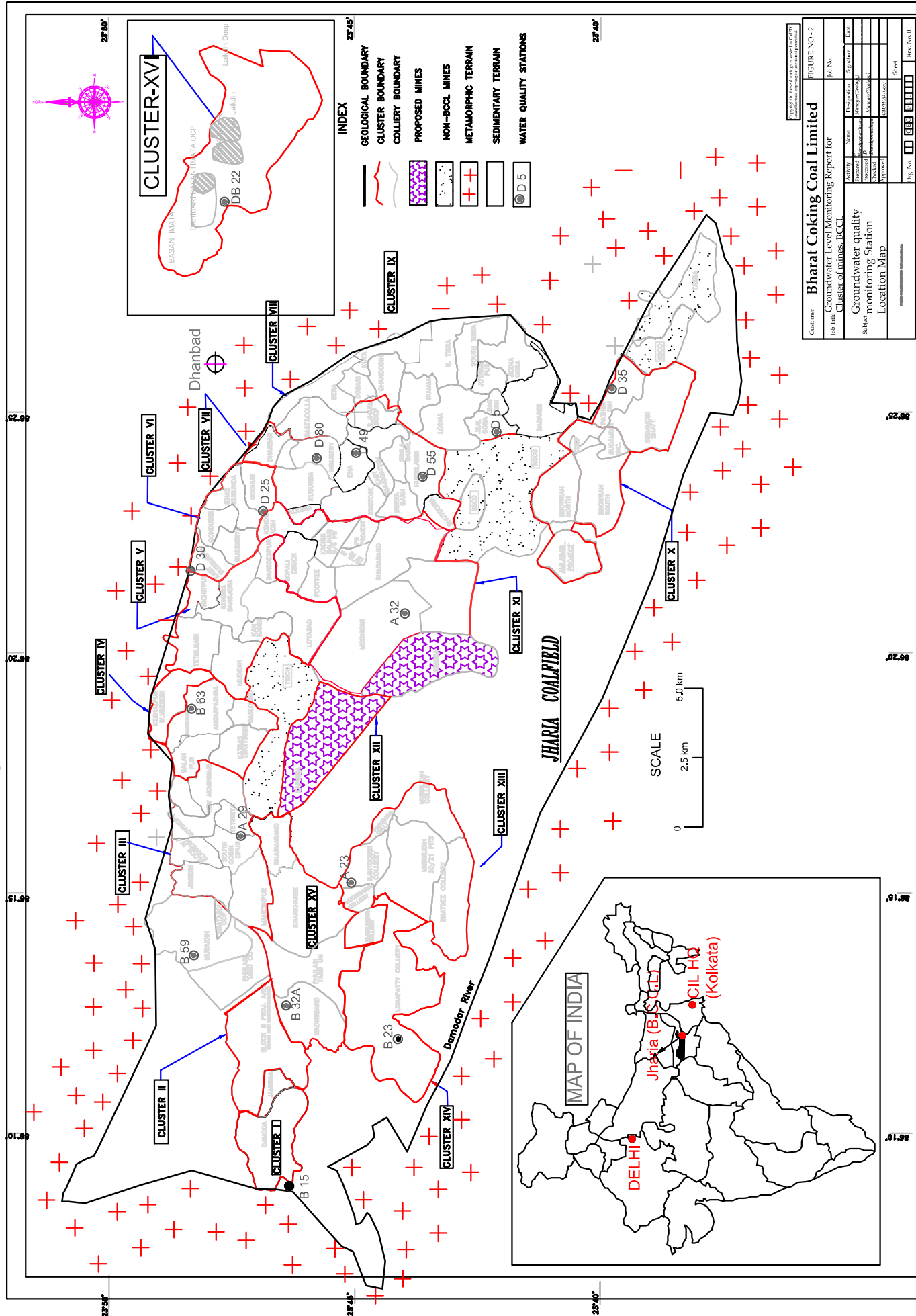
FF: Fire Fighting

GROUNDWATER MONITORING STATION LOCATION MAP



Customer		Bharat Coking Coal Limited		FIGURE NO - 1	
Job Title		Groundwater Level Monitoring Report for Cluster of mines, BCCL		Job No.	
Subject		Groundwater Monitoring Station Location Map		Title	
				Author	
				Checked	
				Approved	
				Signature	
				Date	
				Page No.	
				Sheet	
				Rev. No. 0	

GROUNDWATER QUALITY MONITORING STATION LOCATION MAP



PROPOSED PIEZOMETER LOCATION MAP, JCF & RCF (part)

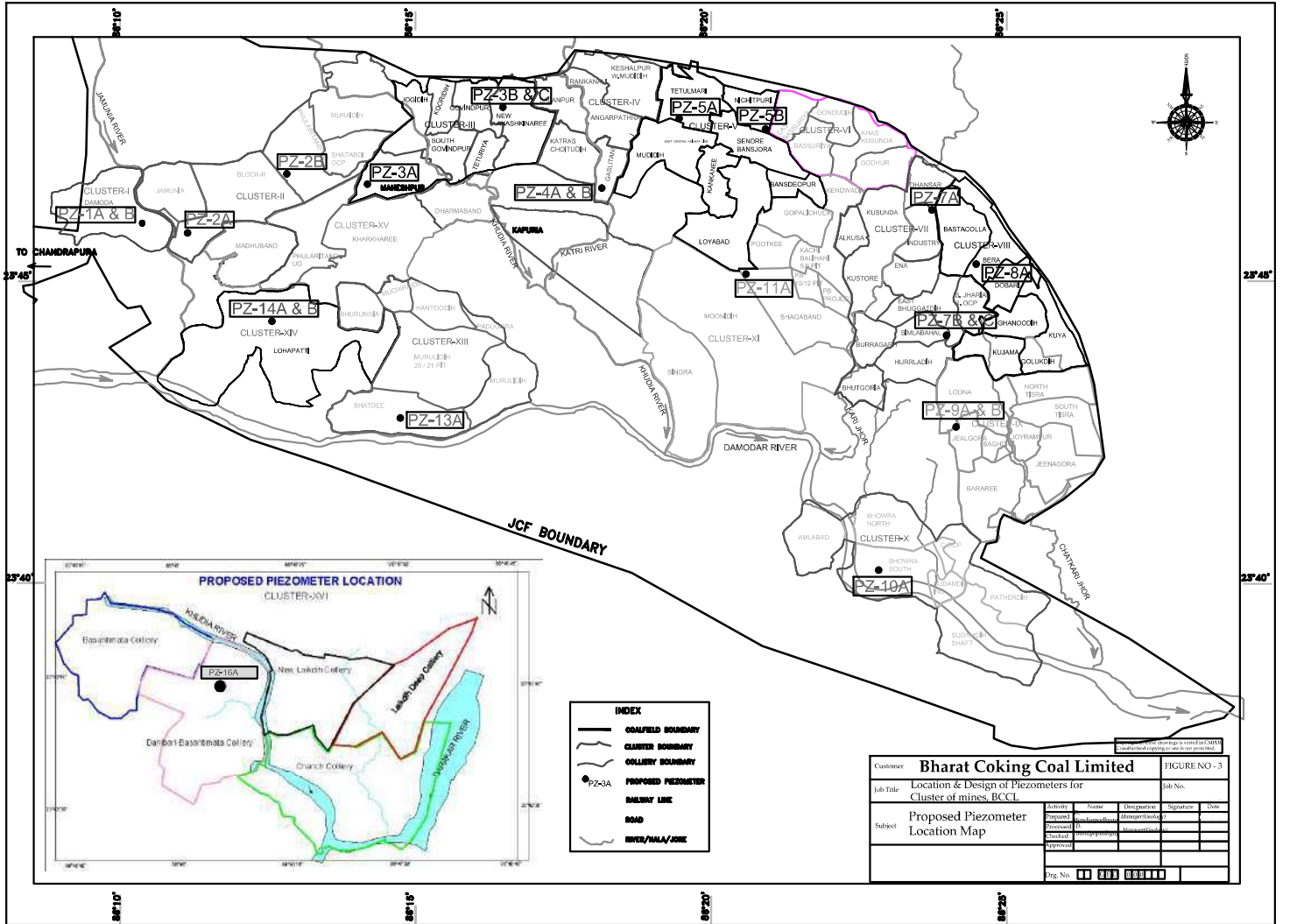
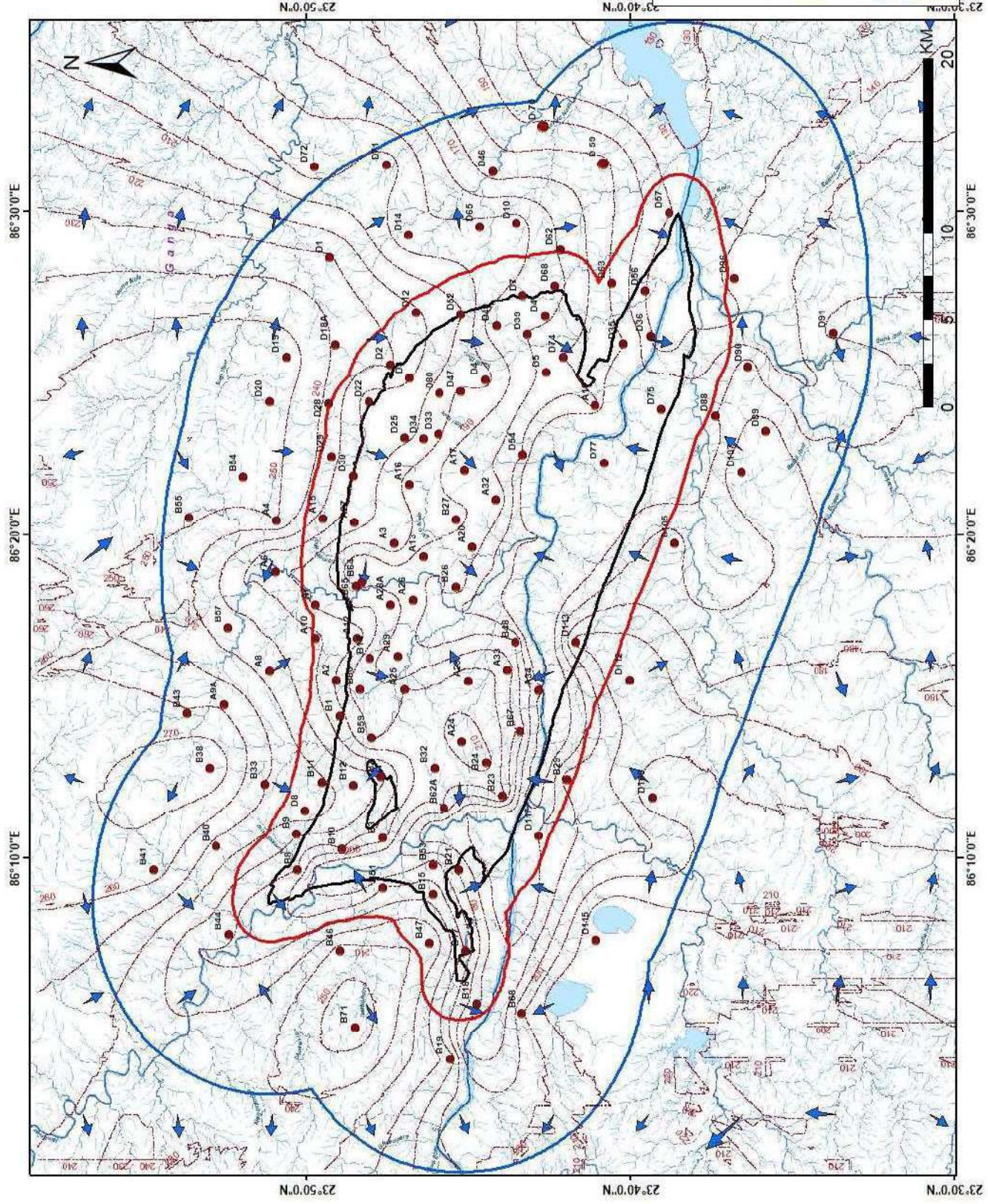


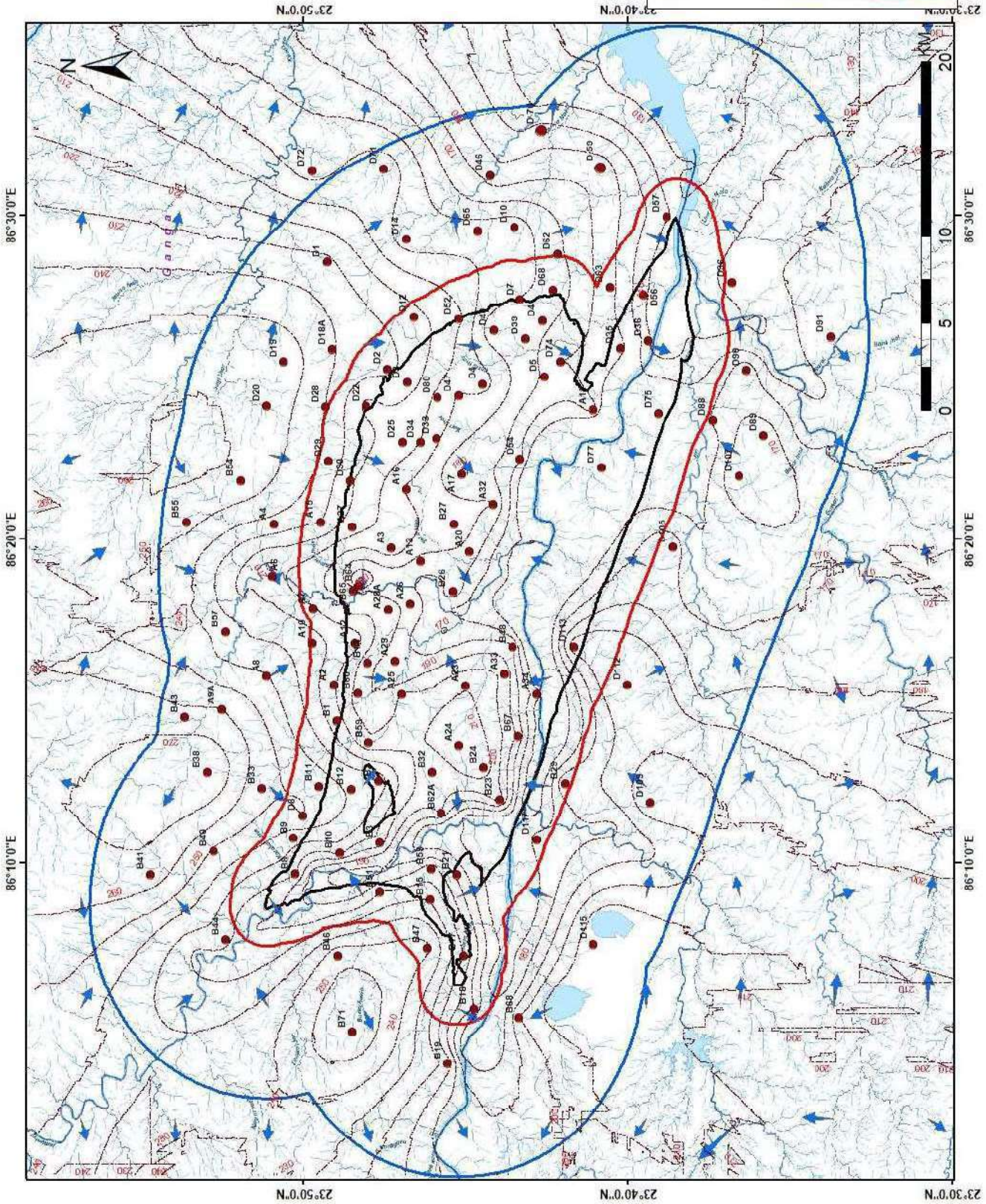
PLATE-IVA



INDEX

- Monitoring Well
- WT Contour Pre22
- Flow direction
- Jharia_CF_Boundary
- Core Zone (2Km)
- Buffer Zone (10Km)

PLATE-IVB



INDEX

- Monitoring Well
- WT Contour Post22
- Flow direction
- Jharia_CF_Boundary
- Core Zone (2Km)
- Buffer Zone (10Km)

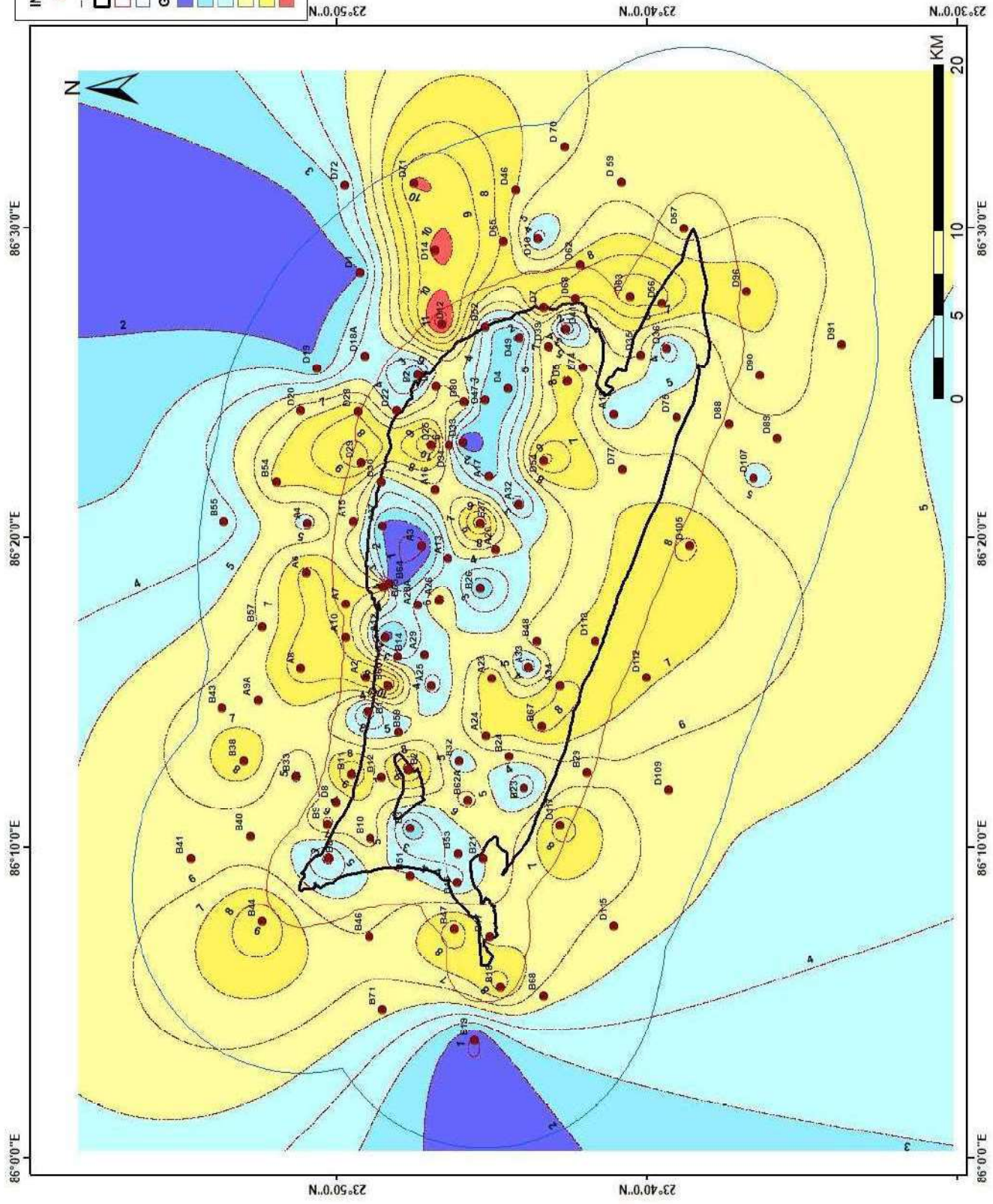


PLATE-VA

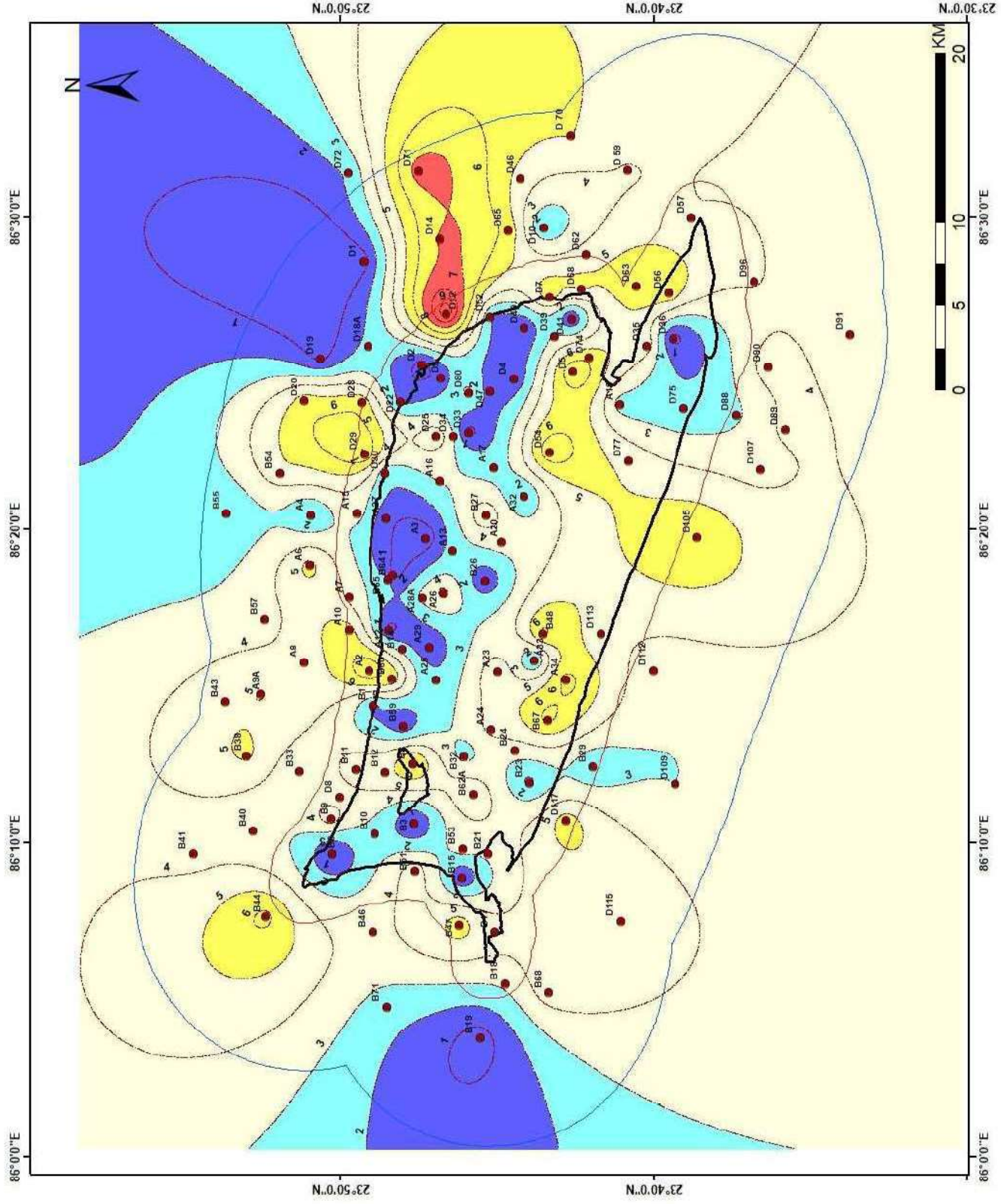
INDEX

- Monitoring Well
- WL Contour_Pre
- Jharia CF_Boundary
- Core Zone (2Km)
- Buffer Zone (10Km)

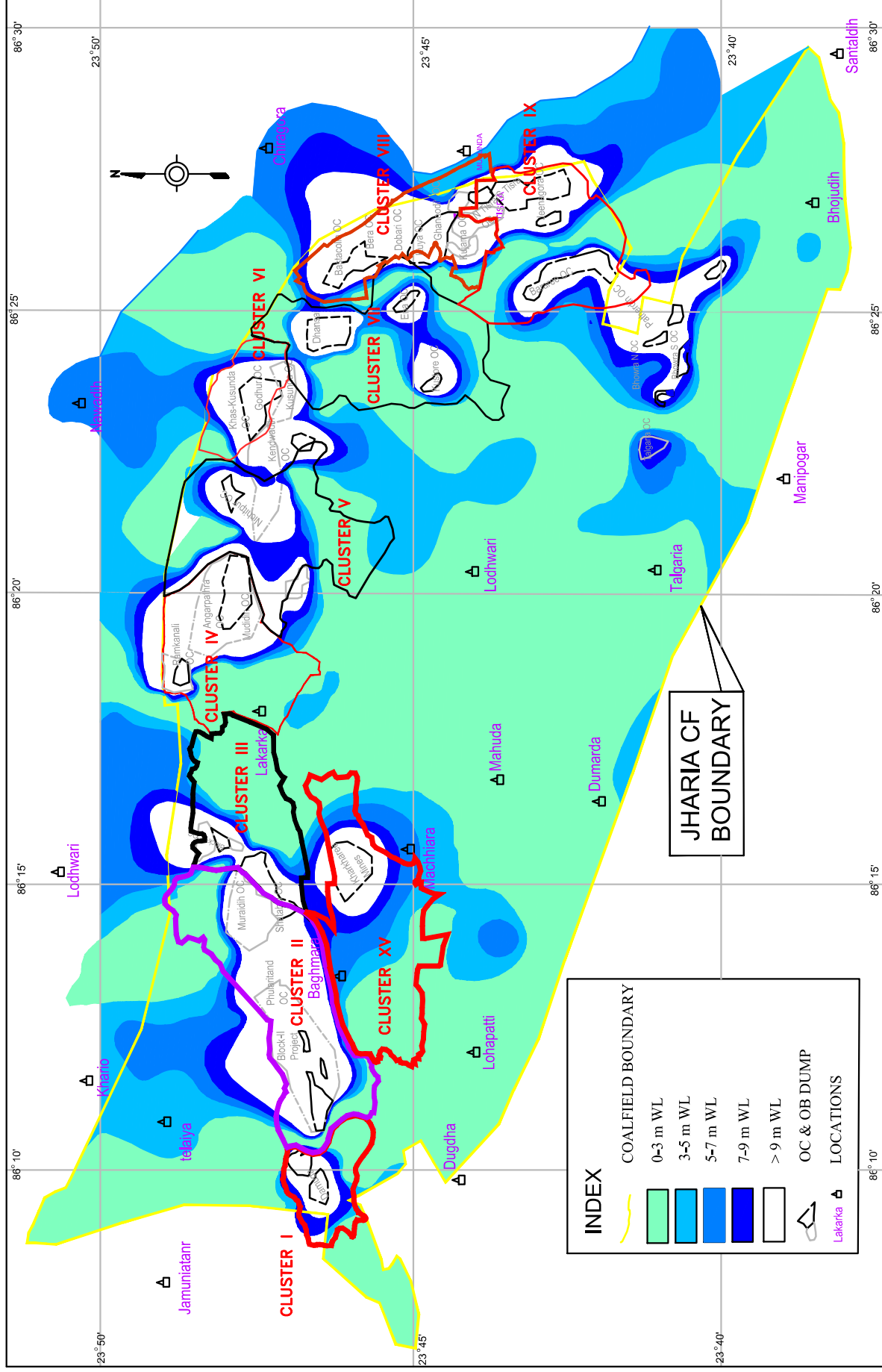
GW Level Range (pre monsoon, 22 bgl (m))

- <2
- 2 - 3
- 3 - 5
- 5 - 7
- 7 - 10
- 10 - 11.98857161

PLATE-VB



DEPTH TO WATER LEVEL MAP OF JHARIA COALFIELD



Customer		Job Title		Name		Designation		Signature		Date	
BHARAT COKING COAL LIMITED		HYDROGEOLOGICAL STUDIES FOR BCCL CLUSTERS		D. MANDIYAPPAH		PROCESSED BY		CHECKED BY		APPROVED BY	
REV. NO. - PWD DATED - 11/11/2017		REV. NO. - XYZABC - 11/11/2017		REV. NO. - 11/11/2017		REV. NO. - 11/11/2017		REV. NO. - 11/11/2017		REV. NO. - 11/11/2017	
Scale 500 0 500 1500 M		Scale 500 0 500 1500 M		Scale 500 0 500 1500 M		Scale 500 0 500 1500 M		Scale 500 0 500 1500 M		Scale 500 0 500 1500 M	
ISO 9001 Company		CMPDI		CMPDI		CMPDI		CMPDI		CMPDI	

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**WATER QUALITY REPORT
OF
BHARAT COKING COAL LIMITED,
CLUSTER – XII**

(FOR THE Q.E. DECEMBER 2022)

E. C. no. J-11015/184/2012-IA.II (M) dated 10.12.2014.



CMPDI

ISO 9001 Company
**Regional Institute-II
Dhanbad, Jharkhand**

CLUSTER - XII
(FOR THE Q.E. DECEMBER 2022)

CONTENTS

SL. NO.	CHAPTER	PARTICULARS
1.		EXECUTIVE SUMMARY
2.	CHAPTER - I	INTRODUCTION
3.	CHAPTER-II	WATER SAMPLING & ANALYSIS
4.	Plate: Plate NO. - I	SURFACE PLAN SHOWING WATER MONITORING LOCATIONS

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**Regional Institute-II
Dhanbad, Jharkhand**

EXECUTIVE SUMMARY

1.0 Introduction

The purpose of environmental monitoring is to assess the quality of various attributes that affects the environment around us. In accordance with the quality of these attributes appropriate strategy is to be developed to control the pollution level within the permissible limits. One of these major attributes is water.

Bharat Coking Coal Limited (BCCL), a Subsidiary company of Coal India Limited is operating Underground and Opencast Mines in Jharia Coalfield (JCF) is a part of Gondwana Coalfields located in Dhanbad district of Jharkhand, the JCF is bounded by 23°37' N to 23°52' N latitudes and 86°09' E to 86°30' E longitude occupying an area of 450 Sq.km. BCCL has awarded Environmental monitoring work of Jharia Coalfield (JCF) to Central Mine Planning & Design Institute Limited (CMPDIL). The environmental monitoring has been carried out as per the conditions laid down by the MoEF&CC while granting environmental clearance of project, consent letter issued by the respective SPCB, and other statutory requirements.

2.0 Sampling location and rationale

2.1 Water sampling stations

The Water sampling stations were selected for Ground water supply, well/ Hand pump water & also surface water samples.

3.0 Methodology of sampling and analysis

3.1 Water quality

Water samples were collected as per standard practice. Effluent samples were analyzed for 25 parameters on quarterly basis & for 27 parameters on half yearly basis. The Ground and Surface water samples were collected and analyzed for 25 and 17 parameters respectively, on quarterly basis. Thereafter the samples were preserved and analyzed at the Environmental Laboratory at CMPDI RI-II, Dhanbad.

4.0 Results and interpretations

4.1 Water quality

The test results indicate that the major parameters compared with MoEF&CC Gazette Notification No. GSR 742(E) dt 25.09.2000 Standards for Coal Mines, IS.10500/2012 (Ground water) and IS: 2296 (Surface water), are with in permissible limits.

CHAPTER - I

INTRODUCTION

- 1.0 Any industry and development activities including coal mining is bound to affect environmental attributes. There are positive as well as negative impacts of such operations. For controlling the adverse impacts a regular monitoring is essential. The environmental monitoring is being done as per the guidelines stipulated by Ministry of Environment, Forests and Climate Change (MoEF&CC), Govt. of India.

Bharat Coking Coal Limited (BCCL), a subsidiary company of Coal India Limited (CIL) is operating UG Mines and Opencast Mines in Jharia Coalfield (JCF). The Jharia Coalfield (JCF) having an area of 450 Sq.KM.

Bharat Coking Coal has awarded Environmental Monitoring work of all Projects, Cluster wise, to Central Mine Planning & Design Institute Limited (CMPDIL). The environmental monitoring has been carried out as per conditions laid down by MoEF&CC while granting environmental clearance to different projects. CMPDI has trained manpower and well equipped laboratory to carry out monitoring, analysis and R&D work in the field of environment.

- 1.1 The Cluster XII is in the Central part of the Jharia coalfield. It includes Kapuria UG Mine. The cluster – XII is situated about 30 - 35 kms from Dhanbad Railway Station. The mines of this cluster - XII are operating since pre nationalization period (prior to 1972-73). It is connected by both Railway and Road. The drainage of the area is governed by Katri River.
- 1.2 The cluster XII is designed to produce 2.4 Mtpa (normative) and 3.12 Mtpa peak capacity of coal. The average grade of coal W-II to W-IV.

The Project has Environmental Clearance from Ministry of Environment, Forests and Climate Change (MoEF&CC) for a rated capacity of 2.4 MTPA (normative) and 3.12 MTPA peak capacity of coal production vide letter no **E.C. no. J-11015/184/2012-IA.II (M) dated 10.12.2014.**

.....

CHAPTER – II

WATER QUALITY MONITORING

2.1 Location of sampling sites (Refer **Plate No. - I**)

- i) Surface water quality at **U/S of Katri River (SW27)**
- ii) Surface water quality at **D/S of Katri River (SW28)**
- iii) Ground Water quality at **Kapuria (GW12)**

2.2 Methodology of sampling and analysis

Water samples were collected as per standard practice. Effluent samples were analyzed for 25 parameters on quarterly basis & for 27 parameters on half yearly basis. The Ground and Surface water samples were collected and analyzed for 25 and 17 parameters respectively, on quarterly basis. Thereafter the samples were preserved and analyzed at the Environmental Laboratory at CMPDI RI-II, Dhanbad.

2.3 Results & Interpretations

The results are given in tabular form along with the applicable standards. Results show that most of the parameters are within the permissible limits.



CENTRAL MINE PLANNING AND DESIGN INSTITUTE LIMITED
Environment Laboratory, Regional Institute-II
SURFACE WATER ANALYSIS TEST REPORT

CMPDI, RI-II
 KOYLA BHAWAN COMPLEX
 DHANBAD. -826005
 Phone: 0326-223-850
 email: rdri2.cmpdi@coalindia.in

Month & Year		DEC 2022		Cluster		XII			Report No.	RI-2/SW/22-23/QE/03				
Customer			Environment Department, Bharat Coking Coal Limited (BCCL), Koyla Bhawan, Dhanbad (E-mail: gmenv.bccl@coalindia.in)							Date of Issue	16.03.2023			
Project			Sample Ref. No.			REM/BCCL/2022/ 06 /SW /12			Sampling Method	(IS 3025 , Part-1) CMPDI/RI-II/LPM 13				
Sampling Stations			(i)	Upstream in Katri River(SW27)			Date of Sampling			19.12..22			Period of Analysis	
		(ii)	Downstream in Katri River(SW28)			Date of Sampling			26.12.22			NOV’’22 TO JAN’23		
Sl. No.	Parameter		Method of Analysis			Observed Values		IS : 2296 INLAND SURFACE WATER [1982] Class 'C	Range of Testing		LDL			
						(i)	(ii)							
1	BOD (3 days 27°C), mg/l		IS 3025 (Part 44) : 1993, R-2019 , 3 day incubation at 27°C			<2.0	<2.0	3	2.00-10.00		2			
2	Colour,Hazen Units		APHA 23rd Edition , 2120-B-:2017			3	3	10	1-100.0		1			
3	Chlorides, mg/l		IS-3025(Part 32):1988, R-2019 Argentometric Method			59	43	600	5.0-1500.0		5			
4	Copper, mg/l		IS 3025 (Part 42) : 1992 R : 2019, AAS-Flame Method			<0.2	<0.2	1.5	0.2-10.0		0.2			
5	Dissolved Oxygen, mg/L		IS 3025 (Part 38) : 1989, R:2003 Winkler Azide Method			6.7	6.6	4	0.1-10.0		0.1			
6	Fluoride, mg/l		APHA, 23rd Edition, SPADNS Method			0.56	0.49	1.5	0.2-2.00		0.2			
7	Hexavalent Chromium, mg/l		APHA 23rd Edition, 1,5-Diphenylcarbohydrazide Method IS 3025 (Part 52) : 2003,R-2019			<0.01	<0.01	0.05	0.01-1.4		0.01			
8	Iron, mg/l		IS 3025 (Part 53):2003,R:2019, AAS-Flame Method			<0.2	<0.2	50	0.2-10		0.2			
9	Nitrate , mg/l		APHA, 23rd Edition, UV-Spectrophotometric Method			4.08	3.63	50	0.5-45.0		0.5			
10	pH value		IS 3025, (Part 11) : 1983 R-2017 Electrometric (Ph Meter) method			8.15	7.85	6.5-8.5	2.0-12.0		2			
11	Sulphate, mg/l		APHA –23rd Edition,4500- S, Turbidity Method			68	31	400	10.0-400.0		10			
12	Total Dissolved Solids, mg/l		IS 3025, (Part 16): 1984 R-2017 Gravimetric method			513	369	1500	25.0-5000.0		25			
13	Zinc, mg/l		IS 3025(Part 49) : 1994, R : 2019, AAS-Flame Method			<0.1	0.11	15	0.1 - 3.0		0.1			

**Grab sampling carried out for water samples. *LDL indicates Lower Detection Limit & BDL indicates Below Detection Limit

***All units in mg/L unless specified otherwise **Sample Collected in 5 Ltr Jerricane , Color as observed is transparent**

(Kumar Vaibhav)

(Kumar Vaibhav)

(Amit Raj Mishra)

Analysed by

CHECKED BY

HOD's Initial/Signature

Note: The results above relate to the samples tested as received. This report can not be reproduced in part or full without the written permission of the HOD(Env) , CMPDI, RI-II.

---- End of Report ----

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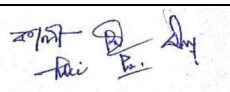
CENTRAL MINE PLANNING AND DESIGN INSTITUTE LIMITED
Environment Laboratory, Regional Institute-II
SURFACE WATER ANALYSIS REPORT

CMPDIL, RI-II
 KOYLA BHAWAN COMPLEX
 DHANBAD. -826005
 Phone: 0326-223-850
 email: rdri2.cmpdi@coalindia.in

Month & Year	DEC 2022		Cluster	XII		Report No.	RI-2/SW/22-23/QE/01
Customer	Environment Department, Bharat Coking Coal Limited (BCCL), Koyla Bhawan, Dhanbad (E-mail: gmenv.bccl@coalindia.in)					Date of Issue	16.03.2023
Project	Sample Ref. No.			REM/BCCL/2022/ 06 /SW /12	Sampling Method	(IS 3025 , Part-1) CMPDI/RI-II/LPM 13	
Sampling Stations	(i)	Upstream in Katri River(SW27)		Date of Sampling	19.12.22	Period of Analysis	
	(ii)	Downstream in Katri River(SW28)		Date of Sampling	26.12.22	NOV''22 TO JAN'23	
Sl. No.	Parameter	Method of Analysis	Observed Values		IS : 2296 INLAND SURFACE WATER [1982] Class 'C	Range of Testing	LDL
			(i)	(ii)			
1	Arsenic (as As), mg/l, Max	IS-3025,Part 37:1988, R-2019/ APHA 23rd Edition AAS-VGA	<0.006	<0.006	0.2	0.006-10	0.006
2	Lead (as Pb), mg/l, Max	APHA, 23rd Edition, AAS-GTA	<0.005	<0.005	0.1	0.005-10	0.005
3	Phenolic compounds (as C6H5OH), mg/l, Max	APHA, 22nd Edition 4-Amino Antipyrine	<0.002	<0.002	0.005	0.002-10	0.002
4	Selenium, mg/l, Max	IS-3025 ,Part 56:2003, R-2019/ APHA 23rd Edition, AAS-VGA	<0.007	<0.007	0.05	0.007-10	0.007

**Grab sampling carried out for water samples. *LDL indicates Lower Detection Limit & BDL indicates Below Detection Limit

***All units in mg/L unless specified otherwise **Sample Collected in 5 Ltr Jerricane , Color as observed is transparent**


 (Kumar Vaibhav)

(Kumar Vaibhav)


 (Amit Raj Mishra)

(Amit Raj Mishra)

Analysed by

CHECKED BY

HOD's Initial/Signature

Note: The results above relate to the samples tested as received. This report can not be reproduced in part or full without the written permission of the HOD(Env) , CMPDI, RI-II.

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Environment Laboratory, Regional Institute-II
GROUND WATER ANALYSIS TEST REPORT

CMPDI, RI-II
KOYLA BHAWAN COMPLEX
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Phone:0326-223-850
mail: rdri2cmpdi@coalindia.in

Month & Year	QUARTER ENDING DEC 2022		Cluster	CLUSTERXII			Report No.	RI-2/GW/22-23/QE/03
Customer	Environment Department, Bharat Coking Coal Limited (BCCL), Koyla Bhawan, Dhanbad (E-mail: gmenv.bccl@coalindia.in)						Date of Issue	16.03.2023
Project	Kapuria Village			Sample Ref. No.	REM/BCCL/2022/DW/12	Sampling Method	CMPDI/RI-II/LPM 13,(IS 3025:Part -1)	
Sampling Stations	GW12		Date of Sampling	07.11.22	Sample Collected in 5 Ltr Jerricane , Color as observed is transparent			
				Period of Analysis		NOV'22	TO	JAN'23
Sl. No.	Parameter	Method of Analysis	Observed Values				IS 10500: 2012	
			GW12	Range Of Testing	LDL	Acceptable Limit (Max)*	Permissible Limit in the Absence of Alternate Source (Max)	
1	Colour, Hazen unit	APHA, 23 rd Edition ,2120-c-Spectrophotometric Single Wavelength Method,2017	3	1-500.0	1	5	15	
2	Calcium, mg/l	IS 3025, (Part 40): 1991 R:2019,AAS-Flame Method & EDTA Method	18	2.0-800.0	2	75	200	
3	Chlorides, mg/l	IS-3025(Part 32):1988, R-2019 , Argentometric Method	130	2.0-1500.0	5	250	1000	
4	Fluoride, mg/l	APHA, 23 rd Edition, SPADNS Method	0.50	0.2-2.00	0.2	1	1.5	
5	Iron, mg/l	IS 3025 (Part 53) : 2003, R : 2019 , AAS-Flame Method	0.94	0.2-10	0.2	1	No relaxation	
6	Magnesium	APHA 23 rd Edition, 3500-Mg B: Calculation Method	82	6.0-700	6	30	100	
7	Nitrate , mg/l	APHA, 23 rd Edition, UV-Spectrophotometric Method	23.39	0.5-45.0	0.5	45	No relaxation	
8	Odour	APHA, 23 rd Edition, , 2150-C	Agreeable	Qualitative	Qualitative	Agreeable	Agreeable	
9	pH value	IS 3025, Part 11 : 1983 R 2017 Electrometric(pH Meter) Method	8.15	1-14	0.1	6.5-8.5	No relaxation	
10	Sulphate, mg/l	APHA -23 rd Edition, 4500 S , Turbidity Method	191	10.0-400.0	10	200	400	
11	Taste	APHA,23 rd Edition, 2160-C	Acceptable	Qualitative	Qualitative	Acceptable	Agreeable	
12	Total Alkalinity (CaCO ₃), mg/l, Max	IS 3025, Part 23: 1986 R 2019 Titration Method	104	4.0-2000.0	4	200	600	
13	Total Dissolved Solids, mg/l	IS 3025, Part 16: 1984 R 2017 Gravimetric method	633	25.0-5000.0	25	500	2000	
14	Total Hardness, mg/l	IS 3025, (Part 21): 2019 EDTA Method	383	4.0-2000.0	4	200	600	
15	Turbidity, NTU	IS 3025, (Part 10):1984, R-2017 Nephelometric/Turbidimetric Method	2.9	1-800	0.1	1	5	
16	Zinc, mg/l	IS 3025(Part 49) : 1994,R:2019, AAS-Flame Method	0.22	0.1 - 2.0	0.1	5	15	

***All units in mg/L unless specified otherwise,

**Grab sampling carried out for water samples. *LDL indicates Lower Detection Limit & BDL indicates Below Detection Limit,

(Kumar Vaibhav)
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(Amit Raj Mishra)
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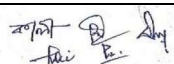
CENTRAL MINE PLANNING AND DESIGN INSTITUTE LIMITED
Environment Laboratory, Regional Institute-II
GROUND WATER ANALYSIS TEST REPORT

CMPDIL, RI-II
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Phone:0326-223-850
mail: rdri2cmpdi@coalindia.in

Month & Year	QUARTER ENDING DEC 2022		Cluster	CLUSTER XII			Report No.	RI-2/GW/22-23/QE/03	
Customer	Environment Department, Bharat Coking Coal Limited (BCCL), Koyla Bhawan, Dhanbad (E-mail: gmenv.bccl@coalindia.in)						Date of Issue	16.03.2023	
Project	Kapuria Village			Sample Ref. No.	REM/BCCL/2022/DW/1 2	Sampling Method	CMPDI/RI-II/LPM 13,(IS 3025:Part -1)		
Sampling Stations	GW12		Date of Sampling	07.11.22	Sample Collected in 5 Ltr Jerricane , Color as observed is transparent				
				Period of Analysis		NOV'22		TO	JAN'23
Sl. No.	Parameter	Method of Analysis	Observed Values				IS 10500: 2012		
			GW12	Range Of Testing	LDL		Acceptable Limit (Max)*	Permissible Limit in the Absence of Alternate Source (Max)	
1	Boron (as B), mg/l, Max	APHA, 23rd Edition ,Carmine	<0.2	0.2-10	0.2		0.5		1
2	Copper (as Cu), mg/l, Max	IS 3025 Part 42 : 1992 R : 2019, AAS-Flame APHA, 23rd Edition, AAS-GTA	<0.01	0.01-10	0.01		0.05		1.5
3	Free Residual Chlorine, mg/l, Min	APHA, 23rd Edition, , 4500-Cl-B. (Iodometric Method-I)	<0.04	0.04-5	0.04		0.2		1
4	Lead (as Pb), mg/l, Max	IS:3025(Part 47):1994 (Reaffirmed 2019) APHA, 23rd Edition, AAS-GTA	<0.005	0.005-10	0.005		0.01		No relaxation
5	Phenolic compounds (as C6H5OH), mg/l, Max	APHA, 22nd Edition,4-Amino Autipyrine	<0.001	0.001-10	0.001		0.002		0.002
6	Selenium, mg/l, Max	APHA 23rd Edition IS-3025,part 56:2003, R-2019/, AAS-VGA	<0.007	0.007-10	0.007		0.01		No relaxation
7	Total Arsenic (as As), mg/l, Max	IS-3025,part 37:1988, R-2019/ APHA 23rd Edition AAS-VGA	<0.006	0.006-10	0.006		0.01		0.05
8	Total Chromium (as Cr), mg/l, Max	IS-3025 Part 52:2003, R:2019,AAS-Flame APHA, 23rd Edition, AAS-GTA	<0.01	0.01-10	0.01		0.05		No relaxation
9	Nickel as Ni, mg/l Max	IS 3025 Part 54 : 2003,R : 2019, AAS-Flame APHA, 23rd Edition, AAS-GTA	<0.005	0.005-10	0.005		0.02		No relaxation
10	Manganese as Mn, mg/l, Max	IS 3025(Part 59) : 2006,R:2019, AAS-Flame Method	0.06	0.02-10	0.02		0.1		0.3

***All units in mg/L unless specified otherwise,

**Grab sampling carried out for water samples. *LDL indicates Lower Detection Limit & BDL indicates Below Detection Limit,



(Kumar Vaibhav)
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(Amit Raj Mishra)

ANALYSED BY

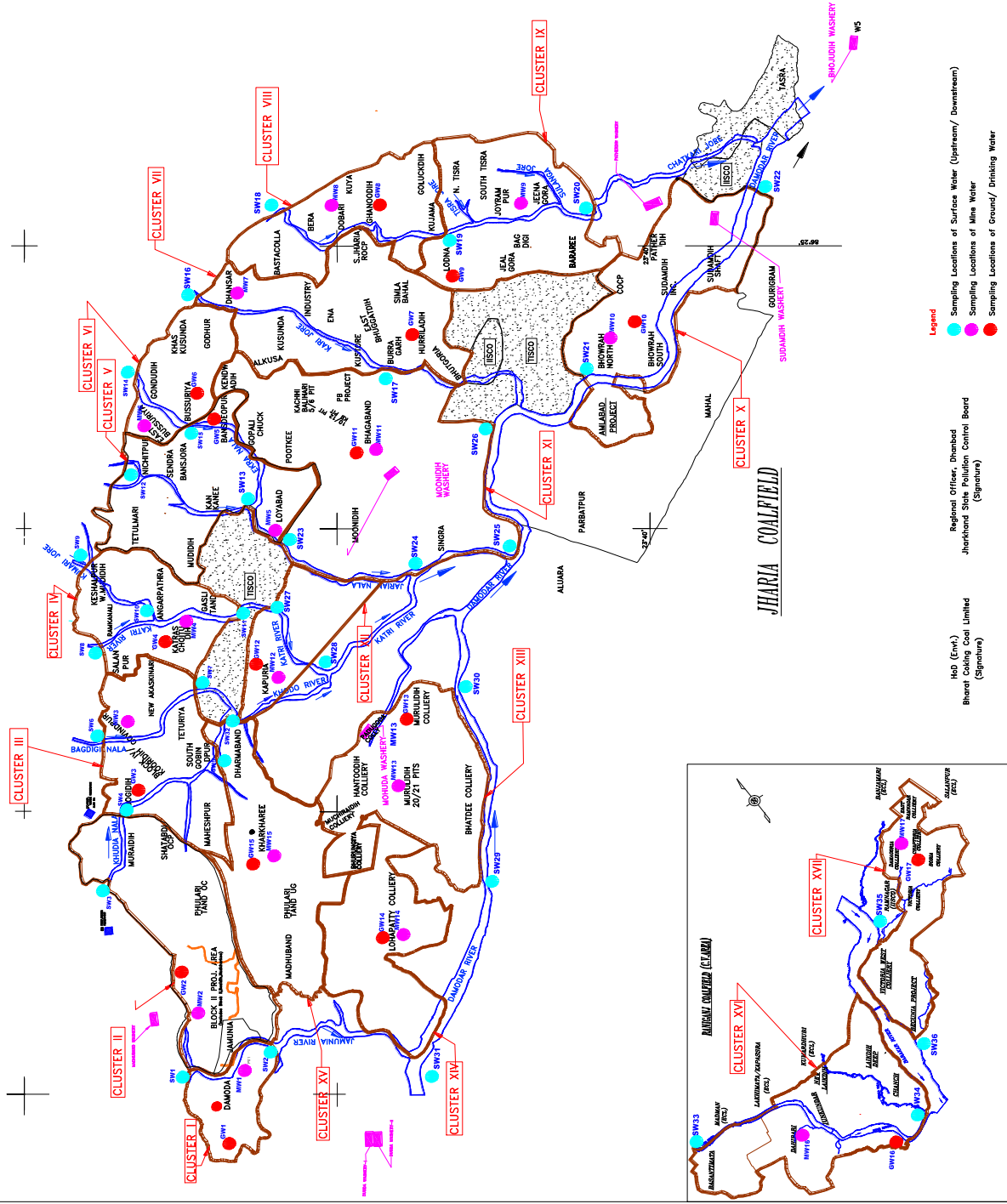
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Water Sampling Locations in BCCL



INDEX

Cluster	Surface Water	Name of River/Well	Sampling Location	Ground Water	Sampling Location
I	SW1, SW2	Kundu River	Chandray	SW1	Chandray
II	SW3, SW4	Kundu River	Chandray	SW2	Chandray
III	SW5, SW6	Kundu River	Chandray	SW3	Chandray
IV	SW7, SW8	Kundu River	Chandray	SW4	Chandray
V	SW9, SW10	Kundu River	Chandray	SW5	Chandray
VI	SW11, SW12	Kundu River	Chandray	SW6	Chandray
VII	SW13, SW14	Kundu River	Chandray	SW7	Chandray
VIII	SW15, SW16	Kundu River	Chandray	SW8	Chandray
IX	SW17, SW18	Kundu River	Chandray	SW9	Chandray
X	SW19, SW20	Kundu River	Chandray	SW10	Chandray
XI	SW21, SW22	Kundu River	Chandray	SW11	Chandray
XII	SW23, SW24	Kundu River	Chandray	SW12	Chandray
XIII	SW25, SW26	Kundu River	Chandray	SW13	Chandray
XIV	SW27, SW28	Kundu River	Chandray	SW14	Chandray
XV	SW29, SW30	Kundu River	Chandray	SW15	Chandray
XVI	SW31, SW32	Kundu River	Chandray	SW16	Chandray
XVII	SW33, SW34	Kundu River	Chandray	SW17	Chandray
XVIII	SW35, SW36	Kundu River	Chandray	SW18	Chandray

BHARAT COOKING COAL LIMITED WATER SAMPLING LOCATIONS MONITORING STATIONS BHARAT COOKING COAL LIMITED WATER SAMPLING LOCATIONS MONITORING STATIONS
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Regional Officer, Dhanbad
 Jharkhand State Pollution Control Board
 (Signature)
 H.O. (Env.)
 Bharat Cooking Coal Limited
 (Signature)

Legend
 Sampling Locations of Surface Water (Upstream/ Downstream)
 Sampling Locations of Mine Water
 Sampling Locations of Ground/ Drinking Water

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**WATER QUALITY REPORT
OF
BHARAT COKING COAL LIMITED,
CLUSTER – XII**

(FOR THE Q.E. JUNE 2022)

E. C. no. J-11015/184/2012-IA.II (M) dated 10.12.2014.



CMPDI

ISO 9001 Company
**Regional Institute-II
Dhanbad, Jharkhand**

CLUSTER - XII
(FOR THE Q.E. JUNE 2022)

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1.		EXECUTIVE SUMMARY
2.	CHAPTER - I	INTRODUCTION
3.	CHAPTER-II	WATER SAMPLING & ANALYSIS
4.	Plate: Plate NO. - I	SURFACE PLAN SHOWING WATER MONITORING LOCATIONS

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ISO 9001 Company
**Regional Institute-II
Dhanbad, Jharkhand**

EXECUTIVE SUMMARY

1.0 Introduction

The purpose of environmental monitoring is to assess the quality of various attributes that affects the environment around us. In accordance with the quality of these attributes appropriate strategy is to be developed to control the pollution level within the permissible limits. One of these major attributes is water.

Bharat Coking Coal Limited (BCCL), a Subsidiary company of Coal India Limited is operating Underground and Opencast Mines in Jharia Coalfield (JCF) is a part of Gondwana Coalfields located in Dhanbad district of Jharkhand, the JCF is bounded by 23°37' N to 23°52' N latitudes and 86°09' E to 86°30' E longitude occupying an area of 450 Sq.km. BCCL has awarded Environmental monitoring work of Jharia Coalfield (JCF) to Central Mine Planning & Design Institute Limited (CMPDIL). The environmental monitoring has been carried out as per the conditions laid down by the MoEF&CC while granting environmental clearance of project, consent letter issued by the respective SPCB, and other statutory requirements.

2.0 Sampling location and rationale

2.1 Water sampling stations

The Water sampling stations were selected for Ground water supply, well/ Hand pump water & also surface water samples.

3.0 Methodology of sampling and analysis

3.1 Water quality

Water samples were collected as per standard practice. Effluent samples were analyzed for 25 parameters on quarterly basis & for 27 parameters on half yearly basis. The Ground and Surface water samples were collected and analyzed for 25 and 17 parameters respectively, on quarterly basis. Thereafter the samples were preserved and analyzed at the Environmental Laboratory at CMPDI RI-II, Dhanbad.

4.0 Results and interpretations

4.1 Water quality

The test results indicate that the major parameters compared with MoEF&CC Gazette Notification No. GSR 742(E) dt 25.09.2000 Standards for Coal Mines, IS.10500/2012 (Ground water) and IS: 2296 (Surface water), are with in permissible limits.

CHAPTER - I

INTRODUCTION

- 1.0 Any industry and development activities including coal mining is bound to affect environmental attributes. There are positive as well as negative impacts of such operations. For controlling the adverse impacts a regular monitoring is essential. The environmental monitoring is being done as per the guidelines stipulated by Ministry of Environment, Forests and Climate Change (MoEF&CC), Govt. of India.

Bharat Coking Coal Limited (BCCL), a subsidiary company of Coal India Limited (CIL) is operating UG Mines and Opencast Mines in Jharia Coalfield (JCF). The Jharia Coalfield (JCF) having an area of 450 Sq.KM.

Bharat Coking Coal has awarded Environmental Monitoring work of all Projects, Cluster wise, to Central Mine Planning & Design Institute Limited (CMPDIL). The environmental monitoring has been carried out as per conditions laid down by MoEF&CC while granting environmental clearance to different projects. CMPDI has trained manpower and well equipped laboratory to carry out monitoring, analysis and R&D work in the field of environment.

- 1.1 The Cluster XII is in the Central part of the Jharia coalfield. It includes Kapuria UG Mine. The cluster – XII is situated about 30 - 35 kms from Dhanbad Railway Station. The mines of this cluster - XII are operating since pre nationalization period (prior to 1972-73). It is connected by both Railway and Road. The drainage of the area is governed by Katri River.
- 1.2 The cluster XII is designed to produce 2.4 Mtpa (normative) and 3.12 Mtpa peak capacity of coal. The average grade of coal W-II to W-IV.

The Project has Environmental Clearance from Ministry of Environment, Forests and Climate Change (MoEF&CC) for a rated capacity of 2.4 MTPA (normative) and 3.12 MTPA peak capacity of coal production vide letter no **E.C. no. J-11015/184/2012-IA.II (M) dated 10.12.2014.**

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CHAPTER – II

WATER QUALITY MONITORING

2.1 Location of sampling sites (Refer **Plate No. - I**)

- i) Surface water quality at **U/S of Katri River (SW27)**
- ii) Surface water quality at **D/S of Katri River (SW28)**
- iii) Ground Water quality at **Kapuria (GW12)**

2.2 Methodology of sampling and analysis

Water samples were collected as per standard practice. Effluent samples were analyzed for 25 parameters on quarterly basis & for 27 parameters on half yearly basis. The Ground and Surface water samples were collected and analyzed for 25 and 17 parameters respectively, on quarterly basis. Thereafter the samples were preserved and analyzed at the Environmental Laboratory at CMPDI RI-II, Dhanbad.

2.3 Results & Interpretations

The results are given in tabular form along with the applicable standards. Results show that most of the parameters are within the permissible limits.



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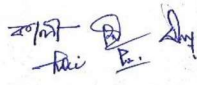
CENTRAL MINE PLANNING AND DESIGN INSTITUTE LIMITED
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SURFACE WATER ANALYSIS TEST REPORT

CMPDIL, RI-II
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Month & Year		JUNE 2022	Cluster	XII		Report No.	RI-2/SW/22-23/QE/01	
Customer		Environment Department, Bharat Coking Coal Limited (BCCL), Koyla Bhawan, Dhanbad (E-mail: gmenv.bccl@coalindia.in)					Date of Issue	14.10.2022
Project		Sample Ref. No.		REM/BCCL/2022/ 06 /SW /011		Sampling Method	(IS 3025 , Part-1) CMPDI/RI-II/LPM 13	
Sampling Stations		(i)	Upstream in Katri River(SW27)	Date of Sampling		20.06.22	Period of Analysis	
		(ii)	Downstream in Katri River(SW28)	Date of Sampling		20.06.22	June'2022 TO Sept'2022	
Sl. No.	Parameter	Method of Analysis		Observed Values		IS : 2296 INLAND SURFACE WATER [1982] Class 'C	Range of Testing	LDL
				(i)	(ii)			
1	BOD (3 days 27°C), mg/l	IS 3025 (Part 44) : 1993, R-2019 , 3 day incubation at 27°C		<2.0	<2.0	3	2.00-10.00	2
2	Colour,Hazen Units	APHA 23rd Edition , 2120-B-:2017		3	3	10	1-100.0	1
3	Chlorides, mg/l	IS-3025(Part 32):1988, R-2019 Argentometric Method		57	38	600	5.0-1500.0	5
4	Copper, mg/l	IS 3025 (Part 42) : 1992 R : 2019, AAS-Flame Method		<0.2	<0.2	1.5	0.2-10.0	0.2
5	Dissolved Oxygen, mg/L	IS 3025 (Part 38) : 1989, R:2003 Winkler Azide Method		5.2	5.4	4	0.1-10.0	0.1
6	Fluoride, mg/l	APHA, 23rd Edition, SPADNS Method		0.81	0.89	1.5	0.2-2.00	0.2
7	Hexavalent Chromium, mg/l	APHA 23rd Edition, 1,5-Diphenylcarbohydrazide Method IS 3025 (Part 52) : 2003,R-2019		<0.01	<0.01	0.05	0.01-1.4	0.01
8	Iron, mg/l	IS 3025 (Part 53):2003,R:2019, AAS-Flame Method		0.44	0.34	50	0.2-10	0.2
9	Nitrate , mg/l	APHA, 23rd Edition, UV-Spectrophotometric Method		2.80	3.14	50	0.5-45.0	0.5
10	pH value	IS 3025, (Part 11) : 1983 R-2017 Electrometric (Ph Meter) method		8.25	8.31	6.5-8.5	2.0-12.0	2
11	Sulphate, mg/l	APHA –23rd Edition,4500- S, Turbidity Method		310	260	400	10.0-400.0	10
12	Total Dissolved Solids, mg/l	IS 3025, (Part 16): 1984 R-2017 Gravimetric method		541	457	1500	25.0-5000.0	25
13	Zinc, mg/l	IS 3025(Part 49) : 1994, R : 2019, AAS-Flame Method		<0.2	<0.2	15	0.1 - 3.0	0.1

****Grab sampling carried out for water samples. *LDL indicates Lower Detection Limit & BDL indicates Below Detection Limit**

*****All units in mg/L unless specified otherwise Sample Collected in 5 Ltr Jerricane , Color as observed is transparent**


(Kumar Vaibhav)

(Kumar Vaibhav)


(Amit Raj Mishra)

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Environment Laboratory, Regional Institute-II
SURFACE WATER ANALYSIS REPORT

CMPDI, RI-II
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 email: rdri2.cmpdi@coalindia.in

Month & Year	Jun 2022		Cluster	XII		Report No.	RI-2/SW/22-23/QE/01
Customer	Environment Department, Bharat Coking Coal Limited (BCCL), Koyla Bhawan, Dhanbad (E-mail: gmenv.bccl@coalindia.in)					Date of Issue	14.10.2022
Project	Sample Ref. No.			REM/BCCL/2022/ 06 /SW /011	Sampling Method	(IS 3025 , Part-1) CMPDI/RI-II/LPM 13	
Sampling Stations	(i)	Upstream in Katri River(SW27)		Date of Sampling	20.06.22	Period of Analysis	
	(ii)	Downstream in Katri River(SW28)		Date of Sampling	20.06.22	June'2022 TO Sept'2022	
Sl. No.	Parameter	Method of Analysis	Observed Values		IS : 2296 INLAND SURFACE WATER [1982] Class 'C	Range of Testing	LDL
			(i)	(ii)			
1	Arsenic (as As), mg/l, Max	IS-3025,Part 37:1988, R-2019/ APHA 23rd Edition AAS-VGA	<0.006	<0.006	0.2	0.006-10	0.006
2	Lead (as Pb), mg/l, Max	APHA, 23rd Edition, AAS-GTA	<0.005	<0.005	0.1	0.005-10	0.005
3	Phenolic compounds (as C6H5OH), mg/l, Max	APHA, 22nd Edition 4-Amino Antipyrine	<0.002	<0.002	0.005	0.002-10	0.002
4	Selenium, mg/l, Max	IS-3025 ,Part 56:2003, R-2019/ APHA 23rd Edition, AAS-VGA	<0.007	<0.007	0.05	0.007-10	0.007

**Grab sampling carried out for water samples. *LDL indicates Lower Detection Limit & BDL indicates Below Detection Limit

***All units in mg/L unless specified otherwise **Sample Collected in 5 Ltr Jerricane , Color as observed is transparent**

(Signature)

(Kumar Vaibhav)

(Signature)
 (Amit Raj Mishra)

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Month & Year	QUARTER ENDING JUNE 2022		Cluster	CLUSTERXII			Report No.	RI-2/GW/22-23/QE/01
Customer	Environment Department, Bharat Coking Coal Limited (BCCL), Koyla Bhawan, Dhanbad (E-mail: gmenv.bccl@coalindia.in)						Date of Issue	25.10.2022
Project	Kapuria Village			Sample Ref. No.	REM/BCCL/2022/DW/06/01	Sampling Method	CMPDI/RI-II/LPM 13,(IS 3025:Part -1)	
Sampling Stations	GW12		Date of Sampling	09.05.22	Sample Collected in 5 Ltr Jerricane , Color as observed is transparent			
				Period of Analysis		June	to	Sept'2022
Sl. No.	Parameter	Method of Analysis	Observed Values			IS 10500: 2012		
			GW12	Range Of Testing	LDL	Acceptable Limit (Max)*	Permissible Limit in the Absence of Alternate Source (Max)	
1	Colour, Hazen unit	APHA, 23 rd Edition ,2120-c-Spectrophotometric Single Wavelength Method ,2017	1	1-500.0	1	5	15	
2	Calcium, mg/l	IS 3025, (Part 40): 1991 R:2019,AAS-Flame Method & EDTA Method	105	2.0-800.0	2	75	200	
3	Chlorides, mg/l	IS-3025(Part 32):1988, R-2019 , Argentometric Method	146	2.0-1500.0	5	250	1000	
4	Fluoride, mg/l	APHA, 23 rd Edition, SPADNS Method	0.45	0.2-2.00	0.2	1	1.5	
5	Iron, mg/l	IS 3025 (Part 53) : 2003, R: 2019 , AAS-Flame Method	0.21	0.2-10	0.2	1	No relaxation	
6	Magnesium	APHA 23 rd Edition, 3500-Mg B: Calculation Method	0.05	6.0-700	6	30	100	
7	Nitrate , mg/l	APHA, 23 rd Edition, UV-Spectrophotometric Method	21.34	0.5-45.0	0.5	45	No relaxation	
8	Odour	APHA, 23 rd Edition, , 2150-C	Agreeable	Qualitative	Qualitative	Agreeable	Agreeable	
9	pH value	IS 3025, Part 11 : 1983 R 2017 Electrometric(pH Meter) Method	8.34	1-14	0.1	6.5-8.5	No relaxation	
10	Sulphate, mg/l	APHA -23 rd Edition, 4500 S , Turbidity Method	150	10.0-400.0	10	200	400	
11	Taste	APHA,23 rd Edition, 2160-C	Acceptable	Qualitative	Qualitative	Acceptable	Agreeable	
12	Total Alkalinity (CaCO ₃), mg/l, Max	IS 3025, Part 23: 1986 R 2019 Titration Method	248	4.0-2000.0	4	200	600	
13	Total Dissolved Solids, mg/l	IS 3025, Part 16: 1984 R 2017 Gravimetric method	789	25.0-5000.0	25	500	2000	
14	Total Hardness, mg/l	IS 3025, (Part 21): 2019 EDTA Method	540	4.0-2000.0	4	200	600	
15	Turbidity, NTU	IS 3025, (Part 10):1984, R-2017 Nephelometric/Turbiditimetric Method	2.7	1-800	0.1	1	5	
16	Zinc, mg/l	IS 3025(Part 49) : 1994,R:2019, AAS-Flame Method	0.61	0.1 - 2.0	0.1	5	15	

***All units in mg/L unless specified otherwise,

**Grab sampling carried out for water samples. *LDL indicates Lower Detection Limit & BDL indicates Below Detection Limit,

(Kumar Vaibhav)
CHECKED BY

(Amit Raj Mishra)

ANALYSED BY

HOD's Signature

Note: The results above relate to the samples tested as received. This report can not be reproduced in part or full without the written permission of the HOD(Env), CMPDI, RI-II.

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---- End of Report ----



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CENTRAL MINE PLANNING AND DESIGN INSTITUTE LIMITED
Environment Laboratory, Regional Institute-II
GROUND WATER ANALYSIS TEST REPORT

CMPDI, RI-II
KOYLA BHAWAN COMPLEX
DHANBAD. -826005
Phone:0326-223-850
mail: rdri2cmpdi@coalindia.in

Month & Year		QUARTER ENDING JUNE 2022		Cluster		CLUSTER XII				Report No.		RI-2/GW/22-23/QE/01	
Customer		Environment Department, Bharat Coking Coal Limited (BCCL), Koyla Bhawan, Dhanbad (E-mail: gmenv.bccl@coalindia.in)								Date of Issue		25.10.2022	
Project		Kapuria Village				Sample Ref. No.		REM/BCCL/2022/DW/06/01		Sampling Method		CMPDI/RI-II/LPM 13,(IS 3025:Part -1)	
Sampling Stations		GW12		Date of Sampling		09.05.22		Sample Collected in 5 Ltr Jerricane , Color as observed is transparent					
					Period of Analysis			June		to		Sept'2022	
Sl. No.	Parameter	Method of Analysis	Observed Values					IS 10500: 2012					
			GW12		Range Of Testing		LDL		Acceptable Limit (Max)*		Permissible Limit in the Absence of Alternate Source (Max)		
1	Boron (as B), mg/l, Max	APHA, 23rd Edition ,Carmine	<0.2		0.2-10		0.2		0.5		1		
2	Copper (as Cu), mg/l, Max	IS 3025 Part 42 : 1992 R : 2019, AAS-Flame APHA, 23rd Edition, AAS-GTA	<0.03		0.01-10		0.01		0.05		1.5		
3	Free Residual Chlorine, mg/l, Min	APHA, 23rd Edition, , 4500-Cl-B. (Iodometric Method-I)	<0.04		0.04-5		0.04		0.2		1		
4	Lead (as Pb), mg/l, Max	IS:3025(Part 47):1994 (Reaffirmed 2019) APHA, 23rd Edition, AAS-GTA	<0.005		0.005-10		0.005		0.01		No relaxation		
5	Phenolic compounds (as C6H5OH), mg/l, Max	APHA, 22nd Edition,4-Amino Autipyrine	<0.001		0.001-10		0.001		0.002		0.002		
6	Selenium, mg/l, Max	APHA 23rd Edition IS-3025,part 56:2003, R-2019/, AAS-VGA	<0.007		0.007-10		0.007		0.01		No relaxation		
7	Total Arsenic (as As), mg/l, Max	IS-3025,part 37:1988, R-2019/ APHA 23rd Edition AAS-VGA	<0.006		0.006-10		0.006		0.01		0.05		
8	Total Chromium (as Cr), mg/l, Max	IS-3025 Part 52:2003, R:2019,AAS-Flame APHA, 23rd Edition, AAS-GTA	<0.04		0.01-10		0.01		0.05		No relaxation		
9	Nickel as Ni, mg/l Max	IS 3025 Part 54 : 2003,R : 2019, AAS-Flame APHA, 23rd Edition, AAS-GTA	<0.01		0.005-10		0.005		0.02		No relaxation		

***All units in mg/L unless specified otherwise,

**Grab sampling carried out for water samples. *LDL indicates Lower Detection Limit & BDL indicates Below Detection Limit,

(Signature)

(Kumar Vaibhav)
CHECKED BY

(Signature)
(Amit Raj Mishra)

ANALYSED BY

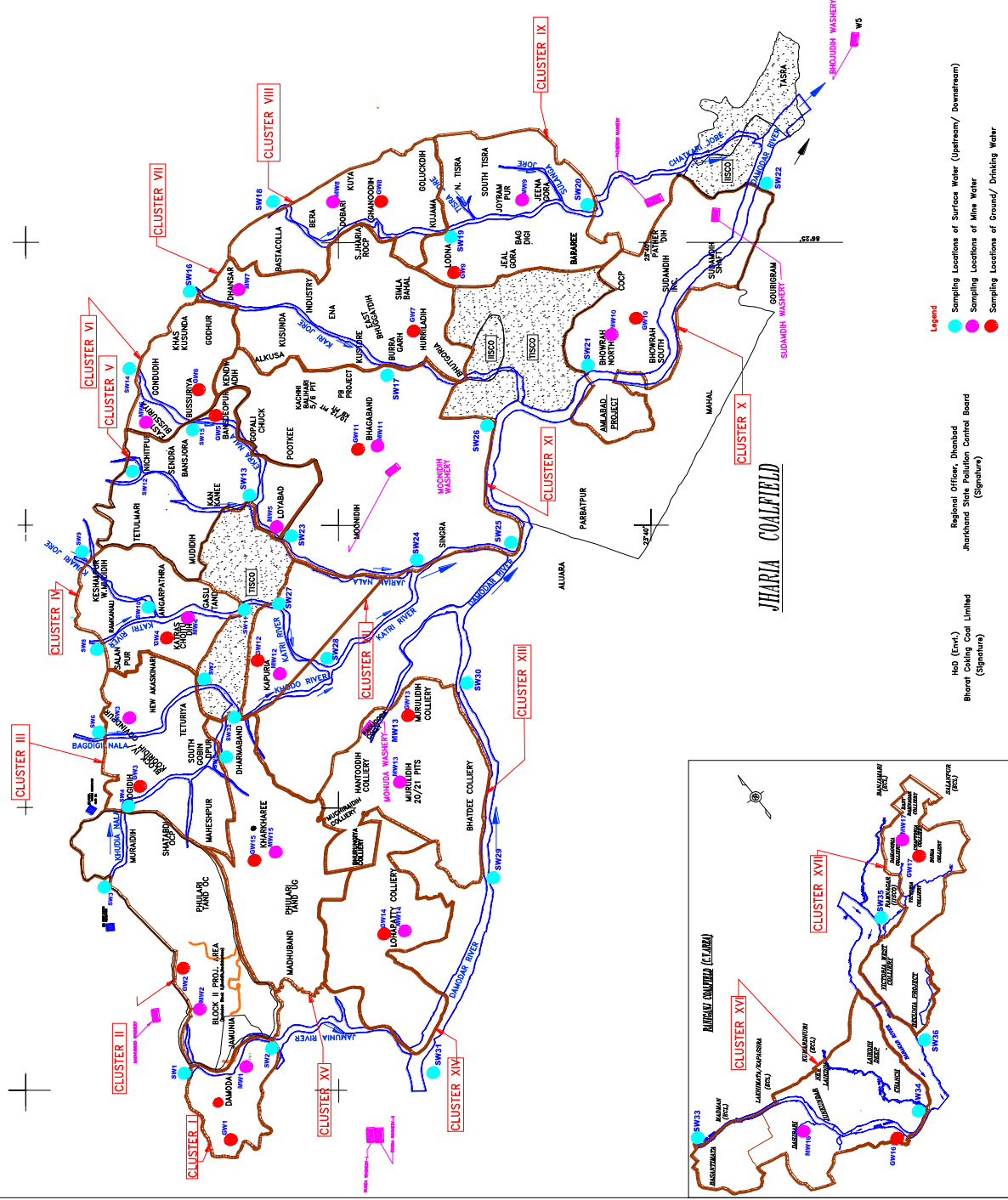
HOD's Signature

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Water Sampling Locations in BCCL



INDEX

Cluster	Source Name	Name of River/Na. Effluent Location	Water Sampling Location	Ground Water Location
I	SW1, SW2	Saluwa River	Manchoda	Chakraborty Village
II	SW3, SW4	Saluwa River	Manchoda	Manchoda Village
III	SW5, SW6	Saluwa River	Manchoda	Manchoda Village
IV	SW7, SW8	Saluwa River	Manchoda	Manchoda Village
V	SW9, SW10	Saluwa River	Manchoda	Manchoda Village
VI	SW11, SW12	Saluwa River	Manchoda	Manchoda Village
VII	SW13, SW14	Saluwa River	Manchoda	Manchoda Village
VIII	SW15, SW16	Saluwa River	Manchoda	Manchoda Village
IX	SW17, SW18	Saluwa River	Manchoda	Manchoda Village
X	SW19, SW20	Saluwa River	Manchoda	Manchoda Village
XI	SW21, SW22	Saluwa River	Manchoda	Manchoda Village
XII	SW23, SW24	Saluwa River	Manchoda	Manchoda Village
XIII	SW25, SW26	Saluwa River	Manchoda	Manchoda Village
XIV	SW27, SW28	Saluwa River	Manchoda	Manchoda Village
XV	SW29, SW30	Saluwa River	Manchoda	Manchoda Village
XVI	SW31, SW32	Saluwa River	Manchoda	Manchoda Village
XVII	SW33, SW34	Saluwa River	Manchoda	Manchoda Village
XVIII	SW35, SW36	Saluwa River	Manchoda	Manchoda Village

BHARAT COOKING COAL LIMITED WATER SAMPLING LOCATIONS MONITORING STATIONS BHARAT COOKING COAL LIMITED WATER SAMPLING LOCATIONS MONITORING STATIONS BHARAT COOKING COAL LIMITED WATER SAMPLING LOCATIONS MONITORING STATIONS
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Legend
 Sampling Locations of Surface Water (Upstream/ Downstream)
 Sampling Locations of Mine Water
 Sampling Locations of Ground/ Drinking Water
 Regional Officer, Jharkhand
 Jharkhand State Pollution Control Board
 (Signature)
 H.O. (Env.)
 Bharat Cooking Coal Limited
 (Signature)