बीसीसीएल BCCL
Bharat Coking Coal Limited

भारत कोकिंग कोल लिमिटेड
(कोल इंडिया लिमिटेड की एक अनुषंगी कंपनी)
Bharat Coking Coal Limited
(A Subsidiary of Coal India Limited)
(एक मिनीरत्न कंपनी / A Miniratna Company)
(भारत सरकार का उपक्रम / A Government of India Undertaking)

महाप्रबंधक का कार्यालय
पश्चिमी झरिया क्षेत्र
पो: मुनिडीह, जिला: धनबाद (झारखंड) - ८२८१२९
फोन नं: ०३२६-२२७३४४५; ई-मेल: gmwj.bccl@coalindia.in

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*"For uploading online on "parivesh portal" of MoEF&CC and sending by e-mail"*

**Ref:- BCCL/WJA/ENV/2025/** 472 **Date:-** 28/11/2025

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

**Sub: -** Submission of six-monthly reports on compliance of Environment Clearance for the period from **April 2025 to September 2025** with respect to **Cluster-XI,** group of mines of M/s Bharat Coking Coal Limited.

**Ref: EC Order No. – J-11015/77/2011-IA.II (M),Dated: - 26.08.2013. Amendment on -26th july 2019**

Respected Sir,

Please find enclosed herewith the six-monthly reports on compliance of Environment Clearances for the period from **April 2025 to September 2025** in respect of **Cluster XI,** group of Mines of M/s Bharat Coking Coal Limited. We hope you will find in order.

Thanking you,
**Encl: -** As Above

Yours faithfully,

28/11/25

**Addl. General Manager**
**W.J. Area**
**(Cluster-XI, BCCL)**

**ENVIRONMENTAL CLEARANCE COMPLIANCE OF**

**CLUSTER-XI (EC No. J-11015/77/2011-IA.II (M) Dated- 26.08.2013**

(From April 2025 – September 2025)

| Sl. No | A. Specific Conditions by MOEF: | Compliance |
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| i. | **No mining shall be undertaken in/under the forestland until prior forestry clearance has been obtained under the provisions of FC Act 1980.** | **Complied**<br>Forest Clearance was applied earlier but Amendment in EC was granted for 3447.03 Ha which excludes the forest land of Moonidih Colliery on 26th July 2019 for Cluster XI group of mines. However FC will be taken in future if needed and Mining plan will be revised accordingly. The amendment is attached to **ANNEXURE – I** |
| ii. | **You will need to seek and obtain approval under the FC Act for diversion of the entire forest land located within the mining lease within a period of two years from 1.2.2013 i.e. date of issue of FC Division's guidelines vide no. 11-362/2012-FC, failing which the mining lease area will be reduced to the non-forest area plus the forest area for which you have been able to obtain the FC at the end of this time period. In the case of reduction in mine lease area, you will need to get a revised mining plan approved from the Competent Authority for reduced area and enter into a new mining lease as per reduced lease area. The EC will be construed to be available for the mining lease area as per the revised mining lease deed.** | **Complied**<br>Forest Clearance was applied earlier but Amendment in EC was granted for 3447.03 Ha which excludes the forest land of Moonidih Colliery on 26th July 2019 for Cluster XI group of mines. However FC will be taken in future if needed and Mining plan will be revised accordingly. The amendment is attached to **ANNEXURE – I** |
| iii. | **The maximum production in the cluster shall not exceed beyond that for which environmental clearance has been granted for the Cluster XI.** | **Complied.** The production from the cluster is within the limit for which environmental clearance has been granted. Enclosed as **ANNEXURE – II** |
| iv. | **The open cast quarries of the abandoned mines should be backfilled to the ground level and restored with native species.** | **Complied.** |

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| v. | **All coal from smaller UG mines should be transported by high capacity and mechanically covered trucks/ tippers.** | **Being Complied.** Various mechanically covered trucks Manufacturers for the transportation of Coal and OB in India have been contacted. Copy of the same is enclosed as **ANNEXURE – III**<br><br>Coal transportation has been done by trucks with tarpaulin cover. Covering of truck has been made mandatory in the transportation contract<br> <br> <br>(Coal transport in tarpaulin covered truck) |
| vi. | **Green belts shall be developed on both sides of the roads.** | **Complied.**<br>Time to time plantation is done either departmental or with the help of Forest Department, Dhanbad. Photographs are attached herewith as **Annexure IV.** |
| **vii.** | **Action plan for quenching of fires and rehabilitation along with the details of master plan be submitted to the MoEF for monitoring purpose.** | **Complied.**<br><br>Jharia Master Plan (JMP) is uploaded on BCCL website and under implementation. Copy of JMP attached in **ANNEXURE – V.** |

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| viii. | **Presently coal to Moonidih washery from other mines of the cluster is taking place through NH.**<br>**An alternate route for coal transportation may be explored.** | Coal from P.B. Area is direct feed coal and hence washing is not required.<br> <br> <br>**(Coal transport in tarpaulin covered truck)**<br>Presently coal (wet enough due to sprinkling at loading and unloading point) from the Moonidih mine transported to Moonidih washery through covered conveyor belt system. The coal dispatched from the washery is transported through rail transportation.<br> <br>**(Coal being transported on conveyor belt system)** |
| ix. | **For understanding the composition of emissions from coal mine fires, BCCL may** | **Agreed.** |
| x. | **Initiate action as proposed in the visit report of the EAC to Dhanbad.** | **Agreed.** |
| xi. | **The approved mining plan be submitted to the MoEF.** | Mining Plan of Gopalichuck OC and Kendwadih OC, Moonidih UG are submitted and Feasibility report of other mines is also submitted. |

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| | | Revised mining plan with mine closure plan was approved by 335th, 342nd &304th, 348th Board empowered sub-committee meeting of BCCL.<br><br>The name of the PB Group of mines has been changed to PBPCCM and accordingly the mining plan of PBPCCM has been approved by the Board by 418th Board Meeting.<br><br>Letter of approved mining plan is attached in ANNEXURE – VI.<br><br>Letter of approval of mining plan of Gopalichack OC and Kendwadih OC, PB Group of mines are attached in ANNEXURE XLII and ANNEXURE XLIII |
| xii. | **The measure to identify in the Environmental Plan for Cluster- XI groups of mine and the conditions given in this environmental clearance letter shall be dovetailed to the implementation of the Jharia Action Plan.** | Environmental plan for Custer XI group of mines and the condition given on the environment clearance has been dovetailed.<br><br>As per table 1 of Jharia Action plan attached in **ANNEXURE – VII**<br><br>Pootkee XV Seam & Moonidih XVII T seam fire status extinguished<br><br>Kendwadiah XII, XIV seam & kachhi Balihari XV seam fire status – Dormant |
| xiii. | **The proponent shall prepare time -series maps of the Jharia Coalfields through NRSC to monitor and prevent fire problems in the Jharia Coalfields by Isothermal mapping /imaging and monitoring temperatures of the coal seams (whether they are close to spontaneous ignition temperatures) and based on which, areas with potential fire problems shall be identified.**<br>**Measures to prevent ingress of air (Ventilation) in such areas, to prevent restart fresh/spread fires in other areas including in mines of cluster II shall be undertaken. Expertise available internationally could also be utilized for control of fire in Jharia Coalfields and for their reclamation and to further minimize time for fire and subsidence control. Isothermal mapping using thermal imaging has been got done by NRSC. Measures would be taken to prevent ingress of air (ventilation) in such areas, which may re-start fresh fires.** | **It has been complied.** NRSC was engaged for preparation of time series maps to monitor and prevent fire problems of Jharia Coalfield by Isothermal mapping/imaging and monitoring temperatures of the coal seams and NRSC has submitted their final report in August 2021 in which the area of fire has been reduced from 3.28 $Km^2$ to 1.8 $km^2$.<br><br>NRSC report is enclosed as **ANNEXURE VIII.** |
| xiv. | **The embankment constructed along the river boundary shall be of suitable dimensions and critical patches shall be strengthened by stone pitching on the river front side and stabilized with plantation so as to withstand the peak water flow and prevent mine inundation.** | **Not Applicable.**<br>This condition does not comply in P.B. Area as there is no river passing from P.B. Area.<br><br>In Moonidih area the condition is not applicable and the submission for the non-applicability is attached in **ANNEXURE IX.** |

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| xv. | **No mining shall be undertaken where underground fires continue. Measure shall be taken to prevent/check such fire including in old OB dump areas where the fire could start due to presence of coal/shale with sufficient carbon content.** | **It is being complied.**<br>It is being complied. Measures are being taken to control the fire. Firefighting by water sprinkling is being done. On OB Dump Grass-seeding is being done.<br> <br> |
| xvi. | **Mining shall be carried out as per statuette from the streams/nalas flowing within the lease and maintaining a safe distance from the Nalas flowing along the lease boundary. A safety barrier of a minimum 60m width shall be maintained along the nalas/water bodies.** | **It has been complied as per statue.** |

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| xvii. | **Thick green belt shall be developed along undisturbed areas, mine boundary and in mine reclamation. A total area of 254.67 ha shall be reclaimed and afforested.** | **It is being Complied**<br><br>Compensatory afforestation have been done in the FY 2021-2022 through forest department, Dhanbad in 20 Ha area.<br><br>18000 nos. of saplings has been planted near Berakar river against Compensatory Afforestation by DFO. Advance work has been completed in FY 2023-24 and completion work has been done in FY 2024-25. Work Order Attached in **ANNEXURE X.**<br><br>12 Ha. Of OB has been taken up for plantation in Gopalichuck and plantation has been done by forest department, Dhanbad in 2018-19.<br><br>1250 Nos.of plantation has been done in the year 2024-25 in under lease hold of Moonidih mine.<br><br>02 Ha. Bamboo Plantation done at Bhagabandh, PB Area in the year 2025-26.<br><br>Ecological restoration has been done at 07 Ha. of site.<br> <br> |

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| xviii | **Details of transportation, CSR, R&R and implementation of environmental action plan for the clusters-XI should be brought out in a booklet form within a year and regularly updated.** | **Complied and being followed. Enclosed as <u>ANNEXURE XI</u>.** |
| xix. | **Specific mitigative measures identified for the Jharia Coalfields in the Environmental Action Plan prepared for Dhanbad as a critically polluted area and relevant for Cluster XI shall be implemented.** | **It is being complied** in the name of Dhanbad Action Plan. It has been prepared in consultation with Jharkhand Pollution Control Board for entire BCCL. It is being implemented comprehensively for all the mines of BCCL.<br>Online PM10 Analyzer has been installed at PBPC and Hindi Bhawan (Gopalichuck) to Check the Ambient Air Quality continuously.<br>Online PM10 Analyzer has been installed at the PO Office in Moonidih project with display board located at the top of the GM office WJ area. The data is being uploaded to JSPCB website. |

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| | | <br>(PM10 Monitor installed at PBPC)<br><br>Water sprinkling is being done with the help of Mobile Water Tanker water on haul road for dust suppression for mitigation of air pollution.<br><br>Truck Mounted Fog Canon and Trolley Mounted fog canon are also in use for dust suppression.<br><br>Some of the salient actions of this cluster are as under:<br>**Enclosed as <u>ANNEXURE XII.</u>**<br><br>The process of operation of COAAQMS is under process<br><br>And it will be completed at the earliest. |
| xx. | **The locations of monitoring stations in the Jharia Coalfields should be finalized in consultation with the Jharkhand State Pollution Control Board. The Committee stated that smoke/dust emission vary from source to source (fuel wood, coal, fly ash from TPPs, silica from natural dust, etc.) and a Source Apportionment Study should be got carried out for the entire Jharia Coalfields. Mineralogical composition study should be undertaken on the composition of the suspended particulate matter ($PM_{10}$ and $PM_{2.5}$) in Jharia Coalfields and also quantified. These studies would help ascertain source and extent of the air pollution, based on which appropriate mitigative measures could be taken.** | **It is being complied.** Establishment of ambient environment quality monitoring stations has been finalized with the consultation of Jharkhand State Pollution Control Board. Copy is enclosed as **<u>ANNEXURE XIII.</u>**<br>Copy of Source Apportionment study is Enclosed as **<u>ANNEXURE XIV.</u>** |

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| xxi. | **The proponent will continue the existing Road-Rail transport network system in view of the implementation of the Master Plan (for 10 years) and another 5 years, gestation period after the completion of Master Plan for consolidation of the backfilled dug out fire areas and unstable areas is required. All mitigation measures (like covered trucks, green belting on either side of the roads, enhanced water sprinkling, strengthening and maintaining the roads etc.) shall be adopted up to 15 years (Phase-I) with the existing road-rail** | Action has been taken for conveyor-cum-rail transport system. Meanwhile transportation is being done by covering vehicle with tarpaulin cover.<br>Enclosed as **<u>Annexure XV.</u>** |

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| | **transport system. In phase-II, BCCL shall implement conveyor-cum-rail transport to avoid movement of trucks within the cluster for coal transportation in Phase-II which shall start after 15 years. Transportation of coal shall be by Rail and Conveyor belt, minimizing the existing road transport system in all the mines of the cluster and shall continue after 15 years. Loading of coal by pay loaders shall be discontinued. Adequate number of suitably designed off-take points shall be provided.** | <br>**(Coal transport in tarpaulin covered truck)**<br> <br>**(Water Sprinkling from Mobile Tanker)**<br> <br>**(Wind barrier on Moonidih washery road)**<br>Presently coal (wet enough due to sprinkling at loading and unloading point) from the Moonidih mine transported to Moonidih washery through covered conveyor belt system. The coal dispatched from the washery is transported through rail transportation<br> <br>**(Coal being transported on conveyor belt system)** |
| xxii. | **16944 nos of PAFs should be rehabilitated at cost of Rs 53776.60 Lakhs as per the approved Jharia Action Plan.** | Implementation of master plan has already been started through Jharia Rehabilitation and Development Authority (JRDA), Dhanbad. |

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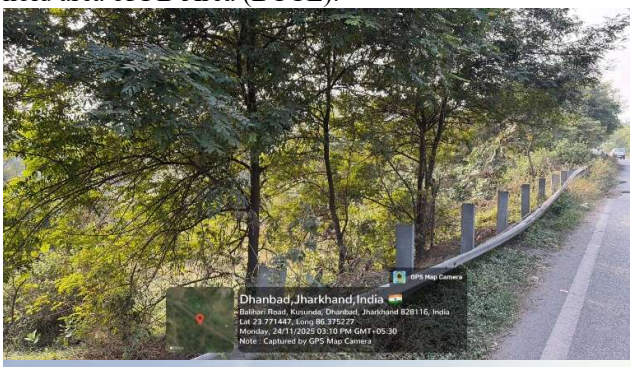
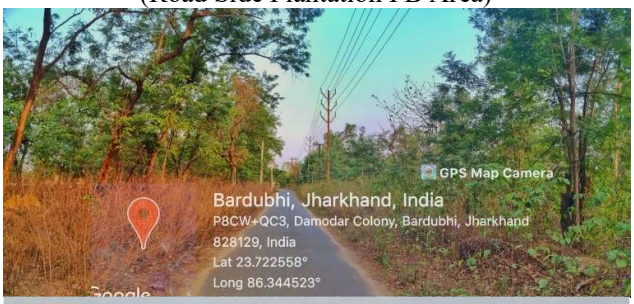
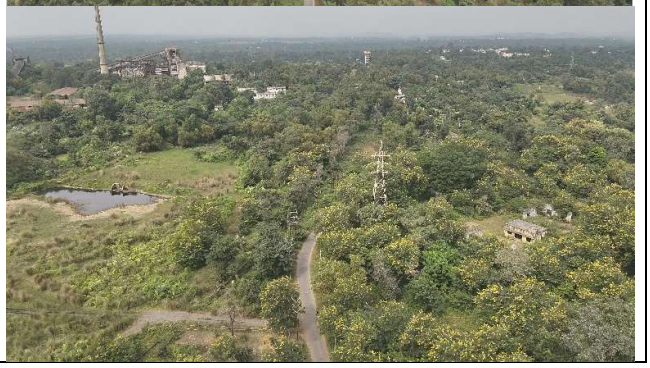
| xxiii | **Regular monitoring of subsidence movement on the surface over and around the working area and impact on natural drainage pattern, water bodies, vegetation, structure, roads, and surroundings shall be continued till movement ceases completely. In case of observation of any high rate of subsidence movement, appropriate effective corrective measures shall be taken to avoid loss of life and material. Cracks shall be effectively plugged with ballast and clayey soil/suitable material.** | **It is being complied.**<br>It will be implemented as the case may be but till now no any subsidence has been observed or recorded in P.B. Area and W.J Area.<br><br>Regular subsidence monitoring is done at underground mines.<br><br>Report of subsidence study conducted by CSIR is attached in **ANNEXURE XVI.** |
| xxiv | **Coal Extraction shall also be optimized 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, water bodies.** | **It is being complied.**<br>Being implemented as per statue. |
| xxv. | **Subsidence shall be monitored closely and if subsidence is found exceeding the permitted limits, then the landowners shall be adequately compensated with mutual agreement with the landowners.** | **It is being complied.**<br>Report of subsidence study conducted by CSIR is attached in **ANNEXURE XVI.** |
| xxvi. | **3-tier plantation should be developed 2 km stretch of road from the mine using native species.** | **It is being complied.** Plantation is being done on roadside in non-coal bearing areas and colonies by departmentally as well as from DFO and DMC in lease hold area of PB Area (BCCL).<br>  <br> |

(Road Side Plantation PB Area)





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| | | <br>(Road Side Plantation WJ Area)<br><br> <br>(Road side Plantation on Moonidih Washery)<br> <br>(Plantation on Railway siding) |
| xxvii | **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.** | **It is being complied.** Mobile water tankers are used for spraying water.<br>1 Number of trolley mounted fog cannon and 1 number truck mounted fog cannon are available and continuously used for spraying water at requires place like coal stock yard, weigh bridge, haul road etc.<br> <br>(Water Sprinkling from Mobile Tanker) |

(Water Sprinkling from Truck Mounted Fog Canon)

(Water Sprinkling from Trolly Mounted Fog Canon in PB area)

Mobile water tanker of capacity of 5 KL is used for the sprinkling water in Moonidih mines and Moonidih washery area. The sprinkling water is sourced from the filter house which treats mine water discharged from the Moonidih underground mine.

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| | | <br>**(Water Sprinkling from mobile water tanker in W.J. Area)**<br><br>Truck mounted fog canon has been procured by Moonidih Mines and is operational for dust suppression.<br><br>Roadside sprinkling systems are installed in the Moonidih washery near loading point and washery gate to VIP office is provided for dust suppression.<br><br> <br>**(Sprinkler arrangement at washery)**<br><br>Similarly for water sprinklers are provided at Moonidih UG mines at the transfer and coal cutting points for dust suppression. |
| xxviii | **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.** | **It is being complied.**<br>1. 400 saplings planted around mine boundary.<br>2. 600 around weigh bridge and area office boundary.<br>3. 30000 saplings planted (FY 2019-20) at OB Dump (compensatory afforestation by Forest Department, Dhanbad)<br>4. 20 Ha site is given to forest department for plantation work in FY 2020-21.<br>5. 200 Saplings are planted at XV seam mine boundary, shaft shrinking and 500 at Dhobni Plantation Site of MoonidIh mines in FY 2020-21. Enclosed in **ANNEXURE XVII** |

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| | | 6. 18000 nos. of plants has been planted against Compensatory Afforestation in FY 2024-25 near Berakar River outside the leasehold of BCCL by DFO in collaboration with P.B Area, BCCL. Completion work is under process.<br>7. 02 Ha. Bamboo Plantation done at Bhagabandh, PB Area in the year 2025-26.<br>8. 1250 Nos.of plantation has been done in the year 2024-25 in under lease hold of Moonidih mine. |
| xxix. | **Acid Water Treatment Plant, volume of water to be treated and disposal of brine should be provided.** | There is no acid water in Cluster XI. |
| xxx. | **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.** | **It is being complied.** Pilot scale Mine Water Treatment Plant is installed at P.B. Area to convert mine water into drinking water.<br><br>02 Nos. of Pressure Filter is installed at Gopalichuck and near P.B. Area office to supply clean water.<br>At present, mine water is sent to the Moonidih Basti pond through pipes from the treatment plant. Currently, the treatment of mine water is being done by one settling tank and two nos. of pressure filters, having capacity of 2000 kiloliters per day. |
| xxxi. | **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 village(s) in case the village wells go dry due to dewatering of mine.** | **It is being complied.** Mine water is being used for the industrial as well as domestic non-drinking purpose. Mine water is also supplied to ponds for community use.<br>Ponds have been constructed at PB Area. They are regularly cleaned and maintained.<br>Artificial Rain Water harvesting structure present at the GM office and Project office of Moonidih colliery W.J Area<br><br> <br> <br>**(Artificial Rain water harvesting structure)**<br><br>Artificial Rain Water Harvesting system has been constructed in PB Area office. Photographs are attached herewith. |

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| xxxii. | **Besides carrying out regular periodic health checkup of their workers, 10% of the workers identified from workforce engaged in active mining operations shall be subjected to health checkup 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 is being complied.**<br>NIOH report is Enclosed as **ANNEXURE XVIII**<br>Regularly PME & IME is carried out for the workers.<br>Details of PME & IME is enclosed herewith as **ANNEXURE XXXVI.** |
| xxxiii. | **The mining in the existing mines would be phased out after expiry of the current mining lease and after reclamation of mined over area. The operating mines may be analyzed and monitored for compliance of conditions, having bearing with movement of wild life until such time they are closed/phased out.** | **It will be complied.**<br>After phased out of mining, it will be reclaimed, eco-restored and will be made sustainable ecology with flora and fauna.<br>At present progressive plantation and Grass-seeding are being done on OB dumps and other sites. |
| xxxiv. | **Sufficient coal pillars shall be left un extracted around the air shaft (within the subsidence influence area) to protect from any damage from subsidence, if any.** | **Being Complied** in respect of all mines of cluster XI. |
| xxxv. | **High root density tree species shall be selected and planted over areas likely to be affected by subsidence.** | **Complied.**<br>Plantation in BCCL is being done on 3-tier basis, in which both, Monocotyledon (Monocots) such as grasses, bamboo etc. and Decotyledon (Dicots) such as sheesham, Mango, Pipal, Nim, Arjun etc. are being planted for developing an extensive root system. The Monocots having fibrous root system helps in developing roots density at the topsoil level while, Diocots having the tap root system have a distributed root density topsoil, subsoil and regolith layer of soil. These two root system together forms the high root density system.<br>High root density plants are regularly planted as per the roadmap prepared by Forest Research Institute, Dehradun. Copy of such is enclosed in **ANNEXURE XIX.** |
| xxxvi. | **Depression due to subsidence resulting in water accumulating within the low lying areas shall be filled up or drained out by cutting drains.** | **Being Complied.** |

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| xxxviii. | **Solid barriers shall be left below the roads falling within the blocks to avoid any damage to the roads.** | **Complied.** |
| xxxviii. | **The CSR Action Plan shall consist of need-based CSR Action Plan, CSR Auditing and monitoring mechanism etc. The proponent will spend 5 % of the retained earnings of the previous year subject to a minimum of Rs. 5/- per ton of coal production which should be adjusted as per the annual inflation The progress made thereon shall be uploaded on the company annually on the company website. Monitoring of the impacts of activities under CSR shall be carried out periodically.** | **Being Complied.** CSR work is handled at company level and every area is assigned work.<br>**The details of** CSR is enclosed as **ANNEXURE XII.**<br>**The link of CSR at BCCL level is as follows:**<br>CSR – Bharat Coking Coal Limited (bcclweb.in) |
| xxxix. | **Third party evaluation shall be got carried out regularly for the proper implementation of activities undertaken in the project area under CSR. Issue raised in the Public Hearing shall also be integrated with activities being taken up under CSR. The details of CSR undertaken along with budgetary provisions for the village-wise various activities and expenditure thereon shall be uploaded on the company website every year. The company must give priority to capacity building both within the company and to the local youth, who are motivated to carry out the work in future. The gap/space available between the entire mine area should be suitably planted with native species. Plantation should also be made in vacant area and along the road side so as to reduce dust pollution**. | **Complied.**<br>TISS has conducted the survey for effective and need based CSR activities implementation. Also Mid- term Evaluation of Project Swablamban - Reeling and Spinning Training Project under CSR has been conducted by TISS, Mumbai (Copy of Report is attached as **Annexure-XLIV**).<br>Plantation is being done on roadside in coal/non-coal bearing areas and colonies by departmentally as well as from DFO and DMC in lease hold area of Cluster XI group of mines (BCCL).<br>Photographs are attached herewith.<br> <br> |

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| xl. | **Central recreation park with herbal garden should be developed for use of all inhabitants.** | Sneh-Smriti Upvan is constructed at P.B. Area Office consisting of flowering, medicinal and ornamental saplings like Tulsi, Neem, Amaltaash, Patharchhur, Paan, Jamun, Bamboo, Ashoka etc. |

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| | | <br>**Sneh Smriti Upvan, P.B Area**<br><br>The construction of the Recreational Park with Herbal Garden in Moonidih mine is in process. |
| xli. | **The mine water should be treated properly before supply to the villager.** | **It is being complied.** An action plan for the utilization and treatment of surplus Mine Water has been prepared by Environment, Civil and CSR department conjointly. In this regard, 26 Mines have been identified for the implementation of scheme in the Phase-I.<br>A pilot scale mine water treatment plant in collaboration with CSIR, CIMFR is installed at P.B. Area office to convert mine water into drinking water. 2 number of pressure filter (1500 GPM each capacity) are installed for treating mine water.<br>Filter House which has a capacity of 2000 KL/day is functional at the present in Moonidih Project. |
| xlii | **Mine discharge water shall be treated to meet standards prescribed standards before discharge into natural water courses/agriculture. The quality of the water discharged shall be monitored at the outlet points and proper records maintained thereof and uploaded regularly on the company website.** | **Complied.** Mine discharge water is being allowed to settle down in the mine sumps before passing through sedimentation tank and pressure filter. The monitoring of water quality parameters is being carried out by CMPDIL. Reports enclosed in **ANNEXURE XX.**<br>Quarterly Water Quality Report is enclosed as Annexure XXIII. |
| xliii | **The void shall be converted into a water reservoir of a maximum depth of 15-20 m and shall be gently sloped and the upper benches of the reservoir shall be stabilized with plantation and the periphery of the reservoir fenced. The abandoned pits and voids should be backfilled with OB and reclaimed with plantation and or may be used for pisciculture.** | As working in P.B. Area does not approach combined seam therefore water reservoir cannot be formed. In due course we will be able to comply this point in future. OB dumps have been reclaimed by the help of DFO, Dhanbad. |
| xliv | **Regular monitoring of groundwater level and quality of the study area shall be carried out by establishing a network of existing wells and construction of new piezometers. 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 including Arsenic and Fluoride during the month of May. Data thus collected shall be submitted to the Ministry of Environment & Forest and to the Central Pollution Control Board/SPCB quarterly within one month of monitoring. Rainwater harvesting measures** | **Complied.** CMPDI RI-II has prepared a report for Location and design of Piezometers. Annual Groundwater monitoring data has been enclosed as **ANNEXURE XXI**.<br><br>Ground water quality monitoring data has been sent to State Pollution Control Board/Central Pollution Control Board. Details are attached as **ANNEXURE XXII.** |

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| | **shall be undertaken in case monitoring of water table indicates a declining trend.** | |
| xlv | **ETP shall also be provided for workshop, and CHP, if any. Effluents shall be treated to confirm to prescribe standards in case discharge into the natural water course.** | There is no CHP in Cluster XI. Effluents from mine is treated before discharge. ETP is provided at compressor house. One no. of O&G Trap with recirculation system is in operation at Kustore Workshop, P.B Area.<br> <br>**(O&G Trap with Recirculation System)**<br>A oil and grease trap is provided at the Compressor House in Moonidih Project.<br> <br>(**O&G Trap at Compressor House in Moonidih Project**)<br><br>The effluent from washery is not discharged into natural water but sent to Washery for further usage. |
| xlvi | **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 any one particular season which is consistent in the time series), and the report submitted to MoEF and its Regional office at Ranchi.** | **Complied.** Presently a time series map of vegetation cover in the Jharia Coal Field is being carried out through CMPDI, Ranchi using satellite imagery.<br>Further CMPDI has been requested to prepare "Time series of land use maps based on satellite imagery of the core zone and buffer zone. Land use land cover report is enclosed in **ANNEXURE XXIV.** |

| | | |
|---|---|---|
| xlvii. | **A Final Mine Closure Plan along with details of Corpus Fund shall be submitted to the Ministry of Environment & Forests five year before mine closure for approval. Habitat Restoration Plan of the mine area shall be carried out using a mix of native species found in the original ecosystem, which were conserved in-situ and ex-situ in an identified area within the lease for reintroduction in the mine during mine reclamation and at the post mining stage for habitat restoration. the mining plan and post- mining plan, closure plan should be prepared and submitted to the Ministry;** | **It shall be complied.** It will be complied when mine life will reach its final phase. |
| xlviii. | **A separate management structure for implementing environment policy and socio-economic issues and the capacity building required in this regard.** | **Agreed**.<br>Separate multidisciplinary environmental Management cell at Area Level has already been established. Office Order of the same has been enclosed as **ANNEXURE XXV.**<br>A full-fledged Environment Department, headed by a HOD (Environment) along with a suitable, qualified multidisciplinary team of executives has been established. The activities are monitored on regular basis at Area and at Headquarters levels. GM (Environment) at Headquarters level, Coordinates with all the Areas and reports to the Director (Technical) and in turn, he reports to the CMD of the company. The team is multidisciplinary and very much motivated under the guidance of the company's Director (Technical) and CMD. Further capacity building at both corporate and operating levels is being done. |
| xlix. | **The raw coal, washed coal and coal wastes (rejects) shall be stacked properly at earmarked** | It is being **complied**.<br>The raw coal, washed coal and rejects are stacked properly at earmarked Coal Stockyards and bunkers. |
| l. | **Site(s) within stockyards fitted with wind breakers/shields. Adequate measures shall be taken to ensure that the stored minerals do not catch fire.** | **Complied.**<br>Wind barriers fitted at various locations<br> <br>**(Wind Barrier along road side at coal stock yard and Water Sprinkling from Mobile Tanker)** |

| | | |
|---|---|---|
| | | <br>**(Wind barrier on Moonidih washery road)** |
| li. | **Hoppers of the coal crushing unit and washery unit shall be fitted with high efficiency bag filters and mist spray water sprinkling system shall be installed and operated effectively at all times of operation to check fugitive emissions from crushing operations, transfer points of closed belt conveyor systems and from transportation roads.** | **Complied.**<br><br>For water spraying at crushing points, loading points and transfer points; fixed water sprinklers have been installed at the hopper and chute of belt- conveyor.<br>Also, regular water sprinkling is done through fixed water sprinklers and mobile water sprinkler on railway siding, internal roads and transportation roads |
| lii. | **All approach roads shall be black topped and internal roads shall be concreted. The roads shall be regularly cleaned with mechanical sweepers.** | **Being complied.**<br>Manual cleaning of roads are done on regular basis.<br>Mechanical Sweeper machine has been procured for PB Area for regular cleaning of road. |
| liii. | **Green belt of 3 ha shall be developed all along the periphery of the site, along the areas such as the washery unit, crushing unit, and stockyard.**<br>**A 3-tier avenue plantation would be developed along vacant areas, near washery, storage yards, loading points and transfer points and along internal roads and main approach roads and on the road upto the railway siding and at the siding. The road between the coal washery and the main -road shall be black topped and thick 3-tier vegetation between the washery and villages/habitations shall be developed. In addition, a 10m thick green avenue plantation in the transportation route from washery to Majhri Railway Siding (of WCL) shall be provided in consultation with and approval of WCL under CSR.** | **Under Compliance.**<br><br>Plantation work has been done along mine boundaries, overburden dump, weighbridge and along roads.<br>1. 400 saplings planted around mine boundary.<br>2. 600 around weigh bridge and area office boundary.<br>3. 30000 saplings planted (FY 2019-20) at OB Dump (compensatory afforestation by Forest Department, Dhanbad)<br>4. 20 Ha site is given to forest department for plantation work in FY 2020-21.<br>5. 200 Saplings are planted at XV seam mine boundary, shaft shrinking and 500 at Dhobni Plantation Site of Moonidih mines in FY 2020-21. Enclosed in **ANNEXURE XVII**<br>6. 18000 nos. of plants will be planted against Compensatory Afforestation in FY 2024-25 near Berakar River outside the leasehold of BCCL by DFO in collaboration with P.B Area, BCCL. Completion work is under process.<br>7. 02 Ha. Bamboo Plantation done at Bhagabandh, PB Area in the year 2025-26.<br>8. 1250 Nos.of plantation has been done in the year 2024-25 in under lease hold of Moonidih mine. |
| liv. | **Trucks engaged for mineral transportation outside the washery up to the railway siding shall be optimally loaded. The trucks shall be properly maintained and emissions shall be below notified limits. Facilities for parking of trucks carrying raw coal from the linked coalmines shall be created within the Unit.** | **Complied**.<br>Certificate of Pollution under control certificate (Form 59) under Rule 115(2) of the Central Motor Vehicles Act, 1989 has been attached in **ANNEXURE XXVI.** |

| | | |
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| f<br>lv. | **Records of quantum of coal (in TPD) and ash content of raw coal being washed, clean coal and coal rejects produced from every batch of washing shall be maintained and details thereof uploaded on the company website.** | **Being Complied.**<br>Records of quantum of coal and ash content of raw coal, clean coal and coal rejects are maintained at the washery and regularly updated on the BCCL website.<br>Reports enclosed in **ANNEXURE XXVII.** |
| lvi. | **The washery unit shall be a zero-discharge facility and no wastewater shall be discharged from the washery into the drains/natural watercourses. Recycled water shall be used for development and maintenance of green belt and in the Plant Operations.** | **Being Complied.**<br>Moonidih Washery operates on Zero-Liquid Discharge and no wastewater is being discharged outside.<br>Recycled water is recirculated into washing operations and plantation activities. |
| lvii. | **Coal fines shall be recovered from the coal slurry, washery discharge and used in power generation and records of quantum of coal fines collected and used shall be properly maintained.** | **Being Complied.**<br>Coal fines are recovered from slurry and records are regularly maintained at the washery.<br>Details enclosed in **ANNEXURE XXVIII.** |
| lviii. | **No additional groundwater shall be used for the Plant Operations. Any additional water requirement envisaged shall be obtained by recycle/reuse to the maximum extent and from rainwater harvesting measures.** | **Complied.**<br>Mine water is being used for washing operations in Moonidih Washery.<br>Any additional water requirements are met from discharge of nearby BCCL mines.<br><br>Undertaking for no additional ground water is being used is attached in as **ANNEXURE XXIX.** |
| lix. | **Heavy metal content in raw coal, and washed coal shall be analyzed once in a year and records maintained thereof.** | Being Complied.<br>The work order for analysis of heavy metal in raw coal and washed coal has been awarded to IIT(ISM) Dhanbad, Copy of SAP PO attached as **Annexure-XXX,** however the reports are awaited. |
| lx<br><br>a | **Corporate Environment Responsibility:**<br><br>**The Company shall have a well laid down Environment Policy approved by the Board of Directors.** | A well-defined Corporate Environment Policy has been constituted at BCCL (https://www.bcclweb.in/environment/CEP_280220.pdf) and at CIL (https://www.coalindia.in/media/documents/CIL_Corporate_Environmental_Policy_2018.pdf) level to promote sustainable development by protecting the environment through integrated project planning & design, prevention/mitigation of pollution, conservation of natural resources, restoration of ecology & biodiversity, recycling/ proper disposal of wastes, addressing climate change and inclusive growth. A well-defined Corporate Environment Policy has already been laid down and approved by the Board of Directors. This is also posted on BCCL website.<br>http://www.bcclweb.in/environment/CEP_280220.pdf. |
| 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.** | Complied |
| c | **The hierarchical system or Administrative Order of the company to deal with environmental issues and for ensuring compliance with the environmental clearance** | A hierarchical system of the company to deal with environmental issue from corporate level to mine level already exists. Flow chart is attached as ANNEXURE XXXI. |

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| d | **conditions shall be furnished.**<br><br>**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.** | Agreed |
| **Sl.No** | **B. General 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 and Forests.** | No change in mining technology and scope of working has been undertaken. The production from the cluster is within the limit for which environment clearance has been granted. |
| ii. | **No change in the calendar plan of production for quantum of mineral coal shall be made.** | **Complied and Being Followed.** |
| iii. | **Four ambient air quality monitoring stations shall be established in the core zone as well as in the buffer zone for $PM_{10}$, $PM_{2.5}$, $SO_2$ and $NO_x$ monitoring.** | Locations of monitoring stations in the Jharia Coalfields has been fixed by the co-ordination with Jharkhand State Pollution Control Board.<br>Enclosed as **ANNEXURE XIII.** |
| 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 Regional Office at Ranchi 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.** | It is being complied. Data is regularly submitted to ministry along with compliance report.<br>Air quality Monitoring report, Water quality monitoring report and report of Monitoring of Heavy metals are being submitted with six monthly compliance report. The work of monitoring of ambient environment (Air quality monitoring and water quality monitoring including monitoring of Heavy metals is carrying out by CMPDIL) Copy of Heavy Metal Report is enclosed as **ANNEXURE XXXII.**<br><br>Monitoring data is Enclosed as **ANNEXURE XXXIII.** |
| 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.** | Being complied. Personnel operating HEMMs, drilling machine and other machines comply with safety regulation and are equipped with Personal Protective Equipment. The noise and vibration during blasting operations are controlled by using Electronic Detonators. Copy of Safety Material Distribution is enclosed as **ANNEXURE XXXIV.** |

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| | | All equipment and machines are regularly maintained and the noise level is within prescribed limits. Noise monitoring data has been enclosed as **ANNEXURE XXXIV.** |
| 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 19th May 1993 and 31st December 1993 or as amended from time to time before discharge. Oil and grease trap shall be installed before discharge of workshop effluents.** | Complied.<br><br>CMPDI Dhanbad is carrying out monitoring of environment quality work. There is arrangement for treatment of effluent discharge to prescribed standards. |
| 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.** | **Complied.** Vehicles used for transportation are covered with tarpaulin covers.<br><br>Certificate of Pollution under control certificate (Form 59) under Rule 115(2) of the Central Motor Vehicles Act, 1989 has been attached in **ANNEXURE XXVI.** |
| 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, 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.** | Presently, CMPDI Dhanbad is carrying out regular monitoring of environmental quality work.<br><br>Regular Environmental Monitoring reports are enclosed in **ANNEXURE XXXIII.** Copy of Heavy Metal Report is enclosed as **ANNEXURE XXXII.** |
| 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.** | **Complied.** Copy of Safety Material Distribution is enclosed as **ANNEXURE XXXIV**.<br>Vocational training Centers under Separate Human Resource Development Dept. is Conducting regular training program on these issues. Enclosed as **ANNEXURE XXXV.** |
| 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**. | Initial Medical Examination (IME) and Periodical Medical Examination (PME) of all the personnel are carried out as per the Statutes and Director General of Mines Safety (DGMS) guidelines. Enclosed as **ANNEXURE XXXVI.** |

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| 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.** | Separate multidisciplinary environmental management cell at Area Level has already been established. Office Order of the same has been enclosed as **ANNEXURE XXV.** Environmental Engineer provided at mine and Area level. The activities are monitored on regular basis at Area and at Head Quarters levels. GM (Environment) at Head Quarter Level Co-ordinates with all the Areas and reports to the Director (Technical) and in turn he reports to the CMD of the company. The team is multidisciplinary and very much motivated under the guidance of company's Director (Technical) and CMD. Further capacity building at both corporate and operating level is being done. |
| 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 Regional Office at Ranchi.** | It is being **complied.**<br>Agreed to report the same.<br>Copy enclosed in **ANNEXURE XXXVII.** |
| xiii. | **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 at http://envfor.nic.in.** | **Complied.**<br>Copy enclosed as **ANNEXURE XXXVIII.** |
| 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.** | **Complied.**<br>Copy enclosed as **Annexure XXXIX.** |
| xv. | **A copy of the environmental clearance letter 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.** | **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.**<br><br>**The monitoring data of environmental quality parameter (air, water, noise and soil) and critical pollutant. Such as $PM_{10}$, $PM_{2.5}$, $SO_2$ and NOx (ambient) and critical sectorial parameters shall also be displayed at the entrance of the project premises and mine office and in corporate office and on company's website.** | **Complied.**<br>The EC, its compliance along with monitoring data is being uploaded regularly on BCCL official website. http://www.bcclweb.in/?page_id=20425.<br><br>Photo of Display Board is enclosed herewith as **ANNEXURE XL.** |
| 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.** | **Complied.**<br>Six monthly reports of cluster –XI is regularly submitted to (twice in a year) the Regional Office of MoEFCC, Ranchi along with required data and information in soft copy.<br>The same has been uploaded on Parivesh Portal. |
| xviii. | **The Regional Office of this Ministry located at Ranchi shall monitor compliance of the stipulated conditions.**<br><br>**The Project authorities shall extend full cooperation to the office(s) of the Regional Office by furnishing the requisite data/ information/monitoring reports.** | Project will extend its all possible support and cooperation to the Regional Office in any kind of monitoring/visit/data collection etc. |
| xix. | **The Environmental statement for each financial year ending 31 March in Form –V is mandated to be submitted by the project proponent to 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 MoEF&CC by e-mail.** | **Complied.**<br>Copy is attached as **Annexure XLI.** |
| xx | **The proponent shall abide by all the commitments and recommendations made in the EIA/EMP report so also during their presentation to the EAC.** | **Complied.** |
| xxi | **The proponent is required to obtain all necessary clearances/approvals that may be required before the start of the project.** | **Agree** |

| | | |
|---|---|---|
| xxii | **The Ministry or any other competent authority may stipulate any further condition for environmental protection.** | **Complied.** |
| xxiii | **Failure to comply with any of the conditions mentioned above may result in withdrawal of this clearance and attract the provisions of the Environment (Protection) Act, 1986.** | **Agree** |
| xxiv | **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. The proponent shall ensure to undertake and provide for the costs incurred for taking up remedial measures in case of soil contamination, contamination of groundwater and surface water and occupational and other diseases due to the mining operations.** | **Complied.** |
| xxv | **The Environmental Clearance is subject to the outcome of the Writ Petition filed by M/S Bharat Coking Coal Limited (BCCL) in response to the closure orders issued by the Jharkhand State Pollution Control Board which is pending in the Jharkhand High Court.** | **Agree** |

28/11/25

**Project officer**
**P.B group of Mines**

Project Officer
PB Project Colliery Coal Mines

28/11/25

**Project officer**
**Gopalichuck colliery**

Project Officer
Gopalichuck Colliery

28/11/25

**Project Officer**
**Moonidih Washery**

परियोजना पदाधिकारी
PROJECT OFFICER
मूनीडीह कोयला परिष्करण संयंत्र
MOONIDIH COAL WASHERY

28.11.25

**Project Officer**
**Moonidih Mine**

PROJECT OFFICER/AGENT
MOONIDIH COLLIERY
B.C.C.L. LTD.

28/11/25

**Addl. GM**
**P.B Area**

Addl. General Manager
P.B. Area
BCCL Dhanbad

Annexure-I

No.J-11015/77/2011-IA-II(M)
Government of India
Ministry of Environment, Forest & Climate Change
IA-II Division

Indira Paryavaran Bhawan,
Jorbagh Road, N Delhi-3
Dated: 26th July, 2019

To,

The General Manager (E&F)
M/s Bharat Coking Coal Ltd.,
Koyla Bhawan, Koyla Nagar,
District **Dhanbad** (Jharkhand) Email: envbccl@gmail.com

**Sub: Cluster XI group of mines of capacity 6.604 MTPA (peak) of M/s Bharat Coking Coal Limited in an area of 3447.14 ha located in Jharia Coalfields, District Dhanbad (Jharkhand) - Amendment in Environmental Clearance - reg.**

Sir,

This is with reference to your online application vide No. IA/JH/CMIN/9513/2011 dated 13th September, 2017 and additional information provided on 7th February, 2019

**2.** The Ministry of Environment, Forest and Climate Change has granted environmental clearance vide letter dated 26th August, 2013 in favour of M/s Bharat Coking Coal Ltd (BCCL) to Cluster XI group of mines of combined capacity 5.08 MTPA (Normative)/6.604 MTPA (Peak) and Moonidih Washery of 1.6 MTPA in a total area of 3447.14 ha located in Jharia Coalfields, District Dhanbad (Jharkhand).

**3.** Now, amendment in environmental clearance has been sought due to proposed restructuring/re-assessment of capacities of some of the constituent mines namely Gopalichuck, Moonidih and Kendwadih, for implementation of Jharia Master Plan dealing with fire and subsidence, with the details as under:-

| S. No. | Mine | UG/ OC | Reasons for amendment | Capacity (MTPA) | Leasehold Area (ha) | Mine life (Balance years) |
|---|---|---|---|---|---|---|
| 1 | Gopalichuck | UG | | 0.143 | 241.94 | >30 |
| 1(a) | Gopalichuck | OC | Excavation of fiery coal under Jharia Master Plan | 0.65 | | |
| 2 | Kachi Balihari 10/12 Pit | UG | | 0.117 | 60.00 | 19 |
| 3 | PB Project | UG | | 1.04 | 89.00 | >30 |
| 4 | Bhagabandh | UG | | 0.104 | 581.17 | 10 |
| 5 | Kendwadih | OC | -do- | 0.26 | 217.54 | 23 |
| 6 | Pootkee | UG | -do- | Nil | 153.77 | Closed |
| 7 | Kachi Balihari 5/6 Pit | UG | -do- | Nil | 120.71 | Closed |
| 8 | Moonidih | UG | | 4.16 | 1982.90 | 28 |
| | **Total** | | | **6.474** | **3447.03** | |

**4.** The sectoral Expert Appraisal Committee in its meeting held on 24th February, 2019 has recommended the proposed amendment in environmental clearance. Based on recommendations of the EAC, Ministry of Environment, Forest and Climate Change hereby accords approval for amendment in environmental clearance dated 26th August, 2013 to Cluster XI group of mines and Moonidih Washery of 1.6 MTPA, of M/s Bharat Coking Coal Limited, located in Jharia Coalfields, District Dhanbad (Jharkhand), ***as stated in para 3 above***.

**5.** All other conditions stipulated in the environmental clearance dated 26th August, 2013 shall remain unchanged.

26/7/2019

**(S. K. Srivastava)**
**Scientist E**

**Copy to:**

1. The Secretary, Ministry of Coal, Shastri Bhawan, New Delhi
2. The Additional Principal Chief Conservator of Forests, Regional office (ECZ), Ministry of Environment & Forests, Bungalow No. A-2, Shyamali Colony, Ranchi - 834002
3. The Advisor, Coal India Limited, SCOPE Minar, Core-I, 4th Floor, Vikas Marg, Laxmi Nagar, New Delhi
4. The Member Secretary, Central Ground Water Authority, Ministry of Water Resources, Curzon Road Barracks, A-2, W-3 Kasturba Gandhi Marg, New Delhi
5. The Secretary, Department of Environment & Forests, Government of Jharkhand, Secretariat, Ranchi
6. The Member Secretary, Central Pollution Control Board, CBD-cum-Office Complex, East Arjun Nagar, Delhi - 32
7. The Member Secretary, Jharkhand State Pollution Control Board, TA Building, HEC Complex, PO Dhurwa, Ranchi
8. The District Collector, Dhanbad, Government of Jharkhand
9. Monitoring File 10. Guard File 11. Record File

issued
ok
30/7/19

Annexure-II

| **Production Data from Mines under Cluster XI from April'2025 – September'2025** | | |
|---|---|---|
| **Cluster XI** | **Coal Production (Tonn.)** | **OB Removal (Cum.)** |
| **PB Area (Hired OCP)** | **188096** | **1570821.28** |
| **PB Area (MDO UG)** | **6138** | **--** |
| **Moonidih Mine** | **131430** | **NIL** |

The production is well below the production values for which EC is granted.

## Moonidih Coal Washery

| Months | Production | | | | Dispatch | | |
|---|---|---|---|---|---|---|---|
| | RCF | WC | WPC | Slurry | WC | WPC | Slurry |
| Apr-25 | 29500 | 10569 | 17886 | 1045 | 10327.34 | 13989.78 | 5982.84 |
| May-25 | 51800 | 18130 | 29850 | 3820 | 18077.58 | 32409.56 | 2838.32 |
| Jun-25 | 42300 | 13592 | 26597 | 2111 | 15468.67 | 21581.61 | 1229.8 |
| Jul-25 | 17100 | 5474 | 10747 | 879 | 7728.42 | 15714.62 | 644.18 |
| Aug-25 | 29220 | 9498.6 | 17676 | 2045.4 | 9925.43 | 16686.07 | 0 |
| Sep-25 | 40400 | 15776.5 | 20706.5 | 3917 | 19433.62 | 19961.28 | 0 |
| Oct-25 | 48200 | 22707 | 20454 | 5039 | 22332.63 | 21358.2 | 0 |
| Total | 258520.00 | 95747.10 | 143916.50 | 18856.40 | 103293.69 | 141701.12 | 10695.14 |

22/11/25
Prepared By Statistician
Moonidih Coal Washery

22/11/25
Dy. Manager(CP)
Moonidih Coal Washery

Gmail

Environment Deptt. P.B. Area <pbenvarea7@gmail.com>

## Availability of Mechanical Covered Trucks for transportation of Coal

1 message

**Environment Deptt. P.B. Area** <pbenvarea7@gmail.com> Sat, May 13, 2023 at 12:55 PM
To: office.cio@beml.co.in, office.dm@beml.co.in

Dear Sir,

Our company Bharat Coking Coal Ltd, a Subsidiary of Coal India Ltd is engaged in the business of mining coking coal . Large no of tipping trucks are in operation in our mines for transportation of coal .
The Ministry of Environment and Forest, Government of India has issued statutory directives to deploy tipping trucks with a mechanical system for covering the trucks to ensure that there is no spillage during coal transportation.

We will be grateful if you confirm the availability of such mechanically covered tipping trucks in your company.

An early reply will be highly appreciated.

Coal India Limited
A Maharatna Company

**Thanks & Regards,**
Assistant Manager, Environment
Environment Department
P.B. Area, BCCL
Dhanbad
***+91-6287697448***

*Take out Print only If it is very Important*
*"Save Paper SaVe TrEe"*

## Fwd: Mechanically covered trucks for transportation of coal

1 message

**ARUN KUMAR** <gmlodna.bccl@coalindia.in> Tue, 19 Apr, 2022 at 1:32 pm
To: agmofficelodna <agmofficelodna@gmail.com>, planninglodna <planninglodna@gmail.com>, TAPAS KUMAR BANDOPADHYAY <tapas.bandopadhyay@coalindia.in>, Pankaj Kumar <pankaj.k3407@coalindia.in>, envlodna <envlodna@gmail.com>

For information and necessary action

---

**From:** "Rakesh Dwivedi" <rdwivedi.cil@coalindia.in>
**To:** "b bhadale" <b.bhadale@tatamotors.com>
**Cc:** "Pradeep Kumar Sinha" <gmenm.bccl@coalindia.in>, "KUMAR RANJEEV" <gmenv.bccl@coalindia.in>, "ARUN KUMAR" <gmlodna.bccl@coalindia.in>, "Nand Kishore Bharati" <gmcmc.bccl@coalindia.in>, "Shailendra Kumar Singh" <tstodtop.bccl@coalindia.in>, agmofficelodna@gmail.com
**Sent:** Tuesday, April 19, 2022 12:03:12 PM
**Subject:** Mechanically covered trucks for transportation of coal

To Sri Bapu Saheb Bhadale
Nodal Officer (Commercial Vehicles)
Tata Motors, Mumbai

Dear Sir,

REF: BCCL Work order no 191 DT 25-11--2011 for 173 nos Tata Tippers (Hywa) LPK2518

Our company Bharat Coking Coal Ltd, a Subsidiary of Coal India Ltd is engaged in the business of mining coking coal . Large no of tipping trucks of Tata make are in operation in our mines for transportation of coal and for reference a` work order issued to Tata Motors for procurement of tipping trucks has been referred above.
Ministry of Environment and Forest, Government of India has issued statutory directives to deploy tipping trucks with a mechanical system for covering the trucks to ensure that there is no spillage during coal transportation. This issue raised with Tata Motors officials and we were informed that Tata Motors would look into the matter

WE will be grateful if you confirm the availability of such mechanically covered tipping trucks in your company. Kindly let us no if it is possible to retrofit the operating Tata Moto Tippers with mechanical covers,

An early reply will be highly appreciated

Dr R. Dwivedi,
General Manager (E&M)/Solar
Bharat Coking Coal Limited
Dhanbad

# Annexure IV

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2023.11.15 11:07

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# BHARAT COKING COAL LIMITED

# MASTER PLAN
# FOR
# DEALING WITH FIRE, SUBSIDENCE AND REHABILITATION
# IN THE LEASEHOLD OF BCCL

## UPDATED
## MARCH' 2008.

CENTRAL MINE PLANNING & DESIGN INSTITUTE LTD
REGIONAL INSTITUTE – 2
DHANBAD

# C O N T E N T


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# SUMMARISED DATA

# SUMMARISED DATA

| SL NO | PARTICULARS | MASTER PLAN'04 | MASTER PLAN'06 | MASTER PLAN'08 |
|---|---|---|---|---|
| A | **Dealing with fire** | | | |
| 1 | Total nos. of fires identified at the time of nationalisation | 70 | 70 | 70 |
| 2 | Additional fires identified after nationalisation | 6 | 7 | 7 |
| 3 | No. of fires extinguished till date | 10 | 10 | 10 |
| 4 | Total no. of fires excluding the extinguished fires | 66 | 67 | 67 |
| 5 | Fires already under control, requiring no action plan except maintenance of status | 9<br>* Kankanee XIII & XIV seam<br>* Loyabad XV, XIV & XIII seam<br>* Kachhi-Balihari XV seam<br>* Bhalgora XIV seam<br>* Bhalgora XV seam<br>* Simlabahal XIV seam<br>* Bhagaband XVI seam<br>* Amlabad XIV seam<br>* Jealgora fire | 9<br>* Kankanee XIII & XIV seam<br>* Loyabad XV, XIV & XIII seam<br>* Kachhi-Balihari XV seam<br>* Bhalgora XIV seam<br>* Bhalgora XV seam<br>* Simlabahal XIV seam<br>* Bhagaband XVI seam<br>* Amlabad XIV seam<br>* Jealgora fire | 9<br>* Kankanee XIII & XIV seam<br>* Loyabad XV, XIV & XIII seam<br>* Kachhi-Balihari XV seam<br>* Bhalgora XIV seam<br>* Bhalgora XV seam<br>* Simlabahal XIV seam<br>* Bhagaband XVI seam<br>* Amlabad XIV seam<br>* Jealgora fire |
| 6 | No. of collieries affected by fires | 40 | 41 | 41 |
| 7 | Total surface area affected by fires | 8.90 sq.km | 8.90 sq.km | 8.90 sq.km |
| 8 | Potential impact of fire | * Dhanbad-Patherdih Rail Line.<br>* Adra-Gomoh Rail Line.<br>* Chatkari, Kari, Ekra, Katri Jores.<br>* Jharia, Kirkend and many other populated areas. | * Dhanbad-Patherdih Rail Line.<br>* Adra-Gomoh Rail Line.<br>* Chatkari, Kari, Ekra, Katri Jores.<br>* Jharia, Kirkend and many other populated areas. | * Dhanbad-Patherdih Rail Line.<br>* Adra-Gomoh Rail Line.<br>* Chatkari, Kari, Ekra, Katri Jores.<br>* Jharia, Kirkend and many other populated areas. |
| 9 | No. of fires for which action plan has been proposed | 66 | 67 | 67 |
| 10 | No. of fires considered for Projectisation. | 66 | 67 | 67 |

| SL NO | PARTICULARS | MASTER PLAN'04 | MASTER PLAN'06 | MASTER PLAN'08 |
|---|---|---|---|---|
| 11 | No. of fire projects to be implemented. | 40* | 45** | 45** |
| 12 | Maximum No of fire projects to be implemented at a time | 15 | 21 | 21 |
| 13 | Total duration proposed for implementation of fire projects (excluding 2 years of pre-implementation activity | 15 years | 10 years | 10 years |
| 14 | Technology suggested for controlling fires | * Excavation of fire material<br><br>*Surface sealing and blanketing. | * Excavation of fire material<br><br>*Surface sealing and blanketing. | * Excavation of fire material<br><br>*Surface sealing and blanketing. |
| | | *Isolation by trenching and back filling with cohesive soil. | *Isolation by trenching and back filling with cohesive soil. | *Isolation by trenching and back filling with cohesive soil. |
| | | *Construction of grout barrier and stabilisation against rail, road and jore. | *Construction of grout barrier and stabilisation against rail, road and jore. | *Construction of grout barrier and stabilisation against rail, road and jore. |
| | | *Filling of opencast high wall, shafts, inclines and other subsided areas. | *Filling of opencast high wall, shafts, inclines and other subsided areas. | *Filling of opencast high wall, shafts, inclines and other subsided areas. |
| | | *Cooling and excavation of fire material and filling with cohesive soil. | *Cooling and excavation of fire material and filling with cohesive soil. | *Cooling and excavation of fire material and filling with cohesive soil. |
| | | *Blind flushing with sand / cement / fly ash/grout mixture. | *Blind flushing with sand / cement / fly ash/grout mixture. | *Blind flushing with sand / cement / fly ash/grout mixture. |
| | | *Cooling by water curtain/ in filteration ponds. | *Cooling by water curtain/ in filteration ponds. | *Cooling by water curtain/ in filteration ponds. |
| | | *Seam sealing, tunnel plug and underground | *Seam sealing, tunnel plug and underground | *Seam sealing, tunnel plug and underground |
| 15 | Phase wise no of fire projects to be implemented | | | |
| | Phase-I (First five year) | 27 | 28 | 28 |
| | Phase-II ( 2nd five year) | 13 | 17 | 17 |
| 16 | Total indicative fund requirement for controlling the fires (Rs. Crs.) | | | |

| SL NO | PARTICULARS | MASTER PLAN'04 | MASTER PLAN'06 | MASTER PLAN'08 |
|---|---|---|---|---|
| | ● Pre-implementation activities (2 years) | 3.27 | 4.75 | 4.93 |
| | ● Phase-I (3rd to 7th yrs.) | 1299.40 | 1014.55 | 1101.19 |
| | ● Phase-II (8th to 12th yrs.) | 1161.48 | 1133.21 | 1205.39 |
| | ● Phase-III (13th to 17th yrs.) | 493.67 | - | - |
| | **Total** | **2957.82** | **2152.51** | **2311.50** |
| **B.** | **Stabilisation** | | | |
| 17 | No. of sites proposed to be stabilized through sand stowing | 121 | - | - |
| 18 | Total duration proposed for implementation of subsidence control projects | 20 years | - | - |
| 19 | Total capital requirement (Rs. Crs) | **387.48** | - | - |
| **C** | **Rehabilitation of in- habitated sites from endangered areas** | | | |
| 20 | No. of sites proposed to be Rehabilitated. | | | |
| | Full | 271 | 326 | 326 |
| | Part | 261 | 269 | 269 |
| | **Total** | **532** | **595** | **595** |
| 21 | No .of houses to be vacated | | | |
| | BCCL | 36208 | 44155 | 44155 |
| | Private (Authorized) | 15571 | 29444 | 29444 |
| | Private (Un -Authorized) | 12719 | 23847 | 23847 |
| | Other | 802 | 868 | 868 |
| | **Total** | **65300** | **98314** | **98314** |
| 22 | No of houses proposed to be Resettled/Constructed | | | |
| | BCCL | 36208 | 25000 | 25000 |
| | Private (Authorized) | 15571 | 29444 | 29444 |
| | Private (Un -Authorized) | 12719 | 23847 | 23847 |
| | Other | 802 | 868 | 868 |
| | **Total** | **65300** | **79159** | **79159** |
| 23 | Phase wise no. of houses proposed to be rehabilitated | | | |

| SL NO | PARTICULARS | MASTER PLAN'04 | MASTER PLAN'06 | MASTER PLAN'08 |
|---|---|---|---|---|
| | • Phase – I (3rd to 7th yrs) | 19984 | 45795 | 45795 |
| | • Phase – II (8th to 12th yrs) | 18861 | 33364 | 33364 |
| | • Phase – III (13th to 17th yrs) | 16321 | - | - |
| | • Phase – IV (18th to 22nd yrs) | 10134 | - | - |
| | **Total** | **65300** | **79159** | **79159** |
| 24 | Land required for rehabilitation (Ha) | | | |
| | For BCCL houses | 978.57 | 400.00 | 400.00 |
| | For Non BCCL houses | 802.07 | 1104.99 | 1104.99 |
| | **Total** | **1780.64** | **1504.99** | **1504.99** |
| 25 | Time frame for implementation (excluding 2 years of pre-implementation period). | 20 Years | 10 years | 10 years |
| 26 | Estimated Capital required ( Rs. Crs.) | | | |
| | • Pre Implementation (1st & 2nd yrs) | 39.42 | 143.31 | 163.79 |
| | • Phase – I (3rd to 7th yrs) | 576.61 | 2184.71 | 2498.26 |
| | • Phase – II (8th to 12th yrs) | 705.59 | 1857.92 | 2118.55 |
| | • Phase – III (13th to 17th yrs) | 683.16 | - | - |
| | • Phase – IV (18th to 22nd yrs) | 442.13 | - | - |
| | **Total** | **2446.91** | **4185.94** | **4780.60** |
| 27. | • Estimated capital required for BCCL houses | | 931.10 | 1068.45 |
| | • Estimated capital required for Non-BCCL houses including others | | 3254.84 | 3712.15 |
| | **Total** | | **4185.94** | **4780.60** |
| **C** | **Diversion of Rail and Road** | | | |
| 28 | Estimated capital (Rs Crs) | - | 20.00 | 20.00 |
| 29 | Phase wise total capital | | | |

| SL NO | PARTICULARS | MASTER PLAN'04 | MASTER PLAN'06 | MASTER PLAN'08 |
|---|---|---|---|---|
| | for **Master Plan** | | | |
| | • Pre Implementation (1st & 2nd yrs) | 46.58 | 148.06 | 168.72 |
| | • Phase – I (3rd to 7th yrs) | 1955.45 | 3199.26 | 3599.45 |
| | • Phase – II (8th to 12th yrs) | 1998.45 | 2991.13 | 3323.94 |
| | • Phase – III (13th to 17th yrs) | 1296.78 | - | - |
| | • Phase – IV (18th to 22nd yrs) | 494.95 | - | - |
| | **Total** | **5792.21** | **6358.45** | **7112.11** |

* Including 6 EMSC / RCFS Schemes.
** Including 5 EMSC / RCFS Schemes

## 30. PHASE WISE SUMMARY OF REHABILITATION

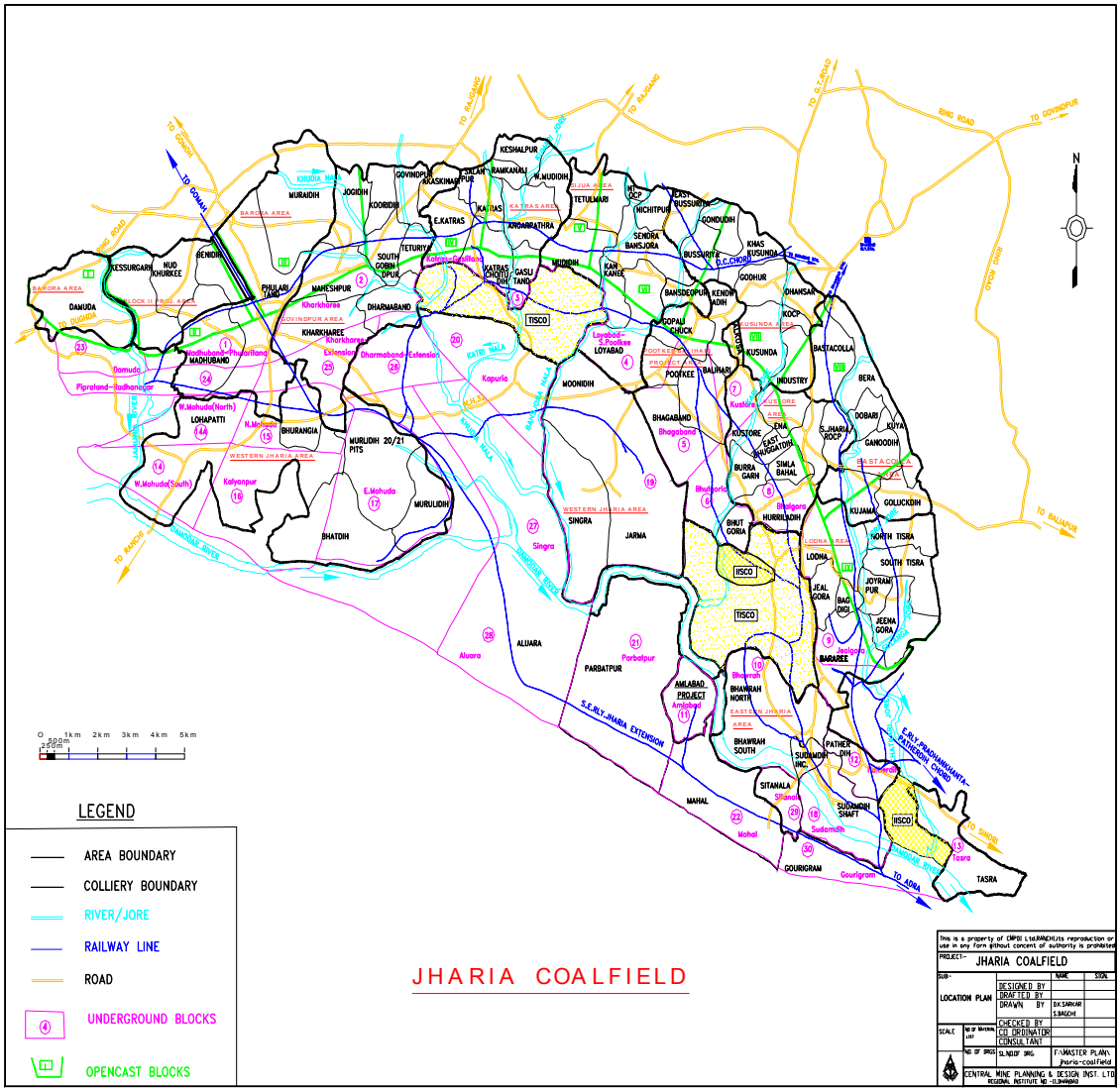
| Phase | No of houses (including demo. Scheme) | | | | Total | Land for resettlement (ha) | | Total (ha) |
|---|---|---|---|---|---|---|---|---|
| | BCCL | PVT. | ENCHR. | OTHER | | BCCL | NON-BCCL | |
| PHASE-I | 12462 | 16671 | 16166 | 496 | 45795 | **199.39** | **660.27** | **859.66** |
| PHASE-II | 12538 | 12773 | 7681 | 372 | 33364 | **200.61** | **444.72** | **645.33** |
| **TOTAL** | **25000** | **29444** | **23847** | **868** | **79159** | **400.00** | **1104.99** | **1504.99** |

# 31. Summary of Physical and Financial Projections

| 1. Projection - Physical | | | | |
|---|---|---|---|---|
| **Particulars** | **Pre-implementation (1st & 2nd Yr.)** | **Phase- I (3rd to 7thYr.)** | **Phase-II (8th to 12th Yr.)** | **Total** |
| **A. Dealing with fire** | | | | |
| **i**) No. of fire project to be implemented | **-** | 28* | 17 | 45 |
| **B) Rehabilitation** | | | | |
| **i**) No. of sites to be rehabilitated | **-** | 300 | 295 | 595 |
| **ii**) No. of houses to be rehabilitated | | | | |
| a) BCCL | **-** | 12462 | 12538 | 25000 |
| b) Private | **-** | 16671 | 12773 | 29444 |
| c) Encroachers | **-** | 16166 | 7681 | 23847 |
| d) Others | **-** | 496 | 372 | 868 |
| **Total** | | **45795** | **33364** | **79159** |
| **2. Projection – Financial ( Rs. In crores )** | | | | |
| **Particulars** | **Pre-implementation (1st & 2nd Yr.)** | **Phase- I (3rd to 7thYr.)** | **Phase-II (8th to 12th Yr.)** | **Total** |
| **A. Dealing with fire** | **4.93** | **1101.19** | **1205.39** | **2311.50** |
| **B) Rehabilitation** | | | | |
| a) BCCLHouses | 34.75 | 478.95 | 554.75 | 1068.45 |
| b) Non BCCL Houses | 129.04 | 2019.32 | 1563.80 | 3712.15 |
| **Total** | **163.79** | **2498.27** | **2118.55** | **4780.60** |
| **c. Diversion of Rail & Road ( Advance Action )** | **20.00** | | | **20.00** |
| **Grand Total ( A+B+C )** | **188.72** | **3599.46** | **3323.94** | **7112.11** |

* Including fire ongoing EMSC/RCFS scheme and one maintenance project.

# INTRODUCTION


LEGEND
AREA BOUNDARY
COLLIERY BOUNDARY
RIVER/JORE
RAILWAY LINE
ROAD
UNDERGROUND BLOCKS
OPENCAST BLOCKS
JHARIA COALFIELD
PROJECT:- JHARIA COALFIELD
LOCATION PLAN
CENTRAL MINE PLANNING & DESIGN INST. LTD
TISCO
IISCO
KESHALPUR
RAMKANALI
N.MUDIDIH
TETULMARI
MICHITPUR
EAST BUSSURIYA
GONDUDIH
SENDRA BANSJORA
BUSSURIYA
KHAS KUSUNDA
GODHUR
DHANSAR
KOCP
BANSDEOPUR
KENDWADIH
GOPALICHUCK
KUSUNDA
BASTACOLLA
BERA
DOBARI
KUYA
GANOODIH
BALIHARI
POOTKEE
INDUSTRY
MOONIDIH
BHAGABAND
KUSTORE
EAST BHAGABATDIH
BURRA GADH
SIMLA BAHAL
GOLUCKDIH
KUJAMA
NORTH TISRA
SOUTH TISRA
JOYRAM PUR
JEENA GORA
BARAREE
HURRILDIH
BHUT GORIA
LODNA
JEAL GORA
BAG DIGI
SINGRA
JARMA
ALUARA
PARBATPUR
AMLABAD PROJECT
BHAWRAH NORTH
BHAWRAH SOUTH
FATHER DIH
SUDAMDIH INC.
SUDAMDIH SHAFT
SITAMALA
MAHAL
GOURIGRAM
TASRA
BHATDIH
MURULIDIH
MURULIDIH 20/21 PITS
E.MAHUDA
W.MAHUDA (SOUTH)
W.MAHUDA (NORTH)
LOHAPATTI
BHURANGIA
KALYANPUR
DHARMABAND
DHARMABAND EXTENSION
KHARKHAREE
KHARKHAREE EXTENSION
MAHESHPUR
PURNADIH
SOUTH GODHUR PUR
TETURIYA
E.KATRAS
KATRAS
KATRAS CHOITO/CHHOTO
GASLI TAND
ARDARBATHRA
KAN KANEE
LOYABAD
LOYABAD EXTENSION
KAPURIA
MURAIDIH
JOGIDIH
KOORIDIH
GOVINDPUR
KRASKIMARI
SALANPUR
GENDIH
NUD KHURKEE
KESSURGARH
DAMUDA
PIPRATAND
MADHUBAND
MADHUBAND-PHUSRO RANI
DAMUDA EXTENSION
DHARMABAND EXTENSION
KHARKHAREE EXTENSION
GOVINDPUR AREA
BARORA AREA
WESTERN JHARIA AREA
EASTERN JHARIA AREA
KUSUNDA AREA
KUSTORE AREA
LODNA AREA
KATRAS AREA
KUJAMA AREA
LOOKOUT SHAFT PROJECT AREA
KHUDIA NALA
KATRI NALA
BARAKAR RIVER
JAMUNIA RIVER
DAMODAR RIVER
KUSTORE NALA
BARAKAR NALA
M.H.S.P.
TO GOMOH
TO RAJGANG
TO GOVINDPUR
TO DHANBAD
TO BALLIAPUR
TO RANCHI
TO ADRA
TO SINDRI
RING ROAD
S.E.RLY.JHARIA EXTENSION
E.R.Y. PRADHANKHANTA-KATRAS (CHORD)
N
0 1km 2km 3km 4km 5km
500m 250m

## 1.0 INTRODUCTION

### 1.1 Historical Background

Mining areas in Jharia and Raniganj coal fields, within the leasehold of Bharat Coking Coal Limited, are faced with problems of Fire and subsidence due to the century old history of mining in these coal fields. These problems have been receiving attention of all concerned from time to time and the mitigation measures have been taken on case to case basis at different times.

The problem of danger of subsidence of surface land over mine workings standing on small stooks vis-à-vis danger to habitations have attracted the attention of authorities concerned, technical organizations and institutions from time to time. MMGI of India formed the first subsidence committee in 1922. The second subsidence committee was formed by the same institute, which submitted its report in 1937, recommending remedial measures to minimize the danger due to mine subsidence. A few more committees were set up to examine the problem and areas where danger due to subsidence was apparent. One such committee was “Barakar Subsidence Committee in 1957”, which submitted its report on the danger subsidence of G.T. Road and residential building in Barakar town. In 1953 two separate reports were submitted by the erstwhile NCDC entitled “Fire, Subsidence and Problems relating to Mine Workings in Underground “. In 1964, Director, CMRS, Dhanbad submitted a report entitled “Report on the Study of Coal Fires, subsidence and Problems Relating to Mine Workings.

The Govt. of India, Ministry of Energy (Department of Coal), constituted a committee under the Chairmanship of Mr. S.P. Gugnani, Joint Secretary, Dept. of Coal on 5$^{th}$ January 1976, to examine the whole question of safety in the nationalized coal mines. The Committee (Gugnani Committee – 1976) also decided to examine the question of safety of surface dwellers arising out of underground workings. The committee constituted a sub-committee with Sri S. Bagchi as convenor on 11.03.76 to make an in-depth study of the problems of subsidence and fire in coal mining areas and suggest solutions for the same. The committee submitted a report in 1979. The committee observed that the gigantic and multifarious subsidence problems in Jharia Coalfield was caused due to existence of old workings with full height extraction and wide galleries, multi-seam and multi-section development under shallow depths, existence of developed seams under extracted lower seam with stowing etc. There are many towns, villages, rivers, jores, roads, railway line etc., in Jharia Coalfield which are standing over small pillars / stooks reported to be water logged. If, by any chance, this water drains away it may cause subsidence. In addition, fire is also active in some areas, causing danger to the surface structure. In many mines, size of pillars, which were left below the surface structures as a protective measure, is not known because of non-availability of off-set plans of abandoned workings. The committee recommended the following eight (8) main measures to control danger due to subsidence depending upon conditions prevailing in individual mines of BCCL.

a. Vacating and / or dismantling the surface structures over the goaved out or unstable workings – 30 collieries.

b. Stabilsation of underground workings by packing or with suitable support system – 45 collieries.

c. Division of road, railway line, jore etc. and shifting of buildings and other infrastructures from unstable workings – 8 collieries.

d. Keeping the unstable workings under observation by measuring surface movement and assessing stability of workings by investigation –15 collieries.

e. Stopping further extension or extraction of mine workings or further construction of structure on the surface – 4 collieries.

f. Preparation, procurement and updating of mine plans to determine the extent of instability – 4 collieries.

g. Controlling underground fire effectively to prevent surface subsidence and breathing of air through subsided area – 8 collieries.

h. Assessing the danger of inundation to the workings due to surface or underground collapse – 3 collieries.

The committee also recommended the formation of Area Development Authorities by the concerned State Governments by 1981 so that these could regulate the construction of structures over coal baring areas to deal with the problems of subsidence on a permanent footing.

The long history of mining in these coal fields have led to increase in the number of sites prone to danger of safety due to fire and subsidence. Recurrent problems of fire and subsidence in these two coal fields and their spurt in 1996 required identification of subsidence and fire prone areas so that measures could be taken to tackle them. CMRI was engaged by BCCL for identification of such inhabited areas within the leasehold of BCCL. Subsequently, DGMS also identified a number of in-habitated areas, which require attention due to problems of fire and subsidence.

It has been felt right from the beginning of this decade that a comprehensive action plan needs to be prepared for dealing with the problems of fire and subsidence in these two coalfields. As a recourse to this, a project entitled “Jharia Mine Fire Control Technical Assistance Project” was funded by the World Bank under the Development Credit Agreement in April 1993. M/s. GAI/MET-CHEM Joint Venture, USA / Canada were engaged for “Development of Fire Fighting Programme in JCF” (a part of the total project, the other part being preparation of Environmental management Plan for JCF). The consultants submitted their study report in 1996, identifying a number of fire projects with their estimated capital requirement.

In December 1996, Govt. of India constituted a high Power Committee under the Chairmanship of Secretary, Ministry of Coal with other members from the Govt. of Bihar & West Bengal, Planning Commission, DGMS, Ministry of Labour, Chairman CIL, CMDs of ECL, BCCL & CMPDI with director (Tech), Ministry of Coal as member Secretary to review the problems of fire & subsidence in Jharia and Raniganj coal fields and suggest measures to deal with problems of existing habitation on subsidence / fire prone areas. The Committee was also asked to suggest areas for resettlement, mechanism for evacuation and resettlement of affected population and Institutional arrangement to prevent new habitation in fire and subsidence prone areas. Subsequently, Ministry of Coal directed CMPDI to study in depth problems of subsidence and fire in BCCL and ECL, and submit its report. As the fire problem was already studied under World Bank funding, two separate projects relating to

subsidence and rehabilitation problems were funded by Ministry of Coal, under Coal S&T Grant as EMSC projects. The projects were as follows:

| SL. No. | Name of the Project | Sanctioned Capital |
|---|---|---|
| 1 | Generation of data and identification of subsidence prone areas and its segregation into controllable and uncontrollable areas in the leasehold of BCCL (Phase-I) | Rs. 25.84 lakhs |
| 2 | Technological Measures for control of subsidence where feasible, assessment of evacuation and resettlement needs where subsidence control is not feasible and assessment of fund requirement for both in the leasehold of BCCL (Phase – II) | Rs. 48.33 lakhs |

The study in respect of the first project as mentioned above (Phase – I) was completed in February / April / August '98 and the report submitted in three volumes. The second project as mentioned above (Phase – II) has been prepared in two parts, one dealing with the technological measures for control of subsidence where feasible and the other dealing with rehabilitation and re-settlement needs for the areas where subsidence control is not feasible. These reports were submitted in January 1999.

The Standing Sub-committee of SSRC on Environment and Ecology directed CMPDI in its XVIth. meeting held at CIL, Calcutta on 30.06.98 to prepare a Master Plan for dealing with the problems of fire, subsidence and rehabilitation in the leasehold of BCCL, considering the fire control measures, areas to be stabilised, areas requiring rehabilitation including the phased requirement of funds for the same.

Accordingly, three separate Draft Master Plan for "Dealing with Fire Subsidence Control of Inhabitated Areas", and "Rehabilitation of Uncontrollable In-habitated Areas" was prepared in the month of February 1999. The drafts were discussed at CMPDI (HQ), Ranchi on 12.03.1999 and BCCL on 16.03.1999. Thereafter, the final report entitled "Master Plan for dealing with fire. Subsidence and Rehabilitation in the Leasehold of BCCL" submitted in March '99 incorporating the views expressed in the above meetings. The three reports mentioned above viz., World Bank funded report for "Development of Fire Fighting Programme in JCF" and coal S&T Grant funded EMSC projects, namely, "Generation of data and identification of subsidence prone areas and its segregation into controllable and uncontrollable areas in the leasehold of BCCL (Phase-I)" and Technological measures for control of subsidence where feasible, evacuation and resettlement needs where subsidence control is not feasible and assessment of fund requirement for both in the leasehold of BCCL (Phase-II)" formed the basis for preparation of the Master Plan prepared in 1999.

## 2.0 BRIEF OF MASTER PLAN, 1999

It the Master Plan for Fire, Subsidence and Rehabilitation in the Leasehold of BCCL (1999) the following aspects were included:

- Dealing with fire
- Subsidence Control of the in-habitated Areas
- Rehabilitation of the uncontrollable subsidence prone in-habitated areas.

Master Plan 1999 envisaged the following:

A) Dealing with 55 nos. of fire out of 64 no, within a time frame of 15 years, in three phases, each of 5 years duration for a capital investment of Rs 1481.93 Crs.

B) Subsidence control of 121 unstable and controllable inhabitated sites through sand stowing within a time frame of 20 years in four phases, each of 5 years duration for a Capital Investment of Rs. 291.88. Crs.

C) Rehabilitation of 65300 houses from the unstable and uncontrollable in-habitated areas within a time frame of 20 years, in 4 phases, each of 5 years for a Capital Investment of Rs 1981.14 Crs. Total no. of houses proposed to be rehabilitated were 65300 from 532 localities (271 full, 261 part).

Total indicative fund requirement for dealing with was Rs.3754.95 Crs

## 3.0 BRIEF OF MASTER PLAN '2004

Cost updation of Master Plan'1999 was done in April '2004 as per directive of Ministry of Coal. The salient features of Master Plan'2004 was as under:

A) Dealing with 57 nos. of fire out of 66 no, within a time frame of 15 years, in three phases, each of 5 years duration for a capital investment of Rs 2952.82 Crs.

B) Subsidence control of 121 unstable and controllable in-habitated sites through sand stowing within a time frame of 20 years in four phases,
each of 5 years duration for a Capital Investment of Rs. 387.82. Crs.

C) Rehabilitation of 65300 houses from the unstable and uncontrollable in-habitated areas with a time frame of 20 years, in 4 phases, each of 5 years for a Capital Investment of Rs 2446.91 Crs. Total no. of houses proposed to be rehabilitated was 65300 from 532 localities (271 in full, 261 in part).

Total indicative fund requirement was Rs. 5792.21 Crs.

## 4.0 CHRONOLOGICAL EVENT AND NECESSITY OF REVISION OF MASTER PLAN

- The Master Plan prepared in March'99 was approved by BCCL Board in April '99 and submitted to CIL for approval in May'99.

- The Master Plan '99 was submitted by CIL to Ministry of Coal in March'2000.

- As an out come of writ petition (Civil) No. 387/97 filed by Sri Haradhan Roy, EX-MP in 1997, an Action Plan for shifting and rehabilitation, dealing with fire and stabilization of unstable areas was prepared in April '03. This Action Plan was prepared based on Master Plan'99.

- The Action Plan was sent to state Govt. of Jharkhand and West Bengal as well as to Ministry Labour / DGMS for their comments and acceptance.

- The Action Plan was finalized in July '03 incorporating the decisions of State Govt. & DGMS.

- Dy. Secretary, Govt. of India, vide his letter 22020/2/2003 – CRC dated 4th Feb'04 advised BCCL to update the Master Plan '99.

- Cost updation of the Master Plan '99 was done and submitted to BCCL in April '04.

- Supreme Court of India appointed Director General of Mines safety to go through the Action Plan and subsequent affidavit / ATR filed by UOI and to verify the same and file a report in the court within three months.

- DGMS constituted a committee and submitted its report in Aug'05. One of the observations of the committee was:

  "As there is no scientific method available to check long-term stability of the site stabilised by sand stowing, it might not be possible to certify that the areas thus stabilised. The present stabilization work may restrict the effect of subsidence and allow some time. The final and permanent solution is evacuation of the affected area and rehabilitation. "

- The updated Master Plan was approved by BCCL and CIL Board in July '04 and submitted to MOC for approval.

- Planning commission accorded "In Principal" approval of the Master Plan vide letter no. M-12026/2/2005 coal dt. 29.03.05. However, planning commission sought some clarifications which were sent to MOC in May'05.

- In June '05, the IMG note of updated Master Plan was submitted to MOC.

- MOC vide letter no. 22020/1-CRC(PT) dt. 25.07.05 communicated that instead of IMG note a PIB note shall be submitted.

- Draft PIB note for Master Plan of BCCL Part was sent to ECL for preparing combined PIB not of BCCL & ECL on 15.10.05.

- MOC vide letter no. 22020/2/2005-CRC dt. 15.12.05 directed for preparation of revised PIB note with the following consideration.

1. All the areas where stabilisation through hydraulic stowing was proposed now have to be considered for total re-settlement.

2. It is being suggested that instead of shifting the affected people from the endangered areas in a number of small townships, it would be prudent to develop large satellite townships through the reputed builders / building organizations providing necessary civic amenities to motivate the people for shifting.

3. To further the rehabilitation process it is being suggested that wherever possible, schemes / project reports may be prepared for the areas where shifting of population is being considered and extraction of the available coal reserves may be undertaken either by O/C or by U/G means.

- On 23.02.06, a meeting was held on Master Plan in the Chamber of Secretary (Coal) where it was decided that as desired by Planning Commission, the execution of Master Plan should be tried to be completed within a period of 10 years. The minutes of the above meeting is enclosed as Annexure – I.

In order to comply with the suggestion of planning commission, Secretary (Coal) and DGMS Committee, it is necessary to revise the Master Plan, April'04.

Accordingly, the Master Plan was revised in April'2006 considering the following:

1. Time frame of Implementation for different activities under Master Plan will be 10 years (excluding 2 years of Pre-Implementation activities) to comply with the suggestion of Planning Commission.

   However, acceptance of such reduction of time frame needs to be obtained from the concerned State Govt.

2. All the sites, which were proposed for stabilization has been considered for rehabilitation to comply with the suggestion of the committee constituted by DGMS.

The above Master Plan, April'2006 with an Indicative Capital requirement of Rs 8637.28 Crs. was presented before Secretary (Coal) in his chamber on 4.7.2006. In the above presentation the following decisions were taken.

I) As the manpower in BCCL is continuously reducing due to super -annuation, only 25000 BCCL houses shall be constructed against 42650 houses as proposed in the Master Plan. Therefore fund for construction of only 25000 houses shall be considered in the Master Plan.

II) The cost estimate of the fire projects should be reduced to the extent possible. Whenever fire is handled by direct removal of coal and OB, the cost shall be set off considering that 50% of coal will be available for selling.

III) A sample survey should be carried out for private (Pucca & Kutcha) for ascertaining suitable fund provision as compensation in the Master Plan.

IV) For the purpose of income generation scheme, it has been decided that head of every displaced house shall be paid wage of 250 days in a year for two years as per minimum wage rate of respective state Govts.

The Master plan, July'2006 has been prepared considering the above decision and was submitted to State Govt. of Jharkhand for their acceptance vide letter no.GM (ENV)/F-rhab/2007/138 dated 6.3.2007. Jharkhand state Govt. has not given acceptance as yet.

Cost up-dation of the Master Plan July'o6 has been done up to Feb'08 considering the increase in WPI and Civil Cost Index.. Increase in WPI was about 7% and Civil cost index was 14.28%

## 5.O SCOPE OF WORK OF MASTER PLAN '2008

Master Plan now covers only following two aspects:

i) **Dealing with fire**, which includes identification of fire areas, selection of technologies to deal with the fires, prioritization for implementation and assessment of tentative fund requirement.

ii) **Rehabilitation & Resettlement** of the affected people from the areas affected by fire & subsidence including identification of affected sites, identification of resettlement sites and assessment of tentative fund requirement.

**Note:** "BCCL vide letter no GM(Env)/F- /06 dated 22nd April, 2006 suggested that diversion of railway lines and NH 32 road passing through coal bearing areas of JCF should also be included in the Master Plan'2006.

Diversion of rails and roads passing over the coal bearing areas are affected by fire and subsidence at many places and may further be affected. As the diversion will affect the operation of other coal producing companies like TISCO & SAIL, other industries operating in the coalfield and State Govt. as well as Railway, a joint decision is to be taken involving all the above stakeholders.

Moreover, the diversion of rail and road requires survey of the alternative routes, detail layout planning by expert agencies like RITES and likely to take about two years time.

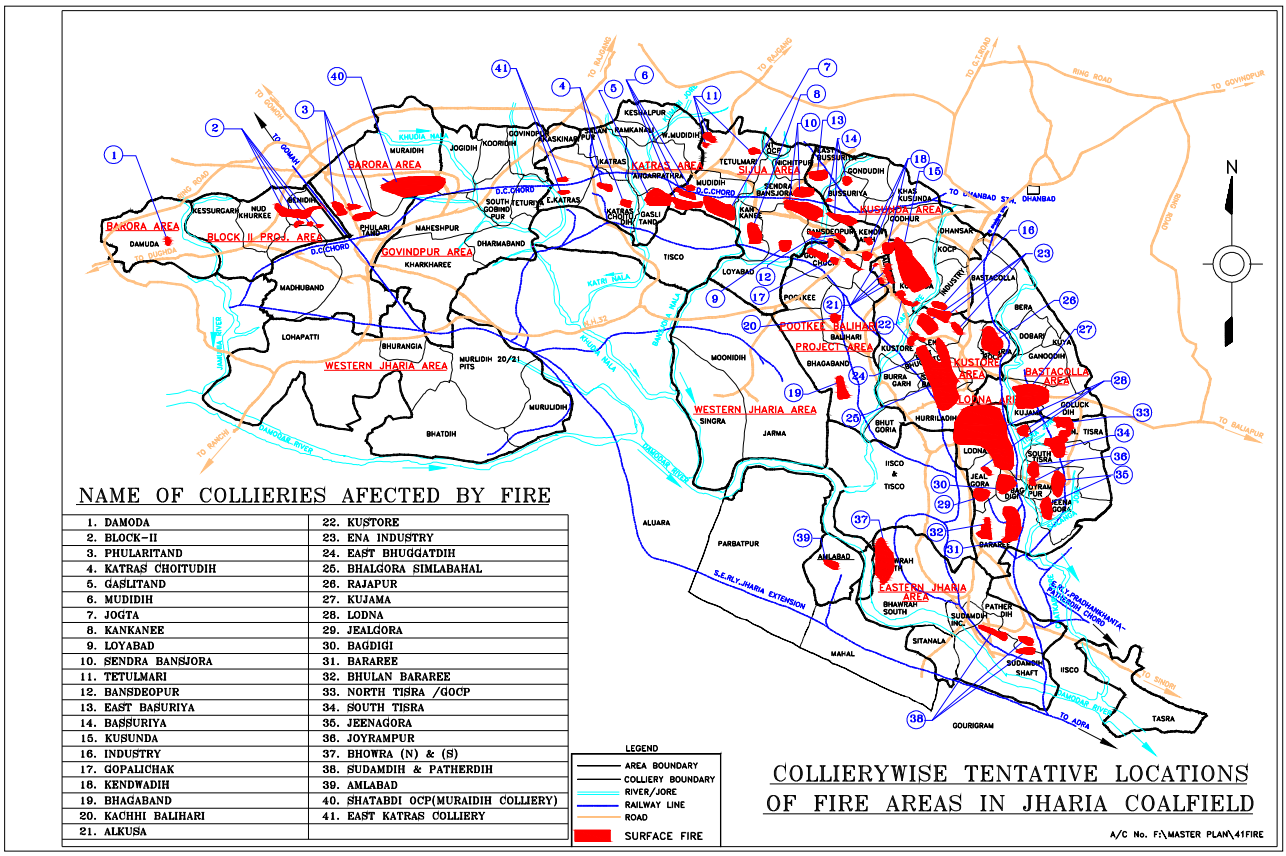
Therefore, in this Master Plan, a lump sum provision of Rs.20 Crs has been kept for survey and planning only as an advance action. The detail proposal for diversion may be taken up as a separate Master Plan in future. “

As per the recommendation of the committee constituted by DGMS, all the sites proposed for stabilization in the Master Plan ’99, have now been considered for rehabilitation. The time frame for implementation of Revised Master Plan has been considered as 10 years proposed to be implemented in two Phases (Phase – I & II each of 5 years duration), excluding 2 years of pre-implementation period.

Implementation of the Fire control measures and rehabilitation of BCCL houses from the endangered area will be the responsibility of BCCL, where as rehabilitation of Non-BCCL houses/structures from the endangered areas will be the responsibility of State Govt. of Jharkhand and West Bengal. Land acquisition for BCCL employees shall be done in association with State Govt. of Jharkhand.

Rehabilitation sites will be located on non-coal bearing area along the fringe / periphery of Jharia coalfield. The sites will have the basic infrastructural facilities like Water & Electricity, School, Banks, Hospitals, Market Complex, Play Ground, and Community Center etc.

# DEALING WITH FIRE




## NAME OF COLLIERIES AFECTED BY FIRE

| | |
|---|---|
| 1. DAMODA | 22. KUSTORE |
| 2. BLOCK-II | 23. ENA INDUSTRY |
| 3. PHULARITAND | 24. EAST BHUGGATDIH |
| 4. KATRAS CHOITUDIH | 25. BHALGORA SIMLABAHAL |
| 5. GASLITAND | 26. RAJAPUR |
| 6. MUDIDIH | 27. KUJAMA |
| 7. JOGTA | 28. LODNA |
| 8. KANKANEE | 29. JEALGORA |
| 9. LOYABAD | 30. BAGDIGI |
| 10. SENDRA BANSJORA | 31. BARAREE |
| 11. TETULMARI | 32. BHULAN BARAREE |
| 12. BANSDEOPUR | 33. NORTH TISRA /GOCP |
| 13. EAST BASURIYA | 34. SOUTH TISRA |
| 14. BASSURIYA | 35. JEENAGORA |
| 15. KUSUNDA | 36. JOYRAMPUR |
| 16. INDUSTRY | 37. BHOWRA (N) & (S) |
| 17. GOPALICHAK | 38. SUDAMDIH & PATHERDIH |
| 18. KENDWADIH | 39. AMLABAD |
| 19. BHAGABAND | 40. SHATABDI OCP(MURAIDIH COLLIERY) |
| 20. KACHHI BALIHARI | 41. EAST KATRAS COLLIERY |
| 21. ALKUSA | |

LEGEND
- AREA BOUNDARY
- COLLIERY BOUNDARY
- RIVER/JORE
- RAILWAY LINE
- ROAD
- SURFACE FIRE

## COLLIERYWISE TENTATIVE LOCATIONS OF FIRE AREAS IN JHARIA COALFIELD

A/C No. F:\MASTER PLAN\41FIRE

## 6.0 MASTER PLAN FOR DEALING WITH FIRE

### 6.1 Introduction

History of fire in Jharia Coal Field dates back to 1916 when the first incidence of fire was reported from XIV seam of Bhowrah colliery. Since then a number of fires have occurred in underground workings, in opencast pits and in opencast overburden debris. According to the investigations made after nationalization 70 fires were known to exit in JCF in the leasehold of BCCL, covering an area of 17.32 Sq.km. It was estimated that about 37 mt of good quality prime coking coal has been destroyed and about 1864 mt of coal has been locked up due to these fires. Subsequently following (7) more fires was identified making the total tally of fires to 77.

XV seam fire, Kachhi Balihari Colliery
- IX & IX spl seam fire, Bassuria Colliery
- XI & XII seam fire, Kendwadih Colliery
- V/VI/VII seam fire, Shatbdih OCP
- X seam fire, Sendra-Bansjora Colliery
- XI, XIII & XIV seam fire of East Katras colliery.

These 77 fires are spread over in 41 collieries of BCCL. The list of 77 fires is given in **Table-1** and the tentative location of the fire areas are shown in **drawing -2.**

The principal issues that BCCL is facing due to pervasive mine fire problem concern the health and well being of the persons living on or near the fire areas, threat to infrastructures like railway lines, roads, buildings, jores / rivers etc. and associated impacts on the exploitation of coal resources in the light of complications brought about by the fires

Out of 77 fires areas, ten (10) fires got completely extinguished due to control measures taken after formation of BCCL. Out of the balance 67 fires, nine (9) are underground fires, sealed behind the stoppings and are now at dormant state. These nine (9) underground fires do not need any action plan except maintenance of the status quo. Remaining 58 fires are although controlled but still requires action proposed to be dealt under this Master Plan, Area wise no. of fires is given in **Table – 2**.

**TABLE -1**

## LIST OF FIRES IN THE LEASEHOLD OF BCCL

| Sl. No. | Name of the fire | Fire Status |
|---|---|---|
| 1 | Ganeshpur X, XI , XII & XIII seam fire | Active |
| 2 | Burwabera X seam fire | Active |
| 3 | Phularitand X, XI, XII seam fire | Active |
| 4 | Angarpathra XII, XI, X, IX Spl. seam fire | Extinguished |
| 5 | Gaslitand XVT, XVB seam fire | Active |
| 6 | Jogta XV, XIV, XIII, XII, XI seam fire | Active |
| 7 | Kankanee XIII & XIV seam fire | Active |
| 8 | Ekra XI & XII seam fire | Active |
| 9 | Ekra XIII & XIV seam fire | Active |
| 10 | Loyabad XV, XIV, XIII seam fire | Active |
| 11 | Bassuriya XIV, XIII & XII, XI and X seam fire | Active |
| 12 | Sendra Bansjora XIV, XIII, XII, XI seam fire | Active |
| 13 | Bansdeopur XIV, XII seam fire | Active |
| 14 | Gopalichak XVI, XV, XIV, XIII, XII,XI seam fire | Active |
| 15 | Industry XII, XI seam fire | Active |
| 16 | Kusunda XII, XI seam fire | Active |
| 17 | Alkusa XII, XIV seam fire | Active |
| 18 | Kustore XIV, XIII, XII, XI seam fire | Active |
| 19 | Ena XII, XI seam fire | Active |
| 20 | Pure jharia X seam fire | Active |
| 21 | K.P. Dobari X, V/VI/VII/VIII/VIIA seam fire | Active |
| 22 | Rajapur X seam fire | Active |
| 23 | Kujama XII, XI seam fire | Active |
| 24 | Kujama IX, X seam fire | Active |
| 25 | Bhalgora XIV seam fire | Dormant |
| 26 | Bhalgora XV seam fire | Dormant |
| 27 | East Bhuggatdih XV, XIV seam fire | Active |
| 28 | Ena XIV seam fire | Active |
| 29 | Ena XV seam fire | Active |
| 30 | Simlabahal XIV seam fire | Dormant |
| 31 | N.S. Lodna XIII, XIIIA, XIV seam fire | Active |
| 32 | Bagdigi XIV, XIA, XV seam fire | Active |
| 33 | Baniahar XV, XIVA, XIV seam fire | Active |
| 34 | Bhaga XV seam fire | Active |
| 35 | South Tisra VII, VIII, IX, X seam fire | Active |
| 36 | Bhowra XIII, XIV seam fire | Active |
| 37 | Bararee XV, XIVA, XIV seam fire | Active |
| 38 | Bhulan Bararee XIII, XIV seam fire | Active |
| 39 | Bhulan Bararee XVI, XV seam fire | Active |
| 40 | Sudamdih IX to XIV seam fire | Active |
| 41 | Patherdih IX to XIII seam fire | Active |

| Sl. No. | Name of the fire | Fire Status |
|---|---|---|
| 42 | Bhowra IX , X seam fire | Active |
| 43 | Block –II XII, XI/XII, X Spl. seam fire | Active |
| 44 | Katras-Choitudih XIII seam fire | Active |
| 45 | Katras-Choitudih XIV, XV seam fire | Active |
| 46 | Tetulmari IV seam fire | Active |
| 47 | Tetulmari VI/VII seam fire | Active |
| 48 | Kendwadih XIII seam fire | Dormant |
| 49 | Kendwadih XIV, XIII seam fire | Dormant |
| 50 | Pootkee XV seam fire | Extinguished |
| 51 | East Bassuriya V/VI seam fire | Active |
| 52 | East Bassuriya VIII seam fire | Active |
| 53 | Kessurgarh V, VI, VII seam fire | Extinguished |
| 54 | Bhagaband XVI seam fire | Dormant |
| 55 | Amlabad XIV seam fire | Dormant |
| 56 | Sudamdih XV seam fire | Extinguished |
| 57 | Moonidih XVIIT seam fire | Extinguished |
| 58 | Damoda V, VI, VII seam fire | Dormant |
| 59 | Mudidih fire | Dormant |
| 60 | Jogidih X seam fire | Extinguished |
| 61 | Kooridih X seam fire | Extinguished |
| 62 | Nudkhurkee X seam fire | Extinguished |
| 63 | West Mudidih IX/X seam fire | Extinguished |
| 64 | East Katras XIV seam fire | Extinguished |
| 65 | North Tisra VII, VIII, IX seam fire | Active |
| 66 | North Tisra X seam fire | Active |
| 67 | Jeenagora IX, X, XI seam fire | Active |
| 68 | Jeenagora IX, X, XI,XII seam fire | Active |
| 69 | Joyrampur XI, XII, XIII seam fire | Active |
| 70 | Jealgora XV, XIV, XIIIB, XIIIA seam fire | Dormant |
| 71 | Bassuriya IX,I X Spl. seam | Active |
| 72 | Industry X seam | Active |
| 73 | Kachhi Balihari XV seam | Dormant |
| 74 | Kendwadih XI, XII seam | Active |
| 75 | Shatabdi V/VI/VII seam | Active |
| 76 | Sendra Bansjora X seam | Active |
| 77 | East Katras XI,XIII & XIV seam fire | Active |

**TABLE – 2**

**ADMINISTRTIVE AREA-WISE NUMBER OF FIRES IN BCCL**

| SL No. | AREA | TOTAL NUMBER OF FIRES | | TOTAL |
|---|---|---|---|---|
| | | ACTIONS REQUIRED | ACTION NOT REQUIRED (Except maintenance) | |
| 1 | Barora | 5 | - | 5 |
| 2 | Block-II | 1 | - | 1 |
| 3 | Western Jharia | - | - | - |
| 4 | Govindpur | - | - | - |
| 5 | Katras | 4 | - | 4 |
| 6 | Sijua | 9 | 2 | 11 |
| 7 | Kusunda | 7 | - | 7 |
| 8 | Pootkee-Balihari | 4 | 2 | 6 |
| 9 | Kustore | 9 | 3 | 12 |
| 10 | Bastacolla | 2 | - | 2 |
| 11 | Lodna | 13 | 1 | 14 |
| 12 | Eastern Jharia | 4 | 1 | 5 |
| | **TOTAL (J.C.F.)** | **58** | **9** | **67** |
| 13 | Chanch-Victoria (R.C.F) | - | - | - |
| | **GRAND TOTAL BCCL (JCF +RCF)** | **58** | **9** | **67** |

**LIST OF EXTINGUISHED FIRES**

1. Angarpathra XII, XI, X Spl. seam (UG Fire)
2. Pootkee XV seam (UG Fire)
3. Kessurgarh V/VI/VII seam (Surface Fire)
4. Jogidih X seam (Surface Fire)
5. Kooridih X seam (Surface Fire)
6. East Katras XIV seam (Surface Fire)
7. West Mudidih IX / X seam (Surface Fire)
8. Nudkhurkee X seam (Surface Fire)
9. Moonidih XVII T seam (UG Fire)
10. Sudamdih XV seam (UG Fire)

## 6.2 Past Efforts to combat Mine Fire

After the nationalization of coal mines, serious thoughts were given for conservation of prime coking coal in JCF., the only source in the country. A Master Plan of Reconstruction of Jharia Coal Field was drawn up where fire was one of the major problems to be dealt in JCF before starting large opencast blocks as envisaged in the Master Plan of JCF Reconstruction. During 1976-1988, 22 fire projects to deal with the fires were sanctioned by BCCL for a total investment of Rs. 114.57 Crores. These fire projects covered the then 59 fires out of the 70 fires exiting at the time of nationalization.

Between 1998-2001, another eight schemes for dealing with fire and subsidence problems were sanctioned by Govt. of India under S&T grant (EMSC/RCFS) for a capital investment of Rs. 39.85 Crores. Out of these six schemes have been completed, 2 are under implementation.

Massive efforts were made in the implementation of 22 fire projects by the application of best available technology, such as surface sealing, digging, trenching, inert gas infusion and remote sand-bentonite mixture flushing. Besides, stabilization work was carried out to save railway lines, jores and other areas, which were accessible.

Over 22 million cubic metre of blanketing work was carried out, and more than 50 million tones of sand stowed below ground. Approximately 3 million cubic meter of nitrogen gas has been flushed below the ground to control fires. A sum of Rs. 76.00 Cores approximately has been incurred in the fire fighting, measures against the fire projects till March 1997. The implementation of these schemes, though could not extinguish all the fires completely, it was possible to achieve the following:

- Liquidated 10 fires completely

- Controlled majority of the fires from total devastation. However, slow fire activities continue.

- Reduced the total surface area affected by fire to 8.90 sq.km from earlier reported 17.32 sq.km.

- Reduced the blockage of coal from 1864 MT to 1453 MT.

## 6.3 Jharia Mine Fire Control Technical Assistance Project

Although the efforts of BCCL in tackling the fire as outlined above and the results obtained were encouraging, it is only minuscule in size if seen in the perspective of all the fires raging in Jharia Coal Filed. The problem of fire is very vital and technical in nature and also due to various other serious issues like environmental pollution, rehabilitation and acute financial constraints, the company approached World Bank through Ministry of coal, Govt. of India for Jharia Mine fire Technical Assistance for exhaustive study of the technology of dealing with fire and environment in Jharia coal field. World Bank provided a loan of 12 million US$ and International Consultant GAI/MET-CHEM was engaged for fire dealing problems. The consultant started the work in 1994 and completed their study in June, 1996. The consultants have used the state of the art technology and modern scientific tools and methods for evaluation of the problems and suggested possible mitigating measures.

### 6.3.1 Fire Study by GAI/MET-CHEM

Utilising the remote sensing data of NRSA for Fires of JCF and colliery details, GAI/MET-CHEM undertook extensive drilling and temperature / gas monitoring along with field investigations for making inventory, boundaries and critical parameters of fires with possible spread and rate of spread of fires vertically and horizontally, potential danger to surface structures arising from spread and rate of propagation of fires. They also evaluated cost for the most suitable method of remedial actions. The final report for dealing with fire was submitted in June 1996.

The main observations / recommendation of the study of GAI/MET-CHEM are as under:

i) The overall surface area affected by fire has reduced. Latest study indicates 8.90 sq.km. against earlier figure of 17.32 sq.km of surface area occupied by Jharia Fires.

ii) Dhanbad - Patherdih rail line (2.8 km stretch) is endangered by fire and requires immediate grout stabilization or preferably relocation.

iii) Adra-Gomoh rail line requires protection near Phularitand.

iv) Ekra, Kari and Chatkari jores are endangered due to fires and require immediate protection at several places.

v) Jharia and Kirkend towns and many other built up areas are endangered due to fires and require immediate isolation from fires.

vi) Total extinguishment of fires immediately is not achievable but further advance of these fires can be controlled by the application of the recommended fire abatement measures / control measures.

The recommended fire abatement measures are the more improved use of one or combination of the following existing control measures:-

- Excavation
- Isolation by trenching
- Grout barrier and stabilization
- Blanketing / surface sealing
- Blind flushing

### 6.4 Control Measures For Dealing with Fires.

A variety of methods can be considered for controlling or extinguishing a fire. These are divided into i) conventional Methods of Fire Control and Extinguishment, and II) Other Methods of Fire Control and Extinguishment.

### 6.4.1 Conventional Methods of Fire Control and Extinguishment

Conventional Methods that have been employed with varying degree of success are as under :

1) Total Excavation of fire
2) Isolation by trenching
3) Blind flushing
4) Surface sealing
5) Isolation by underground stopping
6) Quenching and cooling
7) Cooling by water curtain
8) Flooding
9) Natural Burnout

### 6.4.2 Other Methods of Fire Control and Extinguishment

1) Inert Gas injection
2) Chemical Treatment
3) Burnout Control
4) Modified Bulk filling (Water / Slurry)
5) Modified Bulk filling (Pneumatic) and
6) Underground Coal Gasification

### 6.4.3 Fire Control Measures Proposed in the Master Plan

Out of the various control measures currently available, the recommended control measures are the more improved use of one or combination of the following measures.

- Excavation of fire material and filling with cohesive soil
- Filling of opencast high wall, shafts, inclines and other subsided areas.
- Isolation by trenching and backfilling with soil
- Construction of grout barrier and isolation against rail, road and jores.
- Surface sealing and blanking
- Blind flushing with sand / fly ash / grout mixture
- Cooling by water curtain / infiltration pond
- Cooling, quenching and removal
- Seam sealing, tunnel plug and underground stopping.

## 6.5 Methodology adopted in preparation of the Master Plan

Fire Report submitted by GAI/MET-CHEM in June 1996 under Mine Fire Technical Assistance Project (Fire fighting programme) form the basis of the present Master Plan for dealing with fire. While reviewing the above fire report, it was found that the following underground fires were not considered.

1. Bhagaband XVI seam fire
2. Kachhi Balihari XV seam fire
3. Loyabad XV, XIV and XIII seam fire
4. Industry X seam fire
5. Amlabad XIV seam fire

The above fires have been included in this Master Plan and suggested control measure, time schedule and fund requirement etc. have been given.

## 6.6 Recommended Technologies

Different alternatives for control measures to deal with each fire have been described in the report submitted by GAI/MET-CHEM. The most suitable control measure for each fire has also been recommended. In majority of cases, the measures as recommended by GAI/MET-CHEM have been considered in this Master Plan to arrive at the fund requirement and time schedule or each fire. However, for Block-II fire, Phularitand fire, Protection of Chatkari jore against Lodna group of fires, protection of Dhanbad – Patherdih Railway line in Lodna, Bagdigi, Bararee & Kujama, ROCP fire, Sudamdih – Patherdih fire, the technology has been changed based on the prevailing condition of the fires. The project wise details of fires and recommended technologies have been given in **Table – 3**.

## PROJECTWISE DETAILS OF FIRE AND TECHNOLOGY SUGGESTED (Table-3)

| SL No. | Name of the of Fire projects | Seams on fire | | UG or Surface fire | Technology of fire control |
|---|---|---|---|---|---|
| 1 | JCF-F/LODNA/RAIL/I/1 | | | | |
| | Excavation of rail road bed and backfill with structural fill (length 3.5 km) at Lodna Bagdigi & Bararee Collieries along with diversion of chatkari jore. | Lodna | XVA,XV,XIVA XIV,XIIIB,XIIIA,XIII,XI/XII | Surface fire | Excavation and Back filling |
| | | Bagdigi | XVA,XV,XIVA XIV,XIIIB,XIIIA,XIII,XI/XII | Surface & U/G | |
| | | Bararee | XVA,XV,XIVA XIV,XIIIB,XIIIA,XIII,XI/XII | Surface & U/G | |
| 2 | JCF-F/BASTACOLA/ KUJAMA/JORE/I/2 | | | | |
| | Scheme for dealing with fire for protection of chatkari Jore at Kujama collieriy | Kujama | XI/XII | Surface fire | Temporary diversion of Jore |
| 3 | JCF-F / KUSTORE / RAJAPUR /I/3 (Part A , Rajapur OCP) | | | | |
| | Scheme for dealing with fire at Rajapur Colliery by excavation method with IX/X seam base | Rajapur | X, IX | Surface fire | Back filling of quarry with non combustible material, Excavation in south Jharia Part, Stabilisation along DB road & surface sealing. |
| 4 | JCF-F/BARORA/SHATABDI OCP/I/33 | | | | |
| | Scheme for dealing with fire at Shatabdi OCP by excavation method | Shatabdi | V/VI/VII | Surface | Excavation & Back filling |
| 5 | JCF-F/KATRA/EAST KATRAS (NEW AKASHKINAREE)/I/35 | | | | |
| | Scheme for dealing with fire at East Katras (New Akashkinaree) colliery | East Katras/New Akashkinaree | XI,XII,XIV | Surface | Trench cutting |
| 6 | JCF-F/EJ/SUDAMDIH &PATHREDIH/I/19 | | | | |
| | Scheme for fire dealing at Sudamdih / Patherdih Colliery (Part A ) | Sudamdih & Patherdih | XI/XII,XIV,XV | Surface & UG | Filling with incombistible material and high pressure sand flushing |
| 7 | JCF-F/SIJUA/SENDRA BANSJORA/I/21 (Part A) | | | | |
| | Scheme for dealing with Sendra Bansjora X seam fire | Sendra Banjora | X | Surface | Trench cutting, blind flushing & sealing |
| 8 | JCF-F/KATRAS/GASLITAND/I/24 | | | | |
| | Scheme for dealing with Gaslitand Fire | Gaslitand | XV,XIV & OB | Surface | Surface sealing & blind flushing |
| 9 | JCF-F/KATRAS/KATRAS CHOITUDIH/I/26 | | | | |
| | Scheme for dealing with Katras Chiotudih Fire | Katras Choitudih | XVT&B, XIV,XIII | Surface | Excavation and filling |
| 10 | JCF-F/KUSUNDA/EAST BUSSURIYA/I/32 | | | | |
| | Scheme for dealing with East Bassuria Fire (Part A) | East Bassuria | V/VI,VII,VIII | Surface | Surface sealing, Sand flushing |

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|---|---|---|---|---|---|
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| 11 | JCF -F / LODNA/NT, ST, JEENAGORA, JOYRAMPUR/I/8(SURFACE SEALING) | | | | |
| | Surface sealing for dealing with fire at North Tisra, South Tisra, Jeenagora & Joyrampur Collieries. | Bararee | XV, XIVA, XIV, XVI | Surface & U/G | Surface sealing with incombustible material and cohesive soil |
| | | N.Tisra | X, IX, VIII & VII | Surface & U/G | |
| | | S.Tisra | X, IX, VIII & VII | Surface & U/G | |
| 12 | JCF-F / LODNA / BAGDIGI, BARAREE, B. BARAREE/I/11(SURFACE SEALING) | | | | |
| | Surface sealing for dealing with fire at Bagdigi, Bararee & Bhulan Bararee Collieries. | Bagdigi | XV,XIVA,XIV | Surface & U/G | Surface sealing with incombustible material & cohesive soil. |
| | | Bararee | XV,XIVA,XIV, XVI | Surface & U/G | |
| 13 | JCF-F / LODNA / LODNA / I /12 (SURFACE SEALING) | | | | |
| | Surface sealing for dealing with fire at Lodna Collieriy. | Lodna | XVA,XV,XIVA XIV,XIIIB,XIIIA | Surface fire | Surface sealing with incombustible material & cohesive soil. |
| 14 | JCF-F / BASTACOLLA / KUJAMA / GOCP/I/10 (SURFACE SEALING ) | | | | |
| | Surface sealing for dealing with fire at Kujama & GOCP. | Kujama | XI, XII, XIV 4ft XT/B | Surface & U/G | Surface sealing / Blanketting with incombustible material & cohesive soil. |
| 15 | JCF-F / KUSTORE / RAJAPUR/I/ 37(Part B ,Bastacolla Annexed) | | | | |
| | Scheme for dealing with fire at Rajapur Colliery by excavation method with V/VI/VII seam base | Rajapur | V/VI/VII/VIII, IX & X | Surface & U/G | Digging out of fire by excavation method |
| 16 | JCF-F / KUSTORE / ALKUSA/I/4 (Part-B) | | | | |
| | Scheme for dealing with fire at Alkusa Colliery. | Alkusa | XIV, XIII, XII & XI | Surface | Back filling, seam sealing, and surface reclamation |
| 17 | JCF-F/BARORA/PHULARITAND/I/6 | | | | |
| | Scheme for dealing with fire at Phularitand Colliery (Block-III Coking). | Phularitand | XI/XII, IX/X | Surface & UG | Excavation with water quenching |
| 18 | JCF-F/KUSTORE/KUSTORE/I/7 | | | | |
| | Scheme for dealing with fire at Kustore Colliery (NW & SE fire). | Kustore | XV, XIV, XIII, XII, XI & OB | Surface & UG | Quenching, dozing, surface sealing, trench excavation & back filling |
| 19 | JCF-F/KUSTORE/ ENA( NW)/I/13 | | | | |
| | Scheme for dealing with fire at Ena Colliery. | Ena | XIV, XI/XII | Surface & UG | Trench excavation & soil filling |
| 20 | JCF-F/KUSTORE/ENA (MID & SE)/I/31 | | | | |
| | Scheme for dealing with Ena (Mid& SE ) Fire | Ena | XI,XII,XIII,XIV | Surface | Surface sealing and back filling |
| 21 | JCF-F/SIJUA/MUDIDIH/I/9 | | | | |
| | Scheme for dealing with fire at Mudidih Colliery. | Mudidih | XV Top & Bot | Surface & UG | Maintenance of existing surface seal and establishment of temperature monitoring programme |
| 22 | JCF-F/P.B./GOPALICHAK/I/14 | | | | |

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|---|---|---|---|---|---|
| | **Scheme for dealing with fire at Gopalichak Colliery.** | **Gopalichak** | **XIV, XIII** | **UG** | **Back filling of quarry high wall, tranch excavation back filling cement grout injection.** |
| **23** | **JCF-F/BASTACOLA/KUJAMA/RAIL/I/36** | | | | |
| | **Excavation of rail road bed and backfill with structural fill (length 1.4km) at Kujama colliery with XI/XII seam base along with diversion of chatkari jore.** | **Kujama** | **XI/XII** | **Surface** | **Excavation & Back filling** |
| **24** | **JCF-F / BLOCK -II / BLOCK -II/II/5** | | | | |
| | **Scheme for dealing with fire at Block-II OCP.** | **Block-II OCP** | **XIII, XI/XII, XSpl & Overburden** | **Surface** | **Quenching of fire material with water conon & dozing, spreading.** |
| **25** | **JCF-F/SIJUA/ TETULMARI(W)/II/15** | | | | |
| | **Scheme for dealing with west fire at Tetulmari Colliery.** | **Tetulmari** | **IV/V/VI** | **UG** | **Surface sealing & Blanketting** |
| **26** | **JCF-F/SIJUA/TETULMARI(E)/II/16** | | | | |
| | **Scheme for dealing with Tetulmari (East) Fire** | **Tetulmari** | **V T&B, IVT&B,OB** | **Surface &UG** | **Surface sealing & Blanketting** |
| **27** | **JCF-F/EJ/SUDAMDIH&PATHREDIH/II/38 (Part-B)** | | | | |
| | **Scheme for fire dealing at Sudamdih / Patherdih Colliery (Part B )** | **Sudamdih & Patherdih** | **XI/XII,XIV,XV** | **Surface & UG** | **Trench cutting and Filling with incombistible material** |
| **28** | **JCF-F/KUSTORE/EAST BHUGGATDIH/II/17** | | | | |
| | **Scheme for dealing with East Bhuggatdih Fire** | **Kustore** | **XV,XIV** | **Surface** | **Cohesive soil sealing** |
| **29** | **JCF-F/KUSUNDA/BASSURIYA-1/II/18** | | | | |
| | **Scheme for dealing with Bassuria 1&2 Fire** | **Kusunda** | **XI,XII,XII, XIV** | **UG** | **Sand flushing and grout injection** |
| **30** | **JCF-F/PB/KENDWADIH(S)/II/20** | | | | |
| | **Scheme for dealing with Kendwadih (South) Fire** | **Kenwadih** | **XIII,XIV** | **UG** | **Sand flushing** |
| **31** | **JCF-F/PB/KENDWADIH(N)& (E)/I/23** | | | | |
| | **Scheme for dealing with Kendwadih (North)& (East) Fire** | **Kenwadih** | **XI,XII,XIII** | **UG** | **Blind flushing and tunnel plug** |
| **32** | **JCF-F/SIJUA/SENDRA BANSJORA/II/39 (Part B)** | | | | |
| | **Scheme for dealing with Sendra Bansjora XI,XII,XIII & XIV seam fire** | **Sijua** | **X,XI,XII,XIII,XIV** | **Surface & UG** | **Trench cutting, grout injection, Surface sealing** |
| **33** | **JCF-F/BARORA/DAMODA/I/22** | | | | |
| | **Scheme for dealing with Damuda Fire** | **Baraora** | **V/VI/VII,IX &OB** | **Surface** | **Quenching and removal of fire material** |
| **34** | **JCF-F/E J/BHOWRAH(N) & (S)/II/25** | | | | |
| | **Scheme for dealing with Bhowra N&S Fire** | **Jharia** | **XV,XIV & OB** | **Surface** | **Quenching, surface sealing** |
| **35** | **JCF-F/SIJUA/JOGTA/II/27** | | | | |

| | | | | | |
|---|---|---|---|---|---|
| | **Scheme for dealing with Jogta Fire** | **Sijua** | **XIV,XA,X** | **Surface** | **Cooling through water curtain,Surface sealing** |
| **36** | **JCF-F/KUSUNDA/BASSURIYA (3&4)/II/28** | | | | |
| | **Scheme for dealing with Bassuria 3&4 Fire** | **Kusunda** | **IXI,XII,XII, XIV** | **UG** | **Trench cutting & filling** |
| **37** | **JCF-F/SIJUA/BANSDEOPUR(E)/II/29** | | | | |
| | **Scheme for dealing with Basdeopur (East) Fire** | **Bansdeopur** | **XIII,XIV** | **Surface** | **Surface sealing, cement/fly ash flushing and filling of highwall** |
| **38** | **JCF-F/SIJUA/BANSDEOPUR(W)/II/30** | | | | |
| | **Scheme for dealing with Basdeopur (West) Fire** | **Bansdeopur** | **XIV,XIII** | **Surface** | **Trench cutting,back filling & surface sealing** |
| **39** | **JCF-F/KUSUNDA/EAST BUSSURIYA/II/32 (Part-B)** | | | | |
| | **Scheme for dealing with East Bassuria Fire (Part B)** | **East Bassuria** | **V/VI,VII,VIII** | **Surface** | **Surface sealing, Sand flushing** |
| **40** | **JCF-F/Maintenance** | **Fires of all collieries** | | | **Maintenance of existing status** |
| | **On going EMSC/RCFS schemes** | | | | |
| **41** | **Scheme for dealing with fire and subsidence at Industry colliery** | **Ena/Industry** | | **Surface & UG** | **Blind flushing & surface sealing** |
| **42** | **Scheme for dealing with fire and subsidence at Alkusa colliery** | **Alkusa** | **XIV, XIII, XII & XI** | **Surface** | **Blind flushing & surface sealing** |
| **43** | **Revised Scheme for dealing with fire and subsidence at Lodna & Bagdigi Collierycolliery** | **Lodna & Bagdigi** | **XI/XII** | **Underground** | **Nitrogen flushing** |
| **44** | **Scheme for dealing with fire and subsidence at Jeenagora colliery for protection of Jore** | **Jeenagora & Barraree** | | **Surface** | **Jore diversion, Blind flushing & surface sealing** |
| **45** | **Scheme for dealing with fire and subsidence at Block-II OCP& Phularitand Colliery for protection of Rail colliery for protection of Jore** | **Block-II & Phularitand** | | **Surface & UG** | **Blind flushing, Quarry edge filling & surface sealing** |

## 6.7 Time Schedule

The requirement of time to deal with a particular fire depends on:

- The nature and the extent of the fire.
- The technology to deal with the fire.

The following criteria have been assumed to determine the duration to deal with each fire depending on situation.

### 6.7.1 Trench excavation, fire excavation and simultaneous back filling.

It is assumed that excavation will be done with 5.0$m^3$ capacity shovel. The annual excavation capacity of such a shovel is 8 lakhs m3. A reduction factor of 0.8 has been considered as the excavation would be done in fire areas. Thus annual excavation rate of 8x0.8 = 6.4 lakh $m^3$ (0.64 million cum.) / year per shovel has been considered.

### 6.7.2 Surface Sealing / Seam sealing with cohesive soil and filling with non-combustible material.

Where filling and surface sealing need to be done by bringing material from outside, a transportation and filling rate of 200$m^3$/ day / tripper of 8$m^3$ capacity has been considered (i.e. 5000 m3/ month).

### 6.7.3 Sand Flushing (Blind Flushing) through borehole

A sand flushing rate of 15m3 / day / borehole has been considered depending on the volume of sand a minimum of 8 and a maximum of 16 boreholes will remain in flushing operation.

### 6.7.4 Drilling

For 6" diameter (150 mm) boreholes with rotary cum percussive drill, a drilling rate of 250 m / month / machine has been considered. For 10" diameter (250mm) boreholes, the same has been considered as 150 m/month.

### 6.7.5 Blind Flushing with fly ash / sand / cement / grout mixture

Rate for blind grout flushing mixture has been considered as 600m3 per month with one mixer / flushing unit. The number of mixing unit / flushing unit will depend on the volume of void to be filled within the stipulated time.

### 6.7.6 Cooling by water curtain

Depending on the intensity of fire, 2 to 3 years time has been assumed forcooling by water circulation through borehole.

### 6.7.7 Quenching & Excavation of fire with water

It has been assumed that quenching of hot material before excavation would run simultaneously with excavation. However, a minimum of one month quenching time has been considered before excavation.

### 6.7.8 Maximum time to deal with a fire

Maximum time required to deal with a particular fire project would depend on the volume of jobs involved and the number of equipment engaged at a particular site. Based on the volume or work, such number of different equipment like shovel, tipper, drilling machine etc. are to be engaged at a particular fire site so as to complete the activities within a maximum period of 10 years.

## 6.8 Grouping of fire areas in to Projects

One or more fire areas located in close proximity having same priority on urgency of implementation have been grouped together to form a fire project.. Out of 77 fires, 10 fires have been extinguished and 9 underground fires have been kept under control by underground stopping. 67 fires including 9 underground fires have been grouped into 45 fire projects proposed to be/is being implemented in a time frame of 10 years. These 45 fire projects include 5 ongoing EMSC/RCFS schemes and one project for maintenance of existing fire. The grouping of exiting fires into 45 fire projects has been shown in **TABLE – 4**.

The fire projects are large in size, requiring large amount of capital for dealing with fire in totality. However, in actual practice, some times smaller projects (sub-projects of the Main Projects), may have to be formulated for implementation depending on the urgency of dealing with a particular section of the fire. All these sub-projects (if required) will bear the same project code with different sub-projects.

**TABLE – 4**

**GROUPING OF FIRES INTO PROJECTS**

| SL. No. | CODE NAME OF FIRE PROJECTS | ORIGINAL FIRE NAME |
|---|---|---|
| 1 | JCF-F/LODNA/RAIL/I/1 | NS Lodna XIII, XIIA ,XIV seam |
| | | Baniahir XV, XIV, XIVA seam |
| | | Bhaga XV seam. |
| | | Bagdigi XIV,XIVA, XV seam |
| | | Bararee XV,XIV,XIVA seam |
| | | Bhulan Bararee XIII, XIV seam |
| | | Bhulan Bararee XV seam |
| 2 | JCF-F/BASTACOLLA/KUJAMA/JORE/I/2 | Kujama XI/XII seam |
| 3 | | Pure Jharia X seam |

| SL. No. | CODE NAME OF FIRE PROJECTS | ORIGINAL FIRE NAME |
|---|---|---|
| | JCF-F/KUSTORE/RAJAPUR/I/3 (Part-A) | K.P. Dobari X,XIX,V/VI/VII/VIIA |
| | | Rajapur X seam |
| 4 | JCF-F/BARORA/SHATABDIH/I/33 | Shatabdih V/VI/VII seam |
| 5 | JCF-F/KATRAS/EAST KATRAS (NEW AKASKINAREE)/I/35 | East Katras XIV seam & XI seam |
| 6 | JCF-F/EASTER JHARIA/SUDAMDIH & PATHERDIH/I/19 (Part-A) | Patherdih IX-XIII seam<br>Sudamdih IX - XIV seam |
| 7 | JCF-F/SIJUA/SENDRA BANSJORA/I/21 (Part-I) | Sendra X seam |
| 8 | JCF-F/KATRAS/GASLITAND/I/24 | Gaslitand XVT & B seam |
| 9 | JCF-F/KATRAS/KATRAS CHOITUDIH/I/26 | Katras-Choitudih XIII , XIV, XV seam |
| 10 | JCF-F/KUSUNDA/EAST BUSSURIYA/I/32 | East Bassuria V/VI seam |
| | | East Bassuria VIII seam |
| 11 | JCF -F / LODNA/NT, ST, JEENAGORA, JOYRAMPUR/I/8(SURFACE SEALING) | South Tisra VII, VIII, IX, X seam<br>North Tisra VII, VIII, IX seam<br>Jeenagora IX,X, XI, XII seam<br>Joyrampur XI, XII,XIIA seam |
| 12 | JCF-F / LODNA / BAGDIGI, RARAREE, B. BARAREE/I/11(SURFACE SEALING) | Bagdigi XIV,XIVA, XV seam |
| | | Bararee XV,XIV,XIVA seam |
| | | Bhulan Bararee XIII, XIV seam |
| | | Bhulan Bararee XV seam. |
| 13 | JCF-F / LODNA / LODNA / I /12 (SURFACE SEALING) | NS Lodna XIII, XIIA ,XIV seam |
| | | Baniahir XV, XIV, XIVA seam |
| | | Bhaga XV seam. |
| 14 | JCF-F/BASTACOLA/KUJAMA & GOCP/I/10 (SURFACE SEALING) | Kujama IX,X seam |
| | | Kujama XI,XII seam |
| 15 | JCF-F/KUSTORE/RAJAPUR/I/37 (Part-B, BASTACOLLA ANNEXED)) | Rajapur X,IX,V/VI/VII seam fire. |
| 16 | JCF-F/KUSTORE/ALKUSA/I/4 (Part-B) | Alkusa XIII, XIV seam |
| | | Kusunda XI, XII seam |
| 17 | JCF-F/BARORA/PHULARITAND//I/6 | Phularitand X, XI, XIII seam |
| 18 | JCF-F/KUSTORE/KUSTORE/I/7 | Kustore XI, XII, XIII, XIV seam |
| | | Kusunda XIII, XIV seam |
| | | Ena XV seam |
| 19 | JCF-F/KUSTORE/ENA (NW)/I/13 | Industry XI, XII seam |
| | | Ena XIV seam |
| 20 | JCF-F/KUSTORE/ENA (MID & SE)/I/31 | Ena XI XII seam |
| | | Ena XIV seam |
| 21 | JCF-F/SIJUA/MUDIDIH/9 | Mudidih Fire |
| 22 | JCF-F/PB/GOPALICHUCK/I/14 | Gopalichak Fire, Pootkee XVI seam |

| SL. No. | CODE NAME OF FIRE PROJECTS | ORIGINAL FIRE NAME |
|---|---|---|
| 23 | JCF-F/BASTACOLLA/KUJAMA/RAIL/I/36 | Kujama XI & XII seam. |
| 24 | JCF-F/BL-II/BLOCK-II OCP/I/5 | Block-II XIII, XI/XII, X Spl. Seam |
| 25 | JCF-F/SIJUA/TETULMARI(W)/II/15 | Tetulmari V/VI seam |
| 26 | JCF-F/SIJUA/TETULMARI(E)/II/16 | Tetulmari IV seam |
| 27 | JCF-F/EJSUD. & PATH/II/38 (PSRT-B) | Patherdih IX-XIII seam<br>Sudamdih IX –XIV seam |
| 28 | JCF-F/KUSTORE/EAST BHUGGATDIH/17 | East Bhuggatdih XV, XIV seam |
| 29 | JCF-F/KUSUNDA/BASSURIYA-1/I/18 | Basseriya XIV, XIII, XII XI seam |
| 30 | JCF-F/PB/KENDWADIH(S)/II/20 | Kenduwadih XIII, XIV seam |
| 31 | JCF-F/PB/KENDWADIH(N)/I/23 | Kendwadih XI,XII,XIII seam |
| 32 | JCF-F/SIJUA/SENDRA BANSJORA/I/21 | Ekra XI,XII seam |
| 33 | JCF-F/BARORA/DAMODA/II/22 | Damoda, V,VI,VII,IX seam |
| 34 | JCF-F/EASTER JHARIA/BHOWRAH(N) & (S)/II/25 | Bhowra XIII, XIV seam |
| 35 | JCF-F/SIJUA/JOGTA/II/27 | Jogta XV, XIV, XIII, XII,XI seam |
| 36 | JCF-F/KUSUNDA/BASSURIYA (3&4)/II/28 | Busseriya IXT & B, IX spl. XI, XII seam |
| 37 | JCF-F/SIJUA/BANSDEOPUR(E)/II/29 | Banseopur XIII,XIV seam |
| 38 | JCF-F/SIJUA/BANSDEOPUR(W)/II/30 | Banseopur XIII,XIV seam |
| 39 | JCF-F/KUSUNDA/EAST BASSURIA/II/32 (Part-B) | East Bassuria V/VI/VII<br>East Bassuria VIII seam |
| 40 | F/MAINTENANCE/34 | Existing fires under control |
| | **On going EMSC/RCFS Schemes** | |
| 41 | Scheme for dealing with fire at Industry colliery | Ena/Industry, X seam |
| 42 | Scheme for dealing with fire at Alkusa Colliery | Alkusa XIII & XIV seam |
| 43 | Revised Scheme for dealing with fire at Lodna & Bagdigi collieries | Lodna & Bagdigi XI/XII seam |
| 44 | Scheme for dealing with fire at Jeenagora colliery for protection of Jore | Jeenagora XIII & XI/XII seam |
| 45 | Scheme for dealing with fire at Phularitand / Block-II OCP for protection of rail | Phularitand / Block-II OCP XI/XII & X seam |

### 6.9 Prioritisation of fire Areas

Depending on the urgency of dealing based on the potential impact, all the fire areas have been prioritized into different priorities. The following factors have been considered to determine the priority of dealing with individual fire.

1. Threat to jore / railway line / existing pits
2. Threat to villages / inhabitated areas
3. Number of seams on fire / loss of reserves
4. Intensity of the fire.

Depending on the above, out of 45 projects, 28 projects have been proposed in Priority – I (i.e. Phase-I) and rest 17 projects in Priority-II (i.e. Phase-II). One project is for maintenance of the existing fires under control.

### 6.10 Codification of identified projects

Different fire project has been codified based on their urgency of implementation.

The sample code number is JCF-F/KUSTORE/ ALKUSA/I/4,

Where the first code JCF stands for Jharia Coalfield, F stands for fire, KUSTORE stands for name of the Area, ALKUSA stands for name of the colliery, I stand for priority number 1 and 4 stands for serial number of the fire project in terms of implementation schedule.

For Lodna group of fire code number is JCF-F/LODNA/RAIL/I/1 where 4$^{th}$ code 'RAIL' stands for project for protection of rail fire.

Based on the above, each fire project has been codified.

### 6.11 Action Programme

A composite action programme for all the fire projects have been prepared basedon the following assumptions.

1. There are 45 fire projects of which 28 fire projects including 5 ongoing EMSC/RCFS scheme as well as one maintenance project will be /is being implemented in Phase -I and rest 17 in Phase II. Maximum no. of fire projects to be implemented at any point of time is 21.

2. One Fire Project has been identified for maintenance of existing fires under control including expenses for TIR/GPS/Diagnostic Survey/monitoring of temperature / gas analysis/ scientific studies and plantation of cooled down areas.

The composite Action Plan for all the fire Projects has been shown in **Table-5.**

For speedy implementation, it is suggested that the fire projects should be implemented through contractual means as far as possible.

Table-5

## COMPOSITE ACTION PLAN ALONG WITH YEAR WISE REQUIREMENT OF FUND FOR FIRE PROJECTS

| SL No. | Name of the of Fire projects | Capital (Rs. Crores) | Duration (Month) | Pre-Implem-ntation Activities | Schedule of Implementation Yearwise Requirement of funds | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | Phase-I | | | | | Phase-II | | | | |
| | | | | | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 |
| 1 | **JCF-F/LODNA/LODNA/RAIL/I/1**<br>Excavation of rail road bed (length 3.5 km) at Lodna Bagdigi & Bararee Collieries along with diversion of chatkari jore. | 695.00 | 120 | | 105.00 | 70.00 | 70.00 | 70.00 | 70.00 | 70.00 | 70.00 | 70.00 | 70.00 | 30.00 |
| 2 | **JCF-F/BASTACOLA/KUJAMA/JORE/I/2**<br>Scheme for dealing with fire for protection of chatkari Jore at Kujama collieriy | 6.88 | 48 | | 2.13 | 2.54 | 1.52 | 0.69 | | | | | | |
| 3 | **JCF-F / KUSTORE / RAJAPUR/I/3 (Part A , Rajapur OCP)**<br>Scheme for dealing with fire at Rajapur Colliery by excavation method with IX/X seam base | 62.36 | 84 | | 30.00 | 30.00 | 2.36 | | | | | | | |
| 4 | **JCF-F/BARORA/SHATABDI OCP/I/33**<br>Scheme for dealing with fire at Shatabdi OCP by excavation method | 46.26 | 48 | | 1.85 | 23.00 | 21.41 | | | | | | | |
| 5 | **JCF-F/KATRA/EAST KATRAS (NEW AKASHKINAREE)/I/35**<br>Scheme for dealing with fire at East Katras colliery | 35.02 | 48 | | 5.04 | 9.61 | 19.72 | 0.65 | | | | | | |
| 6 | **JCF-F/EJ/SUDAMDIH&PATHREDIH/I/19**<br>Scheme for fire dealing at Sudamdih / Patherdih Colliery (Part A ) | 25.04 | 60 | | 1.48 | 9.85 | 10.88 | 2.44 | 0.39 | | | | | |
| 7 | **JCF-F/SIJUA/SENDRA BANSJORA/I/21 (Part A)**<br>Scheme for dealing with Sendra Bansjora X seam fire | 9.91 | 24 | | 2.03 | 7.88 | | | | | | | | |
| 8 | **JCF-F/KATRAS/GASLITAND/I/24**<br>Scheme for dealing with Gaslitand Fire | 20.10 | 84 | | 3.38 | 6.73 | 2.59 | 2.67 | 2.66 | 1.98 | 0.09 | | | |
| 9 | **JCF-F/KATRAS/KATRAS CHOITUDIH/I/26**<br>Scheme for dealing with Katras Chiotudih Fire | 15.93 | 48 | | | 3.77 | 5.17 | 1.39 | 0.6 | | | | 2.5 | 2.5 |
| 10 | **JCF-F/KUSUNDA/EAST BUSSURIYA/I/32**<br>Scheme for dealing with East Bassuria Fire | 8.52 | 48 | | 3.79 | 4.28 | 0.35 | 0.10 | | | | | | |
| 11 | **JCF -F / LODNA/NT, ST, JEENAGORA, JOYRAMPUR/I/8(SURFACE SEALING)**<br>Surface sealing for dealing with fire at North Tisra, South Tisra, Jeenagora & Joyrampur Collieries. | 36.30 | 36 | | | | 10.00 | 15.00 | 11.30 | | | | | |
| 12 | **JCF-F / LODNA / BAGDIGI, BARAREE, B. BARAREE/I/11(SURFACE SEALING)**<br>Surface sealing for dealing with fire at Bagdigi, Bararee & Bhulan Bararee Collieries. | 30.30 | 36 | | | | | 12.00 | 12.00 | 6.30 | | | | |



ANNEXURE - VI

| | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 13 | **JCF-F / LODNA / LODNA / I /12 (SURFACE SEALING)**<br>Surface sealing for dealing with fire at Lodna Collieriy. | 27.50 | 72 | | | | 4.58 | 4.58 | 4.58 | 4.58 | 4.58 | 4.60 | | |
| 14 | **JCF-F / BASTACOLLA / KUJAMA / GOCP/I/10 (SURFACE SEALING )**<br>Surface sealing for dealing with fire at Kujama & GOCP. | 40.63 | 48 | | | | 10.15 | 10.15 | 10.15 | 10.18 | | | | |
| 15 | **JCF-F / KUSTORE / RAJAPUR/I/ 37(Part B ,Bastacolla Annexed)**<br>Scheme for dealing with fire at Rajapur Colliery by excavation method with V/VI/VII seam base | 91.00 | 72 | | | | 40.00 | 15.00 | 15.00 | 10.00 | 10.00 | 1.00 | | |
| 16 | **JCF-F / KUSTORE / ALKUSA/I/4**<br>Scheme for dealing with fire at Alkusa Colliery. | 9.08 | 36 | | | | 4.60 | 4.48 | | | | | | |
| 17 | **JCF-F/BARORA/PHULARITAND/I/6**<br>Scheme for dealing with fire at Phularitand Colliery (Block-III Coking). | 90.00 | 84 | | | | | 12.85 | 12.85 | 12.85 | 12.85 | 12.85 | 12.85 | 12.90 |
| 18 | **JCF-F/KUSTORE/KUSTORE/I/7**<br>Scheme for dealing with fire at Kustore Colliery (NW & SE fire). | 32.22 | 38 | | | 7.11 | 8.23 | 8.23 | 8.65 | | | | | |
| 19 | **JCF-F/KUSTORE/ ENA( NW)/I/13**<br>Scheme for dealing with fire at Ena Colliery. | 29.11 | 47 | | | | | | 7.58 | 7.58 | 7.57 | 6.38 | | |
| 20 | **JCF-F/KUSTORE/ENA (MID & SE)/I/31**<br>Scheme for dealing with Ena (Mid& SE ) Fire | 31.04 | 40 | | | | 5.18 | 8.94 | 8.87 | 8.06 | | | | |
| 21 | **JCF-F/SIJUA/MUDIDIH/I/9**<br>Scheme for dealing with fire at Mudidih Colliery. | 16.05 | 48 | | | | 3.00 | 3.00 | 3.00 | 3.00 | 4.05 | | | |
| 22 | **JCF-F/P.B./GOPALICHAK/I/14**<br>Scheme for dealing with fire at Gopalichak Colliery. | 66.88 | 48 | | | | | | 13.37 | 13.37 | 13.37 | 13.37 | 13.40 | |
| 23 | **JCF-F/BASTACOLA/KUJAMA/RAIL/II/36**<br>Excavation of rail road bed and backfill with structural fill (length 1.4km) at Kujama colliery with XI/XII seam base along with diversion of chatkari jore. | 213.00 | 60 | | | | | | | 50.00 | 40.75 | 40.75 | 40.75 | 40.75 |
| 24 | **JCF-F / BLOCK -II / BLOCK -II/II/5**<br>Scheme for dealing with fire at Block-II OCP.(A) and RAI Basti (B) | 43.51 | 60 | | | | 11.00 | 11.0 | | 6.30 | 3.49 | 3.49 | 3.48 | 4.75 |



ANNEXURE - VI

| | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 25 | **JCF-F/SIJUA/ TETULMARI(W)/II/15**<br>Scheme for dealing with west fire at Tetulmari Colliery. | 12.84 | 48 | | | | | | | | 3.21 | 3.21 | 3.21 | 3.21 |
| 26 | **JCF-F/SIJUA/TETULMARI(E)/II/16**<br>Scheme for dealing with Tetulmari (East) Fire | 16.05 | 48 | | | | | | | | 4.00 | 4.00 | 4.00 | 4.05 |
| 27 | **JCF-F/EJ/SUDAMDIH&PATHREDIH/II/38**<br>Scheme for fire dealing at Sudamdih / Patherdih Colliery (Part B ) | 22.84 | 28 | | | | | | | | 8.00 | 10.00 | 4.84 | |
| 28 | **JCF-F/KUSTORE/EAST BHUGGATDIH/II/17**<br>Scheme for dealing with East Bhuggatdih Fire | 6.96 | 33 | | | | | | | | 2.50 | 2.50 | 1.96 | |
| 29 | **JCF-F/KUSUNDA/BASSURIYA-1/II/18**<br>Scheme for dealing with Bassuria 1&2 Fire | 14.78 | 38 | | | | | | | | 3.21 | 5.67 | 4.55 | 1.34 |
| 30 | **JCF-F/PB/KENDWADIH(S)/II/20**<br>Scheme for dealing with Kendwadih (South) Fire | 11.78 | 46 | | | | | | | 1.00 | 3.00 | 3.00 | 3.00 | 1.78 |
| 31 | **JCF-F/PB/KENDWADIH(N)& (E)/II/23**<br>Scheme for dealing with Kendwadih (North)& (East) Fire | 12.91 | 50 | | | | | | | 0.48 | 4.00 | 4.00 | 2.50 | 1.93 |
| 32 | **JCF-F/SIJUA/SENDRA BANSJORA/II/39 (Part B)**<br>Scheme for dealing with Sendra Bansjora XI,XII,XIII & XIV seam fire | 32.81 | 39 | | | | | | | 8.00 | 13.10 | 6.60 | 5.11 | |
| 33 | **JCF-F/BARORA/DAMODA/II/22**<br>Scheme for dealing with Damuda Fire | 14.97 | 17 | | | | | | | | | | 7.68 | 7.29 |
| 34 | **JCF-F/EASTER JHARIA/BHOWRAH(N) & (S)/II/25**<br>Scheme for dealing with Bhowra N&S Fire | 22.12 | 30 | | | | | | | | | 4.00 | 10.00 | 8.12 |
| 35 | **JCF-F/SIJUA/JOGTA/II/27**<br>Scheme for dealing with Jogta Fire | 6.16 | 36 | | | | | | | | 2.43 | 2.28 | 0.81 | 0.64 |
| 36 | **JCF-F/KUSUNDA/BASSURIYA (3&4)/II/28**<br>Scheme for dealing with Bassuria 3&4 Fire | 23.17 | 22 | | | | | | | | | 6.00 | 8.00 | 9.17 |



ANNEXURE - VI

| | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 37 | **JCF-F/SIJUA/BANSDEOPUR(E)/II/29**<br>Scheme for dealing with Basdeopur (East) Fire | 56.19 | 60 | | | | | | | 12.36 | 12.54 | 10.75 | 8.45 | 12.09 |
| 38 | **JCF-F/SIJUA/BANSDEOPUR(W)/II/30**<br>Scheme for dealing with Basdeopur (West) Fire | 14.62 | 14 | | | | | | | | | | 6.36 | 8.26 |
| 39 | **JCF-F/KUSUNDA/EAST BUSSURIYA/II/32**<br>Scheme for dealing with East Bassuria Fire (Part B) | 8.14 | 30 | | | | | | | | | 1.60 | 4.23 | 2.31 |
| 40 | **F/MAINTENANCE/34** | 53.50 | | | 5.35 | 5.35 | 5.35 | 5.35 | 5.35 | 5.35 | 5.35 | 5.35 | 5.35 | 5.35 |
| | **New fire if any** | 107.00 | | | 10.70 | 10.70 | 10.70 | 10.70 | 10.70 | 10.70 | 10.70 | 10.70 | 10.70 | 10.70 |
| | **Sub Total** | **2118.46** | | | **170.75** | **190.82** | **246.78** | **199.22** | **197.05** | **242.09** | **238.79** | **232.10** | **233.73** | **167.14** |
| | Contingencies Charges@ of 3% | 63.55 | | | 5.12 | 5.72 | 7.40 | 5.98 | 5.91 | 7.26 | 7.16 | 6.96 | 7.01 | 5.01 |
| | Supervision Charges @ 5% | 105.92 | | | 8.54 | 9.54 | 12.34 | 9.96 | 9.85 | 12.10 | 11.94 | 11.61 | 11.69 | 8.36 |
| | **Sub Total with contingency & supervision charges** | 2287.94 | | | 184.41 | 206.09 | 266.52 | 215.15 | 212.82 | 261.46 | 257.90 | 250.67 | 252.43 | 180.51 |
| | **Preparation of project/Fire schemes** | 10.65 | | 2.14 | 1.21 | 1.21 | 1.22 | 1.22 | 1.22 | 1.22 | 1.21 | | | |
| | **Total** | **2298.59** | | 2.14 | **185.62** | **207.30** | **267.75** | **216.37** | **214.04** | **262.68** | **259.11** | **250.67** | **252.43** | **180.51** |
| | TIR Survey | 2.79 | | 2.79 | | | | | | | | | | |
| | **Grand total** | **2301.38** | | **4.93** | **185.62** | **207.30** | **267.75** | **216.37** | **214.04** | **262.68** | **259.11** | **250.67** | **252.43** | **180.51** |
| | **Phase Wise total** | | | **4.93** | **1091.08** | | | | | **1205.38** | | | | |



ANNEXURE - VI

## ON GOING EMSC/RCFS SCHEMES (5 NOS) BALANCE AMOUNT

| SL No. | Name of the EMSC/RCFS Projects | Capital (Rs. Crores) | Duration (Month) | Pre-Implem-ntation Activities | Schedule of Implementation Yearwise Requirement of funds | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | Phase-I | | | | | Phase-II | | | | |
| | | | | | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 |
| 41 | Scheme for dealing with fire at industry colliery (EMSC-23) | 1.23 | | | 0.70 | 0.53 | | | | | | | | |
| 42 | Scheme for dealing with fire at Alkusa Colliery (EMSC-22) | 0.004 | | | 0.004 | | | | | | | | | |
| 42 | Scheme for dealing with fire at Lodna & Bagdigi Collieries (RCFS-01) | 2.90 | | | 2.2 | 0.70 | | | | | | | | |
| 44 | Scheme for dealing with fire at Jeenagora Colliery for protection of Jore | 3.40 | | | 1.50 | 1.90 | | | | | | | | |
| 45 | Scheme for dealing with fire at Phularitand/Block-II OCP for protection of Adra-Gomoh rail line.(RCFS-02) | 2.58 | | | 1.50 | 1.08 | | | | | | | | |
| | **Sub Total** | 10.114 | | | 5.90 | 4.21 | | | | | | | | |
| | **Grand Total** | **2311.50** | | **4.93** | **191.52** | **211.51** | **267.75** | **216.37** | **214.04** | **262.68** | **259.11** | **250.67** | **252.43** | **180.51** |
| | **Phase wise Total** | **2311.50** | | **4.93** | **1101.19** | | | | | **1205.38** | | | | |



ANNEXURE - VI

## 6.12 Present status of formulation & Implementation of the fire schemes

Out of the 45 fire schemes/ projects proposed to be prepared and implemented within 10 years of time, 5 schemes under EMSC/RCF is uder implementation and would be completed in next two years, 7 schemes have already been prepared, 6 have been approved and under implementation. Three schemes are under preparation.

The status of preparation & implementation of fire schemes is as under:

| Sl no | Name of the schemes/project | Status |
|---|---|---|
| 1 | JCF-F/BASTACOLA/KUJAMA/JORE/I/2<br>Scheme for dealing with fire for protection of Chatkari Jore at Kujama colliery | Report prepared, sanctioned and under implementation. |
| 2 | JCF-F/KATRA/EAST KATRAS (NEW AKASKINAREE)/I/35 (Revised)<br>Scheme for dealing with fire at East Katras (New Akashkinaree) Colliery | Report prepared, sanctioned, again revised and submitted and in the process of approval. |
| 3 | JCF-F/EJ/SUDAMDIH&PATHREDIH/I/19<br>Scheme for fire dealing at Sudamdih / Patherdih Colliery (Part A ) | Report prepared, sanctioned and under implementation. |
| 4 | JCF-F/SIJUA/SENDRA /I/21 (Part-A)<br>Scheme for dealing with Sendra Bansjora X seam fire | Report prepared, sanctioned and under implementation. |
| 5 | JCF-F/KUSUNDA/EAST BUSSURIYA/I/32<br>Scheme for dealing with East Bassuria Fire (Part A) | Report prepared, sanctioned and under implementation. |
| 6 | JCF-F/BARORA/SHATABDI OCP/I/33<br>Scheme for dealing with fire at Shatabdi OCP by excavation method | Report prepared & sanctioned and under implementation. |
| 7 | JCF-F / KUSTORE / RAJAPUR/I/3 (Part A , Rajapur OCP)<br>Scheme for dealing with fire at Rajapur Colliery by excavation method with IX/X seam base | Report prepared , under process of approval. |
| 8 | JCF-F/LODNA/LODNA/RAIL/I/1<br>Excavation of rail road bed and backfill with structural fill (length 3.5 km) at Lodna Bagdigi & Bararee Collieries along with diversion of chatkari jore. | Report is under preparation |
| 9 | JCF-F/KATRAS/GASLITAND/I/24<br>Scheme for dealing with Gaslitand Fire | Report prepared and under approval |
| 10 | JCF-F/KATRAS/KATRAS CHOITUDIH/I/26 (Part A & B)<br>Scheme for dealing with Katras Chiotudih Fire | Draft Report prepared but could not be finalized due to land problem |
| 11 | Scheme for dealing with fire at kustore colliery | Draft report prepared, under process of finalisation |
| 12 | Scheme for dealing with fire at Rai basti Block-II area | Draft report prepared, under process of finalisation |
| 13 | Scheme for dealing with fire at Industry colliery | Under implementation. |
| 14 | Scheme for dealing with fire at Alkusa Colliery | Under implementation |
| 15 | Revised Scheme for dealing with fire at Lodna & Bagdigi collieries | Under implementation |
| 16 | Scheme for dealing with fire at Jeenagora colliery for protection of Jore | Under implementation |
| 17 | Scheme for dealing with fire at Phularitand/ Block-II OCP for protection of rail | Under implementation |

**6.13 Pre-Implementation Activities**.

Before implementation of the fire projects, certain pre -implementation activities like TIR survey for delineation of present extent of fire, preparation of fire schemes for the projects to be implemented in the 1st and 2nd year of the implementation period, etc. Fund requirement for the pre-implementation activities are as under:

| Sl. No. | Activities | Year wise fund (Rs. Crs.) | | Total |
|---|---|---|---|---|
| | | 1st Yr. | 2nd Yr. | |
| 1 | TIR Survey and other surveys for delineating fire areas | 1.62 | 1.17 | 2.79 |
| 2 | Preparation of some of the schemes for dealing with fire for Phase-I | 1.07 | 1.07 | 2.14 |
| | **Total** | **2.69** | **2.24** | **4.93** |

**6.14 Organization**

Implementation of the 45 nos. fire projects within a time frame of 10 yrs., in two phases, each of 5 yrs duration will be the responsibility of BCCL. In phase-I, 28 nos. and in phase-II 17 nos. of projects are to be implemented. For speedy implementation it is proposed that the projects will be implemented through contractual means wherever feasible.

For implementation the fire abatement measures at different locations, it is proposed to have a separate division for implementation of fire control measures at Company Head Quarter headed by an official of Chief General Manager Rank. The responsibility of Fire division at Company (HQ) level would be as under :

- Implementation of pre-implementation activities as per Master Plan
- Preparation and approval of fire dealing Projects/Schemes
- Preparation of tender documents, tendering and award of work
- Arrangement and disbursement of fund to concerned Areas
- Monitoring and supervision of various fire projects under implementation
- Organising R&D jobs and special study required for dealing with fire.

The fire control measures are proposed to be implemented through a separate fire Cell at each Area, under the administrative control of General Manager/Chief General Manager of the concerned Areas.

The expenditure for running the separate fire cell /division at HQ and at Area level will be met from the supervision cost (5% of total capital) considered in the Master Plan/

## 6.15 Fund Requirement

The fund requirement for dealing with each fire by different alternative technologies was estimated by GAI/MET-CHEM in US in 1996. The fund requirement for the recommended technology has been escalated upto June'06 based on wholesale Price Index (WPI) and has been considered in this Master Plan. However, in some cases the requirement as estimated by GAI/MET-CHEM has been judiciously reduced depending on the present cost of particular activity. Moreover, where the fire schemes have already been prepared, the actual cost based on the technology proposed has been considered.

"While approving the Updated Master Plan '2004 for a total outlay of Rs. 5792.21 Crs. For dealing with fire, subsidence and rehabilitation in the lease hold of BCCL, CIL Board in its meeting held on 19.07.04 directed that as and when fire is handled by direct removal of coal and OB , the cost thereof shall be set off from sale value of coal realised if any"

As actual recovery of coal depends on many factors and can not be correctly ascertained, It has been assumed that 50% of total in-situ coal may be recovered for sale and accordingly sale realization of 50% of total in-situ coal has been off set against the total excavation cost for the fire projects where excavation technology has been proposed. However, the amount may vary from place to place. The cost of rehabilitation of the stable sites falling within the area of excavation for dealing with fire has been considered in rehabilitation projects.

Total indicative capital requirement to deal with all the fires of BCCL is estimated to be Rs.**2311.50** Crores including the fund required for pre implementation activities and balanced fund of ongoing EMSC / RCFS schemes. The total capital is proposed to be spent in 10 years of time.

Total fund requirement includes fire dealing cost, 3% contingency and 5% supervision charges. The supervision charges will cover the expenditure (Revenue, furniture & fittings , vehicle, office equipment etc) of separate fire cell/ organization at BCCL.

Implementation of fire dealing projects will take about 12 years time . During this time new fires may come up which require extra fund.

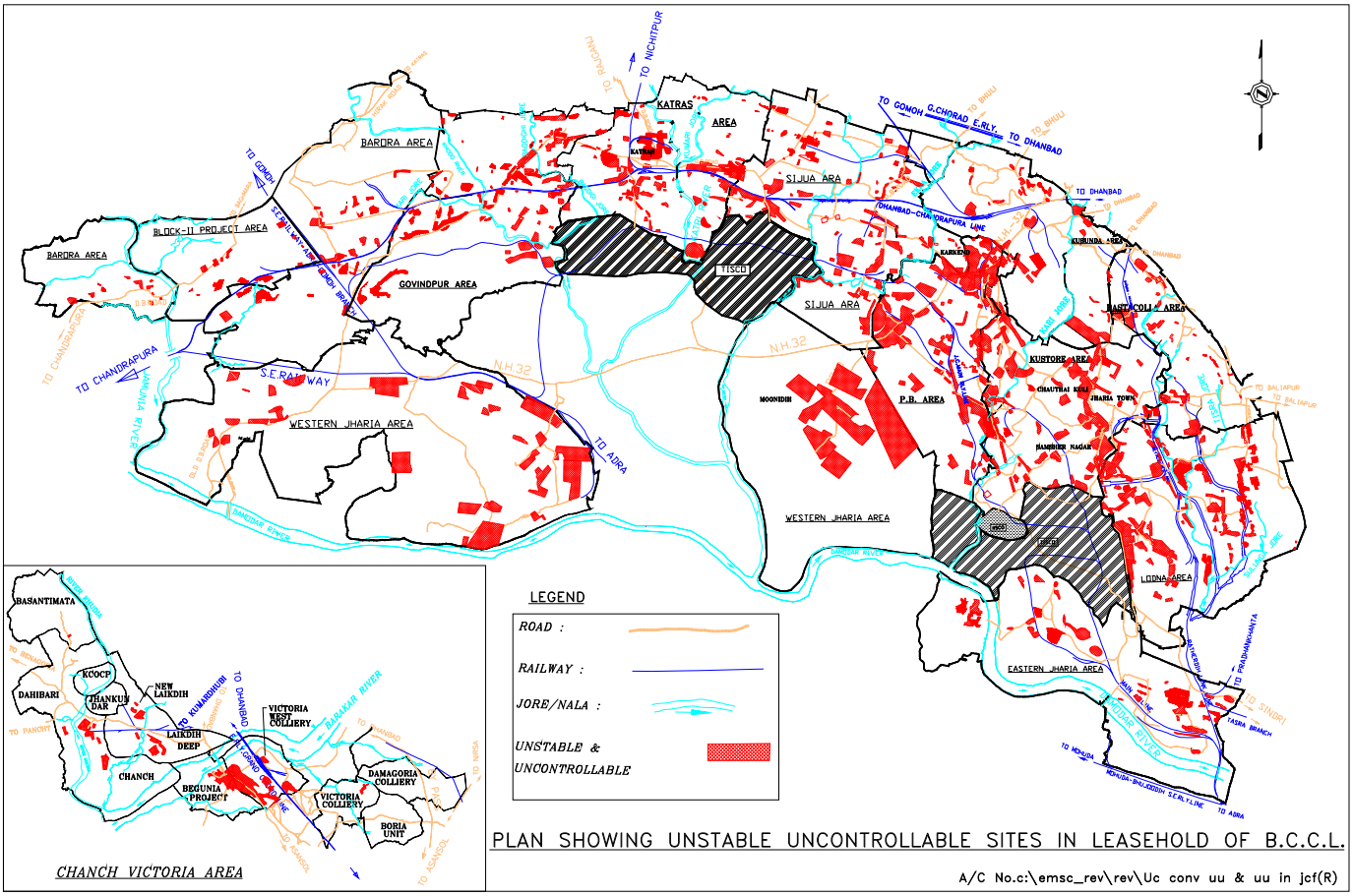
The year wise& phase wise indicative requirement of capital is shown in **TABLE – 6.**

**TABLE -6**

**YEAR-WISE INDICATIVE CAPITAL REQUIREMENT FOR DEALING WITH FIRE PROJECTS**

| PHASE | YEAR | INDICATIVE FUND (Rs.Crs) |
|---|---|---|
| Pre-implementation Phase | | |
| | 1st | 2.69 |
| | 2nd | 2.24 |
| Total Pre-Implementation Phase | | **4.93** |
| Implementation Phase | | |
| Phase-I | 3rd | 191.52 |
| | 4th | 211.51 |
| | 5th | 267.76 |
| | 6th | 216.36 |
| | 7th | 214.04 |
| **Sub Total Phase-I** | | **1101.19** |
| Phase-II | 8th | 262.68 |
| | 9th | 259.11 |
| | 10th | 250.67 |
| | 11th | 252.43 |
| | 12th | 180.50 |
| **Sub Total Phase-II** | | **1205.38** |
| **Grand total** | | **2311.50** |

# REHABILITATION & RESETTLEMENT




PLAN SHOWING UNSTABLE UNCONTROLLABLE SITES IN LEASEHOLD OF B.C.C.L.

A/C No.c:\emsc_rev\rev\Uc conv uu & uu in jcf(R)

## 7.0 MASTER PLAN FOR REHABILITATION OF INHABITATED FIRE & SUBSIDENCE PRONE AREAS.

### 7.1 Introduction:

In the updated Master Plan of April'04, altogether 532 sites (271 in full & 261 in part) were considered for rehabilitation as the houses over these sites were declared unstable & uncontrollable (UU) as ground movement can not be controlled by stowing. Total no. of houses proposed to be evacuated from 532 sites were 65300 which includes

| | | |
|---|---|---|
| BCCL houses | : | 36208 |
| Non-BCCL : Private houses | : | 15571 |
| Non- BCCL : Un-authorised houses (Encroacher) | : | 12719 |
| Others : (Religious places, schools, Hospitals, Post offices, Police stations etc). | : | 802 |

Apart from these 532 sites, 121 sites were considered unstable but controllable (UC) i.e where ground movement could be controlled by stowing.

In accordance with the directive of Supreme court of India, on 3rd May, 2005, Director General of Mines Safety (DGMS) constituted a Committee to go through the Action Plan and subsequent affidavit/ATR filed by UOI and to verify the same in connection with PIL case filed by Sri Haradhan Roy, Ex MP.

The Committee concluded that as there are no scientific methods available to check long term stability, it might not be possible to certify that the areas thus stabilized. The present stabilization work may restrict the effect of subsidence and allow some time. The final and permanent solution is evacuation of the affected area and rehabilitation.

In view of the above, 121 sites which were proposed for stabilization have now been considered for rehabilitation.

### 7.2 Total no. of houses in the endangered areas

Over the period of time from original Master Plan of March'1999 to date, 24 Nos. of sites have been demolished and shifted to other places by BCCL management. These sites have been deleted from this Master Plan.

Where fire dealing has been proposed by excavation method some stable parts are necessarily to be evacuated for digging out the fire. Such stable parts have now been

considered in rehabilitation. 26 such sites (23 part & 3 full) have been included in this Master Plan.

Considering the above & combining the earlier stabilization sites with Rehabilitation, total no. of sites proposed to be rehabilitated under the present Master Plan comes to 595 (326 in full & 269 in part). Total affected area under these site is estimated to be 25.70 sq.km

The number of houses under stabilization sites (now proposed for rehabilitation were supplied by BCCL after survey done in March '06 and the same has been considered for rehabilitation. Total no of houses from stabilization sites were 17302 (BCCL : 6480, Private : 6533, Encroachers and others : 4289). Total no of houses from stable parts were 3055. (BCCL : 1505, Pvt. : 591 and Encroachers : 959)

The no. of Non-BCCL houses under uncontrollable sites as per Master plan'1999 was 28290. Over the time of 7 years, there was further construction of houses in the endangered areas. JRDA/State Govt. of Jharkhand has done demographic survey in 2005 for 119 sites of Phase – I of Master Plan' 2004. It has been verbally reported by JRDA that the total no of Non-BCCL houses in 119 sites under Phase-I has increased to 14075 from 9850, i.e. an increase of 42.89% over a period of seven years with an annualized increase of 5.25%. This has been considered as a sample survey and has been uniformly applied for other sites in this Master Plan.

However no increase in BCCL houses has been considered as there has not been any construction over the years in those areas.

On the above considerations, total no. of houses in the endangered areas has now been estimated at 98314. The details are as under:

| | | |
|---|---|---|
| BCCL houses | : | 44155 |
| Non-BCCL : Private houses | : | 29444 |
| Non- BCCL : Un-authorised houses (Encroacher) | : | 23847 |
| Others : (Religious places, schools, Hospitals, Post offices, Police stations etc.) | : | 868 |
| **TOTAL** | **:** | **98314** |

### 7.2.1 Total no. of houses proposed to be constructed/ resettled

In the meeting held with Secretary (Coal) on 4.7. 2006, it was decided that due to decrease in the manpower strength in BCCL only 25000 houses for BCCL employees required to be constructed. With this consideration total no of houses proposed to be resettled comes to **79159**. The details are as under:

| | | |
|---|---|---|
| BCCL houses | : | 25000 |
| Non-BCCL : Private houses | : | 29444 |
| Non- BCCL : Un-authorised houses (Encroacher) | : | 23847 |
| Others : (Religious places, schools, Hospitals, Post offices, Police stations etc. | : | 868 |
| **TOTAL** | **:** | **79159** |

It is proposed that as soon as a person residing in endangered areas of BCCL houses retires, the house shall be demolished.

### 7.3 Demographic Survey and valuation of Properties

Demographic survey and valuation of the properties of the houses to be rehabilitated should be conducted for assessment of actual compensation and benefits before implementation of rehabilitation project.

### 7.4 **Rehabilitation & Resettlement Package**:

### 7.4.1 PROPOSED R & R PACKAGE FOR THE NON-ECL/NON- BCCL PEOPLE FOR THE REHABILITATION FROM THE UNSTABLE LOCATIONS

It is proposed that R & R package for both BCCL and ECL for Non BCCL/ Non ECL employees should be similar as far as possible. The main elements of the proposed R&R package to be offered to the people to be rehabilitated are as follows:-

1. It is proposed that resettlement should be done in satellite townships located on non-coal bearing areas/ Barren measures identified as per Master Plan.

2.a) Head of every family will be entitled to the compensation equivalent to the assessed cost of homestead land and other infrastructure within their homestead land. In addition, the head of each family shall be provided with a plot of land of $100m^2$ free of cost at the resettlement site having all amenities and infrastructural facilities.

If the above offer is not acceptable then head of each house will be provided a constructed flat of around 40$m^2$ as super built up area having two room , a kitchen and an attached toilet in triple storey building. In such case no other cash compensation shall be paid.

In case the requirement of land is more than 100$m^2$, additional land may be provided at the resettlement site subject to the maximum quantity of land owned at the rehabilitation site on payment basis as per market rate or adjusted against the entitled cash compensation, if land is available.

The assessment for compensation will be done by state Govts./Implementing agencies of State Govts.

2b) In case a house owner does not want to construct house on the 100 $m^2$ free plot of land at the resettlement site, he will be offered equivalent cash compensation in lieu of the free plot along other entitled cash compensation.

3. Those who opt for free plot and cash compensation shall have the choice of constructing their houses over the plot of land allotted to them. No additional money for the construction would be provided. Such house owners shall also be provided assistance ( free of cost ) in designing the house to be constructed, if they so desire.

4 No compensation will be paid to the house owner having no homestead land. They are proposed to be resettled in newly constructed resettlement site with all basic amenities (road, light, water supply etc). Head of each house will be provided with a constructed house of around 27 sq. m. as super built up area in triple- storey building.

5 Proper procedure shall be developed for payment of compensation to those families who opt for cash compensation and construction of their own houses at the new site.

6 Each house owner will be paid a maximum of Rs. 10000/- (Ten thousand) as shifting allowance from their present living places to the new houses at the resettlement site.

7 It will be binding to all house owners that the final payments are made only after they have shifted to the resettlement site and handed over the possession of existing homestead land and buildings to the company along with executing a registered deed of exchange. The existing house at the unstable site shall be demolished.

8 For the purpose of income generation due to displacement/shifting to the new resettlement site, it is proposed to pay minimum wage per day for 250 days in a year for 2 years to the head of each family as per minimum wage rate of respective State Govts.

9 The town planning and construction at the proposed resettlement site will also include infrastructure development like road, street lighting, drainage, sewerage treatment, community centre, water supply etc.

10 The community facilities like primary schools, community centre, small dispensary and shopping centre will also be included in the town planning. These common facilities will be constructed as per the plan under the proposed compensation package. However, the running cost of all the facilities, i.e. water supply, power supply, schools, dispensary etc. shall not be the part of compensation package and will have to be looked after by the Panchayat and other bodies of the State Government.

11 Common structures such as religious places etc. shall be built at resettlement site on mutual agreement basis from Rehabilitation fund of Master Plan.

12 The proposed location of resettlement site is guided by the following considerations:-

a) Preferably the proposed resettlement site should be either land owned by BCCL or vested to the state Government.

b) In case such land are not available, then the required land may be purchased from private owner by State Govt.

13. No employment shall be offered for any rehabilitation under the Master Plan

**7.4.2 BCCL Houses**:

BCCL houses from the endangered areas are proposed to be rehabilitated in four Satellite Township in non-coal bearing areas along the periphery of JCF. The houses over endangered houses will be rehabilitated with equivalent type of house in satellite township in triple storied building having all basic infrastructural facilities. As soon as an employee residing in the identified endangered area retires, the house shall be demolished.

It is proposed that Rehabilitation/resettlement work of BCCL houses shall be the responsibility of BCCL whereas the same for Non BCCL houses including encroachers shall be the responsibility of concerned state Govt. However acquisition of land for rehabilitation of BCCL employees shall be done in association with State Govts of Jharkhand/West Bengal.

**7.5 Amenities & Infrastructures:**

The resettlement sites of the affected population for BCCL & Non-BCCL has been identified exclusively on non coal bearing areas sufficiently away from the impact of future mining. For this purpose, it is proposed that satellite township should be constructed along the fringe of Jharia Coal Field. The size of township should be large enough to accommodate at least 12500 Non-BCCL families and 6000 BCCL families. In each locality, there will be separate town ship for BCCL houses and Non-BCCL (both private & encroachers) adjacent to each other. In each township the following amenities will be provided as per BPE norm.

- Primary school
- High school
- Bank
- Post office
- Community center
- Shopping center
- Hospital
- Play ground & children park
- Water Supply ,Sewage disposal & sanitation
- Road, Culverts & Drains
- Power Supply

It is proposed that rehabilitation sites for Non-BCCL families should be adjacent to rehabilitation sites of BCCL houses.

**7.6 Requirement of land at Resettlement site :**

**A) For BCCL houses**

The BCCL houses will be resettled in satellite townships with equivalent type of houses in triple storey building. The weighted average plinth area of the houses proposed to be rehabilitated has been estimated at 48.09 sq m /house. Considering the amenities, infrastructure, internal roads etc to be provided in the township, requirement of land for BCCL houses has been estimated at 400.00 Ha. (@ 160 $m^2$ /House)

**B) For Non BCCL Houses**

**i) Private (Authorised)**

Head of every family will be provided a plot of land measuring 100 sq.m. Considering the amenities, infrastructure, internal roads etc to be provided in the township, requirement of land for private authorized houses has been estimated at 794.98 Ha. (@ 270 $m^2$ /house)

**ii) Private Houses (Encroachers)**

Encroachers will be provided with a house constructed on about 27 sq.m land in triple storied building in the resettlement site. However provision of 11 sq . m of land has been considered for construction of another room in future . Considering the amenities, infrastructure, internal roads etc to be provided in the township, requirement of land for encroachers has been estimated at 310.01 Ha. (@ 130 $m^2$/house)

With the above consideration, total requirement of land has been estimated at **1504.99 hactre** of which **400.00** ha of land is required for resettlement of BCCL houses and **1104.99** ha for Non-BCCL houses. Phase wise Requirement of land is as under:

| Sl.no | Particulars | Phase-I | Phase II | Total |
|---|---|---|---|---|
| 1. | BCCL houses | 199.39 | 200.61 | 400.00 |
| 2. | Non BCCL Houses | 660.27 | 444.72 | 1104.99 |
| | **Total (Ha)** | **859.66** | **645.33** | **1504.99** |

**7.7 Duration of Implementation**:

Planning Commission vide letter no.M-12026/2/2005 dated 29.3.2005, suggested that the time frame of implementation of the Master Plan should be reduced to 7-8 years. In the meeting held with Secretary (Coal) on 23.2 06, it was decided to reduce the time frame to 10 years. Accordingly, duration of implementation has been considered as 10 years (excluding 2 years of Pre Implementation activities)
in 2 phases, each of 5 years duration

The no. of houses, proposed to be rehabilitated under each phase are as under:

| Sl. No. | NAME | BCCL | PVT | ENCR. | OTHER | TOTAL |
|---|---|---|---|---|---|---|
| 1 | PHASE -I | 12462 | 16671 | 16166 | 496 | 45795 |
| 2 | PHASE -II | 12538 | 12773 | 7681 | 372 | 33364 |
| | **TOTAL** | **25000** | **29444** | **23847** | **868** | **79159** |

**7.8 Prioritisation of Rehabilitation sites**:

Depending on the urgency of evacuation based on the ground condition all the sites were prioritised into 4 different priority. (Priority – I to Priority – IV) in Master Plan'1999 & '2004. As desired by planning Commission, the time frame of implementation has been reduced to 10 years in 2 phases (excluding 2 years of Pre Implementation activities) from 20 years in 4 phases . Therefore, the houses which were proposed in lower priority/phase has now been considered in higher priority/phase i.e. sites of priority III & IV have been considered in Priority - I or II and so on. With the above considerations all the sites have now been prioritised into Priority – I & Priority – II.

UOI has submitted an affidavit against the PIL case filed by Sri Haradhan Roy, Ex MP indicating that houses over 119 sites will be shifted in 1st phase within five years. All those 119 sites has been retained in Phase –I. Out of the total 595 sites, 300 sites will be rehabilitated in priority / Phase – I & 295 sites in Phase- II.

However even after rehabilitating all the sites under Priority – II, or I it may not be possible to start opencast mining operations until the stable sites falling with the area are evacuated. These stable sites, proposed to be evacuated along with mining operation, cost of which will

be included in the mining project report, if mining operation is taken up. However, where fire dealing by excavation method has been proposed no further rehabilitation will be required.

### 7.9 Codification & Grouping of uncontrollable sites into projects.

The uncontrollable sites are proposed to be rehabilitated in a group with proper codification. Each project has been assigned a code name showing the name of the Phase / Priority. The project code JCF / Rehab./ I/ 1 indicates that :

JCF : Jharia Coalfield
Rehab. : Rehabilitation
I : Phase
1 : Priority /project

Total 4 no. of projects has been envisaged.
Phase wise, Project wise details are given in **table no. 7**

**Table-7**

## ACTION PLAN FOR REHABILITATION IN PHASE - I

## 1ST TO 5TH YEAR

| Sl.No. | Area | Colliery | Site name & no. | Affected Area (Sq.m.) |
|---|---|---|---|---|
| | JCF/REHAB/P-I/2 | | | |
| 1 | Barora | Damuda | Albion Section/O9 | 1600 |
| 2 | Barora | Damuda | BJ Section B/O7 | 3200 |
| 3 | Barora | Damuda | North Damuda Sec C/O3 | 4800 |
| 4 | Barora | Damuda | North Damuda Sec D/O4 | 1200 |
| 5 | Barora | Damuda | North Damuda Sec E/O5 | 1600 |
| 6 | Barora | Damuda | Pathrakuli Village/10 | 3200 |
| 7 | Barora | Muraidih | Barora Village No. 2/ O5 | 30400 |
| 8 | Barora | Muraidih | Central Kenduadih Village/O7 | 1600 |
| 9 | Barora | Muraidih | Kenduadih Village/ O6 | 34400 |
| 10 | Barora | Phularitand | Akashkinaree Gwala Patti/O8 | 17600 |
| | Barora | Phularitand(S) | Akashkinaree Gwala Patti/O8 | 1600 |
| 11 | Barora | Phularitand | Ashakhuti Qtrs./O9 | 13600 |
| | Barora | Phularitand(S) | Ashakhuti Qtrs./O9 | 14400 |
| 12 | Barora | Phularitand | Badora/13 | 8400 |
| 13 | Barora | Phularitand | Birajpur/10 | 8400 |
| 14 | Barora | Phularitand | Mandra,Ganheshpur& Barwabera/O5 | 11200 |
| | Barora | Phularitand(S) | Mandra,Ganheshpur& Barwabera/O5 | 41600 |
| 15 | Barora | Phularitand | Manjura near Phularitand station/O6 | 16000 |

| | | | | |
|---|---|---|---|---|
| | Barora | Phularitand(S) | Manjura near Phularitand station/O6 | 9600 |
| 16 | Barora | Phularitand | Mohalpatti Eastern Rly. Quarters/O7 | 18400 |
| | Barora | Phularitand(S) | Mohalpatti Eastern Rly. Quarters/O7 | 4800 |
| 17 | Barora | Phularitand | Nawagarh & Part of Muchikuli/16 | 19200 |
| 18 | **Bastacolla** | Bastacolla | BastaCollaS2 / 05 | 167255 |
| 19 | Bastacolla | Bastacolla | Chandmari Sec-2/O7 | 12211 |
| 20 | Bastacolla | Bastacolla | Leper colony/O8 | 4350 |
| 21 | Bastacolla | Bastacolla | Manjhi Bhasti/O9 | 7890 |
| 22 | Bastacolla | Bastacolla(S) | Bastacolla Section 1/04 | 96347 |
| 23 | Bastacolla | Bera | Bera Kala/Indira Awas/O3 | 41535 |
| 24 | Bastacolla | Bera | Chandmari/O2 | 49972 |
| 25 | Bastacolla | Bera | Jorapathak Road/O1 | 49972 |
| 26 | Bastacolla | Dobari | BCCL Colony-2/O3 | 4999 |
| 27 | Bastacolla | Dobari | Sahana VillageO2 | 41535 |
| 28 | Bastacolla | Ghanoodih | 4/5 Pit Area/O3 | 20179 |
| 29 | Bastacolla | Ghanoodih | Buffer dhowra/O5 | 20179 |
| 30 | Bastacolla | Ghanoodih | Mallah Patti/O1 | 28182 |
| 31 | Bastacolla | GOCP | Bhuiya Dhowra / 05 | 4061 |
| 32 | Bastacolla | Kuiya | ACM Qtrs./O2 | 1706 |
| 33 | Bastacolla | Kuiya | Colliery Office/O1 | 2678 |
| 34 | Bastacolla | Kujama | Road Side Durgapur/O2 | 65436 |
| 35 | Bastacolla | Kujama | Jharia Town / 05 | 108271 |
| 36 | Bastacolla | Kujama(S) | Pandebera/03 | 11748 |
| 37 | Bastacolla | Kujama | South Kujama /01 | 104301 |
| 38 | **Block-II** | Benedih | Khoki Bigha/O1 | 8800 |
| 39 | Block-II | Block-II | Bilaspuri Dhowrah /10 | 2400 |
| 40 | Block-II | Block-II | Kessurgarh Bastee/ O7 | 48000 |
| 41 | Block-II | Block-II | Sidpuki Village/O6 | 1600 |
| 42 | Block-II | Nudkhurkee | Nudkhurkee Bastee no. 2/ O9 | 1600 |
| 43 | Block-II | Nudkhurkee | Nudkhurkee Bastee no. 3 /O7 | 4000 |
| 44 | **C-V Area** | Basantimata | Company Colony near Office/O2 | 3929 |
| 45-48 | C-V Area | Begunia | Barakar Town/1A,1B,1C, &1D | 375299 |
| 49 | C-V Area | Laikdih | Nutugram/O1 | 74956 |
| 50 | C-V Area | New Laikdih | Jograd Bastee/12 | 5388 |
| 51 | C-V Area | New Laikdih | Office Complex,W/S,CHP/O2 | 14690 |
| 52 | C-V Area | Old Chanch | Bautdih 1/O4 | 11368 |
| 53 | C-V Area | Old Chanch | Yadavpur Luchi Bai/O6 | 18000 |
| 54 | C-V Area | Old Chanch (Closed) | Bautdih 2/O5 | 39961 |
| 55 | C-V Area | Old Chanch (Closed) | Reliance Factory 1/O2 | 8539 |
| 56 | C-V Area | Old Chanch (Closed) | Reliance Factory 2/O3 | 93769 |
| 57 | C-V Area | Victoria West | Baltoria/O2 | 81656 |
| 58 | C-V Area | Victoria West | Barakar Town /O3 | 239416 |
| 59 | C-V Area | Victoria West | Jhanakpura/O4 | 71270 |
| 60 | C-V Area | Victoria West | Jhewri Mohalla/O6 | 30491 |
| 61 | C-V Area | Victoria West | Karimdanga/O7 | 48382 |
| 62 | C-V Area | Victoria West | Pahalsadarga /O5 | 15235 |
| 63 | **E. Jharia** | Amlabad | Bhuiya Patti/O3 | 16000 |
| 64 | E. Jharia | Patherdih | Huchuktand /O2 | 4800 |
| 65 | E. Jharia | Patherdih | Pure Chasnalla/O9 | 30400 |

| | | | | |
|---|---|---|---|---|
| 66 | E. Jharia | Sudamdih SM | Patherdih Village/O3 | 16000 |
| 67 | **Gobindpur** | Dharmaband | Barat Area of NHS/O6 | 9600 |
| 68 | Gobindpur | Dharmaband | Dharmaband Village/O5 | 35200 |
| 69 | Gobindpur | Dharmaband | Dispensar Qrts Area/O2 | 17600 |
| 70 | Gobindpur | Dharmaband | No.6 NHS Qtrs/O3 | 51200 |
| 71 | Gobindpur | Dharmaband | Office Area/O4 | 57600 |
| 72 | Gobindpur | Dharmaband | Thana Area Qrts./O1 | 32000 |
| 73 | Gobindpur | Gobindpur | Tiwari Bastee /O2 | 4750 |
| 74 | Gobindpur | Jogidih | Central Sinidih Bastee/12 | 2645 |
| 75 | Gobindpur | Jogidih | East Sinidih Unit/11 | 3825 |
| 76 | Gobindpur | Jogidih | HZL Factory Surroundings/13 | 16495 |
| 77 | Gobindpur | Jogidih | Tundoo Khas Village/15 | 43859 |
| 78 | Gobindpur | Jogidih | Tundoo Village/10 | 9210 |
| 79 | Gobindpur | Kharkharee | Kharkharee & Nawagarh/O2 | 62400 |
| 80 | Gobindpur | Maheshpur | Ashakhuti Phularitand 6/O3 | 5618 |
| 81 | Gobindpur | Maheshpur | Bamandih Colony/15 | 3159 |
| 82 | Gobindpur | Maheshpur | Maheshpur Colliery Office & Houses/O5 | 26304 |
| 83 | Gobindpur | Maheshpur | Sinidih Basti, Quarters & Hutments(North of DB Road)/13 | 1149 |
| 84 | Gobindpur | Maheshpur | Sinidih NHS Qtrs.& Hutment(East & West of HZL Road)/10 | 13056 |
| 85 | Gobindpur | Maheshpur | Sinidih Quarters & houses surround sub-station/12 | 10948 |
| 86 | Gobindpur | S.Gobindpur | 15 A Seam B/16 | 1600 |
| 87 | Gobindpur | S.Gobindpur | Aam Bagan Bastee- A/17 | 22400 |
| 88 | Gobindpur | S.Gobindpur | Aam Bagan Bastee-B/18 | 30400 |
| 89 | Gobindpur | S.Gobindpur | Bilbera 'B' /10 | 18400 |
| 90 | Gobindpur | S.Gobindpur | Bilbera Jealgora Section/05 | 22400 |
| 91 | Gobindpur | S.Gobindpur | Diamond-Teturia B/O8 | 1600 |
| 92 | Gobindpur | S.Gobindpur | Hanuman Nagar/11 | 8000 |
| 93 | Gobindpur | S.Gobindpur | South Govindpur 'A' / O3 | 4000 |
| 94 | Gobindpur | S.Gobindpur | South Govindpur-C/O9 | 16000 |
| 95 | Gobindpur | S.Gobindpur | Tanda Bari 'B' /O4 | 8000 |
| 96 | Gobindpur | Teturia | 4 Pit Area /O5 | 25600 |
| 97 | Gobindpur | Teturia | Agent Bunglow/O4 | 12800 |
| 98 | Gobindpur | Teturia | Baru Bhutu Bastee/O6 | 400 |
| 99 | Gobindpur | Teturia | Dharmaband Agent Bunglow/O7 | 3600 |
| 100 | **Katras** | Angarpathra | A.P. Section -1/O1 | 212100 |
| 101 | Katras | East Katras | Choitudih/19 | 26280 |
| 102 | Katras | East Katras | Koiludih 6/17 | 2500 |
| 103 | Katras | Gaslitand | Gaslitand Colony/O1 | 132900 |
| 104 | Katras | Gaslitand | Gaslitand Upper Dhowra/O5 | 25100 |
| 105 | Katras | Katras-Chaitudih | Bastee No.4/11 | 30450 |
| 106 | Katras | Katras-Chaitudih | Kathal Dhowrah /O8 | 1300 |
| 107 | Katras | Katras-Chaitudih | Lakurka Vill. No. 1/ 12 | 21375 |
| 108 | Katras | Katras-Chaitudih | Lakurka Vill. No. 2/ 13 | 5575 |
| 109 | Katras | Katras-Chaitudih | Lal Dhowra To Pokherpar/03 | 8350 |
| 110 | Katras | Katras-Chaitudih | Near 3 Pit Habitation/02 | 8350 |
| 111 | Katras | Katras-Chaitudih | North of 1 Pit/04 | 4850 |
| 112 | Katras | Katras-Chaitudih | Ramakant Bhartiya House/18 | 465 |
| 113 | Katras | Katras-Chaitudih | Yule Pit Qtrs./07 | 6650 |
| 114 | Katras | Salanpur | Central Salanpur Block -II /O8 | 17420 |
| 115 | Katras | Salanpur | East Salanpur Block 1 /21 | 14980 |
| 116 | Katras | Salanpur | East Salanpur Block -1&2/ (1&2) | 36110 |

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|---|---|---|---|---|
| 117 | Katras | Salanpur | New Lakurka Section Block -1 /16 | 6000 |
| 118 | Katras | Salanpur | North Salanpur Block -2/O5 | 33888 |
| 119 | Katras | Salanpur | North Salanpur Block -3/O6 | 88320 |
| 120 | Katras | Salanpur | Railway Colony/O3 | 16160 |
| 121 | **Kustore** | Alkusa | DAV School & G. Camp / 02 | 43330 |
| 122 | Kustore | Alkusa | Hutment near Durga Mandir / 05 | 33800 |
| 123 | Kustore | Alkusa | Officers Qtr. near Thana / 01 | 43330 |
| 124 | Kustore | Burragarh | Burragarh Office Complex/ O8 | 29049 |
| 125 | Kustore | E. Bhagatdih | 1 Pit Area / 04 | 15612 |
| 126 | Kustore | E. Bhagatdih | Boka Pahari / 01 | 13166 |
| 127 | Kustore | E. Bhagatdih | Chowthai Kuli &Hussainabad / 09 | 172269 |
| 128 | Kustore | E. Bhagatdih | Katras More Area / 11 | 34084 |
| 129 | Kustore | E. Bhagatdih | Khas Jharia / 08 | 44060 |
| 130 | Kustore | E. Bhagatdih | No. 3&5 Colony /0 2 | 22739 |
| 131 | Kustore | E. Bhagatdih | No. 4 Pit Area/0 5 | 33685 |
| 132 | Kustore | Ena | Colliery Qtrs / 03 | 2165 |
| 133 | Kustore | Ena | No.2 Colony/ 04 | 27751 |
| 134 | Kustore | Ena | Officers colony &B.up Area / 05 | 99885 |
| 135 | Kustore | Ena | Parsatand Bast/ 02 | 9869 |
| 136 | Kustore | Kustore | 08 No.Dhowra / 01 | 14000 |
| 137 | Kustore | Kustore | 3 No. Colony &D Mandir /O8 | 100489 |
| 138 | Kustore | Kustore | Simla bahal Basti / 03 | 70000 |
| 139 | Kustore | Rajapur | Kukur Thapa / 02 | 27889 |
| 140 | Kustore | Rajapur | N. WB Colony / 04 | 19250 |
| 141 | Kustore | Rajapur | New Colony &Ena Islampur / 05 | 59500 |
| 142 | Kustore | Rajapur | Rajapur Colony / 03 | 10720 |
| 143 | Kustore | Rajapur | Fatehpur Bastee/O1 | 21263 |
| 144 | Kustore | Simla bahal | Bhalgora Dhaska Patti / 01 | 176574 |
| 145 | Kustore | Simla bahal | Fire Brigd. Area / 09 | 30129 |
| 146 | Kustore | Simla bahal | Inside Colliery Comd. Area / 05 | 71539 |
| 147 | Kustore | Simla bahal | Jharia Town (P. Area) / 02 | 125143 |
| 148 | Kustore | Simla bahal | Shamsher nagar / 03 | 240123 |
| 149 | **Kusunda** | Basseriya | Gwala Patti /O1 | 59705 |
| 150 | Kusunda | Basseriya | No. 1 Basti /O3 | 4009 |
| 151 | Kusunda | Godhur | Rawani Bastee | |
| 152 | Kusunda | Gondudih | Surender Colony (East Loyabad)/ O7 | 11584 |
| 153 | Kusunda | Industry | West Ena 1 & 2 pit / O1 | 268687 |
| 154 | Kusunda | Khas Kusunda | Colliery Office Complex & company's qtrs./ 10 | |
| 155 | Kusunda | Kusunda | Kusunda village /O1 | 21042 |
| 156 | Kusunda | Kusunda | Workshop, Office & Qtrs.(PK-1&2 pit area)/ O4 | 78198 |
| | **JCF/REHAB/P-I/1** | | | |
| 157 | **Lodna** | Bagdigi | Bagdigi Basti /O1 | 89600 |
| 158 | Lodna | Bagdigi | Bagdigi Colony / O2 | 27200 |
| | Lodna | Bagdigi(S) | Bagdigi Colony / O2 | 41600 |
| 159 | Lodna | Bararee | Along Jore Side Colony/11 | 17600 |
| | Lodna | Bararee(S) | Along Jore Side Colony/11 | 11200 |
| 160 | Lodna | Bararee(S) | Bazaar Dhowrah/12 | 7200 |
| 161 | Lodna | Bararee | Brahman Basti / O2 | 14400 |
| 162 | Lodna | Bararee | Chhata Dhowra & Durga Mandir /O5 | 35200 |
| 163 | Lodna | Bararee | Chiraiyatand Colony /O1 | 30400 |
| 164 | Lodna | Bararee | Colony near 1 pit /O4 | 35200 |
| 165 | Lodna | Bararee | Colony near Bararee School / Bagan Dhowra /O3 | 19200 |

| | | | | |
|---|---|---|---|---|
| 166 | Lodna | Bararee | Digwadih New Colony / O8 | 41600 |
| 167 | Lodna | Bararee | Dom Dhowra /O6 | 10400 |
| 168 | Lodna | Bararee | East side of DB Road /O9 | 24000 |
| 169 | Lodna | Bararee | Mudivita Village/10 | 1600 |
| | Lodna | Bararee(S) | Mudivita Village/10 | 1600 |
| 170 | Lodna | Bararee | Naya Dhowra Colony/ O7 | 19200 |
| 171 | Lodna | Jealgora | 1&2 Pit Area/11 | 32000 |
| 172 | Lodna | Jealgora | Bagdigi Basti / 12 | 26400 |
| 173 | Lodna | Jealgora | Bucharkhana Area / O1 | 43200 |
| 174 | Lodna | Jealgora | Buriband /14 | 13600 |
| 175 | Lodna | Jealgora | Check Post area /O6 | 4000 |
| 176 | Lodna | Jealgora | North Jealgora 3&4 Pit/ O2 | 64000 |
| 177 | Lodna | Jealgora | Stadium Area colony/O8 | 76800 |
| 178 | Lodna | Jealgora | Sweeper Dhowra /O9 | 16000 |
| 179 | Lodna | Jeenagora | Central Sulunga Colony No.1/ O9 | 2400 |
| 180 | Lodna | Jeenagora | E.B. Section colony no. 1/O1 | 6400 |
| | Lodna | Jeenagora(S) | E.B. Section colony no. 1/O1 | 800 |
| 181 | Lodna | Jeenagora | EB Sec. Colony No. 2/O2 | 21600 |
| 182 | Lodna | Jeenagora | Khas Jeenagora Colony No.1/O3 | 32000 |
| 183 | Lodna | Jeenagora | Khas Jeenagora & Kalisthan /O5 | 7200 |
| 184 | Lodna | Jeenagora | Khas Jeenagora Colony No. 2/ O4 | 4000 |
| 185 | Lodna | Jeenagora | Khas Jeenagora Colony no. 3/ O6 | 15200 |
| 186 | Lodna | Jeenagora | Khas Jeenagora Colony no. 4/O7 | 10400 |
| 187 | Lodna | Joyrampur | 6 pit Dhowra & Atta Chaki /O1 | 27200 |
| | Lodna | Joyrampur(S) | 6 pit Dhowra & Atta Chaki /O1 | 40000 |
| 188 | Lodna | Joyrampur | Around Area Office/WS & No. 2 Basti/O3 | 56000 |
| 189 | Lodna | Joyrampur | Beer Company Locality/O5 | 8800 |
| 190 | Lodna | Joyrampur | Durga Mandir Area /O4 | 40000 |
| 191 | Lodna | Joyrampur | Hazaribagh Colony near Hosptal /O2 | 30400 |
| | Lodna | Joyrampur(S) | Hazaribagh Colony near Hosptal /O2 | 27200 |
| 192 | Lodna | Lodna | 2 pit Bhaga Colony/ 28 | 44800 |
| 193 | Lodna | Lodna | 16 no incline Jore side Colony / 22 | 8000 |
| 194 | Lodna | Lodna | 2 No. Incline Colony / 23 | 3200 |
| | Lodna | Lodna(S) | 2 No. Incline Colony / 23 | 30400 |
| 195 | Lodna | Lodna | 3 pit basti /O9 | 4800 |
| | Lodna | Lodna(S) | 3 pit basti /O9 | 800 |
| 196 | Lodna | Lodna | 4 pit Colony / 24 | 25600 |
| 197 | Lodna | Lodna | 5 No. Colony/ (C-17) | 46400 |
| 198 | Lodna | Lodna | 8 pit area colony / 19 | 17600 |
| | Lodna | Lodna(S) | 8 pit area colony / 19 | 27200 |
| 199 | Lodna | Lodna | Balugada Colony / 26 | 7200 |
| | Lodna | Lodna(S) | Balugada Colony / 26 | 3200 |
| 200 | Lodna | Lodna | Chalchalia Labour Colony /25 | 20800 |
| 201 | Lodna | Lodna | Chalchalia Labour Colony/ (C-13) | 24000 |
| 202 | Lodna | Lodna | Firkuband Colony / 30 | 7200 |
| 203 | Lodna | Lodna | Hanumangari Basti/14 | 16000 |
| 204 | Lodna | Lodna | Indira Chowk Road side Basti /O7 | 3200 |
| | Lodna | Lodna(S) | Indira Chowk Road side Basti /O7 | 3200 |
| 205 | Lodna | Lodna | Jealgora Barrier Colony / 18 | 30400 |
| 206 | Lodna | Lodna | Jeenagora Branch site / 20 | 1280 |
| | Lodna | Lodna(S) | Jeenagora Branch site / 20 | 1920 |
| 207 | Lodna | Lodna | Jharia Club & road side Basti /O8 | 28000 |

| | | | | |
|---|---|---|---|---|
| 208 | Lodna | Lodna | Joyrampur / Badigi Barrier / 21 | 11200 |
| 209 | Lodna | Lodna | Kalidham Colony / 27 | 10400 |
| 210 | Lodna | Lodna | Kujama Village /O2 | 2880 |
| | Lodna | Lodna(S) | Kujama Village /O2 | 1920 |
| 211 | Lodna | Lodna | Lodna Village /O1 | 46400 |
| | Lodna | Lodna(S) | Lodna Village /O1 | 8800 |
| 212 | Lodna | Lodna | Nadiapar Kujama Basti /O4 | 12800 |
| 213 | Lodna | Lodna | New Bhaga Bast / 11 | 99200 |
| 214 | Lodna | Lodna | New Colony Baniahir /13 | 49600 |
| 215 | Lodna | Lodna | Niluri Patra Bastee /O5 | 1600 |
| 216 | Lodna | Lodna | Office Compelx Area / 31 | 84800 |
| | Lodna | Lodna(S) | Office Compelx Area / 31 | 2400 |
| 217 | Lodna | Lodna | Suratand Basti /O6 | 4000 |
| | Lodna | Lodna(S) | Suratand Basti /O6 | 6400 |
| 218 | Lodna | Lodna | Tar Plant Area / 12 | 20800 |
| | Lodna | Lodna(S) | Tar Plant Area / 12 | 6400 |
| 219 | Lodna | North Tisra | BCCL Colony No. 1/O1 | 12800 |
| 220 | Lodna | North Tisra | SG Section Basti /O3 | 14400 |
| 221 | Lodna | North Tisra | Tilaboni Basti/O2 | 25600 |
| | Lodna | North Tisra(S) | Tilaboni Basti/O2 | 12800 |
| 222 | Lodna | South Tisra | B.J. & S.T. Section/ O3 | 24000 |
| 223 | Lodna | South Tisra | Huchuktand Basti/O1 | 36000 |
| 224 | Lodna | South Tisra | No.1 Pit S.T. Section /O2 | 1600 |
| 225 | **P-B Area** | Balihari 10/12 Pit | 63 Dhowra/O1 | 16300 |
| 226 | P-B Area | Balihari 10/12 Pit | BCCL Colony No.1/13 | 7900 |
| 227 | P-B Area | Balihari 10/12 Pit | Miner's Colony/11 | 5800 |
| 228 | P-B Area | Balihari 10/12 Pit | Miner's Qtrs./O9 | 2400 |
| 229 | P-B Area | Bhagaband | Aralgoria Basti/O2 | 19000 |
| 230 | P-B Area | Bhagaband | Bhagaband Bastee/O4 | 235800 |
| 231 | P-B Area | Bhagaband | DVC Colony/O1 | 44650 |
| 232 | P-B Area | Bhagaband | Kashiatand/O5 | 33500 |
| 233 | P-B Area | Bhagaband | Kenduadih Bastee(6B)/O7 | 0 |
| 234 | P-B Area | GopaliChak | 1 No. Dhowra/13 | 19534 |
| 235 | P-B Area | GopaliChak | Bowri Basti No.3/11 | 6511 |
| 236 | P-B Area | GopaliChak | In Chandra /O3 | 68016 |
| 237 | P-B Area | GopaliChak | Leper Bastee/O5 | 3720 |
| 238 | P-B Area | GopaliChak | Marine Qtrs. /O7 | 10790 |
| 239 | P-B Area | GopaliChak | Pasi Dhowra / 10 | 21395 |
| 240 | P-B Area | GopaliChak | Rly. Colony & Station/O6 | 25116 |
| 241 | P-B Area | GopaliChak | West Side NH-32/O9 | 11348 |
| 242 | P-B Area | Hydro-Mining | 4 Pit Bastee/O6 | 35200 |
| 243 | P-B Area | Hydro-Mining | Balihari Bastee/O4 | 33340 |
| 244 | P-B Area | Hydro-Mining | Kumar Patti/O3 | 5200 |
| 245 | P-B Area | Hydro-Mining | Nehru Nagar/O5 | 7740 |
| 246 | P-B Area | Kenduadih | 2/12 Incl.Dhowra & Hutments/18 | 3060 |
| 247 | P-B Area | Kenduadih | Atwal Colony/12 | 19000 |
| 248 | P-B Area | Kenduadih | Babubasa Colony/O2 | 8600 |
| 249 | P-B Area | Kenduadih | Colony near Post Office /O3 | 40000 |
| 250 | P-B Area | Kenduadih | East of Hindi Bhawan / 16 | 22900 |
| 251 | P-B Area | Kenduadih | E-B Section/O9 | 4800 |
| 252 | P-B Area | Kenduadih | Kathgola Maidan/O6 | 47770 |
| 253 | P-B Area | Kenduadih | Kenduya Bazar /O7 | 146500 |

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|---|---|---|---|---|
| 254 | P-B Area | Kenduadih | Khoira Pit Head Bath/19 | 8360 |
| 255 | P-B Area | Kenduadih | Labour Dhowra/17 | 7000 |
| 256 | P-B Area | Kenduadih | Muslim Bastee/O8 | 36700 |
| 257 | P-B Area | Kenduadih | Naya Dhowra Colony O4 | 52200 |
| 258 | P-B Area | Kenduadih | Officer's Colony/10 | 4800 |
| 259 | P-B Area | Kenduadih | Rajput Basti /O5 | 15340 |
| 260 | P-B Area | Pootkee | Staff Qrts./O4 | 794600 |
| 261 | **Sijua** | Bansdeopur | 8 No. Dhowra /O8 | 9000 |
| 262 | Sijua | Bansdeopur | BSP OH office / 14 | 9000 |
| 263 | Sijua | Bansdeopur | Elec. Sub-station/12 | 3000 |
| 264 | Sijua | Bansdeopur | Harijan Basti /O1 | 5460 |
| 265 | Sijua | Bansdeopur | Indira Awas/11 | 5880 |
| 266 | Sijua | Bansdeopur | Mallah Basti /O2 | 8775 |
| 267 | Sijua | Kankanee | South of 7 pit /O2 | 6000 |
| 268 | Sijua | Loyabad | 5 pit Area /O9 | 45000 |
| 269 | Sijua | Loyabad | 7 / 8 Area /O1 | 21500 |
| 270 | Sijua | Loyabad | 8 pit area /O2 | 19200 |
| 271 | Sijua | Mudidih | 10 pit colony /O7 | 5000 |
| 272 | Sijua | Mudidih | Jogta Colony / 13 | 93200 |
| 273 | Sijua | Mudidih | Liprosy Area /O9 | 11500 |
| 274 | Sijua | Mudidih | Nepali Dhowra /O6 | 95000 |
| 275 | Sijua | Mudidih | New Shyam Bazar /12 | 10000 |
| 276 | Sijua | Mudidih | No. 4 pit area / 11 | 1800 |
| 277 | Sijua | Mudidih | Shyam Bazar/ O8 | 68000 |
| 278 | Sijua | Mudidih | Tetulmari Vill. /O4 | 1500 |
| 279 | Sijua | Nichitpur | Hard coke Bhatta/O3 | 5800 |
| 280 | Sijua | Nichitpur | Nichitpur Bastee/O2 | 10000 |
| 281 | Sijua | Nichitpur | Staff Qrts. /O4 | 46046 |
| 282 | Sijua | Nichitpur | Staff Qrts. /O5 | 12560 |
| 283 | Sijua | Sendra Bansjora | 11 No. Colony/11 | 1900 |
| 284 | Sijua | Sendra Bansjora | 13 No. Colony/13 | 7500 |
| 285 | Sijua | Sendra Bansjora | Gareria Colony /15 | 5700 |
| 286 | Sijua | Sendra Bansjora | Gareria Colony 1/14 | 2000 |
| 287 | Sijua | Sendra Bansjora | Habitation west of DB Road/12 | 10375 |
| 288 | Sijua | Tetulmari | Director's Bunglow / 14 | 25200 |
| 289 | Sijua | Tetulmari | Hirak & Private/12 | 12150 |
| 290 | **W. Jharia** | Bhatdee | Belakhanda Co. Qrts./O6 | 24200 |
| 291 | W. Jharia | Hantoodih (Closed) | Kultand Village/O3 | 116900 |
| 292 | W. Jharia | Hantoodih (Closed) | Washery colony/O1 | 49600 |
| 293 | W. Jharia | Lohapatti | Koraidih & Santadih/O8 | 4700 |
| 294 | W. Jharia | Lohapatti | Kusumtand /10 | 221100 |
| 295 | W. Jharia | Lohapatti | Modidih/O9 | 47900 |
| 296 | W. Jharia | Lohapatti | Telmocho/O4 | 73200 |
| 297 | W. Jharia | Moonidih | Lalpur Rutha Bastee/O6 | 1178800 |
| 298 | W. Jharia | Murulidih (Closed) | BSEB & its surroundings /O1 | 56220 |
| 299 | W. Jharia | Murulidih (Closed) | Murulidih Village/O4 | 266200 |
| 300 | W. Jharia | Murulidih 20/21 Pit | Bhuli Qrts./O2 | 47000 |
| Total for Phase - I | | | | 12044691 |

## ACTION PLAN FOR REHABILITATION IN PHASE - II

## 6TH TO 10TH YEAR

| Sl.No. | Area | Colliery | Site name & no. | Affected Area (Sq.m.) |
|---|---|---|---|---|
| | JCF/REHAB/P-II/1 | | | |
| 1 | **Barora** | Damuda | BJ Section 'A/O6 | 17600 |
| 2 | Barora | Damuda | Karmatand Section/11 | 24000 |
| 3 | Barora | Damuda | North Damuda Section F/18 | 400 |
| 4 | Barora | Damuda | Sijua Village/ O8 | 9600 |
| 5 | Barora | Madhuband | Colliery Office & Qtrs./O6 | 24000 |
| 6 | Barora | Madhuband | Dhowatand Village/O4 | 40000 |
| 7 | Barora | Madhuband | Kutkutia Patti/ O5 | 27200 |
| 8 | Barora | Phularitand | Nawagarh Bastee (Part)/12 | 16000 |
| 9 | Barora | Phularitand | Phularitand Bazar / Hatia/11 | 41600 |
| 10 | Barora | Phularitand | West Side of Punduvita Village/14 | 5600 |
| 11 | **Bastacolla** | Bastacolla | Colony near Dhansar Police Station/ O3 | 12436 |
| 12 | Bastacolla | Kujama | Khas Jharia/O4 | 17491 |
| 13 | **Block-II** | Block-II | Madhuband Colony /O5 | 51200 |
| 14 | **C-V Area** | Laikdih | Dumarkunda & company Qutrs./4A&4B | 38685 |
| 15-16 | C-V Area | Laikdih | Dumarkunda Village/2A&2B | 78617 |
| 17 | C-V Area | Laikdih | Manjhi Bastee/O6 | 12295 |
| 18 | C-V Area | New Laikdih | CMW Colony/O8 | 51138 |
| 19 | C-V Area | Victoria | Heslok Pit Area/O1 | 20806 |
| 20 | **E. Jharia** | Amlabad | Bhuli Quarter & Staff Colony/ (1&2) | 52000 |
| 21 | E. Jharia | Bhowra North | No. 6 Block/O9 | 33600 |
| 22 | E. Jharia | Bhowra North | No. 7 Bastee/O2 | 16000 |
| 23 | E. Jharia | Bhowra North | No.9 Block Near Hospital/10 | 8000 |
| 24 | E. Jharia | Bhowra North | No-8 Block/01 | 12800 |
| 25 | E. Jharia | Bhowra North | Parasiabad Bastee/O5 | 4800 |
| 26 | E. Jharia | Bhowra North | Parasiabad Labour Block/O4 | 12000 |
| 27 | E. Jharia | Bhowra South | 12 No. Area Colliery Office to Kumar Patti/ 16 | 104000 |
| 28 | E. Jharia | Bhowra South | 35 Area Chhapra More/12 | 52000 |
| 29 | E. Jharia | Bhowra South | 36 Jore Area behind Area Office/14 | 20000 |
| 30 | E. Jharia | Bhowra South | 4 no. Dhowrah/Amlabad Road/18 | 52800 |
| 31 | E. Jharia | Bhowra South | Gourkhunti 35 Incline/13 | 77600 |
| 32 | E. Jharia | Bhowra South | Jahaj Tand/19 | 5600 |
| 33 | E. Jharia | Patherdih | Chandrabad/11 | 30400 |
| 34 | E. Jharia | Patherdih | Hattalla Village/ O5 | 51200 |
| 35 | E. Jharia | Patherdih | Kamini Nagar/10 | 14400 |
| 36 | E. Jharia | Patherdih | Modern Sudamdih/O8 | 12800 |
| 37 | E. Jharia | Patherdih | Pandey Bastee/O7 | 11200 |
| 38 | E. Jharia | Patherdih | Patherdih/ O4 | 14400 |
| 39 | E. Jharia | Sudamdih Inc. | Main Colony Chief House/ O4 | 8000 |

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| 40 | E. Jharia | Sudamdih Inc. | Main Colony Miners house/05 | 19200 |
| 41 | E. Jharia | Sudamdih Inc. | Main Colony/ O3 | 16000 |
| 42 | E. Jharia | Sudamdih Inc. | Old Incline Colony/06 | 4800 |
| 43 | E. Jharia | Sudamdih S.M. | New Miners colony/02 | 33600 |
| 44 | E. Jharia | Sudamdih S.M. | River side colony/01 | 30400 |
| 45 | **Gobindpur** | Akashkinaree | Akashkinare Colony/ O6 | 3837 |
| 46 | Gobindpur | Akashkinaree | Labour Qtrs. Along PWD Road/ O2 | 19139 |
| 47 | Gobindpur | Akashkinaree | Part of Bhatmurna Bastee/O3 | 6996 |
| 48 | Gobindpur | Akashkinaree | Qtrs. Along office compound/O4 | 37973 |
| 49 | Gobindpur | Akashkinaree | Qtrs.on South side of Akashkinaree/O5 | 32070 |
| 50 | Gobindpur | Block-IV / Kooridih | Kooridih 3 seam Area Hutment/ O4 | 1870 |
| 51 | Gobindpur | Block-IV / Kooridih | LCH Dhowrah Govindpur/18 | 720 |
| 52 | Gobindpur | Block-IV / Kooridih | Near Block-IV Office/15 | 26846 |
| 53 | Gobindpur | Block-IV / Kooridih | Near Gobindpur Hospital/14 | 24280 |
| 54 | Gobindpur | Block-IV / Kooridih | NHS Qrts/12 | 1400 |
| 55 | Gobindpur | Block-IV / Kooridih | South Gobindpur Bastee/16 | 7040 |
| 56 | Gobindpur | Block-IV / Kooridih | South Gobindpur Dhowra/17 | 1562 |
| 57 | Gobindpur | Gobindpur | Agardih Labour Qtrs/O7 | 17580 |
| 58 | Gobindpur | Gobindpur | Darpan Bastee/O5 | 132 |
| 59 | Gobindpur | Gobindpur | Imli Dhowrah/O3 | 31145 |
| 60 | Gobindpur | Gobindpur | IV Seam Colony/O1 | 57408 |
| 61 | Gobindpur | Gobindpur | Labour Qrts./O6 | 1174 |
| 62 | Gobindpur | Gobindpur | Mehtadih Colony & Bunglow/O4 | 31145 |
| 63 | Gobindpur | Jogidih | Baihardih Colony 'B'/ 1B | 8365 |
| 64 | Gobindpur | Jogidih | Baihardih Village/1A | 5118 |
| 65 | Gobindpur | Kharkharee | Nawagarh More & Phularitand Village/ O3 | 14400 |
| 66 | Gobindpur | Kharkharee | Part of Phularitand Village/ 3A | 24000 |
| 67 | Gobindpur | Maheshpur | Maheshpur Bastee/O1 | 33309 |
| 68 | Gobindpur | Maheshpur | NHS Qtrs. & House North of DB Road/11 | 43823 |
| 69 | Gobindpur | Maheshpur | Premnagar Colony Bastee etc./ 14 | 13418 |
| 70 | Gobindpur | Maheshpur | Staff Qtrs. & Hutment/O4 | 2806 |
| 71 | Gobindpur | S.Gobindpur | Bilbera - C/13 | 8000 |
| 72 | Gobindpur | S.Gobindpur | Bilbera 'A'/ O7 | 1600 |
| 73 | Gobindpur | S.Gobindpur | Kali Nagar Bilbera/12 | 8000 |
| 74 | Gobindpur | S.Gobindpur | South Govindpur 'B/O6 | 2400 |
| 75 | Gobindpur | S.Gobindpur | Tandabari-A/O1 | 18400 |
| 76 | Gobindpur | Teturia | Colliery Office Area/O3 | 22400 |
| 77 | Gobindpur | Teturia | NHS Qtrs.& Hutment/O1 | 43600 |
| 78 | Gobindpur | Teturia | No.2 Locality/O2 | 32800 |
| 79 | **Katras** | Angarpathra | AP Section-2 /O2 | 16800 |
| 80 | Katras | Angarpathra | JK Khas/O4 | 2200 |
| 81 | Katras | Angarpathra | JK Section/O3 | 62400 |
| 82 | Katras | Angarpathra | National Angarpathra-2/O6 | 6500 |
| 83 | Katras | East Katras | Akashkinaree 04/06 | 2800 |
| 84 | Katras | East Katras | Akashkinaree -2/O2 | 400 |
| 85 | Katras | East Katras | Akashkinaree 3/O4 | 3840 |
| 86 | Katras | East Katras | Akashkinaree 5/O7 | 1000 |
| 87 | Katras | East Katras | Akashkinaree-6/O8 | 4350 |
| 88 | Katras | East Katras | Bhandardih 2 /11 | 2500 |
| 89 | Katras | East Katras | Koiludih 01/03 | 3900 |
| 90 | Katras | East Katras | Koiludih 3/10 | 40180 |
| 91 | Katras | East Katras | Koiludih 4/15 | 65752 |

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| 92 | Katras | East Katras | Koiludih-2/O9 | 2450 |
| 93 | Katras | East Katras | Koiludih-5/16 | 65752 |
| 94 | Katras | East Katras | Malkera/18 | 3840 |
| 95 | Katras | East Katras Project | Bhandardih 3/12 | 32400 |
| 96 | Katras | Gaslitand | Qtrs. Near 6 Pit VAP/O4 | 43900 |
| 97 | Katras | Gaslitand | Qtrs. Near 7 Pit & Colliery Office/O2 | 35500 |
| 98 | Katras | Gaslitand | Qtrs. Near Ground UAP/O3 | 6500 |
| 99 | Katras | Katras-Chaitudih | 2 Pit Dhowrah/O6 | 9450 |
| 100 | Katras | Katras-Chaitudih | 5 No. Pit Area/10 | 4550 |
| 101 | Katras | Katras-Chaitudih | Bengali Dhowra/O5 | 6650 |
| 102 | Katras | Katras-Chaitudih | Dhowra of SW portion of 9 Pit/15 | 1850 |
| 103 | Katras | Katras-Chaitudih | Habitation North of 13 Seam Quarry/17 | 1400 |
| 104 | Katras | Katras-Chaitudih | Lakurka Bunglow Surrounding Area/O9 | 32550 |
| 105 | Katras | Katras-Chaitudih | Lakurka Staff Qtrs./14 | 29370 |
| 106 | Katras | Katras-Chaitudih | Loading Dhowrah (Lakurka Section) /16 | 13940 |
| 107 | Katras | Keshalpur | Huts near 3/2 incline/O6 | 3550 |
| 108 | Katras | Keshalpur | Quarter near 3/2 incline/O7 | 460 |
| 109 | Katras | Keshalpur | Quarter near Agent Office/O4 | 2050 |
| 110 | Katras | Salanpur | Central Salanpur Block 4 (10) & Lakurka Khas Block 4/ 15 | 27760 |
| 111 | Katras | Salanpur | Central Salanpur Block 5 (12), Lakurka Khas Block 3/ 14 & 9 | 20170 |
| 112 | Katras | Salanpur | Khas Gobindpur Area/23 | 12800 |
| 113 | Katras | Salanpur | Khas Gobindpur Block 1 /22 | 14400 |
| 114 | Katras | Salanpur | Lakurka Khas Block 1 (11) & Central Salanpur Block 1/ O7 | 15312 |
| 115 | Katras | Salanpur | Lakurka Khas Block 2/ 13 | 2450 |
| 116 | Katras | Salanpur | New Lakurka Section Block 2/17 | 19180 |
| 117 | Katras | Salanpur | New Lakurka Section Block 3/18 | 1040 |
| 118 | Katras | Salanpur | New Lakurka Section Block 5/ 20 | 4800 |
| 119 | Katras | West Mudidih | 2 Seam Area near 8/2 Incline/O2 | 550 |
| 120 | Katras | West Mudidih | Dalahi Bastee/O5 | 7200 |
| 121 | Katras | West Mudidih | House near 4 no. Sub-station/O8 | 1004 |
| 122 | Katras | West Mudidih | Huts near Caplamp Room no. 1/ O6 | 1100 |
| 123 | Katras | West Mudidih | Near 10/2 Incline 1 Area /11 | 1100 |
| 124 | **Kustore** | Alkusa | GM Bunglow & Qtrs./O4 | 36188 |
| 125 | Kustore | Alkusa | Qtrs. Near 6/7 Pit/O3 | 2484600 |
| 126 | Kustore | Burragarh | Burragarh Basti/O2 | 15339 |
| 127 | Kustore | Burragarh | Burragarh CISF Centre/O7 | 6084 |
| 128 | Kustore | Burragarh | Nagu Centre & Bachha Centre/O4 | 30412 |
| 129 | Kustore | Burragarh | Officer's & Staff Colony/O3 | 18660 |
| 130 | Kustore | Burragarh | Pure Burragarh Basti/O5 | 20299 |
| 131 | Kustore | Burragarh | Surendra Colony/Karmik Ngr/O1 | 27713 |
| 132 | Kustore | E. Bhagatdih | Bihar Talkies & Raja Bari Area/12(A) | 219387 |
| 133 | Kustore | E. Bhagatdih | Jharia Water Board Area /O6 | 35750 |
| 134 | Kustore | E. Bhagatdih | Bihar Talkies & Raja Bari Area/12(B) | 10518 |
| 135 | Kustore | E. Bhagatdih | Gopalichak Basti/O3 | 21185 |
| 136 | Kustore | E. Bhagatdih | Koiri Bandh Area/10 | 7363 |
| 137 | Kustore | Hurriladih | 7 No. Colony/O4 | 35526 |
| 138 | Kustore | Hurriladih | Bhutgoria Old Complex/O7 | 16473 |
| 139 | Kustore | Hurriladih | Hurriladih Bastee/O2 | 39223 |
| 140 | Kustore | Hurriladih | Hurriladih Old Colony/O6 | 14914 |
| 141 | Kustore | Hurriladih | New Colony 1&2 No/O3 | 30436 |
| 142 | Kustore | Hurriladih | Pather Bunglow Bastee/O1 | 26499 |
| 143 | Kustore | Hurriladih | Sargujia Bastee/O5 | 24894 |

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| 144 | Kustore | Kustore | Bhagwan Das Centr/O9 | 19173 |
| 145 | Kustore | Kustore | BNR KustoreO4 | 40308 |
| 146 | Kustore | Kustore | Dak Banglow Area/10 | 108191 |
| 147 | Kustore | Kustore | Kalimandir Area/O2 | 9940 |
| 148 | Kustore | Kustore | Khapra Dhowra/O6 | 23373 |
| 149 | Kustore | Kustore | Naya Dhowra/O5 | 34099 |
| 150 | Kustore | Kustore | Old Simlabahal Office/11 | 14382 |
| 151 | Kustore | Kustore | Qtrs. Near 10 Pit Area/O7 | 32000 |
| 152 | Kustore | Simlabahal | Bhaga S.E. Rly. Colony/O8 | 12062 |
| 153 | Kustore | Simlabahal | Bhalgora Project Complex/O6 | 49370 |
| 154 | Kustore | Simlabahal | DAV School Area/O7 | 15867 |
| 155 | Kustore | Simlabahal | Gariban Patti/O4 | 45389 |
| | **JCF/REHAB/P-II/2** | | | |
| 156 | **Kusunda** | Dhansar | Bright Kusunda Colony/O2 | 28000 |
| 157 | Kusunda | Dhansar | East Godhur Colony/O1 | 45637 |
| 158 | Kusunda | Dhansar | New Delhi Colony/O3 | 12056 |
| 159 | Kusunda | E. Bassuriya | Gareria Basti/O1 | 41296 |
| 160 | Kusunda | Godhar | 3 Pit Area/O3 | 58437 |
| 161 | Kusunda | Godhar | Baldar Bastee/O1 | 2000 |
| 162 | Kusunda | Gondudih | 10 No. Dhowrah/O8 | 4882 |
| 163 | Kusunda | Indusrty | Lahabera Bastee/O3 | 2936 |
| 164 | Kusunda | Industry | Huchuktand Bastee/O2 | 2655 |
| 165 | Kusunda | Industry | KOCP Office & Colony Qtrs./O5 | 2936 |
| 166 | Kusunda | Industry | Rise Bhagatdih Colony/O6 | 6908 |
| 167 | Kusunda | Khas Kusunda | B Panel Area/O7 | 14091 |
| 168 | Kusunda | Khas Kusunda | Colony near KG Section School/11 | 6011 |
| 169 | Kusunda | Khas Kusunda | Company Qtr. West of Bhuli Road/12 | 7608 |
| 170 | Kusunda | Khas Kusunda | Dharia Joba Village/O4 | 1573 |
| 171 | Kusunda | Khas Kusunda | Gondudih Bastee/O3 | 12296 |
| 172 | Kusunda | Khas Kusunda | Harijan Basti/O5 | 11451 |
| 173 | Kusunda | Khas Kusunda | Hospital Basti/O8 | 16345 |
| 174 | Kusunda | Khas Kusunda | Kharikabad Bastee/ O9 | 17971 |
| 175 | Kusunda | Khas Kusunda | Kusunda Station Village/O6 | 11451 |
| 176 | Kusunda | Kusunda | Keska Basti Qtrs./O2 | 21042 |
| 177 | **Lodna** | Jealgora | 16 No. Dhowra Area/13 | 32000 |
| 178 | Lodna | Jealgora | 7 Pit Old Hospital Area/10 | 36000 |
| 179 | Lodna | Jealgora | Durga Mandir Colony/O4 | 28800 |
| 180 | Lodna | Jealgora | Guest House Area/O7 | 54400 |
| 181 | Lodna | Jealgora | Jealgora Bastee/O3 | 28800 |
| 182 | Lodna | Jealgora | Jealgora Colony/O5 | 72000 |
| 183 | Lodna | Lodna | 5 No. Colony/29 | 32000 |
| 184 | Lodna | Lodna | GM Bunglow & Road Side Bastee/15 | 48000 |
| 185 | Lodna | Lodna | Phus Bungla Road side Bastee/10 | 3200 |
| 186 | Lodna | Lodna | Phus Bungla Road side colony/16 | 3200 |
| 187 | Lodna | Lodna | Puranadih Village/O3 | 6400 |
| 188 | Lodna | Lodna | Shalimar Colony/17 | 16000 |
| 189 | **P-B Area** | Balihari 10/12 Pit | 60 Dhowra/O3 | 11500 |
| 190 | P-B Area | Balihari 10/12 Pit | 88 Dhowra/O2 | 87350 |
| 191 | P-B Area | Balihari 10/12 Pit | BCCL colony 2/14 | 11150 |
| 192 | P-B Area | Balihari 10/12 Pit | Bunglow & Babu Basa/O8 | 16300 |
| 193 | P-B Area | Balihari 10/12 Pit | Pit Office/12 | 20000 |
| 194 | P-B Area | Balihari 10/12 Pit | Village No. 1 Balihari/O6 | 5000 |

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| 195 | P-B Area | Balihari 10/12 Pit | Village No.2 Balihari/O5 | 29700 |
| 196 | P-B Area | Balihari 10/12 Pit | Villagee No. 3 Balihari/O7 | 2500 |
| 197 | P-B Area | Balihari 10/12 Pit | Shakti School/10 | 144400 |
| 198 | P-B Area | Bhagaband | Aralgoria Basti-3/O3 | 77000 |
| 199 | P-B Area | Bhagaband | Kenduadih Bastee (6A)/O6 | 192600 |
| 200 | P-B Area | Bhagaband | Kenduadih Bastee (6G)/12 | 0 |
| 201 | P-B Area | Bhagaband | Kenduadih Bastee(6)/O8 | 0 |
| 202 | P-B Area | Bhagaband | Kenduadih Bastee(6D)/O9 | 0 |
| 203 | P-B Area | Bhagaband | Kenduadih Bastee/10 | 0 |
| 204 | P-B Area | Bhagaband | Kenduadih Bastee-6F/11 | 0 |
| 205 | P-B Area | GopaliChak | 17 No. Dhowra/14 | 44651 |
| 206 | P-B Area | GopaliChak | 2 No. Gopal Colony/12 | 84651 |
| 207 | P-B Area | GopaliChak | 3 No. Bastee/KK Sec/O4 | 8372 |
| 208 | P-B Area | GopaliChak | Marine Colony-1/O1 | 57674 |
| 209 | P-B Area | GopaliChak | Marine Colony-2/O2 | 12093 |
| 210 | P-B Area | GopaliChak | Sudamdih colony/08 | 48139 |
| 211 | P-B Area | Hydro-mining | BC Plant/O7 | 45440 |
| 212 | P-B Area | Hydro-mining | Krishna Nagar/O8 | 9600 |
| 213 | P-B Area | Hydro-mining | Oranga Patti Birsa Nagar/02 | 4230 |
| 214 | P-B Area | Hydro-mining | Station Dhowra/O1 | 3900 |
| 215 | P-B Area | Kenduadih | 4 Pit Ghansadih Colliery Qtrs./20 | 11100 |
| 216 | P-B Area | Kenduadih | Ghansadih/14 | 48150 |
| 217 | P-B Area | Kenduadih | Gwala Basti & Kali Mandir/15 | 4925 |
| 218 | P-B Area | Kenduadih | Khoira ColonyO/1 | 51400 |
| 219 | P-B Area | Kenduadih | Nimtala/11 | 37700 |
| 220 | P-B Area | Kenduadih | No.5 Dhowra Bastee/13 | 40250 |
| 221 | P-B Area | Pootkee | 13 No. Bastee/O2 | 62156 |
| 222 | P-B Area | Pootkee | 17 No. 10 No. & Gwala Bastee/O1 | 118370 |
| 223 | P-B Area | Pootkee | 2 No. & JMBH/O3 | 79628 |
| 224 | P-B Area | Pootkee | Bowri Basti/O6 | 110576 |
| 225 | P-B Area | Pootkee | Prem Nagar/O5 | 130060 |
| 226 | P-B Area | Pootkee | Sri Nagar Colony/O7 | 111896 |
| 227 | **Sijua** | Bansdeopur | 15 No. Dhowrah/13 | 1000 |
| 228 | Sijua | Bansdeopur | 4 No. colony/O4 | 3000 |
| 229 | Sijua | Bansdeopur | 40 No. Dhowra/10 | 10700 |
| 230 | Sijua | Bansdeopur | 7 No. BSP/O7 | 12000 |
| 231 | Sijua | Bansdeopur | Bansudeopur Colliery/O6 | 6500 |
| 232 | Sijua | Bansdeopur | New Colony /O3 | 5000 |
| 233 | Sijua | Kankanee | 5 Pit Area/O1 | 3500 |
| 234 | Sijua | Kankanee | 7 Pit Area/O3 | 40000 |
| 235 | Sijua | Kankanee | Hanuman Nagar/O4 | 75000 |
| 236 | Sijua | Kankanee | Loyabad Station/O5 | 5400 |
| 237 | Sijua | Kankanee | Railway Quarters/O6 | 1500 |
| 238 | Sijua | Kankanee | Sendra 7 Pit/O7 | 15000 |
| 239 | Sijua | Loyabad | 3 No. Area/O8 | 5000 |
| 240 | Sijua | Loyabad | 6 Pit Area/10 | 96000 |
| 241 | Sijua | Loyabad | Central Hospital/O6 | 7500 |
| 242 | Sijua | Loyabad | Coke Plant-1/14 | 26000 |
| 243 | Sijua | Loyabad | Coke Plant-2/15 | 38400 |
| 244 | Sijua | Loyabad | Idgah Area/12 | 12800 |
| 245 | Sijua | Loyabad | Kankanee Basti/O5 | 22000 |
| 246 | Sijua | Loyabad | Madanadih/O3 | 5000 |

| | | | | |
|---|---|---|---|---|
| 247 | Sijua | Loyabad | New Drift/18 | 56000 |
| 248 | Sijua | Loyabad | Pootkee Barrier/19 | 17600 |
| 249 | Sijua | Loyabad | Pootkee Colony/20 | 72000 |
| 250 | Sijua | Loyabad | Power House-2/17 | 35000 |
| 251 | Sijua | Mudidih | 6/10 Colony/O2 | 3350 |
| 252 | Sijua | Mudidih | 22/12 Colony/O5 | 35900 |
| 253 | Sijua | Mudidih | Jogta Upper/14 | 14100 |
| 254 | Sijua | Mudidih | Kajro Bagan/10 | 6700 |
| 255 | Sijua | Sendra Bansjora | 10 No. Colony/O5 | 1000 |
| 256 | Sijua | Sendra Bansjora | 19 No. Colony/19 | 750 |
| 257 | Sijua | Sendra Bansjora | 21 No. Colony/21 | 625 |
| 258 | Sijua | Sendra Bansjora | 6 Pit Colony/O4 | 5110 |
| 259 | Sijua | Sendra Bansjora | 6 Pit Colony/O8 | 2160 |
| 260 | Sijua | Sendra Bansjora | 6 Pit colony/Past/O9 | 600 |
| 261 | Sijua | Sendra Bansjora | Bansjora Village/16 | 4792 |
| 262 | Sijua | Sendra Bansjora | OCP Office/O2 | 13200 |
| 263 | Sijua | Sendra Bansjora | Office Colony/O6 | 4600 |
| 264 | Sijua | Tetulmari | Beldari Bastee/ 11 | 3000 |
| 265 | Sijua | Tetulmari | Chandore Bastee ./O8 | 3000 |
| 266 | Sijua | Tetulmari | Chandore West No.1/17 | 900 |
| 267 | Sijua | Tetulmari | Chandore West No.2/18 | 675 |
| 268 | Sijua | Tetulmari | Dalahi Basti & BCCL Quarters/O1 | 95890 |
| 269 | Sijua | Tetulmari | Hutments of RNS/15 | 2026 |
| 270 | Sijua | Tetulmari | Malla Dhowrah/O5 | 18000 |
| 271 | Sijua | Tetulmari | Naya More Basti/13 | 2400 |
| 272 | Sijua | Tetulmari | Nimia Dhowra/O7 | 836 |
| 273 | Sijua | Tetulmari | Pondihdih Bastee/ 10 | 16200 |
| 274 | Sijua | Tetulmari | Substation RNS/16 | 660 |
| 275 | Sijua | Tetulmari | Workshop/O6 | 18000 |
| 276 | **W. Jharia** | Bhatdih | Belakhnda & Bhatdih Bastee/O5 | 120400 |
| 277 | W. Jharia | Bhatdih | Colliery Quarters/O4 | 400000 |
| 278 | W. Jharia | Bhatdih | Tentulia & Balakhanda Bastee/O2 | 76400 |
| 279 | W. Jharia | Bhurungia | Bhurungia Village/O1 | 309000 |
| 280 | W. Jharia | Hantodih | Hantoodih Village/O2 | 520600 |
| 281 | W. Jharia | Lohapatti | Chhatatand/O5 | 31800 |
| 282 | W. Jharia | Lohapatti | Jamdiha Bastee/O7 | 139600 |
| 283 | W. Jharia | Lohapatti | Kashiatand/O2 | 64800 |
| 284 | W. Jharia | Lohapatti | Lohapatti Bastee/O1 | 65200 |
| 285 | W. Jharia | Moonidih | Baludih/Dobray Village/O2 | 388500 |
| 286 | W. Jharia | Moonidih | Dhobani Bastee/O4 | 384600 |
| 287 | W. Jharia | Moonidih | Jatudih Colony & Village/O1 | 264000 |
| 288 | W. Jharia | Moonidih | Moonidih Basti/O5 | 244600 |
| 289 | W. Jharia | Moonidih | Moonidih Colony/O3 | 828000 |
| 290 | W. Jharia | Murulidih (closed) | Mohuda Bastee/O2 | 145600 |
| 291 | W. Jharia | Murulidih (Closed) | Murulidih Colliery Qtrs./O3 | 308000 |
| 292 | W. Jharia | Murulidih 20/21 Pit | Bulbazar/O5 | 76000 |
| 293 | W. Jharia | Murulidih 20/21 Pit | Chitrutand Basti/O1 | 27700 |
| 294 | W. Jharia | Pandugora | Lakhanpur/O2 | 59600 |
| 295 | W. Jharia | Pandugora | Padugora/O1 | 24600 |
| | | | Sub Total | 13650508 |
| **Total ( Phase-I & Phase-II )** | | | | **25695199** |

## 7.10 Action Plan for Rehabilitation & Resettlement

Area wise, Colliery wise, site wise and phase wise no. of houses to be rehabilitated along with their land and indicative fund requirement has been shown in **Table no-7.**

## 7.11 Pre-Implementation Activities:

Before commencement of actual implementation of resettlement, the following activities are to be completed.

i. Demographic Survey of affected population with details of houses and land including valuation.

ii. Identification & Acquisition of land for Phase-I township

iii. Tendering and awarding of work for land survey and township planning

iv. Surveying of land

v. Township planning

vi. Tendering and award of work for construction of houses

The pre-implementation activities will be completed within 2 years period and the estimated cost is Rs. 163.79 . The detail of cost is given in **Table 8**

**Table- 8**

**Fund requirement for Pre implementation Activities**

| Sl. no | Activities | 1st year | 2nd year | Total (Rs. Crs) |
|---|---|---|---|---|
| 1 | Socio – Economic survey, Valuation survey and other survey for Non-BCCL houses. | 0.70 | 0.71 | 1.41 |
| 2 | Land acquisition BCCL & Non BCCL houses for Phase-I ( 860 ha) | 69.42 | 69.41 | 138.83 |
| 4. | Contingency (3%) & supervision charges (5%) for land acquisition | 5.55 | 5.56 | 11.11 |
| 3 | Township planning and preparation of Rehabilitation scheme for Phase -I | 6.22 | 6.22 | 12.44 |
| | **Total** | **81.89** | **81.90** | **163.79** |

## 7.12 Identification of Resettlement sites & their description:

Total 79159 Nos. of affected houses are proposed to be resettled in Satellite Township with all basic amenities and infra -structural facilities in non-coal bearing areas along the fringe of JCF. In each township, about 6000houses for BCCL and 12500 houses for Non BCCL are proposed to be constructed in different sector. The resettlement sites will be selected

preferably where Govt. land/BCCL land is available. Tentative resettlement mouzas are as follows:

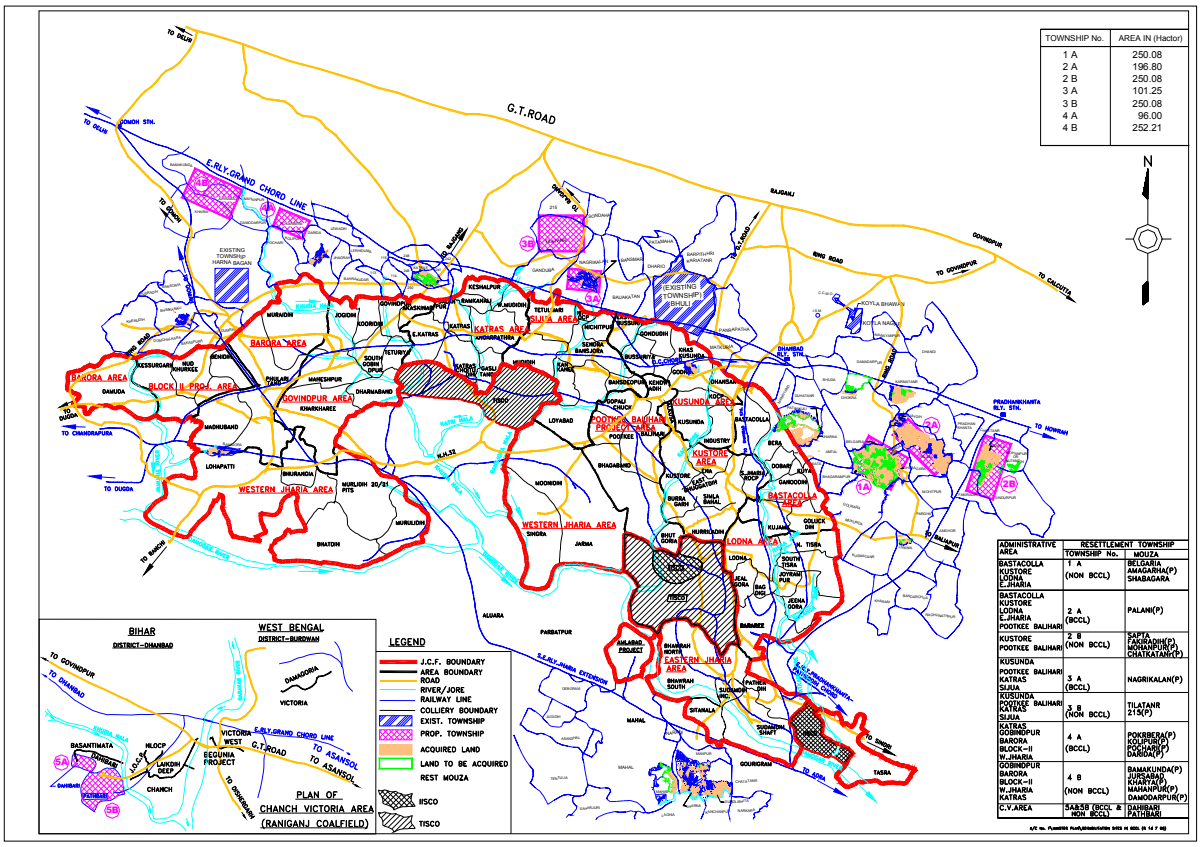
- Belgoira, Amagarha, Shabaigara, Palani, Sapta, Fakiradih, Manoharpur, Nagarikalan, Tilatanr, Pokrabara, Kolipur, Pochari, Darida, Barrakunda, Mahanpur, Dahibari, Pathbari etc.

Resettlement sites should be finalised based on the availability of land during implementation of the project. The tentative satellite townships are shown in Drg. no.4. These sites are tentative and actual location can be decided only after availability of land is finalized by State Govt.

### 7.13 Location wise shifting from rehabilitation site to Resettlement Sites:

**Table- 9**

| Administrative Areas | Resettlement Township | |
|---|---|---|
| | Township no | Mouzas |
| BASTACOLA<br>KUSTORE<br>LODNA<br>E.JHARIA | 1A (NON BCCL) | BELGORIA<br>AMAGARHA(P)<br>SABAIGARA |
| BASTACOLA<br>KUSTORE<br>LODNA<br>E.JHARIA<br>POOTKEE BALIHARI | 2A (BCCL) | PALANI (P) |
| KUSTORE<br>POOTKEE BALIHARI | 2B (NON BCCL) | SAPTA<br>FAKIRADIH (P)<br>MOHANPUR (P)<br>CHATKATANR (P) |
| KUSUNDA<br>POOTKEE BALIHARI<br>KATRAS<br>SIJUA | 3A (BCCL) | NAGRIKALAN(P) |
| KUSUNDA<br>POOTKEE BALIHARI<br>KATRAS<br>SIJUA | 3B (NON-BCCL) | TILATANR<br>215 (P) |
| KATRAS<br>GOVINDPUR<br>BARORA<br>BLOCK-II<br>W. JHARIA | 4A (BCCL) | POKRBERA(P)<br>KOLIPUR(P)<br>POCHARI(P)<br>DARIDA(P) |
| KATRAS<br>GOVINDPUR<br>BARORA<br>BLOCK-II<br>W. JHARIA | 4B (NON-BCCL) | BAMAKUNDA(P)<br>JURSABAD<br>KHARYA(P)<br>MAHANPUR(P)<br>DAMODARPUR(P) |
| C.V. AREA | 5A & 5B (BCCL & NON-BCCL) | DAHIBARI<br>PATHBARI |




| TOWNSHIP No. | AREA IN (Hactor) |
|---|---|
| 1 A | 250.08 |
| 2 A | 196.80 |
| 2 B | 250.08 |
| 3 A | 101.25 |
| 3 B | 250.08 |
| 4 A | 96.00 |
| 4 B | 252.21 |

| ADMINISTRATIVE AREA | RESETTLEMENT TOWNSHIP | |
|---|---|---|
| | TOWNSHIP No. | MOUZA |
| BASTACOLLA<br>KUSTORE<br>LODNA<br>E.JHARIA | 1 A<br>(NON BCCL) | BELGARIA<br>AMAGARHA(P)<br>SHABAGARA |
| BASTACOLLA<br>KUSTORE<br>LODNA<br>E.JHARIA<br>POOTKEE BALIHARI | 2 A<br>(BCCL) | PALANI(P) |
| KUSTORE<br>POOTKEE BALIHARI | 2 B<br>(NON BCCL) | SAPTA<br>FAKIRADIH(P)<br>MOHANPUR(P)<br>CHATKATAM(P) |
| KUSUNDA<br>POOTKEE BALIHARI<br>KATRAS<br>SIJUA | 3 A<br>(BCCL) | NAGRIKALAN(P) |
| KUSUNDA<br>POOTKEE BALIHARI<br>KATRAS<br>SIJUA | 3 B<br>(NON BCCL) | TILATANR<br>215(P) |
| KATRAS<br>GOVINDPUR<br>BARORA<br>BLOCK–II<br>W.JHARIA | 4 A<br>(BCCL) | POKRERA(P)<br>KOLHUA(P)<br>DAMUDA(P) |
| GOBINDPUR<br>BARORA<br>BLOCK–II<br>W.JHARIA<br>KATRAS | 4 B<br>(NON BCCL) | BAMAKUNDA(P)<br>JURKANI<br>KHARTA(P)<br>MANANPUR(P)<br>DAMODARPUR(P) |
| C.V.AREA | 5A&5B (BCCL & NON BCCL) | DAHIBARI<br>PATHARI |

**7.14 Organisation**:

It is proposed that rehabilitation & resettlement of BCCL houses will be the responsibility of BCCL whereas the same for Non BCCL houses including the encroachers will be the responsibility of concerned State Govt.

For rehabilitation of BCCL houses, it is proposed to have a separate R&R division headed by an official of Chief General Manager rank at Company HQ The responsibility of the R&R division at Company (HQ) level would be as under

- Identification & Acquisition of land in association with state govt. and surveying for the BCCL houses

- Preparation of tender documents, tendering and award of work for surveying of land and township planning.

- Preparation of town ship plans through external agencies and approval of cost estimates of townships

- Arrangement and disbursement of fund to different implementing agencies

- Monitoring and supervision of various works under implementation

For rehabilitation of Non-BCCL houses (Pvt. & Encroachers), it is proposed that a suitable organisational set up be formed by State Govt. for implementation of rehabilitation plan under the Master Plan

.

**7.15 Indicative Fund Requirement for Rehabilitation Projects**:

Total fund requirement for rehabilitation Projects has been estimated at Rs 5297.07 Crs. including fund for pre implementation activities. This also includes 3% contingency and 5% supervision charges. The supervision charges will cover the expenditure (Revenue, furniture & fittings, vehicle, office equipment etc) of separate organization at BCCL and state Govt.

Rehabilitation project is proposed to be implemented in 12 years time (including 2 years of pre-implementation activities}. During this period further sites may become endangered which shall be rehabilitated with same R&R package as proposed in the Master Plan. This may require additional fund.

The year wise capital requirement has been shown in **Table -10**

**TABLE -10**

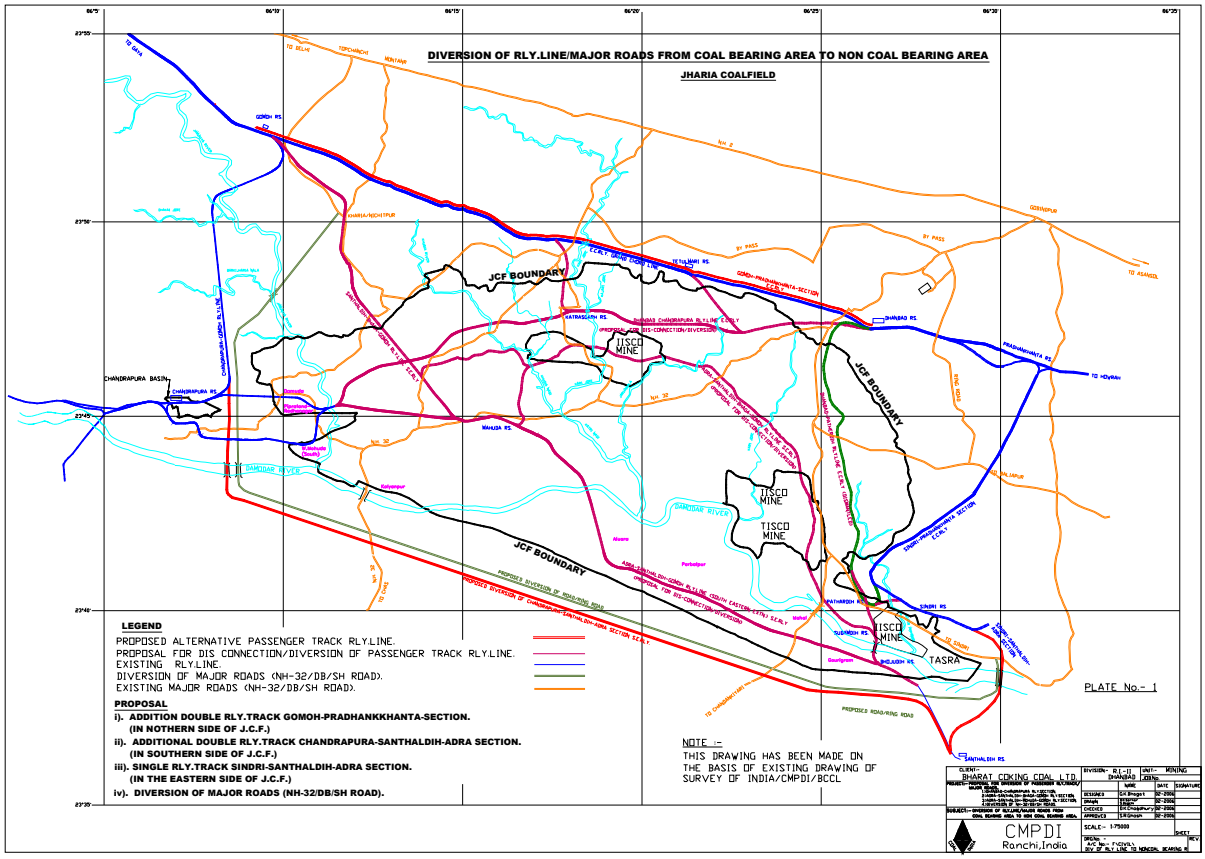
**YEAR-WISE INDICATIVE CAPITAL REQUIREMENT FOR REHABILITATION**

| PHASE | YEAR | INDICATIVE FUND (Rs.Crs) |
|---|---|---|
| **A)** Pre-implementation Phase | | |
| | 1st | 81.89 |
| | 2nd | 81.90 |
| Total Pre-Implementation Phase | | **163.79** |
| Implementation Phase | | |
| Phase-I | 3rd | 448.66 |
| | 4th | 509.75 |
| | 5th | 509.75 |
| | 6th | 515.05 |
| | 7th | 515.05 |
| **B) Sub Total Phase-I** | | **2498.26** |
| Phase-II | 8th | 423.71 |
| | 9th | 423.71 |
| | 10th | 423.71 |
| | 11th | 423.71 |
| | 12th | 423.71 |
| **C) Sub Total Phase-II** | | **2118.55** |
| **Grand total (A+B+C)** | | **4780.60** |

**Phase wise Fund requirement for BCCL and Non BCCL Houses (Rs. Crs)**

| **A) Pre Implementation Activities** | |
|---|---|
| **BCCL houses** | 34.75 |
| **Non BCCL houses** | 129.04 |
| **Sub Total ( A)** | **163.79** |
| **B) Phase-I** | |
| BCCL houses | 478.95 |
| Non BCCL houses | 2019.32 |
| **Sub Total (B)** | **2498.27** |
| **C) Phase-II** | |
| BCCL houses | 554.75 |
| Non BCCL houses | 1563.80 |
| **Sub Total (C)** | **2118.55** |
| **Grand Total (A+B+C)** | **4780.60** |
| BCCL houses (A+B+C) | 1068.45 |
| Non BCCL houses (A+B+C) | 3712.15 |

# DIVERSION OF RAILS AND MAJOR ROADS


DIVERSION OF RLY.LINE/MAJOR ROADS FROM COAL BEARING AREA TO NON COAL BEARING AREA
JHARIA COALFIELD
JCF BOUNDARY
TISCO MINE
TASRA
CHANDRAPURA BASIN
DAMODAR RIVER
LEGEND
PROPOSED ALTERNATIVE PASSENGER TRACK RLY.LINE.
PROPOSAL FOR DIS CONNECTION/DIVERSION OF PASSENGER TRACK RLY.LINE.
EXISTING RLY.LINE.
DIVERSION OF MAJOR ROADS (NH-32/DB/SH ROAD).
EXISTING MAJOR ROADS (NH-32/DB/SH ROAD).
PROPOSAL
i). ADDITION DOUBLE RLY.TRACK GOMOH-PRADHANKKHANTA-SECTION. (IN NOTHERN SIDE OF J.C.F.)
ii). ADDITIONAL DOUBLE RLY.TRACK CHANDRAPURA-SANTHALDIH-ADRA SECTION. (IN SOUTHERN SIDE OF J.C.F.)
iii). SINGLE RLY.TRACK SINDRI-SANTHALDIH-ADRA SECTION. (IN THE EASTERN SIDE OF J.C.F.)
iv). DIVERSION OF MAJOR ROADS (NH-32/DB/SH ROAD).
NOTE :-
THIS DRAWING HAS BEEN MADE ON THE BASIS OF EXISTING DRAWING OF SURVEY OF INDIA/CMPDI/BCCL
PLATE No.- 1
CMPDI
Ranchi,India

## 8.1 Introduction

"BCCL vide letter no. GM(Env)/F-/06/238, dated 22nd April,2006, suggested that diversion of railway lines and NH 32 road passing through coal bearing areas of JCF should also be included in the Master Plan'2006.

The Master Plan envisages dealing with fire, subsidence and rehabilitation in the unstable in-habitated areas only in the leasehold of BCCL. However protection measures against fire affecting the rail and jores have been considered under dealing with fire in this Master Plan.

Diversion of rails and roads passing over the coal bearing areas are affected by fire and subsidence at many places and may further be affected. As the diversion will affect the operation of other coal producing companies like TISCO & SAIL, in addition to other Industries operating in the coalfield, private parties, State Govt. and Railway, a joint decision should be taken involving all the above stake holders.

## 8.2 Brief of Railway lines and Roads proposed for diversion

A number of rail heads passes through JCF. Some of the rail heads are affected by fire at different locations. A brief account of rail heads affected/likely to be by fire in BCCL is as under:

☐ **Adra- Santhaldih-Bhaga-Gomoh Rly. Line (S.E Rly)**

The above Rly line is affected by active surface & underground fire of Patherdih, Sudamdih and Bhowra collieries between Sudamdih station and Bhowra halt.. It is also affected by active fire of Phularitand and Block-II OCP between Kharkharee and Khanoodih station.

XVI seam fire of Pootkee/Gopalichauk Colliery exists on the south side of the above railway line which may affect the line in future.

☐ **Patherdih-Bhojudih Link Line (S.E Rly ) between Patherdih and Sudamdih Stations** (Part of Dhanbad - Patherdih Railway line)

The east ward advance of XIVA/XIV seam fire in the old abandoned quarry of Patherdih Colliery mal affect the line in future.

☐ **Dhanbad-Chandrapura (DC) Rly line (S.E Rly)**

Dhanbad Chandrapura is likely to be affected by fires of Bassuria and sendra Bansjora collieries in future.

□**Dhanbad-Kusunda-Tetulmari link line (S.E Rly)**

The above link line is already affected by fire of East Bassuria colliery and it is likely to be affected by the fires of Bassuria Colliery.

**ROAD :**

National Highway-32 passing over the coal bearing areas of JCF is affected due to fire of Kenduadih colliery between Kedua and Kirkend and District Board road passing from Jharia to Kendua is endangered due to fire of Alkusa colliery near Kendua Police Station.

**8.3 Proposal**

The diversion of rail and road requires accurate survey of the alternative routes, assessment of alternative railway sidings will be affected due to diversion, quantification of benefits, detail layout planning for diversion by expert agencies like RITES. The above activities are likely to take about two years time.

**Therefore, in this Master Plan, a lump sum provision of Rs. 20.00 Crs as advance action has been kept for surveying and planning only. The detail proposal for diversion may be taken up as a separate Master Plan in future.**

## 9.0 Total Indicative fund requirement for Master Plan

The total indicative capital required to implement the Master Plan, for Dealing with Fires, Subsidence Control of Inhabitated Areas and Rehabilitation of unstable-Uncontrollable subsidence –prone Inhabitated areas is estimated at **Rs. 7112.11** Crores. Year-wise requirement of funds for each type of jobs is shown in **Table –11**

**TABLE – 11**

**YEAR-WISE CAPITAL REQUIREMENT FOR MASTER PLAN**

**Rs. In Crs.**

| Phase | Year | Fire Projects | Rehab. Projects | Diversion of Rail/road | Total |
|---|---|---|---|---|---|
| **Pre-implementation** | | | | | |
| | 1st | 2.69 | 81.89 | 10.00 | 94.58 |
| | 2nd | 2.24 | 81.90 | 10.00 | 94.14 |
| **Sub-total** | | **4.93** | **163.79** | **20.00** | **188.72** |
| **Implementation period** | | | | | |
| **Phase -I** | 3rd | 191.52 | 448.66 | | 640.18 |
| | 4th | 211.51 | 509.75 | | 721.26 |
| | 5th | 267.76 | 509.75 | | 777.51 |
| | 6th | 216.36 | 515.05 | | 731.41 |
| | 7th | 214.04 | 515.05 | | 729.09 |
| **Sub Total Phase I** | | **1101.19** | **2498.26** | | **3599.45** |
| **Phase-II** | 8th | 262.68 | 423.71 | | 686.39 |
| | 9th | 259.11 | 423.71 | | 682.82 |
| | 10th | 250.67 | 423.71 | | 674.38 |
| | 11th | 252.43 | 423.71 | | 676.14 |
| | 12th | 180.50 | 423.71 | | 604.21 |
| **Sub Total Phase -II** | | **1205.38** | **2118.55** | | **3323.45** |
| **Grand Total** | | **2311.50** | **4780.60** | **20.00** | **7112.11** |
| | | | | | |

## 10.0 SOURCE OF FUNDING

Committee of Secretaries in its meeting held on 18.03.03 in the committee room of the cabinet secretariat, Rashtrapati Bhawan, New Delhi directed that the Ministry of Coal would examine the extent to which funds could be mobilized by (a) enhancing the cess on coal, and (b) utilising a portion of the profits of BCCL and ECL. Any shortfall would be made good by suitably enhancing the Plan allocation.

Accordingly the following funding arrangement for implementation of Master Plan has been decided by Ministry of Coal

| SL. No. | Source | Amount in Rs. Crores / Annum |
|---|---|---|
| 1 | The Coal Cess (CCDA) i.e. Stowing Excise Duty has been increased to Rs. 10/- tonne | 120 |
| 2 | CIL fund as Rs. 6/ tonne | 165 |
| 3 | EMSC provision | 30 |
| 4 | Unspent fund lying with MOC @ Rs. 80.00 Crs. per year for 5 years. | 80 |
| | **TOTAL** | **395** |

The above fund of Rs. 395 Crs / year was adequate to implement the activities under Master Plan for a period of 20 years for ECL & BCCL. After considering the recommendations of MOC and Planning Commission by reducing the time period from 20 years to 10 years (excluding 2 years of Pre-Implementation), the corresponding yearly fund requirement for BCCL only would vary from Rs 604.21 Crs to Rs. 777.71 Crs as total fund requirement has been estimated at Rs. 7112.11 Crs.

Accordingly, MOC may take necessary steps to enhance the availability of fund to meet the requirements both for ECL and BCCL for completion of all activities under this Master Plan.

ANNEXURE VI

MPP/19/IC
6-3-19

भारत कोकिंग कोल लिमिटेड
**Bharat Coking Coal Limited**
*(A Mini Ratna Company)*
(A Subsidiary of Coal India Ltd.)
(www.bcclweb.in)

पं.का -:.कोयला भवन, कोयला नगर, धनबाद –826005,
Regd. Off: Koyla Bhawan, Koyla Nagar,
Dhanbad - 826005.
CIN: U10101JH1972GOI000918
दूरभाष: 0326-2230190/ फ़ैक्स -0326-2230050,
ईमेल: cos.bccl@coalindia.in

बोर्ड सचिवालय /Board Secretariat

Ref. No. BCCL:CS:F-1A: 69

Dated:05.03.2019
06

To,
GM(P&P),
BCCL, Koyla Bhawan.

**Sub: Certified copy of Minutes of 348th Board Meeting held on 29.01.2019.**

Dear Sir,

We send herewith certified copy of Minutes of **Item No. 348.4E, 348.4F & 348.4T** of 348th Meeting of the Board of Directors of Bharat Coking Coal Limited held at Registered Office, Koyla Bhawan, Dhanbad on 29.01.2019 for taking necessary action at your end.

Yours faithfully

(B.K. Parui)
Company Secretary

Encl: As above

Sri Agrawal
06/3/19

**Item No. 348.4E**

**Approval of Mining & Mine Closure Plan for Moonidh UG Colliery, W. J. Area, BCCL.**

**Background:**

Mining Plan along with Mine Closure Plan of Moonidih Colliery having normative capacity of 3.20 MTPA and the total Mine Closure cost being ₹4993.16 Lakhs (Rupees Forty-Nine Crores Ninety-Three Lakh Sixteen Thousands only), to be deposited in the already existing Escrow Account which includes already deposited amount of ₹454.09 Lakhs (Rupees Four crore Fifty Four lakhs Nine thousand only) was placed before Empowered Sub-Committee Meeting of BCCL held on 29.01.2019 and Empowered Sub-Committee recommended to place it before the BCCL Board for consideration and approval.

**Decision:**

After detailed deliberation the proposal of Mining Plan along with Mine Closure Plan of Moonidih Colliery recommended by ESC in its meeting held on 29.01.2019 having normative capacity of 3.20 MTPA and the total Mine Closure cost being ₹4993.16 Lakhs (Rupees Forty Nine Crores Ninety Three Lakh Sixteen Thousands only) which includes ₹454.09 Lakhs (Rupees Four crore Fifty Four lakhs and Nine thousand only) already deposited in existing Escrow Account was approved by the Board.

**Item No. 348.4F**

**Approval of Mining Plan along with Mine Closure Plan of Amalgamated Sudamdih Patherdih Colliery.**

**Background:**

Mining Plan along with Mine Closure Plan of **Amalgamated Sudamdih - Patherdih Colliery** having normative capacity of 0.545 MTPA and the total Mine Closure cost being ₹4040.061Lakhs (Rupees four thousand forty Lakh six thousand and one hundred only), to be deposited in the new Escrow Account, to be opened(Including already deposited amount of Rs four hundred three lakhs forty five thousand and one hundred only in two escrow accounts namely Sudamdih Incline Mines and Patherdih Group of Mines as both these mines have merged now, already deposited amount shall be transferred to this new Escrow Accounts to be opened), the expenditure already incurred towards Mine Closure activities shall be claimed from this new Escrow Account was placed before Empowered Sub Committee Meeting held on 29.01.2019 and Empowered sub-Committee recommended to place the proposal before Board for approval.

**Decision:**

The proposal of Mining Plan along with Mine Closure Plan of Amalgamated Sudamdih - Patherdih Colliery recommended by ESC in its meeting held on 29.01.2019 having normative capacity of 0.545 MTPA and the total Mine Closure cost being ₹4040.061 Lakhs (Rupees four Thousand forty Lakh six thousand and one hundred only), to be deposited in the new Escrow Account, to be opened (Including already deposited amount of Rs four hundred three lakhs forty five thousand and one hundred only in two escrow accounts namely Sudamdih Incline Mines and Patherdih Group of Mines as both these mines have merged now, already deposited amount shall be transferred to this new

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B. K. Parui
Company Secretary
Bharat Coking Coal Limited
Koyla Bhawan
Dhanbad - 826005

Escrow Account to be opened, the expenditure already incurred towards Mine Closure activities shall be claimed from this new Escrow Account) was approved by the Board.

**Item No. 348.4T**

**Mining Plan along with Mine Closure Plan of Bhowra South Colliery.**

**Background:**

The Mining Plan along with Mine Closure Plan of **Bhowrah South Colliery** having normative capacity of 0.923 MTPA and the total Mine Closure cost being ₹17162.865 Lakhs (Rupees seventeen Thousand one hundred and sixty two lakhs eighty six thousand and five hundred only), to be deposited in the new Escrow Account, to be opened (Including already deposited amount of Rs one thousand fifty one lakhs and fifty four thousand only, already deposited amount shall be transferred to this Escrow Account to be modified, the expenditure already incurred towards Mine Closure activities shall be claimed from this modified Escrow Account). Upon recommendation by the Empowered Sub Committee to the BCCL Board the same shall be placed before BCCL Board for approval.

**Decision:**

The proposal of Mining Plan along with Mine Closure Plan of Bhowrah South Colliery recommended by ESC in its meeting held on 29.01.2019 having normative capacity of 0.923 MTPA and the total Mine Closure cost being ₹7162.865 Lakhs (Rupees seventeen Thousand one hundred and sixty two lakhs eighty six thousand and five hundred only), to be deposited in the new Escrow Account, to be opened (Including already deposited amount of Rs one thousand fifty one lakhs and fifty four thousand only, already deposited amount shall be transferred to this Escrow Account to be modified, the expenditure already incurred towards Mine Closure activities shall be claimed from this modified Escrow Account) was approved by the Board.

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B. K. Paul
Company Secretary
Bharat Coking Coal Limited
Koyla Bhawan
Dhanbad - [illegible]

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**भारत कोकिंग कोल लिमिटेड**
(कोल इंडिया लिमिटेड की अनुषंगी इकाई)
**योजना एवं परियोजना विभाग**
कोयला भवन, कोयला नगर, धनबाद
धनबाद– 826005


OFFICE OF THE GENERAL MANAGER
416
31/1/2014
BCCL W J AREA, MOONIDIH

पत्रांक : बी.सी.सी.एल/ महाप्रबंधक (यो. ए. परि.)/फ-76 /14/ 531 दिनांक :-28.01.2014

सेवा में
महाप्रबंधक
कुसुंडा,, बस्ताकोला, लोदना, पश्चिमी झरिया एरिया
बी सी सी एल.

512
01.2.2014

**विषय:** Implementation of Mine Closure Plan.

महोदय,

The Mine Closure Plan of following mines under the administrative control of your Area has been approved in 303rd BCCL Board held on 04.01.2014. As per the implementation protocol duly approved in the above stated Board as a part of approved Mine Closure Plan of the concerned colliery; the Area CGM/GM has been defined as the implementing authority of the mines for which the Mine Closure Plan has been approved.

| Sl.No. | Name of the mine whose Mine Closure Plan has been approved | Name of the Area | Approved in Board |
|---|---|---|---|
| 1 | Dobari Colliery | Bastacolla | 303rd BCCL Board |
| 2 | Ghanoodih OCP | Bastacolla | 303rd BCCL Board |
| 3 | Rajapur/South Jharia OCP | Bastacolla | 303rd BCCL Board |
| 4 | Busserya UG Mine | Kusunda | 303rd BCCL Board |
| 5 | Ena OCP | Kusunda | 303rd BCCL Board |
| 6 | Amalgamated Dhansar - Industry colliery(AIDC) | Kusunda | 303rd BCCL Board |
| 7 | Barari colliery | Lodna | 303rd BCCL Board |
| 8 | Kujama Colliery | Lodna | 303rd BCCL Board |
| 9 | Lodna colliery | Lodna | 303rd BCCL Board |
| 10 | Moonidih Underground Project | WJ | 303rd BCCL Board |

Two copies of Mine Closure Plan of the above listed mines of your Area is sent to you herewith for its implementation as per the procedure mentioned in the book.

भवदीय

संलग्नक: यथोपरि

1) Project office Moonidih
2) Area survey off

28/1/14

(ए के श्रीवास्तव)
महाप्रबंधक (योजना एवं परियोजना)

D:\BCCL\Letter-14

ANNEXURE VI

F-20A


भारत कोकिंग कोल लिमिटेड
(कोल इंडिया लिमिटेड का एक अंग)
कोयला भवन/ कोयला नगर,
धनबाद –826005
दूरभाष :0326-2230190/ फ़ैक्स-0326-2230050
ईमेल: cos@bccl.gov.in

Bharat Coking Coal Limited
*(A Subsidiary of Coal India Limited)*
Koyla Bhawan/ Koyla Nagar
Dhanbad-826005
Phone No. 0326-2230190/Fax-0326-2230050
email ID: cos@bccl.gov.in


बोर्ड सचिवालय /Board Secretariat

Ref. No. BCCL:CS:F-1(A): 38 Dated:13.01.2014

To
GM(P&P)
BCCL, Koyla Bhawan

**Sub: Extracts of Minutes of 303rd Meeting of the Board of Directors of BCCL held on 04.01.2014 at Dhanbad.**

Dear Sir,

We send herewith extracts of Minutes of the Item No. 303.5F of the 303rd Meeting of the Board of Directors of Bharat Coking Coal Limited held on 04.01.2014 at Dhanbad for taking necessary action at your end.

Action Taken Report (ATR) on the decision of the Board may please be submitted for appraisal of the Board.

Yours faithfully
13/01/14
(B.K. Parui)
Company Secretary

Encl: As above

Sri Patnaik
for na 15/1/14

**Extracts of Minutes of 303rd Board Meeting held on 07.01.2014.**

303.5F **Approval of Mine Closure Plan.**

Board after deliberation passed the following resolution:

**Resolved that** the proposal of Mine Closure Plan of the following 10(ten) mines alongwith their details having total closure cost of ₹20346.283 Lakh (Rupees two hundred three crores forty six lakhs twenty eight thousand three hundred only) to be deposited in **"Escrow Account"** under Revenue head be and is hereby approved."

**Further resolved that** the said **'Escrow Account'** will be opened in accordance with the guidelines issued by D(F) , CIL vide letter no. 168/96 dated 26.06.2013 and 168/98 dated 28.06.2013 be and is hereby approved.

Mine Closure List :

| Sl. No. | Name of Mine/Project | Project Area | Balance Life of Mine | Amount to be deposited to Escrow Account (Rs. Lakh) 1st Year | 2nd Year | nth year | Total Mine Closure Cost |
|---|---|---|---|---|---|---|---|
| | (Ha) | (Years) | | | | (End Year) | |
| 1. | Dobai Colliery | 121.900 | 30 | 5.502 | 5.778 | 22.649 | 365.576 |
| 2. | Ghanoodih OCP | 67.500 | 7 | 78.348 | 82.266 | 104.994 | 637.912 |
| 3. | Rajapur/South Jharia OCP | 196.380 | 30 | 73.809 | 77.499 | 15.678 | 1492.962 |
| 4. | Busserya UG Mine | 142.76 | 30 | 151.882 | 5.913 | 23.180 | 520.401 |
| 5. | Ena OCP | 176.00 | 30 | 47.667 | 50.050 | 196.202 | 3166.918 |
| 6. | Amalgamated Dhansar – Industry Colliery(AIDC) | 302.00 | 21 | 92.019 | 96.620 | 244.153 | 3286.844 |
| 7. | Barari Colliery | 457.80 | 26 | 163.594 | 25.040 | 80.740 | 1358.484 |
| 8. | Kujama Colliery | 167.98 | 30 | 45.495 | 47.769 | 187.262 | 3022.61 |
| 9. | Lodna Colliery | 350.50 | 28 | 61.639 | 17.799 | 63.287 | 1034.685 |
| 10. | Moonidih Underground Project | 1820.586 | 30 | 82.179 | 86.288 | 338.261 | 5459.891 |
| **Total** | | | | **802.134** | **495.022** | | **20346.283** |

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13/01/14

B. [illegible] Prasad
Company Secretary
Bharat Coking Coal Limited
Koyla Bhawan
Dhanbad - 826005

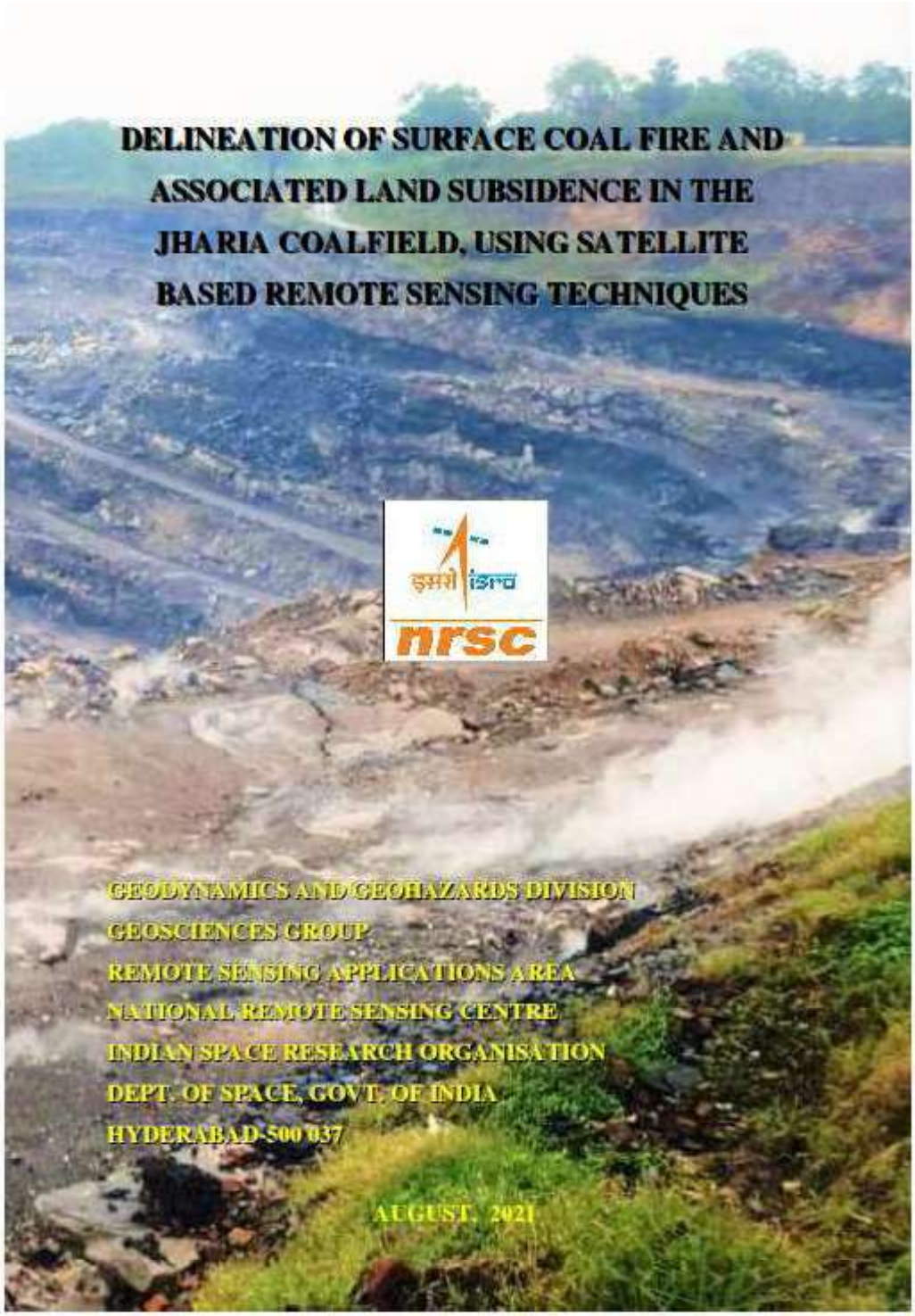
## TABLE -1

## LIST OF FIRES IN THE LEASEHOLD OF BCCL

| Sl. No. | Name of the fire | Fire Status |
|---|---|---|
| 1 | Ganeshpur X, XI , XII & XIII seam fire | Active |
| 2 | Burwabera X seam fire | Active |
| 3 | Phularitand X, XI, XII seam fire | Active |
| 4 | Angarpathra XII, XI, X, IX Spl. seam fire | Extinguished |
| 5 | Gaslitand XVT, XVB seam fire | Active |
| 6 | Jogta XV, XIV, XIII, XII, XI seam fire | Active |
| 7 | Kankanee XIII & XIV seam fire | Active |
| 8 | Ekra XI & XII seam fire | Active |
| 9 | Ekra XIII & XIV seam fire | Active |
| 10 | Loyabad XV, XIV, XIII seam fire | Active |
| 11 | Bassuriya XIV, XIII & XII, XI and X seam fire | Active |
| 12 | Sendra Bansjora XIV, XIII, XII, XI seam fire | Active |
| 13 | Bansdeopur XIV, XII seam fire | Active |
| 14 | Gopalichak XVI, XV, XIV, XIII, XII,XI seam fire | Active |
| 15 | Industry XII, XI seam fire | Active |
| 16 | Kusunda XII, XI seam fire | Active |
| 17 | Alkusa XII, XIV seam fire | Active |
| 18 | Kustore XIV, XIII, XII, XI seam fire | Active |
| 19 | Ena XII, XI seam fire | Active |
| 20 | Pure jharia X seam fire | Active |
| 21 | K.P. Dobari X, V/VI/VII/VIII/VIIA seam fire | Active |
| 22 | Rajapur X seam fire | Active |
| 23 | Kujama XII, XI seam fire | Active |
| 24 | Kujama IX, X seam fire | Active |
| 25 | Bhalgora XIV seam fire | Dormant |
| 26 | Bhalgora XV seam fire | Dormant |
| 27 | East Bhuggatdih XV, XIV seam fire | Active |
| 28 | Ena XIV seam fire | Active |
| 29 | Ena XV seam fire | Active |
| 30 | Simlabahal XIV seam fire | Dormant |
| 31 | N.S. Lodna XIII, XIIIA, XIV seam fire | Active |
| 32 | Bagdigi XIV, XIA, XV seam fire | Active |
| 33 | Baniahar XV, XIVA, XIV seam fire | Active |
| 34 | Bhaga XV seam fire | Active |
| 35 | South Tisra VII, VIII, IX, X seam fire | Active |
| 36 | Bhowra XIII, XIV seam fire | Active |
| 37 | Bararee XV, XIVA, XIV seam fire | Active |
| 38 | Bhulan Bararee XIII, XIV seam fire | Active |
| 39 | Bhulan Bararee XVI, XV seam fire | Active |
| 40 | Sudamdih IX to XIV seam fire | Active |
| 41 | Patherdih IX to XIII seam fire | Active |

| Sl. No. | Name of the fire | Fire Status |
|---|---|---|
| 42 | Bhowra IX , X seam fire | Active |
| 43 | Block –II XII, XI/XII, X Spl. seam fire | Active |
| 44 | Katras-Choitudih XIII seam fire | Active |
| 45 | Katras-Choitudih XIV, XV seam fire | Active |
| 46 | Tetulmari IV seam fire | Active |
| 47 | Tetulmari VI/VII seam fire | Active |
| 48 | Kendwadih XIII seam fire | Dormant |
| 49 | Kendwadih XIV, XIII seam fire | Dormant |
| 50 | Pootkee XV seam fire | Extinguished |
| 51 | East Bassuriya V/VI seam fire | Active |
| 52 | East Bassuriya VIII seam fire | Active |
| 53 | Kessurgarh V, VI, VII seam fire | Extinguished |
| 54 | Bhagaband XVI seam fire | Dormant |
| 55 | Amlabad XIV seam fire | Dormant |
| 56 | Sudamdih XV seam fire | Extinguished |
| 57 | Moonidih XVIIT seam fire | Extinguished |
| 58 | Damoda V, VI, VII seam fire | Dormant |
| 59 | Mudidih fire | Dormant |
| 60 | Jogidih X seam fire | Extinguished |
| 61 | Kooridih X seam fire | Extinguished |
| 62 | Nudkhurkee X seam fire | Extinguished |
| 63 | West Mudidih IX/X seam fire | Extinguished |
| 64 | East Katras XIV seam fire | Extinguished |
| 65 | North Tisra VII, VIII, IX seam fire | Active |
| 66 | North Tisra X seam fire | Active |
| 67 | Jeenagora IX, X, XI seam fire | Active |
| 68 | Jeenagora IX, X, XI,XII seam fire | Active |
| 69 | Joyrampur XI, XII, XIII seam fire | Active |
| 70 | Jealgora XV, XIV, XIIIB, XIIIA seam fire | Dormant |
| 71 | Bassuriya IX,I X Spl. seam | Active |
| 72 | Industry X seam | Active |
| 73 | Kachhi Balihari XV seam | Dormant |
| 74 | Kendwadih XI, XII seam | Active |
| 75 | Shatabdi V/VI/VII seam | Active |
| 76 | Sendra Bansjora X seam | Active |
| 77 | East Katras XI,XIII & XIV seam fire | Active |

As per specific condition no xiii. The proponent shall prepare time -series maps of the Jharia Coalfields through NRSA to monitor and prevent fire problems in the Jharia Coalfields by Isothermal mapping /imaging and monitoring temperatures of the coal seams.



# DELINEATION OF SURFACE COAL FIRE AND ASSOCIATED LAND SUBSIDENCE IN THE JHARIA COALFIELD, USING SATELLITE BASED REMOTE SENSING TECHNIQUES

**Report for**

BHARAT COKING COAL LIMITED (BCCL)

(A SUBSIDIARY OF COAL INDIA LTD.)

ENVIRONMENT DEPARTMENT, KOYLA BHAWAN

KOYLA NAGAR, DHANBAD – 826 005, JHARKHAND

GEODYNAMICS AND GEOHAZARDS DIVISION

GEOSCIENCES GROUP

REMOTE SENSING APPLICATIONS AREA

NATIONAL REMOTE SENSING CENTRE

INDIAN SPACE RESEARCH ORGANISATION

DEPT. OF SPACE, GOVT. OF INDIA

HYDERABAD-500 037

AUGUST, 2021

## REPORT / DOCUMENT CONTROL SHEET

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| 8 | **Author(s)** | Shri Priyom Roy, S/E 'SE' and Dr. Tapas Ranjan Martha S/E 'SG' | | | |
| 9 | **Affiliation of authors** | Geosciences Group, RSA-A, NRSC/ISRO | | | |
| 10 | **Scrutiny mechanism** | **Compiled by**<br>P. Roy | **Reviewed by**<br>Group Director, Geosciences Group | **Approved / Controlled by**<br>DD (RSAA) | |
| 11 | **Originating unit** | NRSC | | | |
| 12 | **Sponsor(s)/ Name and Address** | BHARAT COKING COAL LIMITED (BCCL) | | | |
| 13 | **Date of Initiation** | 01.10.2020 | | | |
| 14 | **Date of Publication** | **31.08.2021** | | | |
| 15 | **Abstract (with Keywords):** | | | | |

Coal fire is a serious problem in Jharia coal field, where high grade coals are gradually burnt due to these fires. The combined effect of surface and sub-surface fires and mining related subsidence has affected the environmental stability of Jharia coal field. Coupled with the ecological changes instigated by open cast mining, the landscape in and around Jharia have changed drastically over the years. In the present study, delineation of coal fire and mining related land subsidence have been addressed. Thermal band data of Landsat-8 (100m resolution) have been used to demarcate the coal mine fire areas from non fire areas. For this study, Landsat-8 data of May, 2021 have been used. The band 10 (10.60-11.19 μm) of Landsat-8 data are used to derive the relative radiant temperature. Further ALOS-PALSAR 2, L band microwave data have been used to delineate zone of probable land subsidence (using differential interferometry) due to mining. The study reflects that, compared to 2017, the eastern flanks (Lodna and Tisra etc) show a significant reduction in total fire area. The western flank (Block II and Shatabdi) and the northern flank (Katras and Gaslitand) show isolated fire pockets in active mines as well as in OB dumps. The current total fire area mapped is 1.8 sq.km. Apart from this, one distinctive area of land subsidence has been identified using interferometric method. These are primarily caused by older or active underground mining in the Moonidih Project. The coal mine fire and subsidence areas are further verified on the ground. The final coal mine fire and subsidence maps of Jharia coal field are prepared by using remote sensing data analysis with field validation.

# *PROJECT TEAM*

1. **Dr. K VINOD KUMAR**, Group Director, Geosciences Group
   Project formulation and co-ordination
2. **Dr. Tapas R. Martha**, Head, Geodynamics and Geohazards Division
   Review and report preparation
3. **Shri Priyom Roy,** Scientist 'SE'
   Image processing, interpretation, field survey, maps and report preparation

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# ACKNOWLEDGEMENTS

The project team is grateful to Dr. Raj Kumar (Director, NRSC) and Shri Shantanu Chaudhury (Ex Director, NRSC) for their support at various stages during execution of this project. We are extremely grateful to Dr. V.V. Rao (Deputy Director, RSAA) and Dr. P.V.N. Rao (Ex Deputy Director, RSAA) NRSC for their overall guidance and encouragement. We thank Shri C. Goswami (Director, Technical Operations) BCCL, for this project initiative and for providing Geosciences group, NRSC, the opportunity to carry out the task. We also thank Shri Dipankar Maity, Deputy Manager (Survey) and Shri Mithilesh Kumar, Chief Manager (Mining) for their support and fruitful discussion during the fieldwork. The support of all the BCCL officials in various collieries visited during the course of the ground truth verification is duly acknowledged.

# EXECUTIVE SUMMARY

Coal fire is a serious problem in Jharia coal field, where high grade coals are gradually burnt due to these fires. The combined effect of surface and sub-surface fires and mining related subsidence has affected the environmental stability of Jharia coal field. Coupled with the ecological changes instigated by open cast mining, the landscape in and around Jharia have changed drastically over the years. In the present study, delineation of coal fire and mining related land subsidence has been addressed. Thermal band data of Landsat-8 (100m resolution) have been used to demarcate the coal mine fire areas from non fire areas. For this study, Landsat-8 data of May, 2021 have been used. The band 10 (10.60-11.19 μm) of Landsat-8 data are used to derive the relative radiant temperature. Further ALOS-PALSAR 2, L band microwave data have been used to delineate zone of probable land subsidence (using differential interferometry) due to mining. The study reflects that, compared to 2017, the eastern flanks (Lodna and Tisra etc) show a significant reduction in total fire area. The western flank (Block II and Shatabdi) and the northern flank (Katras and Gaslitand) show isolated fire pockets in active mines as well as in OB dumps. The current total fire area mapped is 1.8 sq.km. Apart from this, one distinctive area of land subsidence has been identified using interferometric method. These are primarily caused by older or active underground mining in the Moonidih Project. The coal mine fire and subsidence areas are further verified on the ground. The final coal mine fire and subsidence maps of Jharia coal field are prepared by using remote sensing data analysis with field validation.

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**Field Photographs**

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# *CHAPTER I*

## INTRODUCTION

Coal fire is a perennial problem in Jharia coal field (JCF) covering 447 sq. km. area in the Dhanbad district of Jharkhand state. Subsurface and surface coal fires are a serious problem in many coal-producing countries. The severity and extent of mine fires in some of the Indian coalfields, particularly Jharia and Raniganj coalfields, are quite alarming. Combustion can occur either within coal or in coal dumps on the surface. Considerable economic loss and environmental problem arises due to the coal fire. Coal fire burns valuable coal and also creates difficulties in mining by increasing the cost of production or making existing operations difficult. Noxious gases like sulphur dioxide, nitrogen oxide, carbon monoxide, carbon dioxides, which are the result of coal burning processes, often affect the immediate surroundings of an active coal fire area (Gangopadhyay, 2003). These greenhouse gases not only affect local atmosphere but also play a crucial role in the damages, found associated with coal fire such as land surface subsidence and surface cracking. Coal fires are caused by oxidation of coal but the reaction involved in oxidation of coal is not understood till date. Broadly, the potential for spontaneous combustion lies in its ability to react with oxygen at ambient temperature. This occurs through the reaction of oxygen at the surface of the coal resulting in an exothermic reaction. As a consequence, the temperature of coal rises and if temperature reaches the threshold temperature, ranging between $80^0$ to $120^0$C, a steady reaction starts, which produces carbon dioxide. Temperature keeps on increasing once $CO_2$ started to form and at 2300°C, the exothermic reaction becomes rapid. It is known that high grade coals (high carbon content) are more fire prone, though the reason behind this is not well understood. Another important parameter, which controls fire, is the size of the particles. Larger the effective area of coal (fire particles), more rapidly the reaction proceeds. Cracks, fissures play a role like positive catalysts to coal oxidation by slowly supplying oxygen / air through their conduits.

Coal mining in Jharia Coal Field (JCF) started way back in 1895. History of fire in Jharia Coal Field date back to 1916 when the first incidence of fire was reported from XIV seam of Bhowrah colliery. JCF was nationalised in 1972 and over the decades, the fire has spread or been contained but never extinguished. The combination of underground fire and subsidence have affected vast areas of JCF.

## 1.1 Background

Remote sensing technique in thermal band offers a cost-effective and time-saving technology for mapping various geoenvironmental / hazardous features such as coal fires, forest fires, oil well fires, volcanic eruptions etc. NRSC has carried out coal fire mapping projects in the past; conducting an airborne campaign in 1989 and using Landsat-5 TM data in 1995 (Bhattacharya *et. al.,* 1995), over Jharia coalfield, Jharkhand and using Landsat-5 TM data for 2001 over Raniganj coalfield, West Bengal. Further, projects were executed in 2006 and 2012 in which coal fires of the JCF were mapped using Landsat-7 ETM+ and ASTER data, respectively. Additionally, a R&D study was taken up in 2013 to delineate subsidence areas using differential interferomteric (DInSAR) technique. An operational fire and subsidence mapping activity was taken up in 2017. In view of the past experiences, based on the letter (Ref. no. MP/19/270) from General manager (JMP), BCCL addressed to Director, NRSC on 24-10-2019, a project was formulated to take up Coal fire and Land Subsidence study of the Jharia Coal Field using space-borne remote sensing technique. The formal Memorandum of Understanding between BCCL and NRSC was signed on 7$^{th}$ August, 2020.

## 1.2 Objectives

The following objectives are formulated on the basis of the above mentioned background:

I. To map Coal fire in the study area based on pixel integrated relative radiant temperature derived from latest available Landsat-8 data of 2020 time period.

II. To compare the change in the coal fire distribution in the Jharia coalfield between the period of 2017 and 2020.

III. To delineate probable subsidence areas in the region using differential interferometry method.

## 1.3 Study Area

Jharia Coalfield is located in the Dhanbad district of Jharkhand state (Figure 1) and it is named after the main coal mining town of Jharia. It is situated in the Damodar River valley and is about 250 km NW of Kolkata. The coalfield is contained approximately within latitudes 23º 42' N and 23º 50'N and longitudes 86º 09'E and 86º 30'E.

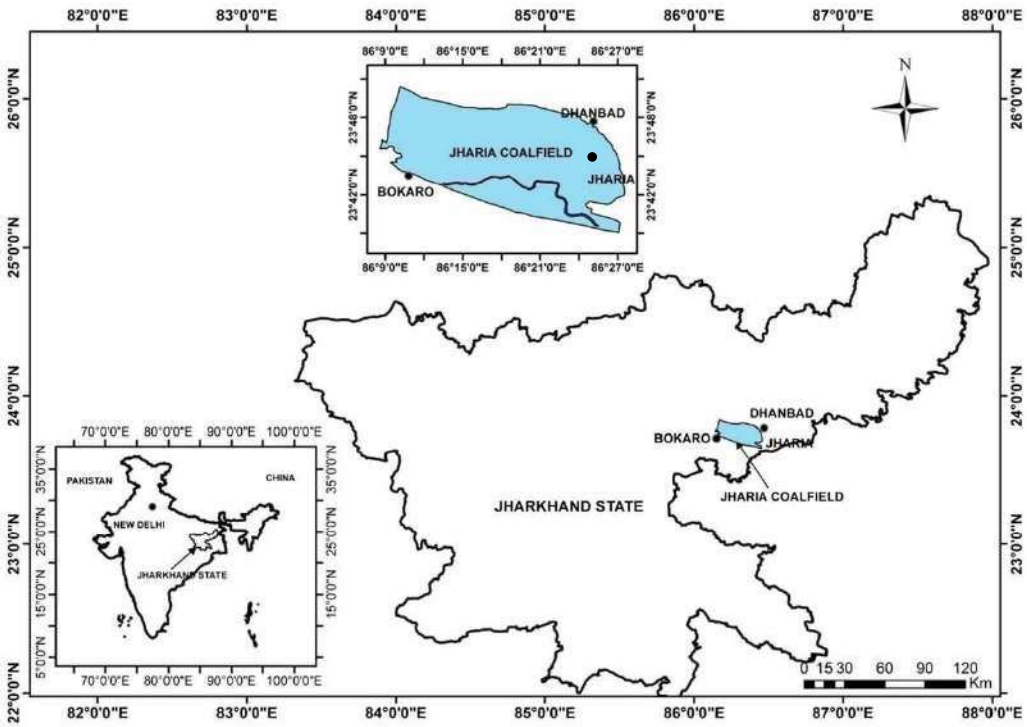


Figure 1: Study area map of Jharia Coalfied, Jharkhand

# *CHAPTER II*

# GENERAL DESCRIPTION OF THE STUDY AREA

## 2.1 Location and Accessibility

Jharia is an old mining town in the Dhanbad district of Jharkhand. This town is famous for its surrounding mines producing high grade coal and supplying mainly to the neighbouring industrial areas. Jharia is approximately 6 km in south western direction from Dhanbad town and connected by metal road. Dhanbad is well connected to Kolkata by road and rail.

## 2.2 Physiography, Drainage and Climate

Jharia coalfield is characterised by undulatory topography with very low rolling slope towards the eastern part of the area. The average height of the area is around 200 meters above the mean sea level. Damodar is the major river in the study area. The other tributaries to the Damodar River in this area are Jamuniya Nadi, Khudia Nadi, Khatri Nadi, Jarian Nala, Kari Jora and Domohani Nadi. Damodar River flows from west to east in this area. The minimum temperature is ~10º C in the month of December – January and maximum temperature is ~50º C in the month of May – June.

## 2.3 General Geology

Gondwana Super Groups of rocks of Up. Carboniferous to Lr. Cretaceous age (i.e. from 320 MY to 98 MY) are exposed here. Gondwana Super Group rocks unconformably overlie Archaean rocks. In Gondwana Rocks, Raniganj and Barakar Formations of Permian age have more potential as far as the coal production is concerned. Barakar Formation is exposed in north and north eastern part of the basin (Figure 2). Most of the coal mines are confined to the Barakar Formation in JCF. Barakars consists of coarse, medium grey and white sandstones, shales and coal seams. Raniganj consists of grey and greenish soft feldspathic sandstones, shales and coal seams. Faults are prevalent in this portion of basins (Figure 2). NW trending faults are conspicuous north to Jharia. Many lamprophyre and dolerite dykes are also exposed in this area in a criss-cross manner. The Raniganj Formation though coal bearing, has suffered much deformation due to faulting, thus causing difficulty for

mining in the area. The generalised stratigraphy of JCF is mentioned below (after Saraf, et al., 1995).

| FORMATION | LITHOLOGY | MAXIMUM THICKNESS |
|---|---|---|
| Supra Panchet | Red and Grey sandstones and shales | 300m |
| Panchet | Micaceous Yellow and Grey sandstones, Red and Greenish shales | 600m |
| Raniganj | Grey and Greenish soft feldspathic sandstones, shales and coal seams | 1050m |
| Ironstone Shales | Dark carbonaceous shales with ironstone bands | 360m |
| Barakar | Coarse and medium Grey and white sandstones, shales and coal seams | 630m |
| Talchir Boulder Bed | Coarse sandstones above and Greenish shales below | 300m |

Table 1: Generalised stratigraphy of JCF.

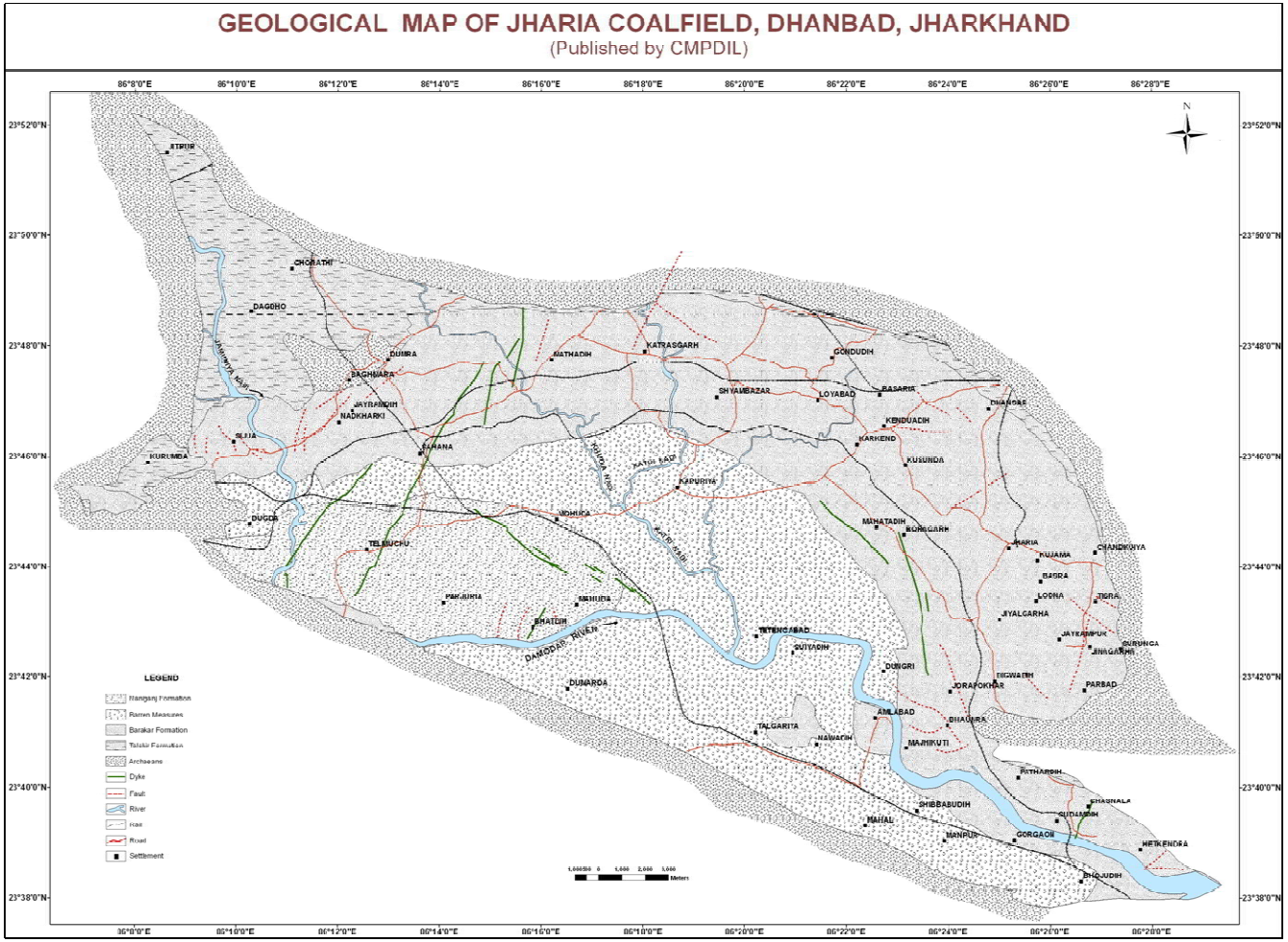


Figure 2 : Geological map of Jharia coal field, Dhanbad, Jharkhand (published by CMPDIL)

# *CHAPTER III*

# DATA REQUIREMENTS

## 3.1 Remote Sensing Data

Coal fire map was created from LANDSAT 8 TIRS data of 22 May 2020. Further, the coal fire map of 2017 prepared by NRSC (NRSC, 2017) from LANDSAT 8 data (of 14 May 2017), was used as a reference to identify the changes that has occurred in the extent and disposition of the fires from 2017 to 2020.

For the land subsidence study, L-band microwave data from ALOS-PALSAR satellite (JAXA) were used. Five scenes of "Fine Beam mode" SLC data were taken from PALSAR-2 archives over a period from September, 2017 to February, 2020. This was done to identify long term terrain changes and differentiate the same from short term changes due to mining excavations and overburden dumping.

Table 2: List of satellite data used in the present study.

| Satellite | Sensor | Resolution | Time | Date | Data source |
|---|---|---|---|---|---|
| LANDSAT-8 | TIRS | 100m resampled to 30m | Daytime | 22 May 2020 | USGS, USA |
| ALOS | PALSAR-2 (Fine Beam mode) | 10 m | NA | 30 September 2017 | JAXA, Japan |
| | | | | 3 March 2018 | |
| | | | | 19 January 2019 | |
| | | | | 02 March, 2019 | |
| | | | | 29 February. 2020 | |

## 3.2 Ancillary data

1. Geological map of Jharia coal field.
2. Mine surface plans as provided by BCCL.

# *CHAPTER IV*

# REMOTE SENSING DATA ANALYSIS

## 4.1 Methodology

### 4.1.1 Processing of Landsat 8 Data

With the launch of the LANDSAT-8 mission in February, 2013; thermal space borne data are available from its thermal infrared sensor (TIRS). This has enabled monitoring of the earth with a spatial resolution of 100 m in the thermal domain with a repeat cycle of 16 days. The LANDSAT-8 has two channels (Band 10 and Band 11) in the thermal infrared region (Table 1) which ranges from 10.4 micrometer to 12.5 micrometer (Gangopadhyay et al. 2012). In present study, band 10 of TIRS sensor (acquired on 22 May, 2020) has been used coal fire mapping. The spectral domain of the band is known for its maximum transmittance (Chatterjee et al. 2007; Martha et al. 2010). The data are freely accessible through USGS portal (Landsat 8 download source: http://landsatlook.usgs.gov).

Landsat-8 data are available in GeoTiff format and the data are converted to top of the atmosphere spectral radiance using the radiance rescaling factors provided in the metadata file, using equation 1.

$$L_\lambda = M_L Q_{cal} + A_L \text{ …….. (1)}$$

Where:

$L_\lambda$ = Spectral radiance (Watts/ ($m^2$ * srad * μm)).

$M_L$ = Band-specific multiplicative rescaling factor from the metadata.

$A_L$ = Band-specific additive rescaling factor from the metadata.

$Q_{cal}$ = Quantized and calibrated standard product pixel values (DN).

Once the spectral radiance ($L_\lambda$) for Landsat-8 band 10 data is generated, it is possible to calculate radiant (brightness) temperature directly using equation 2. Planck's radiation function (Planck, 1914) forms the basis of radiant temperature derivation from spectral radiances and the theory is discussed in detail in existing literature (Gupta, 2003).

$$T_R = K_2 / \ln ((K_1 / L_\lambda) + 1) \text{…….. (2)}$$

$T_R$ = Radiant (brightness) temperature,

$K_1$ = Calibration constant (1260.56 K),

$K_2$ = Calibration constant (666.09 watts/ ($m^2$ *srad*μm)),

$L_\lambda$ = Spectral radiance

### 4.1.2 Thresholding of radiant temperature image

Once the Landsat-8 data are converted to radiant temperature image, the next step was to segregate fire pixels from the background, which requires the estimation of the cut-off temperature. This has been attempted by the statistical analysis of sensor derived radiant temperature to delineate clusters (in the scatter-plot) indicative for fire and non-fire pixels. Mean and maximum radiant temperatures are derived from randomly sampled uniform sized pixel blocks distributed in entire spatial extent of Barakar Formation (Figure 3) known for fire bearing coal seams. The pixel block sizes are chosen to adequately represent the overall areal extent of the coalfield and homogeneously encompass all the mining blocks (27x27 pixels for Landsat-8, Figure 3). The maximum temperature value recorded in each representative area, derived from each of the datasets, is plotted against the mean temperature. The maximum temperature represents that of fire (wherever present), whereas the mean temperature represents the average background temperature, for normalization. The fire and background populations show considerable variance, separating coal fire and background radiant temperatures. The cut-off temperature derived is the maximum temperature of the background cluster, above which all temperatures represent coal fires. In the case of the Landsat-8 data used in this study, the cut-off temperature was determined around 36.5°C (Figure 4). Based on this cut-offs, regional coal fire map was prepared (Figure 5).

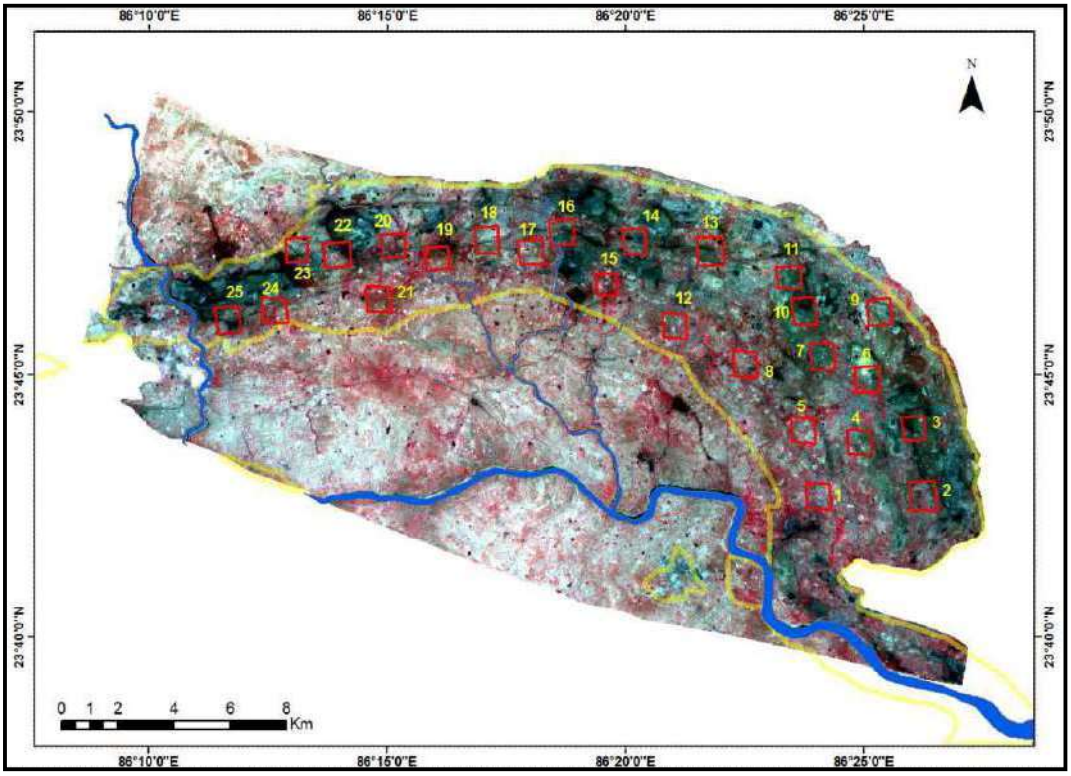


Figure 3. False colour composite image of Jharia Coalfield, with subset blocks (in red boxes) to obtain temperature values (from radiant temperature image) within the Barakar formation across the Jharia coalfield.

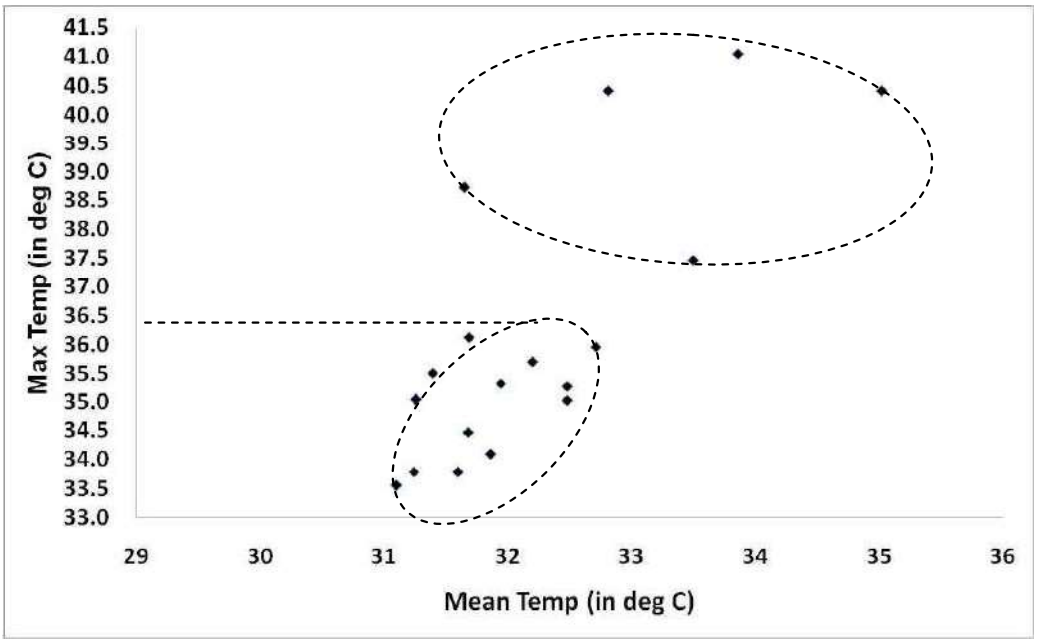


Figure 4. Maximum temperature plotted against mean temperature for various locations; cluster separation observed around 36.5 °C (marked with arrow)

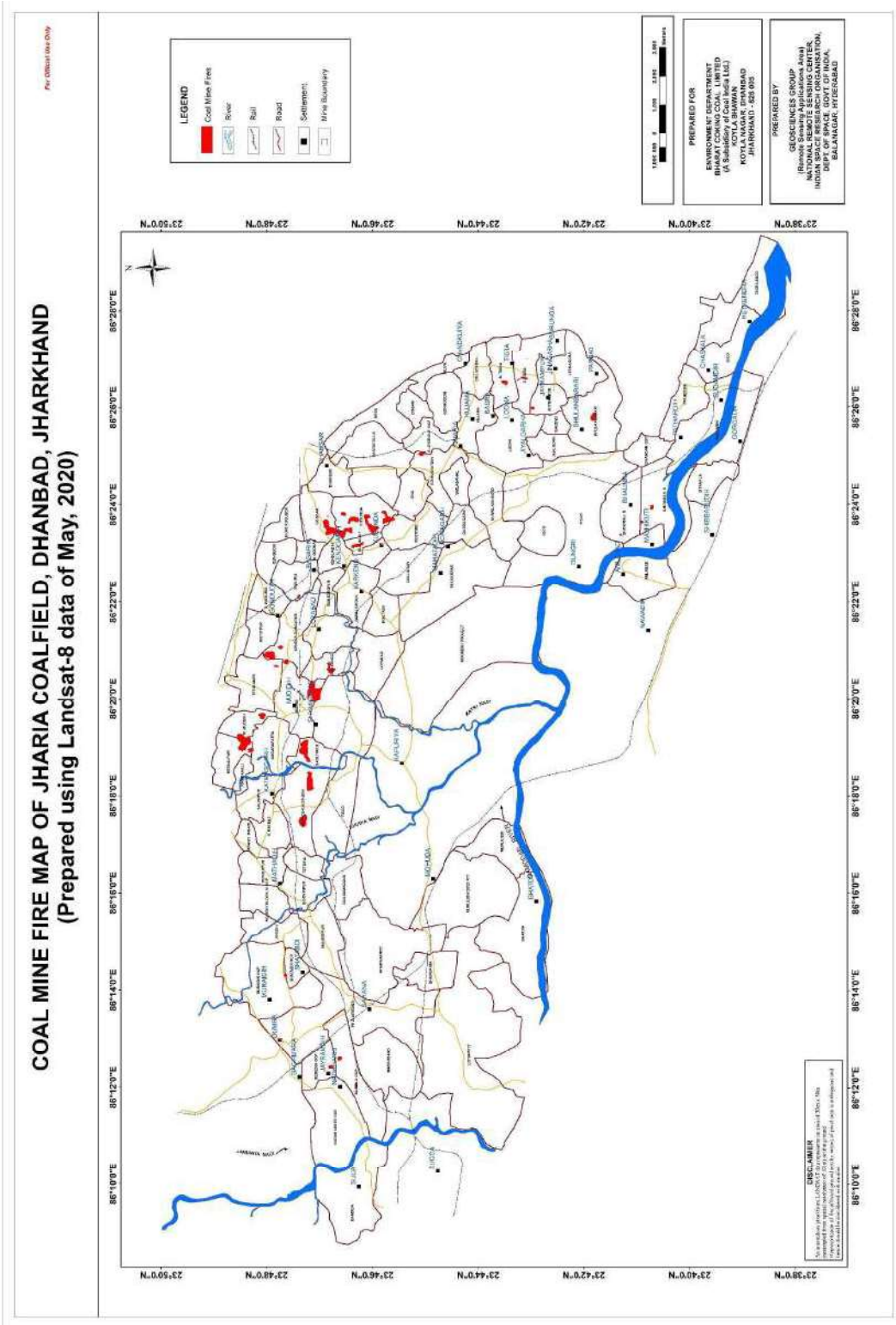


Figure 5: Coal mine fire map (May, 2020) of Jharia coal field, Dhanbad. The fire areas shown in this map have been verified in the field as per field points in figure 12.

### 4.2 Methodology For Subsidence Detection

#### 4.2.1 Processing of ALOS-PALSAR 2 Data

Differential Interferometric SAR (DInSAR) techniques consist of combination of two SAR images of the same area acquired from slightly different positions (Figure 6).

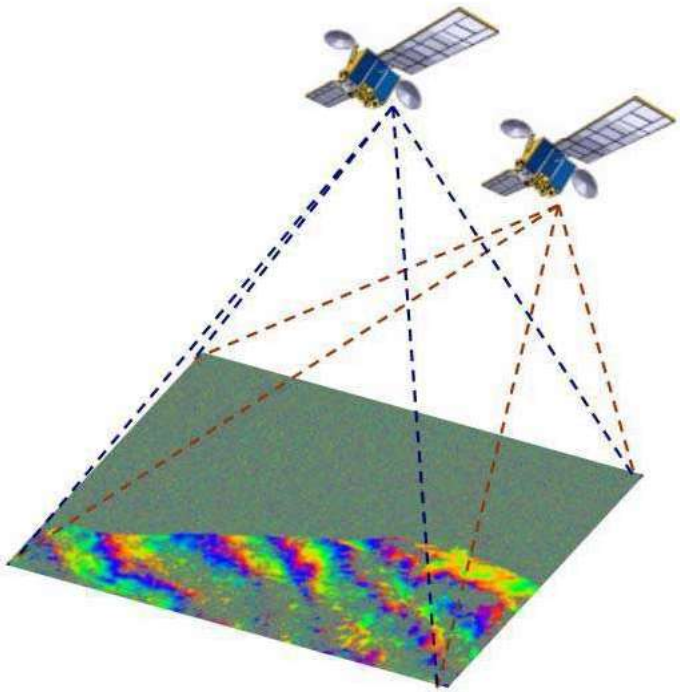

Figure 6. DInSAR acquisition scheme.

The result of this combination provides a new image, known as 'interferogram', whose phase component is formed by the following term:

$$\Delta\Phi Int = \Phi Topo + \Phi Mov + \Phi Atm + \Phi Noise \quad (3)$$

where, ΦTopo denotes the topographic component, ΦMov denotes the terrain deformation/ displacement component, ΦAtm is the noise component and ΦNoise is the thermal noise.

Topography, atmospheric effects and thermal noise needs to be removed or optimized to obtain precise measurements of terrain movement. When working with classical DInSAR interferograms (combination of two SAR images) the main problem is the presence of atmospheric artefacts, since there is no way to cancel them without a priori information. On the other hand, the term related with topography can be cancelled out using and external Digital Elevation Model (DEM) and the orbital ephemeris from the SAR acquisitions, considering no height errors on the DEM.

$$\Delta\Phi dif = \Phi ErrorTopo + \Phi Mov + \Phi Atm + \Phi Noise \quad (4)$$

Since the coal mine area is very dynamic in terms of its surfacial changes (open cast mine, abandoned mine, fire affected waste/reclaimed land, over burden dumps) over time, it is proposed to utilize an advanced DInSAR technique. It is a recent remarkable improvements in SAR differential interferometry that has led to an innovative approach based on the use of a large dataset of SAR images over the same area to overcome the intrinsic limitations of conventional DInSAR in terms of temporal and geometrical decorrelation as well as atmospheric disturbances (Carnec et al., 1996; Bürgmann et al., 2000).

Broad work flow diagram for generating land subsidence map using satellite based DInSAR technique is shown in Figure 7.

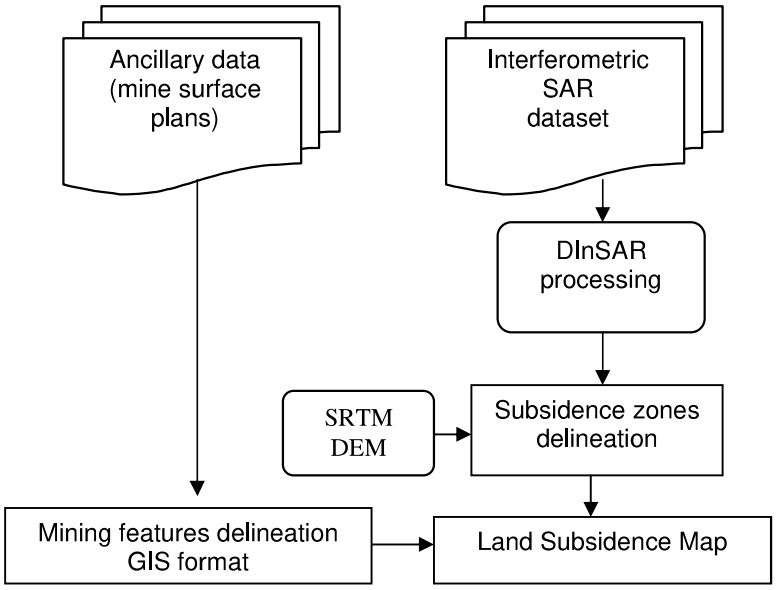


Figure 7. Work flow diagram for generating land subsidence map using DInSAR technique.

In the present study, 5 sets of ALOS-PALSAR L-band microwave data (as mentioned in table 1) were procured. The datasets were paired into master-slave pairs as per short and long temporal baselines. The short temporal base lines include master slave pairs of time difference of six months to one year, whereas long temporal baselines include data pairs of time difference of ~ one year.

This has been illustrated in figure 8.

| | | SLAVE IMAGE | | | | |
|---|---|---|---|---|---|---|
| | | 30 September 2017 | 03 March 2018 | 19 January 2019 | 02 March 2019 | 29 February 2020 |
| MASTER IMAGE | 30 September 2017 | | | | | |
| | 03 March 2018 | | | | | |
| | 19 January 2019 | | | | | |
| | 02 March 2019 | | | | | |
| | 29 February 2020 | | | | | |
| | | Short Temporal Baseline Pair (less than 1 year) | | | | |
| | | Long Temporal Baseline Pair (~ 1 year) | | | | |

Figure 8. ALOS-PALSAR - 2 Master-Slave pairs for short and long temporal base line processing

The interferometric fringes generating from short baseline pairs will generally indicate terrain changes due to mining activity happening over a short period of time. This will include mining excavations and creation of new OB dumps adjacent to the mining area. Any incidences of slow land subsidence will not be demarcated in the results (figure 9).

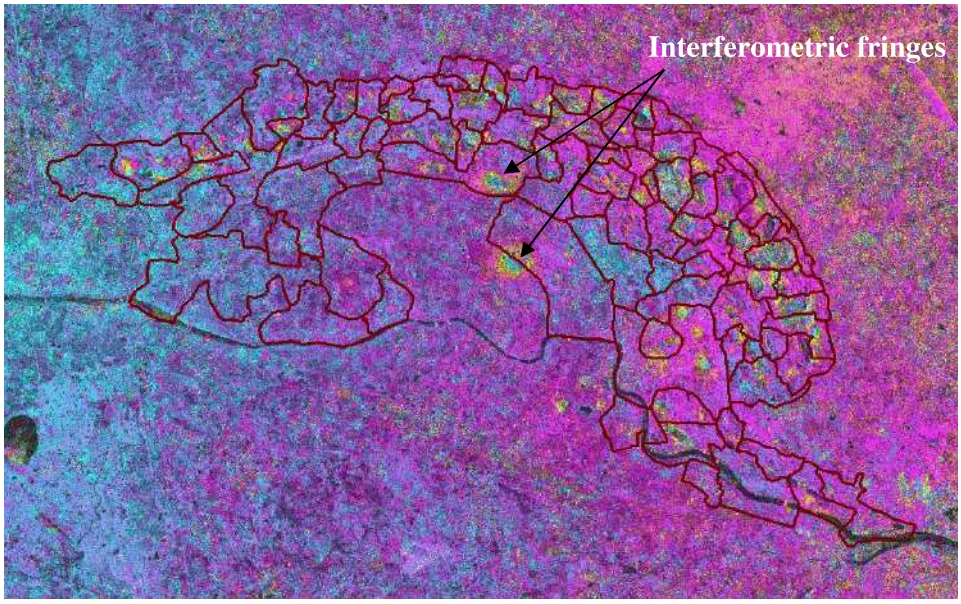


Figure 9. Fringe patterns generated from short baseline processing (e.g. Master: Oct, 19, Slave: Feb, 20).

On the other hand, master-slave pairs of long temporal baseline (approximately one year as shown in figure 8) will incorporate terrain changes due to mining activities as well, as long term ground subsidence from underground mining where ever present (figure10)

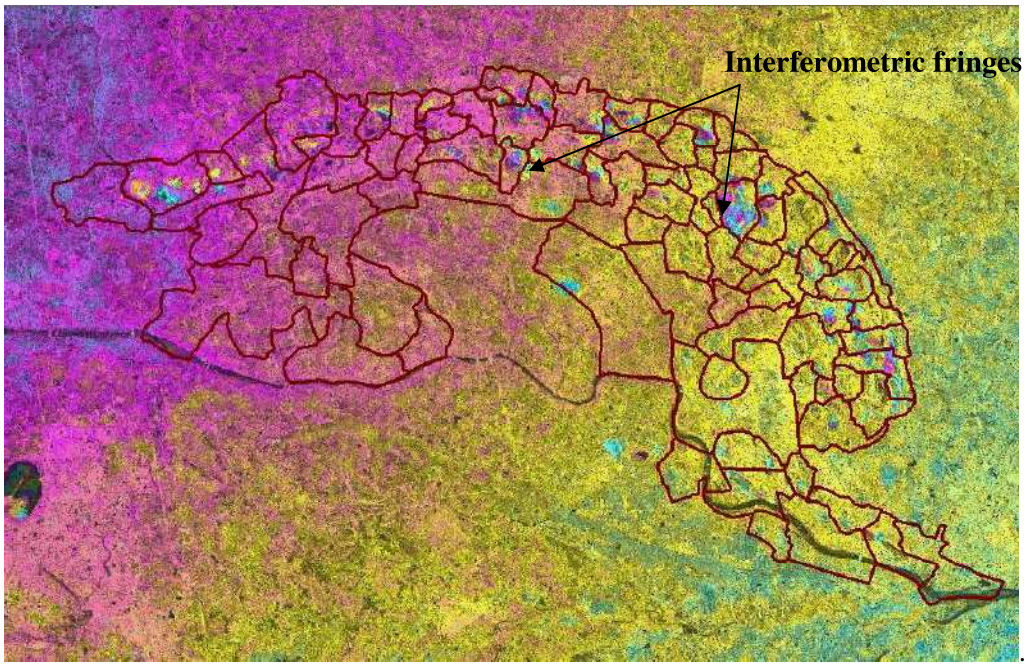


Figure 10. Fringe patterns generated from long baseline processing (e.g. Master: Sept, 17, Slave: Feb, 2020).

The results from the long and short baseline processing can be compared and zone where fringes have been developed due to terrain changes due to mining excavation and dumping, can be systematically identified and demarcated. The remaining fringes from the long temporal baseline processing will then indicated towards zones where subsidence has taken place due to underground mining. Using this, a subsidence map of the Jharia Coalfield was generated due to mining activities and subsidence areas (Figure 11).

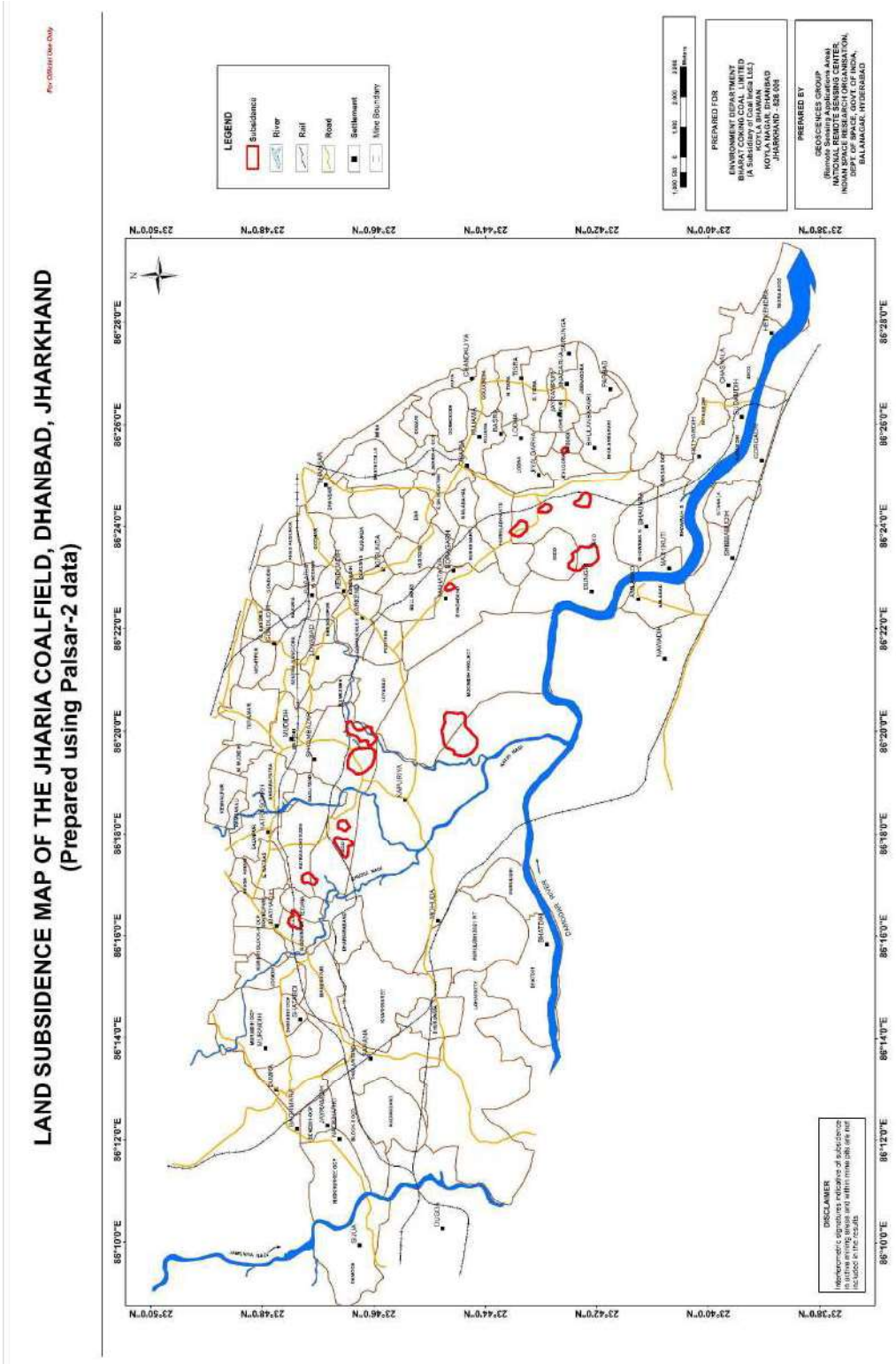


Figure 11: Subsidence map (2017-2020) of the Jharia coal field, Dhanbad.

# *CHAPTER V*

## FIELD WORK

A field work for verification of the coal fire locations and the subsidence zones as identified by the satellite data were taken up during 2nd to 8th August, 2021. Both the coal fire and the subsidence locations were further independently verified by NRSC during the fieldwork. A total of 39 coal fire points and 13 land subsidence locations were identified from the satellite data analysis (figure 12). All 39 points were confirmed to be fire bearing as per the present status of fire in Jharia coalfield. The field observations of coal fire at each location are provided in table 3.

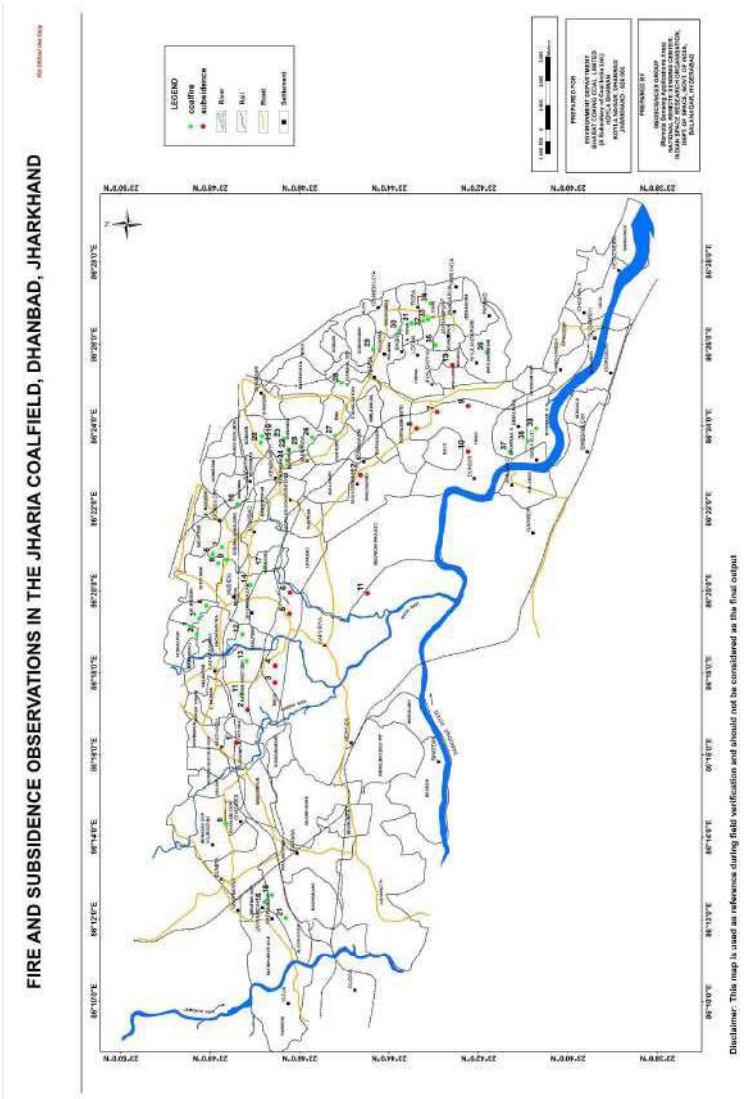


Figure 12. Field data points for coal fire and subsidence verification

Table 3: Summary of field observations (refer figure 12)

| Field observation Point | Mine | Status of Fire (comments)* |
|---|---|---|
| 1 | Keshalpur | Active mine fire |
| 2 | Keshalpur | Active mine fire |
| 3 | W. Mudidih | Active mine fire |
| 4 | W. Mudidih | Active mine fire |
| 5 | Sendra Bansjora | Active mine fire |
| 6 | Tetulmari | Active mine fire |
| 7 | Sendra Bansjora | Active mine fire |
| 8 | Shatabdhi | Old Fire patch (minor fires) |
| 9 | Sendra Bansjora | Active mine fire |
| 10 | Sendra Bansjora | OB dump fire |
| 11 | Katras-Chotudih | Active mine fire (Confirmed by BCCL) |
| 12 | Gaslitand | Active mine fire |
| 13 | Katras-Chotudih | Active mine fire (Confirmed by BCCL) |
| 14 | Mudidih | Active mine fire |
| 15 | Godhar | Active mine fire |
| 16 | Benedih OCP | Active mine fire |
| 17 | Kankanee | Active mine fire |
| 18 | Block II OCP | Active mine fire |
| 19 | Kusunda | Active mine fire |
| 20 | Godhar | Active mine fire (High Risk) |
| 21 | Block II OCP | Active mine fire |
| 22 | Kusunda | Active mine fire |
| 23 | Kusunda | Active mine fire |
| 24 | Alkusha | Active mine fire |
| 25 | Kusunda | Active mine fire |
| 26 | Kusunda | Active mine fire |
| 27 | Ena | OB dump fire (small pockets of active mine fire) |
| 28 | R -OCP | Active mine fire |
| 29 | Goonhodih | Abandoned mine Fire(Fire cutting planned) |
| 30 | NT-ST | OB dump fire (small pockets) |
| 31 | NT-ST | Active mine fire (Ongoing mitigation measures) |
| 32 | NT-ST | Active mine fire (Ongoing mitigation measures) |
| 33 | NT-ST | Active mine fire (Ongoing mitigation measures) |
| 34 | NT-ST | Active mine fire (Ongoing mitigation measures) |
| 35 | Jayrampur | Abandoned mine Fire |
| 36 | Bhulanbarari | OB dump fire |
| 37 | Bhaura | OB dump fire (small pockets of active mine fire) |
| 38 | Bhaura | OB dump fire (small pockets of active mine fire) |
| 39 | Bhaura | OB dump fire (small pockets of active mine fire) |

* *Fire Temperature reading from hand held IR thermometer were seen to be inconsistent due to rains and wet ground condition and hence are not reported.*

*Subsidence location observations*:

1. Subsidence locations as identified by the data are difficult to verify in the field, unless there are tell-tale signatures like large cracks or fissures on the ground or damage to anthropogenic constructions like vertical cracks on building cracks etc.
2. Out of the 13 identified subsidence locations from the microwave data, the main area where subsidence is occurring in a pervasive scale is that in the Moonidih Underground Project. The Moonidih Project is an underground long wall mine where excavations are going on for over decades. This may have resulted in pervasive subsidence in the region. The signatures of subsidence such as sagged ground are observed in the area.
3. Three other minor subsidence areas are identified within the South Govindpur, Bhagaband and Bagdigi mines, where old underground workings are present. However, there was no clear evidence of subsidence from the field based observations.
4. The 9 other locations where subsidence is seen from microwave data, falls within the mining lease of TISCO and IISCO, hence are not under the purview of BCCL mining authorities.

# *CHAPTER VII*

# DISCUSSIONS AND CONCLUSIONS

## 7.1 Discussions

### 7.1.1 Coal fire analysis

The present study is aimed to provide the status of coal fire in the Jharia coal field for the period of 2020. Landsat-8 data of 22 May, 2020 was used to prepare the coal mine fire map (Figure 5) for the year 2020. The data have 100 m spatial resolution in the thermal bands and is as on study date, the best thermal satellite data available. The Coal fire maps of 2020 when compared to map of 2017 (NRSC, 2017) depicts the dynamics of coal fire. Coal fire is difficult to mitigate because of its dynamic nature. But the understanding the trend in the shift of coal fire zones and over all distribution of coal fire will help in environmental and risk management related to coal mining activities.

The coal mine fire map for the year 2020 (Figure 5) illustrates the overall fire distribution in the area. The maps reveal that the coal fires are distributed across the Jharia coal field in pockets associated with major open cast mining activities. All most all the coal mine fires are restricted to the Barakar Formation where coal seams are exposed. In the eastern flank of the arcuate shaped mining extent, the collieries in Tisra (North and South) and Bhaura, Bhulanbarari and R-OCP are affected by multiple small fire pockets. In Bhaura, the fire is seen mostly in OB dumps with minor presence of active mine fires. Similarly in Bhulanbarari, fire is seen in the OB dump only. The North and South Tisra mines have visible presence of fire, mostly manifested by high temperature fume cracks. Active fires are also seen in the R-OCP. Further, towards the north east, in Ena, Alkusha and Kusunda active fires are more prevalent and the area is extensively affected. The highest radiant temperatures (in order of ~50°C) are recorded by the satellite sensors in these areas. In the north, a large number of moderate to small fire pockets are seen in the areas around the related to the mining areas of Katras, Gaslitand, Mudidih and Sendra Bansjora. In the western flank, three distinguishable fire affected zones are seen. Toward the western end of the mining area, the Benedih and Block II OCP are affected by smaller fires from isolated coal seams. An older fire patch is also seen in the Shatabdi mine.

Comparison of the 2020 coal fire map with that of 2017 (NRSC, 2017) indicated the dynamism in the spatial extent and distribution of the coal fires. The changes are highlighted as follows:

i. In reference to the map generated in 2017, the 2020 map shows that the significant decrease of fires in the eastern flank, namely Bhaura, Tisra (North and Soth), Lodna and R-OCP etc. Similar decrease is also observed in Bastacolla and Bhulanbarari.
ii. The areal extent of major fire zone around Kusunda and Ena also appears to have decreased with change in the spatial location of the anomalies. This is probably due to the mitigation and active fire mining in this region.
iii. The fire zones in Benedih/Block II OCP and Shatabdi OCP have also changed/diminished in areal extent with presence of isolated smaller anomalies.
iv. The spatial disposition of fire areas around Katras, Keshalpur, Gaslitand and Mudidih show minor increase. The fire pockets observed in 2017, have given away to a few fire zones of moderate disposition.

In summary, there is a change in the areal disposition of the fires from 2017 to 2020. Satellite and field observations both suggest that there has been an overall decrease in the extent of fire in the JCF. A quantitative comparison of the 2017 and 2020 data was carried out. As compared 2017, when the total fire affected extent of the JCF was about 3.28 $km^2$; in 2020 total fire affected extent is about 1.89 $km^2$ (including TISCO mines).Within the mining lease of BCCL (excluding TISCO) in comparison 2017, when the total fire affected extent of the JCF was about 3.27 $km^2$; in 2020 total fire affected extent is about 1.86 $km^2$. The colliery wise break-up of change in fire area from 2017 to 2020 is given in Annexure-I. Herein, it should be noted that the minimum mapable unit from satellite image it 30m by 30m or 0.0009 $km^2$.

### 7.1.2 Subsidence analysis

An attempt to identify subsidence zones in the Jharia Coalfield was also carried out using ALOS-PALSAR-2 L band microwave data using differential interferometric technique. 5 scenes of PALSAR-2 data spanning over a period of 2017 to 2020 were used to delineate the subsidence if any in the region and separately identify them from the terrain changes due to mining. Verification of the subsidence zones as seen from

data is difficult as it requires visible signatures of subsidence in the form of cracks on the ground and damage to anthropogenic structures. In this study, data analysis and consequent field verification resulted in identification is 4 subsidence areas, within the BCCL mine boundary. Of these, the major area where considerable ground subsidence is occurring is the Moonidih UG project. Long term underground mining has resulted in continuous subsidence in the area. Apart from this, the other three areas are south of South Govindpur, Bagdigi and Bhagaband mines, however, the field evidences of the same are not conclusive. No quantitative estimates of the subsidence have been carried out in the study.

## 7.2 Conclusions

The following conclusions can be made:

1. As of the date of study in the year 2020 and in comparison with the previous study done in 2017, there has been a change in areal extent and disposition of the fire affected areas. On the other hand, persistent subsidence is seen in the Moonidih area due to underground mining activities.
2. Compared to 2012, the eastern flanks (Lodna, Tisra, Bhulanbarai areas) show considerable decrease in fire disposition and the western flank (Shatabdi and Block II area) show diminished fire presence.
3. The fires are continuation of existing fire affected areas as seen in the 2017 study.
4. The mines in Kusunda remain to be the worst affected with maximum presence of active fires.
5. There is a decrease in areal extent of the fire from 2017 to 2020. As compared 2017, when the total fire affected extent of the JCF was about 3.28 $km^2$; in 2020 total fire affected extent is about 1.89 $km^2$ (including TISCO mines). Within the mining lease of BCCL (excluding TISCO) in comparison 2017, when the total fire affected extent of the JCF was about 3.27 $km^2$; in 2020 total fire affected extent is about 1.86 $km^2$.

***Note:*** *The minimum mapable unit from satellite image it 30m by 30m or 0.0009 $km^2$. Estimations of fire extent (in terms of sq.km.) both in 2017 and in the present 2020 study are pixel based. They may differ from the actual ground area under fire. These estimations are made for comparative purpose only, to indicate the increase or decrease of areal disposition of fire. Hence, they should not be quoted as fire area on the ground.*

## *CHAPTER VIII*

# LIMITATIONS

Delineation and mapping of coal fire from thermal data of remote sensing platforms carries with it some inherent limitations which needs to be understood in order to decipher the results obtained from it. This will assist is deducing the correct information and remove any ambiguity associated with the results. The key limitations of the data and the results obtained are as follows:

1) An anomalous pixel from LANDSAT data represents an area of 30m x 30m (resampled from spatial resolution of 100m) on the ground whose temperature is considerably higher than its surroundings. This can be attributed to two circumstances, namely the area has a very high intensity fire located within a smaller pocket or there are a number of low intensity fires spread across it. In both the mentioned cases the actual areal extent of the fire on the surface differs, but appears as a single anomalous pixel in the data. Hence, representation of fire affected ground area by means of pixel area is ambiguous and hence should be considered with caution.

2) There are locations as observed during the fieldwork, where coal seams are affected by active fires along vertical/semi-vertical sections of open cast mines (see cover page). In such cases, the actual areal expression of the fire affected area as seen by the sensor changes considerably and the representation from the same is not accurate.

3) As discussed in section 4.1.2, thresholding the data to separate the fires from the non fire areas, is a statistical technique. However, this method is dependent on how the temperature of non-fire background area is distinctive from the fire temperature.

4) The background temperatures vary with the time of the day when the data are collected, topography, and season of the year when the data is acquired. Night-time data has lower background temperature as compared to day-time. Similarly a data collected in October-November will have a considerably lower background temperature than that collected in May-June due to seasonal temperature variations. Hence, identification of the background temperature range becomes essential in

estimation of threshold temperature and the same varies depending upon the discussed controlling factors.

6) Due to the mitigation measures taking place in various mines, it is seen that in a number of places the fire affected seam is excavated and dumped as overburden. However, these overburden dumps retains the excavated burning coals and thus are seen to have active fires occasionally. There lies a possibility that the same will be identified as anomalous pixels and hence, although the fire is not a part of any active coal seam, it will be included as a fire affected area in the final map.

7) Considering the precision of DInSAR data for different wavelengths, topographic and atmospheric errors, slow subsidence rates may not be detected. Further, the displacement measured is along the line of sight of the sensor and not vertical displacement.

8) Temporal decorrelation and noise due to adverse land use and land cover may affect DInSAR based detection and monitoring of land subsidence. Changes vegetation pattern over time can cause significant decorrelation between the master and slave image, thus producing a very low coherent output. Under such conditions, subsidence information may not be retrieved

9) Verification of the subsidence zones as detected from the interferometric technique is sometimes difficult due to lack in observable signatures of subsidence such as cracks on the ground and damage to anthropogenic structures.

Therefore, in quantitative estimation of fire affected areas and areas denoted as subsidence, the above mentioned limitations needs to be taken into account diligently, as it is inevitable that the area estimate will not define the actual fire/subsidence affected area on the ground. However, the areal extent estimated from the data can be "like to like" compared to earlier estimates of similar studies to understand the change and dynamism of the fire in terms of area affected and spatial disposition.

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***Annexure –I***

Colliery wise break-up of change in fire area from 2017 to 2020

| COLLIERY AREA NAME | FIRE AREA 2017 (SQ. KM.) | FIRE AREA 2020 (SQ. KM.) | AREA CHANGE (SQ. KM.) | Increase/Decrease |
|---|---|---|---|---|
| BENEDIH OCP | 0.045 | 0.020 | -0.026 | DECREASE |
| BLOCK-II OCP | 0.135 | 0.034 | -0.101 | DECREASE |
| MURAIDIH OCP | 0.002 | 0.006 | 0.004 | INCREASE |
| SHATABDI OCP | 0.036 | 0.005 | -0.031 | DECREASE |
| PHULARITAND | 0.021 | 0.000 | -0.021 | DECREASE |
| KATRAS-CHOITUDIH | 0.137 | 0.214 | 0.077 | INCREASE |
| KESHALPUR | 0.001 | 0.134 | 0.132 | INCREASE |
| BASURIA | 0.000 | 0.012 | 0.012 | INCREASE |
| TETULMARI | 0.022 | 0.011 | -0.011 | DECREASE |
| GODHAR | 0.000 | 0.132 | 0.132 | INCREASE |
| INDUSTRY | 0.051 | 0.000 | -0.051 | DECREASE |
| KUSUNDA | 0.740 | 0.399 | -0.340 | DECREASE |
| SENDRA-BANSJORA | 0.027 | 0.110 | 0.083 | INCREASE |
| BASTACOLLA | 0.081 | 0.000 | -0.081 | DECREASE |
| GOLUCKDIH | 0.112 | 0.000 | -0.112 | DECREASE |
| KUJAMA | 0.240 | 0.000 | -0.240 | DECREASE |
| S. JHARIA-R. OCP | 0.112 | 0.010 | -0.102 | DECREASE |
| GONHOODIH | 0.032 | 0.001 | -0.031 | DECREASE |
| ENA | 0.043 | 0.004 | -0.040 | DECREASE |
| N. TISRA | 0.180 | 0.031 | -0.149 | DECREASE |
| LODNA | 0.353 | 0.000 | -0.353 | DECREASE |
| S. TISRA | 0.102 | 0.021 | -0.081 | DECREASE |
| BARAREE | 0.107 | 0.040 | -0.068 | DECREASE |
| KENDUADIH | 0.000 | 0.001 | 0.001 | INCREASE |
| GASLITAND | 0.122 | 0.156 | 0.034 | INCREASE |
| KANKANEE | 0.052 | 0.057 | 0.004 | INCREASE |
| MUDIDIH | 0.110 | 0.220 | 0.110 | INCREASE |
| LOYABAD | 0.006 | 0.000 | 0.079 | DECREASE |
| E.BHUGGATDIH | 0.021 | 0.020 | -0.001 | DECREASE |
| ALKUSHA | 0.029 | 0.046 | 0.016 | INCREASE |
| KUSTORE | 0.046 | 0.014 | -0.032 | DECREASE |
| ANGARAPATRA | 0.015 | 0.036 | 0.021 | INCREASE |
| BHOWRAH. N | 0.098 | 0.006 | -0.092 | DECREASE |
| BAGDIGI | 0.021 | 0.000 | -0.021 | DECREASE |
| JEALGORA | 0.007 | 0.000 | -0.007 | DECREASE |
| JEENAGORA | 0.047 | 0.000 | -0.047 | DECREASE |
| JOYRAMPUR | 0.104 | 0.011 | -0.093 | DECREASE |

| | | | | |
|---|---|---|---|---|
| **TOTAL AREA** | **3.3** | **1.8** | **1.5** | **DECREASE** |

**Note:**

**1) The minimum mapable unit from satellite image it 30m by 30m or 0.0009 $km^2$**

**2) "INCREASE" implies, increase in fire area OR emergence of fire areas not identified in 2017 study**

**3) "DECREASE" implies, decrease in fire area OR fire areas in 2017 not identified in present study** *(either absent or below sensor resolution)*

**4) Values marked in "blue" are collieries where fire has was reported in 2017 study but presently shows no such signatures.**

***Annexure –II***

Figure 13: Active fires in Keshalpur-West Mudidih. (Points 1, 2, 3 & 4 in figure 12)

Figure 14: Active fires in Sendra-Bansjora Mines (Points 5, 6, 7 & 9 in figure 12)

Figure 15: OB dump fires in Sendra Bansjora (Points 10 in figure 12)

Figure 16: Active fires in Godhar-Kusunda Mines (Points 20 to 24 in figure 12)

Figure 17: Fire in R-OCP. (Point 28 in figure 12)

Figure 18: Active fires in N-S Tisra mines (Points 31-33 in figure 12).

Figure 19: Subsidence area in Bagdigi Mines

Figure 20: Subsidence (sag ponds) around Moonidih mine area

***Annexure –III***

Coordinates of Fire locations.

| Mine | UTM_X | UTM_Y | Longitude | Latitude |
|---|---|---|---|---|
| Keshalpur | 430560.28 | 2633068.44 | 86.3183 | 23.8074 |
| Keshalpur | 430287.86 | 2632817.14 | 86.3156 | 23.8051 |
| W. Mudidih | 430935.00 | 2632710.00 | 86.3220 | 23.8042 |
| W. Mudidih | 431468.57 | 2632417.14 | 86.3273 | 23.8015 |
| Kendra Bansjora | 433626.56 | 2632140.94 | 86.3484 | 23.7991 |
| Tetulmari | 433245.00 | 2631915.00 | 86.3447 | 23.7971 |
| Kendra Bansjora | 433899.00 | 2631765.00 | 86.3511 | 23.7958 |
| Shatabdhi | 422415.00 | 2631645.00 | 86.2384 | 23.7942 |
| Kendra Bansjora | 433383.75 | 2631563.75 | 86.3461 | 23.7939 |
| Kendra Bansjora | 435666.92 | 2631113.08 | 86.3685 | 23.7899 |
| Katras-Chotudih | 427797.06 | 2630997.35 | 86.2913 | 23.7886 |
| Gaslitand | 430270.06 | 2630936.18 | 86.3156 | 23.7881 |
| Katras-Chotudih | 429170.29 | 2630763.09 | 86.3048 | 23.7865 |
| Mudidih | 432313.36 | 2630596.98 | 86.3356 | 23.7851 |
| Godhar | 438450.00 | 2630085.00 | 86.3959 | 23.7808 |
| Benedih OCP | 419198.18 | 2630070.00 | 86.2069 | 23.7798 |
| Kankanee | 433072.50 | 2629995.00 | 86.3431 | 23.7797 |
| Block II OCP | 419491.36 | 2629772.73 | 86.2098 | 23.7771 |
| Kusunda | 438532.86 | 2629547.14 | 86.3967 | 23.7759 |
| Godhar | 438187.50 | 2630145.00 | 86.3933 | 23.7813 |
| Block II OCP | 418545.00 | 2629200.00 | 86.2006 | 23.7719 |
| Kusunda | 437910.00 | 2629005.00 | 86.3906 | 23.7710 |
| Kusunda | 438335.37 | 2629195.97 | 86.3948 | 23.7727 |
| Alkusha | 437452.80 | 2629068.00 | 86.3861 | 23.7715 |
| Kusunda | 438007.50 | 2628495.00 | 86.3916 | 23.7664 |
| Kusunda | 438392.33 | 2628011.36 | 86.3954 | 23.7620 |
| Ena | 438465.00 | 2627070.00 | 86.3962 | 23.7535 |
| R -OCP | 440644.55 | 2626785.45 | 86.4176 | 23.7510 |
| Goonhodih | 442050.00 | 2625480.00 | 86.4314 | 23.7393 |
| NT-ST | 442815.00 | 2624385.00 | 86.4389 | 23.7294 |
| NT-ST | 443100.00 | 2623890.00 | 86.4418 | 23.7250 |
| NT-ST | 443205.00 | 2623410.00 | 86.4428 | 23.7206 |
| NT-ST | 443253.33 | 2623211.67 | 86.4433 | 23.7189 |
| NT-ST | 443910.00 | 2623110.00 | 86.4497 | 23.7180 |
| Jayrampur | 442200.00 | 2622915.00 | 86.4330 | 23.7161 |
| Bhulanbarari | 441898.64 | 2620804.77 | 86.4301 | 23.6971 |
| Bhaura | 437768.57 | 2619865.71 | 86.3896 | 23.6884 |
| Bhaura | 438202.50 | 2619131.25 | 86.3939 | 23.6818 |
| Bhaura | 438720.00 | 2618775.00 | 86.3990 | 23.6786 |

भारत कोकिंग कोल लिमिटेड
एक मिनी रत्न कम्पनी
(महारत्न कम्पनी कोल इंडिया का एक उपक्रम)
पंजीकृत कार्यालय : कोयला भवन कोयला नगर
धनबाद–826005
सी आइएन : U10101JH1972GOI000918
महाप्रबंधक का कार्यालय
पश्चिमी झरिया क्षेत्र
पो. मुनीडीह, जिला: धनबाद (झारखण्ड) 828129
फोन नं. 0326 2273483, फेक्स: 0326 2273445 ई-मेल: gmwj.bccl@coalindia.in

Bharat Coking Coal Limited
A Mini Ratna Company
(A Subsidiary of Coal India Limited: A Maharatna Company)
Regd. Off. : Koyla Bhawan, Koyla Nagar
Dhanbad - 826005
CIN : U10101JH1972GO1000918
OFFICE OF THE GENERAL MANAGER
WESTERN JHARIA AREA
PO: MOONIDIH, DISTT: DHANBAD (JHARKHAND) - 828129
PHONE NO: 0326 2273483, FAX NO: 0326 2273445, e-mail : gmwj.bccl@coalindia.in

**EC Cluster-XI Specific Condition no. (xiv) by MoEF –**

The embankment constructed along the river boundary shall be of suitable dimension and critical patches shall be strengthened by stone pitching on the river front side and stabilized with plantation so as to withstand the peak water flow and prevent mine inundation.

**BCCL Submission –**

Moonidih Mine of Bharat coking coal limited is an underground mine. The current underground working are situated at a depth of more than 500 m from surface. The mine working have been designed in such a way that there is no effect of subsidence on the surface.

Damodar River is situated in the south edge of the mine leasehold boundary of Moonidih mine. The underground working of Moonidih mine are situated at a horizontal distance of more than 500 m from the river. There is no opencast mine within the leasehold of Moonidih mine. So there is no danger of inundation of the mine from Damadar River hence this condition is presently not applicable.

13/01/21
AGM
W.J.Area

13-1-2021
GM
W.J.Area

भारतकोकिंगकोललिमिटेड
'एक मिनी रत्न कंपनी'
(कोल इंडिया का एक अंग)
महाप्रबंधक का कार्यालय
पी० बी० क्षेत्र , पो.-कुसुंडा
धनबाद –828116 , (झारखंड)
वेबसाइट :www.bccl.gov.in
ईमेल : gmpb.bccl@coalindia.in,
सी . आई . एन . :U10101JH1972GO1000918

ANNEXURE X

Bharat Coking Coal Limited
*A Mini Ratan Company*
(A Subsidiary of Coal India Limited)
Office of the General Manager
P.B. Area , PO-Kusunda
Dhanbad-828116 (Jharkhand).
Website: www.bccl.gov.in
Email: gmpb.bccl@coalindia.in
CIN:U10101JH1972GO1000918

पत्रसंख्या: भाकोकोलि/पी.बी क्षेत्र/गोपालिचक/परियोजना पदाधिकारी/2024/ 530 दिनांक: 29/04/2024

**सेवा में,**
**वन प्रमंडल पदाधिकारी,**
**धनबाद**

**विषय: Revised Work Order for carrying Compensatory Afforestation of 18000 Trees Near Barakar River (Takipur to Kokrad) outside the leasehold of BCCL.**

**संदर्भ:**
(i) Previous Work Order भाकोकोलि/पी. बी क्षेत्र/गोपालिचक/परियोजना पदाधिकारी/2023/1065 दिनांक: 18.05.2023
(ii) Your letter no. 49 date: 08.01.2024.

माननीय महोदय,

This has reference to above-mentioned previous work order and letters, competent authority has approved revision of the work for carrying **Compensatory Afforestation of 18000 Trees Near Barakar River (Takipur to Kokrad) outside the leasehold of BCCL**, at an revised estimated value of ₹ 13585644.20 (Rupees One Crore Thirty Five lakhs Eighty Five Thousand Six hundred Forty Four and Twenty paisa only) as per the revised estimate provided for 07 years by your good office with the following terms and conditions in respect of above-mentioned work: -

1. The Period of work will be of 07 years which includes advance (preparatory) work, Completion (Plantation) work and subsequent 05 years of maintenance work as per the revised estimate provided by Forest Department.

2. The aforesaid work is to be carried against the Compensatory Afforestation of 18000 trees near **Barakar River (Takipur to Kokrad) outside the leasehold of BCCL**.

3. As per previous work order, an amount of Rs. 73, 72,745.00 was already paid to you vide BCCL/PBA/Gop./23-24/1310 dated: 08.07.2023. Further As per your letter no. 49 date: 08.01.2024, an amount of Rs. 72,61,249.00 is being utilized for advance work (1st year) for the FY 2023-24 and the rest amount of Rs. 1,11,496.00 (Rs. 73,72,745.00 - Rs. 72,61,248.00) will be utilized for completion work for the FY 2024-25.

4. The Forest department shall conduct all its afforestation activities subject to all laws, rules, statutory orders and regulations applicable to the site and the nature of the work.

5. The Forest department shall take up afforestation works with due expertise and supervision as per the scheme & estimates duly sanctioned as per the estimate submitted by the forest department.

6. SCOPE OF WORK
This work shall be done with the following attributes:

(i) Self-sustaining/healthy plantation at the end of the project period.

(ii) The plants planted shall be of native species, high root density, soil binding species, thick canopy and/or fruit bearing. The forest department shall identify such native species and plants at the site with the purpose of regeneration of the forest with native flora and fauna.

(iii) Survival of the plantation shall not be less than 80 per cent at the end of the project period.

7. As the work is to be carried out against Compensatory Afforestation pertaining to P.B Area of BCCL, the regular monitoring by P.B Area official is to be done, therefore, the concerned Forest department officials are required tc co-operate with them.

8. Annual Joint Inspection report of the inspection carried out by joint team of Forest Department and P.B Area officials after the completion of each year work with a report indicating name of the site, year of plantation, number of plants, name of the species present, date of inspection and survival rate.

9. The display boards shall be installed at sites indicating, Compliance details, the name of the company, the nos. of plantation, species planted, name of site of plantation and plantation year.

10. All the materials & manpower required with regard to the aforesaid work shall be arranged by you at your own cost.

11. At the end of the project period, a certificate for successful completion of the project shall be submitted to P.B Area, BCCL.

12. TERMS OF PAYMENT

Total project cost is ₹ 13585644.20 (Rupees One Crore Thirty Five lakhs Eighty Five Thousand Six hundred Forty Four and Twenty paisa only) as per the revised estimate provided by Forest Department. The payment schedule will be as follows: -

| Sl. No. | Year of work | Financial Year | Name of the work | Estimated Amount (₹) by DFO, Dhanbad |
|---|---|---|---|---|
| 1. | 1st Year | 2023-24 | Advance Work | 7261248.91 |
| 2. | 2nd Year | 2024-25 | Completion Work | 1543336.95 |
| 3. | 3rd year | 2025-26 | 1st –Year Maintenance Work | 1419451.81 |
| 4. | 4th year | 2026-27 | 2nd –Year Maintenance Work | 1495115.58 |
| 5. | 5th year | 2027-28 | 3rd –Year Maintenance Work | 723968.49 |
| 6. | 6th Year | 2028-29 | 4th –Year Maintenance Work | 531407.22 |
| 7. | 7th year | 2029-30 | 5th –Year Maintenance Work | 611115.25 |
| **Total** | | | | **13585644.20** |

**Note:**

(i) **For Sl. No. 1**- An amount of Rs. 73,72,745.00 was already paid and As per your letter no. 49 date: 08.01.2024, an amount of Rs. 72,61,249.00 is being utilized for advance work (1st year) for the FY 2023-24 and the rest amount of Rs. 1,11,496.00 (Rs. 73,72,745.00 - Rs. 72,61,249.00) will be utilized for completion work for the FY 2024-25.

(ii) **For Sl. No. 2**: As per your letter no. 49 date: 08.01.2024, The rest amount of Rs. 1,11,496.00 will be utilized for completion work for the FY 2024-25. Therefore, the balance amount of Rs. 14,31,840.95 (Rs. 1543336.95-Rs. 111496.00) will be paid to DFO, Dhanbad for completion work for the FY 2024-25.

13. The Forest department shall pay wages not less than the minimum wages fixed by the Govt of Jharkhand to the labourers engaged in the execution of the aforesaid work and it will be the responsibility of the Forest department to ensure the compliance of the payment of wages to its workmen/labourers as per law and company shall not be held responsible for the same.

14. The estimate has been submitted by Forest Department based on annual increment of 15% on prevailing labour wages of Govt of Jharkhand. However, the payment of Completion work, subsequent years' maintenance work will be made as per the actual labour wages of Govt of Jharkhand prevailing in the corresponding year. Therefore, the forest department shall certify the rate of labour wages for the corresponding year and raise demand letter/ bill based on the actual rates of labour wages to that corresponding year.

15. In case of revision of minimum wages by the Govt of Jharkhand during the work, a revised estimate of the corresponding year of the scheme as per the work order shall be submitted to the company by Forest Department and claim the amount of difference in wages payable due to increase in labour wages on the basis of man days works on revised wage for which the forest department shall certify.

16. **Paying Authority:** AFM, P.B.Area, BCCL

17. All the payment will be made by ELECTRONIC MODE through bank in the account of DFO, Dhanbad.

18. For release of the payment, you have to submit
    a) Utilization certificate of the preceding payment made to you in respect of this work order.
    b) Joint inspection report of preceding year's work.
    c) Demand letter/Bill based on the actual rates of minimum wages by the Govt of Jharkhand to that corresponding year for payment.

    The utilization certificates along with joint inspection report shall be accepted by the accepting authority i.e. Project Officer, P.B Area, BCCL.

19. BCCL shall not have any liability in case of any accident etc. towards Forest Department's personnel/ staffs /workers during the execution of the work.

20. Child labour is prohibited under Mines Act, therefore, child labour shall not be deployed in the aforesaid work.

21. All other conditions stipulated in aforementioned reference letters shall be complied.

22. Matter relating to any dispute or difference arising out of this work order shall be subject to the jurisdiction of Dhanbad court only.

Project Officer

Gopalichuck, P.B.Area

Copy to:-

1. HoD (Env.), BCCL, Koyla Bhawan
2. GM, P.B Area, BCCL
3. AFM, P.B Area, BCCL
4. AM(Env.),P.BArea,BCCL

CM's Secretariat

2546
08/11/18


**भारत कोकिंग कोल लिमिटेड**
एक मिनी रत्न कम्पनी
(कोल इंडिया लिमिटेड का एक अंग)
उप महाप्रबंधक (पर्यावरण) का कार्यालय
कोयला भवन,कोयला नगर, धनबाद-826005
CIN: U10101JH1972GOI000918

**Bharat Coking Coal Limited**
*A Mini Ratna Company*
(A Subsidiary of Coal India Limited)
Office of the Dy. GM (Environment)
Koyla Bhawan, Koyla Nagar, Dhanbad -826005
CIN: U10101JH1972GOI000918


पत्रसंख्या: भाकोकोलि/उपमहाप्रबंधक(पर्या)/फाईल-DFO/2018/3040-3043(H) दिनांक: 03.11.2018

**सेवा में,**
**महाप्रबंधक,**
**सिजुआ/ पीबी/सीवी क्षेत्र**
**भारत कोकिंग कोल लिमिटेड**

महाप्रबंधक
Sl.No. 4112
Date. 8/11/18

**विषय: Work Order for carrying greenery/plantation/afforestation over 54.0 ha of roadside OB dumps of BCCL.**

माननीय महोदय,

Please find enclosed herewith a work order vide no. भाकोकोलि/उपमहाप्रबंधक(पर्या)/फाईल-DFO/2018/1783-1791(H) dt 05.09.2018, awarded to DFO, Dhanbad for carrying greenery/plantation/afforestation over 54.0 ha of roadside OB dumps of BCCL over the roadside OB dumps of which includes the roadside OB dumps of your area for plantation (copy enclosed). The details of the roadside OB dumps identified for for greenery/plantation/afforestation activities.
Is as follows:

| S No | Name of the site | Type | Ha |
|---|---|---|---|
| 1 | Gopalichak (Near Nehru Park) | OBD | 7 |
| 2 | Gopalichak (Near Ekra River) | OBD | 5 |
| 3 | Basdeopur (Near Jore) | OBD | 6 |
| 4 | Dahibari, CV Area | OBD | 10 |
| 5 | Loyabad, Right side of the road (09 no. Near Loyabad Rly stn) | OBD | 16 |
| 6 | Loyabad, left side of the road (09 no. Near Loyabad Rly stn) | OBD | 10 |
| | TOTAL | | 54 |

Further, it is to inform you that DFO, Dhanbad has accepted the aforesaid work order and the payment to DFO, Dhanbad has also been processed at our end. Therefore, it is requested to handover the roadside OB dumps of your area as mentioned in the work order to DFO, Dhanbad for greenery/plantation/afforestation activities.

This is for your kind information.

AGM
AM (Env.)
P.O. Gopalichak
Urgent.
9/11/18

3/11/18
उपमहाप्रबंधक (पर्यावरण)

भारत कोकिंग कोल लिमिटेड
एक मिनी रत्न कम्पनी
(कोल इंडिया लिमिटेड का एक अंग)
उप महाप्रबंधक (पर्यावरण) का कार्यालय
कोयलाभवन,कोयलानगर, धनबाद-826005
826005 CIN :
CIN : U10101JH1972GOI000918

**Bharat Coking Coal Limited**
*A Mini Ratna Company*
(A Subsidiary of Coal India Limited)
Office of the Dy. GM (Environment)
Koyla Bhawan, Koyla Nagar, Dhanbad -
U10101JH1972GOI000918

पत्रसंख्या: भाकोकोलि/उपमहाप्रबंधक(पर्या)/फाईल-DFO /2018/1783 - 1791/H) दिनांक: 05.09.2018

**सेवा में,**
**वन प्रमंडल पदाधिकारी,**
**धनबाद**

**विषय :** **Work Order for carrying greenery/plantation/afforestation over 54.0 ha of roadside OB dumps of BCCL.**

**संदर्भ:** (i) Our offer letter no.भाकोकोलि/उपमहाप्रबंधक (पर्या)/संचिका-Greenery roadside OB dumps /17/3629-3632/ (H) dt 22.12.2017
(ii) Your letter no.920, dated 07.06.2018
(iii) Our letter no.भाकोकोलि/उपमहाप्रबंधक (पर्या)/संचिका-DFO /18/1129-1131/(H) dt 19.06.2018
(iv) Your letter no.nil, received on 25.06.2018

Dear Sir,

This has reference to above mentioned letters, Competent Authority has approved DFO, Dhanbad for carrying greenery/plantation/afforestation over 54.0 ha of roadside OB dumps of BCCL, for a total value of Rs. 14091475.99 (Rupees One crore forty lakhs ninety one thousand four hundred seventy five and ninety nine paisa only) for four years with the following terms and conditions in respect of above mentioned work:-

1. The Period of work from the date of acceptance of work order will be 04 years.

2. The aforesaid work is to be carried out at below mentioned sites:

| S No | Name of the site | Type | Ha |
|---|---|---|---|
| 1 | Gopalichak (Near Nehru Park) | OBD | 7 |
| 2 | Gopalichak (Near Ekra River) | OBD | 5 |
| 3 | Basdeopur (Near Jore) | OBD | 6 |
| 4 | Dahibari, CV Area | OBD | 10 |
| 5 | Loyabad, Right side of the road (09 no. Near Loyabad Rly stn) | OBD | 16 |
| 6 | Loyabad, left side of the road (09 no. Near Loyabad Rly stn) | OBD | 10 |
| | TOTAL | | 54 |

3. The Forest department shall conduct all its afforestation activities subject to all laws, rules, statutory orders and regulations applicable to the site and the nature of the work.

4. The Forest department shall take up afforestation works on company's land with due expertise and supervision as per the scheme, estimates duly sanctioned as per the estimate submitted by forest department (The estimate has been submitted by Forest Department considering 15% enhancement in labour rate on labour rate of preceding year).

5. The payment of Completion work, first maintenance year work and second maintenance year work will be made as per the actual wages of labours of that year.

6. The Forest department shall exercise precautions on the aid and advice of the company for the safety of all lives and properties involved in the afforestation activities.

7. **SCOPE OF WORK:**

This work shall be done with the following attributes:

(i) Self-sustaining / healthy plantation at the end of project period/ at the handover of the site.

(ii) The plants planted shall be of native species, high root density, soil binding species, thick canopy and/or fruit bearing. Name of some of the species are as follows. The following native species shall preferably but not limited to be planted:

| S.No. | Botanical Name | Common name | S.No. | Botanical Name | Common name |
|---|---|---|---|---|---|
| 1. | *Ailanthus excelsa* | Mahanim | 2. | *Ficus hispida* | Kath gular |
| 3. | *Albizzia lebbeck* | Siris | 4. | *Ficus religiosa* | Pipal |
| 5. | *Alstonia scholaris* | Chatni | 6. | *Albizia Procera* | Safed Siris |
| 7. | *Azadirachta indica* | Neem | 8. | *Madhuca indica* | Mahua |
| 9. | *Bombax ceiba* | Semal | 10. | *Melia composita* | Bakain |
| 11. | *Butea monosperma* | Palas | 12. | *Tamarindus indica* | Imli |
| 13. | *Cassia fistula* | Amaltas | 14. | *Terminalia arjuna* | Arjun |
| 15. | *A. Odoratissima* | Kala Siris | 16. | *Aegle marmelos* | Bel |
| 17. | *Dalbergia sissoo* | Shisham | 18. | *Mangifera indica,* | Aam |
| 19. | *Ehretia laevis* | Chamror | 20. | *Zizyphus nummularia* | Ber |
| 21. | *Ficus glomerata* | Gular | 22. | Embilica officianlis | Awala |
| 23. | *Syzygium cumini* | Jamun | 24. | Anthocephalus indicus | Kadamb |
| 25. | *Acacia Catechu* | *Desi Kher* | 26. | Gmelina arbora | Gamhar |
| 27. | And other fruit bearing native species plants suitable | | | | |

(iii) Survival of the plantation shall not be less than 80 per cent at the end of the project period.

8. Annual Joint Inspection report of the inspection carried out by joint team of Forest Department and BCCL personnel after the completion of each year work should indicate name of the site, year of plantation, number of plants, name of the species present, date of inspection and survival rate.

9. The display boards shall be installed at all the plantation sites indicating, the name of the company, the no. of plantation, species planted, name of site of plantation and plantation year.

10. All the materials & manpower required with regard to the aforesaid work shall be arranged by you at your own cost.

11. The Forest department shall pay wages not less than the minimum wages fixed by the Govt of Jharkhand to the labourers engaged in the execution of the aforesaid work and it will be the responsibility of the Forest department to ensure the compliance of the payment of wages to its workmen/labourers as per law and company shall not be held responsible for the same.

12. In case of revision of minimum wages by the Govt of Jharkhand during the aforesaid work, a revised estimate of the scheme for the aforesaid work order along with Govt. Notification of Revised wages rates should be forwarded to the company without delay by the Forest department to amend the cost of the work. The Forest department then shall claim the amount of difference in wages payable due to increase in labour wages on the basis of man days works on revised wage for which the forest department shall certify.

13. As the afforestation work has been directly monitored by Ministry of Coal, every year on monthly basis; therefore, you will provide the plantation data from June 2019 to October 2019 on monthly basis during the completion year (2019-20).

14. **TERMS OF PAYMENT**

Total project cost is Rs. 14091475.99 (Rupees One crore forty lakhs ninety one thousand four hundred seventy five and ninety nine paisa only). The payment schedule will be as follows: -

| S. No | Financial Year | Details of the work | Amount (Rs.) | Remarks |
|---|---|---|---|---|
| 1. | 2018-19 | Advance Work | 5385462.81 | Wages @ Rs 237.38 per MD |
| 2. | 2019-20 | Completion work | 4967042.40 | Wages @ Rs 264.38 per MD |
| 3. | 2020-21 | Maintenance work-1 | 2126720.55 | Wages @ Rs 304.03 per MD |
| 4. | 2021-22 | Maintenance work-2 | 1612250.23 | Wages @ Rs 349.63 per MD |
| **Total** | | | 14091475.99 | |

15. The estimate calculated for the Completion work, Maintenance work-1 and Maintenance work-2 is based on the tentative increase in the labour wages @ 15% of preceding year's wages as submitted in the estimate by the Forest Department. Therefore, the forest department shall certify the rate of labour wages for the corresponding year and demand letter/ bill based on the actual rates of labour wages to that corresponding year.

16. **Paying Authority:** HOD (Pay), Pay Office, BCCL HQ, Koyla Bhawan, Dhanbad.

17. All the payment will be made by ELECTRONIC MODE through bank in the account of DFO, Dhanbad. You are required to fill the format of Electronic Fund Transfer (EFT) in triplicate which is enclosed as annexure-A.

18. For release of the payment, you have to submit
    a) The letter of acceptance of the work order along with the Demand letter/Bill for the Advance work.

2 Set

And for further payments regarding this work order

a) Utilization certificate of the preceding payment made to you in respect of this work order
b) Joint inspection report of preceding year's work.
c) Demand letter/Bill based on the actual rates of labour wages to that corresponding year for payment.

The utilization certificates along with joint inspection report shall be accepted by the accepting authority i.e. Dy. GM (Env)/ HOD (Env), BCCL.

19. BCCL shall not have any liability in case of any accident etc. towards Forest Department's personnel/ staffs /workers during the execution of the work.

20. Child labour is prohibited under Mines Act, therefore, child labour shall not be deployed in the aforesaid work.

9/9/12

उप-महाप्रबंधक (पर्यावरण)

Copy to:-

1. TS to D (T) OP/ D(T) PP, BCCL..... for kind information please.
2. GM (Vigilance), BCCL..... .....for kind information please.
3. CGM (Environment), CIL, Kolkata. ..... for kind information please.
4. HOD, (Pay)/ In-charge Pay Office, BCCL HQ, Koyla Bhawan, Dhanbad.
5. Master File/Office Copy

19/9/12

उप-महाप्रबंधक (पर्यावरण)

# CSR, R&R and Transportation Plan of Cluster XI

## As per EC Condition

## (Specific Condition No XVIII)

Details of transportation, CSR, R&R and implementation of environmental action plan for each of the 17 clusters

Should be brought out in a booklet form

**Bharat Coking Coal Limited**

*(A Mini Ratna Company)*

**P.B Area**

**Dhanbad**

# UNDERSTANDING THE SCOPE OF CSR INTERVENTION

## (BASELINE STUDY REPORT)

FOR

BHARAT COKING COAL LTD. (BCCL)

DHANBAD

BY-

NATIONAL CORPORATE SOCIAL RESPONSIBILITY HUB

TISS, MUMBAI

25th NOVEMBER 2013

# CIL'S POLICY FOR CORPORATE SOCIAL RESPONSIBILITY (CSR)

## Introduction

Mining of coal has profound impact on the people living in and around the areas where the mines are established. The obvious impact of the introduction of any production activity in such areas change the traditional lifestyle of the original inhabitants and indigenous communities and also change the socio-economic profile of the Area. Hence, the primary beneficiaries of CSR for the company are:

- Land oustees
- PAPs and
- Those staying within the radius of 25 Kms of the Project.

Poor and needy section of the society living in different parts of India are the second beneficiaries.
In the aforesaid backdrop, policy on Corporate Social Responsibility of CIL has been framed after incorporating the features of the Companies Act 2013 and as per notification issued by Ministry of Corporate Affairs, Govt. of India on 27.02.2014 as well as DPEs guidelines and broadly covers the following: -

a) Welfare measures for the community at large, so as to ensure the poorer section of the Society derived the maximum benefits.
b) Contribution to the society at large by way of social and cultural development, imparting education, training and social awareness especially with regard to the economically backward class for their development and generation of income to avoid any liability of employment.
c) Protection and safeguard of environment and maintaining ecological balance.

## Objectives

The main objective of CSR policy is to lay down guidelines for the coal companies to make CSR a key business process for sustainable development for the society. It aims at supplementing the role of the Govt. in enhancing welfare measures of the society based on the immediate and long term social and environmental consequences of their activities. CIL will act as a good Corporate Citizen, subscribing to the principles of Global Compact for implementation.

## Areas Covered under CSR

- The poor and needy Section of the Society living in different parts of India are covered.
- The CSR Programme also covers the existing components of Special Component Plan (SCP) and Tribal Sub Plan (TSP) for development of the SC and ST population besides development components for the entire population.

80% of the budgeted amount is spent within the radius of 25 Km of the Project Site/Mines/Area HQ/Company HQ and 20% of the budget is spent within the State.

**Allocation of Fund**

The fund for the CSR is allocated based on 2% of the average net profit of the Company for the three immediate preceding financial years or Rs. 2.00 per ton of Coal Production of previous year whichever is higher.

**Scope**

As per Schedule VII of New Companies Act 2013, the following are the Scope of Activities under Corporate Social Activities:

i) Eradicating hunger, poverty and malnutrition, promoting healthcare including preventive health care and sanitation and making available safe drinking water.

ii) Promoting education, including special education and employment enhancing vocation skills especially among children, women, elderly, and differently abled and livelihood enhancement projects;

iii) Promoting gender equality, empowering women, setting up homes and hostels for women and orphans, setting up old age homes, day care centers and such other facilities for senior citizens and measures for reducing inequalities faced by socially and economically backward groups;

iv) Ensuring environmental sustainability, ecological balance, protection of Flora and Fauna, animal welfare, agro-forestry, conservation of natural resources and maintaining quality of soil, air and water;

v) Protection of national heritage, art and culture including restoration of buildings and sites of historical importance and works of art; setting up public libraries, promotion and development of traditional arts and handicrafts;

vi) Measures for the benefit of armed forces veterans, war widows and their dependents

vii) Training to promote rural sports, nationally recognized sports, Paralympics sports and Olympic sports;

viii) Contribution to the Prime Minister's National Relief Fund or any other fund set up by the Central Government for socio-economic development and relief and welfare of the Scheduled Castes, the Scheduled Tribes, other backward classes, minorities and women;

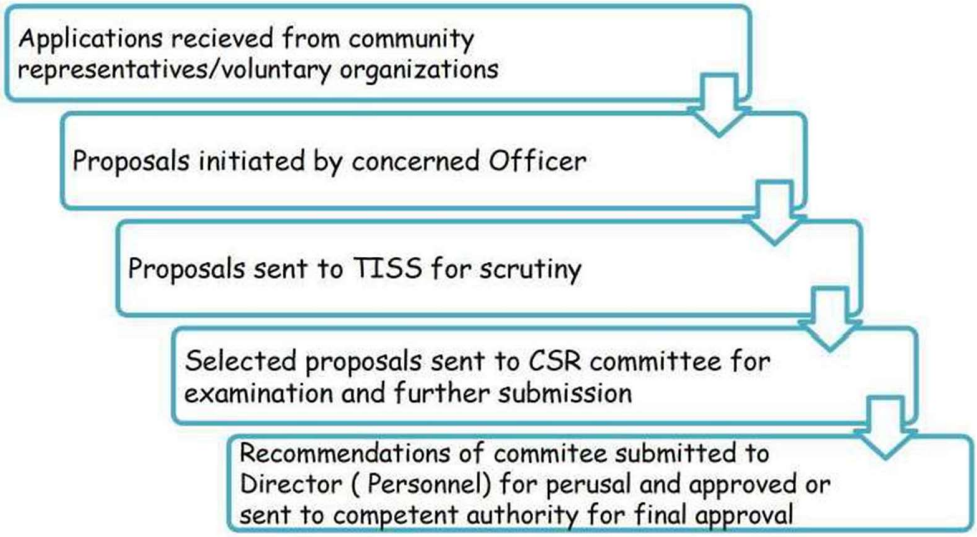
ix) Contributions or funds provided to technology incubators located within academic institutions which are approved by the Central Government;

x) Rural development projects

**Implementation**

- The investment in CSR is project based and for every project time framed periodic mile stones should be finalized at the outset.
- Project activities identified under CSR are implemented by Specialized Agencies. Specialized Agencies are made to work singly or in tandem with other agencies. Specialized agencies that are included presently for implementation of CSR projects in Cluster VII are through Contracted agencies for civil works.

**Institutional Arrangement**



**Baseline study done by TISS (Putki Balihari Area)**

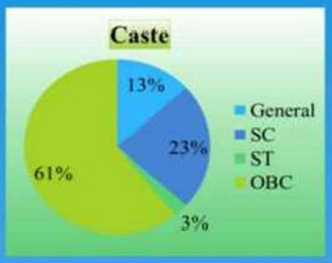
**KENDUAHDIH**

## Tola: Kenduahdih (Ward 12 ) | Panchayat: Kenduahdih | Block: Dhanbad | District: Dhanbad

| Census Year | 2001 |
|---|---|
| Households | 150 |
| Population | 1300 |

**Religion**

**Caste**




| Source of water | |
|---|---|
| Irrigation | None |
| Drinking Purpose | Tank, Public and private tap |

**Crop Grown**

Paddy
Maize
Wheat
vegetables

| Migration Pattern | |
|---|---|
| Location | Status |
| Outside State (Agri Labour) | Few |

**Sources of Livelihood**

Own farm activities
Agricultural labour
Non-agri labour (rural)
Salaried employment
Petty business/trade
Collect & sale forest/mining products, factory labor
Rent/pension/remittance

**Recreation / Common Facilities**

Playground
Samaaj Mandir
Cremation Place, community hall

**Accessibility to Forest/Mining Produce**

Coal Collection, Firewood
Cultivation

**Common Transport Facilities**

Motor Cycle
Bicycle

**Facilities Located in Villages**

Cemented tar road
PDS Shop
Grocery Shop
Pre-Pri/Nursery School
Govt Primary School
Pvt. Primary School
Govt Secondary School
Higher Sec School
Pvt Clinic (RMP+)
Asha worker
Dai

**Facilities Located More Than 5 Kms**

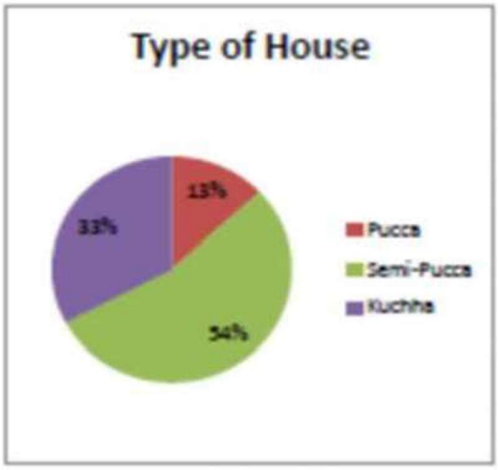
Weekly Market
Block Development Office (Dhanbad)
District Headquarters (Dhanbad)
Warehouse (Dhanbad)
APMC/Mandi (Dhanbad)
ITI/Polytechnic(Dhanbad)
Health Sub – Centre (Karkend Mor)
Primary Health Centre(Dhanbad)
Veterinary Clinic(Karkend Mor)

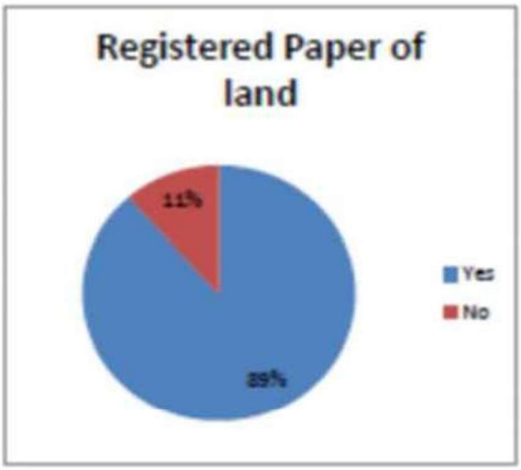
**Facilities Located Within 5 Kms**

Bus Stop (Putki)
Daily Evening Market (Boragarh)
DTP/Xerox (Bhagabandh)
Post Office (Bhagabandh)
Railway Station (Bhagabandh)
Police Station (Putki)
Gram Panchayat Office (South Balihari)
Cooperative Society (Putki)
Bank for S/B account (Bhagabandh)
Degree College(Jharia)
CHC Govt /Gen Hospital (Bhagabandh)
Private Hospital (Bhagabandh)
Medical Shop/Chemist (Bhagabandh)

**HOUSEHOLD STATUS**

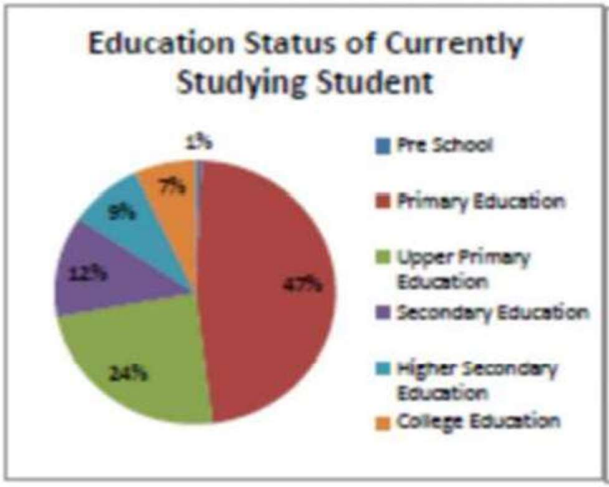
### 4.10.1.1 HOUSEHOLD STATUS

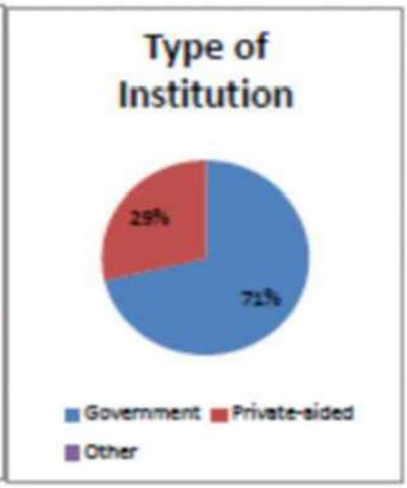



In Kenduahdih Basti, 40% of the households are found to be Semi- Pucca while 48% are Kuchha and 12% are Pucca. 95% of the houses are registered while only 5% was found to be non-registered. Nearly 85% of the houses in this village are electrified.

### 4.10.1.2 EDUCATION




In Kenduahdih Basti, it has been found that 35% of the students are enrolled in Primary education followed by 28% in Upper primary, 10% in secondary education, and 5% in higher secondary, 3% in college. Education after 12th standard is found comparatively less with any

**Major Problems and Recomendations**

| Area | Major problems and Recommendations |
|---|---|
| **Education** | There is no road which can join schools to main working road |
| | No electricity and in-house circuiting of lights and fans in the class room of primary school |
| | Shakti Nath Mehto School needs school boundary and toilet in school premises |
| **Water Supply** | Pipeline already exists in this village. More number of pipelines are required in Harijan Basti of Kenduahdih |
| **Health Care** | Mobile medical Van should treat children every month in primary school |
| | Maternity health camp should be initiated through MMV |
| **Social Empowerment** | Nearly 5-6 SHG has been identified in this village. SHG *(Ma Sarazwati Mahila Samuh)* already exist in the village. They need are trained in agriculture. They need support of land to start collective farming of horticultural crops. They are also trained in preparation *Agarbatti* and bangles made from lac. |
| | Vocational training school for girls and boys is needed in this village. School building of Shakti Nath Mehto School can be used for providing vocation al training center in the weekends or after the school hours with prior permission of the school administration. Not only that the training center for women to start small enterprise can be establish in the same school premises. |
| **Sanitation** | No toilets in any of the households. Toilets is needed to construct |
| **Infrastructural Development** | There *Kuccha* road in the village which creates problem during rainy season |
| | On hand pump/tap point is needed in ICDC |
| | One kitchen room is required in primary school |
| | Playground boundary in needed with gate in primary school |

**Bhagabandh**

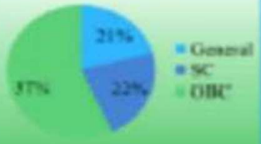
## 4.10.2 BHAGABANDH

**Tola: Bhagabandh(Ward 12 ) | Panchayat:Bhagabandh| Block: Dhanbad | District: Dhanbad**

| Census Year | 2001 |
|---|---|
| Households | 720 |
| Population | 4409 |

**Religion**

**Caste**




**Source of water**

| | |
|---|---|
| Irrigation | None |
| Drinking Purpose | Tank, public and private tap |

**Migration Pattern**

| Location | Status |
|---|---|
| Outside State (Agri Labour) | Rarely |

**Sources of Livelihood**

Own farm activities
Cattle rearing
Non-agri labour (rural)
Salaried employment
Petty business/trade
Collect & sale forest/mining products, factory labor
Rent/pension/remittance

**Crop grown**

Paddy
Maize
Vegetables

**Accessibility to Forest/Mining Produce**

Coal Collection, fire wood
Cultivation

**Common Transport Facilities**

Motor Cycle, Share Auto
Bicycle

**Recreation / Common Facilities**

Playground
Samaj Mandir
Cremation Place

**Facilities Located Within the village**

Cemented tar road
Grocery Shop
DTP/Aanik
PDS Shop
Post Office
Bank for S/B account
Pre-Pri/Nursery School
Govt Primary School
Govt Secondary School
Pvt. Secondary School
CHC Govt /Gen Hospital
Pvt Clinic (MBBS/BAMS+)
Medical Shop/Chemist
Asha worker
Dai(Trained/Untrained)
Pvt Clinic (RMP+)

**Facilities Located with 5 kms**

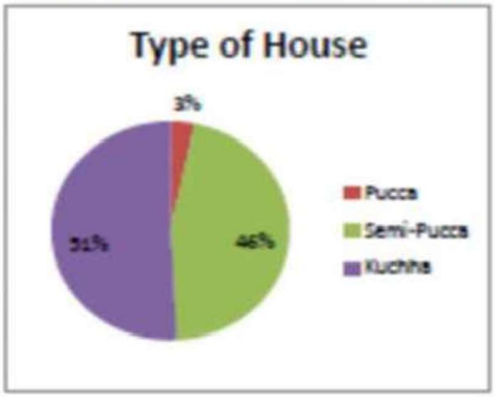
Bus Stop (Putki)
Daily Evening Market (Putki)
Weekly Market (Putki)
Police Station (Putki)
Veterinary Clinic (Putki)
Health Sub – Centre (Putki)

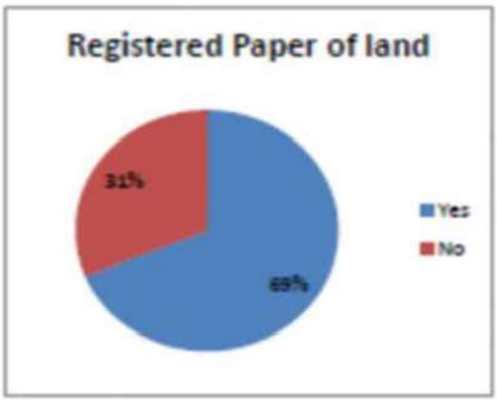
**Facilities Located more than 5 kms**

Railway Station (Dhanabd)
Block Development Office (Dhanabd)
District Headquarters (Dhanabd)
Warehouse (Dhanabd)
APMC/Mandi (Dhanabd)
Degree College (Dhanabd)
Primary Health Centre (Dhanabd)

**Household Status**

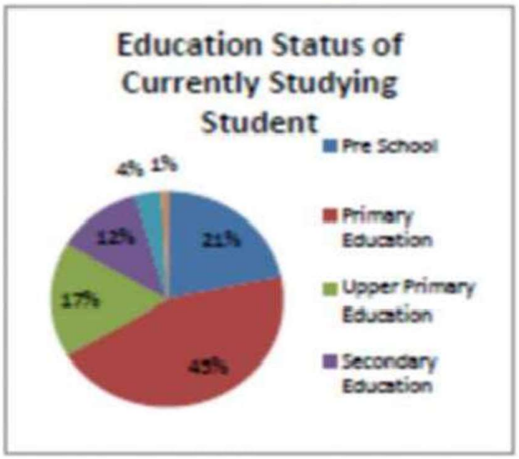
### 4.10.2.1 HOUSEHOLD STATUS

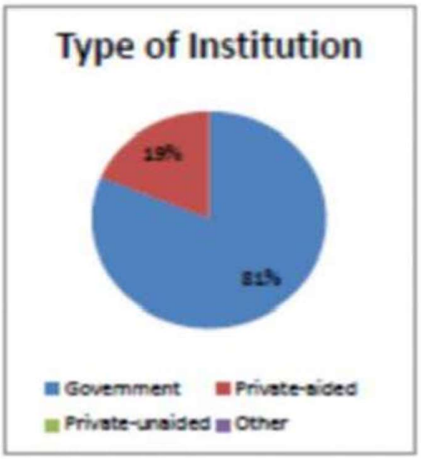



In Bhagabandh Village, 3% of the sample is living in pucca house and 51% were having kuccha house while 46% were having semi -pucca house. Among the sample 69% of the people have registered paper of land while 31% of them do not have registered paper of land. 94% of the sample is living in electrified.

### 4.10.2.2 EDUCATION




In Bhagabandh Village, status of education does not seem positive as far as college education is considered, only 1% of the children among sample households are found at the time of data collection enrolled in higher education. Among the students of sample households who are currently studying, 45% are currently studying in primary school, 17% are in upper primary school, 12% in secondary school and another 4% is studying in

## Major Problems and Recommendations

| AREA | MAJOR PROBLEMS AND RECOMMENDATIONS |
|---|---|
| Education | There should scholarship for the children belongin to underprivileged section of the society who is going for education after matriculation to schools of Dhanbad by BCCL |
| | Library is required in this village |
| | Evening school has been requested by the people |
| Water Supply | More number of tap points are required in Manjhi Tola of Bhagabandh Basti |
| Health Care | Maternity health ccmpa |
| | Regular check-up of primary school children |
| Rural Electrification | School should have in-house electric fitting of fans and light |
| Sports & Culture | Sports equipment should be provided to the sports club |

| | |
|---|---|
| Sanitation | No toilets in houses. |
| | There should be provision for garbage disposal By BCCL at regular interval along with fumigation |
| | Ponds should be cleaned with involving community by providing them daily wage as followed in MNREGS |
| Social Empowerment | SHG for women and men should be formed to start Income Generation activity |
| | Group activity on Piggery and poultry has been requested by the people. But for that a formal group has to be formed who have to register in the local bank |
| | Women who are not getting widow pension should be supported with livestock's like poultry, duckery and goatry |
| Infrastructural Development | Playground for children with boundary |
| | Repair of damage road should be done so that medical vans or ambulance should reach at the door step for pregnant women |
| | Playground with boundary should be constructed |
| | There is requirement of High school covering students from nearby villages like Bhagabandh. It can be done constructing additional school building in government secondary school in the village itself |

## CSR Activities (April, 2020 to March, 2021)

### Relief work during Lockdown:

P.B Area through its CSR initiative carried out relief work within peripheral villages/wards in the form of distribution of dry ration and hygiene kits since phase one of Coronavirus induced lockdown

The kits were distributed to the poor needy families of the community affected due to Covid-19 lockdown. Both ration kit and hygiene kit consisted of basic items; while ration kit had Sattu Chana, Gur, Chura and Biscuits, hygiene kit included mask and soap. Covid-19 awareness sessions were also organized on social distancing, hand washing techniques and wearing mask in crowded places. Total 1000 ration kits distributed among needy families and 500 hygiene kits distributed among communities residing nearby villages of P.B Area office and Collieries.

**A. Expenditure incurred in distribution of Ration Packet, Face Mask & Soap under CSR:**

| Sl. No. | Item | No. of Units Distributed | Expenditure (in Rs.) | Sanctioned Amount from HQ | Remarks |
|---|---|---|---|---|---|
| 1. | Ration Packet | 1000 | 1,99,500 | 2,00,000 | |
| 2. | Face Mask | 500 | 11,025 | 15,000 | Remaining amount returned to HQ CSR Fund |
| 3. | Soap | 500 | 12,375 | 34,840 | |

**Details of ward/ panchayat wise No. of Beneficiaries covered for Food Packets**

| Area of BCCL | Name of Panchayat/Ward No. | Name of Village/ward | No. of Beneficiaries covered for Food Packet (APPROX.) |
|---|---|---|---|
| P.B Area | Aralgaria | Aralgaria | 40 |
| P.B Area | Ward No. 10 | Bhagabandh | 73 |
| P.B Area | Ward No. 10 | Kenduadih Basti | 47 |
| P.B Area | Ward No. 12 | Kendua Bazar | 58 |
| P.B Area | Ward No. 09 | Kerkend | 33 |
| P.B Area | Ward No. 35 | Burragarh | 25 |
| P.B Area | Ward No. 35 | Surrendranagar | 45 |
| P.B Area | Ward No. 11 | Khaira | 54 |
| P.B Area | Ward No. 11 | Kenduadih | 68 |
| P.B Area | Ward No. 09 | Gopalichak | 30 |
| P.B Area | Aralgaria | Bauri Basti | 70 |
| P.B Area | Ward No. 12 | Kendua Bazar/EB Section | 100 |
| P.B Area | Ward No. 10 | South Balihari | 50 |
| P.B Area | Ward No. 10 | Khapra Dhowra | 28 |
| P.B Area | Ward No. 10 | Tina Dhowra | 25 |
| P.B Area | Ward No. 11 | BNR Kustore | 27 |
| P.B Area | Aralgaria | Singh Tola | 20 |
| P.B Area | Pandarkanali | Dhobni, Parasia, Pandarkanali | 77 |
| P.B Area | Sialgudri | Sialgudri | 80 |
| P.B Area | Ward No. 12 | Kendua No 4 | 50 |
| **Total** | | | **1000** |

| Details of ward/ panchayat wise No. of Beneficiaries covered for Face mask & Hand Wash/Soap | | | | |
|---|---|---|---|---|
| **Area of BCCL** | **Name of Panchayat/Ward No.** | **Name of Village/ward** | **No. of Beneficiaries for face masks** | **No. of Beneficiaries for Dettol soap** |
| P.B Area | Aralgaria | Aralgaria | 47 | 47 |
| P.B Area | Ward No. 10 | Bhagabandh, Kenduadih basti & Station Dhawra | 100 | 100 |
| P.B Area | Ward No. 10 | Bihibari & Orao Patti | 46 | 46 |
| P.B Area | Ward No. 12 | Kendua Bazar & EB Section | 65 | 65 |
| P.B Area | Ward No. 11 | Khaira & Kenduadih | 82 | 82 |
| P.B Area | Pandarkanali | Dhobni, Parasia & Pandarkanali | 85 | 85 |
| P.B Area | Sialgudri | Sialgudri | 75 | 75 |
| **Total** | | | **500** | **500** |

- Amount of Rs 17178/- was spent towards celebration of Har Ghar Tiranga.

- **CSR Expenditure in FY 2024-25 :**

| Sl. No. | Name of Project | Total Cost(in Rs.) |
|---|---|---|
| 1. | Providing and fixing Water Purifier cum Cooler in Government School PB Area | 146,779/- |
| 2. | Providing and fixing solar lights in nearby villages of PB Area | 1717410/- |
| 3. | Providing and fixing ceiling fans in Government Schools in Putki Madhya Vidyalaya and Kustore Madhya Vidyalaya | 106,560/- |

- A Proposal for Rejuvenation of Shiv Shankar Nagar Pond is under process.

Bluescent
100% COPPER

Bluescent
100% COPPER

FRUITS
BANANAS
MANGO आम
GRAPES अंगूर
FLOWERS
LILY कुमुदिनी
ROSE गुलाब
LOTUS कमल
VEGETABLES
TOMATO
PEA मटर
GOURD
WEEK NAME
SUNDAY
MONDAY
TUESDAY
WEDNESDAY
THURSDAY
FRIDAY
SATURDAY
MONTH NAME
JULY
AUGUST
SEPTEMBER
OCTOBER
NOVEMBER
DECEMBER
MARCH
APRIL
MAY
1 से 100 तक

SAY No
To Violence

# Transportation Route

| Sl. No. | Mine | Existing siding | Other Transport Sites | Existing Transport distance (in KM) | Avg. Capacity of Dumper (T) |
|---|---|---|---|---|---|
| 1. | Gopalichuck OC | Burragarh | | 5 9 | 25 |
| | | | Belatand Tata Washery | 9-10 | 28 5 |
| | | | Jamadoba Tata Washery | 9-10 | 28 5 |
| *It includes departmental and contractual transportation | | | | | |

## CSR Budget & Expenditure Summary from 2015-16 to 2020-21

| Sl. No. | Fin. Yr. | Obligation as per CSR Policy of Company (₹ in crores) | Expenditure (₹ in crores) |
|---|---|---|---|
| 1 | 2015-16 | 33.01 | 50.67 |
| 2 | 2016-17 | 26.85 | 11.45 |
| 3 | 2017-18 | 9.98 | 2.74 |
| 4 | 2018-19 | 6.52 | 1.43 |
| 5 | 2019-20 | 6.21 | 6.01 |
| 6 | 2020-21* | 5.54 | 2.39 |

***Unaudited/ provisional expenditure for the FY 2020-21***

## Details of CSR expenditure incurred by BCCL in FY 2021-22

**CSR Budget: ₹ 4.93 Cr**

| Sl No | CSR Projects identified | Sector in which the Project is Covered | Local area (Yes/No). | Location of the project | | Amount spent for the project (₹ lakhs) | Mode of implementation-Direct (Yes/No). |
|---|---|---|---|---|---|---|---|
| | | | | State | District | | |
| 1 | Financial assistance to D.C., Dhanbad for combating COVID-19 situation in Dhanbad | Eradicating hunger, poverty and malnutrition, promoting preventive health care and sanitation including contribution to the Swachh Bharat Kosh set-up by the Central Government for the promotion of sanitation and making available safe drinking water.<br><br>Disaster Management, including relief, rehabilitation and reconstruction activities. | Yes | Jharkhand | Dhanbad | 100.00 | Yes |
| 2 | Financial assistance to Jharkhand State Disaster Mitigation Fund for distributing home isolation kits to COVID-19 patients | Eradicating hunger, poverty and malnutrition, promoting preventive health care and sanitation including contribution to the Swachh Bharat Kosh set-up by the Central Government for the promotion of sanitation and making available safe drinking water.<br><br>Disaster Management, including relief, rehabilitation and reconstruction activities. | Yes | Jharkhand | Dhanbad | 25.00 | Yes |
| 3 | Procurement of masks & hand wash/ sanitizers for distribution amongst public for combating COVID-19 | Eradicating hunger, poverty and malnutrition, promoting preventive health care and sanitation including contribution to the Swachh Bharat Kosh set-up by the Central Government for the promotion of sanitation and making available safe drinking water.<br><br>Disaster Management, including relief, rehabilitation and reconstruction activities. | Yes | Jharkhand | Dhanbad | 0.72 | Yes |
| 4 | Fooding through Administration department for Doctors and Frontline workers at Covid Ward, CHD, Dhanbad and other miscellaneous COVID-19 expenditure like temporary contract of doctor etc. | Eradicating hunger, poverty and malnutrition, promoting preventive health care and sanitation including contribution to the Swachh Bharat Kosh set-up by the Central Government for the promotion of sanitation and making available safe drinking water.<br><br>Disaster Management, including relief, rehabilitation and reconstruction activities. | Yes | Jharkhand | Dhanbad | 36.45 | Yes |

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| 5 | Additional financial liability on submission of fresh bills for the work "Boarding and lodging of doctors and paramedical staff engaged in COVID-19 Hospital, CHD" | Eradicating hunger, poverty and malnutrition, promoting preventive health care and sanitation including contribution to the Swachh Bharat Kosh set-up by the Central Government for the promotion of sanitation and making available safe drinking water.<br><br>Disaster Management, including relief, rehabilitation and reconstruction activities. | Yes | Jharkhand | Dhanbad | 22.62 | Yes |
| 6 | Cleaning and sanitization of temporary quarantine centres for doctors and paramedic staff engaged in treatment of COVID 19 | Eradicating hunger, poverty and malnutrition, promoting preventive health care and sanitation including contribution to the Swachh Bharat Kosh set-up by the Central Government for the promotion of sanitation and making available safe drinking water.<br><br>Disaster Management, including relief, rehabilitation and reconstruction activities. | Yes | Jharkhand | Dhanbad | 1.80 | Yes |
| 7 | Training of Youths in Various Plastic Engineering Courses through Central Institute of Plastics Engineering and Technology (CIPET) | Promoting education, including special education and employment enhancing vocation skills especially among children, women, elderly, and differently abled and livelihood enhancement projects | Yes | Jharkhand | Ranchi | 28.00 | Yes |
| 8 | Development of Aanganwadi Centres in Dhanbad | Eradicating hunger, poverty and malnutrition, promoting preventive health care and sanitation including contribution to the Swachh Bharat Kosh set-up by the Central Government for the promotion of sanitation and making available safe drinking water. | Yes | Jharkhand | Dhanbad | 263.78 | Yes |
| 9 | Swachh Vidyalaya Abhiyan Survey Expenditure | Eradicating hunger, poverty and malnutrition, promoting preventive health care and sanitation including contribution to the Swachh Bharat Kosh set-up by the Central Government for the promotion of sanitation and making available safe drinking water. | Both | Jharkhand | Dhanbad, Bokaro, Dumka, Gumla, Purbi Sinhjbhum, Paschimi Singhbhum, Latehar, Lohardaga, Koderma, Saraikela, Simdega, Ranchi, Hazaribag, Palamu, Ramgarh | 6.97 | Yes |

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| 10 | Distribution of blankets during winter season | Eradicating hunger, poverty and malnutrition, promoting preventive health care and sanitation including contribution to the Swachh Bharat Kosh set-up by the Central Government for the promotion of sanitation and making available safe drinking water. | Yes | Jharkhand | Dhanbad | 3.58 | Yes |
| 11 | Submission of fresh bills for project "Training of mining sirdar for SC/ST PAPs" by PB Area | Promoting education, including special education and employment enhancing vocation skills especially among children, women, elderly, and differently abled and livelihood enhancement projects | Yes | Jharkhand | Dhanbad | 3.26 | Yes |
| 12 | Submission of fresh bills for "Operation of COVID quarantine centre" by Bastacolla Area | Eradicating hunger, poverty and malnutrition, promoting preventive health care and sanitation including contribution to the Swachh Bharat Kosh set-up by the Central Government for the promotion of sanitation and making available safe drinking water. | Yes | Jharkhand | Dhanbad | 3.80 | Yes |
| 13 | Upgradation of public toilets and approach road in Central Hospital, Dhanbad | Eradicating hunger, poverty and malnutrition, promoting preventive health care and sanitation including contribution to the Swachh Bharat Kosh set-up by the Central Government for the promotion of sanitation and making available safe drinking water. | Yes | Jharkhand | Dhanbad | 3.15 | Yes |
| 14 | Submission of final bills for "Gymnasium at Ambedkar Academy, Dhanbad" | Eradicating hunger, poverty and malnutrition, promoting preventive health care and sanitation including contribution to the Swachh Bharat Kosh set-up by the Central Government for the promotion of sanitation and making available safe drinking water. | Yes | Jharkhand | Dhanbad | 2.35 | Yes |
| 15 | Procurement of printed key chains for distribution amongst donors during blod donation camp under AKAM iconic week | Eradicating hunger, poverty and malnutrition, promoting preventive health care and sanitation including contribution to the Swachh Bharat Kosh set-up by the Central Government for the promotion of sanitation and making available safe drinking water. | Yes | Jharkhand | Dhanbad | 0.05 | Yes |
| 16 | Reversal of Financial Liability for Medical Camps under CSR through Areas (FY 2019-20) | Eradicating hunger, poverty and malnutrition, promoting preventive health care and sanitation including contribution to the Swachh Bharat Kosh set-up by the Central Government for the promotion of sanitation and making available safe drinking water. | Yes | Jharkhand | Dhanbad | (8.53) | Yes |
| **Total** | | | | | | **493.00** | |

## Details of CSR Expenditure incurred by BCCL in FY 2022-23

| CSR Budget 11.42 Cr. | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| S.No | Name of the Project | Item from the list of the activities in schedule VII to the act | Local area (Yes/No). | Location of the project. | | Amount spent for the project (₹ lakhs) | Mode of implementation- Direct (Yes/No). | Mode of implementation - Through implementing agency. | |
| | | | | State | District | | | Name. | CSR registration number. |
| 1 | Construction of low cost houses for 111 Nos. of flood affected families of Chirkunda Nagar Parishad under "Pradhanmantri Awash Yojna (Urban)" for EWS/LIG/MIG categories including slum dwellers near CV Area (through Dhanbad district administration) | Eradicating hunger, poverty and malnutrition, promoting healthcare including preventive health care and sanitation including contribution to the Swachh Bharat Kosh set-up by the Central Government for the promotion of sanitation and making available safe drinking water. | Yes | Jharkhand | Dhanbad | 249.75 | Yes | NA | NA |
| 2 | Development of 500 Aanganwadis to model Aanganwadis in Dhanbad district | Eradicating hunger, poverty and malnutrition, promoting healthcare including preventive health care and sanitation including contribution to the Swachh Bharat Kosh set-up by the Central Government for the promotion of sanitation and making available safe drinking water. | Yes | Jharkhand | Dhanbad | 486.22 | Yes | NA | NA |
| 3 | CSR Conclave | Promoting education, including special education and employment enhancing vocation skills especially among children, women, elderly, and differently abled and livelihood enhancement projects | Yes | Jharkhand | Dhanbad | 5.00 | Yes | NA | NA |
| 4 | Expenditure towards Har Ghar Tiranga Campaign | Promoting education, including special education and employment enhancing vocation skills especially among children, women, elderly, and differently abled and livelihood enhancement projects | Yes | Jharkhand | Dhanbad | 27.60 | Yes | NA | NA |
| 5 | Blankets distribution to poor during winter season | Eradicating hunger, poverty and malnutrition, promoting healthcare including preventive health care and sanitation including contribution to the Swachh Bharat Kosh set-up by the Central Government for the promotion of sanitation and making available safe drinking water. | Yes | Jharkhand | Dhanbad | 8.80 | Yes | NA | NA |

| | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| 6 | Expenditure towards Medical Camps | Eradicating hunger, poverty and malnutrition, promoting healthcare including preventive health care and sanitation including contribution to the Swachh Bharat Kosh set-up by the Central Government for the promotion of sanitation and making available safe drinking water. | Yes | Jharkhand | Dhanbad | 0.18 | Yes | NA | NA |
| 7 | Installation of Masala Grinder for SHGs/women through Bastacolla Area | Promoting education, including special education and employment enhancing vocation skills especially among children, women, elderly, and differently abled and livelihood enhancement projects | Yes | Jharkhand | Dhanbad | 1.65 | Yes | NA | NA |
| 8 | Skill development training in plastic engineering for 40 candidates at Central Institute of Petrochemicals Engineering and Technology (CIPET) | Eradicating hunger, poverty and malnutrition, promoting healthcare including preventive health care and sanitation including contribution to the Swachh Bharat Kosh set-up by the Central Government for the promotion of sanitation and making available safe drinking water. | Yes | Jharkhand | Dhanbad | 28.00 | Yes | NA | NA |
| 9 | Distribution of assistive devices to Divyangjans in Dhanbad | Eradicating hunger, poverty and malnutrition, promoting healthcare including preventive health care and sanitation including contribution to the Swachh Bharat Kosh set-up by the Central Government for the promotion of sanitation and making available safe drinking water. | Yes | Jharkhand | Dhanbad | 58.71 | Yes | NA | NA |
| 10 | Skill development training in General Duty Assistant (GDA)-advanced for beneficiaries of Dhanbad | Promoting education, including special education and employment enhancing vocation skills especially among children, women, elderly, and differently abled and livelihood enhancement projects | Yes | Jharkhand | Dhanbad | 27.60 | No | Pramith Foundation | CSR00002914 |
| 11 | Developmental activities for special needs children at Pehla Kadam School, Jagjeevan Nagar, Dhanbad | Eradicating hunger, poverty and malnutrition, promoting healthcare including preventive health care and sanitation including contribution to the Swachh Bharat Kosh set-up by the Central Government for the promotion of sanitation and making available safe drinking water. | Yes | Jharkhand | Dhanbad | 16.5 | Yes | NA | NA |
| 12 | Construction of water tank at the campus of Leprosy Centre at G'pur Dhanbad | Eradicating hunger, poverty and malnutrition, promoting healthcare including preventive health care and sanitation including contribution to the Swachh Bharat Kosh set-up by the Central Government for the promotion of sanitation and making available safe drinking water. | Yes | Jharkhand | Dhanbad | 28.9 | Yes | NA | NA |
| | | Eradicating hunger, poverty and | | | | | | | |

| | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| 13 | Infrastructural works at Lalmani Vriddh Seva Ashraam, Dhanbad | malnutrition, promoting healthcare including preventive health care and sanitation including contribution to the Swachh Bharat Kosh set-up by the Central Government for the promotion of sanitation and making available safe drinking water. | Yes | Jharkhand | Dhanbad | 27.53 | Yes | NA | NA |
| 14 | Infrastructural development works of Vinod Bihari Mahto Inter Mahila Mahavidyalay Topchanchi, Dhanbad | Promoting education, including special education and employment enhancing vocation skills especially among children, women, elderly, and differently abled and livelihood enhancement projects | Yes | Jharkhand | Dhanbad | 12.47 | Yes | NA | NA |
| 15 | CSR funding for the educational performance of tribal children of Jharkhand state through 'Healthy Aging India' | Promoting education, including special education and employment enhancing vocation skills especially among children, women, elderly, and differently abled and livelihood enhancement projects | Yes | Jharkhand | Dhanbad | 20 | No | Healthy Aging India | CSR00005412 |
| 16 | Drinking water supply arrangement in 03 colleges of Tundi & East Tundi blocks of Dhanbad district. (1) Sibu Soren Inter College, Tundi (2) Sibu Soren Degree College, Tundi (3) Binod Bihari Mahato Inter College, East Tundi | Eradicating hunger, poverty and malnutrition, promoting healthcare including preventive health care and sanitation including contribution to the Swachh Bharat Kosh set-up by the Central Government for the promotion of sanitation and making available safe drinking water. | Yes | Jharkhand | Dhanbad | 7.68 | Yes | NA | NA |
| 17 | Arranging water supply to Palashiya village for domestic use | Eradicating hunger, poverty and malnutrition, promoting healthcare including preventive health care and sanitation including contribution to the Swachh Bharat Kosh set-up by the Central Government for the promotion of sanitation and making available safe drinking water. | Yes | Jharkhand | Dhanbad | 13.4 | Yes | NA | NA |
| 18 | Arranging water supply to Jograd Basti | Eradicating hunger, poverty and malnutrition, promoting healthcare including preventive health care and sanitation including contribution to the Swachh Bharat Kosh set-up by the Central Government for the promotion of sanitation and making available safe drinking water. | Yes | Jharkhand | Dhanbad | 7.58 | Yes | NA | NA |
| 19 | Arranging water supply to Niche Deoghara village for mine water utilisation for domestic use | Eradicating hunger, poverty and malnutrition, promoting healthcare including preventive health care and sanitation including contribution to the Swachh Bharat Kosh set-up by the Central Government for the promotion of sanitation and making available safe drinking water. | Yes | Jharkhand | Dhanbad | 42.26 | Yes | NA | NA |

| | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| 20 | Construction of community hall under Harina Panchayat | Rural Development Projects | Yes | Jharkhand | Dhanbad | 17.49 | Yes | NA | NA |
| 21 | Water supply arrangement at Harsudih Basti | Eradicating hunger, poverty and malnutrition, promoting healthcare including preventive health care and sanitation including contribution to the Swachh Bharat Kosh set-up by the Central Government for the promotion of sanitation and making available safe drinking water. | Yes | Jharkhand | Dhanbad | 4.84 | Yes | NA | NA |
| 22 | Infrastructural development works in Gandhi Smarak Uccha Vidyalaya | Promoting education, including special education and employment enhancing vocation skills especially among children, women, elderly, and differently abled and livelihood enhancement projects | Yes | Jharkhand | Dhanbad | 7.23 | Yes | NA | NA |
| 23 | Constrution of toilets in Nagarikala Utkramit Uccha Vidyalaya | Eradicating hunger, poverty and malnutrition, promoting healthcare including preventive health care and sanitation including contribution to the Swachh Bharat Kosh set-up by the Central Government for the promotion of sanitation and making available safe drinking water. | Yes | Jharkhand | Dhanbad | 5.86 | Yes | NA | NA |
| 24 | Distribution of TB nutritional Baskets | Eradicating hunger, poverty and malnutrition, promoting preventive health care and sanitation including contribution to the Swachh Bharat Kosh set-up by the Central Government for the promotion of sanitation and making available safe drinking water. | Yes | Jharkhand | Dhanbad | 24.89 | Yes | CINI | CSR00000494 |
| 25 | Expenditure towards GST for ongoing projects | | | | | 11.86 | | | |
| | **Total** | | | | | **1,142.00** | | | |

# COMPLIANCE OF DHANBAD ACTION PLAN

**(1) Covering of loaded transport vehicles**

It has been complied. The clause of covering of loaded coal transport vehicle has also been incorporated in the transport agreement/ contract.

**(2) Coal transport roads shall be made pucca**

Coal transport route are made pucca, route around weighbridge has been made pucca and wheel washing arrangement has also been made at coal stock yard. Compound wall around weighbridge has also been constructed.

**(3) All drillings to be done with dust containment and suppression systems. Sprinklers will be installed including at all coal stock & sidings**

**Complied**. At present mobile water sprinklers are used. 1 number of Trolley mounted fog cannon and 1 number truck mounted fog cannon has been procured and are in operation.

**(4) Mobile Sprinklers**

| Sl. no. | Mine/Workshop | Status | No. of Fixed Sprinklers | No. of Mobile Sprinklers | Total Capacity(KL) | Trips per day |
|---|---|---|---|---|---|---|
| 1 | Bhagabandh UG Mine | Not-Operational | 1 (At coal Unloading Site) | 0 | N.A | N.A |
| 2 | P.B. project Colliery UG Mine | Not-Operational | 1 (At coal Unloading Site) | 1 | 15 | 2 |
| 3 | Central Auto Workshop | Not-Operational | Nil | 2 | 8 and 12 | 2 |
| 4 | Kendwadih Workshop | Not-Operational | Nil | 1 | 15 | 2 |
| 5 | Gopalichuck OCP | Operational | Nil | 1 | 15 | 4 |
| 6 | Gopalichuck OCP | Operational | Nil | 1 (Truck Mounted Fog Cannon) | 12 | 4 |

**(5) The direction of surface run-off of the premises of collieries shall be diverted to created water bodies.**
Creation of water bodies in coal bearing area will pose safety threats to nearby mine and it will be violation of mines act. However, artificial ponds have been created where, there are no chances of future coal extraction.

Pond Constructed for Villagers at KB 10/12 Colliery

Pond Created for Villagers at Kendwadih

**(6) Dealing of mine fires**

A Master plan for Dealing with fires and subsidence and rehabilitation in the Leasehold of BCCL has been approved by Govt. of India vide letter no- 22020/1/2005-CRC dated 12.08.09. In fire patch of V/VI/VII/VIII seam of Gareria Secn. At East Bassuriya about 1, 70,000 cu.m. mitti and non-combustible material has been filled, rest will be filled by quarry OB.

**(7) The waste water shall be passed through oil separator-cum-filtration system**

Complied. 1 number of Oil Separator has been constructed at P.B. Project Colliery.
1 Number Oil and Grease Trap has been constructed at Auto workshop

Oil and Grease Trap at P.B. Project Colliery

Oil and Grease Trap along with Washing Platform at Kustore Auto workshop

**(8) The removed OBs shall be utilized for low land filling or for making roads**

It is backfilled and then reclaimed by plantation of native species

**(9) Monitoring and Reporting six monthly**

**Complied**. Monitoring work is being done by CMPDI, Dhanbad as per work order issued by BCCL HQ. Six monthly air, water and noise monitoring data is submitted to governing bodies.

**(10) Tree plantation on the dumps**

**Complied.** Plantation work is in progress at 12 Ha site.

Overburden Dump is under reclamation process.

Soil has been spread and native species are planted.

(11) **All hazardous wastes shall be disposed off**

**Complied**.

a. All working units have applied for authorization as per Hazardous Wastes (Management, Handling and Tran's boundary Movement) Rules.

b. Burnt/used oil is disposed of as per rule.

c. Disposal of Hazardous waste, burnt Oil / batteries is being done through E-auctioning to authorized recycler/ re-processor having valid authorization from CPCB/ SPCB. Return are also being filed.

**(12) Introduction of GIS/ GPS**

GPS installed vehicles are used for transportation of coal. CMPDI, HQ has been given the job of satellite surveillance of the Jharia coal field through NRSA Hyderabad and the information is being uploaded in the website.

(7)

Ph: 0326-2204933

झारखण्ड राज्य प्रदूषण नियंत्रण पर्षद्
Jharkhand State Pollution Control Board
HIG-1, Housing Colony, Dhanbad-826001

Letter No....2650 Dated ....6/7/13....

From,

Regional Officer,
Dhanbad

To,

HOD (Envt.),
M/s. B.C.C.L.,
Koyla Bhawan, Koyla Nagar,
Dhanbad.

Sub: **Fixing up monitoring station/Sampling location of Air, Water & Noise.**

Sir,

With reference to you letter no. GM(Env.)/F-JSPCB/2013/783, dt. 06.07.2013 We have approved Air, Water & Noise monitoring Station/Sampling location after verification and return a copy of the map.

Encl-A/a.

Your's faithfully,

6/7/13

**( Dinesh Prasad Singh)**
Regional Officer.

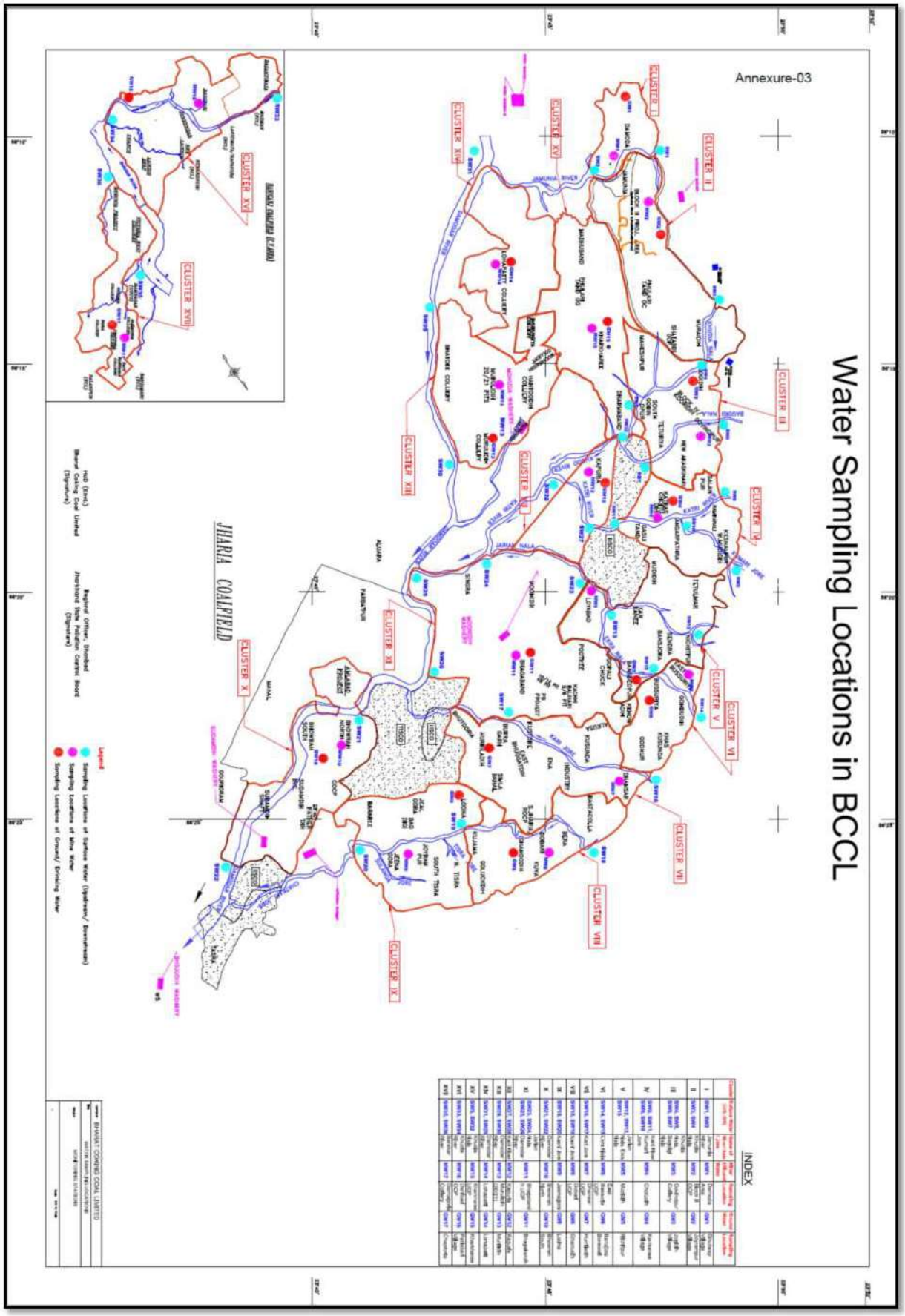
Memo..... Dhanbad, dated.....

Copy to: The Member Secretary, Jharkhand State Pollution Control Board for information & enclose a copy of the map for necessary action.

Encl-A/a.

**(Dinesh Pd. Singh)**
Regional Officer.

Printed by Sandip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Water Sampling Locations in BCCL
JHARIA COALFIELD
CLUSTER I
CLUSTER II
CLUSTER III
CLUSTER IV
CLUSTER V
CLUSTER VI
CLUSTER VII
CLUSTER VIII
CLUSTER IX
CLUSTER X
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CLUSTER XIII
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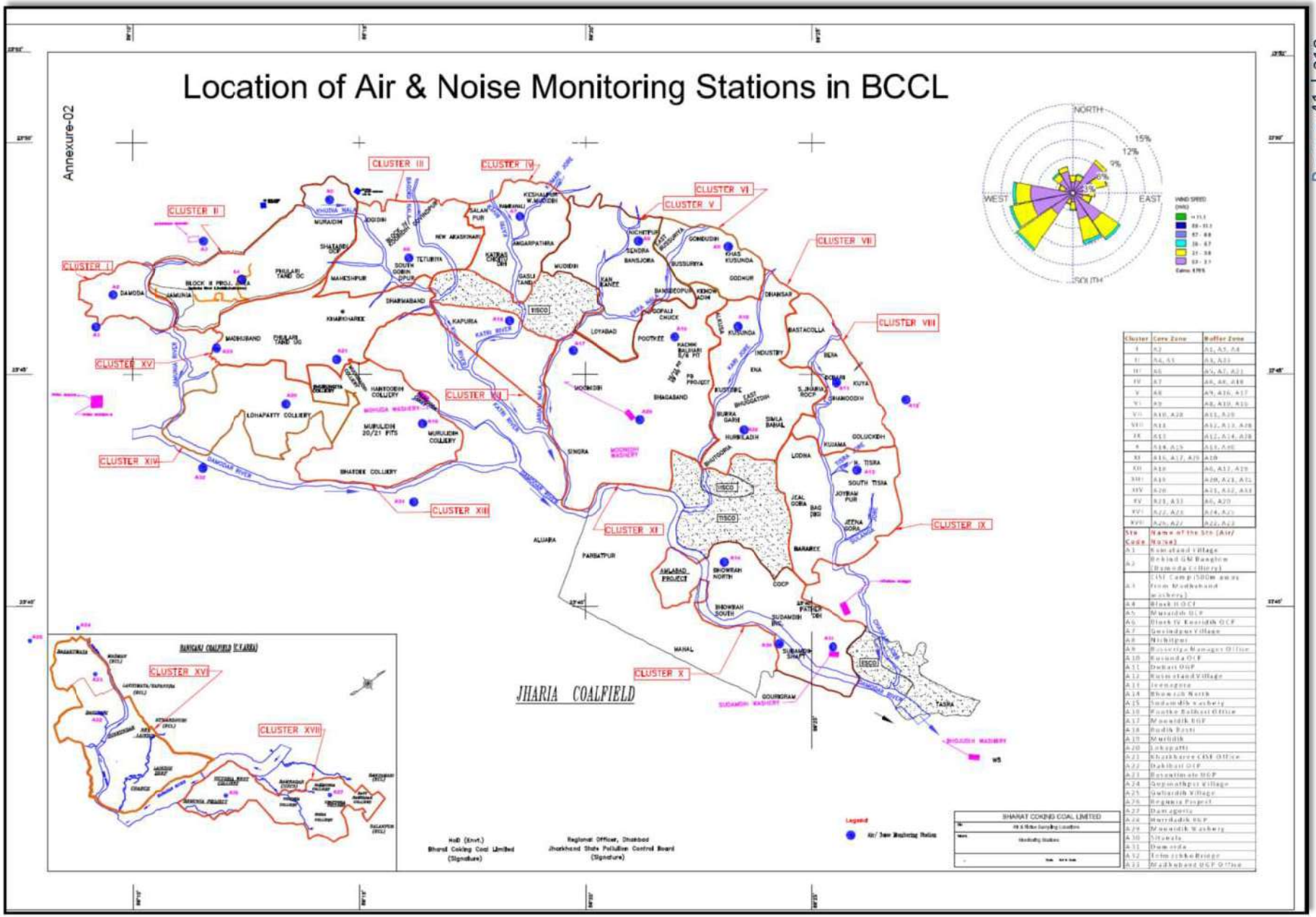
DAMODA RIVER
BARAKAR RIVER
KATRI RIVER
JAMUNIA RIVER
JHARIA
BHARAT COKING COAL LIMITED
INDEX

# Location of Air & Noise Monitoring Stations in BCCL

Annexure-02



# "Source apportionment of ambient air particulate matter in Jharia coalfields region, Jharkhand"

Sponsor

Bharat Coking Coal Limited (BCCL)

CSIR-National Environmental Engineering Research Institute, Nagpur

April 2022

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# Chapter 1 Introduction

Jharia Coalfield (JCF) is one of the oldest coalfields of India and has been subjected to coal exploitation for more than 100 years. JCF is one of the significant coal-producing areas in the country and occupies an important place in India's industrial and energy scenario by virtue of prime coking coal and is an essential source of coal. Jharia coalfield is crucial and a large coalfield situated in Dhanbad and Bokaro district, Jharkhand. Geographically the JCF is bounded by latitude 23°38' N to 23°49' N and longitude 86°09'E to 86°30'E and encompassing a total area of about 450sq km (Figure 1.1). Jharia is the largest coal producer in India and has an estimated reserved of 19.4 billion tonnes of coking coal. The coalfield contributes to the local economy and directly or indirectly employs the local population.

Bharat Coking Coal Limited, a subsidiary of Coal India Limited, has been operating the majority of the coal mines in the Jharia coalfield regions since its inception in 1972. Jharia, one of the eight blocks in Dhanbad and the main source of metallurgical coal in India can be termed as the country powerhouse since its mines are the only source for the best quality coking coal required by the steel industries and others in the country.

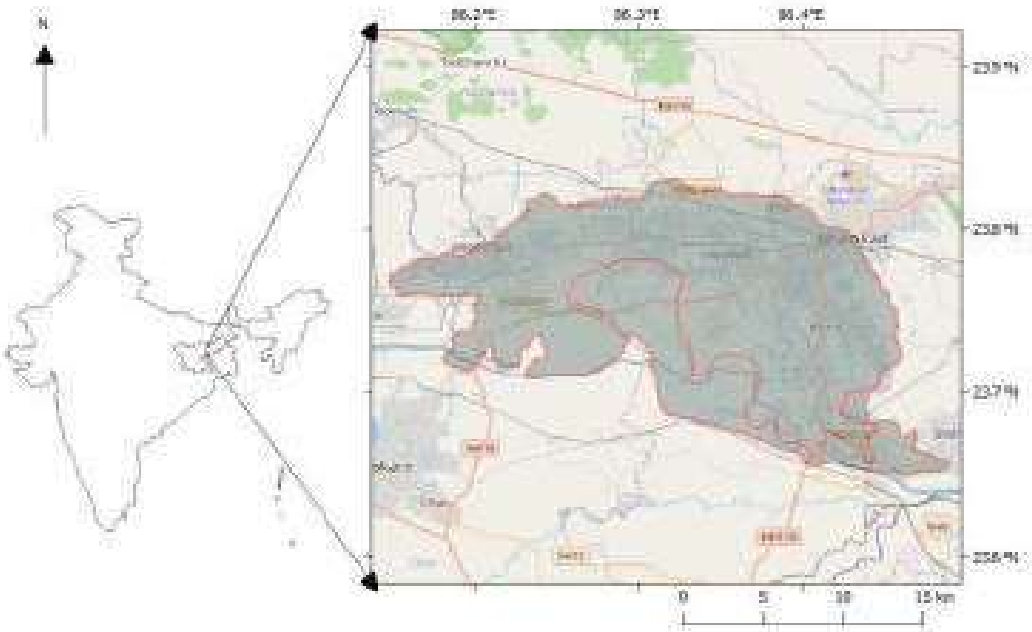



Figure 1.1: Geographical location of Jharia Coalfield in India

### 1.1. Climate

Dhanbad lies 236 m above the mean sea level and experiences the tropical climate. When compared with the winter, the summers have much more rainfall. The Köppen-Geiger climate classification is Aw (Tropical wet-dry climate) and experiences an average temperature of 25.9 °C and 1203 mm of precipitation falls annually. The driest month is December. There is 3 mm of precipitation in December. In July, the precipitation reaches its peak, with an average of 321 mm. With an average of 32.5 °C, May is the warmest month. At 18.4 °C on average, January is the coldest month of the year. The windrose for the March-June months is presented in Figure 1.2.

### 1.2. Land use & Land cover

In the present investigation, the Jharia coalfield area (2827.43 sq km) has been undertaken to study the Land use land cover (LULC). For this study, Sentinel-2A satellite image is used in the month of 17 February 2019 having a minimum cloud. These images were downloaded from the United States Geological Survey (USGS) Earth Explorer. Each Sentinel 2A satellite imagery band was geo-referenced to the WGS_84 datum and Universal Transverse Mercator Zone 45 North coordinate system. The Sentinel 2A satellite image stacking of the band-2, band-3, band-4 and band-8 of 10 m resolution was performed on the ArcGIS 10.5 software for studying the LULC of the Jharia coalfield.

For LULC classification, supervised classification was carried out in the study area. Thus allocations of each classified area in sq. km and its percentages are tabulated in Table 1.1. The percentage of areas as classified as; agriculture (74.5%), barren land (7.45%) built-up areas (5.14%), mining (2.64%), vegetation (9.40%) and water body (0.86%) (Figure 1.2).

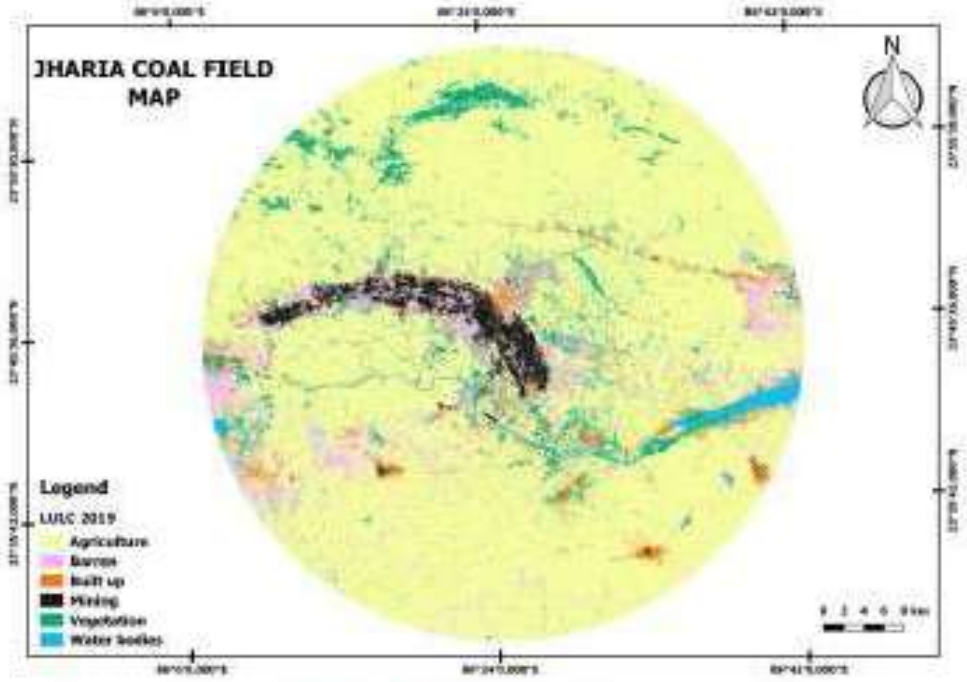



Figure 1.2: Land Use land cover map of Jharia coal field area

Table 1.1: LULC classification of Dhanbad study area

| Sr. No | Name | Area in sq. km | Area in % |
|---|---|---|---|
| 1. | Agriculture | 2106.7 | 74.51 |
| 2. | Barren | 210.64 | 7.45 |
| 3. | Built up | 145.31 | 5.14 |
| 4. | Mining | 74.67 | 2.64 |
| 5. | Vegetation | 265.74 | 9.40 |
| 6. | Water bodies | 24.37 | 0.86 |
| **Total** | | **2827.43** | **100** |

### 1.3. Population

The study area covers four district boundaries; namely Dhanbad (1710.2sq km), Bokaro (620.43sq km), Giridih (29.8sq km) in Jharkhand and Puruliya (465.85sq km) district in West Bengal state. The Dhanbad district covers the maximum study area and the population is around 23, 94,434 in the year 2001 and is around 26,84,487 in 2011. The Bokaro district total population is in 2001 is 17, 75,961 and in 2011 it is 20, 62,330. The Giridih district total population is 19, 01,564 in 2001 and is 24,45,474 in 2011. The Puruliya district in West Bengal state total population is in 2001 is 25, 35,233 and in 2011 are 29, 30,115.

Based on the covered study area the total population in the study area is tabulated in Table 1.2. The total population in the study area based on Census book 2001 is 25,32,195 and 2011 is 28,62,600.

Table 1.2: Population in the study area as per 2011 census

| District Name | District Area Covered by Study Area | % of Area Covered of District by Study Area | Population of 2001 | Population 2001 in Study Area | Population of 2011 | Population 2011 in Study Area |
|---|---|---|---|---|---|---|
| Bokaro | 620.43 | 21.50 | 17,75,961 | 3,81,791 | 2,062,330 | 4,43,353 |
| Dhanbad | 1710.2 | 81.51 | 23,94,434 | 19,51,645 | 2,684,487 | 21,88,060 |
| Giridih | 29.8 | 0.59 | 19,01,564 | 11,275 | 2,445,474 | 14,500 |
| Puruliya | 465.85 | 7.40 | 25,35,233 | 1,87,484 | 2,930,115 | 2,16,686 |
| Total | 2826.28 | | Total Population 2001 | 25,32,195 | Total Population 2011 | 28,62,600 |

### 1.4. Purpose of Study

Urban air pollution is a notable concern across the world. Inferring to the rapid rates of industrialization and urbanization in Indian cities, polluted air quality is considered a key factor in crumbling the quality of life with an adverse effect on the human being. Hence air quality gained a significant role in recent decades since it is worsened by emission from major pollutants including particulate matter ($PM_{10}$ and $PM_{2.5}$), $NO_2$, $SO_2$ and $O_3$ were found to exceed the national ambient air quality standard (NAAQS) limits.

Particulate pollution is a major concern in the field of air pollution. The particulate matter in the air result from dispersion of dust from industrial (mining and non-mining) and allied activities, transportation, local vehicular movement and domestic fuel (Coal, wood-burning etc.) burning. Assessment of the air quality can provide useful insight for the development of the air quality management plan. The database developed on air quality also helps the regulatory agency identify the locations where natural resources and human health could be at risk.

Jharia coal mines having low ash content and high calorific value coals are subjected to intensive mining activities because of the easy availability of coal at shallow depths in thick seams. Therefore, they are often used directly in iron and steel plants for metal oxide reduction after washing. Although these coal mines are highly-priced for their high-quality coal, they are notorious for their mine fires, which cause a lot of fugitive gaseous and PM emissions. Hence, the Jharia region has been under scrutiny by various public authorities and the common public with a vision to improve the ambient air quality.

Various sources contribute to high particular matter concentration in the Jharia region: vehicles, mining activities, re-suspended dust, fugitive emissions, fuel oils, household LPG. The percentage contribution of these factors in the ambient depends exclusively on a particular region's economic activities. To improve the existing ambient air quality, the major sources of PM emissions first need to be identified.

Hence, the environmental clearance committee of MoEFCC has directed BCCL to conduct a source apportionment study for particulate matter. In this context, BCCL has approached CSIR-NEERI to conduct a source apportionment study of ambient air particulate matter in the Jharia coalfields region to quantify the various sources of PM emissions and suggest an effective environmental management plan.

The study's major objective is to assess the current ambient air quality, sources of air pollution, and propose the priorities for the actions for improvement of air quality. The study includes the entire Jharia Coalfield and an area up to 10 Km from the periphery/boundary of BCCL mines.

The detailed objectives are as follows:

i. Ambient Air Monitoring

- Monitoring of ambient air quality at selected receptor locations for pollutants including $PM_{10}$, $PM_{2.5}$(limited), $SO_x$, $NO_x$, PAHs to establish the status of the air quality in Jharia Coalfields and an area up to 10 K.M from the periphery/boundary of BCCL mines. Also, review of the available air quality monitoring data from Central Pollution Control Board (CPCB) /Jharkhand State Pollution Control Board (JSPCB).
- To validate dispersion modelling predictions using measured air quality parameters
- To draw supportive data through the specific site-related monitoring regarding impact causing sources such as kerbside monitoring
- To establish the impact of meteorological conditions on a few select indicator pollutants in different micrometeorological conditions of the Jharia Coalfields

- Emission Inventory related to Jharia Coalfields along with area up to 10 Km from the periphery/boundary of BCCL mines

ii. To identify the pollution load grid wise for point, line and area source

- To establish possibilities of receptor level concentrations of air pollutants by matching dispersion modelling and air quality monitoring data
- Source apportionment
- To identify and apportion the pollution load at receptor level to various sources in the Jharia Coalfields along with an area up to 10 Km from the periphery/boundary of BCCL mines
- To carry out the source apportionment using molecular markers for a limited number of samples through a time-resolved sample collection at various periods of the day and day-of-the-week.
- Any other item in consensus between both BCCL/CIL & NEERI evolved during the study.

### 1.5. Approach of study

The study approach has many components, each one of them having its importance and interdependence as shown in Figure 1.3. The ultimate objective is source apportionment of ambient air of JCF that primarily requires knowledge of ambient air quality status, sources and emission load. These three objectives were achieved by monitoring air pollutants at 13 locations in Jharia Coalfield using various instruments and multiple analyses. These locations were selected based on land use and activity profile. All monitoring was carried out using varied instruments and all attributes were analysed using standards methodologies. The study's methodology of the study was divided into three parts namely ambient air quality monitoring, sources emission inventory and source apportionment analysis.

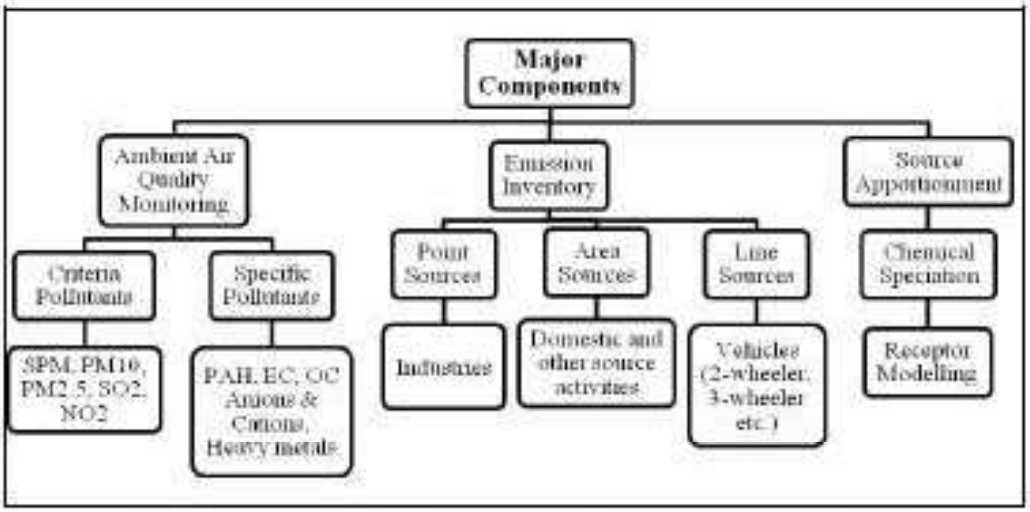



Figure 1.3: Air quality Monitoring & emission source apportionment studies

# Chapter 2 Emission Inventory

This section consists of all methodologies that have been applied for the emission inventory and dispersion modelling in the Jharia Coalfield. The emission inventory is the process to identify the possible source and its contribution. Emission inventory and dispersion modelling are based on the primary data collection to calculate emission load from a particular source. It provides fundamental information for air quality modelling and air pollution control strategy development. In the coal mining area, mining, non-mining, industrial, vehicular and other sources are contributing. Air quality monitoring includes the suitable location selected based on the metrological conditions, chemical characterization for identification of the source, CMB model to estimate the source apportionment to $PM_{2.5}$.

Air pollutant emission inventory is a process to identify the possible sources and their contribution. It provides fundamental information for air quality modelling and air pollution control strategy development. Mining, non-mining, industrial, vehicular and other sources are contributing to critical coal mining zone like JCF, India. According to possible emission sources, sources are divided into three categories like point sources, area sources and line sources. The inventory of these sources is important to make a proper source profile.

## 2.1. Inventory of Point Sources

A point source of pollution is a single identifiable source that is responsible for significant pollution load in the study area, like thermal power stations. A comprehensive list of different point-like industries in the study area was obtained from the regional office of the Jharkhand State Pollution Control Board (JSPCB), at Dhanbad. The industries specific information of includes production capacities, raw material used, manufacturing process, fuel consumption, etc. also collected from the regional office by the CSIR-NEERI team.

## 2.2. Inventory of Area Sources

Area sources are sources of pollution that emit a substance or radiation from a specified area. Mining activities, domestic/hotel fuel (coal) burning, garbage burning, etc. are the major contributor to area sources. In order to assess the fuel consumption in the study area, the necessary information was collected through surveys at petrol pumps, hotels and restaurants, bakeries, open eat out and crematoria. Also, surveys collected data on the seasonal implication of fuel used particularly wood and coal. The data on trash burning and solid waste generated in the study were collected from Municipal Corporation Dhanbad.

## 2.3. Inventory of Line Sources

Vehicles contribute a whole range of HCs besides contributing $SO_x$, $NO_x$ (as $NO_2$), HC and lead. Diesel vehicles are the primary source of smoke and $NO_x$ in addition to CO and HCs. However, CO and HCs per litre of fuel consumed by diesel vehicles in relatively low compared to gasoline-powered vehicles. In gasoline-powered vehicles, the exhaust is the major source of pollution that contributes 100 % CO and $NO_x$ and 80% of HCs emitted to the atmosphere. The remaining 20% of HCs are emitted from crankcase blow-by and evaporative emissions. In the

two-stroke engine, the crankcase blow-by is absent. The exhaust emissions are the principal sources of pollutants emitting about 40% of fuel supplied without burning due to short circulating, contributing high concentration of HCs. In diesel vehicles, practically all pollutants are emitted through exhaust gases and the contribution to crankcase blow-by and evaporative fuel emission are negligible.

Though the quantity of pollutants emitted by the vehicles is directly proportional to the number of vehicles playing on the road, the intensity of pollution potential depends on several contributory factors such as a geographical location, unplanned development of central business areas, inadequate and ill-maintained road as well as the type of vehicle, unplanned traffic management, meteorological conditions, and non-availability of adequate emission control technology.

Vehicle activity data were collected during the field campaign at 12 road networks in the study area, and the daily average vehicular activity is presented in Table 2.1.

Table 2.1: Daily average vehicle activity on different road network considered during the field survey

| Label | Road Network | HDV | LMV | 3W | 2W | Total |
|---|---|---|---|---|---|---|
| L1 | Jharia to Lodna -5 km | 1254 | 1385 | 3640 | 9560 | 15839 |
| L2 | Pathardih to Sindri -7 km | 1539 | 5356 | 4362 | 15633 | 26890 |
| L3 | Bastacola to Pathardih -13km | 2153 | 8325 | 3678 | 10233 | 24389 |
| L4 | Bhuli to Bankmore - 6km | 1475 | 13832 | 12965 | 18241 | 46513 |
| L5 | Katras to Harina–12.5 km | 1802 | 7290 | 3156 | 15329 | 27577 |
| L6 | Bankmore to Kusunda -5 km | 658 | 2685 | 1896 | 10235 | 15474 |
| L7 | Kusunda to Katras - 10 km | 1306 | 4521 | 5327 | 15689 | 26843 |
| L8 | Moonidih to Kusunda -7 Km | 1208 | 7659 | 3985 | 14698 | 27550 |
| L9 | Lohpiti to Mahuda Area Colony - 8 km | 1535 | 4523 | 2235 | 6356 | 14649 |
| L10 | Mahuda to Parasia Chowk -7 km | 1223 | 4023 | 1759 | 5623 | 12628 |
| L11 | Parasia Chowk To Moonidih - 3 km | 269 | 2159 | 236 | 2347 | 5011 |
| L12 | Bhowra to Parbatpur - 13 Km | 2135 | 7856 | 4258 | 14578 | 28827 |

The vehicle utilization factors (km travelled per day per vehicle type) were adapted from the Auto Fuel Policy Report (Table 2.2). Two-to-four-wheelers Emission factors were taken from various project reports conducted by CPCB and Indian Clean Air Programmed (ICAP) (CPCB 2010; ARAI 2007). The percentage distribution of various types of vehicles moving on the road network considered during the field survey is presented in Fig 2.1. It shows that major numbers of vehicles moving in the considered Road network are two-wheelers (51%), followed by light motor vehicles (26%), three-wheeler (17%) and heavy-duty diesel vehicles (6%).

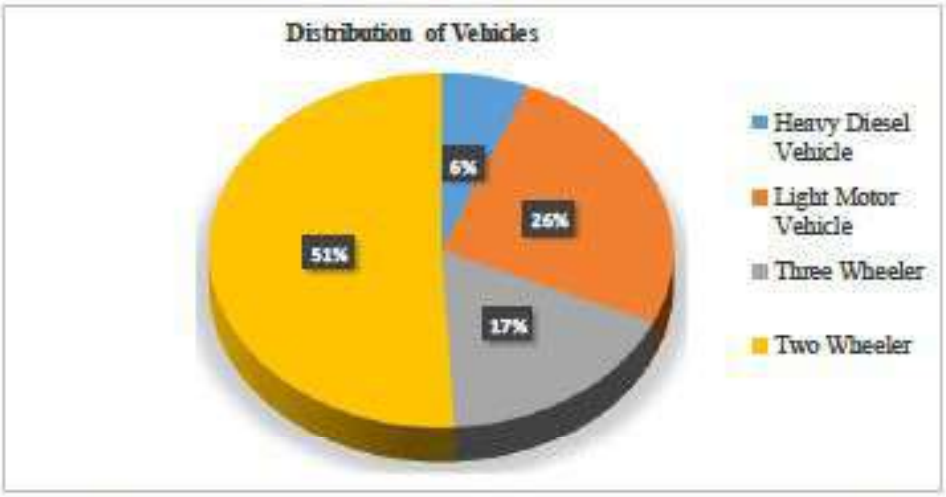



Figure 2.1 Percentage of different types of vehicle surveyed on the road network during the field survey

Table 2.2: Utilization Factors for different types of vehicle

| Vehicle Type | km per day |
|---|---|
| LMV (Car Jeep) | 52.6 |
| LMV (Taxi) | 77.89 |
| 2 Wheeler | 25.1 |
| 3 Wheeler (Auto) | 97.72 |
| HCV | 45.5 |

**2.4. Methodology**

The following method is adopted to estimate the emission load due to vehicles

$$E_i = N_v \times VKT \times E_f \quad (2.1)$$

Where, $E_i$ is the emission from a particular type of vehicle

$N_v$ is the number of vehicles of a particular type

VKT is the vehicle km travelled

$E_f$ km is the emission factor for a specific vehicle

Table 2.3: Emission estimate for road transport

| Label | Road Network | Emission (kg/day) | |
|---|---|---|---|
| | | $PM_{10}$ | $PM_{2.5}$ |
| L1 | Jharia to Lodna -5 km | 230.12 | 113.08 |
| L2 | Pathardih to Sindri -7 km | 379.07 | 180.37 |
| L3 | Bastacola to Pathardih -13km | 632.21 | 451.98 |
| L4 | Bhuli to Bankmore - 6km | 331.41 | 187.69 |
| L5 | Katras to Harina–12.5 km | 719.42 | 415.63 |
| L6 | Bankmore to Kusunda -5 km | 308.69 | 194.34 |
| L7 | Kusunda to Katras - 10 km | 576.31 | 277.95 |
| L8 | Moonidih to Kusunda -7 Km | 317.83 | 114.25 |
| L9 | Lohpiti to Mahuda Area Colony - 8 km | 360.24 | 151.99 |
| L10 | Mahuda to Parasia Chowk -7 km | 241.56 | 148.24 |

| | | | |
|---|---|---|---|
| L11 | Parasia Chowk To Moonidih - 3 km | 94.26 | 57.23 |
| L12 | Bhowra to Parbatpur - 13 Km | 592.82 | 379.80 |

Re-suspension of the unpaved and paved roads depends on the 'silt loading' factor and 'vehicles weight' roaming on the road (Table 2.4). The silt loading ($S_L$) is the mass of the silt-sized material per unit area of the road surface. The amount of dust produces by vehicles movement on a paved road can be appraised by the following equation:

$$E = k. (SL/2)^{0.65} . (W/3)^{1.5} \quad (2.2)$$

Where, 'E' = emission rate of PMs (Table 2.3);

SL is silt load (g/m2);

W is the average weight of the vehicle (Tons);

k is constant (the function of particle size) in g $VKT^{-1}$ (Vehicle Kilometer Travel)

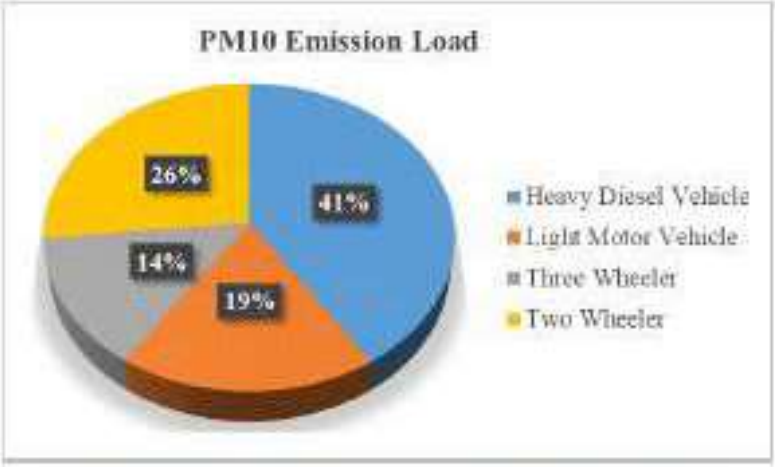



Figure 2.2 $PM_{10}$ emission load for different categories of vehicle

It is observed that 41% of $PM_{10}$ emission is contributed by the Heavy-duty diesel vehicles followed by two-wheelers (26%), Light motor vehicles (19%) and three-wheelers (14%) in the considered road network during the study period.

Table 2.4: Emission rate for the paved and unpaved road

| | Emission Rate | |
|---|---|---|
| Emission Sector | $PM_{10}$ (kg/day) | $PM_{2.5}$ (kg/day) |
| Re-suspension dust from Paved & Unpaved Road | 1756 | 843 |

## 2.5. Results

### 2.5.1. Industrial Emission

Emission inventory estimates are determined based on considering available industrial activity information, emission factors (Table 2.5) and observations. For the current study, industrial and mining information was collected for emission inventory development. Emission inventory information for industries was collected from the regional office of JSPCB. In Dhanbad, the major industries are the power plant and the coking industry. Other

than those are coal mines, thus coal as a fuel is majorly used in industries and households. Emission loads by point source are depicted in Table 2.6 as per emission inventory.

Table 2.5: Emission factor for coal mining activities

| EF | TSP | $PM_{10}$ | $PM_{2.5}$ | $SO_2$ | $NO_2$ |
|---|---|---|---|---|---|
| g/Mg Coal | 1914 | 1864 | 1176 | 420 | 820 |

Table 2.6: Emission load from Industrial sector in Dhanbad

| Sr. No | Name of Industry | Type of Fuel | Fuel consumption | Unit | TSP (Ton/yr) | $PM_{10}$ (Ton/yr) | $PM_{2.5}$ (Ton/yr) | $SO_2$ (Ton/yr) | $NO_2$ (Ton/yr) |
|---|---|---|---|---|---|---|---|---|---|
| 1 | M/s Mahalaxmi Industries | Coal | 4 | MT/Oven/cycle (24hrs) | 2.79 | 2.72 | 1.72 | 0.61 | 1.20 |
| 2 | GEETEE Hard Coke Traders | Coal | 100 | TPD | 69.86 | 68.04 | 42.92 | 15.33 | 29.93 |
| 3 | M/s Shree Gopal Coke Industries | Coal | 77.4 | TPD | 54.07 | 52.66 | 33.22 | 11.87 | 23.17 |
| 4 | M/s Laxmi Hard coke Manufacturing Company | Coal | 102 | TPD | 71.26 | 69.40 | 43.78 | 15.64 | 30.53 |
| 5 | M/s - Sanjay Hard Coke Industries | Coal | 70 | TPD | 48.90 | 47.63 | 30.05 | 10.73 | 20.95 |
| 6 | M/s Inder Hard Coke Industries | Coal | 36 | TPD | 25.15 | 24.49 | 15.45 | 5.52 | 10.77 |
| 7 | M/s Shiv Shakti Coke Industries | Coal | 80 | TPD | 55.89 | 54.43 | 34.34 | 12.26 | 23.94 |
| 8 | Khetawat Coke Manufacturing Company | Coal | 4.5 | MT/ Oven/ Batch (24hrs) | 3.14 | 3.06 | 1.93 | 0.69 | 1.35 |
| 9 | M/s Pawan Hard Coke Industries | Coal | 100 | TPD | 69.86 | 68.04 | 42.92 | 15.33 | 29.93 |
| 10 | M/s Ganapati Udyog | Coal | 135 | TPD | 94.31 | 91.85 | 57.95 | 20.70 | 40.41 |
| 11 | M/s Aman Sofi Coke Industries | Coal | 29.76 | TPD | 20.79 | 20.25 | 12.77 | 4.56 | 8.91 |

### 2.5.2. Area/Distributed source

An area source emission inventory estimates the pollutant loads emanating from several small but numerous individual sources in a specific geographic area and which cannot be included underline no point sources.

Area sources considered for emission inventory for Dhanbad city are:

- Cooking operations in households: Slum and non-slum
- Cooking operations in hotels, restaurants, open eat-outs and bakeries
- Crematoria

The following sections will detail the methodology adopted for estimating emissions from each of the above-mentioned sources and the results thus obtained.

- **Emission load from mining activities**

The emission loads from coal mine activities are depicted in Table 2.7. The emission load is calculated based on the secondary data collected from the BCCL mines covered in the study. The data includes coal and overburden quantity handled per day during loading and unloading, transfer from pit to stockyard through haul road and conveyor, vehicular movement frequency and diesel consumption for HEMM and DG sets. Emission factors from EEA air pollutant emission inventory guidebook 2019 were considered for the estimations of TSP and PM load.

Table 2.7. Emission load from coal mine activities in Jharia coalfield region

| Mine | Area ($m^2$) | $PM_{10}$ (Tone/y) | $PM_{2.5}$ (Tone/y) |
|---|---|---|---|
| ABOCP | 2355283 | 156.1 | 78.0 |
| ADI Colliery | 1444818 | 47.9 | 23.9 |
| ASP Colliery | 19540 | 27.7 | 13.8 |
| Bhowra south | 78079 | 26.9 | 13.4 |
| Block IV Govindpur | 432827 | 22.5 | 11.2 |
| DBOCP | 605747 | 64.7 | 32.4 |
| East Bassuriya Colliery | 576494 | 24.3 | 12.2 |
| Gopalichuck Colliery | 37573 | 3.7 | 1.9 |
| Jeenagora OCP | 2079123 | 208.0 | 104.0 |
| Karya OCP | 1134723 | 90.1 | 45.1 |
| NAKC | 245205 | 78.3 | 39.1 |
| NGK | 261847 | 126.0 | 63.0 |
| Nichitpur colliery | 791140 | 61.4 | 30.7 |
| Pimularitand colliery | 335887 | 84.1 | 42.1 |
| Rajapur OCP | 1170784 | 90.4 | 45.2 |
| Sendra Bansjora | 472760 | 63.0 | 31.5 |
| Shatabdi colliery (Muraidhih) | 34270 | 77.0 | 38.5 |
| Tetulmari | 876320 | 23.3 | 11.7 |
| **Total** | | **1275.4** | **637.7** |

- **Cooking operations in non-slum household**

A survey of 20 non-slum household areas was conducted in randomly selected areas of Dhanbad to understand which fuels are being used in these households and their quantities. The survey results indicated that Liquefied Petroleum Gas (LPG) was the fuel of choice in all the households and that each household used about 1 cylinder per month on average. It was assumed that LPG use remains the same for all 365 days of the year. The results obtained are presented in Table 2.8.

Table 2.8: Emissions from the use of LPG in non-slum households in Dhanbad

| LPG Pollutant | $PM_{10}$ | $SO_2$ | $NO_2$ | CO | HC |
|---|---|---|---|---|---|
| Emission Factor (g/kg) | 2.1 | 0.4 | 1.8 | 0.25 | 0.07 |
| Emission (T/Year) | 0.00575 | 0.0011 | 0.0049 | 0.0007 | 0.0002 |

- **Cooking operations in slum households**

A survey of 15 areas having slum households was conducted, spread in Jharia Coalfield which was known to have significant slum populations, to understand which fuels are being used in these households and their quantities. It was seen that a majority of the slum households use coal as a cooking fuel (Table 2.9).

Table 2.9: Emission from coal as fuel

| Pollutant | SPM | $SO_2$ | $NO_2$ | CO | HC |
|---|---|---|---|---|---|
| Emission Factor (g/kg) | 20 | 13.3 | 3.99 | 24.92 | 0.5 |
| Emission (T/Year) | 28.354 | 18.856 | 5.657 | 35.330 | 0.709 |

- **Emissions from crematorium**

In order to calculate emission from crematoria data were obtained from crematoriums in Dhanbad. Emission from the burning of bodies using woods mainly produces $PM_{10}$, CO and HC majorly as depicted in Table 2.10.

Table 2.10: Emission from Crematoria using Wood as fuel

| Pollutant | $PM_{10}$ | $SO_2$ | $NO_2$ | CO | HC |
|---|---|---|---|---|---|
| Emission Factor (g/Kg) | 17.3 | 0.2 | 1.3 | 126.3 | 114.5 |
| Emission (kg/day) | 7.178 | 0.083 | 0.537 | 52.183 | 47.308 |

- **Emissions from bakeries**

Data were collected from 34 bakeries operating in Dhanbad in which 12 bakeries were using electrical ovens. The emissions from such bakeries were not considered. All the other bakeries were using coal as fuel. Emissions from such bakeries are given in Table 2.11.

Table 2.11: Emission from Bakeries using Coal as fuel

| Pollutant | SPM | $SO_2$ | $NO_2$ | CO | HC |
|---|---|---|---|---|---|
| Emission Factor (g/kg) | 20 | 13.3 | 3.99 | 24.92 | 0.5 |
| Emission (T/Year) | 6.26 | 4.16 | 1.25 | 7.80 | 0.16 |

- **Emissions from hotels and restaurants**

Data were collected from 35 hotels in Dhanbad city. It has been found that most hotels/restaurants were using a combination of coal and LPG as cooking fuel. Emission

from coal and LPG were calculated and depicted in Table 2.12 and 2.13.

Table 2.12: Emission from Hotel & Restaurants using Coal

| Pollutant | SPM | $SO_2$ | $NO_2$ | CO | HC |
|---|---|---|---|---|---|
| Emission Factor (g/kg) | 20 | 13.3 | 3.99 | 24.92 | 0.5 |
| Emission (T/Year) | 8.110 | 5.393 | 1.618 | 10.105 | 0.203 |

Table 2.13: Emission from Hotel & Restaurants using LPG

| Pollutant | $PM_{10}$ | $SO_2$ | $NO_2$ | CO | HC |
|---|---|---|---|---|---|
| Emission Factor (g/kg) | 2.1 | 0.4 | 0.8 | 0.25 | 0.07 |
| Emission (T/Year) | 0.136 | 0.026 | 0.117 | 0.016 | 0.005 |

- **Emission from open eat-outs**

From the survey it has been observed that most of the open eat-outs were using coal as cooking fuel, only a few were using LPG (Table 2.14).

Table 2.14: Emission loads from open eat-outs

| Pollutant | SPM | $SO_2$ | $NO_2$ | CO | HC |
|---|---|---|---|---|---|
| Emission Factor (g/kg) | 20 | 13.3 | 3.99 | 24.92 | 0.5 |
| Emission (T/Year) | 14.07 | 9.36 | 2.81 | 17.54 | 0.35 |

### 2.5.3. Grid wise emission inventory

The grid-wise particulate emission inventory maps were prepared from the primary and secondary data collected during the field surveys and the information received from the open cast mines, respectively. The PM emissions from restaurants, eat-outs, domestic chullahs, vehicles, crematoria, etc. were estimated based on the primary data obtained from the filed campaigns, whereas, the emissions from the mine operations were estimated based on the data received from the mines and the emission factors reported in the literature. Once the emissions rates were estimated, the cumulative emissions (including all types of sources like line, point, and area) were calculated falling under the grid defined (shown in Figure 2.3 and Figure 2.4). From the figures, it can be interpreted that the PM emissions are high on the northeast side of the study area. Whereas, the actual transport and dispersion of these emissions can be interpreted through the dispersion modelling carried out using the AERMOD model.

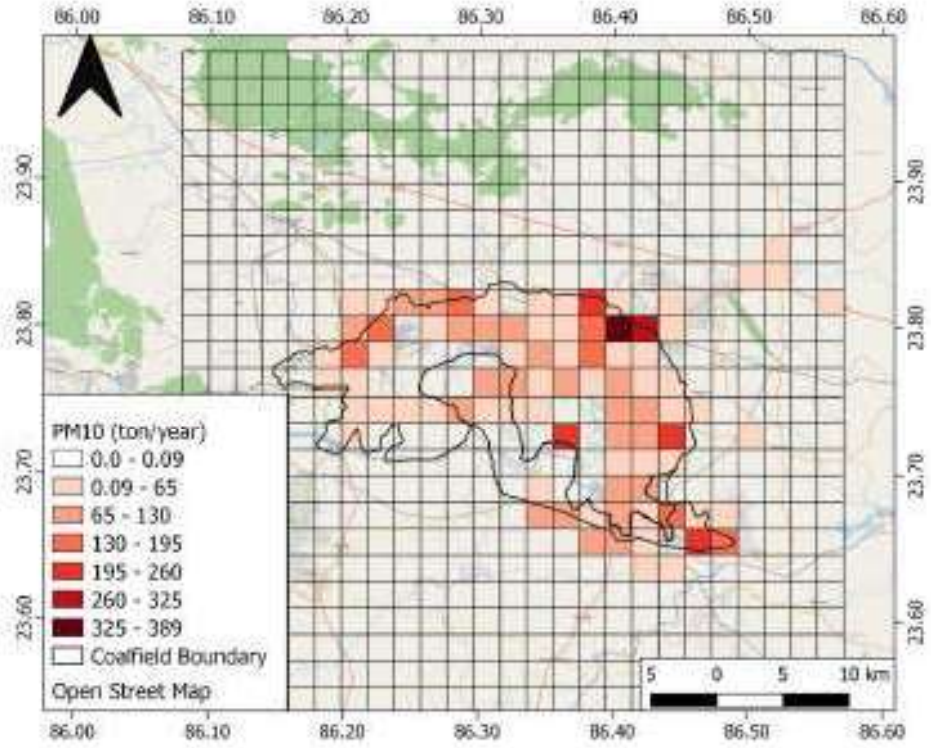



Figure 2.3 Grid-wise emission inventory of $PM_{10}$ in tons/year over the study area

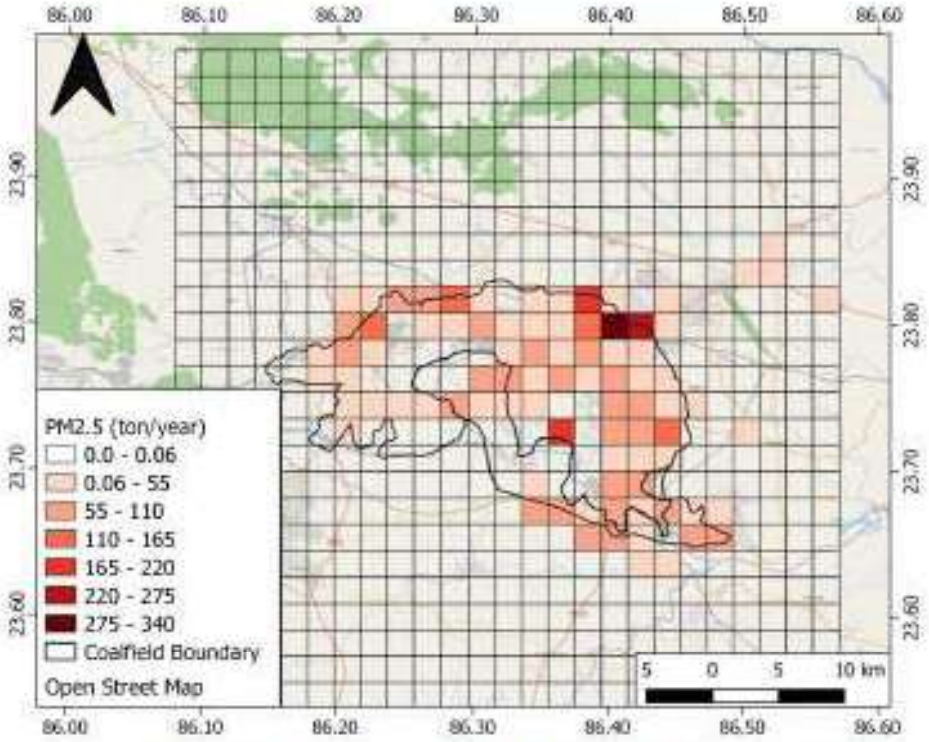
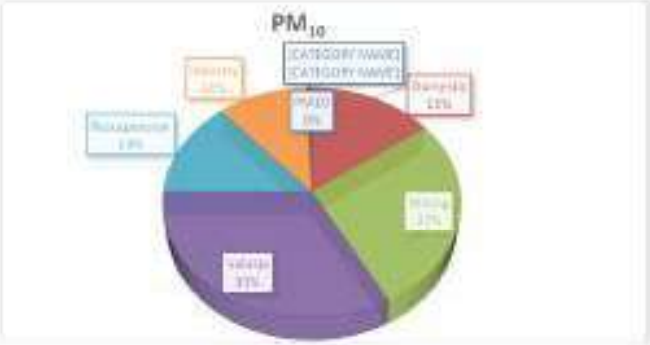


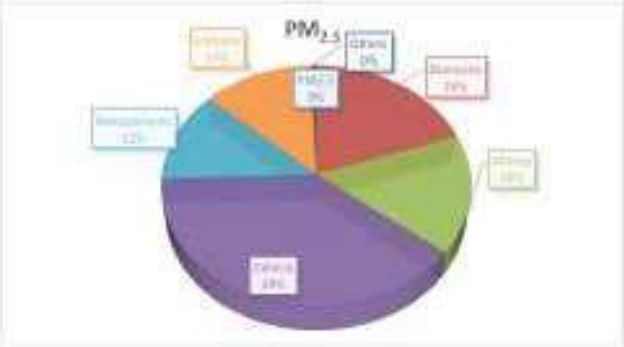

Figure 2.4 Grid-wise emission inventory of PM2.5 in tons/year over the study area

The respective share of various emission sources is represented through pie diagrams shown in Figure 2.5. Data shows that $PM_{10}$ emissions are contributed mostly from vehicular emissions

followed by emissions from the mines whereas, $PM_{2.5}$ emissions are contributed mostly from vehicular emissions, domestic burning and mine activities. The grid-wise emission inventory maps and the information on the pollution sources provide the basis for the policymakers to target the hotspots of pollution generation in order to take effective mitigation actions.




(a)




(b)

Figure 2.5 (a) and (b) represents emission load from various sectors over JCF region for $PM_{10}$ and $PM_{2.5}$ respectively

**References**

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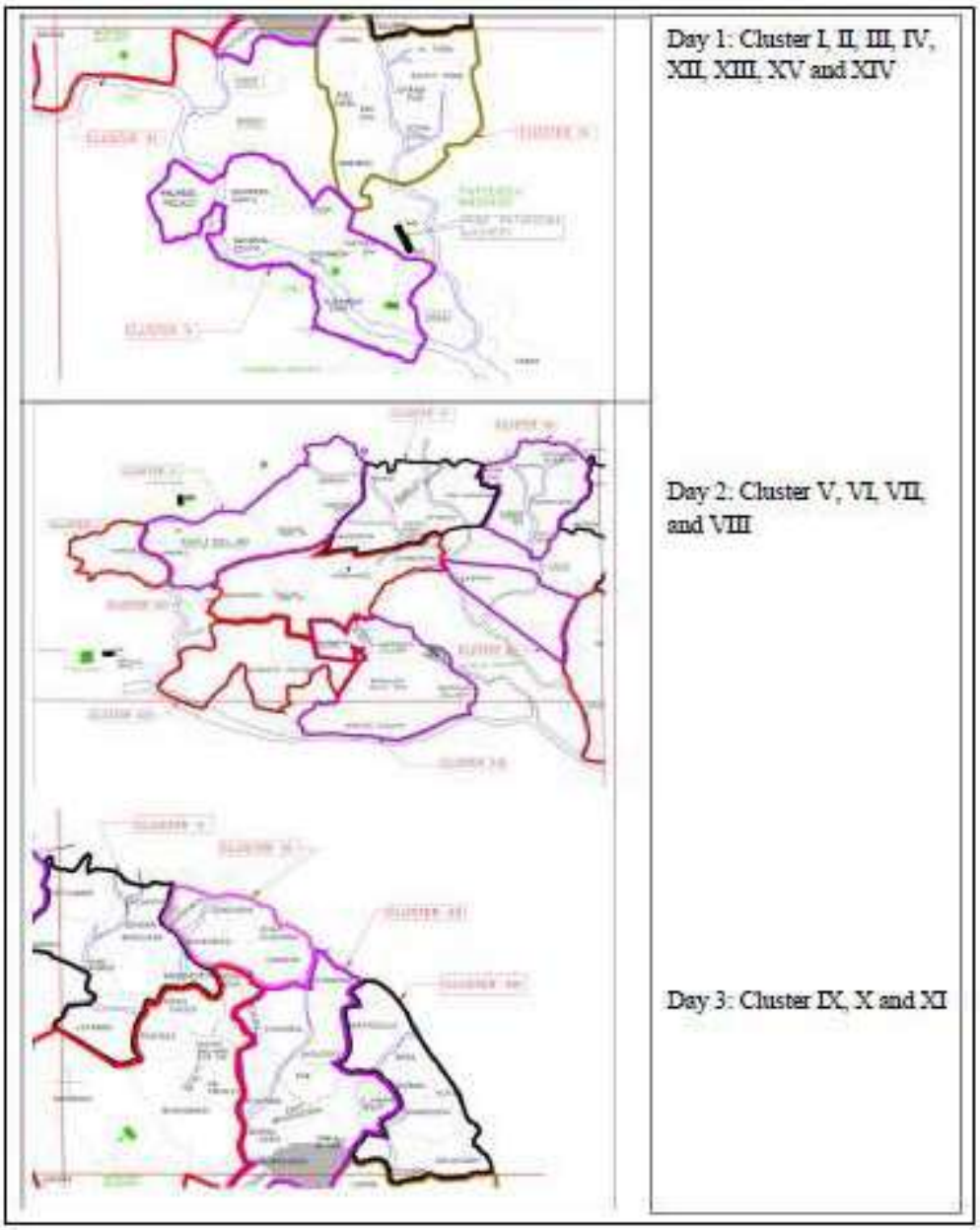
Roy, D., Singh, G., Sinha, S., Park, J., & Seo, Y. C. (2021). Emission inventory of PM10 in Dhanbad/Jharia coalfield (JCF), India: an intricate coal mining sector. *Environment, Development and Sustainability*, *23*(3), 3048-3061. https://doi.org/10.1007/s10668-020-00702-4.

## Chapter 3 Air Quality Monitoring and Receptor modelling

BCCL environmental department provided the map of the Jharia region. The site visit was carried out with assistance from BCCL's team. The 15 Jharia mines coal fields were segregated into three parts. The details of the visit and mine cluster names are given in Table 3.3.1. The Entire Jharia Coal Field (JCF) is divided into 16 clusters. Both open cast and underground mines are operational in JCF. Standard mining operations like drilling, blasting, hauling, accumulation, and transfer are the major sources of emissions and air pollution. Apart from that, a typical emission source, mine fire, is prevailing at JCF. Besides, JCF encompasses large non-mining regions with their emission sources like vehicular emission in congested traffics, road dust, Power Plant emission, other industrial emissions (coke oven plants, brick kilns, stone crushers, etc.), crematoria, domestic burning, open burning, etc.

Table 3.3.1: The details of mine cluster in Jharia Coalfield



Based on preliminary field visit by NEERI Scientists along with BCCL staffs, the following locations (Figure 3.1) were selected for the establishment of Air Quality Monitoring Stations for source apportionment study;

- **Core Zone**

1. Cluster XIV Lohapatty– nearby sources: Chandrapura Thermal Power Plant
2. Cluster VII Mine rescue station- nearby sources: Coal Mine, Industry
3. Cluster V- Katras
4. Cluster IX Lodhna
5. Cluster XI Moonidih nearby sources: Coal Mine
6. Cluster X Patherdih: nearby sources: Coal Mine, Steel Industry
7. Cluster VIII Bastacola nearby sources: Coal Mine

- **Buffer Zone**

8. Bank More
9. Harina
10. Bhuli
11. Sindri
12. Parbatpur Electro steel/ Bhaga
13. Background

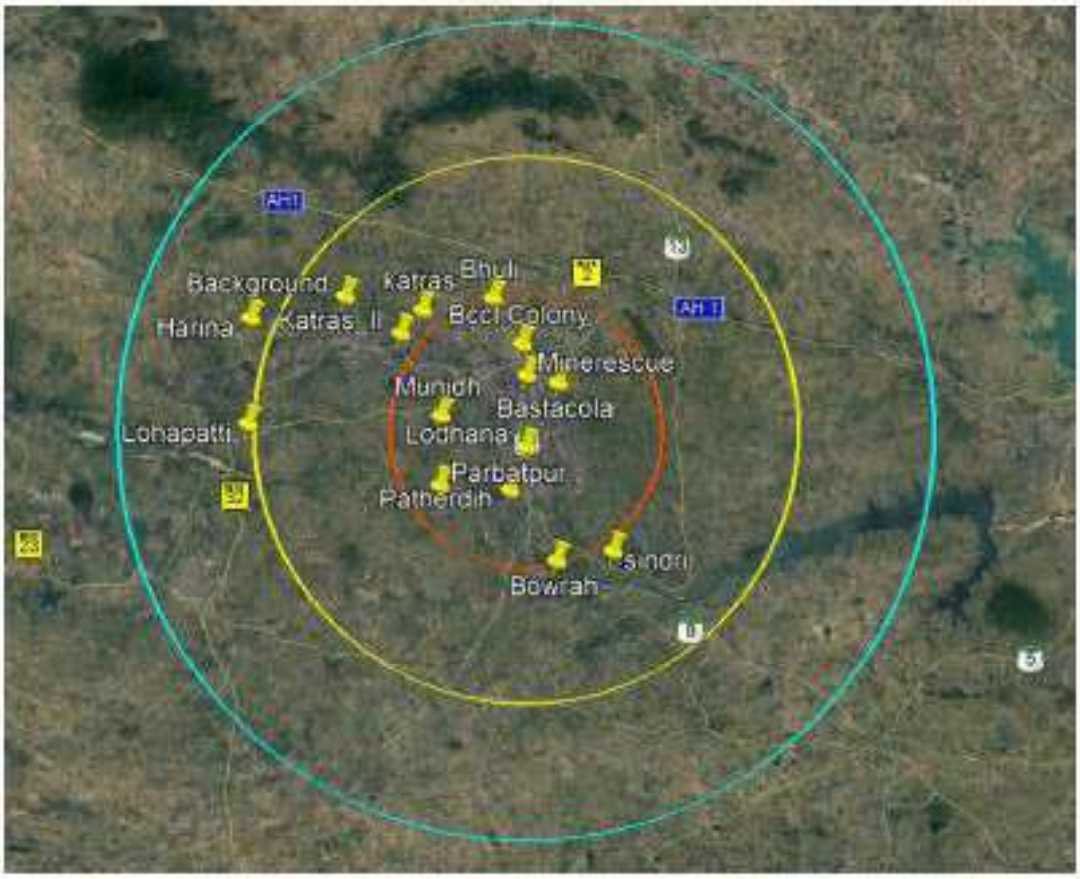



Figure 3.1: Air monitoring sites under 30 km buffer area

### 3.1. Sampling Method and Schedule

The $PM_{10}$ and $PM_{2.5}$ sampling for Jharia Coalfields was done at all the 13 sampling sites for the period of 24 h using low volume respirable suspended particulate matter samplers (Instrumax, ARA and Envirotech) on Quartz and polytetrafluoroethylene (PTFE) filter paper of 47 mm diameter. Samplers at a flow rate of 16.67 LPM were used. The filter papers were desiccated before and after sampling for 24h at a temperature of 27 ± 3°C and at a relative humidity (RH) of 55 ± 2% to remove the moisture present in them. The $PM_{10}$ and $PM_{2.5}$ field samples were collected periodically throughout the sampling period. The sampling frequency and types of equipment used for monitoring are described in Table 3.3.2 and 3.3.3. The national Ambient quality and Standards for Coal Mines (Stipulated by Ministry of Environment and Forests are depicted in Table 3.3.4. and Table 3.3.5.

Table 3.3.2: Frequency of Air pollutants sampling in Jharia Coalfields

| Parameter | Number of Days | Change of Filter/ absorbing media | Reporting |
|---|---|---|---|
| $PM_{10}$ | 10 | 24 hourly,<br>Teflon: 5 Days<br>Quartz: 5 Days | 24 hourly |
| $PM_{2.5}$ | 10 | 24 hourly<br>Teflon: 5 Days<br>Quartz: 5 Days | 24 hourly |
| $NO_2$ | 10 | 8 hourly | 8 hourly |
| $SO_2$ | 10 | 8 hourly | 8 hourly |

Table 3.3.3: Ambient Air Quality Sampling/Analysis Methodology for Target Pollutants

| Particulars | Parameters | | | |
|---|---|---|---|---|
| | $PM_{10}$ | $PM_{2.5}$ | $NO_2$ | $SO_2$ |
| **Sampling Instrument** | INSTUMEX and ARA-N-FRM Sampler | INSTUMEX and ARA-N-FRM Sampler | APM sampler | APM sampler |
| **Sampling Principle** | Cyclonic Flow Technique | Cyclonic Flow Technique | Chemical absorption in suitable media | Chemical absorption in suitable media |
| **Flow rate** | 16.7 LPM | 16.7 LPM | 0.5 LPM | 0.5 LPM |
| **Sampling Period** | 24 hourly | 24 hourly | 8 hourly | 8 hourly |
| **Sampling Frequency** | 7 days continuous, Teflon and quartz on alternate days | 7 days continuous, Teflon and quartz on alternate days | 7 days continuous | 7 days continuous |
| **Analytical Instrument** | Electronic Micro Balance | Electronic Micro Balance | Spectrophotometer | Spectrophotometer |
| **Analytical Method** | Gravimetric | Gravimetric | Modified Jacob and Hochheiser method | Colorimetric Improved West & Gaeke Method |
| **Minimum reportable value** | 5µg/m³ | 5µg/m³ | 9µg/m³ | 4µg/m³ |

Table 3.3.4: National Ambient Air Quality Standards (2009)

| Sr. No. | Pollutant | Time Weighted Average | Concentration in ambient Air (in µg/m³) Industrial, Residential Rural & Other Areas | Concentration in ambient Air (in µg/m3) Ecologically Sensitive Area | Concentration In ambient Air (in µg/m³) Methods of Measurement |
|---|---|---|---|---|---|
| 1 | Sulphur Dioxide ($SO_2$) | Annual* | 50 | 20 | Improved West & Geake, Ultraviolet fluorescence |
| | | 24Hours** | 80 | 80 | |
| 2 | Nitrogen Dioxide ($NO_2$) | Annual* | 40 | 30 | Modified Jacob & Hochheiser (Na-Arsenite) Chemiluminescence |
| | | 24Hours** | 80 | 80 | |
| 3 | Particulate matter (Size less than 10µm) or $PM_{10}$ | Annual* | 60 | 60 | Gravimetric, TOEM, Beta attenuation |
| | | 24Hours** | 100 | 100 | |
| 4 | Particulate matter (Size less than 2.5µm) or $PM_{2.5}$ | Annual* | 40 | 40 | Gravimetric, TOEM, Beta attenuation |
| | | 24Hours** | 60 | 60 | |
| 5 | Ozone ($O_3$) | 8 Hours* | 100 | 100 | UV photometric, Chemiluminescence chemical method |
| | | 1 Hour | 180 | 180 | |
| 6 | Lead (Pb) | Annual* | 0.5 | 0.5 | ASS / ISP method after sampling on EPM 2000 or equivalent filter paper ED-XRF using Teflon filter |
| | | 24Hours** | 1 | 1 | |
| 7 | Carbon Monoxide (CO) | Annual* | 0.2 | 0.2 | Non-dispersive Infra-Red (NDIR) Spectroscopy |
| | | 24Hours** | 0.4 | 0.4 | |
| 8 | Ammonia ($NH_3$) | Annual* | 100 | 100 | Chemiluminescence, Indo-phenol's blue method |
| | | 24Hours** | 400 | 400 | |
| 9 | Benzene ($C_6H_6$) | Annual* | 0.5 | 0.5 | Gas Chromatography based continuous analyzer. Adsorption and description followed by GC analysis |
| 10 | Benzo (a) Pyene (BaP)- particulate phase only | Annual* | 0.1 | 0.1 | Solvent extraction followed by HPLC / GC analysis |
| 11 | Arsenic (As) | Annual* | 0.6 | 0.6 | AAS/ ICP method after sampling on EPM 2000 or equivalent filter paper |
| 12 | Nickel (Ni) | Annual* | 20 | 20 | |

Table 3.3.5 Standards for Coal Mines (Stipulated by Ministry of Environment and Forests (MoEF), Vide Notification No. GSR 742(E), Dt: 25.09.2000)

| Pollutant | Time weighted Average | Concentration in Ambient Air | |
|---|---|---|---|
| | | New Coal Mines (commenced after 25.09.2000) | Existing Coal Mines (commenced prior to 25.09.2000) |
| **Suspended Particulates Matter (SPM)** | Annual Average<br>24 hours | 360µg/m3<br>500µg/m3 | 430µg/m3<br>600µg/m3 |
| **Respirable Particulate Matter (size less than 10 µm) (RPM)** | Annual Average<br>24 hours | 180µg/m3<br>250µg/m3 | 215µg/m3<br>300µg/m3 |
| **Sulphur Dioxide ($SO_2$)** | Annual Average<br>24 hours | 80µg/m3<br>120µg/m3 | 80µg/m3<br>120µg/m3 |
| **Oxides of Nitrogen as $NO_2$** | Annual Average<br>24 hours | 80µg/m3<br>120µg/m3 | 80µg/m3<br>120µg/m3 |

### 3.2. Chemical Analysis

#### 3.2.1. Gravimetric analysis

The exposed filters were analysed by gravimetric technique using a weighing balance for $PM_{10}$ particles and using a microbalance for $PM_{2.5}$ particles with a precision of 5µg with automatic (internal) calibration.

#### 3.2.2. Elemental analysis

$PM_{10}$ samples collected on glass fibre filters were digested in a microwave digester. The samples were made up to 50ml using deionized distilled water. Similarly, the exposed filters containing $PM_{2.5}$ particles were cut equally into 2 halves. A part of the exposed filter was used for ions analysis. Whereas, the other half was cut into tiny fragments and digested and made up to 15mL using distilled deionized water. The obtained samples (both $PM_{10}$ and $PM_{2.5}$) after digestion were stored in vials and refrigerated at 4°C until further analysis. These samples were later subjected to estimate the elemental composition using ICP-OES (Thermo Scientific, USA).

#### 3.2.3. Analysis of $SO_2$ and $NO_2$

$SO_2$ analysis: Modified West and Gaeke method was followed for sampling and analysis of Sulfur dioxide in ambient air. $SO_2$ from the air is absorbed in a solution of potassium tetracholo-mercute (TCM). A dichlorosulphitomercurate complex, which resists oxidation by the oxygen in the air was formed. Once formed, that complex was stable to strong oxidants such as ozone and oxides of nitrogen and therefore, the absorber solution may be stored for some time prior to analysis. The complex was made to react with pararosaniline and formaldehyde to form the intensely colored pararosaniline methylsulphonic acid. The absorbance of the solution was measured by means of a suitable spectrophotometer.

$NO_2$ analysis: Modified Jacobs and Hochheiser method was followed for sampling and analysis of $NO_2$ in ambient air. Ambient $NO_2$ was collected by bubbling air through a solution of sodium hydroxide and sodium arsenite. The concentration of nitrite ion produced during sampling was determined calorimetrically by the nitrite ion reaction with phosphoric acid, sulphanilamide, and N-(1-napthyl)-ethlylenediamine di-hydrochloride (NEDA) and the absorbance of the highly colored azo dye was measured at 540nm.

### 3.2.4. Ion analysis

The filter papers containing both $PM_{10}$ and $PM_{2.5}$ samples were extracted and subjected to ion analysis as per standards. The filter papers were divided into tiny fragments and moistened with isopropanol slightly before extraction since the filters are hydrophobic. Further 25 mL of deionized distilled water was added and sonicated using an ultrasonic bath for 60 min at 60°C. The samples were then kept overnight after sonication. Furthermore, the samples were then filtered using nylon filter discs (25mm, 0.45mm) and were refrigerated at 4°C until further analysis. The extracted samples were subjected to IC to analyse the ions (anions and cations) present in them.

### 3.2.5. Polycyclic Aromatic Hydrocarbons (PAH) analysis

Filter papers were cut into pieces using scissors and transferred to a 100 ml beaker and 50 ml of Dichloromethane (DCM) (GC/HPLC grade) was added. The samples were extracted with DCM using an ultrasonic bath for about 30 minutes. The extracted samples were filtered with Whatman filter paper containing 2gm Anhydrous Sodium Sulphate. After filtration, the filtrate is concentrated using a rotary vacuum evaporator to 2ml final volume. Solid-phase extraction may be used to clean up the impurities of the sample and re-concentrated in a rotary evaporator. The samples were analyzed through GC with conditions as injector 300°C and FID temperature 320°C.

### 3.2.6. EC & OC analysis

This is a thermal/optical-transmittance (TOT) method that speciates carbon in particulate matter collected on a quartz-fiber filter into OC, EC, and CC. In the first (or non-oxidizing) heating stage, organic and carbonate carbon is thermally desorbed from the filter under a flow of helium with controlled temperature ramps. The oven is then partially cooled, and the original flow of helium is switched to an oxidizing carrier gas ($He/O_2$). In the second (or oxidizing) heating stage, the original elemental carbon component plus pyrolyzed organic carbon formed during the first heating stage are oxidized/desorbed from the filter with another series of controlled temperature ramps. All carbon evolved from the sample is converted to $CO_2$ in an oxidizing oven immediately downstream from the desorption oven, and the $CO_2$ is converted to methane ($CH_4$) by a methanator oven before being measured with a flame ionization detector (FID). (https://www3.epa.gov/ttnamti1/files/ambient/pm25/spec/RTIOCECSOP.pdf)

### 3.3. Results

#### 3.3.1. Mass concentration of $PM_{10}$ and $PM_{2.5}$

In summer monitoring, the mean mass concentrations of $PM_{10}$ particles in all 13 sampling sites were found to be in the range of 74-184µg/m$^3$ with the highest concentration of 184µg/m$^3$ at mine rescue site and lowest concentration of 74µg/m$^3$ at Bastacola site. Also, the mean mass concentration of $PM_{2.5}$ particles was found in the range of 49-117µg/m$^3$ with the highest concentration of 117µg/m$^3$ and the lowest concentration of 49µg/m$^3$ recorded at Harina and Lohapatti site respectively.

The average concentrations of $PM_{10}$ and $PM_{2.5}$ in two seasons are described in Table 3.6 and 3.7. Results revealed that the average concentrations of $PM_{10}$ are within the prescribed limits of MoEF notification guidelines for coal mine areas. In the case of $PM_{2.5}$, there is no Govt. notified standard for mining areas but in the case of buffer zones, National Ambient Air Quality Standard, NAAQS, 2009 may be applicable. The highest $PM_{10}$ and $PM_{2.5}$ concentrations were found in Mine rescue and Harina (Figure 3.2 and 3.3).

Table 3.6: Average concentration of $PM_{10}$ and $PM_{2.5}$ in Summer of Jharia Coalfield

| Monitoring Sites | | Average Concentration (µg/m$^3$)-Summer | |
|---|---|---|---|
| | Site Description | $PM_{10}$ (µg/m$^3$) | $PM_{2.5}$ (µg/m$^3$) |
| Lohapatti | Core Zone | 133.7 | 49.42 |
| | | (83-203) | (44-83) |
| Mines Rescue | Core Zone | 184.8 | 83.43 |
| | | (124-255) | (55-205) |
| Katras | Core Zone | 141.4 | 80.01 |
| | | (100-216) | (42-150) |
| Lodhna | Core Zone | 156.8 | 63.98 |
| | | (100-303) | (32-99) |
| Moonidih | Core Zone | 118.4 | 62.84 |
| | | (80-153) | (34-94) |
| Patherdih | Core Zone | 94.7 | 67.22 |
| | | (50-119) | (37-91) |
| Bastacola | Core Zone | 74.21 | 62.85 |
| | | (52 -209) | (36-96) |
| BCCL colony | Buffer Zone | 157.35 | 74.37 |
| | | (113-222) | (47-103) |
| Harina | Buffer Zone | 177.7 | 117.3 |
| | | (73-265) | (42-175) |
| Bhuli | Buffer Zone | 141.7 | 105.89 |
| | | (85-243) | (44-161) |
| Sindri | Buffer Zone | 122.2 | 76.05 |
| | | (82-139) | (18-127) |
| Parabatpur | Buffer Zone | 122.4 | 110.98 |
| | | (86-171) | (70-150) |
| Background | Buffer Zone | 144.4 | 57.13 |
| | | (24-255) | (23-97) |

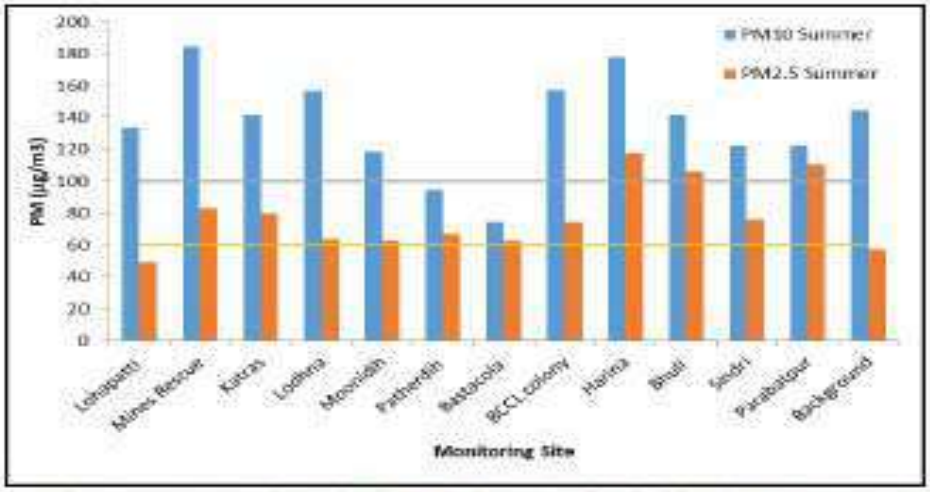



Figure 3.2: Average concentration of $PM_{10}$ and $PM_{2.5}$ in JCF region in summer compared to NAAQS (2009)

Table 3.7: Average concentration of $PM_{10}$ and $PM_{2.5}$ in winter of Jharia Coalfield

| Monitoring Sites | Site Description | Average Concentration (µg/m³)-Winter | |
|---|---|---|---|
| | | $PM_{10}$ (µg/m³) | $PM_{2.5}$ (µg/m³) |
| Lohapani | Core Zone | 174.28 | 139.59 |
| | | (122-241) | (114-236) |
| Mines Rescue | Core Zone | 303.49 | 176.97 |
| | | (175-350) | (114-233) |
| Katras | Core Zone | 230.06 | 50.87 |
| | | (134-332) | (24-78) |
| Lodhna | Core Zone | 322.8 | 112.17 |
| | | (243-412) | (98-209) |
| Moonidih | Core Zone | 300.16 | 188.27 |
| | | (128-728) | (64-600) |
| Patherdih | Core Zone | 222.71 | 113.23 |
| | | (182-246) | (111-167) |
| Bastacola | Core Zone | 332.05 | 176.48 |
| | | (251-663) | (54-425) |
| BCCL colony | Buffer Zone | 219.98 | 128.79 |
| | | (155-300) | (94-175) |
| Harina | Buffer Zone | 130.73 | 42.93 |
| | | (65-215) | (44-98) |
| Bhuli | Buffer Zone | 174.75 | 151.66 |
| | | (150-200) | (89-180) |
| Sindri | Buffer Zone | 171.82 | 167.07 |
| | | (81-210) | (142-184) |
| Parabatpur | Buffer Zone | 228.76 | 148.16 |
| | | (75-660) | (101-192) |
| Background | Buffer Zone | 233 | 121.18 |
| | | (195-254) | (63-170) |
| Katras II | | 107.13 | 98.42 |
| | Core Zone | (128-181) | (94-104) |

Whereas in winter monitoring, the highest $PM_{10}$ mass concentration was found to be 332µg/m$^3$ at Bastacola site (exceeding the prescribed limit of GSR 742(E)) along with other core mining zones like Mines Rescue, Moonidih. The lowest average concentration of $PM_{10}$ was found in Katras II (Table 3.7).

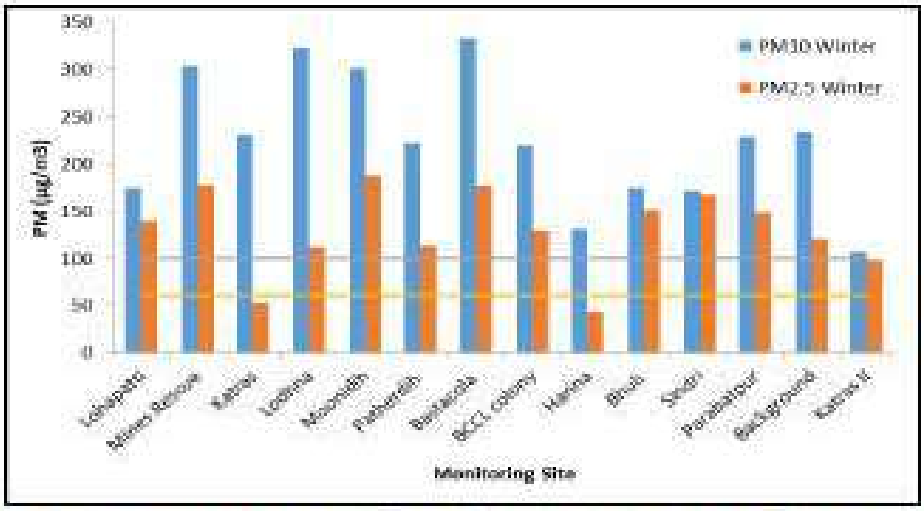



Figure 3.3: Average concentration of $PM_{10}$ and $PM_{2.5}$ in JCF region during Winter compared to NAAQS (2009)

### 3.3.2. Elemental concentration of $PM_{10}$ and $PM_{2.5}$ in summer

The digested samples of $PM_{10}$ and $PM_{2.5}$ particles from all the 13 sampling sites were subjected to estimate the elemental composition using ICP-OES. The analysis of $PM_{10}$ particles yields 11 different elements such as Al, As, Cd, Co, Cu, M, Ni, Pb, Zn, Fe and Cr. Similarly, the samples containing $PM_{2.5}$ particles revealed the same elements as $PM_{10}$. It was observed that Al and Fe were found to be higher for both $PM_{10}$ and $PM_{2.5}$ particles. Al is the most abundant element. The concentration of Al was detected in the range of 6.32-14.62µg/m$^3$. Maximum Al concentrations were found at BCCL colony, Parbatpur, Harina and Background. The concentrations of Fe and Cr were estimated as 0.78-7.74µg/m3 and 0.075-1.32µg/m3 respectively. The highest concentrations of both Fe (7.74µg/m3) & Cr (1.32µg/m3) were found at the Bastacola site Figure 3.4. Similarly, in the case of PM2.5 particles the concentrations of Al (4.87-14.47µg/m3), Fe (0.44-11.77µg/m3) and Cr (0.066-2.17µg/m3) were found higher than other elements. For PM2.5 particles, maximum concentrations of Fe (11.77µg/m3) and Cr (2.17µg/m3) were obtained at the Mine Rescue site and Al (14.47µg/m3) at Katras. Since, the elements such as Al, Fe and Cr possess higher concentrations in the PM10 elemental composition, Al would have been emitted from road dust, whereas Fe would have been emitted from the re-suspension of dust containing deposits from the emissions of vehicular and other anthropogenic activities Figure 3.5.

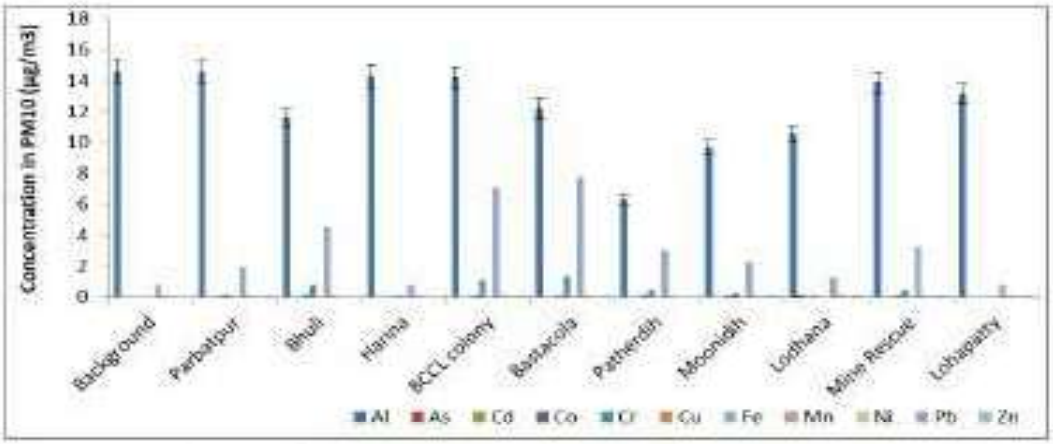



Figure 3.4: Metal concentration of $PM_{10}$ in the summer season

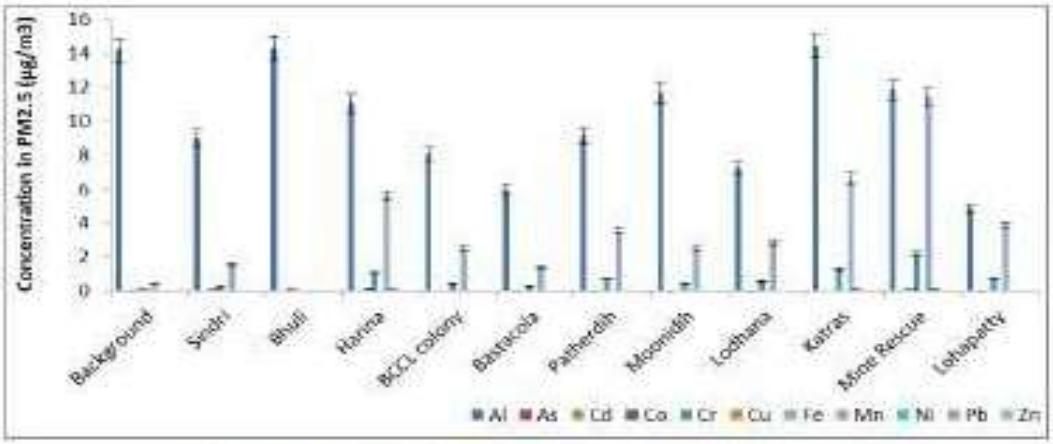



Figure 3.5: Metal concentration of $PM_{2.5}$ in the summer season

### 3.3.3. Elemental Concentration of $PM_{10}$ and $PM_{2.5}$ in Winter

The elemental analysis was performed using inductively coupled plasma optical emission spectroscopy (ICP-OES). For the air quality assessment, the concentrations of 11 elements i.e. Al, As, Cd, Cr, Cu, Fe, K, Mn, Ni, Pb, and Zn in $PM_{10}$ and $PM_{2.5}$ samples, were measured. Among all the elements, Al, Fe, and K concentrations were found considerably higher for $PM_{10}$ samples in the winter season. Al was observed in the range of 2.02-10.77µg/m3 followed by Fe (0.79-9.26µg/m3) and K (0.90-4.19µg/m3). Maximum Al concentration (10.77µg/m$^3$) was observed at the BCCL colony, followed by Lodhna (10.29µg/m$^3$). The Highest Fe concentration (9.26µg/m$^3$) was observed at Bastacola while K (4.19µg/m$^3$) at the Lodhna site. This may be due to vehicular emissions, paved roads, construction dust, coal combustion, soil dust, etc. The concentration of As, Ni, Pb was found within the limits of CPCB standards. The remaining elements i.e. Cd, Cr, Cu, Mn, and Zn were found very low (Figure 3.6).

Similarly, in the case of $PM_{2.5}$ samples concentrations of Al, Fe and K were detected higher than other elements. The concentration of Al, Fe, and K was obtained as 0.11-2.91µg/m$^3$, 0.05-1.93µg/m$^3$ and 0.08-2.12µg/m$^3$. For $PM_{2.5}$ particles, maximum Al and K were found at the Munidih site, which were 2.91µg/m$^3$ and 2.12µg/m$^3$ respectively. The highest concentration of

Fe i.e. 1.93µg/m$^3$ was detected at Lodhna site. The concentrations of all other analysed elements were low (Figure 3.7).

From the elemental analysis of the summer and winter seasons, it was observed that the average Al concentration obtained was more in the summer season than in the winter season. In contrast, the average concentration of Cr was more in the winter season.

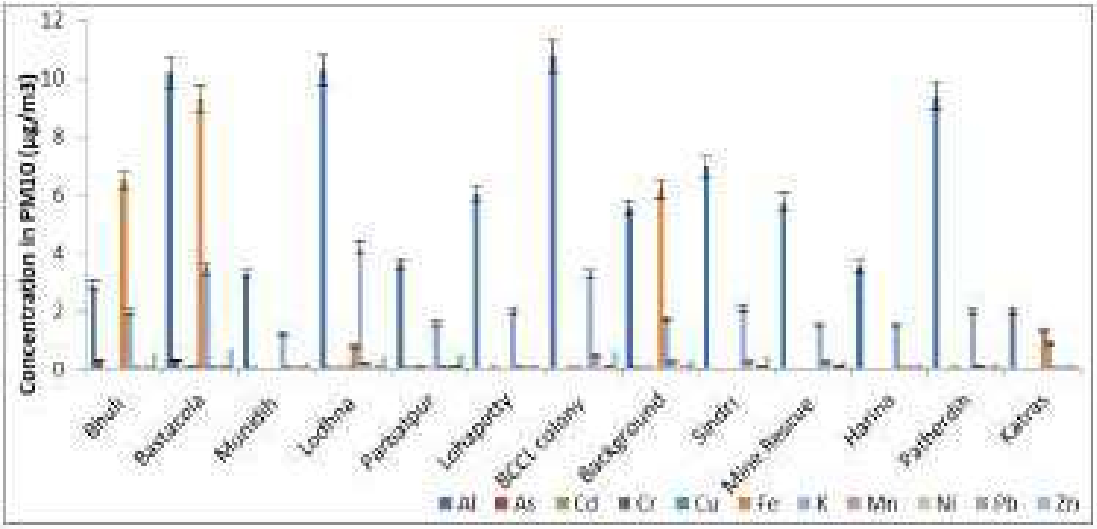



Figure 3.6: Metal concentration of $PM_{10}$ in winter season

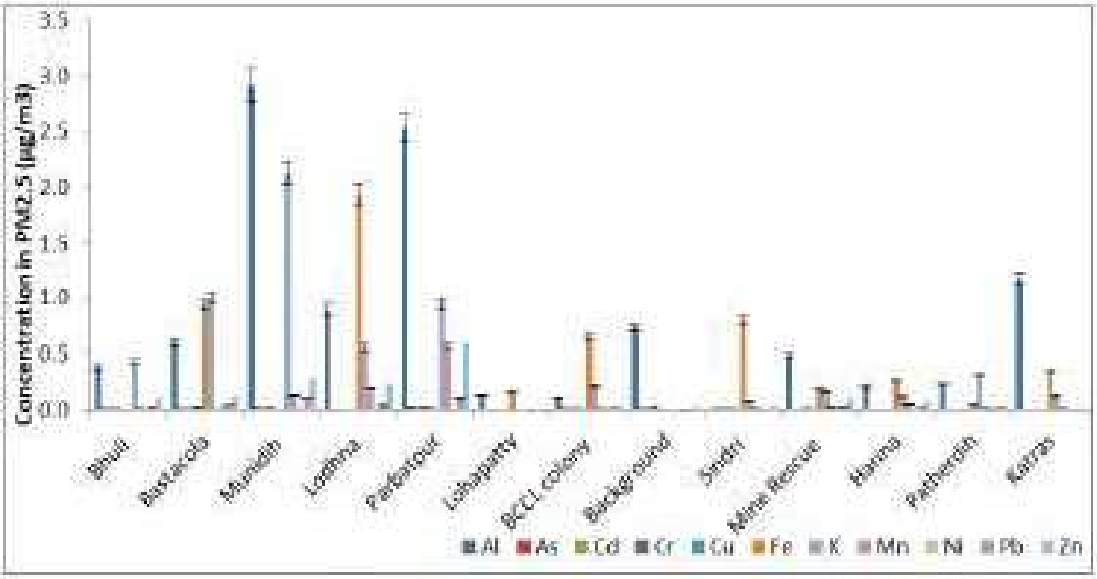



Figure 3.7: Metal concentration of PM 2.5 in winter season

### 3.3.4. $SO_2$ and $NO_2$ concentration in ambient air in the Summer season

The mean average $SO_2$ concentration in the summer season among all the monitoring stations ranged between 11µg/m$^3$ (Harina & Bastacola) and 24.5µg/m$^3$ (Moonidih), being well below the threshold limits of 80µg/m$^3$ (residential or industrial). The 8-hour average $NO_2$ concentrations were between 10.3µg/m$^3$ (Background) and 40.9µg/m$^3$ (Lodhana), well within the standard limits of 80µg/m$^3$ (residential or industrial) Figure 3.8. The $SO_2$ in the residential areas may be received from the open burning of raw coal and other domestic and commercial activities.

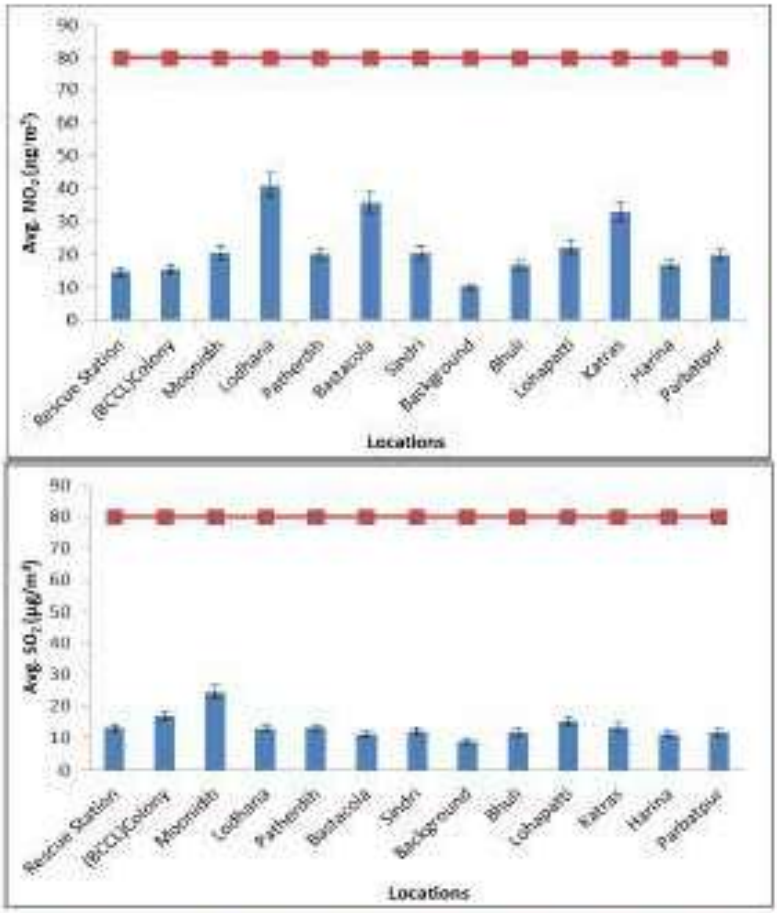



Figure 3.8: $NO_2$ and $SO_2$ Concentration of all monitoring sites in summer season

### 3.3.5. $SO_2$ and $NO_2$ concentration in ambient air in Winter season

The mean concentration of $NO_2$ and $SO_2$ in the winter season was found below the threshold limit i.e. 80µg/m$^3$. The concentration of $SO_2$ was below 10µg/m$^3$ in Katra, BCCL colony, Mine Rescue, Bastacola, Lodhana and Munidih. Bastacola and Bhuli site has a $NO_2$ concentration above 10µg/m$^3$ (Figure 3.9). It has been observed that the concentration of $NO_2$ and $SO_2$ in the winter and summer seasons were below the standard limit. But the average concentration of $NO_2$ and $SO_2$ in the summer season was higher than in the winter season.

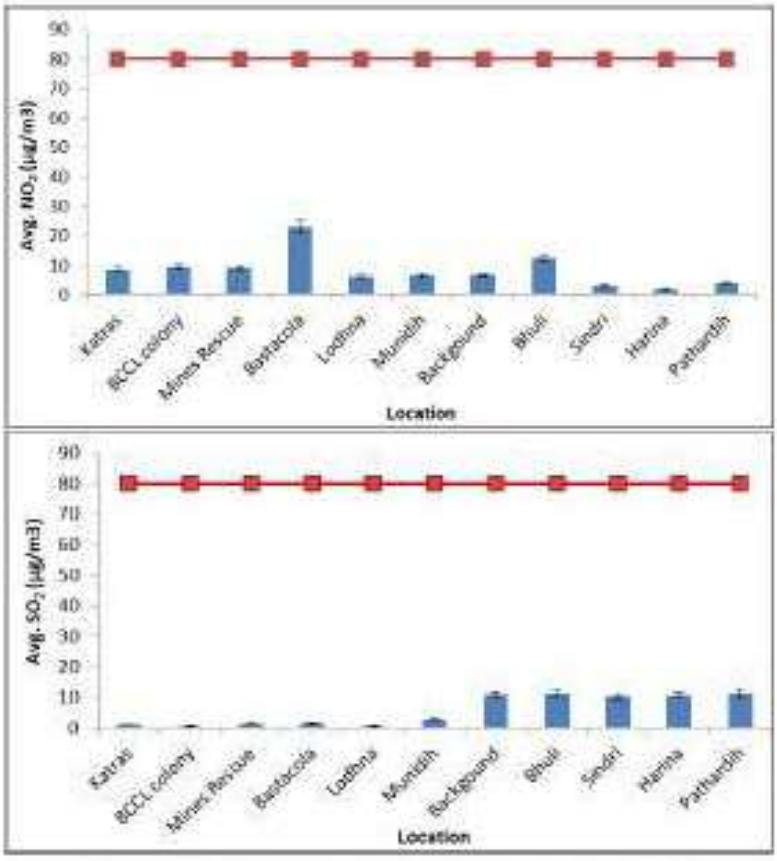



Figure 3.9: $NO_2$ and $SO_2$ Concentration of all monitoring sites in Winter season

### 3.3.6. Carbonaceous Aerosol/EC & OC in Summer

Data were obtained for four OC fractions (OC1, OC2, OC3 and OC4 in He atmosphere at 140, 280, 480 and 580°C, respectively) and three EC fractions (EC1, EC2, and EC3 in a 2% O2/98% He atmosphere at 580, 740 and 840°C, respectively). The IMPROV protocol defines OC as OC1 + OC2 + OC3 + OC4 and EC as EC1 + EC2 + EC3. The mass concentration of organic matter (OM) in the atmosphere was estimated by multiplying OC by 1.6 (conversion factor for urban aerosol). The total carbonaceous aerosol (TCA) was calculated as the sum of OM and EC. The highest concentration of OC and EC in $PM_{2.5}$ was found in the BCCL colony site i.e. 37.85 and 42.33µg/m$^3$, respectively, and the lowest OC concentration was 15.36µg/m$^3$ and EC was 13.08µg/m$^3$ in Sindri site. In comparison, the concentration of OC (67.35µg/m3) and EC (81.67µg/m$^3$) in $PM_{10}$ were higher in the BCCL colony among all the sites. The lowest OC concentration as 17.95µg/m$^3$ was in Bastacola and EC in Parbatpur i.e. 15.44µg/m$^3$ (Figure 3.10).

### 3.3.7. Carbonaceous Aerosol/EC & OC in winter

The mass concentration of EC and OC in $PM_{10}$ and $PM_{2.5}$ are more significant than 100µg/m$^3$ and 70µg/m$^3$, respectively in Bastacola, Katras, Mine Rescue, Background, and Sindri. The highest concentration of EC in $PM_{10}$ and $PM_{2.5}$ was observed in the Sindri site, whereas OC was found higher in Sindri and Bastacola. OC contributing to $PM_{10}$ mass concentration was lowest in

Harina followed by Lohapatti and Patherdih. In the case of $PM_{2.5}$, Parbatpur was found to have the lowest concentration among other sites.

The higher mean concentration of EC and OC in winter were likely related to the influence of emissions from residential heating (in addition to traffic source) and, on the other hand, to the unfavourable meteorological conditions leading to more excellent dispersion of pollutants in the atmosphere during this season. Elemental carbon is emitted directly into the atmosphere during incomplete combustion emissions, such as motor vehicle exhaust, fuel burning, and biomass burning (Figure 3.11).

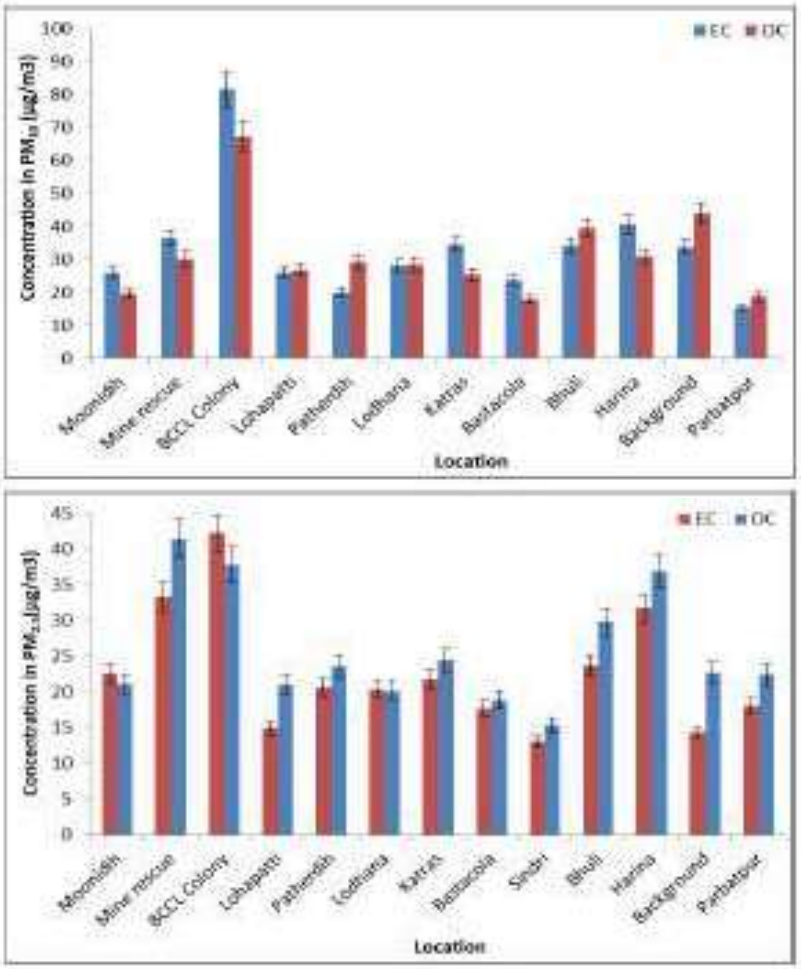



Figure 3.10: EC & OC concentration in $PM_{10}$ and $PM_{2.5}$ in Summer season

sites which followed the increasing order of $Na^+ < Mg^{2+} < F^- < K^+ < Ca^{2+} < Cl^- < NH_4^+ < SO_4^{2-} < NO_3^-$. It has been observed that $SO_4^{2-}$, $NO_3^-$ and $NH_4^+$ ions were present in abundant in $PM_{10}$ mass concentration, and concentration of $NO_3^-$ in these sites contributes majorly to $PM_{10}$. Ions concentration in Katras, Lohapatti, and Bhuli sites were observed having lower ionic concentration Figure 3.14.

The ionic composition of $PM_{2.5}$ comprises mainly of $SO_4^{2-}$, $NO_3^-$, $Cl^-$, $NH_4^+$, $Ca_2^+$ and $K^+$ ions. Locations such as Bastacola and Parbatpur have higher concentration of ions compared to remaining sites in following order: $Mg^{2+} < Na^+ < Ca^{2+} < K^+ < Cl^- < NH_4^+ < SO_4^{2-} < NO_3^-$. The same trend has been observed i.e. $SO_4^{2-}$, $NO_3^-$ and $NH_4^+$ ions contribute mainly in $PM_{2.5}$ mass concentration. The average concentration of $SO_4^{2-}$ and $NO_3^-$ in winter was higher than in summer.

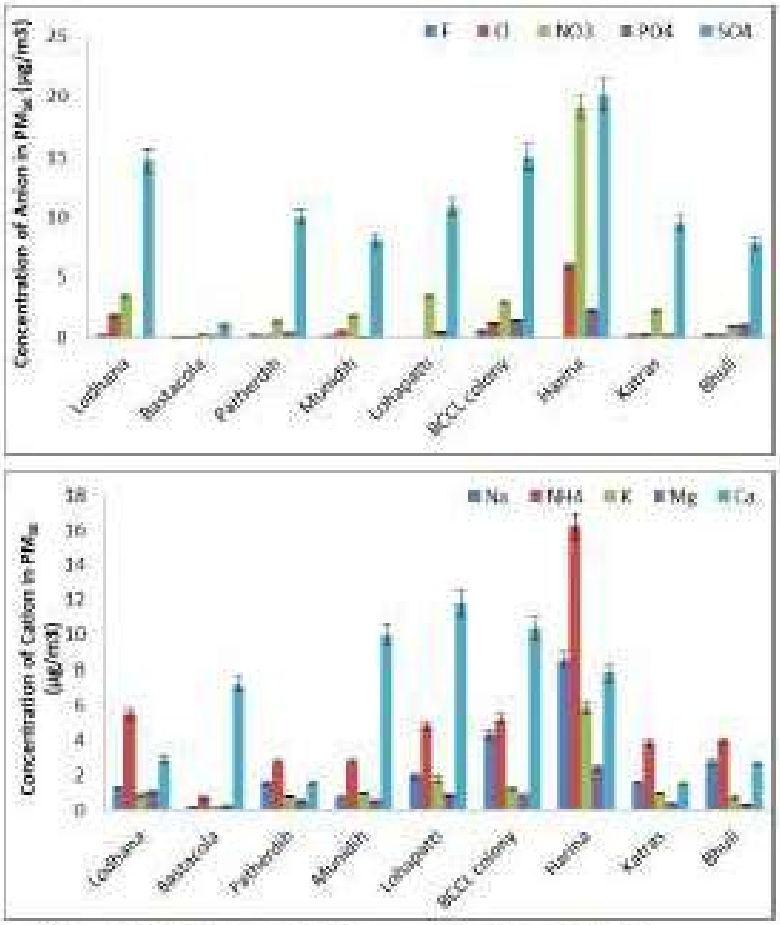



Figure 3.12: Anion and Cation concentration in $PM_{10}$ in summer

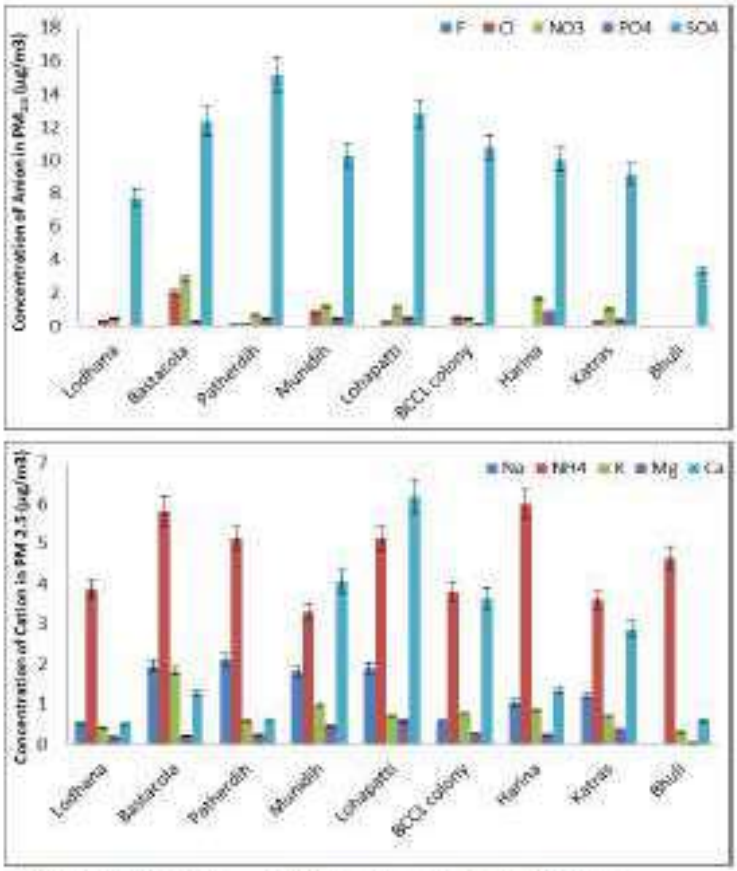



Figure 3.13: Anion and Cation concentration in $PM_{2.5}$ in summer

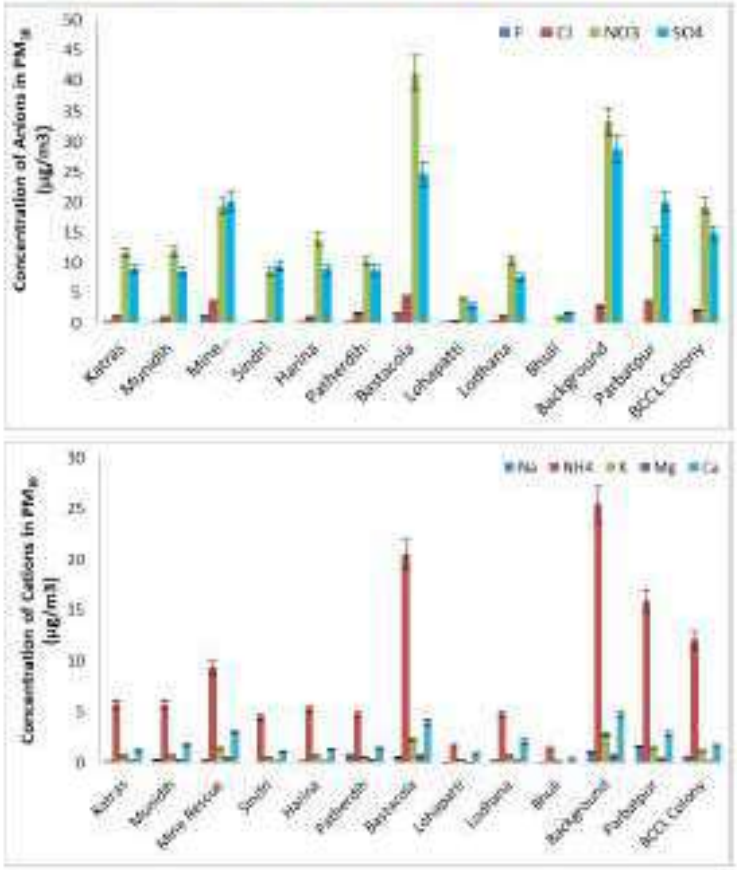



Figure 3.14: Anion and Cation concentration in $PM_{10}$ in winter

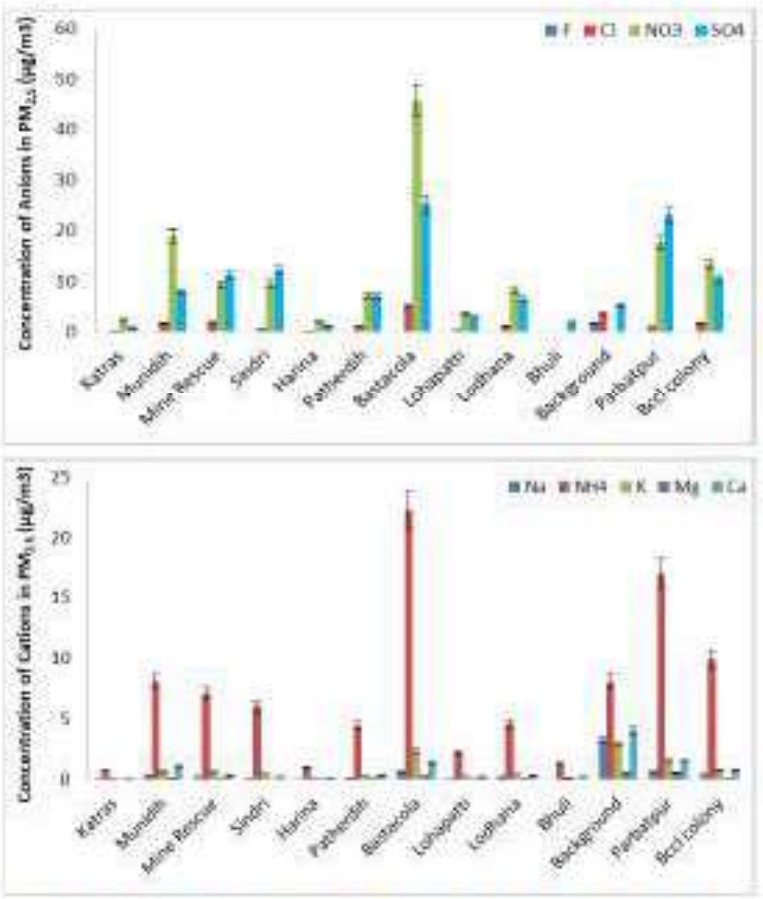



Figure 3.15: Anion and Cation concentration in $PM_{2.5}$ in winter

# Chapter 4 Receptor modelling

## 4.1. Source Apportionment

The source apportionment study was carried out to identify the potential sources contributing to the particulate matter of aerodynamic size less than 10 µm in the Jharia coalfield (JCF) using a receptor modelling approach. In receptor modelling, the particulate matter ($PM_{10}$) characterization in terms of metal, ions, elementary and organic carbon profiles is statistically matched with that of various source profiles in the study area. For the source apportionment study of JCF, the area is divided into various zones (buffer, core and background zone). And the ambient $PM_{10}$ characterization obtained from the multiple monitoring locations in the study area is conflated and compared with source profiles viz. industrial (mining and non-mining) and allied industrial activities, transportation, local vehicular movement and domestic fuel (coal wood burning, etc.). The chemical mass balance (CMB) model EPA-CMB v8.2 is one of the several receptor models and is most trusted for coarse and fine particulate matter source apportionment. The CMB model estimates source contributions by determining the best linear combination of emission source profiles and the chemical composition of ambient particulate, aerosol, and volatile organic compound samples. The study is studying the apportionment of particulate matter is considered owing to the nature of high particulate matter pollution in the study area. The source apportionment study is useful for devising an effective action plan for abatement of emission load in the region; thereby the region's overall air quality can be improved.

Jharia is one of the eight blocks in Dhanbad and is the main source of metallurgical coal in India, and is termed as the powerhouse of the country owing to its best quality coking coal, which is required by the steel and other industries in India. Dhanbad lies between 23°37'3" N and 24°4' N latitude and between 86°6'30" E and 86°50' E longitude with an average elevation of 222 m. Its geographical length, extending from North to South, is 43 miles and width 47 miles, stretching across East to West. It shares its boundaries with West–Bengal in the Eastern and Southern parts, Dumka and Giridih in the North, Bokaro in the west. It is the administrative headquarter of the district and Dhanbad Municipal Corporation (DMC).

The air quality status is determined by dividing the study area into background, core, and buffer zones. Thirteen sites were selected to represent various regions, including two references or background sites. The sampling locations are shown in Figure 3.1.

### 4.1.1. Chemical Mass Balance (CMB)

A mass balance equation can be written to account for all the chemical species in the samples as contributions from independent sources:

$$C_i = \sum_j m_j X_{ij} a_{ij} \qquad 4.1$$

$C_i$ is the concentration of species i measured at a receptor site (derived from the chemical analysis), $X_{ij}$ is the $i^{th}$ elemental concentration measured in the $j^{th}$ sample, and $m_j$ is the airborne mass concentration of material from the $j^{th}$ source contributing to the $j^{th}$ sample. The term $a_{ij}$ is

included as an adjustment for any gain or loss of species i between the source and receptor. The term is assumed to be unity for most of the chemical species.

The CMB 8.2 software (USEPA 1997) is used in this study. It is windows-based software that requires input data on ambient (at receptor locations) and source profiles of PM characterization. The model runs multiple iterations to provide optimum goodness of fit among the sources and receptors and verifies the model with various checks viz. Chi-square statistic, t-tests, mass percentage, and correlation coefficient. The following assumptions should be understood before proceeding with the CMB analysis.

The CMB model assumptions are:

- The concentration of emissions sources is constant throughout ambient and source sampling;
- Chemical species do not react with each other (i.e., they add linearly);
- All sources with potential for contributing to the receptor have been identified and have had their emissions characterized;
- The number of sources or source categories is less than or equal to the number of species;
- The source profiles are linearly independent of each other; and
- Measurement uncertainties are random, uncorrelated, and normally distributed.

The following steps are followed for running the CMB model:

- Identification of the contributing emission source types based on primary survey and emission inventory data collected around the monitoring sites.
- The selection of chemical species to be included in the CMB modelling calculation is based on the Central pollution control board (CPCB) guidelines.
- The source profiles with the fraction of each chemical species and uncertainty are withdrawn from the SPECIATE 5.1 database. SPECIATE 5.1 is US-EPA's repository of organic gas and particulate matter (PM) speciation profile of air pollution sources.
- Estimate ambient concentration (ambient data) is based on chemical analysis of the PM samples collected at the respective site during monitoring. The uncertainty of the chemical species is mainly based on the instrument uncertainty.
- The CMB 8.2 model run provides the solution of the chemical mass balance equation.

For source apportionment of $PM_{10}$, CMB 8.2 software (USEPA 1997) provides many goodness's of fit tests to verify the accuracy of the model. The normal checks, as specified in the manual by USEPA (1997) to accept the model are; t-statistics i.e., source contribution divided by the error of source contribution should be greater than 2, $\chi^2$ (chi-square) is the weighted sum of squares of the differences between calculated and measured fitting species concentrations divided by the effective variance and the degrees of freedom, it should be less than 4. The weighting is inversely proportional to the squares of the precision in the source profiles and ambient data for each species. Ideally, $\chi^2$ would be zero, there would be no difference between calculated and measured species concentrations. The $\chi^2$ less than one indicate a very good fit for the data. Values greater than 4 indicate that one or more of the fitting species concentrations are

not well-explained by the source contribution estimates (SCE). The source contribution estimate approximates the total mass concentration which is a convenient check on the %mass explained value. When the SCE is less than its standard error, the source contribution is undetectable. Two or three times the standard error may be taken as the upper limit of the SCE in this case. Assuming that the errors are normally distributed, there is about a 66% probability that the true source contribution is within one standard error and about a 95% probability that the true concentration is within two standard errors of the SCE.

$R^2$ is determined by the linear regression of the measured versus model-calculated values for the fitting species. $R^2$ ranges from 0 to 1. The closer the value is to 1.0, the better the SCEs explain the measured concentrations. When $R^2$ is less than 0.8, the SCEs does not explain the observations very well with the given source profiles. The percentage mass explained should be between 80% and 120%, the ratio of the computed and the measured concentration of each element (C/M ratio) should be close to 1 and R/U ratio, i.e., the ratio of residuals to uncertainty should be less than 2. As the model requires the source contribution estimates and receptor concentrations in ambient air, the significant sources in the area need to be identified first. The investigation of sources of $PM_{10}$ to be accounted for in the CMB model is carried out using emission inventory studies.

### 4.1.2. Source profiling

The Chemical profile needs to be developed for the air-polluting source as input to the receptor-oriented source apportionment models like CMB8.2 (chemical mass balance). The U.S Environmental Protection Agency's (EPA) SPECIATE database and several studies carried out in other parts of the world provide an extensive collection of source profiles. The source profiles required in this study are extracted from SPECIATE5.1 the database.

The source of the particulate matter in JCF accompanies various coal handling activities such as opencast coal mining and its associated activities, thermal power stations, automobiles, generator sets fuel burning, construction activities, domestic coal, cooking gas burning, etc. and even the background contribution of natural dust (crustal origin) cannot be ruled out, particularly, in the zones having loose topsoil (Roy and Singh 2014). So, the sources profiles considered here are coal dust, coal combustion, road dust, heavy vehicle diesel, light vehicle gasoline, etc.

### 4.1.3. Ambient profiling

As discussed in Chapter 3, the samples collected from the sampling location undergo chemical characterization. The species obtained from the chemical analysis used in ambient profile structuring and the uncertainty is based on the instrument.

The overall methodology used in the source apportionment study is depicted by the flow diagram as follows:

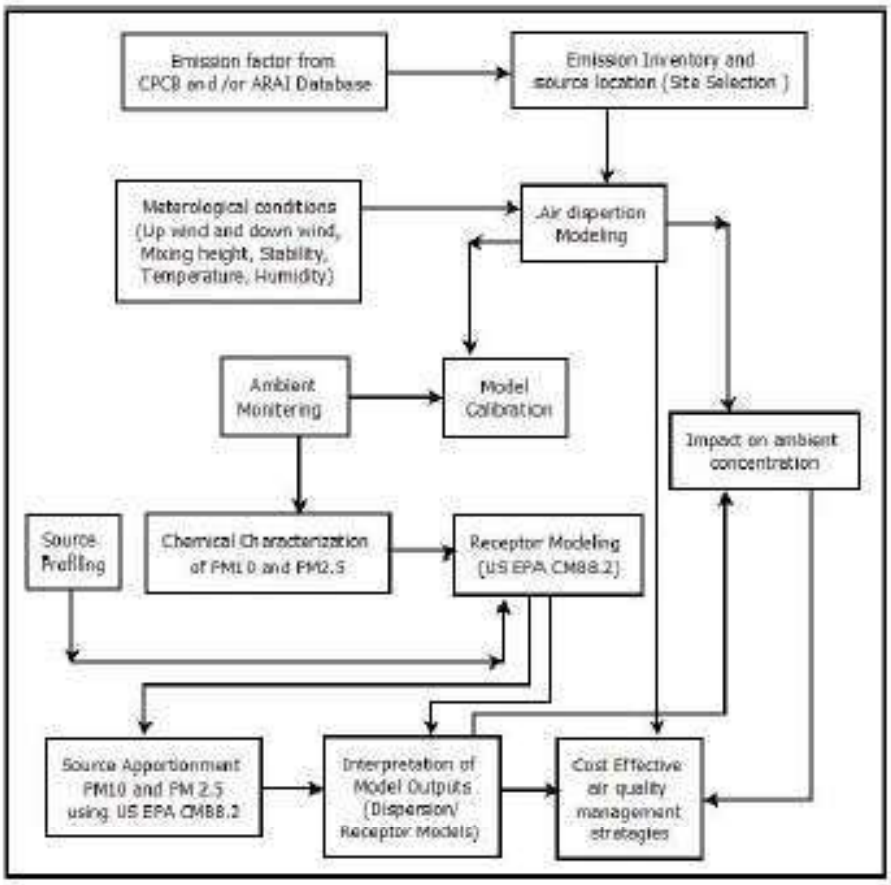



Figure 4.1: General methodology followed in the source apportionment studies

### 4.2. Results of the Chemical Mass Balance

CMB8.2 is performed for all the air quality monitoring locations. The significant sources in the area are identified first based on the field surveys. The general category of sources included in the model for all the sites are composites of all the vehicular sources, domestic combustion, road dust, agricultural waste burning, Industries, etc (Summary of relevant air quality studies from major Indian cities is given in Table 4.1). However, the choice of sources varies concerning the activities prevailing in the area and CMB model performance. A similar approach also applies to the selection of species. Efforts were made to include as many species in the model as possible. The choice was, however, restricted based on model performance. The source contributions are shown in the following Figures 4.3. The CMB model performance with respect to various sources is shown in Annexure 1.

#### 4.2.1. Domestic combustion

In the summer season, the foremost emission source was domestic combustion for $PM_{10}$ and $PM_{2.5}$. The domestic combustion percentage was observed at 22% and 25% for $PM_{10}$ and $PM_{2.5}$ in the summer season. In the winter season, domestic combustion contribution was the second most percentage contributor for $PM_{10}$ and $PM_{2.5}$. The $PM_{10}$ percentage was 23% while the $PM_{2.5}$

percentage contribution was 28% in this season. The higher concentration of $Cl^-$, $F^-$, Cr, and Br. $Cl^-$ and $F^-$ are the markers of coal-burning and wood-burning (Jain et al., 2020). High Br along with $Cl^-$ suggests the contributions from coal combustion.

#### 4.2.2. Industrial Emission

The industrial combustion percentage contribution observed 16% in $PM_{10}$ and 13% in $PM_{2.5}$ in the summer season. In the winter season, contribution to industries is determined to be 15% in $PM_{10}$ and 24% in $PM_{2.5}$. The abundances of elements like As, Zn, Fe, Cu, Cr, Pb, and S indicate the industrial source's emissions. Kumar et al. (2001) used Cu, Mn, and Ni as tracers for industrial emissions in Mumbai; Sharma et al. (2014b) used Cu, Cr, Mn, Ni, Co, and Zn as industrial emission tracers for metal manufacturing plants in Delhi; Kulshrestha et al. (2009) used a combination of Ni, Cu, Fe, and Cr as a marker for construction activities in Agra; and Karet al. (2010) used Zn, Cu, and Ni as tracers of galvanizing, metallurgy, and electroplating industries while Cr from tannery industry in Kolkata.

#### 4.2.3. Coal Mining

Opencast coal mining activity comprises heavy-duty diesel vehicle usage, blasting, Coal handling and overburden management. During the summer season, the coal mining activity in $PM_{10}$ and $PM_{2.5}$ is observed to be 8% and 7% respectively while in the winter season it contributes somewhat 6% and 5% in $PM_{10}$ and $PM_{2.5}$ respectively.

#### 4.2.4. Transportation

The overall transportation contribution is 25% for $PM_{10}$ and 32% for $PM_{2.5}$ in the summer season. In the winter season, the transportation emission contribution is examined at 16% for $PM_{10}$ and 18% for $PM_{2.5}$. The OC/EC ratio is a convenient diagnostic tool for investigating the sampling site and its emission sources. In the present study, the OC/EC ratio shows significant seasonal variations for a coarser fraction of PM than for a finer fraction. It is well established that OC/EC ratio values between 1.4 and 4 indicate emissions from gasoline catalyst vehicles and 0.3 to 1 suggest diesel vehicle emissions (Amato et al., 2016; Cesari et al., 2018). Assessing the ratio of nss-K+/EC is another diagnostic check for estimating the relative loading of vehicular emissions, where nss-K+ is a non-sea-salt water-soluble potassium ion (calculated as K+- 0.129Na+) (Andreae and Merlet, 2001).

#### 4.2.5. Secondary Inorganic Aerosol

During summer, the secondary inorganic aerosol contribution to $PM_{10}$ and $PM_{2.5}$ is about 8% and 16%, respectively. Secondary inorganic aerosols contribution found in winter is about 14% and 17%, respectively for $PM_{10}$ and $PM_{2.5}$. The secondary inorganic aerosol source is a high concentration of nitrate ($NO_3^-$), sulphate ($SO_4^{2-}$), and ammonium ($(NH_4^-)$. These secondary products are formed in the atmosphere, being emitted either by natural or anthropogenic sources. The oxidation of $NO_x$ forms the secondary nitrate. It is favoured by low temperature (Li et al.2004), while high temperature and strong solar radiations favour the formation of secondary sulfates through photochemical reactions (Seinfeldand Pandis, 2016). Secondary inorganic aerosol formation from precursors ($SO_2$ and $NO_2$) enhances the pollution burden over the

vicinity. Biomass burning, the presence of metal traces (Fe, Al, Mn, Zn, Cr etc.) from vehicular or industrial emission play a key role to neutralise the oxides of nitrogen and sulphur and thus raises the amount of secondary inorganic aerosols in the atmosphere.

#### 4.2.6. Agriculture

The agriculture contribution observed that 5% for $PM_{10}$ and 2% for $PM_{2.5}$ in the study period during the summer season. In the winter season, the contribution is 3% and 2% for $PM_{10}$ and $PM_{2.5}$ respectively. Agricultural activities contribute ammonium to the atmosphere (Pant and Harrison, 2012; Jain et al., 2019). The OC and EC are also significant agricultural activity sources (Ram and Sarin 2011; Sharma et al.2016a).

#### 4.2.7. Open burning

The contribution of open burning in the summer season is 5% for both $PM_{10}$ and $PM_{2.5}$ In winter, the garbage burning contribution is 6% and 2% for $PM_{10}$ and $PM_{2.5}$ respectively during study time. The abundance of tracers like $K^+$, Pb, Br and consider-able $Cl^-$ marks this garbage/biomass burning source. $K^+$ and levoglucosan are globally employed as biomass burning markers. Biomass consists of residential and agricultural wastes, post-harvest residue, cow dung, dry leaves, fuelwood, and wildfires (Almeida et al., 2006; Khare and Baruah, 2010; Shridhar et al., 2010). The OC and EC are also traced insignificant amounts along with K+, indicating the biomass burning emanations (Cesari et al., 2018; Sharma et al., 2014; Jain et al., 2018).

#### 4.2.8. Road Resuspension dust

The re-suspension dust is a significant contributor to $PM_{10}$. The contribution of resuspension dust is during the summer season 12% while in the winter season the emission contribution is 10% for $PM_{10}$. In the summer season, resuspension dust's contribution is higher because of the high wind velocity and dry condition. The lower percentage contribution of road dust to fine particulate matter is attributed to substantial road dust particulates in coarse mode, found in other studies (Gupta et al., 2007; Masri et al., 2015). Crustal elements are significant constituents of airborne soil and re-suspension road dust. Generally, they contribute to coarse aerosols, including Al, Si, Ca, Ti, Mg, Fe, and Na used as tracers for soil dust or crustal re-suspension (Lough et al.2005; Begum et al. 2011). The marker elements that have been used in India for the identification of soil dust include Al, Si, Ca, Ti, Fe, Pb, Cu, Cr, Ni, Co, and Mn (Sharma et al., 2017). Cu, Zn, and Ba are associated with road dust/re-suspension dust due to the release of these marker elements from cars and non-exhaust sources.

#### 4.2.9. Other emission Contribution

Other area sources contributed in the summer season is 12% for $PM_{10}$ and 7% for $PM_{2.5}$ during the study period. In the winter season, emission contribution is 14% for $PM_{10}$ and 9% for $PM_{2.5}$.

### 4.3 Inferences

The receptor modelling (CMB) results (Figure 4.3) revealed that the transport sector and domestic combustion are the predominant emission sources contributing to the receptor levels. During the summer season, the contribution of the transport sector was found maximum in both $PM_{10}$ (23%) and $PM_{2.5}$ (30%) followed by the contribution of domestic combustion (17% and 23% for $PM_{10}$ & $PM_{2.5}$ respectively). While in the winter season, the contribution of domestic combustion outruns the contribution of the transport sector. During the winter season, domestic combustion has contributed 22% ($PM_{10}$) and 28% ($PM_{2.5}$) whereas the transport sector has contributed 16% ($PM_{10}$) and 21% ($PM_{2.5}$) of the total emission.

After transport sector and domestic combustion, Industrial emission (12% of $PM_{10}$ emission) and Road Resuspension (12% of $PM_{10}$ emission) followed by Coal mining activity and secondary inorganic aerosol formation (both 8%) are contributing majorly to $PM_{10}$ emission at receptor during the summer season.

In $PM_{2.5}$ source contribution, secondary inorganic aerosol formation contributed majorly (16% & 15% in summer and winter seasons respectively) after domestic combustion and transport sector. Secondary inorganic aerosol formation from precursors ($SO_2$ and $NO_2$) enhances the pollution burden over the vicinity. Biomass burning, the presence of metal traces (Fe, Al, Mn, Zn, Cr etc.) from vehicular or industrial emission play a key role to neutralise the oxides of nitrogen and sulphur and thus raises the amount of secondary inorganic aerosols in the atmosphere.

Industrial activity contributed 12% and 11% of total $PM_{10}$ load in summer and winter respectively but in the case of finer dust ($PM_{2.5}$), it contributed 17% in the winter season at the receptor level. This may be due to the calm winter conditions that allow finer dust ($PM_{2.5}$) to settle near to ground than that of summer conditions that allow more turbulence mixing in the atmosphere.

Road re-suspension of dust contributes significantly in $PM_{10}$ load at receptor both in summer (12%) and in winter (8%). As these are larger and heavier particles, they contribute to $PM_{10}$ fraction and are not found in $PM_{2.5}$ fraction at the receptor.

After the contribution of the industrial sector, coal-mining activity contributed around 8% and 6% of the total $PM_{10}$ receptor dust load during summer and winter respectively. In the case of $PM_{2.5}$ dust load at the receptor, coal-mining activity contributed 7% and 5% during summer and winter respectively.

From the results and analysis of receptor modelling, it can be summarised that mitigation and abatement of the emissions from domestic combustion and transport sector alone may reduce receptor dust load by 40% (approx.).

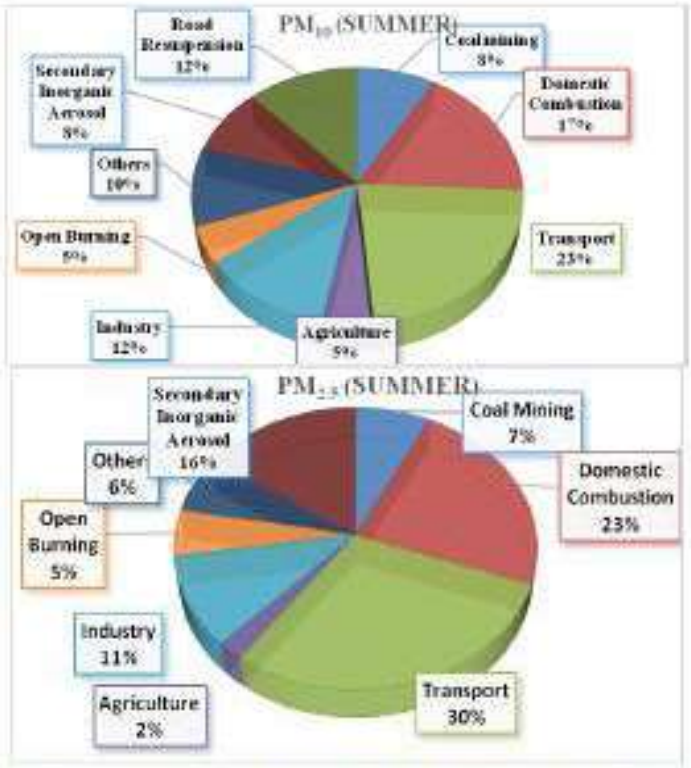



Figure 4.2: Source contribution at receptor locations of $PM_{10}$ and $PM_{2.5}$ in summer

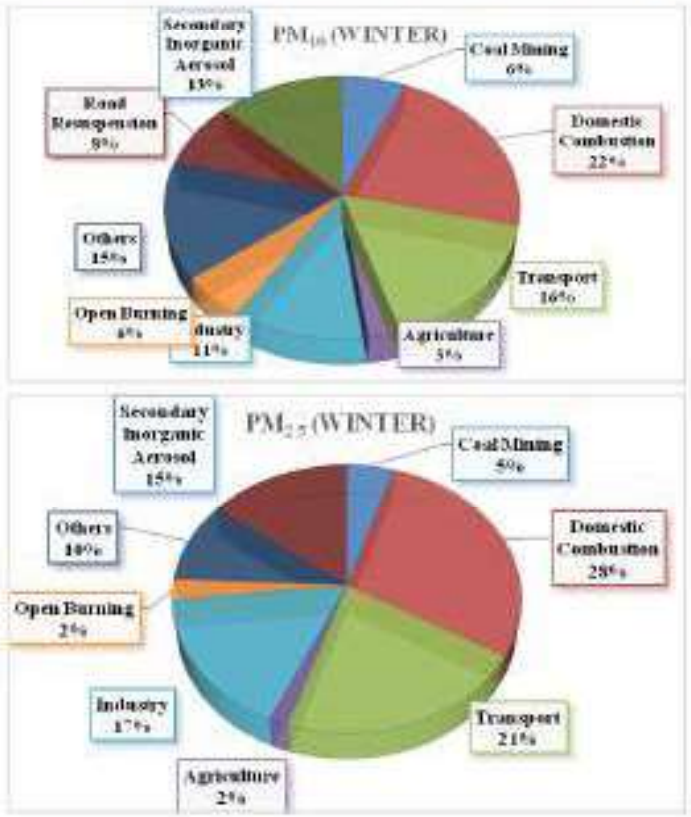



Figure 4.3: Source contribution at receptor locations of $PM_{10}$ and $PM_{2.5}$ in winter

Table 4.1: Summary of relevant air quality studies from major Indian cities.

| Area/Location | Particle size | Sources | Elements and Ions | References |
|---|---|---|---|---|
| Delhi | $PM_{10}$ and $PM_{2.5}$ | Secondary Nitrate, Secondary Sulfate, Vehicular emission, Biomass burning, Soil dust, Fossil fuel combustion, Sodium and magnesium salt, Industrial emission | Al, Mg, Ca, Ti, Fe, Cr, Mn, Zn, As, Pb, Br, M, $F^-$, $Cl^-$, $NO_3^-$, $SO_4^{2-}$, $K^+$, $NH_4^+$, and $Na^+$ | Jain et. Al., 2020 |
| Mangalore | $PM_{10}$ and $PM_{2.5}$ | Construction dust, Diesel generator, Tyre wear emission, Brake lining emission, Sand dust emission, gasoline vehicle emission, Diesel vehicle emission, Unpaved and paved road emission, Biomass burning, LPG stove emission, Solid fuel emission, Ferrous and steel industries emission, Fabrication and welding emission, Kerosene stove emission | As, Ba, Cd, Cr, Cu, Fe, Mg, Mn, Mo, Ni, Pb, Sr, Zn, $F^-$, $Cl^-$, $NO_3^-$, $PO_4^{3-}$, $SO_4^{2-}$, $Na^+$, $K^+$, $Mg^{2+}$ and $Ca^{2+}$ | G. Kalaiarasan et al. 2018 |
| Delhi NCR | $PM_{10}$ and $PM_{2.5}$ | Dust construction, Vehicle emission, Biomass Burning, Industrial emission, Secondary Pollutants, DG sets emission, | Al, Si, P, S, Cl, Br, V, Mn, Fe, Co, Ni, Cu, Zn, As, Ti, Ca, $F^-$, $Cl^-$, $NO_3^-$, $Br^-$, $NO_2^-$, $SO_4^{2-}$, $Na^+$, $K^+$, $Mg^{2+}$ and $Ca^{2+}$ | Report No. ARAI/16-17/DHI-SA-NCR/Final Report August 2018 |
| Delhi | $PM_{2.5}$ | Secondary Aerosol, Vehicular emission, Biomass burning, Soil dust, Fossil fuel combustion, Sea salt, Industrial emission | Al, Mg, S, Si, Cl, K, Ca, Ti, Cu, Mn, Fe, Zn, Br, Cr, As, Pb, $F^-$, $Cl^-$, $NO_3^-$, $SO_4^{2-}$, $K^+$, $NH_4^+$, and $Na^+$ | Jain et. Al., 2017 |
| Nagpur | $PM_{2.5}$ | DG sets, biomass burning, resuspended dust, secondary aerosol and mobile sources. | Al, Ba, Cd, Cr, Cu, Fe, Mg, Mn, Ni, Pb, Si, Zn, $F^-$, $Cl^-$, $NO_3^-$, $PO_4^{3-}$, $SO_4^{2-}$, $Na^+$, $K^+$, $Mg^{2+}$ and $Ca^{2+}$ | Pipalatkar et al., 2014 |
| Raipur | $PM_{2.5}$ | Brick kiln process, steel re-rolling mills, steel processing industries, biomass burning, metallurgical industrial emissions and coal burning | Al, As, Ca, Cd, Co, Cr, Cu, Fe, Hg, K, Mg, Mn, Mo, Na, Ni, Pb, S, Sb, Se, V, Zn, $Na^+$, $K^+$, $Mg^{2+}$ $NH_4^+$, $F^-$, $Cl^-$, $NO_3^-$, $SO_4^{2-}$, and $Ca^{2+}$ | Matawle et al., 2014 |
| Hyderabad | $PM_{10}$ and $PM_{2.5}$ | Vehicles exhaust, resuspension of dust, secondary sulfates, secondary nitrates, biomass | Na, Mg, K, Al, Si, Ca, Fe, Cl, $SO_4^{2-}$, $NO_3$, $NH_4^+$ | Gummkunda et al., 2013 |

| | | | | |
|---|---|---|---|---|
| | | burning, coal burning. | | |
| Pune | $PM_{10}$ and $PM_{2.5}$ | Vehicles, DG sets, construction dust, solid fuels emissions, resuspended dust | Al, Pb, Cu, Zn, As, Se, Br, Ni, Fe, Mn, Mg, Cr, Ti, Ca, Cd, S, Si, Na, Ba, Sb, Cd, Sr, $Cl^-$, $NO_3^-$, $SO_4^{2-}$, $K^+$, $NH_4^+$ | ARAI, 2010 |
| Kanpur | $PM_{10}$ and $PM_{2.5}$ | Vehicles, open burn, road dust, domestic wood, coal and LPG, metal smelting, DG sets. | $Cl^-$, $NO_3^-$, $SO_4^{2-}$, $K^+$, $NH_4^+$, $Na^+$, $Ca^{2+}$, $Mg^{2+}$ Si, V, Cr, Mn, Fe, Co, Ni, Cu, Zn, As, Se, Cd, Sn, Sb, Pb | CPCB, 2010b |
| Mumbai | $PM_{10}$ and $PM_{2.5}$ | Wood combustion, Fuel oil combustion, kerosene combustion, biomass burning, LPG, ammonium sulfate, ammonium nitrate, heavy duty diesel vehicles emissions, soil dust. | Na, Mg, Al, Si, P, S, Cl, Ca, Br, V, Mn, Fe, Co, Ni, Cu, Zn, As, Ti, Ga, Rb, Y, Zr, Pd, Ag, In, Sn, La, Se, Sr, Mo, Cr, Cd, Sb, Ba, Hg, and Pb. $F^-$, $Cl^-$, $Br^-$, $NO_2^-$, $NO_3^-$, $SO_4^{2-}$, $K^+$, $NH_4^+$, $Na^+$, $Ca^{2+}$, $Mg^{2+}$ | CPCB, 2010a |
| Chennai | $PM_{10}$ and $PM_{2.5}$ | Vehicles, DG sets, bakeries, soil dust, construction dust, paved road dust, kerosene and LPG emissions. | As, Ag, Ca, Na, Fe, Mg, Cu, Zn and other metals. $Cl^-$, $NO3^-$, $SO4^{2-}$, $K^+$, $NH_4^+$, $Na^+$, $Mg^{2+}$ | IIT Madras, 2010 |
| Bangalore | $PM_{10}$ and $PM_{2.5}$ | Petrol vehicles, diesel vehicles, secondary particulates, fuel oil burning, wood domestic wood burning, DG set, kerosene generator set, paved road dust re suspension, soil dust. | Na, Mg, Al, Si, P, S, Cl, Ca, Br, V, Mn, Fe, Co, Ni, Cu, Zn, As, Ti, Ga, Rb, Y, Zr, Pd, Ag, In, Sn, La, Se, Sr, Mo, Cr, Cd, Sb, Ba, Hg, and Pb. $F^-$, $Cl^-$, $Br^-$ $NO_2^-$, $NO_3^-$, $SO_4^{2-}$, $Na^+$, $K^+$, $Mg^{2+}$ and $Ca^{2+}$ | TERI, 2010 |

DG - Diesel generators; LPG - Liquefied petroleum gas; OC - Organic carbon; EC - Elemental carbon.

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# Chapter 5 Dispersion Modelling

Air quality modeling includes four major processes (a) emission of pollutants, (b) transportation of the pollutants due to mean wind profile (c) chemical transformations and (d) deposition/removal. In the present study the particulate matter emissions, transportation and dispersion are carried out using the AERMOD model, which is developed by USEPA. AERMOD model estimates the spatial profile of pollutants based on the Gaussian plume equation, which is an analytical solution to the steady-state approximation of the advection-diffusion phenomenon. The boundary conditions about the atmospheric mixing height and other thermodynamic vertical profiles for the simulations are derived from the mesoscale model. The model relies on the atmospheric stability classes for deriving the dispersion coefficients across the multiple dimensions with respect to the distance away from the sources. In this study, only the ground level concentrations of the particulate matter are simulated during the study period. The study domain envelops the Jharia Coal Fields situated in the Jharkhand state of India. The methodology followed in the present study is shown in Figure 5.1. The southwest part of the Dhanbad City shares borders with the study area, but the majority of emission load used in the study is included from the JCF.

## 5.1. Wind data analysis

The nearest IMD (India Meteorological Department) observations are at Patna and Kolkata, which are approximate >150km from the study area. Hence, hourly meteorological observations required for the study for the AERMOD dispersion model were simulated through the Weather Research and Forecast, version-3.9 (WRF), which is a meteorological model that dynamically downscales the global NCAR/UCAR meteorological data to the regional level data (www.mmm.ucar.edu). Nested domains of grid resolution 12km and 4km, respectively were laid over the study area for simulation of hourly meteorological variables using the WRF model (Figure 5.2). Hourly meteorological data, including both the surface variables and upper atmosphere variables, were simulated for the study period viz. 23 May to 12 June 2019 and 23 January to 12 February 2020, representing the summer and winter seasons, respectively.

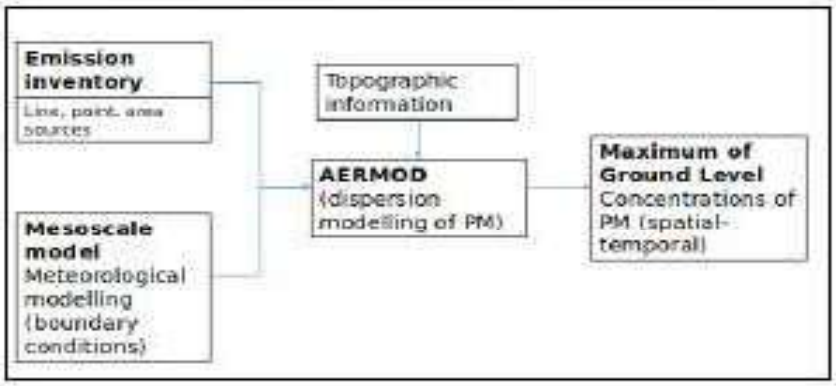


Figure 5.1: Methodology followed in the study.

The mesoscale model interface program MMIF (https://www.epa.gov/) converter tool was used

to convert the inner domain's gridded WRF model simulated meteorological data into a format suitable for the AERMOD model. The AERMOD receptor grid covering the study area is shown in Figure 5.3. A Cartesian receptor grid having 21 rows and 21 columns with a resolution of 2000 m was laid for the simulation of particulate matter dispersion /concentration at the receptor locations. Overall there are 20 grids in each direction covering an area of 40 km by 40 km enveloping the JCF.

The spatial pattern of the predominant wind profile over the study area is plotted using the windrose diagrams for the summer (March to May 2019) and winter season (November 2019 to February 2020), shown in Figures 5.2 and 5.3, respectively. Results show that the study area is experiencing the predominant wind (having high frequency) flow from east to west direction followed by north-west to south-east direction during summer, while in winter the predominant wind direction is from north to south. The wind speeds vary in the range of 0.5 to 11.1m/s during the summer predominantly in the range of 2.1 to 3.6m/s whereas wind speeds vary in the range of 0.5 to 8.8m/s during the winter, predominantly in the range of 2.1 to 3.6m/s.

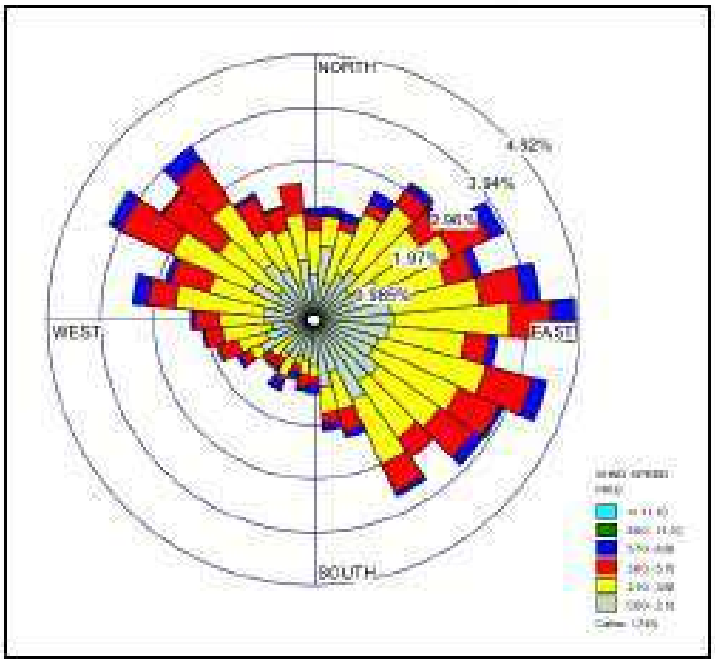


Figure 5.2: Windrose of the study area during March-June, 2019 (wind direction blowing towards the center)

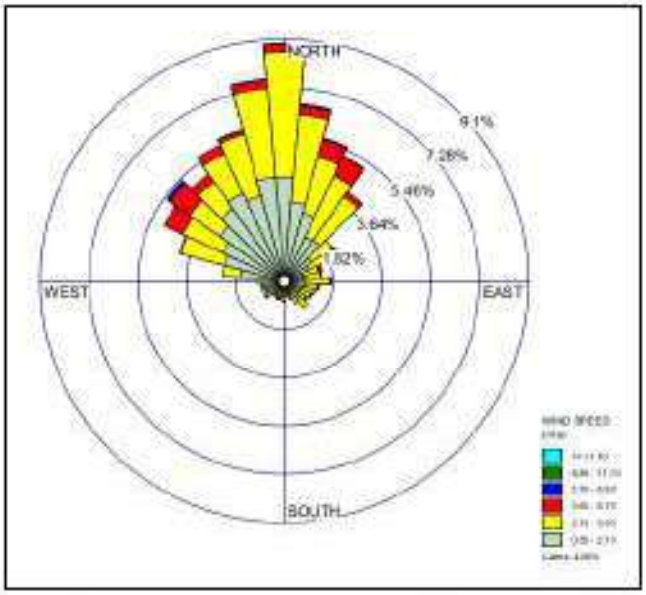


Figure 5.3: Windrose of the study area during November-December 2019 (wind direction blowing towards the centre)

**5.2. Dispersion of Particulate matter**

Spatial profiles of maximum ground-level concentrations of 24-hour average values of $PM_{10}$ and $PM_{2.5}$ were simulated using the AERMOD Gaussian plume model. The emission rates of particulate matter from multiple source types including the point, line, and area were derived from the field monitoring of the emission inventory. Point sources mainly include the emissions from the industries situated in the study area that mainly use coke/coal as the fuel. The line sources include the emissions from the vehicular exhaust. Emission inventory of traffic pollution was carried out in the study area by noting down the vehicular activity. The vehicular activity of different vehicular types such as trucks, light motor vehicles, three-wheeled vehicles, motorbikes, etc. was multiplied by the corresponding emission factors for the estimation of gaseous pollution. The summation of emissions from all vehicle types adds to the overall line sources contributing to the pollution load in the study area. The area sources include emissions from the open cast mining emissions (including all the activities in the mine premises) and domestic burning (including emissions from crematoria, bakeries, open eat-outs, restaurants, chulha burning from the slum, etc.).

The emissions in grams per second were calculated from the emission inventory survey, for the line and point sources. Whereas, the emission rates in $g/s/m^2$ were calculated for the area sources including mining. These emission rates from each source type have been computed in the study area and fed into the AERMOD model domain for the simulation of spatial average concentrations of $PM_{10}$ and $PM_{2.5}$. In the present study, the maximum GLC (ground level concentrations, in $\mu g/m^3$) was simulated at several receptor grid locations in AERMOD domains. The AERMOD model was run during the sampling period in May 2019 and November 2019, representing the pre-monsoon and post-monsoon seasons, respectively.

Analysis of WRF model simulated wind speed and direction data shows that the wind is

predominantly flowing from south-east direction to north-west direction, followed by the reversal in the direction, during the monitoring in summer, representing pre-monsoon conditions (Figure 5.5). The wind speeds during the monitoring period in summer month varied between 0.5 and 8.8m/s. During the monitoring period in winter (post-monsoon), the wind predominantly flowed from the north-east to south-west direction having wind speeds in the range of 0.5 to 3.6m/s (Figure 5.5).

The wind blowing from different directions in the study area determines the direction of pollution dispersion. The Gaussian plume equation used in the AERMOD model estimates the diffusion and advection of the pollutants concerning the emission rates and meteorology (wind speed, direction and atmospheric stability categories). The model simulated maximum ground level concentration of the particulate matter ($PM_{10}$ and $PM_{2.5}$) in the study area covering the JCF is shown through the isopleths. The isopleths (contours connecting the regions with the same ground level concentration in the context of the present study) of maximum GLC of $PM_{10}$ and $PM_{2.5}$ were observed to form a pattern according to the predominant wind directions flowing in different monitoring seasons. It is observed that the line sources in the study area have contributed the maximum to the surface GLC of $PM_{10}$, following the open cast mines. The AERMOD model simulated the value of GLC of $PM_{10}$ due to line sources, open cast mines, and all sources are 927, 286, and 978$\mu g/m^3$, respectively, for the summer season. The $PM_{2.5}$ maximum GLC contributed by the line sources, open cast mines, and all sources included are 809, 143, and 835$\mu g/m^3$, respectively. It is evident from the result that the line sources are significantly contributing to the overall particulate pollution in the study area during summer.
The analysis of the $PM_{10}$ and its maximum GLC simulated by the AERMOD model for the winter season also follows a similar pattern as of summer. The contribution of line sources, open cast mines, and all sources included are 1565, 597, and 1679$\mu g/m^3$, respectively. The $PM_{2.5}$ maximum GLCs during the winter are 1004, 299, 1167$\mu g/m^3$ as contributed by line, open cast mines, and all sources including, respectively. Based on the emission inventory and the prevailing meteorological conditions during the winter season have in general contributed to the higher particulate matter than that of the summer season.

Pockets of maximum concentrations of $PM_{10}$ (200-1000 $\mu g/m^3$ and above) are observed in the vicinity to roads nearer to the open cast mines south of Dhanbad City during the winter (Figure 5.5). The localities of the high concentrations of $PM_{10}$ are Sabji Patri road and Sudamdih mine area, which is reflected in the figure. The area covering the Dhanbad city and the mines situated in the southwest have $PM_{10}$ concentrations in the range of 200-900$\mu g/m^3$. The fringes of the JCF have recorded the $PM_{10}$ concentrations in the range of 100-250$\mu g/m^3$. In contrast, the $PM_{10}$ concentrations for the summer season have significantly lower and the majority of the study area have $PM_{10} < 100\mu g/m^3$, however, the area extending from south of Dhanbad City and Sudamdih mine have relatively high $PM_{10}$ concentration in the range of 100-500$\mu g/m^3$. Baghmara and Sonardih mine area in the west of Dhanbad City have also been observed to have high GLC of $PM_{10}$ in the range of 100-500$\mu g/m^3$.

A similar pattern of the spatial distribution of $PM_{2.5}$ is reflected as of $PM_{10}$. As the underlying meteorological conditions are the same for both the $PM_{10}$ and $PM_{2.5}$ simulations the

spatial pattern is nearly similar. High concentrations of $PM_{2.5}$ (100-500$\mu g/m^3$) are observed in the southwest direction of Dhanbad City (Figure 5.6). The maximum GLC of $PM_{10}$ is found to be higher than $PM_{2.5}$ during both the monitoring seasons, and higher concentrations are observed during the winter season. The prevailing winter meteorology in the region has lower wind speeds and mixing heights, which poses an unfavorable situation for the dispersion of particulate matter, hence containing a high chance of accumulation of airborne pollutants. The significant contribution of particulate matter from the line sources is observed in the study area, followed by the area sources (from open cast mining, domestic burning, bakeries, open eat-outs, and restaurants). The locations of the highly polluted can be interpreted from the images shown in Figures 5.6 (a) and 5.6 (b) for devising realistic and grass-root level mitigation strategies.

Figure 5.4: AERMOD grid covering the Jharia Coal Fields (JCF). The line, area, and point sources covered in the study are indicated in red color. The UTM coordinates of the left bottom point are x=406111 and y=2603492, and the coordinates of the right top point are x=456248 and y=2653417.

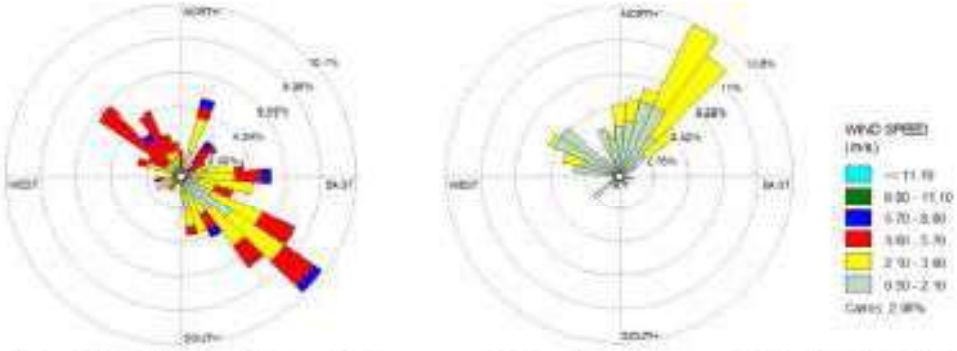

Figure 5.5: Windrose diagram for the summer (left) and winter seasons (right) at Jharia Coal Fields during the sampling period. Wind direction is flowing towards the centre.

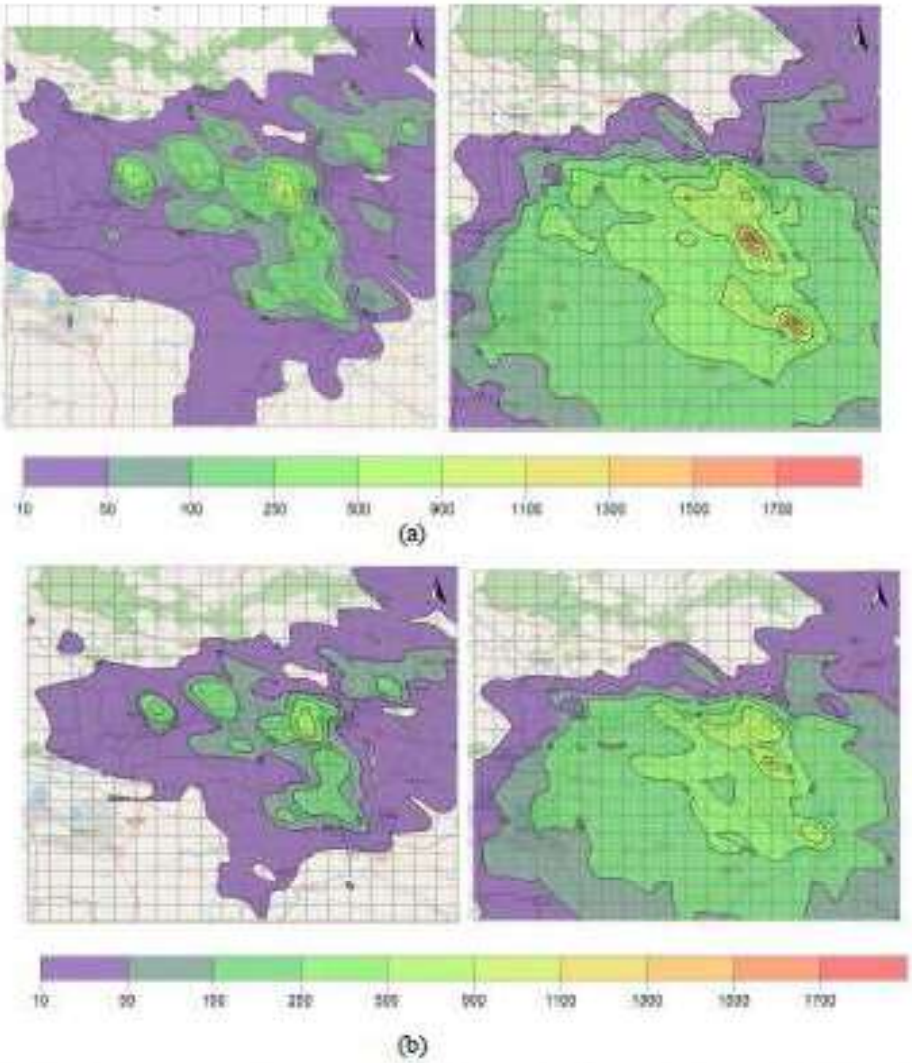


Figure 5.6. 24-hour average maximum ground level concentration of PM contours in the study area simulated during the study periods in summer (left) and winter (right) seasons (a) $PM_{10}$ ($\mu g/m^3$) and (b) $PM_{2.5}$ ($\mu g/m^3$)

### 5.3 Validation of the model

Comparison between the model simulated period average PM and the measured PM concentrations was made to determine the overall efficiency of the dispersion model. In the present study, the model validation metrics viz. mean bias (MB), normalized mean bias (NMB), mean gross error (MGE), normalized mean gross error (NMGE), and Pearson's correlation (r) were calculated for $PM_{10}$ and $PM_{2.5}$ separately including data of both seasons. At some of the monitoring locations like Mines Rescue, Katras, Patherdih, Harina, Lodhna, and Lohapatti the discrepancies between the modeled and observed data were found to be high, for both summer and winter seasons. At remaining locations for both seasons, the results indicate an acceptable/fair degree of model performance in simulating the particulate dispersion. Results show that the correlation coefficient between the measured and modeled $PM_{10}$ is 0.6, which is

fair enough in environmental open systems, similarly, for $PM_{2.5}$ the correlation value is around 0.7 (Table 5.1).

Table 5.1 Performance Stimulation Metric

| Model metric | $PM_{10}$ | $PM_{2.5}$ |
|---|---|---|
| MB | -19.46 | 20.67 |
| NMB | -0.11 | 0.24 |
| NMGE | 0.32 | 0.37 |
| Correlation Coefficient | 0.6 | 0.7 |

The NMB values are observed to be lower for $PM_{10}$ (-0.11) than $PM_{2.5}$ (0.24), which indicates the slight negative bias in $PM_{10}$ simulations (under-prediction of the concentrations) and positive bias in $PM_{2.5}$ (over-prediction of the concentrations). Whereas, the NMGE for both $PM_{10}$ and $PM_{2.5}$ are 0.32 and 0.37, respectively, which indicates the variation in the model simulations deviate around 30% from the mean values on average (which is a result due to some extreme values in the simulations). However, this discrepancy could be minimized if long-term simulations are carried out, which is highly computationally intensive. Nevertheless, the model performance metrics in terms of correlation and normalized mean gross error infer that the model could capture the spatial profile of the particulate matter distribution to a good extent.

# Chapter 6 Recommendation

## 6.1. Mine industries

1. The project proponent might consider installing conveyor systems for transporting the coal from the coal handling plant to the railway siding or to the nearest thermal power plant (if feasible).
2. A sufficient number of plants should be planted around the mine pit to arrest the movement of particulate matter or dust into the surrounding areas.
3. Scientific studies might be necessary to design a green belt with an optimized dimension of plot size and direction as per the prevailing meteorology. Similar studies are required to design a wind barrier for optimized benefits.
4. Adequate dust control measures should be in place, like mechanized sweeping, water sprinkling or mist spraying systems on the haul roads and at loading sites. Long-range misting or fogging canons are also should be in place.
5. Dust suppression measures at all operations of mining should be ensured.
6. Ensuring the complete coverage of the trucks and railway wagons that carry coal with a tarpaulin sheet is necessary.
7. In the long-run mobilization of closed trucks to carry the coal is preferable.
8. The coal transport roads should not be left with open curb sides. End to end covering up of curb side is essential to avoid the re-suspension of coal due to the truck movement.

## 6.2. Area Sources

Area sources are mainly domestic sources of fuel (coal, wood, kerosene, LPG) burning, trash/MSW combustion, bakeries, hotels/restaurants etc. and re-suspension of dust. Based on the survey and assessment, the following recommendations emerge:

1. Construction and demolition of buildings in the urban area give high local dust contribution resulting health problems. These practices need to follow compliance guidelines to reduce emissions.
2. Road and pavement should be well constructed to suppress road dust. The standard specifications and code of practice for road construction should be followed and implemented as per the Indian Road Congress (IRC) guidelines or international standard guidelines.
3. Strategically placed green cover in urban and semi-urban areas can help to improve local air quality.
4. Manage agricultural residues, including strict enforcement of bans on open burning
5. Strictly enforce bans on the open burning of household waste.
6. Use clean fuels – electricity, natural gas, liquefied petroleum gas (LPG) in cities, and LPG and advanced biomass cooking and heating stoves in rural areas; substitution of coal by briquettes
7. Use incentives to improve the energy efficiency of household appliances, buildings, lighting, heating and cooling; encourage roof-top solar installations
8. Promote the use of electric vehicles

9. Encourage centralized waste collection with source separation and treatment, including gas utilization.
10. There is a substantial population that also uses available coal. These houses could be given a combination of improved chulla or free/subsidised power for cooking purposes.
11. Hotels and dhabas need to be educated and compulsorily asked to use LPG for its cooking purposes.
12. The trash and MSW burning is very common. Some of the places contain a mix of plastics and thermocol. The combustion of these materials is very harmful to human health.
13. Coal depot pollution is due to open storage and unregulated buying, selling and transportation. These coal depots are responsible for nearby air pollution peaks. However, the contribution of the same need to be assessed.

### 6.3. Line Source

The vehicular sector in cities has been seen to be a major source of gaseous and fine particulate matter. The action plan for this sector would need a combination of efforts:

1. Vehicle inspection and maintenance: Enforce mandatory checks and repairs for vehicles.
2. Improved public transport: Encourage a shift from private passenger vehicles to public transport.
3. Set up a mechanism of Inspection and Maintenance programme for all vehicles in the district through RTO with automated system assessment.
4. The Inspection & Maintenance (I & M) centre shall also test all vehicles for their inbuilt emission tests.
5. All commercial vehicles should be phased out after 8 years of age or subjected to two years extension after rigorous I&M tests
6. All private vehicles should be subjected to proper assessment and fitness tests through I&M centres.
7. All autos and buses shall also be subjected to I&M tests
8. Dhanbad city does not have a designated place for truck parking and maintenance related activities. A separate designated place should be allocated to prevent illegal parking and repair shops on the roads and kerbside.
9. Dhanbad city does not have a designated place for Auto-rikshaw. A separate designated place should provide to prevent traffic congestion and control vehicle emission.
10. Major haul trucks with heavy loads should not pass through the main city. The plan being made should be implemented in the next 1-1.5 years.
11. Overloading is a common phenomenon in the region resulting in poor road quality. This can be avoided through online checking when vehicles leave industries with a guarantee that the vehicle is not carrying more material than its designated loads.

### 6.4. Others

- There is a need to explore various options for controlling air pollutants to tackle increased emissions in future.
- The local authority should stress sustainable and affordable public transport keeping clean air goals in mind.
- Frequent (time to time) arrangement of campaign/awareness programmes for lawmakers, stakeholders, health professionals, academicians to brainstorm about the future scenario and importance of clean air.
- Strategic installation of continuous air quality monitoring systems at various locations of urban, semi-urban and rural areas to check the existing air quality and information dissemination to the general public.

**Annexure -1**

[A] Cumulative receptor sample of $PM_{10}$ for source profiling with fitting parameters

| Source contribution estimate | Source profiles | Std Error | R-square | Chi-square |
|---|---|---|---|---|
| 82.7% mass | Unpaved road | 0.056 | 0.96 | 2.41 |
| | Coal combustion | 0.643 | | |
| | Light Duty vehicle | 1.60 | | |
| | Heavy Diesel vehicle | 2.19 | | |
| | Residential combustion | 5.59 | | |
| | Iron and steel industry | 7.16 | | |
| | Agriculture soil dust | 0.212 | | |
| | Solid waste | 1.37 | | |

[B] Cumulative receptor sample of $PM_{2.5}$ for source profiling with fitting parameters

| Source contribution estimate | Source profiles | Std Error | R-square | Chi-square |
|---|---|---|---|---|
| 88.1% mass | Residential combustion | 3.34 | 0.98 | 2.44 |
| | Coal combustion | 0.094 | | |
| | Light Duty vehicle | 0.30 | | |
| | Heavy Diesel vehicle | 1.91 | | |
| | Agriculture soil dust | 0.10 | | |
| | Flyash | 0.51 | | |

Point XVI

सेंट्रल माईन प्लानिंग एण्ड डिज़ाइन इंस्टीच्यूट लिमिटेड
( कोल इंडिया लिमिटेड की अनुषंगी कम्पनी / भारत सरकार की एक लोक उपक्रम )
पंजीकृत कार्यालय : गोन्दवाना प्लेस , कांके रोड , राँची - 834031 ( झारखण्ड ) भारत
क्षेत्रीय संस्थान-2, पत्रा. बीसीसीएल टाउनशीप, कोयला नगर, धनबाद 826005 (झारखण्ड) भारत
Central Mine Planning & Design Institute Limited
( A Subsidiary of Coal India Limited / Govt. of India Public Sector Undertaking )
Registered Office : Gondwana Place, Kanke Road, Ranchi –834031(Jharkhand )
Regional Institute-II, P.O. BCCL Township, Koylanagar, Dhanbad 826005(Jharkhand) India
Corporate Identity No. U14292JH1975GOI001223

पत्रांकः आर.आई.-2/पर्यावरण/एम-30/ 1150

दिनांकः 20.06.2015

सेवा में,
उप महाप्रबंधक (पर्यावरण)
बी. सी. सी. एल.
कोयला भवन
धनबाद ।

**विषयः Study of installation of Rail-cum-Conveyor System in BCCL for transportation of coal.**

महोदय,

This has reference to your letter no. BCCL/GM(Env.)/F-EC/13/622, dated 25.05.2013 for conducting the study and preparation of plan for installation of Rail-cum-Conveyor System for coal transportation in BCCL as a part of compliance of environmental clearance (EC) conditions stipulated by MoEF & CC in EC orders of different clusters. In this regard, we would like to inform you the following:

a. As per EC clearance order transportation plan for Rail-cum-Conveyor system should dovetailed with Jharia Action Plan (Master Plan). The system of transportation is required to be installed in 2nd phase of EC implementation i.e. after completion of Master Plan (10 years) and 5 years of gestation period.

b. JRDA has issued direction to RITES for traffic survey and data collection to initiate feasibility study regarding Diversion of Railway lines from fire affected and subsidence prone areas

c. Coal transportation route / conveyor installation layout will be finalized after liquidation of coal mine fire, rehabilitation of 595 unstable sites, road and rail route alignment and location of Rly. Sidings of BCCL.

CMPDI will be able to submit the plan / study for installation of Rail-cum-Conveyor System in BCCL for transportation of coal only after diversions and re-alignments of roads and railway lines and relocation of railway sidings

This is for your kind information.

भवदीय

( वि. कु. सिंह )
क्षेत्रीय निदेशक

Sri Amarlanshu Sb.
For compliance pl.
23/6/15

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सीएसआईआर-केन्द्रीय खनन एवं ईंधन अनुसंधान संस्थान
(वैज्ञानिक तथा औद्योगिक अनुसंधान परिषद)
बरवा रोड, धनबाद - 826 015, झारखण्ड, भारत
एक आई एस ओ 9001 प्रमाणित संस्थान

CSIR-Central Institute of Mining and Fuel Research
(Council of Scientific and Industrial Research)
Barwa Road, Dhanbad – 826 015, Jharkhand, India
An ISO 9001 Certified Institute

संदर्भ संख्या/Ref.No.BDIL/PME/CNP/4466/2016-17 कूर दवारा 25 दिनांक/Dated: 12th मई /May'2017

सेवा में

मैसर्स इंदु - एससीसीएल - सीजीएमड़ कंसोर्टियम / M/s INDU-SCCL-CGME Consortium
साईट ऑफिस मुनीडीह - 828129 / Site Office Moonidih - 828129

विषय/Sub:- अनुसंधान एवं विकास परियोजना के संबंध में अन्तिम प्रतिवेदन/Final Report in respect of R&D Project entitled "Advice for finding the effect of subsidence due to coal extraction in XV seam at Moonidih and design the workings in XV(T) & XV(B) sections with no subsidence impact on surface".

आपके संदर्भ संख्या/Your Ref.No:. MND/PO/9/2016/180 दिनांक 26/04/2016

प्रिय महाशय/ Dear Sir,

कृपया ध्यान दें, आपके संगठन द्वारा प्रायोजित उपरोक्त अनुसंधान एवं विकास जांच पूरा हो चुकी है और इसकी अन्तिम प्रतिवेदन आपके अवलोकन के लिए संलग्न की जा रही है। मैं प्रतिवेदन के साथ एक फार्मेट संलग्न कर रहा हूँ, आपके द्वारा भरा जाना है (फार्मेट के प्रत्येक पंक्ति के उपयुक्त बॉक्स में टिक निशान लगाए) जो अनिवार्यरूप से ग्राहकों की संतुष्टि के उद्देश्य के साथ अनुसंधान एवं विकास परियोजनाओं के मूल्यांकन के लिए हमारे पैतृक संगठन सीएसआईआर मुख्यालय को अनिवार्य रूप से इसकी आवश्यकता है।

Please note that the above R&D investigation, sponsored by your organization, has been completed and its final report is enclosed for your kind perusal. Along with the report I am enclosing a **format** for getting it filled by you **(tick mark the appropriate box in each row)** which is mandatorily required by CSIR, our parent body, with the purpose of **evaluating customer satisfaction of R&D projects** undertaken by this CSIR Laboratory.

मैं आपका अत्यंत आभारी रहूँगा यदि आप कृपया आगे की कार्रवाई हेतु भरा हुआ फार्मेट हमें भेजने का कष्ट करेंगे। वांछित जानकारी कृपया अधोहस्ताक्षरी को या फैक्स के माध्यम से ( 0326 ) 2296025/ 2296021/2296033 भेजें।

It will be highly appreciated if you would kindly extend your co-operation by advising your good office for sending the filled up format to us for taking further action. The desired information may kindly be **sent to the undersigned or fax to (0326) 2296025/2296021/2296033.**

धन्यवाद,

Thanking you,

आपका विश्वासी/Yours faithfully

संलग्न/Encl: रिपोर्ट की दो प्रतियां/two copies of the report,
ग्राहक संतुष्टि फीडबैक फॉर्म/Customer Satisfaction Feedback Form

(तपन कुमार मंडल)
प्रधान तकनीकी अधिकारी/Principal Technical Officer
परियोजना प्रकोष्ठ/Project Cell

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## 1.0 INTRODUCTION

With the prime objective to have no adverse mining-induced subsidence on the surface, the extraction in XV (Top) and XV (Bottom) seams at Moonidih Mine, Bharat Coking Coal Limited (BCCL), need to be planned keeping two aspects in view, namely,

(a) the extraction spans should be suitably designed to have subsidence strain less than 3mm/m and
(b) the chain/barrier pillars between the extraction spans should have factor of safety (FOS) more than 2.0, i.e., long term stable or stable forever.

These norms are as per guidelines from regulatory authorities/inspectorates. Moonidih colliery of BCCL in Jharia coalfield is the only colliery of India, which is planned for total exploitation of coal seams by longwall with caving only. At localities, wherever there were old overlying goaves of XVII, XVI or such overlying seams, managing no-adverse subsidence seemingly becomes a challenge to the researchers as detailed in this study report.

It is obvious that planning an extraction of width less than the non-effective width (NEW). NEW is the maximum width till which there is no mining-induced subsidence on the surface or a plane of reference, would certainly result into 'completely' no subsidence on the surface. However, the safe limit of 3mm/m mining-induced subsidence strain may also mean "no adverse subsidence impact" on the surface. In latter case, there would obviously be better recovery of coal in comparison. It is, therefore, proposed to take up the latter approach to achieve the prime objectives as mentioned above. In the way, it is also necessary to check, as to whether the planned extraction spans i.e., of 250m face-width [1], would result in 3mm/m subsidence strains or less. If not, the research addresses the issues of possible remedial measures. While taking up this comprehensive research studies as detailed in the text, the aspects of parting stability, especially while extracting XV (Bottom) seam below settled goaf of XV (Top) seam have also been considered with the help of numerical modelling.

Keeping above in view, a research study has been taken up by CSIR-CIMFR. This study report, therefore, includes aspects of subsidence engineering, specifically aspects related to (a) & (b) above and stability of parting between XV (T) and XV (B) seams during extraction. The conclusions and recommendations drawn in this study report would allow the mine operator INDU-SCCL-CGME Consortium to extract longwall panel no. 1-5 belowground in XV (T) and/or XV(Bottom) seams, as the analysis so suggests at Moonidih mine, BCCL without the need to acquire surface land.

## 2.0 OBJECTIVES

The objectives of this research study include:

a. To design suitable extraction spans to have subsidence strain less than 3mm/m (the safe limit) at the surface, so as to effect no adverse mining-induced subsidence on the surface.

b. To design the chain/barrier pillars between the extractions spans to have a factor of safety (FOS) more than 2.0, i.e., long-term stable.
c. To assess parting stability while longwalling in XV (B) seam below the respective settled goaf of XV (T) Seam.
d. In the case of non-fulfilment or partial fulfilment of (a), (b) or (c), to suggest the remedial measures and associated issues.

## 3.0 GEO-MINING DETAILS

Plans and sections of the proposed extraction areas of XV (Top) and XV (Bottom) seams at Moonidih colliery were studied with particular attention towards the stability of the immediate roof, caving behaviour of goaf during longwalling and observable conditions of barrier pillars and chain pillars from stability points of view. The geo-mining details are given in Table 1. The mine layout of proposed panels is shown in Fig. 1.

**Table 1:** Geo-mining details of the coal seams at Moonidih Colliery

| | | |
|---|---|---|
| 1 | Workable seams | 2 Nos.: XV(T) and XV(B) |
| 2 | Thickness of the seam | XV(T):Min.:1.53mMax.: 4.18m<br>XV(B):Min.:1.93mMax.: 7.20m |
| 3 | Longwall face width, proposed by the mine management | XV(T): 250 m<br>XV(B): 238.6 m |
| 4 | Depth range (By and large) | XV(T): 644 – 782 m<br>XV(B): 647 – 756 m |
| 5 | Single chain pillar size (avg.) formed in XVI seam | 160 x 55m (corner-to-corner) |
| 6 | Width of Tail and Main gate in XV seam | 5.7 m (average) |
| 7 | % of extraction in the panel | 90% |
| 8 | Strength of coal tested of XV Seam | 5.88 MPa |

## 4.0 FIELD INVESTIGATIONS

XV Seam has been developed in Moonidih mine in the areas from where coal samples were taken for physico-mechanical properties evaluation. To confirm the tested values, twice the sample were collected and evaluation of physic-mechanical properties were revisited. The analysis of plans, sections and earlier submitted reports were led to the conclusion that the proposed area of longwalling in XV (T) and XV (B) were not significantly affected by geological anomalies. Accordingly, the numerical modelling exercises (sections 10.0) did not account for simulation of geological anomalies separately. The latter were subsumed in Rock-mass estimation as detailed in section 10.

Recent visits were made to observe the strata behaviour in overlying longwall panels being extracted at XVI seam in the Moonidih mine. It was observed that the roof caving is regular. The goaf is getting completely packed, more so in the middle of the panel. There was no adverse load coming on the support and the supports were behaving properly even during periodic and local mainfall. No problem is reported till date from supports. This may be perhaps due to regular caving behind the goaf edges as one of the important reasons. The surface properties above the proposed panels were visited and it

was of the opinion that these important properties need to be protected from mining-induced subsidence point of view. At the moment, the mine-management founds the other alternative, i.e., shifting these properties and acquiring the land, not a viable option and therefore research study as detailed in this study report is need of the hour.

## 5.0 SUBSIDENCE ENGINEERING ASPECTS

Subsidence prediction nomograms/formulations were developed by CSIR-CIMFR, based on extensive scientific subsidence monitoring studies over caved and stowed panels (> 200 in numbers) and subsequent analysis and mathematical treatments [2-7]. These studies included Longwall panels of Moonidih (XVII-Top & XVI-Top seams, caving extraction) with varying depths (H) from 327m to 450m, having $w_p$/H ratio varying from 0.33 to 1.36. Understandably, width of the panel ($w_p$) is the face width of the longwall.

Principles of subsidence engineering state that when the width of extraction belowground exceeds a threshold value (depending on the nature of the strata and other geo-mining details), there will be a significant symptom of subsidence (i.e. 5mm or more) on the surface. This value is called as Non-effective width (NEW), expressed as a $w_p$/H ratio, where $w_p$ = width of extraction-span (or width of a panel) and H = the depth of cover. An important observation in this regard is that harder strata (of all types, not only sandstones) will give a greater value of NEW [2, 3 & 4]. The concept of NEW is simplified to be two-dimensional, although subsidence is associated with three-dimensional (rock) movements. The range of NEW observed in Jharia coalfields is 0.3-0.6 [2]. The critical width (**C**$_w$), also expressed as a $w_p$/H ratio, is defined as the width of extraction belowground for which there will be maximum possible subsidence recorded, at least on one point, at surface or on the plane of reference. The observed value of **C**$_w$ in Jharia coalfields is found to be 1.1 to 1.3 [2].

Let us take the minimum value of NEW i.e. 0.33 (in terms of $w_p$/H) for single seam (say the topmost seam) extraction, as per the scientific observations undertaken by CSIR-CIMFR (erstwhile CMRI) in the past. Understandably, if the proposed $w_p$/H ratio of longwall panels is less than 0.33 for single seam-extraction situation, there will not be any subsidence on the surface due to extraction of such seams. In case of XV (T) seam extraction, five panels namely P-1, P-2, P-3, P-4 and P-5 are planned to be extracted. The panels P-1, P-2 and P-3 have a settled overlying goaf of XVII (T) seam. The panels P-4 and P-5 are not significantly affected by overlying extracted seam(s) i.e., above the proposed XV (T) seam extraction, there is no caved goaf. Hence, XV (T) & XV (B) seams in these 2 panels can be considered as multi-seam-extraction for the purpose of subsidence parameter calculations. When the XV (B) seam is also extracted below the settled goaf of XV (T) seam, then the total seam thickness of both the seams will be considered for subsidence calculation as the parting is found to be failing, as detailed in section 10.0 of this report.

To account for seam XV (T) in panels P-1, P-2 and P-3, we need to consider XVII (T) seam as goaved out immediately located above the XV (T) seams. Based on the earlier studies [3,5,6,7], a 40% reduction in NEW value has to be incorporated for the

consideration that overlying strata above the extracted XVII (T) seam were regarded as fractured rock types before the proposed extraction in XV(T) may be started. The adjusted NEW for either of lower seams i.e. XV (T) for panels P-1, P-2 and P-3 are given as:

$$NEW' = \frac{[0.6*NEW*(H-P)+NEW*P]}{H} \quad (1)$$

Where, $NEW$ is the non-effective width for single-seam extraction situation, m; $P$ = thickness of intact parting, m; $H$ = depth of the seam, m.

### 5.1 Empirical subsidence formulation

$$x = \frac{width-to-depth\ ratio}{NEW} = \frac{(w_p/H)}{NEW} \quad (2)$$

***Single-seam cases:***

$$\frac{S}{h*e} = 0.33 * [1 + 1.1 * tanh\{1.4(x - 1.8)\}] \quad (3)$$

***Multi-seam cases (i.e., below goaved out overlying workings):***

$$\frac{S}{h*e} = 0.12 * [1 + 5.9 * tan\, h\{0.38(x - 1.45)\}] \quad (4)$$

Where, $w_p$= width of the panel, m; $NEW$= non-effective width (as determined) or NEW' (as per eqn. 1), as the case may be, m; $S$ = maximum subsidence, m; $h$ = extraction height, m; $e$ = extraction ratio, 0.9, considering for 90% extraction as may be extracted during longwalling.

**Note:** For maximum severity to be considered, the minimum depth (and not the average depth) of the seam [here, XV (T)] in the proposed panel should be considered from subsidence management point of view.

The index of determination ($R^2$) was obtained as 0.85 and 0.86 respectively, for eqns. (3) and (4), which may be regarded as quite satisfactory. It is obvious that the equations are significantly different. A word of caution regarding eqn. (4) is necessary. It may be noted that in multi-seam extractions, the overlying goaf (s) may or may not overlap the extraction panel and also can have widely different and irregular shapes. Eqn. (4), therefore, is only approximate and provides a maximum possible value [6, 7].

$$G = K_1 \frac{S}{H} \quad (5)$$

$$E_{(-)} = K_2 \frac{S}{H} \quad (6)$$

$$E_{(+)} = K_3 \frac{S}{H} \quad (7)$$

Where, $G$= maximum slope, mm/m;, $E_{(-)}$= maximum compressive strain, mm/m; $E_{(+)}$= maximum tensile strain, mm/m; and H= depth of cover, m.

The calculations made for different panels in XV (Top) and XV (Bottom) seams are given in Table 2. It has been observed that the nature of subsidence at Moonidih would be of continuous one (Fig. 2), as calculated with the help of data in Table 2. Thus, it is reasonable to predict subsidence parameters due to the extraction of these seams. $K_1$, $K_2$ and $K_3$ constants are calculated from the nomograms developed by CSIR-CIMFR (erstwhile CMRI) based on extensive subsidence monitoring and discussed in detail elsewhere [5, 6, 7] – for single seam and multi-seam situations [Fig. 3(a) and 3(b) respectively] [3, 4, 7]. The subsidence damage classification, followed worldwide is taken into consideration while designing coal extraction in XV (T) and XV (B) seams, as listed in Table 3. The safe limit 3mm/m would keep the class of damage in the zone of Sl. No. 1 of Table 3.

**Table 2:** Subsidence calculations for Panels 1-5 in XV (Top) and XV (Bottom) seams

| Panel name | $H$ | $P$ | $NEW'$ (eq. 1) | $w_p$ | $x$ (eq. 2) | $h$ | $S$ (eq. 3 & 4) | $K_3$ | $E_{(+)}$ (eq. 7) | Remarks |
|---|---|---|---|---|---|---|---|---|---|---|
| Panels in XV (Top) | | | | | | | | | | |
| Panel 1 | 564 | 164 | 0.236 | 250 | 1.88 | 3 | 0.633 | 2 | 2.247 | Multi-seam |
| Panel 2 | 640 | 240 | 0.247 | 250 | 1.58 | 3 | 0.418 | 1.5 | 0.98 | |
| Panel 3 | 676 | 276 | 0.252 | 250 | 1.47 | 3 | 0.336 | 1.5 | 0.746 | |
| Panels in XV (Bottom) | | | | | | | | | | |
| Panel 4 | 704 | -- | 0.33 | 238.6 | 1.08 | 7* | 0.329 | 1 | 0.467 | Single seam |
| Panel 5 | 742 | -- | 0.33 | 238.6 | 1.02 | 7* | 0.255 | 1 | 0.343 | |

***Note:** The heights of extraction in XV (T) and XV (B) seams were added to be 7m as mentioned against Panel-4 and Panel-5 in Table 2 only for subsidence calculation purpose.

**Table 3**: Subsidence Damage Classification [2]

| Sl. No. | Change in length of structure | Class of damage | Description of typical damage |
|---|---|---|---|
| 1 | Up to 30 mm | Very slight or negligible | Hair cracks in plaster. Perhaps isolated slight fractures in the buildings, not visible on the outside. |
| 2 | 30 – 60 mm | Slight | Several slight fractures visible inside the building. Doors and windows may stick slightly. Repairs to decoration probably necessary. |
| 3 | 60 – 120 mm | Appreciable | Slight fractures visible on outside of buildings (or one main fracture). Doors and windows sticking; service pipes may fracture. |
| 4 | 120 – 180 mm | Severe | Service pipes disturbed. Open fractures requiring rebending and allowing weathering into the structure. Windows and door frames distorted; floors sloping noticeably. Some loss of bearing in beams. If compressive damage, overlapping of roof joints out lifting of brickwork with open horizontal fractures. |
| 5 | More than | Very severe | As above, but worse, and requiring partial or complete |

| | | | |
|---|---|---|---|
| | 180 mm | | rebuilding. Roof and floor beam loose bearings and needs sharing up. Windows were broken with distortion. Severe slopes on the floor. If compressive damage, severe buckling and bulging of the roof and walls. |

As obvious from Table 2, the Panels 1, 2, and 3 are to be extracted either in XV (T) or XV (B) depending on subjective judgements based on quality of coal and thickness of seam in comparison. In this situation, the land above the panels need not to be acquired as the subsidence strain is less than 3mm/m, the safe limit. However, if it is decided to extract both the seams in these panels also, the land over the panels are to be acquired. It may be noted that with the chain pillar size as detailed in section 9, both XV (T) and XV (B) seams may be extracted for a depth range of 670 m and above without affecting surface. Meaning hereby, the future panels on the dip side of Panels 4 and 5 as proposed at the moment, would not require land to be acquired even for double section extraction in XV (T) and XV (B) seams.

## 6.0 BOREHOLE LITHOLOGY AND PHYSICO-MECHANICAL PROPERTIES OF THE OVERLYING ROOF ROCKS

The borehole no. 1 lies in the center of Panel 5 (Fig. 1), thus its lithology (as shown in Fig. 4) and physico-mechanical properties (given in Table 4), have been considered for numerical modelling exercises undertaken in this report. The lithology of borehole no. 1, has been analysed to get the major bedding planes overlying the seam under consideration and to estimate the immediate roof and main roof so as to get an idea of the variation in the strata over the coal seam. The immediate roof is the fractured lower roof, which readily caves behind the supports forming the goaf during the fracturing process. The main roof can induce vertical load on the supports and cause periodic weighting, if regular caving is not effected after progressive coal extraction during longwalling.

The beds up to a height of 46.45 m above the coal seam are laminated beds of sandstone, shale and carbonaceous shale with a weighted average compressive strength of 44.5 MPa, tensile strength of 8.7 MPa and caving index of 3175. This indicates that the cavability of the roof overlying the coal seam within the caving zone is good and due to the high depth of the coal seam, the goaf will be normally packed behind the supports.

**Table 4:** Litholog and physico-mechanical properties of Borehole No. 1

| **Rock Bed Characteristics** | Bed | Depth above XV coal seam, **(m)** | Thickness of bed, **t (m)** | RQD, **%** | Avg. Length, est. **L (cm)** | Density **(t/m$^3$)** | Weighted comp. Str., [redacted] **Kg/cm$^2$)** | Weighted tens. Str., [redacted] **(Kg/cm$^2$)** | Caving Index |
|---|---|---|---|---|---|---|---|---|---|
| Coal Seam XV | XV Seam | -3.65 | -3.65 | 100.0 | 24.2 | 1471 | 59 | 12 | 543 |
| Grey Shale | Bed 1 | 0 | 5.45 | 64.8 | 12.6 | 2417 | 333 | 68 | 1954 |
| Sandstone fine to medium grained | Bed 2 | 5.45 | 1.2 | 83.3 | 18.7 | 2631 | 577 | 107 | 4242 |
| Sandstone fine to medium grained | Bed 3 | 6.65 | 2.2 | 80.9 | 17.9 | 2601 | 487 | 95 | 2581 |
| Sandstone fine to medium grained | Bed 4 | 8.85 | 1.9 | 92.6 | 21.7 | 2631 | 577 | 107 | 6407 |
| Grey Shale | Bed 5 | 10.75 | 3.7 | 77.0 | 16.6 | 2442 | 365 | 74 | 2332 |
| Sandstone medium grained | Bed 6 | 14.45 | 2.87 | 78.8 | 17.2 | 2611 | 516 | 99 | 5302 |
| Grey Shale | Bed 7 | 17.32 | 2.88 | 43.8 | 5.6 | 2417 | 333 | 68 | 858 |
| Sandstone fine grained | Bed 8 | 20.2 | 1.26 | 54.0 | 9.0 | 2681 | 699 | 103 | 1760 |
| Grey Shale | Bed 9 | 21.46 | 1.67 | 65.9 | 12.9 | 2417 | 333 | 68 | 1113 |
| Sandstone medium grained | Bed 10 | 23.13 | 2.02 | 90.1 | 20.9 | 2601 | 487 | 95 | 5786 |
| Carbonaceous Shale | Bed 11 | 25.15 | 2.9 | 63.1 | 12.0 | 2486 | 420 | 83 | 1715 |
| Sandstone fine grained | Bed 12 | 28.05 | 1.17 | 84.6 | 19.1 | 2681 | 699 | 103 | 5212 |
| Carbonaceous Shale | Bed 13 | 29.22 | 1.54 | 92.2 | 21.6 | 2463 | 392 | 78 | 2139 |
| Sandstone fine to medium grained | Bed 14 | 30.76 | 1.34 | 88.8 | 20.5 | 2631 | 577 | 107 | 5556 |
| Very coarse grained Sanstone | Bed 15 | 32.1 | 2.2 | 82.7 | 18.5 | 2586 | 484 | 99 | 2652 |
| Sandstone medium grained | Bed 16 | 34.3 | 0.76 | 73.7 | 15.5 | 2601 | 487 | 95 | 2906 |
| Grey Shale | Bed 17 | 35.06 | 1.91 | 99.0 | 23.8 | 2361 | 269 | 63 | 1774 |
| Sandstone medium grained | Bed 18 | 36.97 | 1.88 | 99.5 | 24.0 | 2601 | 487 | 95 | 6050 |
| Shaly Sandstone | Bed 19 | 38.85 | 3.22 | 87.9 | 20.2 | 2498 | 437 | 91 | 3164 |
| Sandstone medium grained | Bed 20 | 42.07 | 1.16 | 91.4 | 21.3 | 2601 | 487 | 95 | 4125 |
| Sandy Shale | Bed 21 | 43.23 | 1.42 | 80.3 | 17.7 | 2517 | 458 | 90 | 1927 |
| Sandstone medium grained | Bed 22 | 44.65 | 1.8 | 92.8 | 21.8 | 2601 | 487 | 95 | 5272 |
| Grey Shale | Bed 23 | 46.45 | 17.99 | 92.8 | 21.8 | 2478 | 421 | 87 | 7784 |
| Sandstone medium to coarse grained | Bed 24 | 64.44 | 3.51 | 87.2 | 19.9 | 2624 | 403 | 90 | 5486 |
| Alternate Shale & Sandstone | Bed 25 | 67.95 | 1.77 | 85.9 | 19.5 | 2591 | 452 | 100 | 2659 |
| Sandstone medium grained | Bed 26 | 69.72 | 1.35 | 85.9 | 19.5 | 2601 | 487 | 95 | 4003 |
| Coal Seam XV | Bed 27 | 71.07 | 1.08 | 100.0 | 24.2 | 1646 | 110 | 23 | 551 |
| Sandstone medium grained | Bed 28 | 72.15 | 1.6 | 83.1 | 18.6 | 2601 | 487 | 95 | 4112 |
| Grey Shale | Bed 29 | 73.75 | 1.8 | 81.1 | 17.9 | 2381 | 281 | 66 | 1354 |
| Sandstone medium grained | Bed 30 | 75.55 | 0.9 | 97.8 | 23.4 | 2601 | 487 | 95 | 4069 |
| Grey Shale | Bed 31 | 76.45 | 2.2 | 90.5 | 21.0 | 2582 | 461 | 98 | 2873 |
| Sandstone medium grained | Bed 32 | 78.65 | 2.2 | 86.4 | 19.7 | 2601 | 487 | 95 | 5156 |
| Grey Shale | Bed 33 | 80.85 | 5.7 | 85.8 | 19.5 | 2558 | 451 | 95 | 4196 |

## 7.0 BARRIER PILLAR DESIGN

For the stability of the workings, barrier pillar design is the major requirement for any successful longwall mining endeavour. Such a design is made using the safety factor concept of structural mechanics, which consists of estimating load and strength of the pillars and linking the two through a proper safety factor.

### 7.1 Pillar Strength

The barrier pillars or chain pillars designed so far in all the Indian sites are primarily using CIMFR empirical equation, owing to the confidence gained over a couple of decades of its use in real cases and obtained results. The strength of the chain pillars can be estimated using the CIMFR pillar strength equation as given below [8]:

$$S = 0.27\sigma_c h^{-0.36} + \left(\frac{H}{250} + 1\right)\left(\frac{W_e}{h} - 1\right) \tag{8}$$

$$W_e = \frac{2ww_1}{w + w_1}$$

Where, S = pillar strength, MPa, $\sigma_c$ = compressive strength of 1" coal cube, MPa, h = working height, m, H = depth of cover of the seam, m, $w$ = width of rectangular pillar, m, $w_1$= length of rectangular pillar, m, $W_e$= effective width of pillar, m

### 7.2 Calculation of Load on chain pillars

With reference to longwall extraction, chain pillar loading has been established by Wilson who analysed roof-to-floor convergence measurements behind caved longwall faces. Based on these, he proposed a linear rise in the vertical goaf stress starting from zero at the rib-side or face to the cover pressure $\gamma H$ at a distance of 0.3-0.4$H$ [9]. American findings from extensive measurements propose this distance of goaf settlement on an average as 0.38$H$ [10]. This range can thus be accepted for normally caveable strata. In India, the value of 0.3$H$ is taken for normally cavable strata. For hard, difficult to cave strata, it is assumed that no caving takes place and the goaf does not offer any support. Some differences in this distance can obviously exist depending on the nature of strata. Some observations at CIMFR, Dhanbad have put this distance of 0.2$H$ for stowed panels.

#### *7.2.1 Chain pillar load for both-side goaf*

The chain pillar load can be estimated based on the 'vertical stress balance' concept of Wilson. According to this concept, since no part of the cover is added or removed during mining, the total vertical load before mining must remain the same as the total vertical load after mining. This implies that the load reduction in the goaf area must be compensated for by an increase in the load at rib-sides or on chain pillars. If the general

pattern of load distribution is known, knowledge of the one can lead to an estimate of the other.

A typical chain pillar, during its life, will be subjected to the following types of loads:

(a) Development load before extraction starts.
(b) Front abutment load, when the face is at the pillar.
(c) Side abutment load, when the face advances further from the pillar.

If goaf exists on both sides, the pillars will be subjected to loads (b) and (c) twice during their life period. If the panel width is less than 2*fH*, the load in the centre will not reach cover load. If goafs exist on both sides of the pillar chain, the average pillar load could be obtained from the equation below. In this case, 2*fH* = 2*0.3*862 = 517.2 i.e., > Panel width ($L_1$, $L_2$) as shown in Fig. 5.

$$P = \frac{\gamma(w_1 + B)}{w w_1}\left[ H\left( w + \frac{L_1 + L_2}{2} \right) - \frac{1}{8f}\left( L_1^2 + L_2^2 \right) \right] \tag{9}$$

Where, P = Chain pillar load, MPa, γ = rock load density, MPa/m, H = depth below surface, m, B = gate road width, m, w = width of rectangular pillar, m, $w_1$= length of rectangular pillar, m, $L_1$=$L_2$=L= width of panels, m, f = 0.3 (for caving)

### *7.3 Safety Factor*

The safety factor of the pillars can be calculated as given below:

$$Safety\ Factor,\ S.F. = \frac{Strength of\ barrier\ pillar}{Pillar\ Load} = \frac{S}{P} \tag{10}$$

Chain pillar sizing should normally be done on the basis of the safety factor. It is felt that if the pillars have an adequate safety factor, the chain pillars should remain stable during first-panel extraction i.e. under one-sided goaf loading. During extraction of a neighbouring panel, these chain pillars will undergo both-side goaf loading and it is desirable that they remain short term stable or yield. For short term stability of this chain pillar, the pillar size should be calculated so as to have a safety factor of greater than 1.5 with goaf on both sides; and the safety factor should be greater than 2.0 with goaf on one side. However, to prevent mining-induced subsidence impact at the surface the pillars must be long-term stable. Hence, in this study, the pillar size has been calculated so as to have a safety factor, more than 2.0 with goaf on both sides.

Had this long-term (i.e., stable for ever) stability not ensured, the face width of one panel would combine with the width of the neighbouring panel along with failing chain pillar. On long term basis, $w_p$ (now)=250 + 55 (say)+ 250+ 10 (gallery width)= 565m, and H=742m, i.e., $w_p$/H= 0.76, which is much more than NEW. Therefore, in case of not-long-term stable chain pillars or arrays of pillars, the subsidence would eventually take place even if the extraction span of each longwall panel is less than NEW. Thus, it is

prudent to opt for numerical modelling to assess the load on pillars, especially when there is extraction nearby and depth of cover is more than 300m as shown in Table 7.

## 8.0 CALCULATIONS BASED ON WILSON'S MODEL

Pillar stability calculations are based on mine management proposal of the inter-panel barrier of pillar size of 55 m x 160 m corner to corner. Table 5 gives the calculated average load on the pillar, its strength and safety factor as explained in section 7. The depths of the inter-panel barriers have been considered according to those shown in Fig. 6.

Taking $\sigma_c$ = 5.9 MPa, $\gamma$ = 0.025 MPa/m, h = 3.5 m, $L_1$=$L_2$=L=250 m, B = 5.7 m, f = 0.3 for caving, H = 862 m

**Table 5:** Calculation of barrier pillar load and safety factor based on Wilson's formula

| Width (m) | Length (m) | Load (MPa) | Strength, MPa | S.F. |
|---|---|---|---|---|
| 70 | 195 | 81.59 | 122.09 | 1.50 |
| 75 | 195 | 77.62 | 128.57 | 1.66 |
| 80 | 195 | 74.14 | 134.81 | 1.82 |

It has been found that Wilson's formulae overestimate the load on pillars as it is based on tributary area method. The overestimation in a typical case study may be as high as 40% [11].

## 9.0 NUMERICAL MODELLING PROCEDURE

This part of the report deals with numerical modelling to study the stability of inter-panel barriers and its effect on longwall workings.

Numerical modelling using FLAC$^{3D}$ software [12] has been done for analysis of the stability of the barrier pillars (Fig. 6) for the depth of 862 m corresponding to the maximum depth of Panel No. 5. The modulus of elasticity and Poisson's ratio values of the goaf material are taken based on its values assumed for numerical modelling in published literature.

To have a better understanding of the problem a fine mesh/grid was prepared at the zone of interest. Fig. 7(a) shows the mesh/grid of the numerical models of the barrier pillar with applied load on the surface of the model before the start of the extraction of longwall panels. The boundary of the model lies on the centre line of the two longwall panels on both sides of the line of the barrier pillar. The model boundary, coal seam and the rock beds are shown in the figure. The boundaries are placed sufficiently far away from the area of interest and the behaviour in the area of interest is not affected. Fig. 7(b) shows the mesh/grid of the numerical model after drive of the gate roads. Fig. 7(c) shows the numerical model to estimate the load on the barrier pillar with goaf present on both sides.

Table 6 lists the different rock beds obtained from analysis of the litholog of Borehole No. 1 (Table 4). Bed 2 corresponds to coal of the XV seam and Bed 3 to Bed 1 (grey

shale) of Table 4. Bed 4 comprises of Bed nos. 2 to 4 of Table 4. Bed 5 consists of Bed nos. 5 to 13, Bed 6 is made up of Bed nos. 14 to 16, Bed 7 comprises of Bed nos. 17 to 22. Bed 8 corresponds to Bed no. 23 of Table 4. Bed nos. 24 to 26 constitute the Bed 9. Bed 10 corresponds to Bed no. 27, Bed 11 comprises of Bed nos. 28 to 32 and Bed 12 corresponds to Bed no. 33 of Table 4.

**Table 6:** Physico - mechanical properties of different rock beds considered for numerical modelling

| Bed No. | Bed (Table 4) | | Bed Thickness (m) | Young's Modulus (Pa) | Density | Comp. Str. (Pa) | Tens. Str. (Pa) |
|---|---|---|---|---|---|---|---|
| | From | To | | | | | |
| N_Bed 1 (Floor) | - | | 50 | 6E+09 | 2313 | 3.61E+07 | 7.30E+06 |
| N_Bed 2 (Coal) | Coal XV seam | | 3.65 | 2E+09 | 1471 | 5.90E+06 | 1.20E+06 |
| N_Bed 3 | 1 | 1 | 5.45 | 5E+09 | 2417 | 3.33E+07 | 6.80E+06 |
| N_Bed 4 | 2 | 4 | 5.3 | 6E+09 | 2619 | 5.40E+07 | 1.02E+07 |
| N_Bed 5 | 5 | 13 | 20.01 | 7E+09 | 2514 | 4.42E+07 | 8.40E+06 |
| N_Bed 6 | 14 | 16 | 4.3 | 9E+09 | 2603 | 5.14E+07 | 1.01E+07 |
| N_Bed 7 | 17 | 22 | 11.39 | 8E+09 | 2521 | 4.33E+07 | 8.80E+06 |
| N_Bed 8 | 23 | 23 | 17.99 | 8E+09 | 2478 | 4.21E+07 | 8.70E+06 |
| N_Bed 9 | 24 | 26 | 6.63 | 8E+09 | 2610 | 4.33E+07 | 9.40E+06 |
| N_Bed 10 | 27 | 27 | 1.08 | 2E+09 | 1646 | 1.10E+07 | 2.30E+06 |
| N_Bed 11 | 28 | 32 | 8.7 | 8E+09 | 2551 | 4.38E+07 | 9.00E+06 |
| N_Bed 12 | 33 | 33 | 5.7 | 8E+09 | 2558 | 4.51E+07 | 9.50E+06 |

### 9.1 In-situ Stress field Initialisation

In the absence of measurements of the in-situ stress values, theoretical values were calculated by the following equation [13]:

$$K = \frac{S_h}{S_v} = \frac{\nu}{1-\nu} + \frac{\alpha E G}{(1-\nu)\gamma}\left(1 + \frac{1000}{H}\right) \qquad (11)$$

Where, K= ratio of in-situ horizontal to vertical stress, ν = Poisson's ratio, α = Coefficient of thermal expansion of rock=$0.3 \times 10^{-5}/^{0}$C, E= Modulus of elasticity, Mpa, G= Thermal Gradient = 0.03°C/m, γ = Volumetric density 0.025 MPa/m, H= Depth of cover, m.

### 9.2 Steps for Numerical Modelling

***STEP-1*** **:**
a. Grid generation;
b. Selection of appropriate material behaviour model;
c. Incorporation of material properties, in situ stresses and boundary conditions;

d. The model is run in virgin state;

***STEP-2*** : Development of roadway excavations in the model; The gallery of width 5 m and height 3.65 m was driven on both sides of the barrier pillar in the coal seam.

***STEP-3*** : Panel 1 is extracted and is filled with goaf.

***STEP-4*** : The adjoining longwall panel is also extracted and is filled with goaf.

### 9.3 Numerical Modelling Result

Numerical modelling was carried out to estimate the average load on the barrier pillars considering the different width of the pillars. Pillar strength was calculated using CIMFR pillar strength eqn. (8) mentioned above. From the above two parameters safety factor was determined to analyse the stability of the barrier pillars of various width using eqn. (10).

**Option I:**

Numerical modelling was carried out considering different values of barrier pillar width viz. 70 m, 75 m and 80 m. The result of this activity is tabulated below.

Taking $\sigma_c$ = 5.9 MPa, $\gamma$ = 0.025 MPa/m, h = 3.5 m, $L_1$=$L_2$=L=250 m, B = 5.7 m, f = 0.3 for caving, H = 862 m.

**Table 7: Pillar load and safety factor obtained from numerical modelling**

| Barrier width (m) | Barrier length (m) | Modelled Load (MPa) | Strength (MPa) | S.F. |
|---|---|---|---|---|
| 70 | 195 | 70.76 | 122.09 | 1.72 |
| 75 | 195 | 67.45 | 128.57 | 1.91 |
| 80 | 195 | 64.48 | 134.81 | 2.09 |

From the above study, as shown in Fig. 8, it is evident that for long-term stability, the width of the inter-panel barriers has to be 80 m (rib to rib). The idea behind long-term stable chain/barrier pillar rests on the fact that if barrier pillars(s) or an array of barrier pillars fails [having F.O.S less than 2.0], say at much later period after completion of coal extraction in the panel, the load, before failure, are shared among these pillars, would now be redistributed, resulting into higher abutments on non-failed barrier pillars. This redistribution may make non-failed pillars more vulnerable to failure. Eventually, there can be likely subsidence on the surface, although not expected. Ensuring long-term stable-designed chain pillars is therefore very important, not only from operational working reasons but also from surface subsidence management aspects.

**Option II:**

As per the approved mine plan, the dimensions of inter-panel barriers are suggested to be 55 m width and 160 m length (both rib to rib). Due to operational convenience, the mine operator has insisted on the approved mine plan dimensions for chain/barrier pillar.

Numerical modelling was also carried out using the above-mentioned pillar dimensions the result of which is given below.

Taking $\sigma_c$ = 5.9 MPa, h = 3.65 m, H = 862 m, w = 55 m, $w_1$ = 160 m.

$$W_e = \frac{2 * w * w_1}{w + w_1} = \frac{2 * 55 * 160}{55 + 160} = 81.86$$

$$Pillar\ Strength(S) = 0.27\sigma_c h^{-0.36} + \left(\frac{H}{250} + 1\right)\left(\frac{W_e}{h} - 1\right)$$

$$= 0.27 * 5.9 * 3.65^{-0.36} + \left(\frac{862}{250} + 1\right)\left(\frac{81.86}{3.65} - 1\right)$$

$$= 96.309 MPa$$

As in Option I, numerical modelling was carried out to assess the average load on the barrier pillar.

Average load on barrier pillar (P) = 84.88 MPa

Safety Factor = $\frac{S}{P} = \frac{96.309}{84.88} = 1.13$

**Option III:**

As the safety factor of the barrier pillar calculated using option II is quite low, it will be necessary to increase the pillar strength by employing side bolting. The best policy is to install bolts such that the top and bottom ones in a vertical row enter the roof and floor at an angle. To prevent both spalling and robbing it will be necessary to place the bolts over a wire mesh. Grouted or resin-anchor pre-tensioned bolts should be preferred to other types. The strength of the bolted pillar is given by eqn. (12) [13].

$$S_b = S + \frac{20A_s(q-1)}{\sigma_c a^2} S \qquad (12)$$

Where, $S_b$ = strength of bolted pillar, S = strength of unbolted pillar, $A_s$ = anchorage strength of rock bolts, T, q = 3.4, $\sigma_c$ = uniaxial compressive strength of coal, $T/m^2$, a = spacing between rock bolts, m.

The anchorage strength of rock bolts depends, among other things, upon the care adopted during bolting operation. Considering anchorage strength of 15 T, $\sigma_c$ of 5.9 MPa = 590 $T/m^2$ and spacing of 1.25 m, the strength of bolted barrier pillar is calculated in the following manner.

$$S_b = S + \frac{20A_s(q-1)}{\sigma_c a^2} S$$

$$= 96.309 * \left(1 + \frac{20 * 15 * (3.4-1)}{590 * 1.25^2}\right)$$

$$= 171.528$$

Safety Factor $= \frac{S_b}{P} = \frac{171.528}{84.88} = 2.02$

Therefore, for long-term stability of 55 m wide barrier pillars, bolting needs to be carried out at a spacing of 1.25 m. There are various patterns as shown in Fig. 9 in which side bolting can be done.

Further Option I is recommended for the size of chain pillars/arrays of pillars including barrier pillars in XV (T) and XV (B) seams at Moonidih colliery. However, if there is insipient side-falls expected and/or observed from instrumentation-data analysis then side bolting/suitable side supports, if necessary with more support-reinforcement may be put in place at such locations.

## 10.0 NUMERICAL MODELLING FOR EVALUATION OF PARTING STABILITY

This part of the report deals with numerical modelling for evaluation of parting stability during extraction of Panels 4 and 5 in XV (Bottom) seam.
Numerical modelling using FLAC 3D software has been done for analysis of the stability of the parting between top and bottom section of the XV seam in two stages-

**Stage I:** Extraction of the Top Section and Goaf formation
**Stage II:** Extraction of the Bottom Section under stabilised goaf of Top Section

The model is prepared at the centre line of the longwall panel, along the section BB', as shown in Fig. 6. It is 200 m along the X-axis and 3 m along the Y axis. The beds as given in Table 4 are along the Z-axis. A fine mesh/grid of 1 m along X-axis and 1 m along Y-axis was prepared. Fig. 10(a) shows the mesh/grid of the numerical model before the start of the extraction of Top and Bottom Section. The model boundary, coal seam (Top Section Bed 6 and Bottom Section Bed 2) and the rock beds are shown in the figure. The Bed 3 (coal), Bed 4 (sandstone) and Bed 5 (coal) of thickness 1 m each constitute the parting of total thickness 3 m.

The boundaries are placed sufficiently far away from the area of interest and the behaviour in the area of interest is not affected. Fig. 10(b) shows the typical mesh/grid of the numerical model during extraction of Top section. Fig. 10(c) shows the numerical model to estimate the stability of the parting during extraction of Bottom section. Longwall Powered supports are modelled as nodal forces as shown in Fig. 10(d).

The elastic properties assumed in the model are given below in Table 8.

**Table 8: Elastic properties of goaf used in the model**

| Sl. No. | Rock Bed | Young's Modulus 'E' (Pa) | Poisson's ratio 'ν' |
|---|---|---|---|
| 1. | Goaf | 0.6 e 9 | 0.1 |
| 2. | Stabilised Goaf | 1.0 e 9 | 0.1 |

### 10.1 In-situ Stress field initialization

In the absence of measurements of the in-situ stress values, theoretical values were calculated by the following equation [13]:

$$K = \frac{S_h}{S_v} = \frac{\nu}{1-\nu} + \frac{\alpha E G}{(1-\nu)\gamma}\left(1 + \frac{1000}{H}\right) \quad (11)$$

Where, K= ratio of in-situ horizontal to vertical stress, ν = Poisson's ratio, α = Coefficient of thermal expansion of rock=0.3x10-5/0C, E= Modulus of elasticity, Mpa, G= Thermal Gradient = 0.03oC/m, γ = Volumetric density 0.025 MPa/m, H= Depth of cover, m.

### 10.2 Steps for Numerical Modelling

**Stage I:Extraction of the Top Section and Goaf formation**

***STEP-1*** **:**
a. Grid generation
b. Selection of appropriate material behaviour model
c. Incorporation of material properties, in situ stresses and boundary conditions
d. The model is run in virgin state

***STEP-2*** **:** The face is advanced to 68 m with caved goaf behind. The goaf behind the face is simulated with modulus of elasticity as 0.6 GPa.

***STEP-3*** **:** The face is advanced in stages with 8 m advance and progressive goaf filling till 196 m.

***STEP-4*** **:** The face is advanced 4 m and thereby entire Top Section is extracted and goaf is formed up to a height of 105 m.

**Stage II: Extraction of the Bottom Section under stabilised goaf of Top Section**

***STEP-1*** **:** The face is advanced to 68 m with caved goaf behind. The goaf behind the face is simulated with modulus of elasticity as 0.6 GPa. The stabilised goaf of the Top Section is simulated with modulus of elasticity as 1 GPa.

***STEP-2*** **:** The face is advanced in stages with 8 m advance and progressive goaf filling till 92 m.

***STEP-3*** **:** The face is advanced in stages with 2 m advance and progressive goaf filling till 108 m.

### *10.3* Safety Factor Calculations

The best way to know about the roof stability of the working area and its caving characteristics in the goaf is by calculating the safety factor for each element in the

overlying strata using the induced principal stress obtained from the output of the numerical model. Safety factor calculation was done using the Sheorey criterion for jointed rock masses developed at CIMFR for this purpose.

$$\sigma_{cm} = \sigma_c \exp\left(\frac{RMR-100}{20}\right)$$

$$\sigma_{tm} = \sigma_t \exp\left(\frac{RMR-100}{27}\right)$$

$$b_m = b^{\frac{RMR}{100}}$$

Where,

$\sigma_1$ & $\sigma_3$ are major and minor principal stresses induced on an element at failure
$\sigma_c$ is intact rock compressive strength, MPa
$\sigma_t$ is intact rock tensile strength, MPa
b is constant for rock type
RMR is Bieniwaski's Rock Mass Rating

The safety factor 'F' is obtained as-

$$F = \frac{\sigma_1 - \sigma_{3i}}{\sigma_{1i} - \sigma_{3i}}$$

Except when $\sigma_{3i} > \sigma_{tm}$,

$$F = \frac{\sigma_{tm}}{-\sigma_{3i}}$$

**10.4 Numerical Modelling Result**

Numerical modelling was done to understand the stress redistribution during extraction of the bottom section below the caved goaf of the top section of XV seam. The observations from numerical modelling are plotted in the following figures:

**Fig. 11(a)** : Contour of Major Principal Stress
The maximum major principal stress ($\sigma_1$) of magnitude 122 MPa is observed in the abutment zone and the minimum $\sigma_1$ of 3.7 MPa is observed in the cantilever behind the supports.

**Fig. 11(b)** : Contour of Minor Principal Stress
The maximum minor principal stress ($\sigma_3$) is compressive of magnitude 33.6 MPa is observed in the abutment zone and the minimum $\sigma_3$ is tensile with magnitude of 7.7 MPa which is observed over the canopy behind the supports.

**Fig. 11(c)** : Principal Stress Vectors and orientation
The orientation are in line with the observed principal stresses in the

abutment zone and in the cantilever roof

**Fig. 11(d)** : Contour of Vertical Stress
The maximum vertical stress ($\sigma_{zz}$) of magnitude 117 MPa is observed in the abutment zone which is approximately 5 times the cover load.

**Fig. 11(e)** : Safety Factor Contour
The major portion of the parting overlying XV (Bottom) seam, especially in the cantilever section over the powered supports has a safety factor of less than 0.5 which indicates that the coal roof is expected to be fractured and will be prone to cavity formation primarily due to high vertical stress at such high depth of cover. The stone roof is having a safety factor of more than 0.6 which indicates that it will be stable on a short-term basis. The canopy of the powered supports should be kept within 0.2-0.3 m out-bye from the face at all times to prevent any shear fracture and cavity formation ahead of the supports. This may facilitate ease of coal extraction in XV(B) seam below caved goaf of XV(T) seam.

**Fig. 11(f)** : Distribution of vertical stress along the panel
The distribution of vertical stresses all along the panel is plotted. As can be seen, cover pressure in a distant inbye from the abutment zone is re-established within the goaf and the coal block pillar, proposed to be extracted,.

It may be recommended to opt for the instrumentation plan with a suite of geotechnical instruments as mentioned in Fig. 13 on a “design by measurement” mode and Annexure I. Based on instrumentation data, parting stability should be ensured with respect to gate-road stability and its maintenance. The strata evaluation, monitoring and management should be done by the mine management under supervision of a scientific body. As understandable, the gate road has a better stability if the adjoining chain pillars and array of pillars are stable, meaning hereby, that the FOS should be more than 2.0. As already mentioned in section 8.0 of the report, with forward analysis of eqn. (10), the strength of barrier pillar is calculated using eqn. (8) and chain pillar load by the use of numerical modelling as described in section 9.0. It is pertinent to highlight that the prime objective of this research project was to suggest a method of extraction with an aim to have no mining-induced subsidence impact on the surface. The extensive numerical modelling exercise were executed with focus on extraction areas, and the parting stability while extracting in, longwall panels of XV (B) seam below caved goaf of XV(T) seam. The issues of parting stability affecting gate road stability, especially in XV (B) seam would require therefore a separate treatment of research where the strength of pillars has to be estimated using numerical modelling on one hand and on the other hand, the focus area of modelling need to be concentrated on roof and floor of gate road in addition to the chain pillars.

## 11.0 CONCLUSIONS AND RECOMMENDATIONS

1. Subsidence strain is calculated to be less than 3 mm/m, the safe limit. Here two types of considerations have been made: (a) single-section extraction in Panel nos. 1, 2 and

3 – subjective solution based primarily on the thickness of XV (Top) and XV (Bottom) seams and the quality of coal, and (b) double-section vertically-superimposed extraction in XV (Top) and XV (Bottom) seams, where the latter would be below settled goaf. Understandably the surface land need not to be acquired based on details of subsidence study in Section 5 of the report.

2. Subsidence monitoring for suitably laying out the monitoring stations over each panel of extraction on the surface needs to be undertaken during and one year after the completion of extraction in the respective panel(s).
3. In case it is feasible to acquire the surface land, scientific study needs to be conducted with new objectives and applicable guidelines. For example, the stability requirement of chain/barrier pillars would be reduced from a factor of safety of 2 or more to a new requirement.
4. Based on the stability criteria of chain/barrier pillars, it is recommended that chain pillars of width at least 80 m be left between longwall panels having length not less than 195 m for the long-term stability of the pillars.
5. Due to operational constraints as envisaged by the mine operator and as communicated to CSIR-CIMFR, the length of the chain pillars was modified to 160 m where the width of the chain pillar should not be less than 55 m as approved in the mine plan. Taking these two parameters, the FOS of the chain pillars was calculated to be 1.135, i.e., less than the design criteria of FOS 2.0. A pattern of side bolting therefore is recommended in this case, with a grid spacing of not more than 1.25 m (as per Fig. 9) so that pillar has adequate enhanced strength and for which the FOS calculated was 2.02.
6. As a corollary to (5) above, it is recommended to opt for side-bolting of chain pillars as per Fig. 9, not only to ensure stability of chain/barrier pillars but also to prevent side falls that may happen at high stress regime of such high depth of cover as in XV (T) and XV (B) seams of Moonidih Colliery.
7. Once the chain pillars are developed, the above recommendations (4-6) shall be suitably revisited depending on the ‘design by measurement’ approach using a suite of geotechnical instruments as per instrumentation plan. As per discussions with DGMS and recommendations of a technical workshop conducted at DGMS Dhanbad on 20.01.2017 on latest trends in strata control in longwall mining with a special reference to strata monitoring techniques, the instrumentation plan for longwall is given in Annexure I. The recommended plan shall be put in place pillar-after-pillar. The modifications can be either reducing or increasing the spacing of side bolts or using the calculated anchorage test values which may be higher than 15 T taken in this study report, supposing the better practice of side-bolting put in place at the mine sites.
8. The XV (B) seam can be worked with not less than 3 m thick parting in between.
9. After extraction of the XV (T) seam, it is observed from numerical modelling exercises (please refer to Section 10) that the safety factor of the 3 m parting is varying between 1.0 and 2.5. Accordingly, the width of the barrier/chain pillars in bottom section will be increased by 11.4 m (2 x 5.7 m) compared to those of the top section as shown in Fig. 12. The width of gate roads is recommended to be 5.7 m.
10. During development and final extraction, the relevant guidelines of Coal Mines Regulations should be followed, maintaining straight line of extraction all along.

## 12.0 ACKNOWLEDGEMENTS

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**Fig. 1:** Mine layout showing workings of XV seam

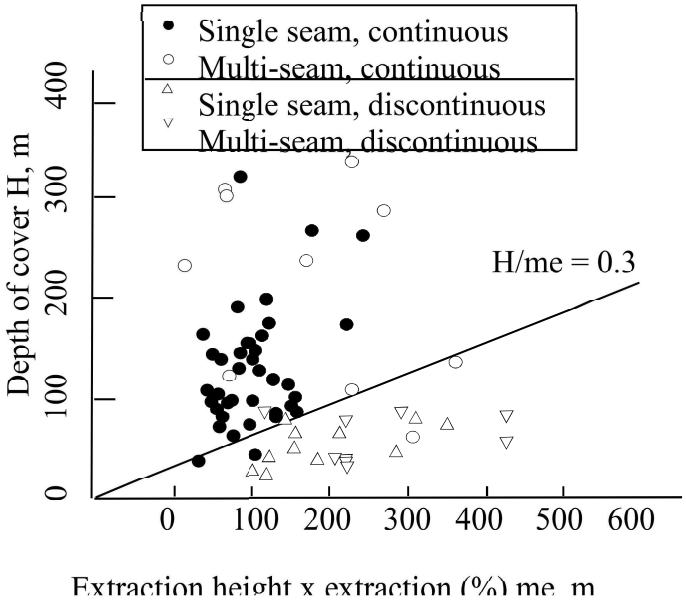



**Fig. 2:** Line of demarcation between continuous and discontinuous subsidence

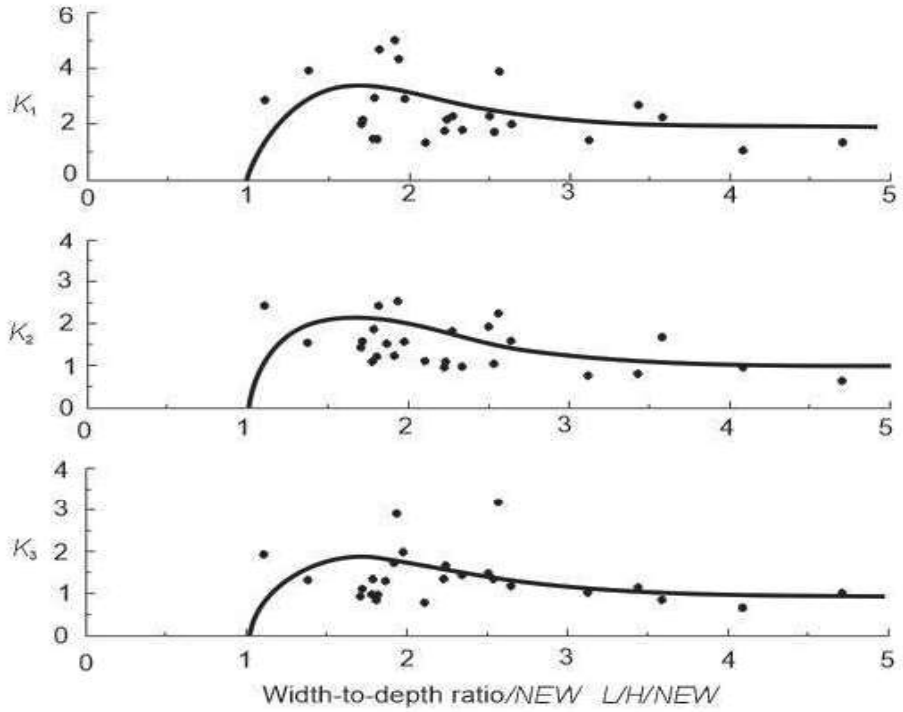



**Fig. 3(a):** Reference graph for estimation of $K_1$, $K_2$ and $K_3$ constants for Single Seam

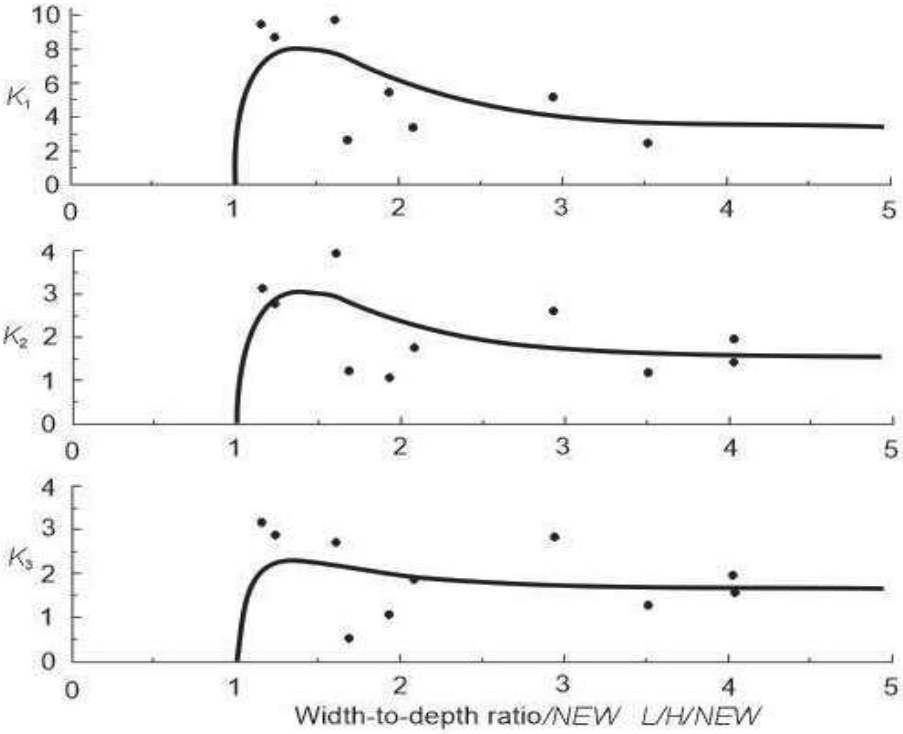



**Fig. 3(b):** Reference graph for estimation of $K_1$, $K_2$ and $K_3$ constants for multi-seam

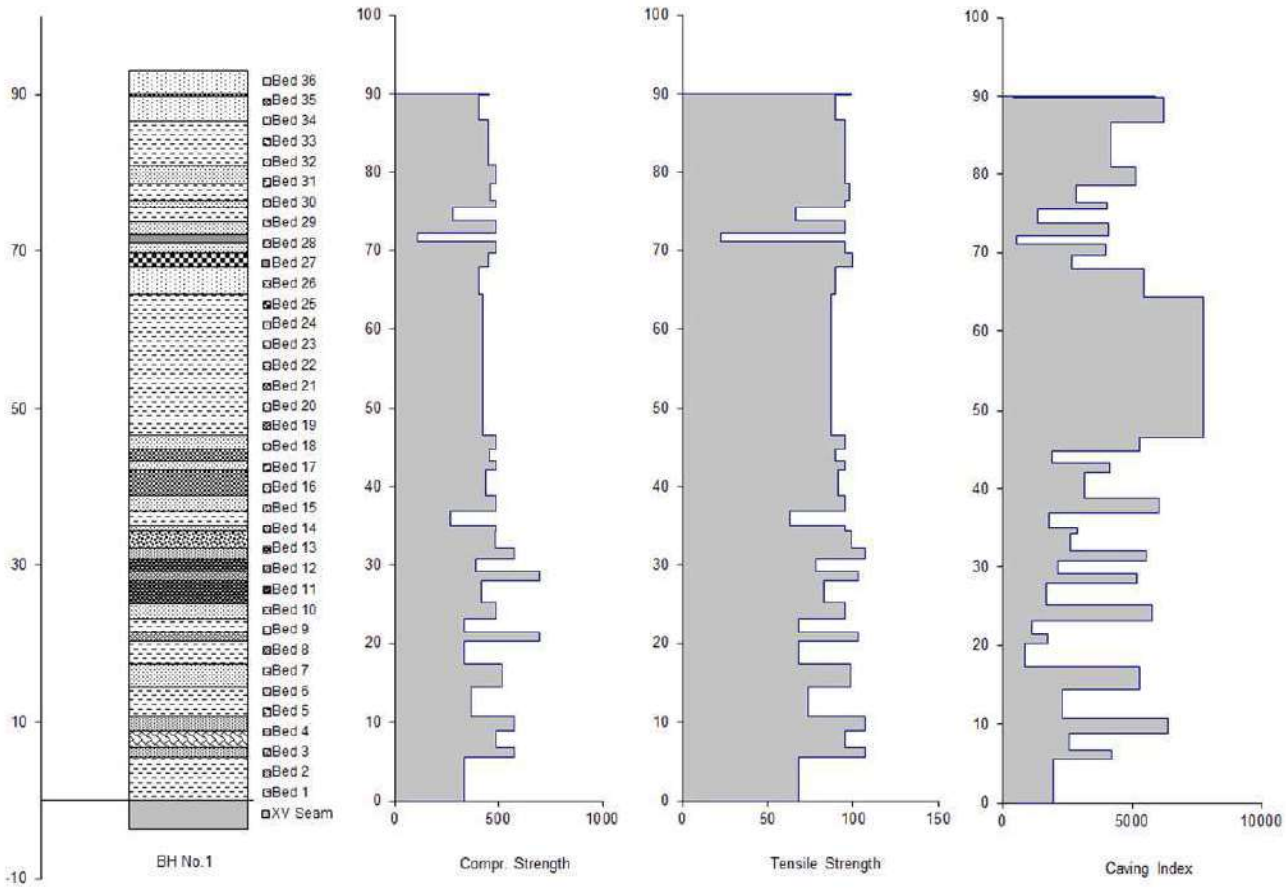



**Fig. 4:** Histogram of physico-mechanical properties and caving index for different rock beds overlying XV seam at Moonidih Mine as per Borehole No. 1. More intricate and sub-divided beds are listed above, for modelling purpose the beds are suitably merged as listed in Table 4 with determined properties.

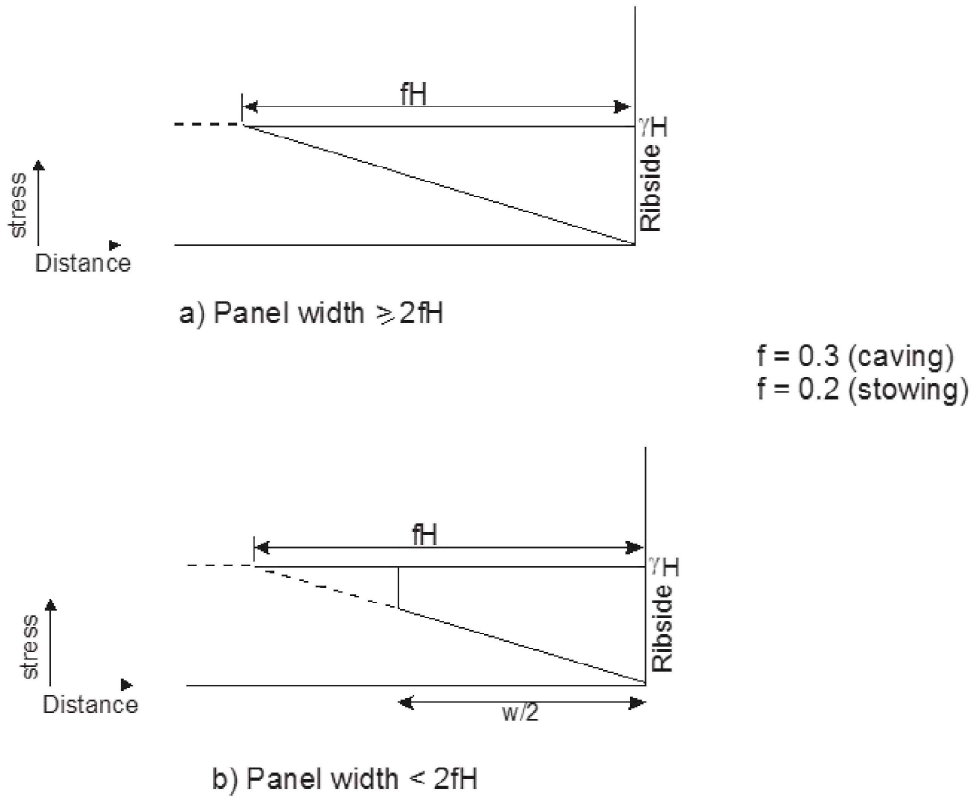



**Fig. 5**: Stress distribution in the goaf: a) panel width ≥ 2fH b) panel width < 2fH

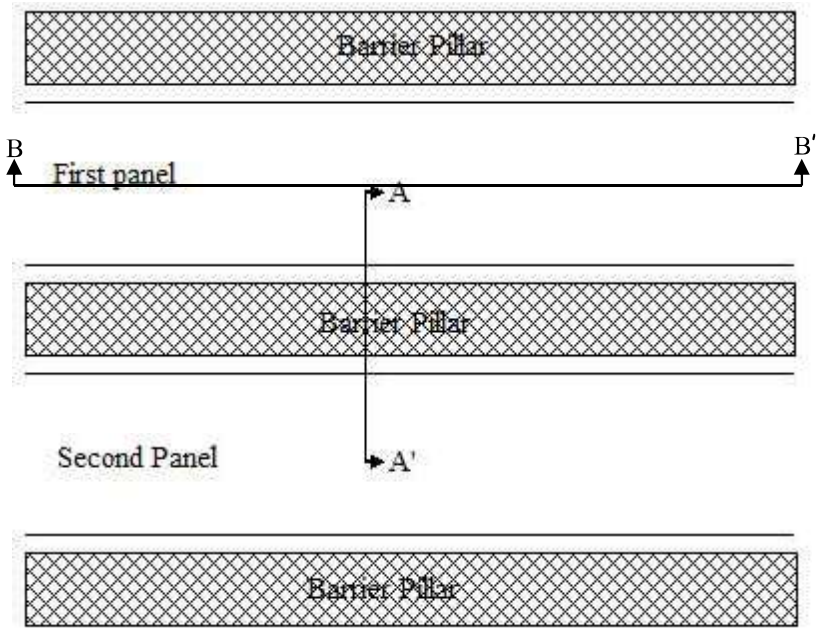



**Fig. 6:** Schematic diagram showing proposed Longwall panels (Plan view)

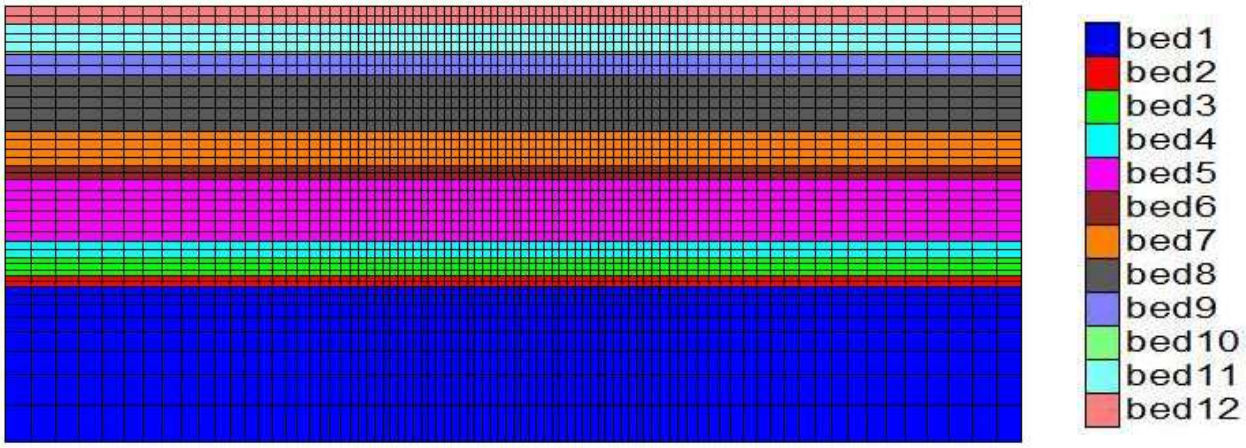



**Fig. 7(a):** Mesh/grid of the numerical models at virgin state

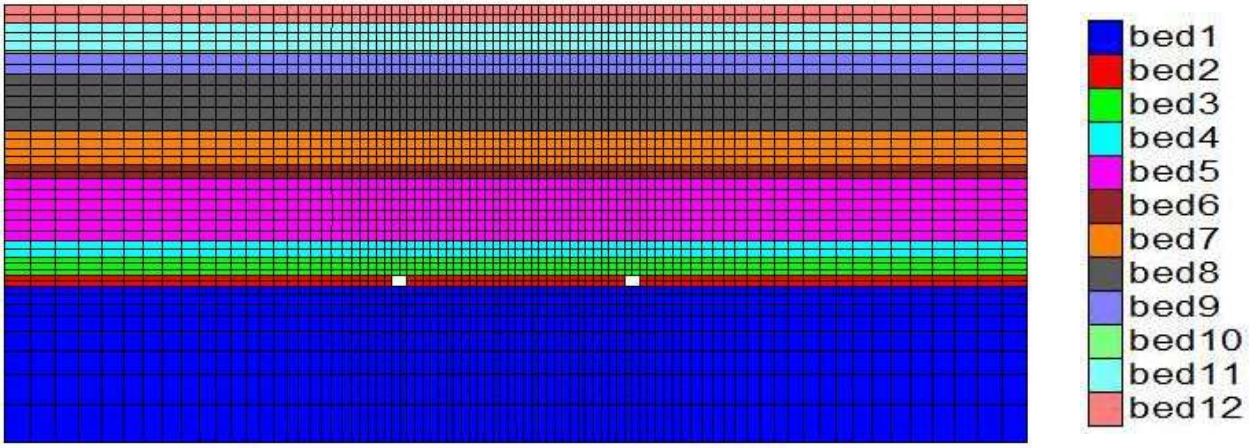



**Fig. 7(b):** Mesh/grid of the numerical models after drive of the gate roads

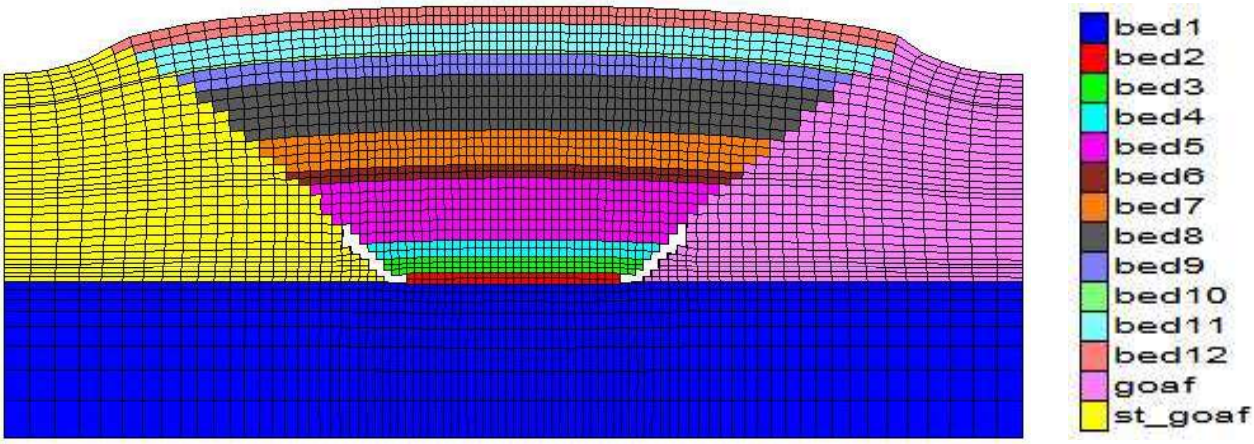



**Fig. 7(c):** Mesh/grid of the numerical models to study the stability of the barrier pillar with goaf on both sides

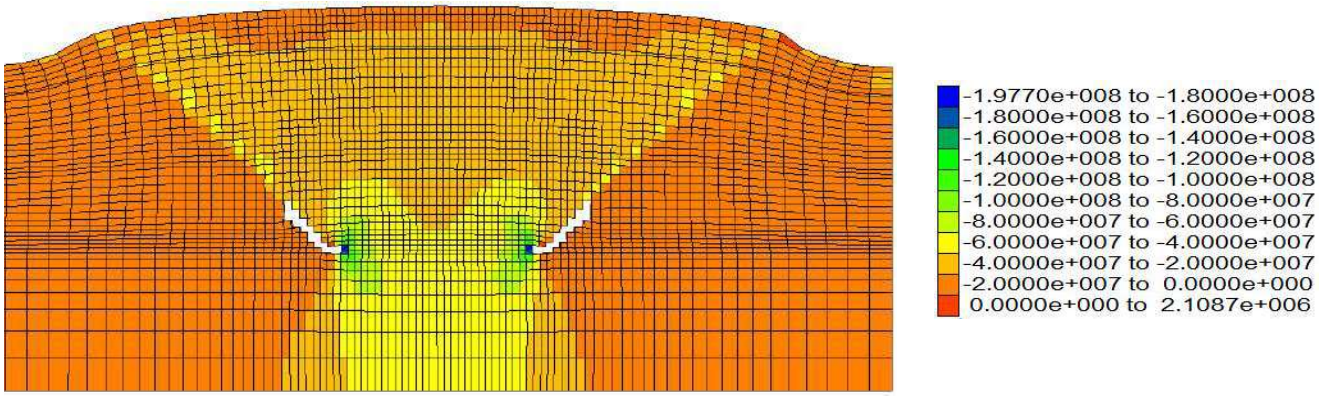



**Fig. 8:** Block contour of vertical stresses

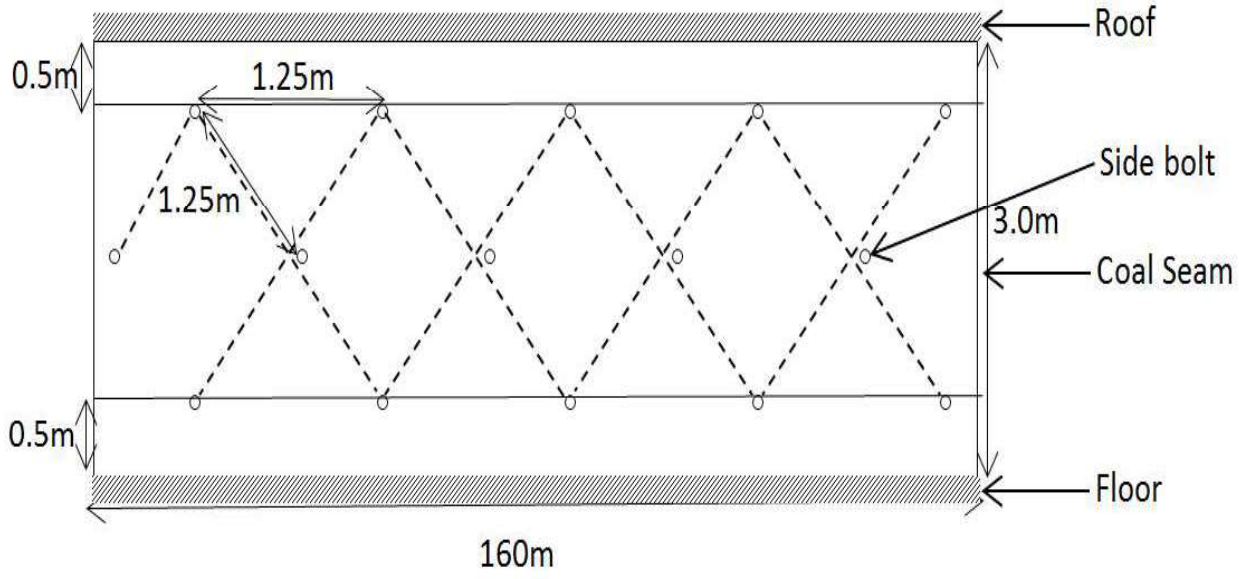



**Fig. 9:** Pattern of side bolting (not to scale)

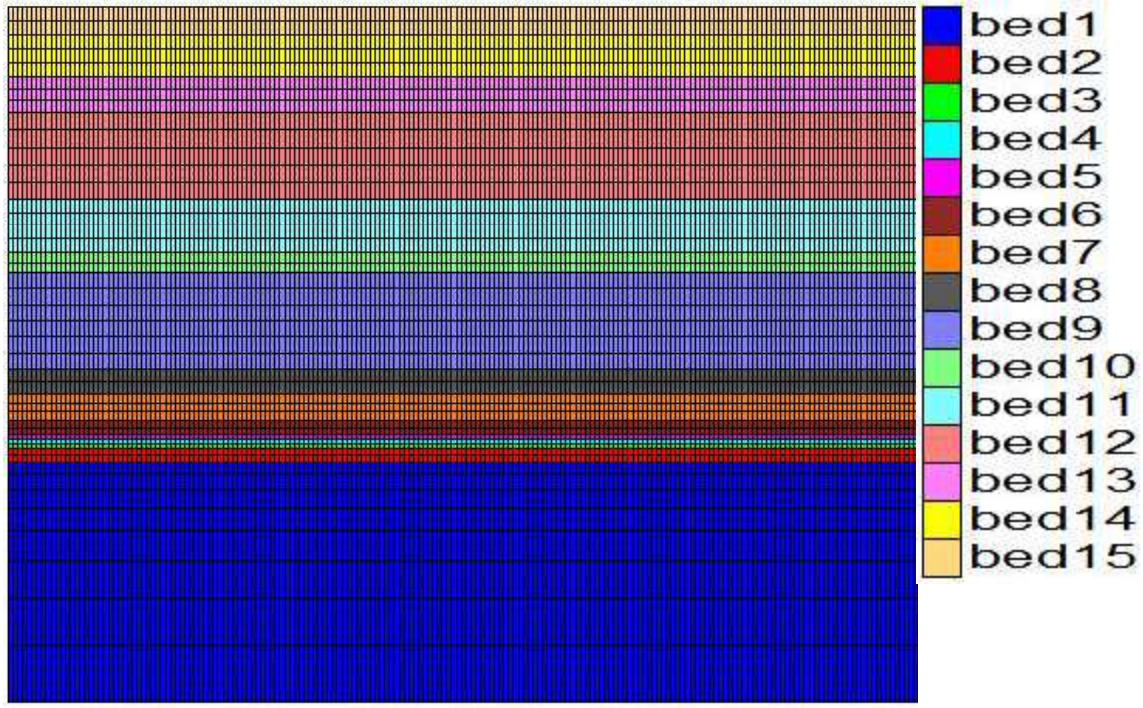



**Fig. 10(a) :** Mesh/grid of the numerical model in virgin condition

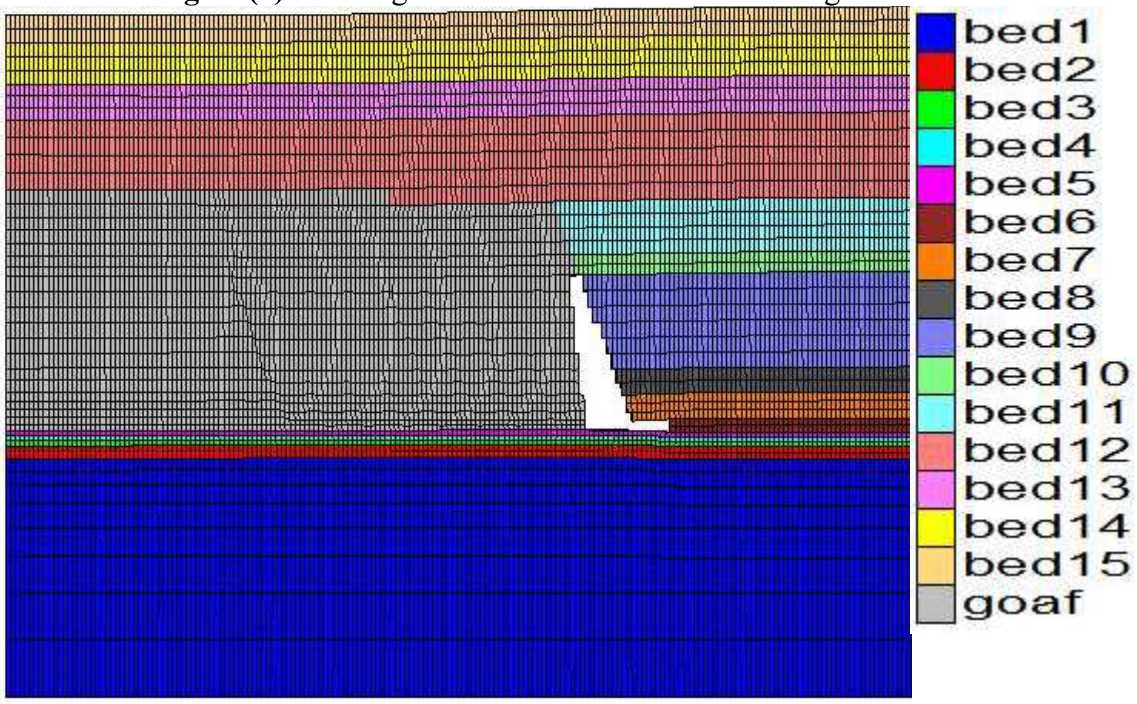



**Fig. 10(b):** Mesh/grid of the numerical model during extraction of Top section

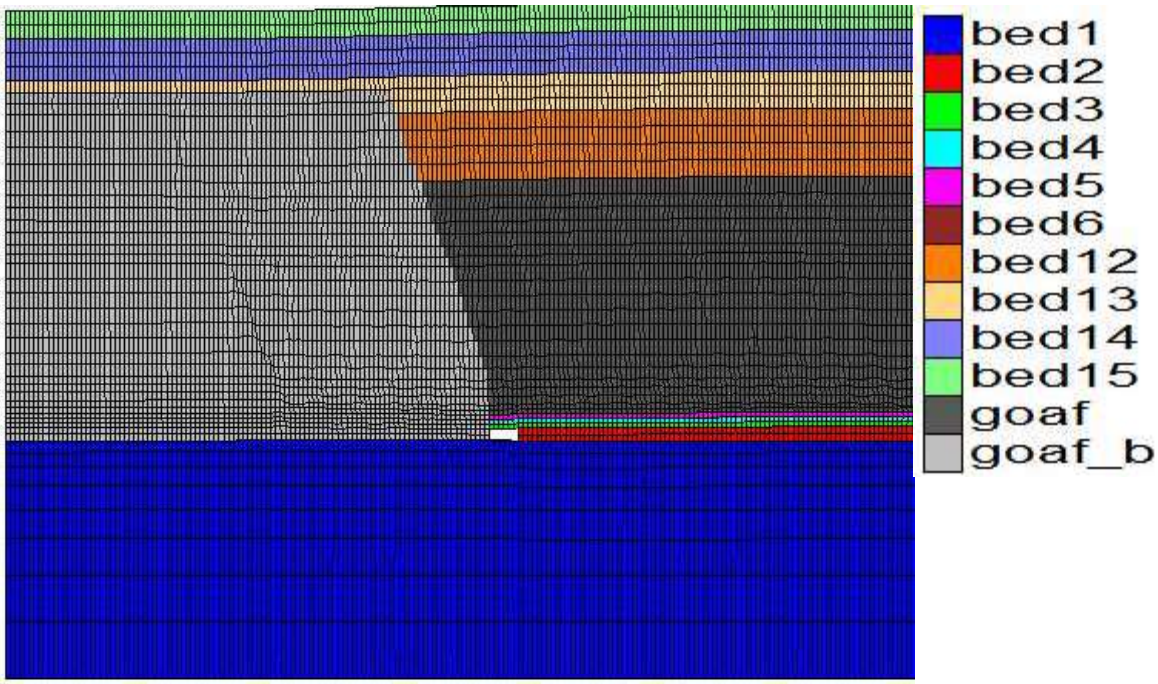



**Fig. 10(c):** Mesh/grid of the numerical model during extraction of Bottom section

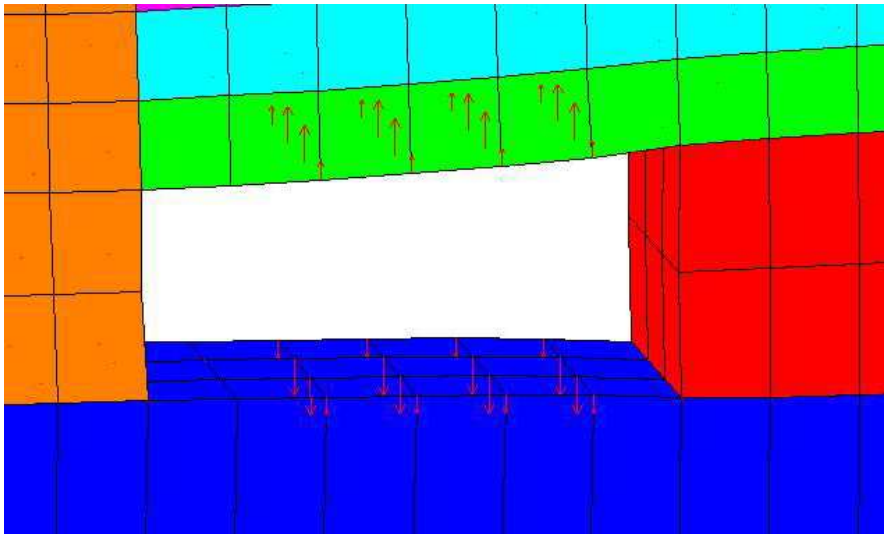


**Fig. 10(d):** Longwall Powered supports are modelled as nodal forces

**Fig. 11(a):** Contour of Major Principal Stress

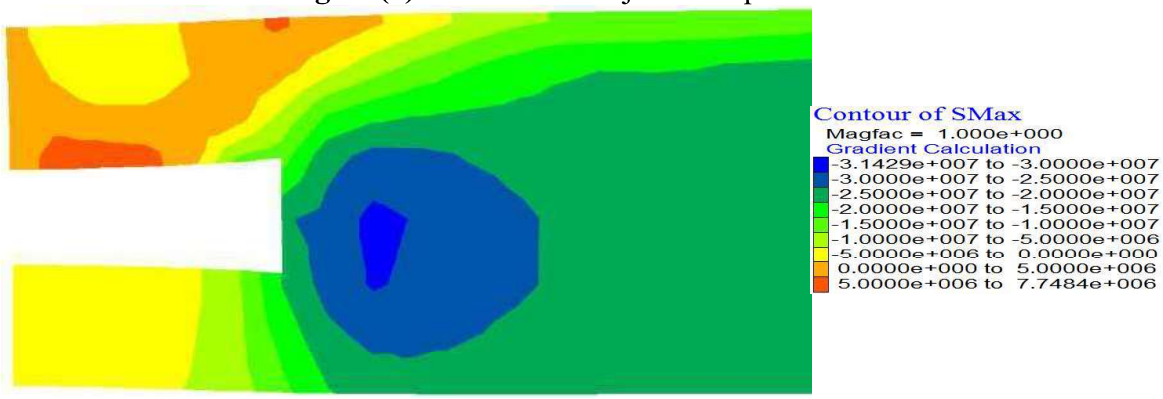



**Fig. 11(b):** Contour of Minor Principal Stress

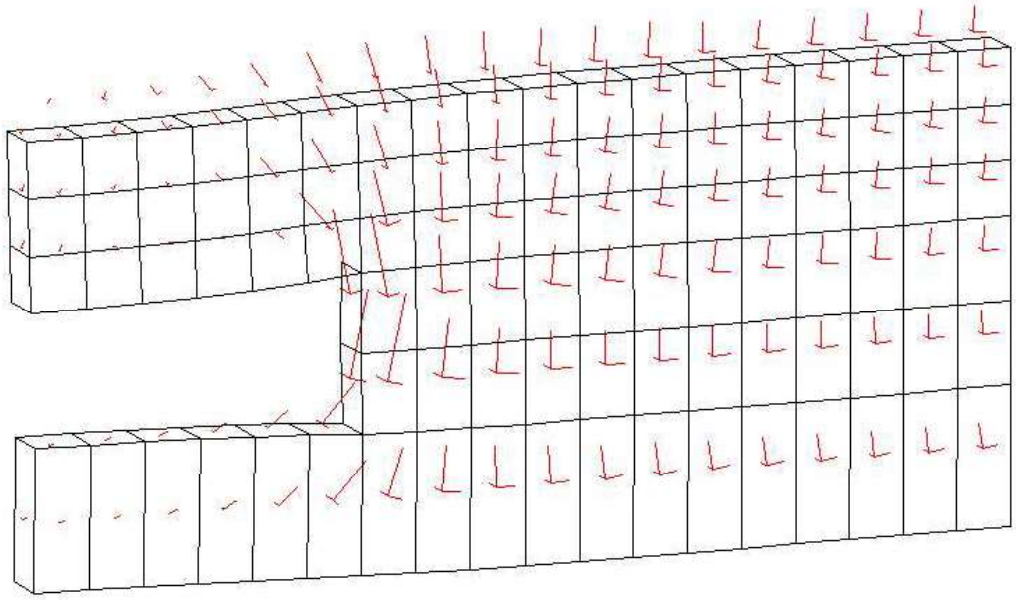


**Fig. 11(c):** Principal Stress Vectors and orientation

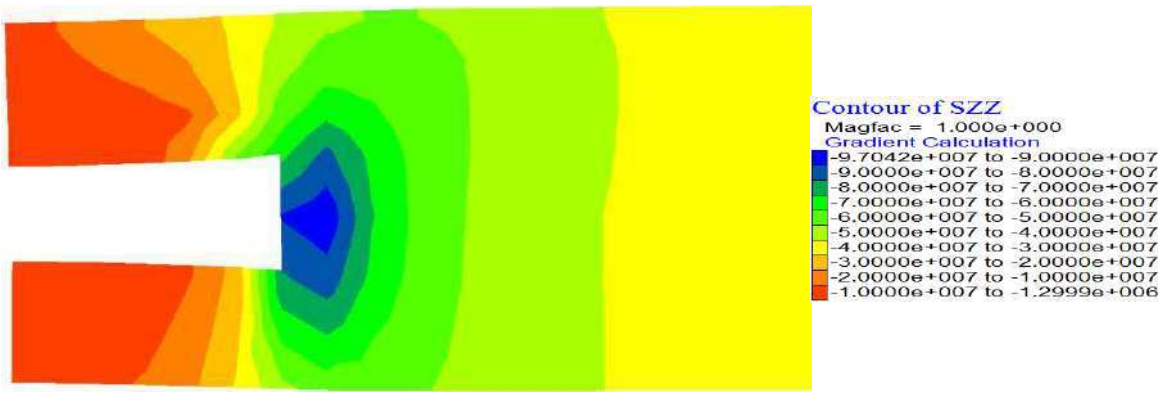



**Fig. 11(d):** Contour of Vertical Stress

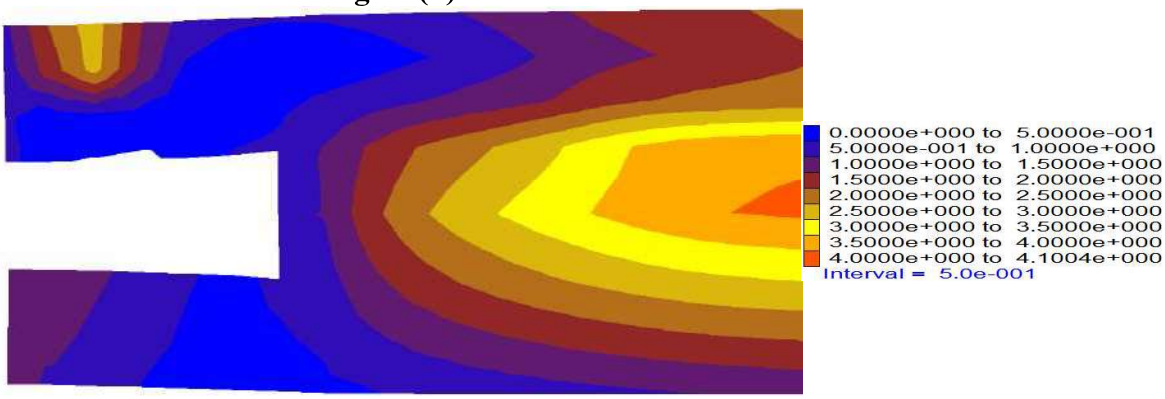



**Fig. 11(e):** Safety Factor Contour

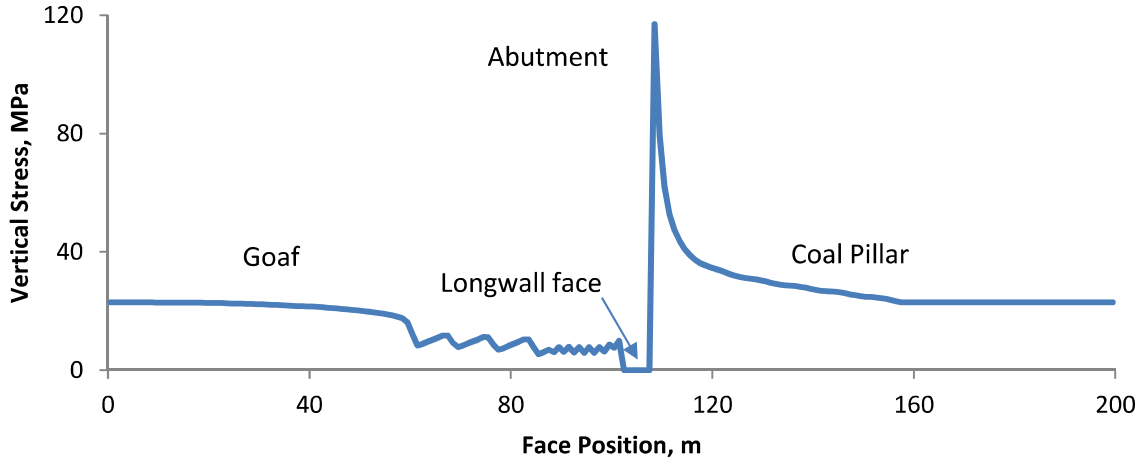



**Fig. 11(f):** Distribution of vertical stress along the panel

**Fig. 12:** Schematic diagram of multiple sections working of longwall face (not to scale)

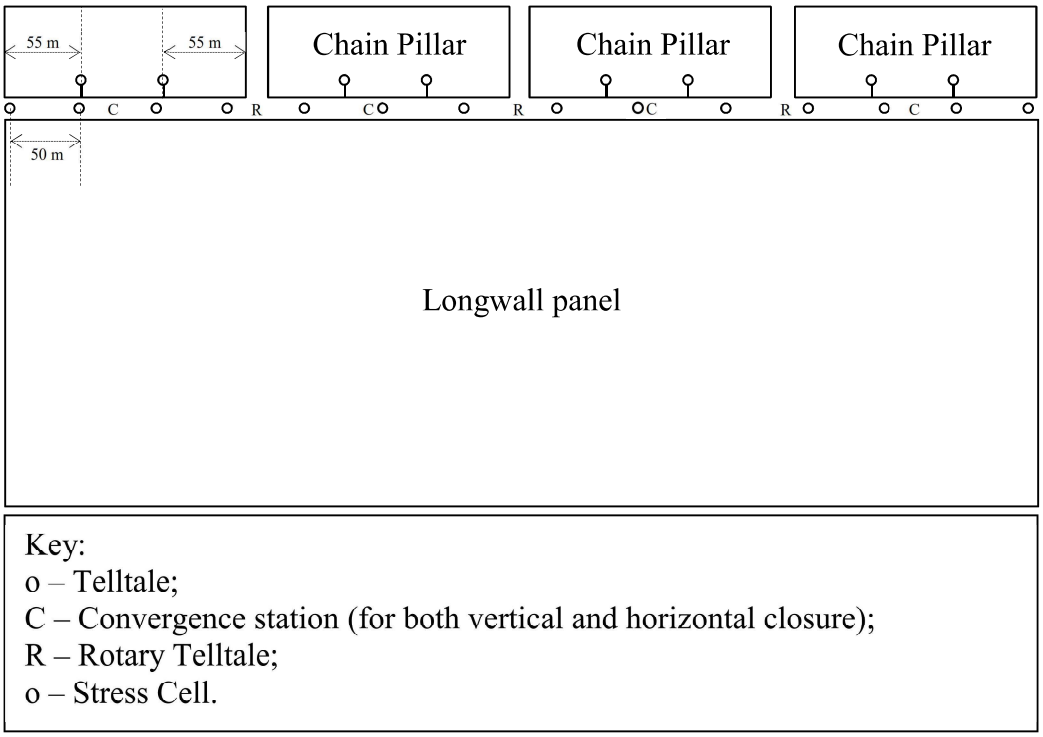



**Fig. 13:** Schematic diagram of instrumentation plan (not to scale)

## ANNEXURE I: Instrumentation Plan

1. Roof to floor convergence and floor heaving of gate roadways shall be monitored on regular basis (once at least in every shift) up to a distance of minimum 40m from the face at an interval not exceeding 10m by convergence indicators.

2. Floor heaving of gate roads in XV (T) seam should be additionally monitored if XV (B) seam is planned to be extracted below.

3. Load cells shall be installed in main-gate and tail gate roadways up to a distance of minimum 40m from the face at an interval not exceeding 10m on Open-circuit (OC) props or with the roof bolts as the case may be. Readings of the load cells shall be recorded in every shift in a bound-paged book kept for the purpose.

4. At least 2 to 3 instrumented roof bolts shall also be installed in each gate roadway at strategic places to monitor the loading pattern on the bolts and their performance.

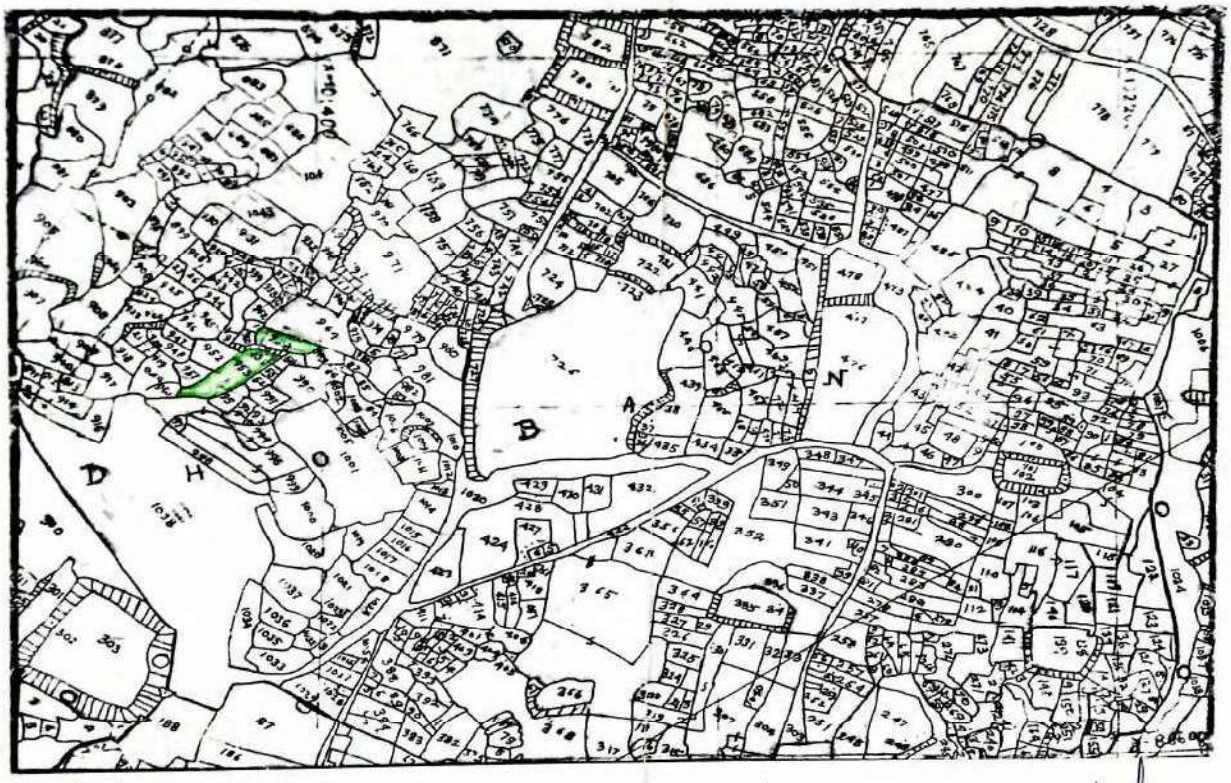
5. Multi point extensometers/Tell tales/Rotary tale tales/Sonic probe extensometers shall be installed in main-gate and tailgate roadways at interval not exceeding 50m to monitor dilation/ bed separation at least up to 400m from the face.

6. To predict abutment stresses in longwall pillar under extraction, stress cells shall be installed in the longwall pillar from main gate road and tail gate roadways up to a distance of minimum 400m from the face at 100 m intervals. The first stress cell shall be installed at the expected main fall position.

7. To monitor the stability of the barrier/chain pillars and predict magnitude and location of the abutment stresses, stress cells shall be installed in the barrier/chain pillars from main gate road and tail gate roads up to a distance of minimum 400m from the face at 200 m intervals. The first stress cell shall be installed at the expected main fall position.

8. The instrumentation suggest as above is primarily related to gate roads and chain pillars for their detailed evaluation and should be done under the guidance of a reputed scientific institution having expertise in this subject.

## Mauza Plan of Dhobni Showing Plantation Site in Moonidih for the year of 2020-21




29/5/21
Area Survey Officer
Moonidih Colliery

Mine Manager
Moonidih Colliery

29-5-21
Area Manager (Estate)
W.J. Area

27/05/2021
Area Manager (Env.)
W.J. Area

# Study of Occupational diseases and Hearing impairments of Coal Mines workers of BCCL directly involved in active mining operations

CMS/699(2)/11/10/19

11/10/19

GM (Environment)

Dr. Pandey/11/10 M.D. Manager and Admin. Officer Bank 11/10/19 Patkar 11/10/19

**REGIONAL OCCUPATIONAL HEALTH CENTRE (EASTERN), KOLKATA**

**&**

**NATIONAL INSTITUTE OF OCCUPATIONAL HEALTH, AHMEDABAD**

**(Indian Council of Medical research)**

# Study of Occupational diseases and Hearing impairments of Coal Mines workers of BCCL directly involved in active mining operations

REGIONAL OCCUPATIONAL HEALTH CENTRE (EASTERN), KOLKATA

&

NATIONAL INSTITUTE OF OCCUPATIONAL HEALTH, AHMEDABAD

(Indian Council of Medical research)



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## BACKGROUND

Although coal remains a major energy resource worldwide, coal mining causes environmental problems, whereas the inhaled coal particles at the work place may lead to the development of coal workers' pneumoconiosis (CWP). Typically, coal workers pneumoconiosis takes many years to develop and to be manifested. Further, once initiated the disease is progressive in nature, often leading to lungfunction impairment, disability. The workers' exposure to coal dust generally occurs during mining operations. Coal mining can also increase the risk of developing asthma and chronic obstructive pulmonary disease (COPD), such as emphysema and chronic bronchitis. It is suggested that coal mining operations may also induce noise induced hearing impairment among the workers.

A request was received from Bharat Coking Coal Limited, Dhanbad to assess the health status of their workers involved in the mining activities in Cluster 11 and 15 areas around Dhanbad. About 10% of the subjects involved in mining activities were to be included in this study. The workers were to be assessed for their health status, presence of any occupational disease and hearing impairments. Under this circumstance, in consultation of the scientists of National Institute of Occupational Health (NIOH) and the concerned officers of Bharat Coking Coal Limited, it was decided that an epidemiological study would be carried out involving workers involved in mining activities.



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# INTRODUCTION

Coal is an aggregate of heterogeneous substances composed of organic and inorganic materials. The four major coal types ranked in order of increasing heat value are lignite, sub-bituminous, bituminous, and anthracite. The inorganic portion of coal can range from a few percent to >50% (by weight) and is composed of phyllo-silicates (kaolinite, illite, etc.), quartz, carbonates, sulfides, sulfates, and other minerals. In general, aluminum and iron are the main metals in the coals. Arsenic, nickel, zinc, cadmium, cobalt, and copper are trace metals that represent only a very small fraction of the mineral matter[1].

Coal mining in India has a long history of commercial exploitation covering nearly 220 years starting in 1774 in the Raniganj Coalfield along the Western bank of river Damodar. However, for about a century the growth of Indian coal mining remained sluggish for want of demand but the introduction of steam locomotives in 1853 gave a fillip to it. As on 2011, India had 285 billion tonnes of resource. The production of coal was 532.69 million tonnes in 2010-11. The production of lignite was 37.73 million tonnes in 2010-11. As on 2011, India ranked 3rd in world coal production.[2]

Coal remains a major energy resource worldwide. In the United States, > 50% of electricity is generated in coal-fired power plants. However, coal mining causes environmental problems such as acid mine drainage, whereas the inhaled coal particles at the work place may lead to the development of coal workers' pneumoconiosis (CWP).[3,4]Typically, coal workers pneumoconiosis takes many years to develop and be manifested requiring a surveillance for a longer duration. Further once initiated the disease is progressive in nature often leading to lung function impairment, disability, and premature death.



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## AIM AND OBJECTIVES

### AIMS

To study the coal mining as well as coal dust related health effects in the coal mining workers.

### OBJECTIVES

1. To understand health status of workers through questionnaire survey, health examination.
2. To study respiratory health in coal field mining workers.
3. To assess ventilatory functions of coal field mining workers.
4. To analyze hearing ability through audiometric evaluation.



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Questionnaire survey

Medical Examination



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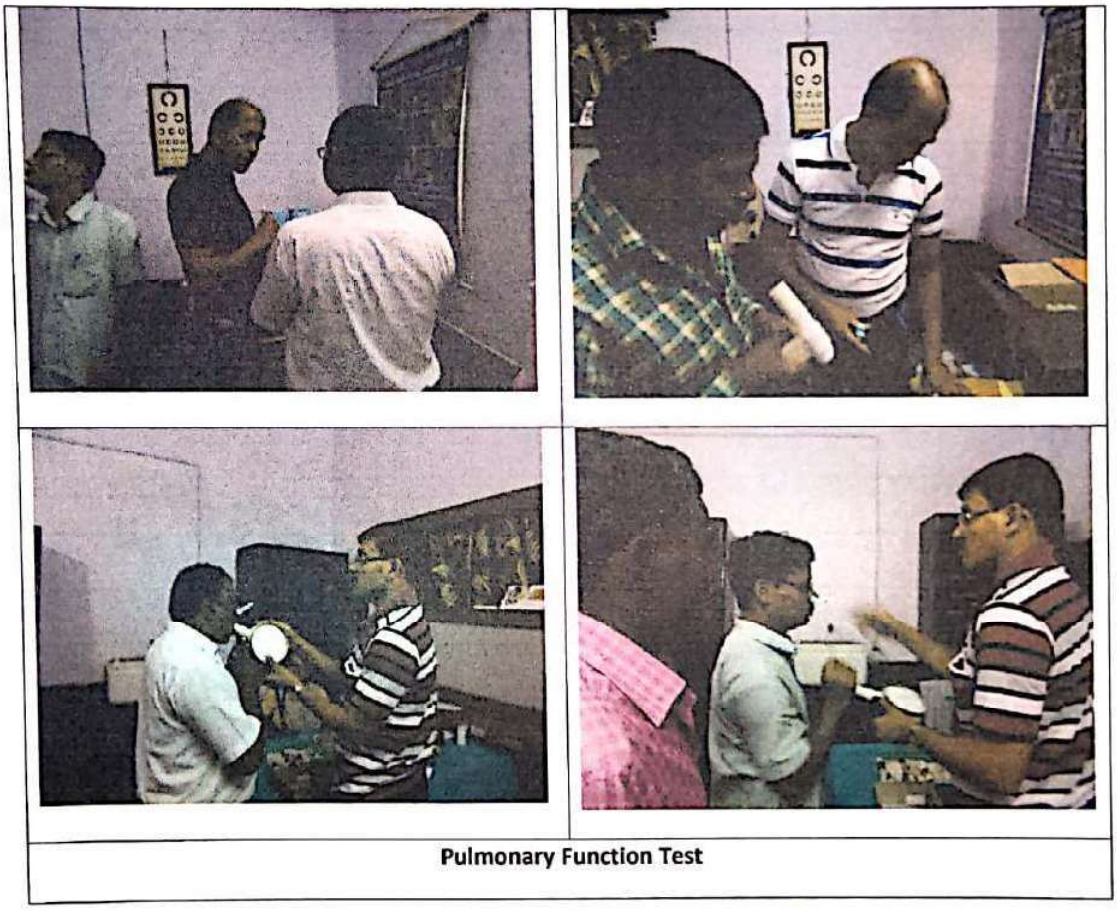

Pulmonary Function Test



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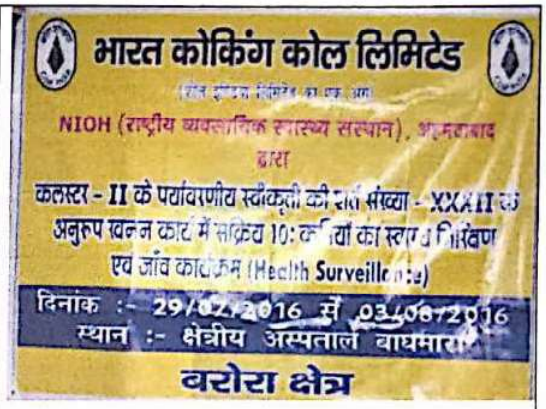
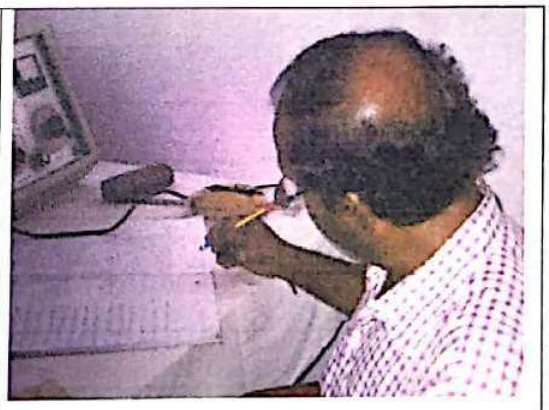



Information- Communication



Audiometry



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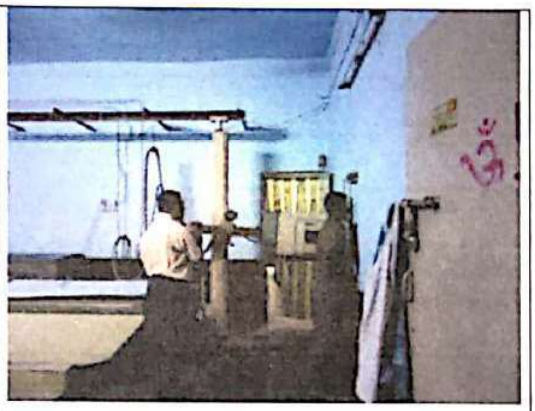

Haematology & Radiology Examination



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# RESULT

# &

# DISCUSSION

# (Total subjects)



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This study covered 351 subjects from Kustore sector and 140 subjects from Baghmara sector of BCCL Collieries. Among the subjects of Kustore sector 49 were from Kachi Balihari mines, 51 from Bhagabandh mines, 40 from Gopali Chawk mines and 100 from Munidi mines. PB project mines contributed 111 subjects (Table 1). Similarly among the subjects of Baghmara sector, Kharkharee mines and Phularitand mines contributed 75 subjects and 65 subjects respectively. Workers actively involved in mining activity were mainly included in this study. However, about 10% subjects of this study were enrolled from supervisory staffs in order to have a complete and comprehensive understanding of the occupational health condition.

**Table 1: Distribution of Supervisory workers and coal miners according to the name of the mine**

| Sector | Mine Name | Supervisory workers | Coal Miners | Total |
|---|---|---|---|---|
| | | N (%) | N (%) | N (%) |
| Kustore | 10/12 KACHI BALIHARI PITS | 8 (2) | 41 (12) | 49 (14) |
| | BHAGABANDH COLLIARY | 10 (3) | 41 (12) | 51 (15) |
| | GOPALI CHAWK COLLIARY | 7 (2) | 33 (9) | 40 (11) |
| | MUNIDI COLLIARY | 17 (5) | 83 (24) | 100 (29) |
| | P.B.PROJECT COLLIARY | 5 (1) | 106 (30) | 111 (31) |
| **Total** | | 47 (13) | 304 (87) | 351 |
| Baghmara | KHARKHAREE COLLIARY | 5 (4) | 70 (50) | 75 (54) |
| | PHULARITAND COLLIARY | 1 (1) | 64 (45) | 65 (46) |
| **Total** | | 6 (5) | 134 (95) | 140 |
| **Grand Total** | | **53 (10)** | **438 (90)** | **491 (100)** |

Mean age of the workers was 45.9 ± 8.36 years. Most of the workers were between 35-54 years age group. Mean age of supervisory staffs was slightly higher than that of miners. About 98% workers were married. As far as education is concerned majority (56%) had middle school education. Only 4% subjects had graduate level education or higher (Table 2).



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**Table 2: Demographic characteristics of the study subjects**

| Demographic characteristics | Supervisory workers | Coal Miners | Total |
|---|---|---|---|
| **Age group (in years)** | **N (%)** | **N (%)** | **N (%)** |
| <25 | 0(0) | 4(1) | 4(1) |
| 25 - 34 | 5(1) | 34(7) | 39(8) |
| 35 - 44 | 9(2) | 148(30) | 157(32) |
| 45 - 54 | 18(4) | 175(36) | 193(40) |
| ≥55 | 16(3) | 77(16) | 93(19) |
| **Mean age (in years)** | **48.31 ± 9.47** | **45.55 ± 8.189** | **45.9 ± 8.36** |
| **Marital status** | | | |
| Single | 2(0.5) | 6(1.5) | 8(2) |
| Married | 46(8.5) | 432(89.5) | 478(98) |
| **Education status** | | | |
| Illiterate | 0(0) | 102(21) | 102(21) |
| Primary schooling | 1(0) | 15(3) | 16(3) |
| Middle schooling | 18(4) | 256(53) | 274(56) |
| Secondary schooling | 19(4) | 56(12) | 75(15) |
| Graduate and above | 10(2) | 9(2) | 19(4) |

So far as personal habits are concerned, 86% of subjects were non-smokers, 10% were smokers and 3% were ex-smokers. Tobacco chewing habit was present in 61% subjects and occasional alcohol intake history was found in 39% workers (Table 3).

**Table 3: Personal habits of the study subjects**

| Demographic characteristics | Supervisory workers | Coal Miners | Total |
|---|---|---|---|
| **Smoking habits** | N (%) | N (%) | N (%) |
| Non-smoker | 38(8) | 382(79) | 420(86) |
| Smoker | 9(2) | 40(8) | 49(10) |
| Ex-smoker | 1(0) | 16(3) | 17(3) |
| **Tobacco chewer** | | | |
| No | 27(6) | 160(33) | 187(39) |
| Yes | 21(4) | 283(57) | 304(61) |
| **Alcohol drinking habit** | | | |
| No | 34(7) | 264(54) | 298(61) |
| Yes | 14(3) | 174(36) | 188(39) |



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Mean job experience was 11.72 ± 8.49 years. About 83% workers had job experience of up to 20 years, 3% workers had experience more than 30 years (Table 4). Mean experience was a little higher in supervisory employee group than miners group.

**Table 4: Occupational characteristics of Supervisory workers & Coal miners**

| Demographic characteristics | Supervisory workers | Coal Miners | Total |
|---|---|---|---|
| **Duration of job (in years)** | N (%) | N (%) | N (%) |
| <10 | 23(5) | 241(49) | 264(54) |
| 10 - 20 | 12(2) | 129(26) | 141(29) |
| 21 - 30 | 13(3) | 60(12) | 73(15) |
| >30 | 0(0) | 13(3) | 13(3) |
| **Mean duration of job (years)** | **12.65 ± 9.31** | **11.61 ± 8.39** | **11.72 ± 8.49** |

Most common symptoms complained by study subjects were musculoskeletal pain (34%) (Table 5). Other complaints were Cough, difficulty in breathing, chest pain, loose teeth, and soreness of mouth and colicky pain in abdomen. Headache, sleep disturbance, weakness, tremor in fingers was also experienced by some subjects.

**Table 5: Distribution of symptoms among study subjects**

| Symptoms | Supervisory workers | Coal Miners | Total |
|---|---|---|---|
| | N (%) | N (%) | N (%) |
| Cough | 1 (0.5) | 23 (4.5) | 24 (5) |
| Cough with Phlegm | 0 (0) | 7 (1) | 7 (1) |
| Difficulty in Breathing | 2 (0.5) | 27 (5.5) | 29 (6) |
| Chest Pain | 2 (0.5) | 23 (4.5) | 25 (5) |
| Colicky pain | 1 (0.5) | 14 (2.5) | 15 (3) |
| Loose Teeth | 5 (1) | 36 (7) | 41 (8) |
| Soreness of mouth/throat | 3 (1) | 21 (4) | 24 (5) |
| Urinary problems | 1 (0.25) | 5 (0.75) | 6 (1) |
| Musculoskeletal pain | 21 (4) | 146 (30) | 167 (34) |
| Headache/sleep difficulty /weakness/dizziness/tremor | 6 (2) | 46 (9) | 52 (11) |



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**Table 8: Pulmonary function impairments among study subjects**

| Pulmonary function category | Supervisory workers | Coal Miners | Total |
|---|---|---|---|
| | N (%) | N (%) | N (%) |
| **FVC/PFVC** | | | |
| <80% | 0 (0.0) | 15 (3.0) | 15 (3.0) |
| ≥80% | 53 (11.0) | 423 (86.0) | 476 (97.0) |
| **$FEV_{1\%}$** | | | |
| < 70 % | 2 (0.5) | 29 (6.0) | 31 (6.5) |
| 70- 79.99 % | 21 (4.5) | 158 (32.0) | 179 (36.5) |
| ≥ 80 % | 30 (6.0) | 251 (51.0) | 281 (57.0) |
| **FVC/PFVC <80% + $FEV_{1\%}$ <70%** | 0 (0.0) | 3 (0.6) | 3 (0.6) |

FVC – Forced Vital Capacity; PFVC – Predicted Forced Vital Capacity; $FEV_1$ – Forced Expiratory Volume in first second

**Table 9: Forced Vital Capacity according to study variables among study subjects**

| Study variables | Forced Vital Capacity [ Mean ± SD (litres)] | | |
|---|---|---|---|
| | Supervisory workers | Coal Miners | Total |
| **Age group (in years)** | **Mean ± SD (litres)** | **Mean ± SD (litres)** | **Mean ± SD (litres)** |
| < 45 | 3.85 ± 0.585 | 3.71 ± 0.646 | 3.72 ± 0.641 |
| ≥ 45 | 3.53 ± 0.576 | 3.36 ± 0.64 | 3.38 ± 0.634 |
| | t = 3.120;df =1;p=0.083 | t=30.586;df=1;p=0.00 | t=32.016;df=1;p=0.00 |
| **Duration of exposure (yrs)** | | | |
| < 20 | 3.64 ± 0.562 | 3.52 ± 0.65 | 3.53 ± 0.643 |
| ≥ 20 | 3.55 ± 0.672 | 3.47 ± 0.71 | 3.48 ± 0.702 |
| | t=0.264;df=1;p=0.610 | t=0.430;df=1;p=0.512 | t=0.519;df=1;p=0.472 |
| **Smoking habit** | | | |
| Never smoker | 3.6 ± 0.587 | 3.5 ± 0.655 | 3.51 ± 0.649 |
| Ever smoker | 3.76 ± 0.613 | 3.49 ± 0.616 | 3.54 ± 0.619 |
| | t=0.210;df=1;p=0.649 | t=0.115;df=1;p=0.735 | t=0.317;df=1;p=0.574 |

Similar trend was observed in case of FEV1 values also (Table 10). Significant difference was observed between subject of less than 45 years and rest of the workers. This difference was more prominent in miners than supervisory staffs. No such remarkable difference was observed when compared in relation to job experience and smoking habit.



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**Table 10: Forced Expiratory Volume in first second according to study variables among study subjects**

| Study variables | Forced Expiratory Volume in first second [ Mean ± SD (litres)] | | |
|---|---|---|---|
| | Supervisory workers | Coal Miners | Total |
| **Age group (in years)** | **Mean ± SD (litres)** | **Mean ± SD (litres)** | **Mean ± SD (litres)** |
| < 45 | 3.073 ± 0.3887 | 3.028 ± 0.5229 | 3.031 ± 0.5139 |
| ≥ 45 | 2.837 ± 0.4553 | 2.685 ± 0.5597 | 2.705 ± 0.5486 |
| | t=2.95;df=1;p=0.092 | t=42.02;df=1;p=0.001 | t=43.53;df=1;p=0.001 |
| **Duration of exposure (yrs)** | | | |
| < 20 | 2.945 ± 0.4025 | 2.844 ± 0.5556 | 2.854 ± 0.5427 |
| ≥ 20 | 2.791 ± 0.5426 | 2.769 ± 0.6072 | 2.772 ± 0.5962 |
| | t=1.259;df=1;p=0.267 | t=1.319;df=1;p=0.25 | t=1.872;df=1;p=0.172 |
| **Smoking habit** | | | |
| Never smoker | 2.886 ± 0.4428 | 2.836 ± 0.5617 | 2.841 ± 0.5509 |
| Ever smoker | 2.972 ± 0.5042 | 2.763 ± 0.5127 | 2.805 ± 0.5129 |
| | t=0.208;df=1;p=0.650 | t=0.131;df=1;p=0.72 | t=0.018;df=1;p=0.895 |

Same pattern could be found in case of Peak Expiratory Flow Rate also (Table 11). Significant difference was present in relation to age (more so in miners than supervisor), however, smoking and duration of exposure wise classification did not show any significant difference.



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**Table 11: Peak Expiratory Flow Rate according to study variables among study subjects**

| Study variables | Peak Expiratory Flow Rate [ Mean ± SD (litres/minute)] | | |
|---|---|---|---|
| | Supervisory workers | Coal Miners | Total |
| Age group (in years) | Mean±SD (litres/minute) | Mean±SD (litres/minute) | Mean ± SD (litres/minute) |
| < 45 | 465 ± 63.579 | 473.23 ± 65.358 | 472.65 ± 65.113 |
| ≥ 45 | 479.47 ± 60.402 | 444.83 ± 85.172 | 449.4 ± 83.078 |
| | t=0.571;df=1;p=0.458 | t=14.37;df=1;p=0.00 | t=10.97;df=1;p=0.001 |
| **Duration of exposure (yrs)** | | | |
| < 20 | 474.86 ± 59.704 | 458.15 ± 75.028 | 459.79 ± 73.769 |
| ≥ 20 | 477.33 ± 66.167 | 450.2 ± 89.349 | 453.97 ± 86.752 |
| | t=0.01;df=1;p=0.896 | t=0.785;df=1;p=0.376 | t=0.506;df=1;p=0.477 |
| **Smoking habit** | | | |
| Never smoker | 475.37 ± 61.851 | 456.31 ± 78.316 | 458.17 ± 77.012 |
| Ever smoker | 475 ± 63.64 | 461.75 ± 76.691 | 464.4 ± 73.849 |
| | t=0.002;df=1;p=0.962 | t=0.193;df=1;p=0.661 | t=0.301;df=1;p=0.583 |

So far as chest radiographic findings are concerned, 93% subjects (Table 12) had findings within normal limits. 3% subjects showed findings suggestive of opacities in lung and almost 1.5% had other features on chest X-ray (mostly suggestive of Koch's infection of lung).

**Table 12: Chest radiographic findings among the study subjects**

| Chest X ray findings | Supervisory workers | Coal Miners | Total |
|---|---|---|---|
| | N (%) | N (%) | N (%) |
| Within normal limit | 50 (10) | 408 (83) | 458 (93) |
| Pulmonary Opacities | 1 (0.5) | 12 (2.5) | 13 (3) |
| Koch's infection | 0 (0) | 7 (1.5) | 7 (1.5) |
| Not Done | 2 (0.5) | 11(2.0) | 13(2.5) |
| **Total** | **53 (11)** | **438 (89)** | **491 (100)** |

Haematological and biochemical findings of the subjects were mostly within normal limits. Almost 11% workers had random blood sugar level >140. Mean Hemoglobin level in 13.1±0.8 gm%. Mean ESR was 7.0±2.1 unit. Random Blood sugar, blood urea and creatinine was 114.7±36.4 unit, 22.7±3.6 unit and 0.8±0.1unit respectively (Table 13).



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**Table 13: Haematological & Biochemical findings of study subjects**

| Parameter | Minimum | Maximum | Mean ± SD |
|---|---|---|---|
| Haemoglobin (g/dL) | 10 | 15 | 13.15 ± 0.845 |
| Erythrocyte Sedimentation Rate (mm/h) | 3 | 20 | 7.046 ± 2.144 |
| Total Leucocyte Count (mcL) | 5500 | 12600 | 9064.61 ± 1167.13 |
| Neutrophil | 46 | 89 | 61.77 ± 5.826 |
| Lymphocyte | 20 | 62 | 31.97 ± 6.013 |
| Eosinophil | 2 | 13 | 5.62 ± 1.77 |
| Monocyte | 0 | 8 | 0.80 ± 0.905 |
| Besophil | 0 | 0 | 0.00 |
| Random Blood Sugar (mg/dL) | 55 | 300 | 114.74 ± 36.46 |
| Blood Urea (mg/dL) | 14 | 38 | 22.75 ± 3.63 |
| Serum Creatinine (mg/dL) | .30 | 7.00 | 0.83 ± 0.32 |

As far as ophthalmological findings are concerned, 5% subjects had uncorrected vision (although using spectacles) and 9% subjects had Cataract in eyes. Colour blindness was also observed in few subjects (Table 14).

**Table 14: Ophthalmological findings of study subjects**

| | Supervisory workers | Coal Miners | Total |
|---|---|---|---|
| | N (%) | N (%) | N (%) |
| People having uncorrected vision after correction | 1 (0.5) | 24 (4.5) | 25 (5) |
| Colour Blindness | 0 | 6 (1) | 6 (1) |
| Cataract | 4 (1) | 29 (8) | 33 (9) |
| Glaucoma | 0 (0) | 2 (1) | 2 (1) |
| Muscular Pathology | 0 | 1 | 1 |
| Pterygium | 0 | 1 | 1 |



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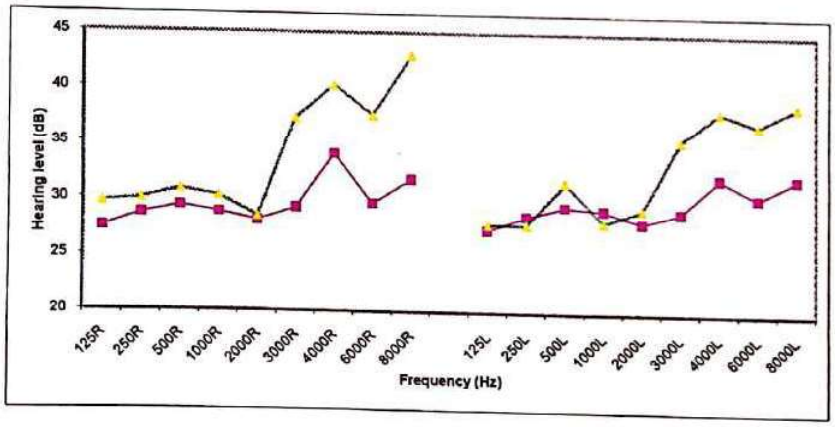
Figure 1 describes hearing ability of workers examined by audiometry. Two curves depict the median hearing ability of subjects with <10 years (lower curve), and ≥ 10 years (higher curve) of job experience. On preliminary observation, decreased hearing ability at high frequency was observed in some workers. Difference of hearing ability with increasing duration of exposure was also observed at higher frequency; however, this observation also is subject to adjustment for age and other probable factors that can affect hearing ability. Moreover, hearing assessment was done in field condition where despite best efforts ideal experimental chamber condition could not be achieved, which may also be a contributing factor.

**Figure 1: Distribution of hearing ability according to job experience**



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# CONCLUSION

# &

# RECOMMENDATION



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## CONCLUSION

- This study covered 351 subjects from Kustore sector and 140 subjects from Baghmara sector of BCCL Collieries. Mean age of the workers was 45.9 ± 8.36 years. Most of the workers were between 35-54 years age. Mean job experience was 11.72 ± 8.49 years.

- Most common symptoms complained by study subjects were musculoskeletal pain (34%). Other complaints were Cough, difficulty in breathing, chest pain, soreness of mouth etc. Headache, sleep disturbance, weakness, tremor in fingers was also experienced by some subjects.

- About 20% subjects had systolic blood pressure >140 as well as diastolic blood pressure > 90 mm of Mercury. 9% workers had only higher systolic blood pressure and 11% had only higher diastolic blood pressure.

- As far as pulmonary functional status of study subjects in concerned, about 3% subjects had restrictive type of abnormality (FVC/PFVC < 80%) and 0.6 % subjects had combined type of abnormality (FVC/PFVC <80 % and FEV1% <70%). A good number of subjects (36.5%) had FEV1% values between 70% and 80%. Mean FVC values were significantly lower among the subjects of age 45 years or above.

- So far as chest radiographic findings are concerned, 93% subjects had findings within normal limits. 3% subjects showed findings suggestive of opacities in lung and almost 1.5% had other features on chest X-ray (mostly suggestive of Koch's infection of lung). Such findings may be due to pneumoconiotic changes in lung, hence these subjects should be properly followed up and necessary medical, ethical, legal, administrative actions may be initiated as necessary.



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- Haematological and biochemical findings of the subjects were mostly within normal limits. Almost 11% workers had random blood sugar level more than 140 units. As far as ophthalmological findings are concerned, 5% subjects had uncorrected vision and 9% subjects had Cataract in eyes.

- Decline in hearing ability with increasing duration of exposure was observed more at higher frequency; however, this observation is subject to adjustment for age and other probable factors.

- The subjects for this study are selected from workplaces identified by BCCL, Govt. of India, as required for the purpose of this study. The findings of this study may thus be restricted to the concerned workplaces and may not be generalisable.



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## RECOMMENDATION

- Prevalence of musculoskeletal pain during work in a good number of workers reflects that manual work of the work processes might be causing some discomfort for the workers. Training on proper method of manual material handling may prove useful of these workers. On the other hand regular proper exercise should be promoted among workers especially supervisory employees to get rid of ill effects of sedentary activities.

- Special emphasis should be given to protection of respiratory health, hearing ability. Periodic relevant examination (lung function test, audiometry) at regular interval is recommended.

- Industrial hygiene survey (periodic monitoring of dust and other environmental hazards) at regular interval should be undertaken including noise level monitoring in different operations.

- Some prevalent symptoms observed may be representation of nervous system effect due to exposures to toxicants. In order to exclude the possibility of exposure from occupational environment, environmental study should include assessment of exposure to metals.

- Measures like using protective appliances (e.g. PPEs), pre-placement- and periodic medical examination, for the control and prevention of relevant health hazards, are to be implemented and maintained by all the mining areas to protect the health of the workers.



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# EXECUTIVE SUMMARY



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## BACKGROUND

Although coal remains a major energy resource worldwide, coal mining causes environment problems, whereas the inhaled coal particles at the work place may lead to the development of coal workers' pneumoconiosis (CWP). Typically, coal workers pneumoconiosis takes many years to develop and to be manifested. Further, once initiated the disease is progressive in nature, often leading to lungfunction impairment, disability.
The workers' exposure to coal dust generally occurs during mining operations.
Coal mining can also increase the risk of developing asthma and chronic obstructive pulmonary disease (COPD), such as emphysema and chronic bronchitis. It is suggested that coal mining operations may also induce noise induced hearing impairment among the workers.

A request was received from Bharat Coking Coal Limited, Dhanbad to assess the health status of their workers involved in the mining activities in Cluster 11 and 15 areas around Dhanbad. About 10% of the subjects involved in mining activities were to be included in this study. The workers were to be assessed for their health status, presence of any occupational disease and hearing impairments. Under this circumstance, in consultation of the scientists of National Institute of Occupational Health (NIOH) and the concerned officers of Bharat Coking Coal Limited, it was decided that an epidemiological study would be carried out involving workers involved in mining activities.

## OBJECTIVES

5. To understand health status of workers through questionnaire survey, health examination.
6. To study respiratory health in coal field mining workers.
7. To assess ventilatory functions of coal field mining workers.
8. To analyze hearing ability through audiometric evaluation.



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## METHODOLOGY

An occupational health study was conducted involving different mines of Cluster 11 and 15 of Bharat coking Coal Limited, Dhanbad. This study was undertaken among the exposed workers mainly from active mining activity. Representative sample from workers working in such occupations is included in this study. Initially the aim of the study was explained to the workers, informed consent was obtained after which they were enrolled for this study. Every individual subject was interviewed with a pre-designed questionnaire to collect information in relation to personal, occupational and morbidity details of the workers. The participants of this study were subjected to following interview/examination/investigations:

- Detailed personal, occupational and medical history.
- Clinical examination with special emphasis on examination of respiratory system.
- Haematological examination.
- Lung function test.
- Audiometry.
- Ophthalmological assessment.

***Study design:*** Cross sectional study

***Study subjects:*** This study covered 351 subjects from Kustore sector and 140 subjects from Bagmara sector of BCCL Collieries. Among the subjects of Kustore sector 49 were from Kachi Balihari mines, 51 from Bhagabandh mines, 40 from Gopali Chawk mines and 100 from Munidi mines. PB project mines contributed 111 subjects. Similarly among the subjects of Bagmara sector, Kharkharee mines and Phularitand mines contributed 75 subjects and 65 subjects respectively. Workers actively involved in mining actively were mainly included in this study. However, few subjects of this study were enrolled from supervisory staffs in order to have a complete and comprehensive understanding of the occupational health condition. These workers were randomly selected from the total workforce in the selected clusters and mines.



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***Data collection:*** The information regarding demographic, occupational and clinical history was collected on a pre-designed and pre-tested proforma through interview of subject. This was followed by complete clinical examination, spirometry, audiometry and chest radiography of each subject. The audiometer and spirometer were brought by NIOH team while for chest radiography the facilities at BCCL hospitals were used. The processing of exposed films was done by the technicians at BCCL hospital. The ophthalmological examination and haematological – biochemical estimations were also done using facilities and expertise at BCCL hospitals.

***Data analysis:*** Data entry and analysis were done in standard statistical software. The statistical analysis included calculation of differences, proportions and application of tests of significance etc, to ascertain health effects especially respiratory health conditions.

**RESULTS**

- This study covered 351 subjects from Kustore sector and 140 subjects from Baghmara sector of BCCL Collieries. Mean age of the workers was 45.9 ± 8.36 years. Most of the workers were between 35-54 years age. Mean job experience was 11.72 ± 8.49 years.

- Most common symptoms complained by study subjects were musculoskeletal pain (34%). Other complaints were Cough, difficulty in breathing, chest pain, soreness of mouth etc. Headache, sleep disturbance, weakness, tremor in fingers was also experienced by some subjects.

- About 20% subjects had systolic blood pressure >140 as well as diastolic blood pressure > 90 mm of Mercury. 9% workers had only higher systolic blood pressure and 11% had only higher diastolic blood pressure.



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- As far as pulmonary functional status of study subjects in concerned, about 3% subjects had restrictive type of abnormality (FVC/PFVC < 80%) and 0.6 % subjects had combined type of abnormality (FVC/PFVC <80 % and FEV1% <70%). A good number of subjects (36.5%) had FEV1% values between 70% and 80%. Mean FVC values were significantly lower among the subjects of age 45 years or above.

- So far as chest radiographic findings are concerned, 93% subjects had findings within normal limits. 3% subjects showed findings suggestive of opacities in lung and almost 1.5% had other features on chest X-ray (mostly suggestive of Koch's infection of lung). Such findings may be due to pneumoconiotic changes in lung, hence these subjects should be properly followed up and necessary medical, ethical, legal, administrative actions may be initiated as necessary.

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- The subjects for this study are selected from workplaces identified by BCCL, Govt. of India, as required for the purpose of this study. The findings of this study may thus be restricted to the concerned workplaces and may not be generalisable.



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## RECOMMENDATION

- Prevalence of musculoskeletal pain during work in a good number of workers reflects that manual work of the work processes might be causing some discomfort for the workers. Training on proper method of manual material handling may prove useful of these workers. On the other hand regular proper exercise should be promoted among workers especially supervisory employees to get rid of ill effects of sedentary activities.

- Special emphasis should be given to protection of respiratory health, hearing ability. Periodic relevant examination (lung function test, audiometry) at regular interval is recommended.

- Industrial hygiene survey (periodic monitoring of dust and other environmental hazards) at regular interval should be undertaken including noise level monitoring in different operations.

- Some prevalent symptoms observed may be representation of nervous system effect due to exposures to toxicants. In order to exclude the possibility of exposure from occupational environment, environmental study should include assessment of exposure to metals.

- Measures like using protective appliances (e.g. PPEs), pre-placement- and periodic medical examination, for the control and prevention of relevant health hazards, are to be implemented and maintained by all the mining areas to protect the health of the workers.



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## Certificate of high root density plant for controlling subsidence

This is to certify that BCCL has been doing plantation/ecological restoration under the guidelines of Forest Research Institute. The various species selected for the restoration are having a tap root system with branches which serve the purpose. These species have high root density and are already being planted at all the ecorestoration/plantation sites of BCCL. The various species having tap root system are given below.

| S.No. | Species | Common name |
|---|---|---|
| 1. | *Acacia nilotica* | Kikkar |
| 2. | *Albizia odoratissima* | Kala siris |
| 3. | *Bauhinia variegata* | Kachnar |
| 4. | *Cassia fistula* | Amaltas |
| 5. | *Ficus benghalensis* | Baniyan /bargad |
| 6. | *Ficus racemosa* | Gular |
| 7. | *Ficus religiosa* | Pipal |
| 8. | *Gmelina arborea* | Ghamar |
| 9. | *Lagerstroemea parviflora* | Jarul |
| 10. | *Lannea coromandelica* | Zhingan |
| 11. | *Madhuca latifolia* | Mahua |
| 12. | *Mangifera indica* | Aam |
| 13. | *Morus alba* | Shahtoot |
| 14. | *Phyllanthus emblica* | Aonla |
| 15. | *Pithecellobium dulce* | Jangal jalebi |
| 16. | *Pongamia pinnata* | Karanj |
| 17. | *Tamarindus indica* | Imli |
| 18. | *Trema orientalis* | Tree |
| 19. | *Terminalia arjuna* | Arjun |
| 20. | *Terminalia bellerica* | Bahera |
| 21. | *Dalbergia sissoo* | Shisham |
| 22. | *Syzigium cumini* | Jamun |
| 23. | *Azadirachta indica* | Neem |
| 24. | *Holoptelea integrifolia* | Indian elm |
| 25. | *Butea monosperma* | Palash /dhak |

Scientist / Scientist
वन पारिस्थितिकी एवं जलवायु परिवर्तन प्रभाग
Forest Ecology & Climate Change Division
वन अनुसंधान संस्थान, देहरादून - 248006
Forest Research Institute, Dehradun-248006

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[ ANNEXURE-20

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**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 – XI

**(FOR THE MONTH APRIL, 2025)**

**E. C. no. J-11015/77/2011-IA.II (M) dated 26.07.2019.**

# 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 $23^0$37' N to $23^0$52' N latitudes and $86^0$09' E to $86^0$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 ($PM_{10}$), Fine Particulate Matter ($PM_{2.5}$), Sulphur Di-oxide ($SO_2$) and Nitrogen Oxides ($NO_X$). Respirable Dust Samplers (RDS) and Fine Dust

Sampler ($PM_{2.5}$ sampler) were used for sampling of $PM_{10,}$ $SO_2$, & $NO_x$ 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 $PM_{10,}$ $PM_{2.5}$, $SO_2$ 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 $PM_{10}$& $PM_{2.5}$ 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 Standards for Coal Mines were within permissible limits.

### 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-XI is in the Western & Southern part of the Jharia coalfield. It includes a group of 8 Mines (viz. Gopalichak UG&OC Mine**,** Kachhi Balihari 10/12 Pit UG Mine**,** PB UG Project,Bhagabandh UG Mine, Kenwadih UG, Pootkee UG, Kachi Balihari 5/6Pit UG, Moonidih UG mine). The Cluster – XI is situated about 25 - 30 kms from Dhanbad Railway Station. The mines of this Cluster – XI 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 Jarian nala & Damodar River.

1.2 The Project has Environmental Clearance from Ministry of Environment, Forests and Climate Change (MoEF&CC) for a rated capacity 5.08 MTPA (normative) and 6.604 MTPA (peak) capacity of coal production vide letter no. J-11015/77/2011-IA.II (M) dated 26$^{th}$ July, 2019.

.

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 $PM_{10}$, $PM_{2.5}$, $SO_2$, NOx 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) Pootkee Balihari Office (A16): Industrial Area**

The location of the sampling station is 23°45'17.23"N 86°21'46.27"E. The sampler was placed at an elevated platform approx. 1.5m above ground level at Project 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 sampler was placed at an elevated platform approx. 1.5m above ground level at project office.

**iii) Moonidih Washery (A29): Industrial Area**

The location of the sampling station is 23°44'26.00"N 86°21'16.00"E. The sampler was placed at a height of approx. 1.5m above ground level at Project office.

**II.BUFFER ZONE Monitoring Location**

**I) Kusunda OCP (A10)**

The location of the sampling station is 23°46'49.07"N 86°24'15.71"E. The sampler was placed at a height of approx. 1.5m above ground level at Safety 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** | **04/2025** | **Cluster** | **Cluster XI** | **ULR No.** | **TC1432125000001794F** |
| **Customer** | **Environment Department, Bharat Coking Coal Limited (BCCL), Koyla Bhawan, Dhanbad (E-mail: gmenv.bccl@coalindia.in)** | | | **Date of Issue** | **30.05.2025** |
| **Project** | **Pootkee Balihari Office** | **Sample Ref. No.** | **REM/BCCL/2025/04** | **Sampling Method** | **CMPDI/RI-II/LPM 13 , ( IS 5182)** |
| **Date of Sampling** | 03.04.25 | 18.04.25 | **Period of Analysis** | 03.04.25 to 25.05.25 | **Zone of Station:** **Core Zone** |

| **Sl. No.** | **Parameter** | **Method of Analysis** | **Observed Values ( in µg/m³)** | | **Range Of Testing** | **LDL** | **MoEF Standards Notification dated 25th September,2000 (GSR 742 E )** | **NAAQS, 2009** |
|---|---|---|---|---|---|---|---|---|
| | | | **1st FN A3710** | **2nd FN A3790** | | | | |
| 1 | $PM_{10}$ | IS -5182(Part 23):2006, R-2017 | 105 | 103 | 10 µg/m³ - 1000 µg/m³ | 10 µg/m³ | 300 | 100 |
| 2 | $PM_{2.5}$ | IS -5182(Part 24):2019 | 59 | 60 | 10 µg/m³ - 400 µg/m³ | 10 µg/m³ | Not Specified | 60 |
| 3 | $SO_2$ | IS-5182(Part-2): 2001 , R-2017 | 11 | 10 | 10 µg/m³ - 1050 µg/m³ | 10 µg/m³ | 120 | 80 |
| 4 | $NO_2$ | IS-5182 (Part-6): 2006 , R-2017 | 33 | 31 | 06 µg/m³ - 420 µg/m³ | 06 µg/m³ | 120 | 80 |

** LDL indicates Lower Detection Limit,*

***All units are in µg/m3, 24 hourly Average,*

***ANALYSED BY*** (Gaurav Kant) ***CHECKED BY*** (Amit Raj Mishra) ***Authorised Signatory***

***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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Environment Laboratory, Regional Institute-II
Ambient Air Quality Test Report

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

TC-14321

**Test Report for Ambient Air Samples**

| | | | | | |
|---|---|---|---|---|---|
| **Month & Year** | **04/2025** | **Cluster** | **Cluster XI** | **ULR No.** | **TC1432125000001794F** |
| **Customer** | **Environment Department, Bharat Coking Coal Limited (BCCL), Koyla Bhawan, Dhanbad (E-mail: gmenv.bccl@coalindia.in)** | | | **Date of Issue** | **30.05.2025** |
| **Project** | **Moonidih UGP** | **Sample Ref. No.** | **REM/BCCL/2025/04** | **Sampling Method** | **CMPDI/RI-II/LPM 13 , ( IS 5182)** |
| **Date of Sampling** | 04.04.25 | 28.04.25 | **Period of Analysis** | 04.04.25 to 25.05.25 | **Zone of Station:** **Core Zone** |

| **Sl. No.** | **Parameter** | **Method of Analysis** | **Observed Values ( in µg/m³)** | | **Range Of Testing** | **LDL** | **MoEF Standards Notification dated 25th September,2000 (GSR 742 E )** | **NAAQS, 2009** |
|---|---|---|---|---|---|---|---|---|
| | | | **1st FN A3715** | **2nd FN A3837** | | | | |
| 1 | $PM_{10}$ | IS -5182(Part 23):2006, R-2017 | 99 | 105 | 10 µg/m³ - 1000 µg/m³ | 10 µg/m³ | 300 | 100 |
| 2 | $PM_{2.5}$ | IS -5182(Part 24):2019 | 56 | 60 | 10 µg/m³ - 400 µg/m³ | 10 µg/m³ | Not Specified | 60 |
| 3 | $SO_2$ | IS-5182(Part-2): 2001 , R-2017 | <10 | <10 | 10 µg/m³ - 1050 µg/m³ | 10 µg/m³ | 120 | 80 |
| 4 | $NO_2$ | IS-5182 (Part-6): 2006 , R-2017 | 32 | 30 | 06 µg/m³ - 420 µg/m³ | 06 µg/m³ | 120 | 80 |

** LDL indicates Lower Detection Limit,*

***All units are in µg/m3, 24 hourly Average,*

***ANALYSED BY***

(Gaurav Kant)
***CHECKED BY***

(Amit Raj Mishra)
***Authorised Signatory***

***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*

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Environment Laboratory, Regional Institute-II
Ambient Air Quality Test Report

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**Test Report for Ambient Air Samples**

| | | | | | |
|---|---|---|---|---|---|
| **Month & Year** | **04/2025** | **Cluster** | **Cluster XI** | **ULR No.** | **TC1432125000001794F** |
| **Customer** | **Environment Department, Bharat Coking Coal Limited (BCCL), Koyla Bhawan, Dhanbad (E-mail: gmenv.bccl@coalindia.in)** | | | **Date of Issue** | **30.05.2025** |
| **Project** | **Moonidih Washery** | **Sample Ref. No.** | **REM/BCCL/2025/04** | **Sampling Method** | **CMPDI/RI-II/LPM 13 , ( IS 5182)** |
| **Date of Sampling** | 04.04.25 | 28.04.25 | **Period of Analysis** | 04.04.25 to 25.05.25 | **Zone of Station:** **Core Zone** |

| **Sl. No.** | **Parameter** | **Method of Analysis** | **Observed Values ( in µg/m³)** 1st FN A3714 | 2nd FN A3836 | **Range Of Testing** | **LDL** | **MoEF Standards Notification dated 25th September,2000 (GSR 742 E )** | **NAAQS, 2009** |
|---|---|---|---|---|---|---|---|---|
| 1 | $PM_{10}$ | IS -5182(Part 23):2006, R-2017 | 122 | 112 | 10 µg/m³ - 1000 µg/m³ | 10 µg/m³ | 300 | 100 |
| 2 | $PM_{2.5}$ | IS -5182(Part 24):2019 | 61 | 53 | 10 µg/m³ - 400 µg/m³ | 10 µg/m³ | Not Specified | 60 |
| 3 | $SO_2$ | IS-5182(Part-2): 2001 , R-2017 | <10 | <10 | 10 µg/m³ - 1050 µg/m³ | 10 µg/m³ | 120 | 80 |
| 4 | $NO_2$ | IS-5182 (Part-6): 2006 , R-2017 | 30 | 28 | 06 µg/m³ - 420 µg/m³ | 06 µg/m³ | 120 | 80 |

** LDL indicates Lower Detection Limit,*

***All units are in µg/m3, 24 hourly Average,*

***ANALYSED BY*** (Gaurav Kant) ***CHECKED BY*** (Amit Raj Mishra) ***Authorised Signatory***

***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

TC-14321

**Test Report for Ambient Air Samples**

| | | | | | |
|---|---|---|---|---|---|
| **Month & Year** | **04/2025** | **Cluster** | **Cluster XI** | **Report No.** | TC1432125000001794F |
| **Customer** | **Environment Department, Bharat Coking Coal Limited (BCCL), Koyla Bhawan, Dhanbad (E-mail: gmenv.bccl@coalindia.in)** | | | **Date of Issue** | **30.05.2025** |
| **Project** | **Kusunda** | **Sample Ref. No.** | **REM/BCCL/2025/04** | **Sampling Method** | **CMPDI/RI-II/LPM 13 , ( IS 5182)** |
| **Date of Sampling** | 15.04.25 | 26.04.25 | **Period of Analysis** | 15.04.25 to 25.05.25 | **Zone of Station:** **Buffer Zone** |

| **Sl. No.** | **Parameter** | **Method of Analysis** | **Observed Values ( in µg/m³)** | | **Range Of Testing** | **LDL** | **MoEF Standards Notification dated 25th September,2000 (GSR 742 E )** | **NAAQS, 2009** |
|---|---|---|---|---|---|---|---|---|
| | | | **1st FN A3769** | **2nd FN A3830** | | | | |
| 1 | $PM_{10}$ | IS -5182(Part 23):2006, R-2017 | 102 | 118 | 10 µg/m³ - 1000 µg/m³ | 10 µg/m³ | 300 | 100 |
| 2 | $PM_{2.5}$ | IS -5182(Part 24):2019 | 58 | 67 | 10 µg/m³ - 400 µg/m³ | 10 µg/m³ | Not Specified | 60 |
| 3 | $SO_2$ | IS-5182(Part-2): 2001 , R-2017 | 12 | 11 | 10 µg/m³ - 1050 µg/m³ | 10 µg/m³ | 120 | 80 |
| 4 | $NO_2$ | IS-5182 (Part-6): 2006 , R-2017 | 33 | 27 | 06 µg/m³ - 420 µg/m³ | 06 µg/m³ | 120 | 80 |

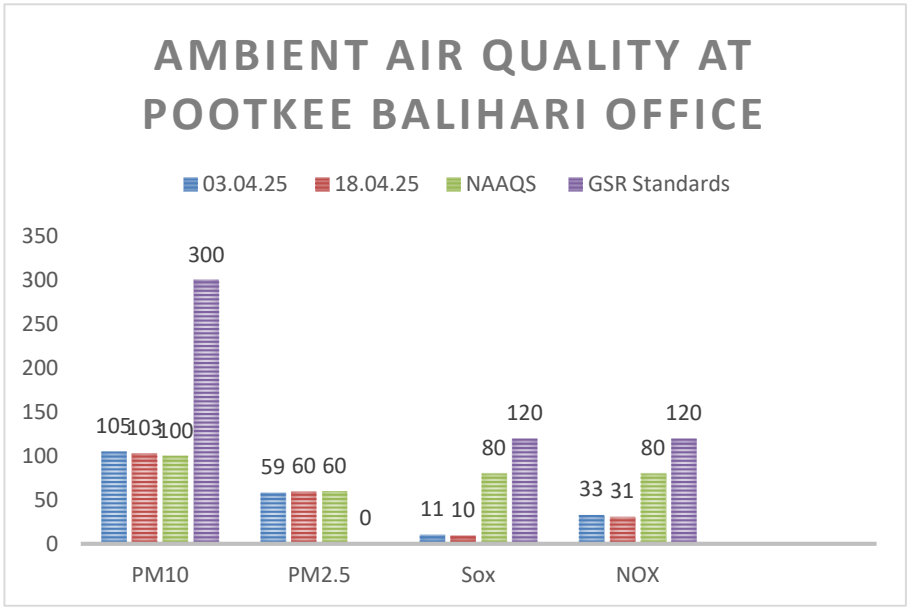
** LDL indicates Lower Detection Limit,*
***All units are in µg/m3, 24 hourly Average,*

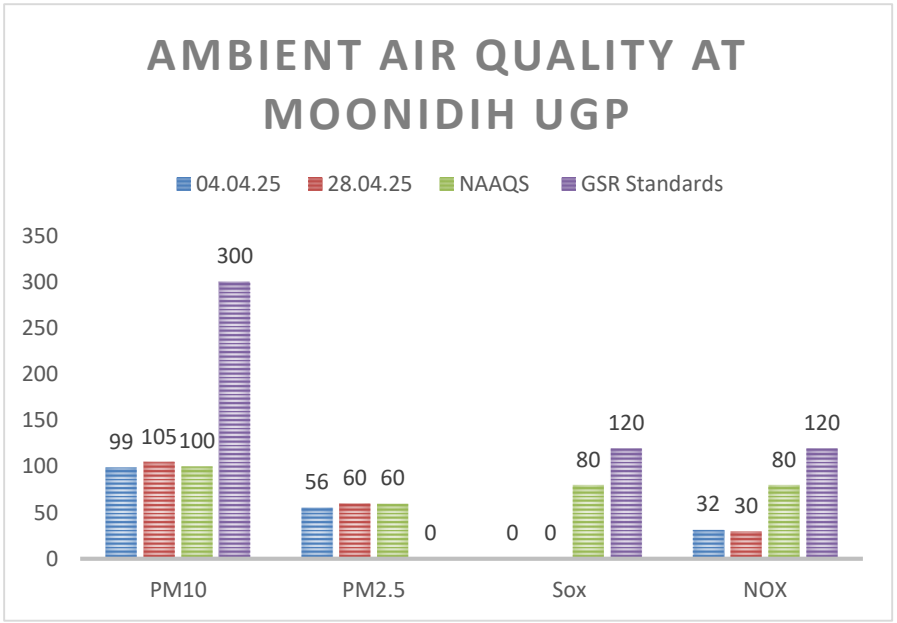
***ANALYSED BY*** (Gaurav Kant) ***CHECKED BY*** (Amit Raj Mishra) ***Authorised Signatory***

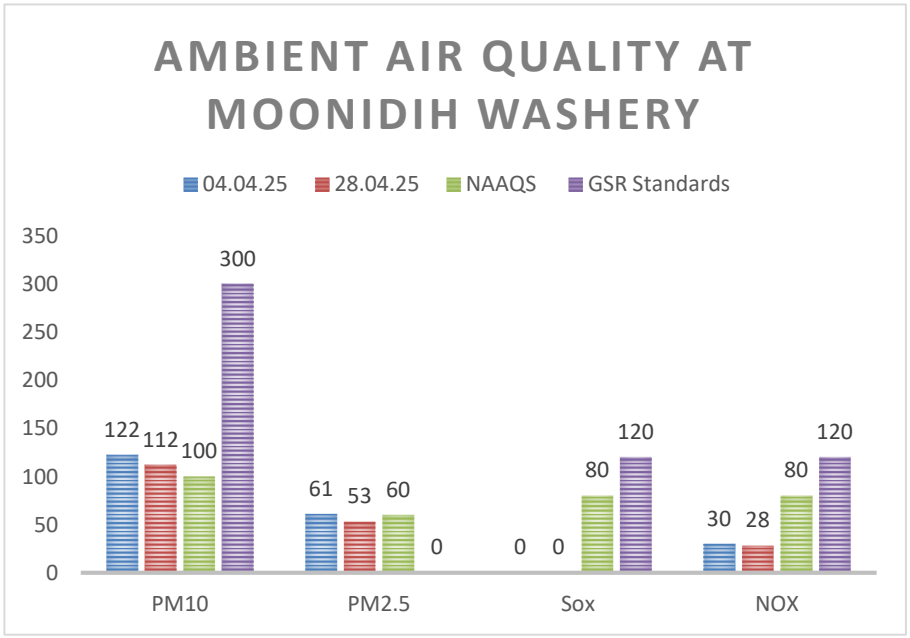
***Note**: The results above relate to the samples tested as received. This report can not be reproduced in part or full without the written permission of the HOD(Env) , CMPDI, RI-II.*

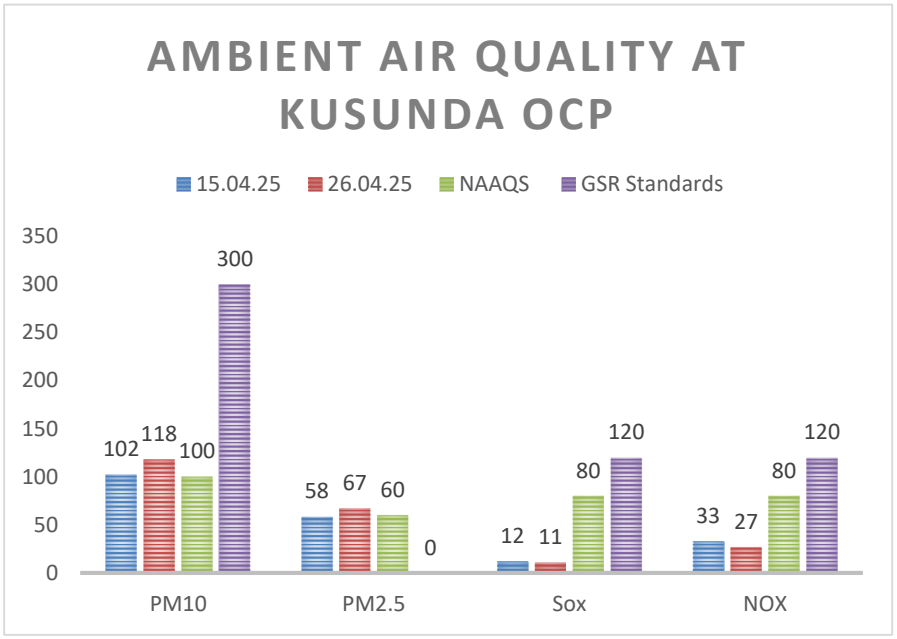
*---- End of Report ----*

*Page -1 of 1*


AMBIENT AIR QUALITY AT POOTKEE BALIHARI OFFICE
03.04.25
18.04.25
NAAQS
GSR Standards
350
300
250
200
150
100
50
0
105 103 100 300
59 60 60 0
11 10 80 120
33 31 80 120
PM10
PM2.5
Sox
NOX


AMBIENT AIR QUALITY AT MOONIDIH UGP
04.04.25
28.04.25
NAAQS
GSR Standards
350
300
250
200
150
100
50
0
99 105 100 300
56 60 60 0
0 0 80 120
32 30 80 120
PM10
PM2.5
Sox
NOX


AMBIENT AIR QUALITY AT MOONIDIH WASHERY
04.04.25
28.04.25
NAAQS
GSR Standards
350
300
250
200
150
100
50
0
122 112 100 300
61 53 60 0
0 0 80 120
30 28 80 120
PM10
PM2.5
Sox
NOX


AMBIENT AIR QUALITY AT KUSUNDA OCP
15.04.25
26.04.25
NAAQS
GSR Standards
350
300
250
200
150
100
50
0
102 118 100 300
58 67 60 0
12 11 80 120
33 27 80 120
PM10
PM2.5
Sox
NOX

# WATER QUALITY MONITORING

## 3.1 Location of sampling sites

(Refer **Plate No. – II**)

### i) Mine Discharge of Bhagabandh (MW11)

A sampling point is fixed to assess the effluent quality of Mine discharge. This location is selected to monitor effluent discharge in to Kari jore.

## 3.2 Methodology of sampling and analysis

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

## 3.3 Results & Interpretations

The results are given in tabular form along with the applicable standards. Results are compared with Schedule - VI, effluent prescribed by MoEF&CC. Results show that most of the parameters are within the permissible limits.

TC-14321

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

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

**Test Report for Mine Effluent samples**

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| **Month & Year** | **04/2025** | **Cluster** | **Cluster XI** | **ULR No.** | | TC1432125000001812F | |
| **Customer** | **Environment Department, Bharat Coking Coal Limited (BCCL), Koyla Bhawan, Dhanbad (E-mail: gmenv.bccl@coalindia.in)** | | | | | **Date of Issue** | **30.05.2025** |
| **Project** | | **Sampling Ref. No.** | **REM/BCCL/2025/ 04** | **Sampling Method** | **IS 3025 (Part-1)** | | **CMPDI/RI-II/LPM 13** |
| **Sampling Stations** | **(i)** | **Bhagabandh** | **Sample Collected in 2.5 Ltr Jerricane , Color as observed is transparent** | | | **Period of Analysis** | **01.04.25 TO 30.04.25** |
| | | | **Date of Sampling** | 01.04.25 | 28.04.2025 | | |

| **Sl. No.** | **Parameter** | **Method of Analysis** | **Observed Values** | | **STANDARDS FOR COAL MINES (Stipulated by Ministry of Environment and Forests (MoEF), Vide Notification No. GSR 742(E), Dt: 25.09.2000)** | **LDL** |
|---|---|---|---|---|---|---|
| | | | **M1447** | **M1484** | | |
| 1 | Total Suspended Solids | IS 3025/17:1984, R :2017, Gravimetric | 34 | 32 | *100 (Max)* | 10 |
| 2 | pH | IS-3025/11:1983, R-2017, Electrometric | 7.64 | 7.62 | *5.5 - 9.0* | 0.2 |
| 3 | Oil & Grease | IS 3025/39:1991, R : 2019, Partition Gravimetric | <4.0 | <4.0 | *10 (Max)* | 2 |
| 4 | COD | APHA 23rd Edition 5220 C Titrimetric Method | 32 | 36 | *250 (Max)* | 4 |

***Grab sampling carried out for water samples **All units in mg/L unless specified otherwise *LDL indicates Lower Detection Limit & BDL indicates Below Detection Limit,*

***ANALYSED BY***

(Kumar Vaibhav)
***CHECKED BY***

(Amit Raj Mishra)
***Authorised Signatory***

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

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

# NOISE LEVEL QUALITY MONITORING

## 4.1Location of sampling sites

1. **Pootkee Balihari Office (N16)**
2. **Moonidih UGP (N17)**
3. **Moonidih Washery (N29)**
4. **Kusunda OCP (N10)**

**4.2**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

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

TC-14321

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| **Month & Year** | **04/2025** | **Cluster** | **Cluster XI** | | | **ULR No.** | **TC1432125000001828F** |
| **Customer** | **Environment Department, Bharat Coking Coal Limited (BCCL), Koyla Bhawan, Dhanbad (E-mail: gmenv.bccl@coalindia.in)** | | | | | **Date of Issue** | **30.05.2025** |
| **Project** | | **Sample Ref. No.** | **REM/BCCL/2025/ 04** | | **Sampling Method** | **CMPDI/RI-II/LPM 22** | |
| **Sampling Stations** | **i** | **Pootki Balihari Office** | **Date of Sampling** | 03.04.25 | 18.04.25 | **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 | 49.7 | 50.8 | CPCB, Protocol for Ambient Level Noise Monitoring -2015 | 35 dB-135 dB | 35 Db (A) | Industrial<br>Commercial<br>Residential<br>Silence | 75<br>65<br>55<br>50 |
| 2 | | 07:00 - 08:00 | 52.9 | 53.5 | | | | | |
| 3 | | 08:00 - 09:00 | 55.4 | 56.1 | | | | | |
| 4 | | 09:00 – 10:00 | 61.6 | 62.2 | | | | | |
| 5 | | 10:00 - 11:00 | 63.1 | 63.9 | | | | | |
| 6 | | 11:00 - 12:00 | 58.4 | 59.1 | | | | | |
| 7 | | 12:00 - 13:00 | 56.9 | 56.2 | | | | | |
| 8 | | 13:00 - 14:00 | 54.3 | 54 | | | | | |
| 9 | | 14:00 - 15:00 | 53.2 | 51 | | | | | |
| 10 | | 15:00 - 16:00 | 50.4 | 50.7 | | | | | |
| 11 | | 16:00 - 17:00 | 49.7 | 49.2 | | | | | |
| 12 | | 17:00 - 18:00 | 49.3 | 50 | | | | | |
| 13 | | 18:00 - 19:00 | 49.3 | 49.8 | | | | | |
| 14 | | 19:00 - 20:00 | 47.6 | 48.9 | | | | | |
| 15 | | 20:00 - 21:00 | 47.5 | 47.7 | | | | | |
| 16 | | 21:00 - 22:00 | 47.4 | 47 | | | | | |
| | | Leq Day | 56.0 | 56.4 | | | | | |
| 1 | Noise Level dB(A)Leq -Night | 22:00-23:00 | 49.7 | 49.9 | CPCB, Protocol for Ambient Level Noise Monitoring -2015 | 35 dB-135 dB | 35 dB (A) | Industrial<br>Commercial<br>Residential<br>Silence | 70<br>55<br>45<br>50 |
| 2 | | 23:00- 00:00 | 48.9 | 49.2 | | | | | |
| 3 | | 00:00- 01:00 | 47.8 | 48.8 | | | | | |
| 4 | | 01.00-02.00 | 47.7 | 48.5 | | | | | |
| 5 | | 02.00-03.00 | 47.1 | 47.3 | | | | | |
| 6 | | 03.00-04.00 | 46.9 | 46.8 | | | | | |
| 7 | | 04.00-05.00 | 47.8 | 47.9 | | | | | |
| 8 | | 05:00-06:00 | 48.3 | 48.1 | | | | | |
| | | Leq Night | 48.1 | 48.4 | | | | | |

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

| | | | |
|---|---|---|---|
| Sampling Assistants | (Gaurav Kant) | | (Amit Raj Mishra) |
| ANALYSED BY | CHECKED BY | | Authorised Signatory |

Note: The results above relate to the samples tested as received. This report cannot 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
CMPDIL, RI-II
KOYLA BHAWAN OMPLEX
DHANBAD. -826005
Phone:0326-223-850
email:i2cmpdi@coalindia.in

# Ambient Noise Level Test Report

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| **Month & Year** | **04/2025** | **Cluster** | **Cluster XI** | | | **ULR No.** | **TC1432125000001828F** |
| **Customer** | **Environment Department, Bharat Coking Coal Limited (BCCL), Koyla Bhawan, Dhanbad (E-mail: gmenv.bccl@coalindia.in)** | | | | | **Date of Issue** | **30.05.2025** |
| **Project** | | **Sample Ref. No.** | **REM/BCCL/2025/04** | **Sampling Method** | | **CMPDI/RI-II/LPM 22** | |
| **Sampling Stations** | **i** | **Moonidih UGP** | **Date of Sampling** | 04.04.25 | 28.04.25 | **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 | 49.5 | 50.2 | CPCB, Protocol for Ambient Level Noise Monitoring -2015 | 35 dB-135 dB | 35 dB(A) | Industrial<br>Commercial<br>Residential<br>Silence | 75<br>65<br>55<br>50 |
| 2 | | 07:00 - 08:00 | 45.1 | 46.1 | | | | | |
| 3 | | 08:00 - 09:00 | 52.6 | 54.2 | | | | | |
| 4 | | 09:00 – 10:00 | 50.7 | 48.3 | | | | | |
| 5 | | 10:00 - 11:00 | 53.7 | 52.7 | | | | | |
| 6 | | 11:00 - 12:00 | 56 | 57.8 | | | | | |
| 7 | | 12:00 - 13:00 | 55.2 | 54.9 | | | | | |
| 8 | | 13:00 - 14:00 | 56.9 | 55.8 | | | | | |
| 9 | | 14:00 - 15:00 | 53.1 | 52.7 | | | | | |
| 10 | | 15:00 - 16:00 | 51.4 | 50.7 | | | | | |
| 11 | | 16:00 - 17:00 | 50.9 | 51.1 | | | | | |
| 12 | | 17:00 - 18:00 | 50.6 | 51.1 | | | | | |
| 13 | | 18:00 - 19:00 | 49.8 | 50.2 | | | | | |
| 14 | | 19:00 - 20:00 | 50.4 | 50 | | | | | |
| 15 | | 20:00 - 21:00 | 48.9 | 48.8 | | | | | |
| 16 | | 21:00 - 22:00 | 48.4 | 48.7 | | | | | |
| | | **Leq Day** | 52.4 | 52.5 | | | | | |
| 1 | Noise Level dB(A)Leq -Night | 22:00-23:00 | 48.2 | 48.2 | CPCB, Protocol for Ambient Level Noise Monitoring -2015 | 35 dB-135 dB | 35 dB(A) | Industrial<br>Commercial<br>Residential<br>Silence | 70<br>55<br>45<br>50 |
| 2 | | 23:00- 00:00 | 47.6 | 47.8 | | | | | |
| 3 | | 00:00- 01:00 | 46.8 | 47.8 | | | | | |
| 4 | | 01.00-02.00 | 45.8 | 46.5 | | | | | |
| 5 | | 02.00-03.00 | 45.6 | 45.7 | | | | | |
| 6 | | 03.00-04.00 | 45.6 | 45.8 | | | | | |
| 7 | | 04.00-05.00 | 47.2 | 47.3 | | | | | |
| 8 | | 05:00-06:00 | 47.6 | 47.8 | | | | | |
| | | **Leq Night** | 46.9 | 47.2 | | | | | |

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

| | | | |
|---|---|---|---|
| Sampling Assistants | (Gaurav Kant) | | (Amit Raj Mishra) |
| ***ANALYSED BY*** | ***CHECKED BY*** | | ***Authorised Signatory*** |

*Note: The results above relate to the samples tested as received. This report cannot 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*

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

TC-14321

cmpdi A Mini Ratna Company

# CENTRAL MINE PLANNING AND DESIGN INSTITUTE LIMITED

## Environment Laboratory, Regional Institute-II

## Ambient Noise Level Test Report

| | | | | | |
|---|---|---|---|---|---|
| **Month & Year** | **04/2025** | **Cluster** | **Cluster XI** | **ULR No.** | **TC1432125000001828F** |
| **Customer** | **Environment Department, Bharat Coking Coal Limited (BCCL), Koyla Bhawan, Dhanbad (E-mail: gmenv.bccl@coalindia.in)** | | | **Date of Issue** | **30.05.2025** |
| **Project** | | **Sample Ref. No.** | **REM/BCCL/2025/04** | **Sampling Method** | **CMPDI/RI-II/LPM 22** |
| **Sampling Stations** | **i** | **Moonidih Washery** | **Date of Sampling** | 04.04.25 – 28.04.25 | **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 | 48.4 | 48.7 | CPCB, Protocol for Ambient Level Noise Monitoring -2015 | 35 dB-135 dB | 35 dB(A) | Industrial<br>Commercial<br>Residential<br>Silence | 75<br>65<br>55<br>50 |
| 2 | | 07:00 - 08:00 | 50.7 | 51.1 | | | | | |
| 3 | | 08:00 - 09:00 | 54.5 | 53.9 | | | | | |
| 4 | | 09:00 – 10:00 | 57.9 | 58 | | | | | |
| 5 | | 10:00 - 11:00 | 60.1 | 60.1 | | | | | |
| 6 | | 11:00 - 12:00 | 61.1 | 58.8 | | | | | |
| 7 | | 12:00 - 13:00 | 62.8 | 64.5 | | | | | |
| 8 | | 13:00 - 14:00 | 62.2 | 62.2 | | | | | |
| 9 | | 14:00 - 15:00 | 57.3 | 58 | | | | | |
| 10 | | 15:00 - 16:00 | 58 | 57 | | | | | |
| 11 | | 16:00 - 17:00 | 56.3 | 55.4 | | | | | |
| 12 | | 17:00 - 18:00 | 55.2 | 54.5 | | | | | |
| 13 | | 18:00 - 19:00 | 53.7 | 53.6 | | | | | |
| 14 | | 19:00 - 20:00 | 52.6 | 53.2 | | | | | |
| 15 | | 20:00 - 21:00 | 51.7 | 50 | | | | | |
| 16 | | 21:00 - 22:00 | 49.5 | 50.2 | | | | | |
| | | | 57.8 | 57.8 | | | | | |
| 1 | Noise Level dB(A)Leq -Night | 22:00-23:00 | 51.9 | 52.6 | CPCB, Protocol for Ambient Level Noise Monitoring -2015 | 35 dB-135 dB | 35 dB(A) | Industrial<br>Commercial<br>Residential<br>Silence | 70<br>55<br>45<br>50 |
| 2 | | 23:00- 00:00 | 50.6 | 49.9 | | | | | |
| 3 | | 00:00- 01:00 | 46.1 | 46 | | | | | |
| 4 | | 01.00-02.00 | 45.8 | 45.8 | | | | | |
| 5 | | 02.00-03.00 | 45.5 | 44.5 | | | | | |
| 6 | | 03.00-04.00 | 45 | 45.7 | | | | | |
| 7 | | 04.00-05.00 | 47.2 | 47.6 | | | | | |
| 8 | | 05:00-06:00 | 47.6 | 47.8 | | | | | |
| | | **Leq Night** | 48.2 | 48.3 | | | | | |

***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) | | | (Amit Raj Mishra) |
| | ***ANALYSED BY*** | | ***CHECKED BY*** | | ***Authorised Signatory*** |

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

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

*Page -1 of 1*

CMPDIL, RI-II
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TC-14321

# CENTRAL MINE PLANNING AND DESIGN INSTITUTE LIMITED

## Environment Laboratory, Regional Institute-II

## Ambient Noise Level Test Report

| | | | | | |
|---|---|---|---|---|---|
| **Month & Year** | **04/2025** | **Cluster** | **Cluster XI** | **ULR No.** | **TC1432125000001828F** |
| **Customer** | **Environment Department, Bharat Coking Coal Limited (BCCL), Koyla Bhawan, Dhanbad (E-mail: gmenv.bccl@coalindia.in)** | | | **Date of Issue** | **30.05.2025** |
| **Project** | | **Sample Ref. No.** | **REM/BCCL/2025/ 04** | **Sampling Method** | **CMPDI/RI-II/LPM 22** |
| **Sampling Stations** | **i** | **Kusunda OCP** | **Date of Sampling** | 15.04.25 – 26.04.25 | **Zone Category of Station: Bufferr 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 | 48.4 | 48.8 | CPCB, Protocol for Ambient Level Noise Monitoring -2015 | 35 dB-135 dB | 35 dB(A) | Industrial<br>Commercial<br>Residential<br>Silence | 75<br>65<br>55<br>50 |
| 2 | | 07:00 - 08:00 | 51.7 | 51.1 | | | | | |
| 3 | | 08:00 - 09:00 | 54.9 | 51 | | | | | |
| 4 | | 09:00 – 10:00 | 60.1 | 58.3 | | | | | |
| 5 | | 10:00 - 11:00 | 62.2 | 61 | | | | | |
| 6 | | 11:00 - 12:00 | 60.9 | 59.5 | | | | | |
| 7 | | 12:00 - 13:00 | 63.8 | 62.3 | | | | | |
| 8 | | 13:00 - 14:00 | 65.3 | 63 | | | | | |
| 9 | | 14:00 - 15:00 | 65.3 | 58.2 | | | | | |
| 10 | | 15:00 - 16:00 | 57.8 | 56 | | | | | |
| 11 | | 16:00 - 17:00 | 58 | 64.8 | | | | | |
| 12 | | 17:00 - 18:00 | 57.5 | 56.2 | | | | | |
| 13 | | 18:00 - 19:00 | 55.9 | 55.4 | | | | | |
| 14 | | 19:00 - 20:00 | 56.1 | 54.5 | | | | | |
| 15 | | 20:00 - 21:00 | 54.7 | 53.7 | | | | | |
| 16 | | 21:00 - 22:00 | 55.1 | 53.8 | | | | | |
| | | **Leq Day** | 60.2 | 58.9 | | | | | |
| 1 | Noise Level dB(A)Leq -Night | 22:00-23:00 | 57 | 41.9 | CPCB, Protocol for Ambient Level Noise Monitoring -2015 | 35 dB-135 dB | 35 dB(A) | Industrial<br>Commercial<br>Residential<br>Silence | 70<br>55<br>45<br>50 |
| 2 | | 23:00- 00:00 | 56.1 | 41.9 | | | | | |
| 3 | | 00:00- 01:00 | 54.9 | 41.4 | | | | | |
| 4 | | 01.00-02.00 | 50.7 | 41.3 | | | | | |
| 5 | | 02.00-03.00 | 48.9 | 40.8 | | | | | |
| 6 | | 03.00-04.00 | 47.9 | 40.3 | | | | | |
| 7 | | 04.00-05.00 | 46.6 | 40 | | | | | |
| 8 | | 05:00-06:00 | 48.4 | 39.8 | | | | | |
| | | Leq Night | 53.0 | 41.0 | | | | | |

***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) | | | (Amit Raj Mishra) |
| | ***ANALYSED BY*** | | ***CHECKED BY*** | | ***Authorised Signatory*** |

*Note: The results above relate to the samples tested as received. This report cannot 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**<br><br>Coal mines located in the coal fields of<br>• Jharia<br>• Raniganj<br>• Bokaro | Suspended Particulate Matter (SPM) | Annual Average *<br>24 hours ** | 500 µg/$m^3$<br><br>700 µg/$m^3$ | - High Volume Sampling (Average flow rate not less than 1.1 |
| | Respirable Particulate Matter (size less than 10 µm) (RPM) | Annual Average *<br>24 hours ** | 250 µg/$m^3$<br><br>300 µg/$m^3$ | Respirable Particulate Matter sampling and analysis |
| | Sulphur Dioxide ($SO_2$) | Annual Average *<br>24 hours ** | 80 µg/$m^3$<br><br>120 µg/$m^3$ | 1.Improvedwest and Gaeke method<br>2.Ultraviolet fluorescene |
| | Oxide of Nitrogen as $NO_2$ | Annual Average *<br>24 hours ** | 80 µg/$m^3$<br><br>120 µg/$m^3$ | 1. Jacob & Hochheiser Modified (Na-Arsenic) Method<br>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.

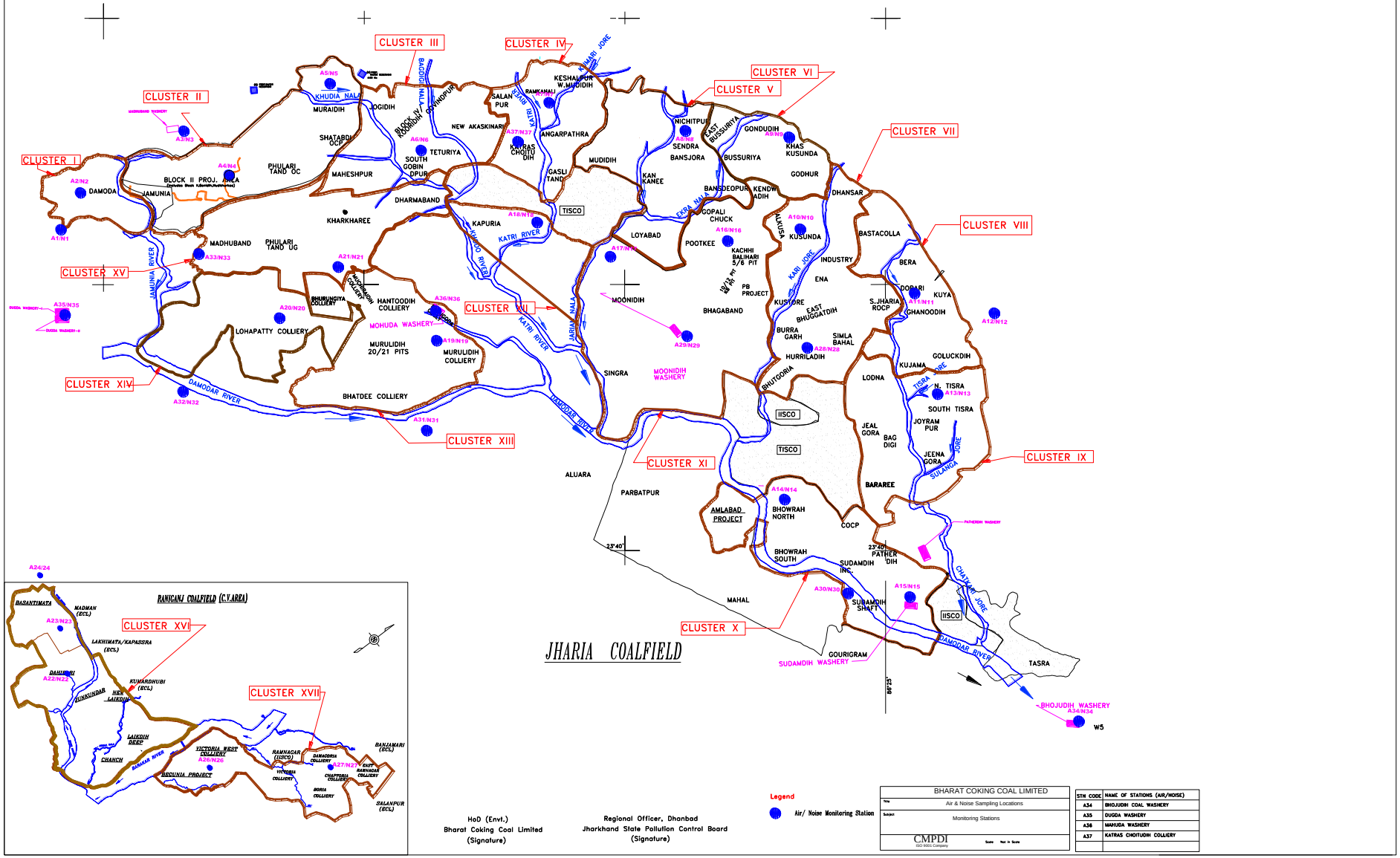
| Pollutant | Time Weighted Average | Concentration in Ambient Air | | Methods of Measurement |
|---|---|---|---|---|
| | | Industrial, Residential, Rural and other Areas | Ecologically Sensitive Area (Notified by Central Government) | |
| **Sulphur Dioxide ($SO_2$), µg/m³** | Annual *<br>24 Hours ** | 50<br>80 | 20<br>80 | -Improved West and Gaeke Method<br>-Ultraviolet Fluorescence |
| **Nitrogendioxide ($NO_2$), µg/m³** | Annual *<br>24 Hours ** | 40<br>80 | 30<br>80 | -Jacob &Hochheiser modified ($NaOH$-$NaAsO_2$) Method<br>-Gas Phase Chemiluminescence |
| **Particulate Matter (Size less than 10µm) or $PM_{10}$, µg/m³** | Annual *<br>24 Hours ** | 60<br>100 | 60<br>100 | -Gravimetric<br>-TEOM<br>-Beta attenuation |
| **Particulate Matter (Size less than 2.5µm) or $PM_{2.5}$, µg/m³** | Annual *<br>24 Hours ** | 40<br>60 | 40<br>60 | -Gravimetric<br>-TEOM<br>-Beta attenuation |
| **Ozone ($O_3$) , µg/m³** | 8 Hours *<br>1 Hour ** | 100<br>180 | 100<br>180 | -UV Photometric<br>-Chemiluminescence<br>-Chemical Method |
| **Lead (Pb) , µg/m³** | Annual *<br>24 Hours ** | 0.50<br>1.0 | 0.50<br>1.0 | -AAS/ICP Method after sampling on EPM 2000 or equivalent filter paper<br>-ED-XRF using Teflon filter |
| **Carbon Monoxide (CO), mg/m³** | 8 Hours **<br>1 Hour ** | 02<br>04 | 02<br>04 | -Non dispersive Infrared (NDIR) Spectroscopy |
| **Ammonia ($NH_3$), µg/m³** | Annual *<br>24 Hours ** | 100<br>400 | 100<br>400 | -Chemiluminescence<br>-Indophenol blue method |
| **Benzene ($C_6H_6$), µg/m³** | Annual * | 05 | 05 | -Gas Chromatography (GC) based continuous analyzer<br>-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.

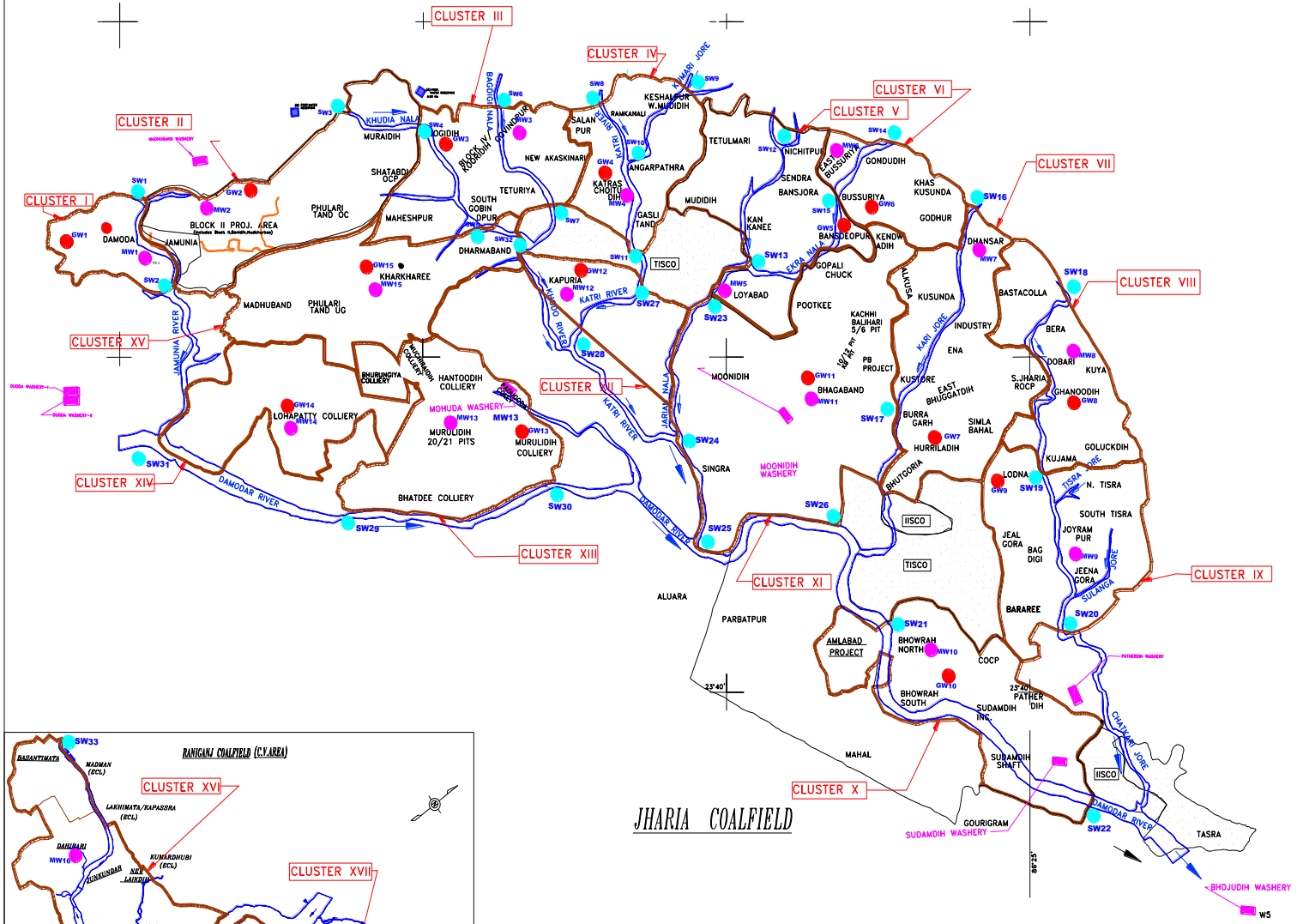
** 24 hourly or 8 hourly or 1 hourly monitored values, as applicable, shall be complied with 98% of the time in a year. 2% of the time, they JUNE exceed the limits but not on two consecutive days of monitoring.

**NOTE:**Whenever and wherever monitoring results on two consecutive days of monitoring exceed the limits specified above for the respective catego

# Location of Air & Noise Monitoring Stations in BCCL



# Water Sampling Locations in BCCL




## INDEX

| Cluster | Suface Water (U/S, D/S) | Name of River/ Nala / Jore | Mine/ Effluent Water | Sampling Location | Ground Water | Sampling Location |
|---|---|---|---|---|---|---|
| I | SW1, SW2 | Jamunia River | MW1 | Damoda Area | GW1 | Ghutway Village |
| II | SW3, SW4 | Khudia Nala | MW2 | Block II OCP | GW2 | Joyrampur Village |
| III | SW4, SW5, SW6, SW7 | Khudia Nala, Bagdigi Nala | MW3 | Govindpur Colliery | GW3 | Jogidih Village |
| IV | SW8, SW11, SW9, SW10 | Katri River, Kumari Jore | MW4 | Chotudih | GW4 | Kankanee Village |
| V | SW12, SW13, SW15 | Jarian Nala, Ekra Nala | MW5 | Mudidih | GW5 | Nichitpur |
| VI | SW14, SW15 | Ekra Nala | MW6 | East Bassuria UGP | GW6 | Bansjora Borewell |
| VII | SW16, SW17 | Kari Jore | MW7 | Dhansar UGP | GW7 | Hurriladih |
| VIII | SW18, SW19 | Kashi Jore | MW8 | Dobari UGP | GW8 | Ghanudih |
| IX | SW19, SW20 | Kashi Jore | MW9 | Jeenagora | GW9 | Lodna |
| X | SW21, SW22 | Damodar River | MW10 | Bhowrah North | GW10 | Bhowrah South |
| XI | SW23, SW24, SW25, SW26 | Jarian Nala, Damodar River | MW11 | Bhagaband h UGP | GW11 | Bhagabandh |
| XII | SW27, SW28 | Katri River | MW12 | Kapuria | GW12 | Kapuria |
| XIII | SW29, SW30 | Damodar River | MW13 | Murulidih (20/21) | GW13 | Murilidih |
| XIV | SW31, SW29 | Damodar River | MW14 | Lohapatti | GW14 | Lohapatti |
| XV | SW5, SW32 | Khudia Nala | MW15 | Kharkharee UGP | GW15 | Kharkharee |
| XVI | SW33, SW34 | Khudia River | MW16 | Dahibari OCP | GW16 | Patlabari Village |
| XVII | SW35, SW36 | Barakar River | MW17 | Damagoria Colliery | GW17 | Chaptoria |

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# ENVIRONMENTAL MONITORING REPORT OF BHARAT COKING COAL LIMITED, CLUSTER – XI

**(FOR THE MONTH MAY, 2025)**

**E. C. no. J-11015/77/2011-IA.II (M) dated 26.07.2019.**

# CMPDI

ISO 9001 Company

**Regional Institute-II**

**Dhanbad, Jharkhand**

# CONTENTS


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| 4. | CHAPTER-IV | STANDARDS AND PLANS | 20-21 |

# 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 $23^0$37' N to $23^0$52' N latitudes and $86^0$09' E to $86^0$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 ($PM_{10}$), Fine Particulate Matter ($PM_{2.5}$), Sulphur Di-oxide ($SO_2$) and Nitrogen Oxides ($NO_X$). Respirable Dust Samplers (RDS) and Fine Dust

Sampler ($PM_{2.5}$ sampler) were used for sampling of $PM_{10,}$ $SO_2$, & $NO_x$ 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 $PM_{10,}$ $PM_{2.5}$, $SO_2$ 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 $PM_{10}$& $PM_{2.5}$ 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 Standards for Coal Mines were within permissible limits.

### 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-XI is in the Western & Southern part of the Jharia coalfield. It includes a group of 8 Mines (viz. Gopalichak UG&OC Mine**,** Kachhi Balihari 10/12 Pit UG Mine**,** PB UG Project,Bhagabandh UG Mine, Kenwadih UG, Pootkee UG, Kachi Balihari 5/6Pit UG, Moonidih UG mine). The Cluster – XI is situated about 25 - 30 kms from Dhanbad Railway Station. The mines of this Cluster – XI 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 Jarian nala & Damodar River.

1.2 The Project has Environmental Clearance from Ministry of Environment, Forests and Climate Change (MoEF&CC) for a rated capacity 5.08 MTPA (normative) and 6.604 MTPA (peak) capacity of coal production vide letter no. J-11015/77/2011-IA.II (M) dated 26$^{th}$ July, 2019.

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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 $PM_{10}$, $PM_{2.5}$, $SO_2$, NOx 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) Pootkee Balihari Office (A16): Industrial Area**

The location of the sampling station is 23°45'17.23"N 86°21'46.27"E. The sampler was placed at an elevated platform approx. 1.5m above ground level at Project 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 sampler was placed at an elevated platform approx. 1.5m above ground level at project office.

**iii) Moonidih Washery (A29): Industrial Area**

The location of the sampling station is 23°44'26.00"N 86°21'16.00"E. The sampler was placed at a height of approx. 1.5m above ground level at Project office.

**II.BUFFER ZONE Monitoring Location**

**I) Kusunda OCP (A10)**

The location of the sampling station is 23°46'49.07"N 86°24'15.71"E. The sampler was placed at a height of approx. 1.5m above ground level at Safety 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** | **05/2025** | **Cluster** | **Cluster XI** | **ULR No.** | **TC1432125000001846F** |
| **Customer** | **Environment Department, Bharat Coking Coal Limited (BCCL), Koyla Bhawan, Dhanbad (E-mail: gmenv.bccl@coalindia.in)** | | | **Date of Issue** | **24.06.2025** |
| **Project** | **Pootkee Balihari Office** | **Sample Ref. No.** | **REM/BCCL/2025/05** | **Sampling Method** | **CMPDI/RI-II/LPM 13 , ( IS 5182)** |
| **Date of Sampling** | 06.05.25 | 21.05.25 | **Period of Analysis** | 06.05.25 to 20.06.25 | **Zone of Station:** **Core Zone** |

| **Sl. No.** | **Parameter** | **Method of Analysis** | **Observed Values ( in µg/m³)** | | **Range Of Testing** | **LDL** | **MoEF Standards Notification dated 25th September,2000 (GSR 742 E )** | **NAAQS, 2009** |
|---|---|---|---|---|---|---|---|---|
| | | | **1st FN A3872** | **2nd FN A3952** | | | | |
| 1 | $PM_{10}$ | IS -5182(Part 23):2006, R-2017 | 97 | 95 | 10 µg/m³ - 1000 µg/m³ | 10 µg/m³ | 300 | 100 |
| 2 | $PM_{2.5}$ | IS -5182(Part 24):2019 | 53 | 51 | 10 µg/m³ - 400 µg/m³ | 10 µg/m³ | Not Specified | 60 |
| 3 | $SO_2$ | IS-5182(Part-2): 2001 , R-2017 | 11 | 12 | 10 µg/m³ - 1050 µg/m³ | 10 µg/m³ | 120 | 80 |
| 4 | $NO_2$ | IS-5182 (Part-6): 2006 , R-2017 | **29** | **34** | 06 µg/m³ - 420 µg/m³ | 06 µg/m³ | 120 | 80 |

** LDL indicates Lower Detection Limit,*

***All units are in µg/m3, 24 hourly Average,*

***ANALYSED BY*** (Gaurav Kant) ***CHECKED BY*** (Amit Raj Mishra) ***Authorised Signatory***

***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 Air Quality Test Report

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

**Test Report for Ambient Air Samples**

| | | | | | |
|---|---|---|---|---|---|
| **Month & Year** | **05/2025** | **Cluster** | **Cluster XI** | **ULR No.** | **TC1432125000001846F** |
| **Customer** | **Environment Department, Bharat Coking Coal Limited (BCCL), Koyla Bhawan, Dhanbad (E-mail: gmenv.bccl@coalindia.in)** | | | **Date of Issue** | **24.06.2025** |
| **Project** | **Moonidih UGP** | **Sample Ref. No.** | **REM/BCCL/2025/05** | **Sampling Method** | **CMPDI/RI-II/LPM 13 , ( IS 5182)** |
| **Date of Sampling** | 07.05.25 | 21.05.25 | **Period of Analysis** | 07.05.25 to 20.06.25 | **Zone of Station:** **Core Zone** |

| **Sl. No.** | **Parameter** | **Method of Analysis** | **Observed Values ( in µg/m³)** | | **Range Of Testing** | **LDL** | **MoEF Standards Notification dated 25th September,2000 (GSR 742 E )** | **NAAQS, 2009** |
|---|---|---|---|---|---|---|---|---|
| | | | **1st FN A3878** | **2nd FN A3954** | | | | |
| 1 | $PM_{10}$ | IS -5182(Part 23):2006, R-2017 | 90 | 118 | 10 µg/m³ - 1000 µg/m³ | 10 µg/m³ | 300 | 100 |
| 2 | $PM_{2.5}$ | IS -5182(Part 24):2019 | 54 | 62 | 10 µg/m³ - 400 µg/m³ | 10 µg/m³ | Not Specified | 60 |
| 3 | $SO_2$ | IS-5182(Part-2): 2001 , R-2017 | <10 | 10 | 10 µg/m³ - 1050 µg/m³ | 10 µg/m³ | 120 | 80 |
| 4 | $NO_2$ | IS-5182 (Part-6): 2006 , R-2017 | **32** | **34** | 06 µg/m³ - 420 µg/m³ | 06 µg/m³ | 120 | 80 |

** LDL indicates Lower Detection Limit,*

***All units are in µg/m3, 24 hourly Average,*

***ANALYSED BY***

(Gaurav Kant)
***CHECKED BY***

(Amit Raj Mishra)
***Authorised Signatory***

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

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Environment Laboratory, Regional Institute-II
Ambient Air Quality Test Report

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email: rdri2cmpdi@coalindia.in

**Test Report for Ambient Air Samples**

| | | | | | |
|---|---|---|---|---|---|
| **Month & Year** | **05/2025** | **Cluster** | **Cluster XI** | **ULR No.** | **TC1432125000001846F** |
| **Customer** | **Environment Department, Bharat Coking Coal Limited (BCCL), Koyla Bhawan, Dhanbad (E-mail: gmenv.bccl@coalindia.in)** | | | **Date of Issue** | **24.06.2025** |
| **Project** | **Moonidih Washery** | **Sample Ref. No.** | **REM/BCCL/2025/05** | **Sampling Method** | **CMPDI/RI-II/LPM 13 , ( IS 5182)** |
| **Date of Sampling** | 07.05.25 | 21.05.25 | **Period of Analysis** | 07.05.25 to 20.06.25 | **Zone of Station:** **Core Zone** |

| **Sl. No.** | **Parameter** | **Method of Analysis** | **Observed Values ( in µg/m³)** 1st FN **A3877** | 2nd FN **A3953** | **Range Of Testing** | **LDL** | **MoEF Standards Notification dated 25th September,2000 (GSR 742 E )** | **NAAQS, 2009** |
|---|---|---|---|---|---|---|---|---|
| 1 | $PM_{10}$ | IS -5182(Part 23):2006, R-2017 | 97 | 93 | 10 µg/m³ - 1000 µg/m³ | 10 µg/m³ | 300 | 100 |
| 2 | $PM_{2.5}$ | IS -5182(Part 24):2019 | 52 | 51 | 10 µg/m³ - 400 µg/m³ | 10 µg/m³ | Not Specified | 60 |
| 3 | $SO_2$ | IS-5182(Part-2): 2001 , R-2017 | 10 | <10 | 10 µg/m³ - 1050 µg/m³ | 10 µg/m³ | 120 | 80 |
| 4 | $NO_2$ | IS-5182 (Part-6): 2006 , R-2017 | **29** | **33** | 06 µg/m³ - 420 µg/m³ | 06 µg/m³ | 120 | 80 |

** LDL indicates Lower Detection Limit,*

***All units are in µg/m3, 24 hourly Average,*

***ANALYSED BY***

(Gaurav Kant)
***CHECKED BY***

(Amit Raj Mishra)
***Authorised Signatory***

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*Page -1 of 1*

CENTRAL MINE PLANNING AND DESIGN INSTITUTE LIMITED
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Ambient Air Quality Test Report

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**Test Report for Ambient Air Samples**

| | | | | | |
|---|---|---|---|---|---|
| **Month & Year** | **05/2025** | **Cluster** | **Cluster XI** | **Report No.** | TC1432125000001846F |
| **Customer** | **Environment Department, Bharat Coking Coal Limited (BCCL), Koyla Bhawan, Dhanbad (E-mail: gmenv.bccl@coalindia.in)** | | | **Date of Issue** | **24.06.2025** |
| **Project** | **Kusunda** | **Sample Ref. No.** | **REM/BCCL/2025/05** | **Sampling Method** | **CMPDI/RI-II/LPM 13 , ( IS 5182)** |
| **Date of Sampling** | 09.05.25 | 16.05.25 | **Period of Analysis** | 09.05.25 to 20.06.25 | **Zone of Station:** **Buffer Zone** |

| **Sl. No.** | **Parameter** | **Method of Analysis** | **Observed Values ( in µg/m³)** | | **Range Of Testing** | **LDL** | **MoEF Standards Notification dated 25th September,2000 (GSR 742 E )** | **NAAQS, 2009** |
|---|---|---|---|---|---|---|---|---|
| | | | **1st FN A3892** | **2nd FN A3931** | | | | |
| 1 | $PM_{10}$ | IS -5182(Part 23):2006, R-2017 | 102 | 118 | 10 µg/m³ - 1000 µg/m³ | 10 µg/m³ | 300 | 100 |
| 2 | $PM_{2.5}$ | IS -5182(Part 24):2019 | 58 | 67 | 10 µg/m³ - 400 µg/m³ | 10 µg/m³ | Not Specified | 60 |
| 3 | $SO_2$ | IS-5182(Part-2): 2001 , R-2017 | 12 | 11 | 10 µg/m³ - 1050 µg/m³ | 10 µg/m³ | 120 | 80 |
| 4 | $NO_2$ | IS-5182 (Part-6): 2006 , R-2017 | 33 | 27 | 06 µg/m³ - 420 µg/m³ | 06 µg/m³ | 120 | 80 |

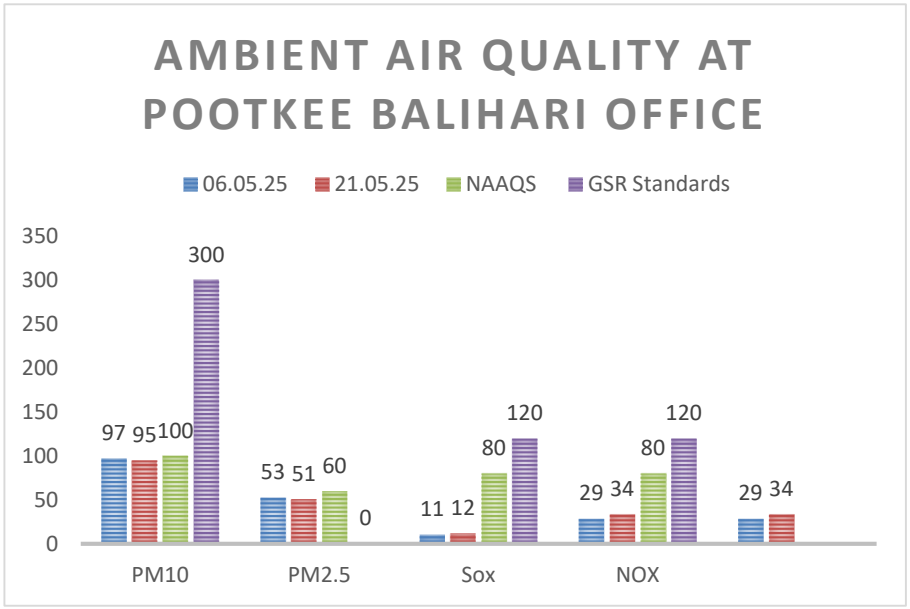
** LDL indicates Lower Detection Limit,*
***All units are in µg/m3, 24 hourly Average,*

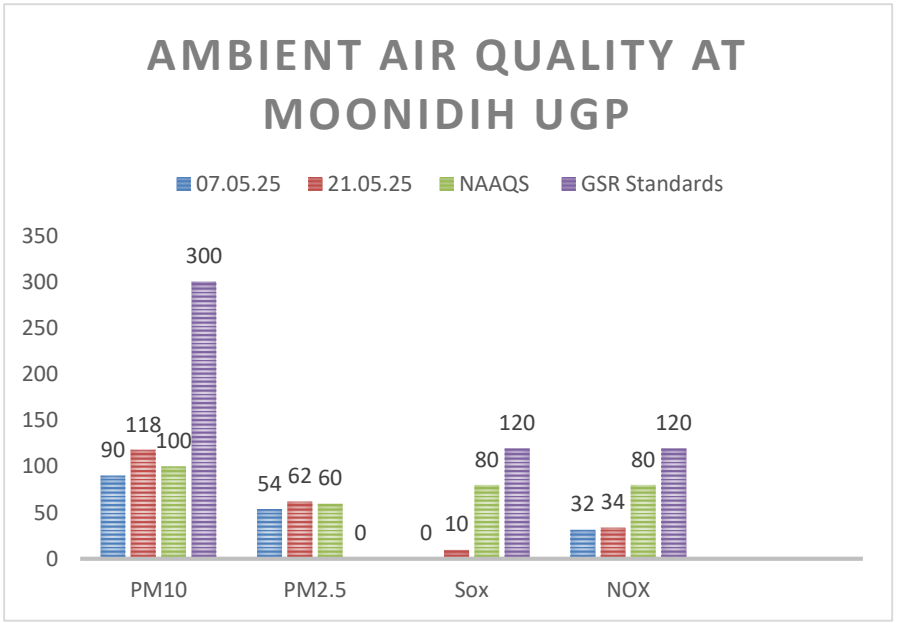
***ANALYSED BY*** (Gaurav Kant) ***CHECKED BY*** (Amit Raj Mishra) ***Authorised Signatory***

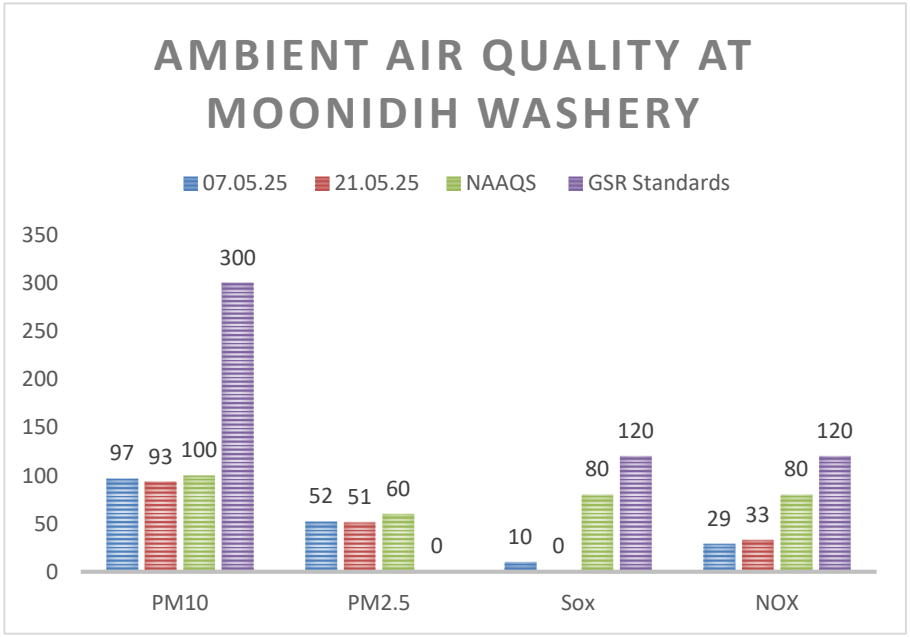
***Note**: The results above relate to the samples tested as received. This report can not be reproduced in part or full without the written permission of the HOD(Env) , CMPDI, RI-II.*

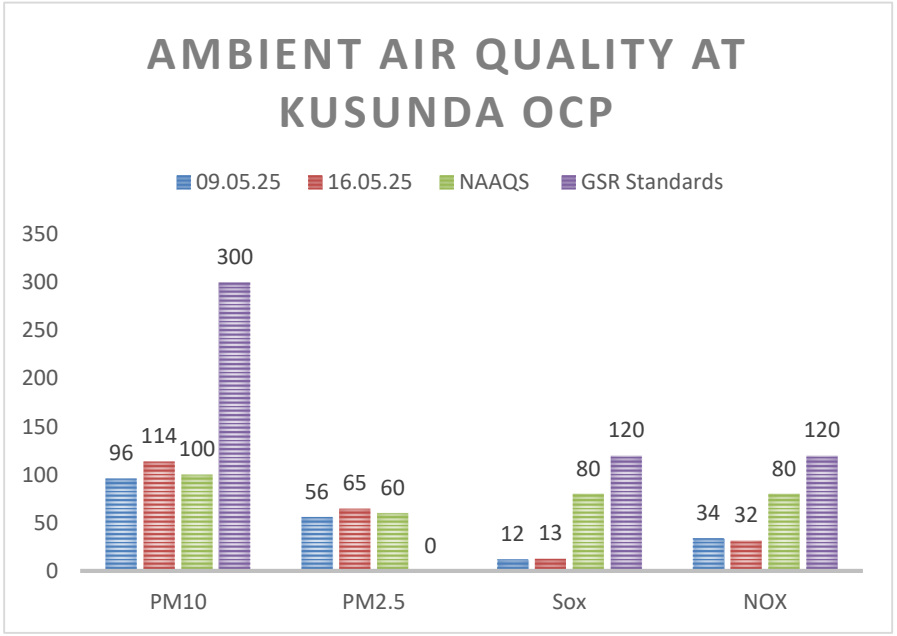
*---- End of Report ----*

*Page -1 of 1*


AMBIENT AIR QUALITY AT POOTKEE BALIHARI OFFICE
06.05.25
21.05.25
NAAQS
GSR Standards
350
300
250
200
150
100
50
0
97 95 100 300
53 51 60 0
11 12 80 120
29 34 80 120
29 34
PM10
PM2.5
Sox
NOX


AMBIENT AIR QUALITY AT MOONIDIH UGP
07.05.25
21.05.25
NAAQS
GSR Standards
350
300
250
200
150
100
50
0
90 118 100 300
54 62 60 0
0 10 80 120
32 34 80 120
PM10
PM2.5
Sox
NOX


AMBIENT AIR QUALITY AT MOONIDIH WASHERY
07.05.25
21.05.25
NAAQS
GSR Standards
350
300
250
200
150
100
50
0
97 93 100 300
52 51 60 0
10 0 80 120
29 33 80 120
PM10
PM2.5
Sox
NOX


AMBIENT AIR QUALITY AT KUSUNDA OCP
09.05.25
16.05.25
NAAQS
GSR Standards
350
300
250
200
150
100
50
0
96 114 100 300
56 65 60 0
12 13 80 120
34 32 80 120
PM10
PM2.5
Sox
NOX

# WATER QUALITY MONITORING

## 3.1 Location of sampling sites

(Refer **Plate No. – II**)

### i) Mine Discharge of Bhagabandh (MW11)

A sampling point is fixed to assess the effluent quality of Mine discharge. This location is selected to monitor effluent discharge in to Kari jore.

## 3.2 Methodology of sampling and analysis

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

## 3.3 Results & Interpretations

The results are given in tabular form along with the applicable standards. Results are compared with Schedule - VI, effluent prescribed by MoEF&CC. Results show that most of the parameters are within the permissible limits.

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

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

**Test Report for Mine Effluent samples**

| | | | | | | |
|---|---|---|---|---|---|---|
| **Month & Year** | **05/2025** | **Cluster** | **Cluster XI** | **ULR No.** | TC1432125000001864F | |
| **Customer** | **Environment Department, Bharat Coking Coal Limited (BCCL), Koyla Bhawan, Dhanbad (E-mail: gmenv.bccl@coalindia.in)** | | | | **Date of Issue** | **24.06.2025** |
| **Project** | | **Sampling Ref. No.** | **REM/BCCL/2025/ 05** | **Sampling Method** **IS 3025 (Part-1)** | | **CMPDI/RI-II/LPM 13** |
| **Sampling Stations** | **(i)** | **Bhagabandh** | **Sample Collected in 2.5 Ltr Jerricane , Color as observed is transparent** | | **Period of Analysis** | **13.05.25 TO 31.05.25** |
| | | | **Date of Sampling** | **13.05.25** **26.05.25** | | |

| **Sl. No.** | **Parameter** | **Method of Analysis** | **Observed Values** | | **STANDARDS FOR COAL MINES (Stipulated by Ministry of Environment and Forests (MoEF), Vide Notification No. GSR 742(E), Dt: 25.09.2000)** | **LDL** |
|---|---|---|---|---|---|---|
| | | | **M1515** | **M1542** | | |
| 1 | Total Suspended Solids | IS 3025/17:1984, R :2017, Gravimetric | 40 | 42 | *100 (Max)* | 10 |
| 2 | pH | IS-3025/11:1983, R-2017, Electrometric | 7.59 | 7.54 | *5.5 - 9.0* | 0.2 |
| 3 | Oil & Grease | IS 3025/39:1991, R : 2019, Partition Gravimetric | <4.0 | <4.0 | *10 (Max)* | 2 |
| 4 | COD | APHA 23rd Edition 5220 C Titrimetric Method | 32 | 36 | *250 (Max)* | 4 |

***Grab sampling carried out for water samples **All units in mg/L unless specified otherwise *LDL indicates Lower Detection Limit & BDL indicates Below Detection Limit,*

***ANALYSED BY***

(Kumar Vaibhav)
***CHECKED BY***

(Amit Raj Mishra)
***Authorised Signatory***

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

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

# NOISE LEVEL QUALITY MONITORING

## 4.1Location of sampling sites

1. **Pootkee Balihari Office (N16)**
2. **Moonidih UGP (N17)**
3. **Moonidih Washery (N29)**
4. **Kusunda OCP (N10)**

**4.2**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

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

TC-14321

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| **Month & Year** | **05/2025** | **Cluster** | **Cluster XI** | | | **ULR No.** | **TC1432125000001880F** |
| **Customer** | **Environment Department, Bharat Coking Coal Limited (BCCL), Koyla Bhawan, Dhanbad (E-mail: gmenv.bccl@coalindia.in)** | | | | | **Date of Issue** | **24.06.2025** |
| **Project** | | **Sample Ref. No.** | **REM/BCCL/2025/ 05** | | **Sampling Method** | **CMPDI/RI-II/LPM 22** | |
| **Sampling Stations** | **i** | **Pootki Balihari Office** | **Date of Sampling** | 06.05.25 | 21.05.25 | **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 | 51.5 | 52.8 | CPCB, Protocol for Ambient Level Noise Monitoring -2015 | 35 dB-135 dB | 35 Db (A) | Industrial<br>Commercial<br>Residential<br>Silence | 75<br>65<br>55<br>50 |
| 2 | | 07:00 - 08:00 | 54.9 | 55.5 | | | | | |
| 3 | | 08:00 - 09:00 | 57.5 | 58.2 | | | | | |
| 4 | | 09:00 – 10:00 | 63.9 | 64.6 | | | | | |
| 5 | | 10:00 - 11:00 | 65.5 | 66.4 | | | | | |
| 6 | | 11:00 - 12:00 | 60.6 | 61.4 | | | | | |
| 7 | | 12:00 - 13:00 | 59 | 58.3 | | | | | |
| 8 | | 13:00 - 14:00 | 56.3 | 56.1 | | | | | |
| 9 | | 14:00 - 15:00 | 55.2 | 53 | | | | | |
| 10 | | 15:00 - 16:00 | 52.3 | 52.7 | | | | | |
| 11 | | 16:00 - 17:00 | 51.5 | 51.1 | | | | | |
| 12 | | 17:00 - 18:00 | 51.2 | 51.9 | | | | | |
| 13 | | 18:00 - 19:00 | 51.2 | 51.6 | | | | | |
| 14 | | 19:00 - 20:00 | 49.4 | 50.7 | | | | | |
| 15 | | 20:00 - 21:00 | 49.3 | 49.5 | | | | | |
| 16 | | 21:00 - 22:00 | 49.2 | 48.8 | | | | | |
| | | Leq Day | 58.2 | 58.8 | | | | | |
| 1 | Noise Level dB(A)Leq -Night | 22:00-23:00 | 45.8 | 46 | CPCB, Protocol for Ambient Level Noise Monitoring -2015 | 35 dB-135 dB | 35 dB (A) | Industrial<br>Commercial<br>Residential<br>Silence | 70<br>55<br>45<br>50 |
| 2 | | 23:00- 00:00 | 45.1 | 45.4 | | | | | |
| 3 | | 00:00- 01:00 | 44.1 | 45 | | | | | |
| 4 | | 01.00-02.00 | 44 | 44.7 | | | | | |
| 5 | | 02.00-03.00 | 43.4 | 43.6 | | | | | |
| 6 | | 03.00-04.00 | 43.2 | 43.1 | | | | | |
| 7 | | 04.00-05.00 | 44.1 | 44.2 | | | | | |
| 8 | | 05:00-06:00 | 44.5 | 44.4 | | | | | |
| | | Leq Night | 44.4 | 44.6 | | | | | |

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

| | | | | | |
|---|---|---|---|---|---|
| Sampling Assistants | | (Gaurav Kant) | | | (Amit Raj Mishra) |
| ANALYSED BY | | CHECKED BY | | | Authorised Signatory |

Note: The results above relate to the samples tested as received. This report cannot 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
CMPDIL, RI-II
KOYLA BHAWAN OMPLEX
DHANBAD. -826005
Phone:0326-223-850
email:i2cmpdi@coalindia.in

# Ambient Noise Level Test Report

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| **Month & Year** | **05/2025** | **Cluster** | **Cluster XI** | | | **ULR No.** | **TC1432125000001880F** |
| **Customer** | **Environment Department, Bharat Coking Coal Limited (BCCL), Koyla Bhawan, Dhanbad (E-mail: gmenv.bccl@coalindia.in)** | | | | | **Date of Issue** | **24.06.2025** |
| **Project** | | **Sample Ref. No.** | **REM/BCCL/2025/05** | **Sampling Method** | | **CMPDI/RI-II/LPM 22** | |
| **Sampling Stations** | **i** | **Moonidih UGP** | **Date of Sampling** | 07.05.25 | 21.05.25 | **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 | 51.3 | 52.1 | CPCB, Protocol for Ambient Level Noise Monitoring -2015 | 35 dB-135 dB | 35 dB(A) | Industrial<br>Commercial<br>Residential<br>Silence | 75<br>65<br>55<br>50 |
| 2 | | 07:00 - 08:00 | 46.9 | 47.8 | | | | | |
| 3 | | 08:00 - 09:00 | 54.6 | 56.2 | | | | | |
| 4 | | 09:00 – 10:00 | 52.7 | 50.2 | | | | | |
| 5 | | 10:00 - 11:00 | 55.8 | 54.7 | | | | | |
| 6 | | 11:00 - 12:00 | 59.2 | 60 | | | | | |
| 7 | | 12:00 - 13:00 | 57.3 | 57 | | | | | |
| 8 | | 13:00 - 14:00 | 59 | 57.9 | | | | | |
| 9 | | 14:00 - 15:00 | 55.1 | 54.7 | | | | | |
| 10 | | 15:00 - 16:00 | 53.3 | 52.7 | | | | | |
| 11 | | 16:00 - 17:00 | 52.9 | 53.1 | | | | | |
| 12 | | 17:00 - 18:00 | 52.5 | 53.1 | | | | | |
| 13 | | 18:00 - 19:00 | 51.6 | 52.1 | | | | | |
| 14 | | 19:00 - 20:00 | 52.3 | 51.9 | | | | | |
| 15 | | 20:00 - 21:00 | 50.8 | 50.6 | | | | | |
| 16 | | 21:00 - 22:00 | 50.3 | 50.5 | | | | | |
| | | **Leq Day** | 54.6 | 54.6 | | | | | |
| 1 | Noise Level dB(A)Leq -Night | 22:00-23:00 | 44.4 | 44.4 | CPCB, Protocol for Ambient Level Noise Monitoring -2015 | 35 dB-135 dB | 35 dB(A) | Industrial<br>Commercial<br>Residential<br>Silence | 70<br>55<br>45<br>50 |
| 2 | | 23:00- 00:00 | 43.9 | 44.1 | | | | | |
| 3 | | 00:00- 01:00 | 43.1 | 44.1 | | | | | |
| 4 | | 01.00-02.00 | 42.3 | 42.9 | | | | | |
| 5 | | 02.00-03.00 | 42.1 | 42.2 | | | | | |
| 6 | | 03.00-04.00 | 42.1 | 42.3 | | | | | |
| 7 | | 04.00-05.00 | 43.5 | 43.6 | | | | | |
| 8 | | 05:00-06:00 | 43.9 | 44.1 | | | | | |
| | | **Leq Night** | 43.2 | 43.5 | | | | | |

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

| | | | |
|---|---|---|---|
| Sampling Assistants | (Gaurav Kant) | | (Amit Raj Mishra) |
| ***ANALYSED BY*** | ***CHECKED BY*** | | ***Authorised Signatory*** |

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

*Page -1 of 1*

CMPDIL, RI-II
KOYLA BHAWAN COMPLEX
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email: rdri2cmpdi@coalindia.in

TC-14321

cmpdi A Mini Ratna Company

# CENTRAL MINE PLANNING AND DESIGN INSTITUTE LIMITED

## Environment Laboratory, Regional Institute-II

## Ambient Noise Level Test Report

| | | | | | |
|---|---|---|---|---|---|
| **Month & Year** | **05/2025** | **Cluster** | **Cluster XI** | **ULR No.** | **TC1432125000001880F** |
| **Customer** | **Environment Department, Bharat Coking Coal Limited (BCCL), Koyla Bhawan, Dhanbad (E-mail: gmenv.bccl@coalindia.in)** | | | **Date of Issue** | **24.06.2025** |
| **Project** | | **Sample Ref. No.** | **REM/BCCL/2025/05** | **Sampling Method** | **CMPDI/RI-II/LPM 22** |
| **Sampling Stations** | **i** | **Moonidih Washery** | **Date of Sampling** 07.05.25 – 21.05.25 | **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 | 50.3 | 50.5 | CPCB, Protocol for Ambient Level Noise Monitoring -2015 | 35 dB-135 dB | 35 dB(A) | Industrial<br>Commercial<br>Residential<br>Silence | 75<br>65<br>55<br>50 |
| 2 | | 07:00 - 08:00 | 52.7 | 53.1 | | | | | |
| 3 | | 08:00 - 09:00 | 56.5 | 56 | | | | | |
| 4 | | 09:00 – 10:00 | 60.1 | 60.2 | | | | | |
| 5 | | 10:00 - 11:00 | 62.4 | 62.4 | | | | | |
| 6 | | 11:00 - 12:00 | 63.5 | 61 | | | | | |
| 7 | | 12:00 - 13:00 | 65.2 | 66.9 | | | | | |
| 8 | | 13:00 - 14:00 | 64.6 | 64.6 | | | | | |
| 9 | | 14:00 - 15:00 | 59.4 | 60.2 | | | | | |
| 10 | | 15:00 - 16:00 | 60.2 | 59.1 | | | | | |
| 11 | | 16:00 - 17:00 | 58.5 | 57.5 | | | | | |
| 12 | | 17:00 - 18:00 | 57.3 | 56.5 | | | | | |
| 13 | | 18:00 - 19:00 | 55.8 | 55.7 | | | | | |
| 14 | | 19:00 - 20:00 | 54.6 | 55.2 | | | | | |
| 15 | | 20:00 - 21:00 | 53.7 | 51.9 | | | | | |
| 16 | | 21:00 - 22:00 | 51.3 | 52.1 | | | | | |
| | | | 60.0 | 60.1 | | | | | |
| 1 | Noise Level dB(A)Leq -Night | 22:00-23:00 | 48 | 48.6 | CPCB, Protocol for Ambient Level Noise Monitoring -2015 | 35 dB-135 dB | 35 dB(A) | Industrial<br>Commercial<br>Residential<br>Silence | 70<br>55<br>45<br>50 |
| 2 | | 23:00- 00:00 | 46.6 | 46 | | | | | |
| 3 | | 00:00- 01:00 | 42.5 | 42.4 | | | | | |
| 4 | | 01.00-02.00 | 42.3 | 42.3 | | | | | |
| 5 | | 02.00-03.00 | 42 | 41 | | | | | |
| 6 | | 03.00-04.00 | 41.5 | 42.2 | | | | | |
| 7 | | 04.00-05.00 | 43.5 | 43.9 | | | | | |
| 8 | | 05:00-06:00 | 43.9 | 44.1 | | | | | |
| | | **Leq Night** | 44.4 | 44.5 | | | | | |

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

| | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| Sampling Assistants | | | (Gaurav Kant) | | | | | | (Amit Raj Mishra) |
| | ***ANALYSED BY*** | | ***CHECKED BY*** | | | | | | ***Authorised Signatory*** |

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

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

*Page -1 of 1*

TC-14321

# 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** | **05/2025** | **Cluster** | **Cluster XI** | **ULR No.** | **TC1432125000001880F** |
| **Customer** | **Environment Department, Bharat Coking Coal Limited (BCCL), Koyla Bhawan, Dhanbad (E-mail: gmenv.bccl@coalindia.in)** | | | **Date of Issue** | **24.06.2025** |
| **Project** | | **Sample Ref. No.** | **REM/BCCL/2025/ 05** | **Sampling Method** | **CMPDI/RI-II/LPM 22** |
| **Sampling Stations** | **i** | **Kusunda OCP** | **Date of Sampling** | 09.05.25 – 16.05.25 | **Zone Category of Station:** **Bufferr 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 | 50.3 | 50.6 | CPCB, Protocol for Ambient Level Noise Monitoring -2015 | 35 dB-135 dB | 35 dB(A) | Industrial<br>Commercial<br>Residential<br>Silence | 75<br>65<br>55<br>50 |
| 2 | | 07:00 - 08:00 | 53.7 | 53.1 | | | | | |
| 3 | | 08:00 - 09:00 | 57 | 53 | | | | | |
| 4 | | 09:00 – 10:00 | 62.4 | 60.5 | | | | | |
| 5 | | 10:00 - 11:00 | 64.6 | 63.4 | | | | | |
| 6 | | 11:00 - 12:00 | 63.2 | 61.8 | | | | | |
| 7 | | 12:00 - 13:00 | 66.3 | 64.7 | | | | | |
| 8 | | 13:00 - 14:00 | 67.7 | 65.4 | | | | | |
| 9 | | 14:00 - 15:00 | 67.7 | 60.4 | | | | | |
| 10 | | 15:00 - 16:00 | 60 | 59.4 | | | | | |
| 11 | | 16:00 - 17:00 | 60.2 | 67.3 | | | | | |
| 12 | | 17:00 - 18:00 | 59.7 | 58.3 | | | | | |
| 13 | | 18:00 - 19:00 | 58 | 57.4 | | | | | |
| 14 | | 19:00 - 20:00 | 58.2 | 56.5 | | | | | |
| 15 | | 20:00 - 21:00 | 56.8 | 55.8 | | | | | |
| 16 | | 21:00 - 22:00 | 57.2 | 55.9 | | | | | |
| | | **Leq Day** | 62.6 | 61.3 | | | | | |
| 1 | Noise Level dB(A)Leq -Night | 22:00-23:00 | 52.7 | 38.6 | CPCB, Protocol for Ambient Level Noise Monitoring -2015 | 35 dB-135 dB | 35 dB(A) | Industrial<br>Commercial<br>Residential<br>Silence | 70<br>55<br>45<br>50 |
| 2 | | 23:00- 00:00 | 51.8 | 38.6 | | | | | |
| 3 | | 00:00- 01:00 | 50.7 | 38.2 | | | | | |
| 4 | | 01.00-02.00 | 46.7 | 38.1 | | | | | |
| 5 | | 02.00-03.00 | 45.1 | 37.7 | | | | | |
| 6 | | 03.00-04.00 | 44.2 | 37.2 | | | | | |
| 7 | | 04.00-05.00 | 43 | 36.9 | | | | | |
| 8 | | 05:00-06:00 | 44.6 | 36.7 | | | | | |
| | | Leq Night | 48.8 | 37.8 | | | | | |

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

| | | | | |
|---|---|---|---|---|
| Sampling Assistants | (Gaurav Kant) | | | (Amit Raj Mishra) |
| ***ANALYSED BY*** | ***CHECKED BY*** | | | ***Authorised Signatory*** |

*Note: The results above relate to the samples tested as received. This report cannot 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**<br><br>Coal mines located in the coal fields of<br>• Jharia<br>• Raniganj<br>• Bokaro | Suspended Particulate Matter (SPM) | Annual Average *<br>24 hours ** | 500 µg/$m^3$<br><br>700 µg/$m^3$ | - High Volume Sampling (Average flow rate not less than 1.1 |
| | Respirable Particulate Matter (size less than 10 µm) (RPM) | Annual Average *<br>24 hours ** | 250 µg/$m^3$<br><br>300 µg/$m^3$ | Respirable Particulate Matter sampling and analysis |
| | Sulphur Dioxide ($SO_2$) | Annual Average *<br>24 hours ** | 80 µg/$m^3$<br><br>120 µg/$m^3$ | 1.Improvedwest and Gaeke method<br>2.Ultraviolet fluorescene |
| | Oxide of Nitrogen as $NO_2$ | Annual Average *<br>24 hours ** | 80 µg/$m^3$<br><br>120 µg/$m^3$ | 1. Jacob & Hochheiser Modified (Na-Arsenic) Method<br>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.

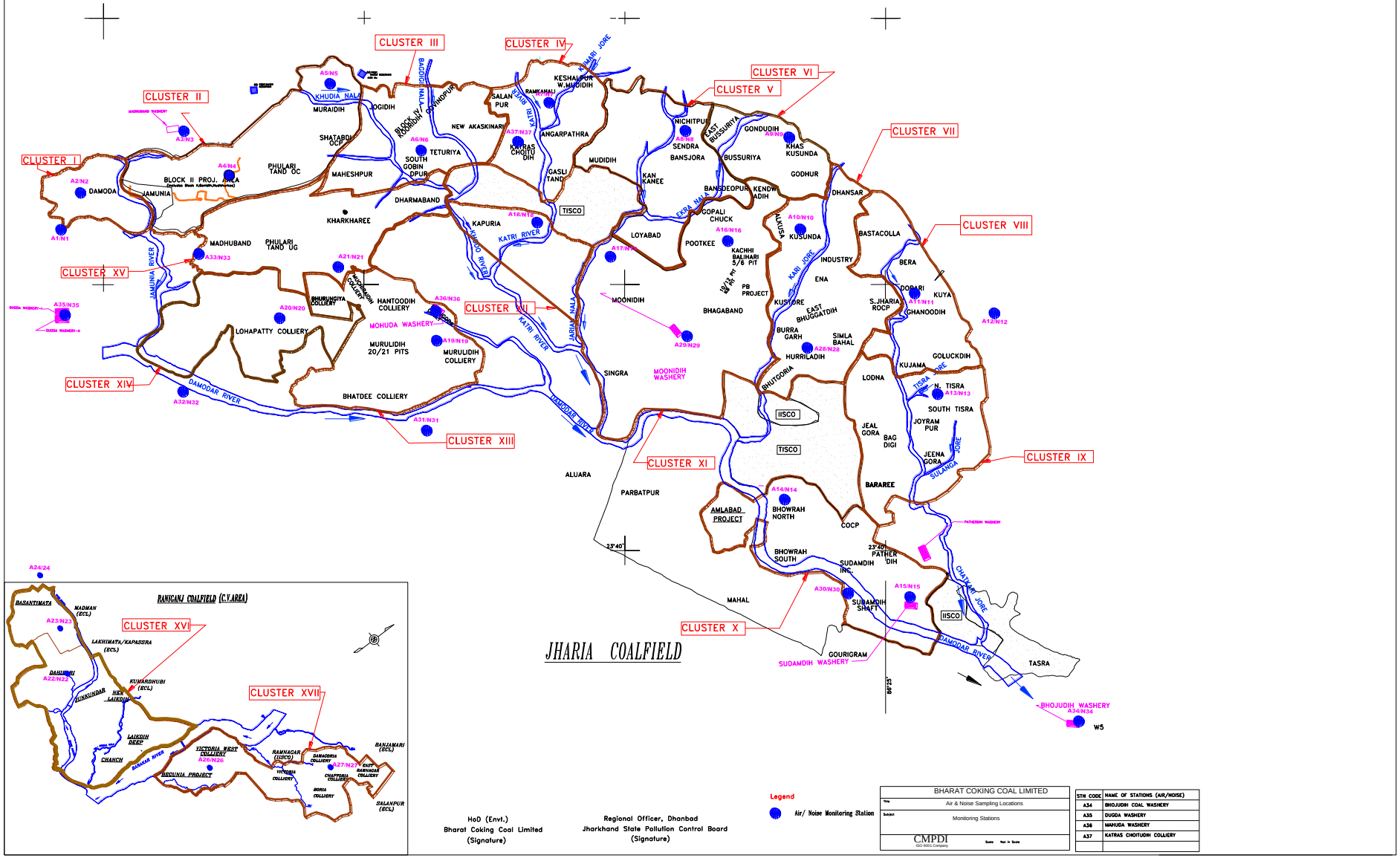
| Pollutant | Time Weighted Average | Concentration in Ambient Air | | Methods of Measurement |
|---|---|---|---|---|
| | | Industrial, Residential, Rural and other Areas | Ecologically Sensitive Area (Notified by Central Government) | |
| **Sulphur Dioxide ($SO_2$), µg/m³** | Annual *<br>24 Hours ** | 50<br>80 | 20<br>80 | -Improved West and Gaeke Method<br>-Ultraviolet Fluorescence |
| **Nitrogendioxide ($NO_2$), µg/m³** | Annual *<br>24 Hours ** | 40<br>80 | 30<br>80 | -Jacob &Hochheiser modified ($NaOH$-$NaAsO_2$) Method<br>-Gas Phase Chemiluminescence |
| **Particulate Matter (Size less than 10µm) or $PM_{10}$, µg/m³** | Annual *<br>24 Hours ** | 60<br>100 | 60<br>100 | -Gravimetric<br>-TEOM<br>-Beta attenuation |
| **Particulate Matter (Size less than 2.5µm) or $PM_{2.5}$, µg/m³** | Annual *<br>24 Hours ** | 40<br>60 | 40<br>60 | -Gravimetric<br>-TEOM<br>-Beta attenuation |
| **Ozone ($O_3$) , µg/m³** | 8 Hours *<br>1 Hour ** | 100<br>180 | 100<br>180 | -UV Photometric<br>-Chemiluminescence<br>-Chemical Method |
| **Lead (Pb) , µg/m³** | Annual *<br>24 Hours ** | 0.50<br>1.0 | 0.50<br>1.0 | -AAS/ICP Method after sampling on EPM 2000 or equivalent filter paper<br>-ED-XRF using Teflon filter |
| **Carbon Monoxide (CO), mg/m³** | 8 Hours **<br>1 Hour ** | 02<br>04 | 02<br>04 | -Non dispersive Infrared (NDIR) Spectroscopy |
| **Ammonia ($NH_3$), µg/m³** | Annual *<br>24 Hours ** | 100<br>400 | 100<br>400 | -Chemiluminescence<br>-Indophenol blue method |
| **Benzene ($C_6H_6$), µg/m³** | Annual * | 05 | 05 | -Gas Chromatography (GC) based continuous analyzer<br>-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.

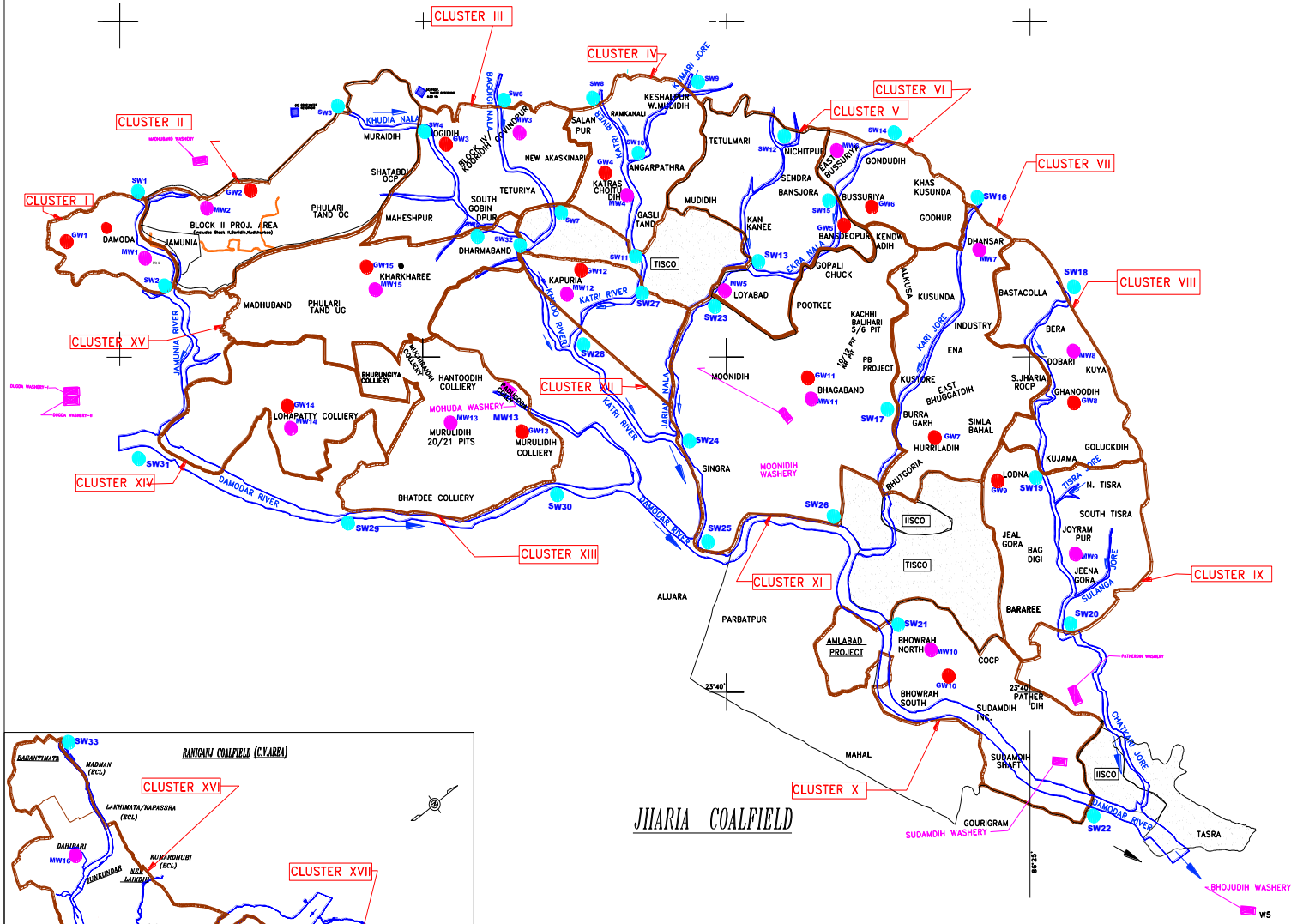
** 24 hourly or 8 hourly or 1 hourly monitored values, as applicable, shall be complied with 98% of the time in a year. 2% of the time, they JUNE exceed the limits but not on two consecutive days of monitoring.

**NOTE:**Whenever and wherever monitoring results on two consecutive days of monitoring exceed the limits specified above for the respective catego

# Location of Air & Noise Monitoring Stations in BCCL



# Water Sampling Locations in BCCL




## INDEX

| Cluster | Suface Water (U/S, D/S) | Name of River/ Nala / Jore | Mine/ Effluent Water | Sampling Location | Ground Water | Sampling Location |
|---|---|---|---|---|---|---|
| I | SW1, SW2 | Jamunia River | MW1 | Damoda Area | GW1 | Ghutway Village |
| II | SW3, SW4 | Khudia Nala | MW2 | Block II OCP | GW2 | Joyrampur Village |
| III | SW4, SW5, SW6, SW7 | Khudia Nala, Bagdigi Nala | MW3 | Govindpur Colliery | GW3 | Jogidih Village |
| IV | SW8, SW11, SW9, SW10 | Katri River, Kumari Jore | MW4 | Chotudih | GW4 | Kankanee Village |
| V | SW12, SW13, SW15 | Jarian Nala, Ekra Nala | MW5 | Mudidih | GW5 | Nichitpur |
| VI | SW14, SW15 | Ekra Nala | MW6 | East Bassuria UGP | GW6 | Bansjora Borewell |
| VII | SW16, SW17 | Kari Jore | MW7 | Dhansar UGP | GW7 | Hurriladih |
| VIII | SW18, SW19 | Kashi Jore | MW8 | Dobari UGP | GW8 | Ghanudih |
| IX | SW19, SW20 | Kashi Jore | MW9 | Jeenagora | GW9 | Lodna |
| X | SW21, SW22 | Damodar River | MW10 | Bhowrah North | GW10 | Bhowrah South |
| XI | SW23, SW24, SW25, SW26 | Jarian Nala, Damodar River | MW11 | Bhagaband h UGP | GW11 | Bhagabandh |
| XII | SW27, SW28 | Katri River | MW12 | Kapuria | GW12 | Kapuria |
| XIII | SW29, SW30 | Damodar River | MW13 | Murulidih (20/21) | GW13 | Murilidih |
| XIV | SW31, SW29 | Damodar River | MW14 | Lohapatti | GW14 | Lohapatti |
| XV | SW5, SW32 | Khudia Nala | MW15 | Kharkharee UGP | GW15 | Kharkharee |
| XVI | SW33, SW34 | Khudia River | MW16 | Dahibari OCP | GW16 | Patlabari Village |
| XVII | SW35, SW36 | Barakar River | MW17 | Damagoria Colliery | GW17 | Chaptoria |

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# ENVIRONMENTAL MONITORING REPORT OF BHARAT COKING COAL LIMITED, CLUSTER – XI

**(FOR THE MONTH JUNE, 2025)**

**E. C. no. J-11015/77/2011-IA.II (M) dated 26.07.2019.**

# CMPDI

ISO 9001 Company

**Regional Institute-II**

**Dhanbad, Jharkhand**

# CONTENTS


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| 4. | CHAPTER-IV | STANDARDS AND PLANS | 20-21 |

# 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 $23^0$37' N to $23^0$52' N latitudes and $86^0$09' E to $86^0$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 ($PM_{10}$), Fine Particulate Matter ($PM_{2.5}$), Sulphur Di-oxide ($SO_2$) and Nitrogen Oxides ($NO_X$). Respirable Dust Samplers (RDS) and Fine Dust

Sampler ($PM_{2.5}$ sampler) were used for sampling of $PM_{10,}$ $SO_2$, & $NO_x$ 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 $PM_{10,}$ $PM_{2.5}$, $SO_2$ 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 $PM_{10}$& $PM_{2.5}$ 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 Standards for Coal Mines were within permissible limits.

### 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-XI is in the Western & Southern part of the Jharia coalfield. It includes a group of 8 Mines (viz. Gopalichak UG&OC Mine**,** Kachhi Balihari 10/12 Pit UG Mine**,** PB UG Project,Bhagabandh UG Mine, Kenwadih UG, Pootkee UG, Kachi Balihari 5/6Pit UG, Moonidih UG mine). The Cluster – XI is situated about 25 - 30 kms from Dhanbad Railway Station. The mines of this Cluster – XI 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 Jarian nala & Damodar River.

1.2 The Project has Environmental Clearance from Ministry of Environment, Forests and Climate Change (MoEF&CC) for a rated capacity 5.08 MTPA (normative) and 6.604 MTPA (peak) capacity of coal production vide letter no. J-11015/77/2011-IA.II (M) dated 26$^{th}$ July, 2019.

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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 $PM_{10}$, $PM_{2.5}$, $SO_2$, NOx 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) Pootkee Balihari Office (A16): Industrial Area**

The location of the sampling station is 23°45'17.23"N 86°21'46.27"E. The sampler was placed at an elevated platform approx. 1.5m above ground level at Project 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 sampler was placed at an elevated platform approx. 1.5m above ground level at project office.

**iii) Moonidih Washery (A29): Industrial Area**

The location of the sampling station is 23°44'26.00"N 86°21'16.00"E. The sampler was placed at a height of approx. 1.5m above ground level at Project office.

**II.BUFFER ZONE Monitoring Location**

**I) Kusunda OCP (A10)**

The location of the sampling station is 23°46'49.07"N 86°24'15.71"E. The sampler was placed at a height of approx. 1.5m above ground level at Safety Office.

# AMBIENT AIR QUALITY DATA

TC-14321

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** | **06/2025** | **Cluster** | **Cluster XI** | **ULR No.** | **TC1432125000001900F** |
| **Customer** | **Environment Department, Bharat Coking Coal Limited (BCCL), Koyla Bhawan, Dhanbad (E-mail: gmenv.bccl@coalindia.in)** | | | **Date of Issue** | **11.08.2025** |
| **Project** | **Pootkee Balihari Office** | **Sample Ref. No.** | **REM/BCCL/2025/06** | **Sampling Method** | **CMPDI/RI-II/LPM 13 , ( IS 5182)** |
| **Date of Sampling** | | | **Period of Analysis** | **Zone of Station:** | **Core Zone** |

| **Sl. No.** | **Parameter** | **Method of Analysis** | **Observed Values ( in µg/m³)** | | **Range Of Testing** | **LDL** | **MoEF Standards Notification dated 25th September,2000 (GSR 742 E )** | **NAAQS, 2009** |
|---|---|---|---|---|---|---|---|---|
| | | | **A4064** | **A4142** | | | | |
| 1 | $PM_{10}$ | IS -5182(Part 23):2006, R-2017 | 89 | 94 | 10 µg/m³ - 1000 µg/m³ | 10 µg/m³ | 300 | 100 |
| 2 | $PM_{2.5}$ | IS -5182(Part 24):2019 | 48 | 52 | 10 µg/m³ - 400 µg/m³ | 10 µg/m³ | Not Specified | 60 |
| 3 | $SO_2$ | IS-5182(Part-2): 2001 , R-2017 | <10 | <10 | 10 µg/m³ - 1050 µg/m³ | 10 µg/m³ | 120 | 80 |
| 4 | $NO_2$ | IS-5182 (Part-6): 2006 , R-2017 | 24 | 33 | 06 µg/m³ - 420 µg/m³ | 06 µg/m³ | 120 | 80 |

*Environmental Condition : Sunny*
** LDL indicates Lower Detection Limit,*
***All units are in µg/m3, 24 hourly Average,*

***ANALYSED BY*** (Gaurav Kant) ***CHECKED BY*** (Amit Raj Mishra) ***Authorised Signatory***

***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 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** | **06/2025** | **Cluster** | **Cluster XI** | **ULR No.** | **TC1432125000001900F** |
| **Customer** | **Environment Department, Bharat Coking Coal Limited (BCCL), Koyla Bhawan, Dhanbad (E-mail: gmenv.bccl@coalindia.in)** | | | **Date of Issue** | **11.08.2025** |
| **Project** | **Moonidih UGP** | **Sample Ref. No.** | **REM/BCCL/2025/06** | **Sampling Method** | **CMPDI/RI-II/LPM 13 , ( IS 5182)** |
| **Date of Sampling** | 12.06.25 | 26.06.25 | **Period of Analysis** | 12.06.2025 TO 25.07.2025 | **Zone of Station:** **Core Zone** |

| **Sl. No.** | **Parameter** | **Method of Analysis** | **Observed Values ( in µg/m³)** | | **Range Of Testing** | **LDL** | **MoEF Standards Notification dated 25th September,2000 (GSR 742 E )** | **NAAQS, 2009** |
|---|---|---|---|---|---|---|---|---|
| | | | **1st FN A4072** | **2nd FN A4150** | | | | |
| 1 | $PM_{10}$ | IS -5182(Part 23):2006, R-2017 | 99 | 96 | 10 µg/m³ - 1000 µg/m³ | 10 µg/m³ | 300 | 100 |
| 2 | $PM_{2.5}$ | IS -5182(Part 24):2019 | 58 | 53 | 10 µg/m³ - 400 µg/m³ | 10 µg/m³ | Not Specified | 60 |
| 3 | $SO_2$ | IS-5182(Part-2): 2001 , R-2017 | 10 | <10 | 10 µg/m³ - 1050 µg/m³ | 10 µg/m³ | 120 | 80 |
| 4 | $NO_2$ | IS-5182 (Part-6): 2006 , R-2017 | 34 | 25 | 06 µg/m³ - 420 µg/m³ | 06 µg/m³ | 120 | 80 |

*Environmental Condition : Sunny*

** LDL indicates Lower Detection Limit,*

***All units are in µg/m3, 24 hourly Average,*

***ANALYSED BY*** (Gaurav Kant) ***CHECKED BY*** (Amit Raj Mishra) ***Authorised Signatory***

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

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Environment Laboratory, Regional Institute-II
Ambient Air Quality Test Report

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**Test Report for Ambient Air Samples**

| | | | | | |
|---|---|---|---|---|---|
| **Month & Year** | **06/2025** | **Cluster** | **Cluster XI** | **ULR No.** | **TC1432125000001900F** |
| **Customer** | **Environment Department, Bharat Coking Coal Limited (BCCL), Koyla Bhawan, Dhanbad (E-mail: gmenv.bccl@coalindia.in)** | | | **Date of Issue** | **11.08.2025** |
| **Project** | **Moonidih Washery** | **Sample Ref. No.** | **REM/BCCL/2025/06** | **Sampling Method** | **CMPDI/RI-II/LPM 13 , ( IS 5182)** |
| **Date of Sampling** | 12.06.25 | 26.06.25 | **Period of Analysis** | 12.06.2025 TO 25.07.2025 | **Zone of Station:** **Core Zone** |

| **Sl. No.** | **Parameter** | **Method of Analysis** | **Observed Values ( in µg/m³)** 1st FN **A4071** | 2nd FN **A4149** | **Range Of Testing** | **LDL** | **MoEF Standards Notification dated 25th September,2000 (GSR 742 E )** | **NAAQS, 2009** |
|---|---|---|---|---|---|---|---|---|
| 1 | $PM_{10}$ | IS -5182(Part 23):2006, R-2017 | 115 | 91 | 10 µg/m³ - 1000 µg/m³ | 10 µg/m³ | 300 | 100 |
| 2 | $PM_{2.5}$ | IS -5182(Part 24):2019 | 60 | 45 | 10 µg/m³ - 400 µg/m³ | 10 µg/m³ | Not Specified | 60 |
| 3 | $SO_2$ | IS-5182(Part-2): 2001 , R-2017 | 10 | 10 | 10 µg/m³ - 1050 µg/m³ | 10 µg/m³ | 120 | 80 |
| 4 | $NO_2$ | IS-5182 (Part-6): 2006 , R-2017 | 23 | 33 | 06 µg/m³ - 420 µg/m³ | 06 µg/m³ | 120 | 80 |

*Environmental Condition : Sunny*

** LDL indicates Lower Detection Limit,*

***All units are in µg/m3, 24 hourly Average,*

***ANALYSED BY*** (Gaurav Kant) ***CHECKED BY*** (Amit Raj Mishra) ***Authorised Signatory***

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*---- 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
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email: rdri2cmpdi@coalindia.in

**Test Report for Ambient Air Samples**

| | | | | | |
|---|---|---|---|---|---|
| **Month & Year** | **06/2025** | **Cluster** | **Cluster XI** | **Report No.** | TC1432125000001900F |
| **Customer** | **Environment Department, Bharat Coking Coal Limited (BCCL), Koyla Bhawan, Dhanbad (E-mail: gmenv.bccl@coalindia.in)** | | | **Date of Issue** | **11.08.2025** |
| **Project** | **Kusunda** | **Sample Ref. No.** | **REM/BCCL/2025/06** | **Sampling Method** | **CMPDI/RI-II/LPM 13 , ( IS 5182)** |
| **Date of Sampling** | 09.06.25 | 23.06.25 | **Period of Analysis** | 09.06.2025 TO 25.07.2025 | **Zone of Station:** **Buffer Zone** |

| **Sl. No.** | **Parameter** | **Method of Analysis** | **Observed Values ( in µg/m³)** | | **Range Of Testing** | **LDL** | **MoEF Standards Notification dated 25th September,2000 (GSR 742 E )** | **NAAQS, 2009** |
|---|---|---|---|---|---|---|---|---|
| | | | **1st FN A4047** | **2nd FN A4125** | | | | |
| 1 | $PM_{10}$ | IS -5182(Part 23):2006, R-2017 | 96 | 112 | 10 µg/m³ - 1000 µg/m³ | 10 µg/m³ | 300 | 100 |
| 2 | $PM_{2.5}$ | IS -5182(Part 24):2019 | 52 | 58 | 10 µg/m³ - 400 µg/m³ | 10 µg/m³ | Not Specified | 60 |
| 3 | $SO_2$ | IS-5182(Part-2): 2001 , R-2017 | 14 | 10 | 10 µg/m³ - 1050 µg/m³ | 10 µg/m³ | 120 | 80 |
| 4 | $NO_2$ | IS-5182 (Part-6): 2006 , R-2017 | 35 | 29 | 06 µg/m³ - 420 µg/m³ | 06 µg/m³ | 120 | 80 |

*Environmental Condition : Sunny*

** LDL indicates Lower Detection Limit,*

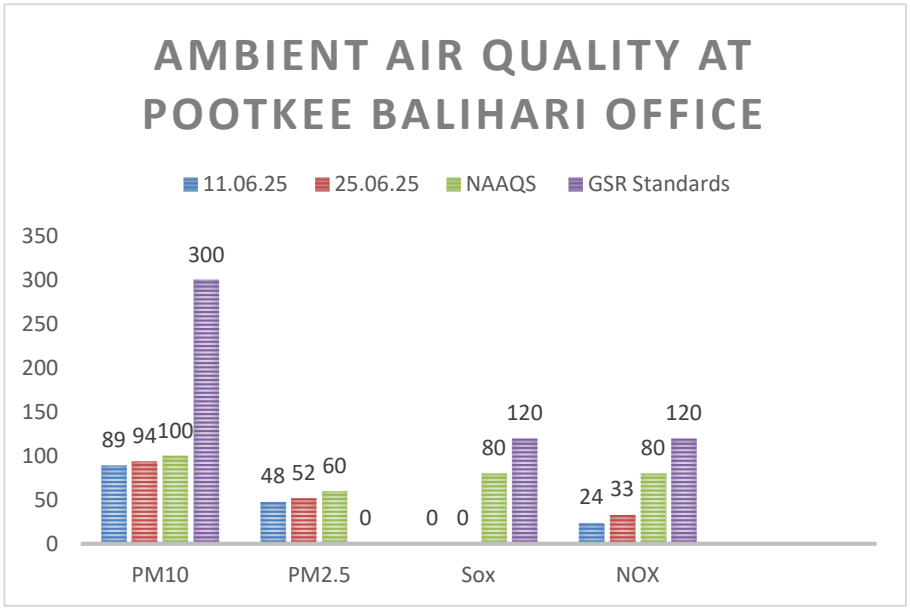
***All units are in µg/m3, 24 hourly Average,*

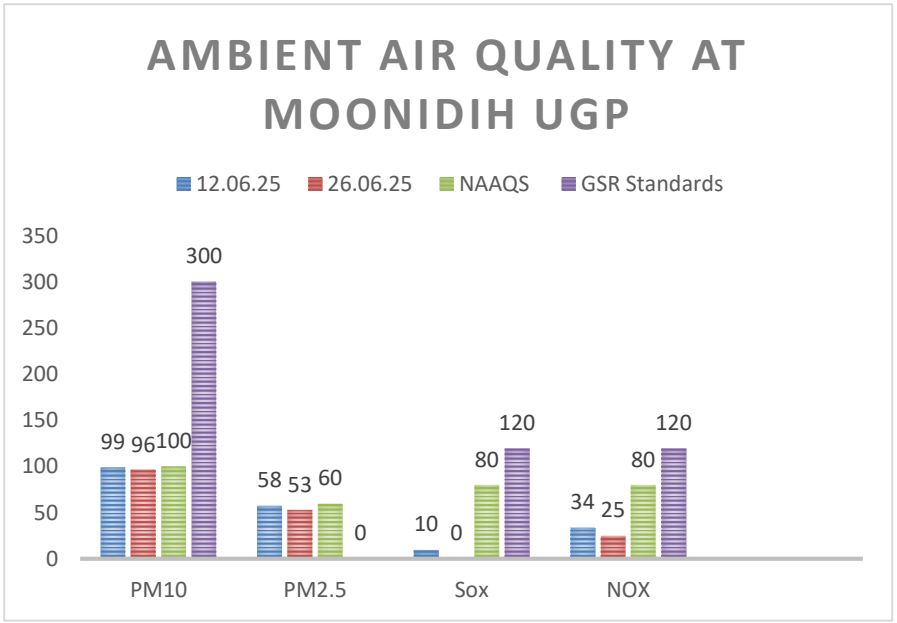
***ANALYSED BY*** (Gaurav Kant) ***CHECKED BY*** (Amit Raj Mishra) ***Authorised Signatory***

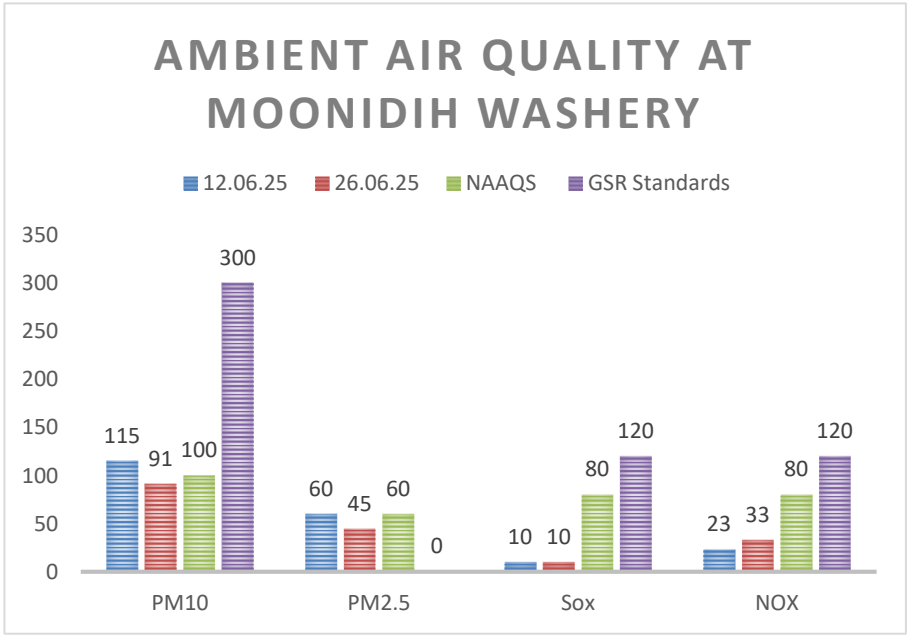
***Note**: The results above relate to the samples tested as received. This report can not be reproduced in part or full without the written permission of the HOD(Env) , CMPDI, RI-II.*

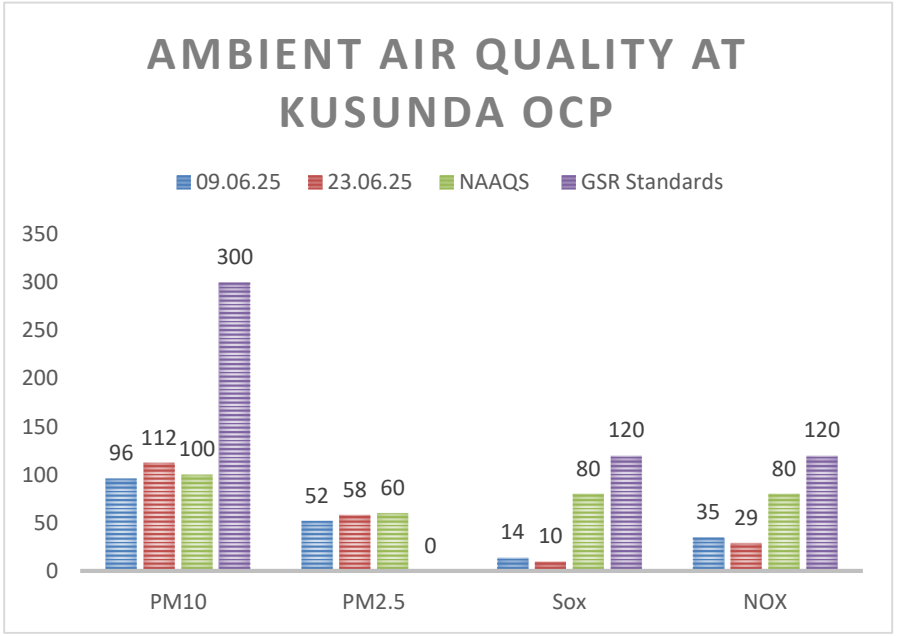
*---- End of Report ----*

*Page -1 of 1*


AMBIENT AIR QUALITY AT POOTKEE BALIHARI OFFICE
11.06.25
25.06.25
NAAQS
GSR Standards
350
300
250
200
150
100
50
0
89 94 100 300
48 52 60 0
0 0 80 120
24 33 80 120
PM10
PM2.5
Sox
NOX


AMBIENT AIR QUALITY AT MOONIDIH UGP
12.06.25
26.06.25
NAAQS
GSR Standards
350
300
250
200
150
100
50
0
99 96 100 300
58 53 60 0
10 0 80 120
34 25 80 120
PM10
PM2.5
Sox
NOX


AMBIENT AIR QUALITY AT MOONIDIH WASHERY
12.06.25
26.06.25
NAAQS
GSR Standards
350
300
250
200
150
100
50
0
115 91 100 300
60 45 60 0
10 10 80 120
23 33 80 120
PM10
PM2.5
Sox
NOX


AMBIENT AIR QUALITY AT KUSUNDA OCP
09.06.25
23.06.25
NAAQS
GSR Standards
350
300
250
200
150
100
50
0
96 112 100 300
52 58 60 0
14 10 80 120
35 29 80 120
PM10
PM2.5
Sox
NOX

# WATER QUALITY MONITORING

## 3.1 Location of sampling sites

(Refer **Plate No. – II**)

### i) Mine Discharge of Bhagabandh (MW11)

A sampling point is fixed to assess the effluent quality of Mine discharge. This location is selected to monitor effluent discharge in to Kari jore.

## 3.2 Methodology of sampling and analysis

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

## 3.3 Results & Interpretations

The results are given in tabular form along with the applicable standards. Results are compared with Schedule - VI, effluent prescribed by MoEF&CC. Results show that most of the parameters are within the permissible limits.

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

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

**Test Report for Mine Effluent samples**

| | | | | | | |
|---|---|---|---|---|---|---|
| **Month & Year** | **06/2025** | **Cluster** | **Cluster XI** | **ULR No.** | TC1432125000001918F | |
| **Customer** | **Environment Department, Bharat Coking Coal Limited (BCCL), Koyla Bhawan, Dhanbad (E-mail: gmenv.bccl@coalindia.in)** | | | | **Date of Issue** | **11.08.2025** |
| **Project** | | **Sampling Ref. No.** | **REM/BCCL/2025/ 06** | **Sampling Method** **IS 3025 (Part-1)** | | **CMPDI/RI-II/LPM 13** |
| **Sampling Stations** | **(i)** | **Bhagabandh** | **Sample Collected in 2.5 Ltr Jerricane , Color as observed is transparent** | | **Period of Analysis** | **09.06.25 to 30.06.2025** |
| | | | **Date of Sampling** | 09.06.25 23.06.25 | | |

| **Sl. No.** | **Parameter** | **Method of Analysis** | **Observed Values** | | **STANDARDS FOR COAL MINES (Stipulated by Ministry of Environment and Forests (MoEF), Vide Notification No. GSR 742(E), Dt: 25.09.2000)** | **LDL** |
|---|---|---|---|---|---|---|
| | | | M1570 | M1597 | | |
| 1 | Total Suspended Solids | IS 3025/17:1984, R :2017, Gravimetric | 41 | 42 | *100 (Max)* | 10 |
| 2 | pH | IS-3025/11:1983, R-2017, Electrometric | 7.79 | 7.78 | *5.5 - 9.0* | 0.2 |
| 3 | Oil & Grease | IS 3025/39:1991, R : 2019, Partition Gravimetric | <4.0 | <4.0 | *10 (Max)* | 2 |
| 4 | COD | APHA 23rd Edition 5220 C Titrimetric Method | 44 | 32 | *250 (Max)* | 4 |

***Grab sampling carried out for water samples **All units in mg/L unless specified otherwise *LDL indicates Lower Detection Limit & BDL indicates Below Detection Limit,*

***ANALYSED BY***

(Kumar Vaibhav)
***CHECKED BY***

(Amit Raj Mishra)
***Authorised Signatory***

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

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

# NOISE LEVEL QUALITY MONITORING

## 4.1Location of sampling sites

1. **Pootkee Balihari Office (N16)**
2. **Moonidih UGP (N17)**
3. **Moonidih Washery (N29)**
4. **Kusunda OCP (N10)**

**4.2**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

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

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| **Month & Year** | **06/2025** | **Cluster** | **Cluster XI** | | | **ULR No.** | **TC1432125000001934F** |
| **Customer** | **Environment Department, Bharat Coking Coal Limited (BCCL), Koyla Bhawan, Dhanbad (E-mail: gmenv.bccl@coalindia.in)** | | | | | **Date of Issue** | **11.08.2025** |
| **Project** | | **Sample Ref. No.** | **REM/BCCL/2025/ 06** | | **Sampling Method** | **CMPDI/RI-II/LPM 22** | |
| **Sampling Stations** | **i** | **Pootki Balihari Office** | **Date of Sampling** | 11.06.25 | 25.06.25 | **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 | 53.2 | 54.5 | CPCB, Protocol for Ambient Level Noise Monitoring -2015 | 35 dB-135 dB | 35 Db (A) | Industrial<br>Commercial<br>Residential<br>Silence | 75<br>65<br>55<br>50 |
| 2 | | 07:00 - 08:00 | 56.7 | 57.3 | | | | | |
| 3 | | 08:00 - 09:00 | 59.4 | 60.2 | | | | | |
| 4 | | 09:00 – 10:00 | 66 | 66.7 | | | | | |
| 5 | | 10:00 - 11:00 | 67.6 | 68.5 | | | | | |
| 6 | | 11:00 - 12:00 | 62.6 | 63.4 | | | | | |
| 7 | | 12:00 - 13:00 | 60.9 | 60.3 | | | | | |
| 8 | | 13:00 - 14:00 | 58.1 | 57.9 | | | | | |
| 9 | | 14:00 - 15:00 | 57 | 54.7 | | | | | |
| 10 | | 15:00 - 16:00 | 53.9 | 54.3 | | | | | |
| 11 | | 16:00 - 17:00 | 53.2 | 52.7 | | | | | |
| 12 | | 17:00 - 18:00 | 52.8 | 53.6 | | | | | |
| 13 | | 18:00 - 19:00 | 52.8 | 53.3 | | | | | |
| 14 | | 19:00 - 20:00 | 51.1 | 52.3 | | | | | |
| 15 | | 20:00 - 21:00 | 50.9 | 51.2 | | | | | |
| 16 | | 21:00 - 22:00 | 50.8 | 50.4 | | | | | |
| | | Leq Day | 60.2 | 60.8 | | | | | |
| 1 | Noise Level dB(A)Leq -Night | 22:00-23:00 | 49.3 | 49.5 | CPCB, Protocol for Ambient Level Noise Monitoring -2015 | 35 dB-135 dB | 35 dB (A) | Industrial<br>Commercial<br>Residential<br>Silence | 70<br>55<br>45<br>50 |
| 2 | | 23:00- 00:00 | 48.6 | 48.9 | | | | | |
| 3 | | 00:00- 01:00 | 47.6 | 48.5 | | | | | |
| 4 | | 01.00-02.00 | 47.5 | 48.2 | | | | | |
| 5 | | 02.00-03.00 | 46.9 | 47.1 | | | | | |
| 6 | | 03.00-04.00 | 46.6 | 46.5 | | | | | |
| 7 | | 04.00-05.00 | 47.6 | 47.6 | | | | | |
| 8 | | 05:00-06:00 | 48 | 47.8 | | | | | |
| | | Leq Night | 47.8 | 48.1 | | | | | |

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

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| Sampling Assistants | | | (Gaurav Kant) | | | | (Amit Raj Mishra) |
| | ANALYSED BY | | CHECKED BY | | | | Authorised Signatory |

Note: The results above relate to the samples tested as received. This report cannot 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
CMPDIL, RI-II
KOYLA BHAWAN OMPLEX
DHANBAD. -826005
Phone:0326-223-850
email:i2cmpdi@coalindia.in

# Ambient Noise Level Test Report

| | | | | | |
|---|---|---|---|---|---|
| **Month & Year** | **06/2025** | **Cluster** | **Cluster XI** | **ULR No.** | **TC1432125000001934F** |
| **Customer** | **Environment Department, Bharat Coking Coal Limited (BCCL), Koyla Bhawan, Dhanbad (E-mail: gmenv.bccl@coalindia.in)** | | | **Date of Issue** | **11.08.2025** |
| **Project** | | **Sample Ref. No.** | **REM/BCCL/2025/06** | **Sampling Method** | **CMPDI/RI-II/LPM 22** |
| **Sampling Stations** | **i** | **Moonidih UGP** | **Date of Sampling** | 12.06.25 – 26.06.25 | **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 | 53 | 53.7 | CPCB, Protocol for Ambient Level Noise Monitoring -2015 | 35 dB-135 dB | 35 dB(A) | Industrial<br>Commercial<br>Residential<br>Silence | 75<br>65<br>55<br>50 |
| 2 | | 07:00 - 08:00 | 48.4 | 49.2 | | | | | |
| 3 | | 08:00 - 09:00 | 56.4 | 58 | | | | | |
| 4 | | 09:00 – 10:00 | 54.3 | 51.8 | | | | | |
| 5 | | 10:00 - 11:00 | 57.6 | 56.5 | | | | | |
| 6 | | 11:00 - 12:00 | 61.1 | 61.9 | | | | | |
| 7 | | 12:00 - 13:00 | 59.1 | 58.7 | | | | | |
| 8 | | 13:00 - 14:00 | 60.9 | 59.8 | | | | | |
| 9 | | 14:00 - 15:00 | 56.9 | 56.5 | | | | | |
| 10 | | 15:00 - 16:00 | 55 | 54.3 | | | | | |
| 11 | | 16:00 - 17:00 | 54.6 | 54.8 | | | | | |
| 12 | | 17:00 - 18:00 | 54.1 | 54.8 | | | | | |
| 13 | | 18:00 - 19:00 | 53.3 | 53.7 | | | | | |
| 14 | | 19:00 - 20:00 | 53.9 | 53.6 | | | | | |
| 15 | | 20:00 - 21:00 | 52.4 | 52.2 | | | | | |
| 16 | | 21:00 - 22:00 | 51.9 | 52.1 | | | | | |
| | | **Leq Day** | 56.4 | 56.3 | | | | | |
| 1 | Noise Level dB(A)Leq -Night | 22:00-23:00 | 47.9 | 47.9 | CPCB, Protocol for Ambient Level Noise Monitoring -2015 | 35 dB-135 dB | 35 dB(A) | Industrial<br>Commercial<br>Residential<br>Silence | 70<br>55<br>45<br>50 |
| 2 | | 23:00- 00:00 | 47.4 | 47.6 | | | | | |
| 3 | | 00:00- 01:00 | 46.5 | 47.6 | | | | | |
| 4 | | 01.00-02.00 | 45.5 | 46.3 | | | | | |
| 5 | | 02.00-03.00 | 45.3 | 45.4 | | | | | |
| 6 | | 03.00-04.00 | 45.3 | 45.5 | | | | | |
| 7 | | 04.00-05.00 | 47 | 47.1 | | | | | |
| 8 | | 05:00-06:00 | 47.4 | 47.6 | | | | | |
| | | **Leq Night** | 46.6 | 47.0 | | | | | |

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

Sampling Assistants — (Gaurav Kant) — (Amit Raj Mishra)

***ANALYSED BY*** — ***CHECKED BY*** — ***Authorised Signatory***

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

*Page -1 of 1*

TC-14321

cmpdi A Mini Ratna Company

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** | **06/2025** | **Cluster** | **Cluster XI** | **ULR No.** | **TC1432125000001934F** |
| **Customer** | **Environment Department, Bharat Coking Coal Limited (BCCL), Koyla Bhawan, Dhanbad (E-mail: gmenv.bccl@coalindia.in)** | | | **Date of Issue** | **11.08.2025** |
| **Project** | | **Sample Ref. No.** | **REM/BCCL/2025/06** | **Sampling Method** | **CMPDI/RI-II/LPM 22** |
| **Sampling Stations** | **i** | **Moonidih Washery** | **Date of Sampling** 12.06.25 – 26.06.25 | **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 | 51.9 | 52.1 | CPCB, Protocol for Ambient Level Noise Monitoring -2015 | 35 dB-135 dB | 35 dB(A) | Industrial<br>Commercial<br>Residential<br>Silence | 75<br>65<br>55<br>50 |
| 2 | | 07:00 - 08:00 | 54.3 | 54.8 | | | | | |
| 3 | | 08:00 - 09:00 | 58.2 | 57.8 | | | | | |
| 4 | | 09:00 – 10:00 | 62 | 62.1 | | | | | |
| 5 | | 10:00 - 11:00 | 64.5 | 64.5 | | | | | |
| 6 | | 11:00 - 12:00 | 65.5 | 62.9 | | | | | |
| 7 | | 12:00 - 13:00 | 67.3 | 69.2 | | | | | |
| 8 | | 13:00 - 14:00 | 66.7 | 66.7 | | | | | |
| 9 | | 14:00 - 15:00 | 61.3 | 62.1 | | | | | |
| 10 | | 15:00 - 16:00 | 62.1 | 61 | | | | | |
| 11 | | 16:00 - 17:00 | 60.5 | 59.4 | | | | | |
| 12 | | 17:00 - 18:00 | 59.1 | 58.2 | | | | | |
| 13 | | 18:00 - 19:00 | 57.6 | 57.5 | | | | | |
| 14 | | 19:00 - 20:00 | 56.4 | 57 | | | | | |
| 15 | | 20:00 - 21:00 | 55.5 | 53.6 | | | | | |
| 16 | | 21:00 - 22:00 | 53 | 53.7 | | | | | |
| | | | 62.0 | 62.2 | | | | | |
| 1 | Noise Level dB(A)Leq -Night | 22:00-23:00 | 51.7 | 52.3 | CPCB, Protocol for Ambient Level Noise Monitoring -2015 | 35 dB-135 dB | 35 dB(A) | Industrial<br>Commercial<br>Residential<br>Silence | 70<br>55<br>45<br>50 |
| 2 | | 23:00- 00:00 | 50.3 | 49.5 | | | | | |
| 3 | | 00:00- 01:00 | 45.9 | 45.8 | | | | | |
| 4 | | 01.00-02.00 | 45.5 | 45.5 | | | | | |
| 5 | | 02.00-03.00 | 45.2 | 44.3 | | | | | |
| 6 | | 03.00-04.00 | 44.7 | 45.4 | | | | | |
| 7 | | 04.00-05.00 | 47 | 47.4 | | | | | |
| 8 | | 05:00-06:00 | 47.4 | 47.6 | | | | | |
| | | **Leq Night** | 47.9 | 48.0 | | | | | |

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

| | | | | |
|---|---|---|---|---|
| Sampling Assistants | (Gaurav Kant) | | | (Amit Raj Mishra) |
| ***ANALYSED BY*** | ***CHECKED BY*** | | | ***Authorised Signatory*** |

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

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

*Page -1 of 1*

TC-14321

# 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** | **06/2025** | **Cluster** | **Cluster XI** | **ULR No.** | **TC1432125000001934F** |
| **Customer** | **Environment Department, Bharat Coking Coal Limited (BCCL), Koyla Bhawan, Dhanbad (E-mail: gmenv.bccl@coalindia.in)** | | | **Date of Issue** | 11.08.2025 |
| **Project** | | **Sample Ref. No.** | **REM/BCCL/2025/ 06** | **Sampling Method** | **CMPDI/RI-II/LPM 22** |
| **Sampling Stations** | **i** | **Kusunda OCP** | **Date of Sampling** | 09.06.25 – 23.06.25 | **Zone Category of Station:** **Bufferr 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 | 51.9 | 52.2 | CPCB, Protocol for Ambient Level Noise Monitoring -2015 | 35 dB-135 dB | 35 dB(A) | Industrial | 75 |
| 2 | | 07:00 - 08:00 | 55.5 | 54.8 | | | | Commercial | 65 |
| 3 | | 08:00 - 09:00 | 58.7 | 54.7 | | | | Residential | 55 |
| 4 | | 09:00 – 10:00 | 64.5 | 62.5 | | | | Silence | 50 |
| 5 | | 10:00 - 11:00 | 66.7 | 65.4 | | | | | |
| 6 | | 11:00 - 12:00 | 65.2 | 63.8 | | | | | |
| 7 | | 12:00 - 13:00 | 68.4 | 66.8 | | | | | |
| 8 | | 13:00 - 14:00 | 69.9 | 67.4 | | | | | |
| 9 | | 14:00 - 15:00 | 69.9 | 62.3 | | | | | |
| 10 | | 15:00 - 16:00 | 61.9 | 61.3 | | | | | |
| 11 | | 16:00 - 17:00 | 62.1 | 69.6 | | | | | |
| 12 | | 17:00 - 18:00 | 61.6 | 60.3 | | | | | |
| 13 | | 18:00 - 19:00 | 60 | 59.3 | | | | | |
| 14 | | 19:00 - 20:00 | 60.2 | 58.2 | | | | | |
| 15 | | 20:00 - 21:00 | 58.5 | 57.6 | | | | | |
| 16 | | 21:00 - 22:00 | 59 | 57.7 | | | | | |
| | | **Leq Day** | 64.7 | 63.4 | | | | | |
| 1 | Noise Level dB(A)Leq -Night | 22:00-23:00 | 50.7 | 48.6 | CPCB, Protocol for Ambient Level Noise Monitoring -2015 | 35 dB-135 dB | 35 dB(A) | Industrial | 70 |
| 2 | | 23:00- 00:00 | 47.6 | 47.6 | | | | Commercial | 55 |
| 3 | | 00:00- 01:00 | 46.2 | 44.3 | | | | Residential | 45 |
| 4 | | 01.00-02.00 | 44.3 | 44 | | | | Silence | 50 |
| 5 | | 02.00-03.00 | 43.5 | 43.1 | | | | | |
| 6 | | 03.00-04.00 | 37.3 | 43 | | | | | |
| 7 | | 04.00-05.00 | 38.9 | 44.6 | | | | | |
| 8 | | 05:00-06:00 | 41 | 45.9 | | | | | |
| | | Leq Night | 45.6 | 45.6 | | | | | |

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

| | | | | |
|---|---|---|---|---|
| Sampling Assistants | | (Gaurav Kant) | | (Amit Raj Mishra) |
| ***ANALYSED BY*** | | ***CHECKED BY*** | | ***Authorised Signatory*** |

*Note: The results above relate to the samples tested as received. This report cannot 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**<br><br>Coal mines located in the coal fields of<br>• Jharia<br>• Raniganj<br>• Bokaro | Suspended Particulate Matter (SPM) | Annual Average *<br>24 hours **| 500 µg/$m^3$<br><br>700 µg/$m^3$ | - High Volume Sampling (Average flow rate not less than 1.1 $m^3$ |
| | Respirable Particulate Matter (size less than 10 µm) (RPM) | Annual Average *<br>24 hours **| 250 µg/$m^3$<br><br>300 µg/$m^3$ | Respirable Particulate Matter sampling and analysis |
| | Sulphur Dioxide ($SO_2$) | Annual Average *<br>24 hours **| 80 µg/$m^3$<br><br>120 µg/$m^3$ | 1.Improvedwest and Gaeke method<br>2.Ultraviolet fluorescene |
| | Oxide of Nitrogen as $NO_2$ | Annual Average *<br>24 hours **| 80 µg/$m^3$<br><br>120 µg/$m^3$ | 1. Jacob & Hochheiser Modified (Na-Arsenic) Method<br>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.

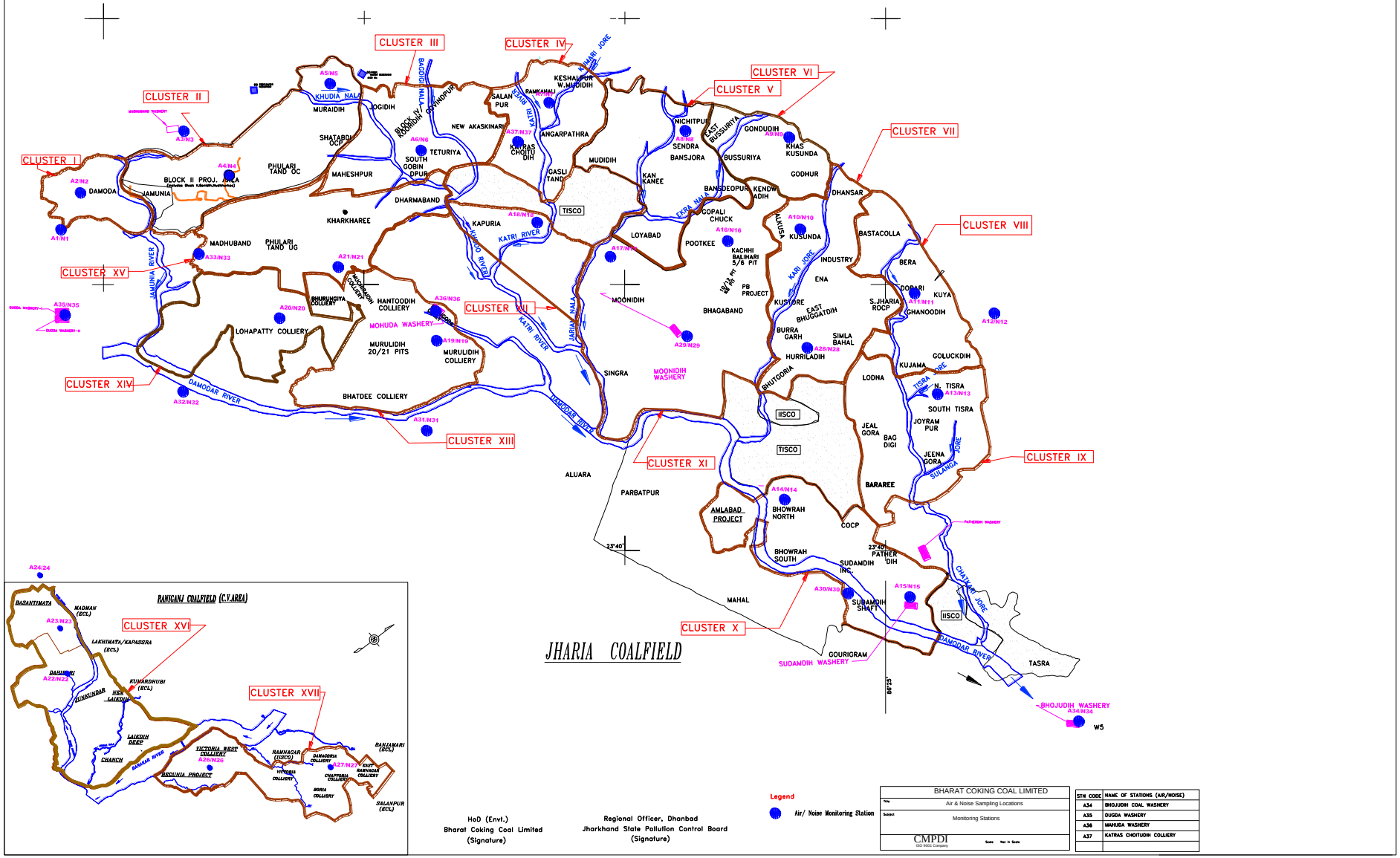
| Pollutant | Time Weighted Average | Concentration in Ambient Air | | Methods of Measurement |
|---|---|---|---|---|
| | | Industrial, Residential, Rural and other Areas | Ecologically Sensitive Area (Notified by Central Government) | |
| **Sulphur Dioxide ($SO_2$), µg/m³** | Annual *<br>24 Hours ** | 50<br>80 | 20<br>80 | -Improved West and Gaeke Method<br>-Ultraviolet Fluorescence |
| **Nitrogendioxide ($NO_2$), µg/m³** | Annual *<br>24 Hours ** | 40<br>80 | 30<br>80 | -Jacob &Hochheiser modified ($NaOH$-$NaAsO_2$) Method<br>-Gas Phase Chemiluminescence |
| **Particulate Matter (Size less than 10µm) or $PM_{10}$, µg/m³** | Annual *<br>24 Hours ** | 60<br>100 | 60<br>100 | -Gravimetric<br>-TEOM<br>-Beta attenuation |
| **Particulate Matter (Size less than 2.5µm) or $PM_{2.5}$, µg/m³** | Annual *<br>24 Hours ** | 40<br>60 | 40<br>60 | -Gravimetric<br>-TEOM<br>-Beta attenuation |
| **Ozone ($O_3$) , µg/m³** | 8 Hours *<br>1 Hour ** | 100<br>180 | 100<br>180 | -UV Photometric<br>-Chemiluminescence<br>-Chemical Method |
| **Lead (Pb) , µg/m³** | Annual *<br>24 Hours ** | 0.50<br>1.0 | 0.50<br>1.0 | -AAS/ICP Method after sampling on EPM 2000 or equivalent filter paper<br>-ED-XRF using Teflon filter |
| **Carbon Monoxide (CO), mg/m³** | 8 Hours **<br>1 Hour ** | 02<br>04 | 02<br>04 | -Non dispersive Infrared (NDIR) Spectroscopy |
| **Ammonia ($NH_3$), µg/m³** | Annual *<br>24 Hours ** | 100<br>400 | 100<br>400 | -Chemiluminescence<br>-Indophenol blue method |
| **Benzene ($C_6H_6$), µg/m³** | Annual * | 05 | 05 | -Gas Chromatography (GC) based continuous analyzer<br>-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.

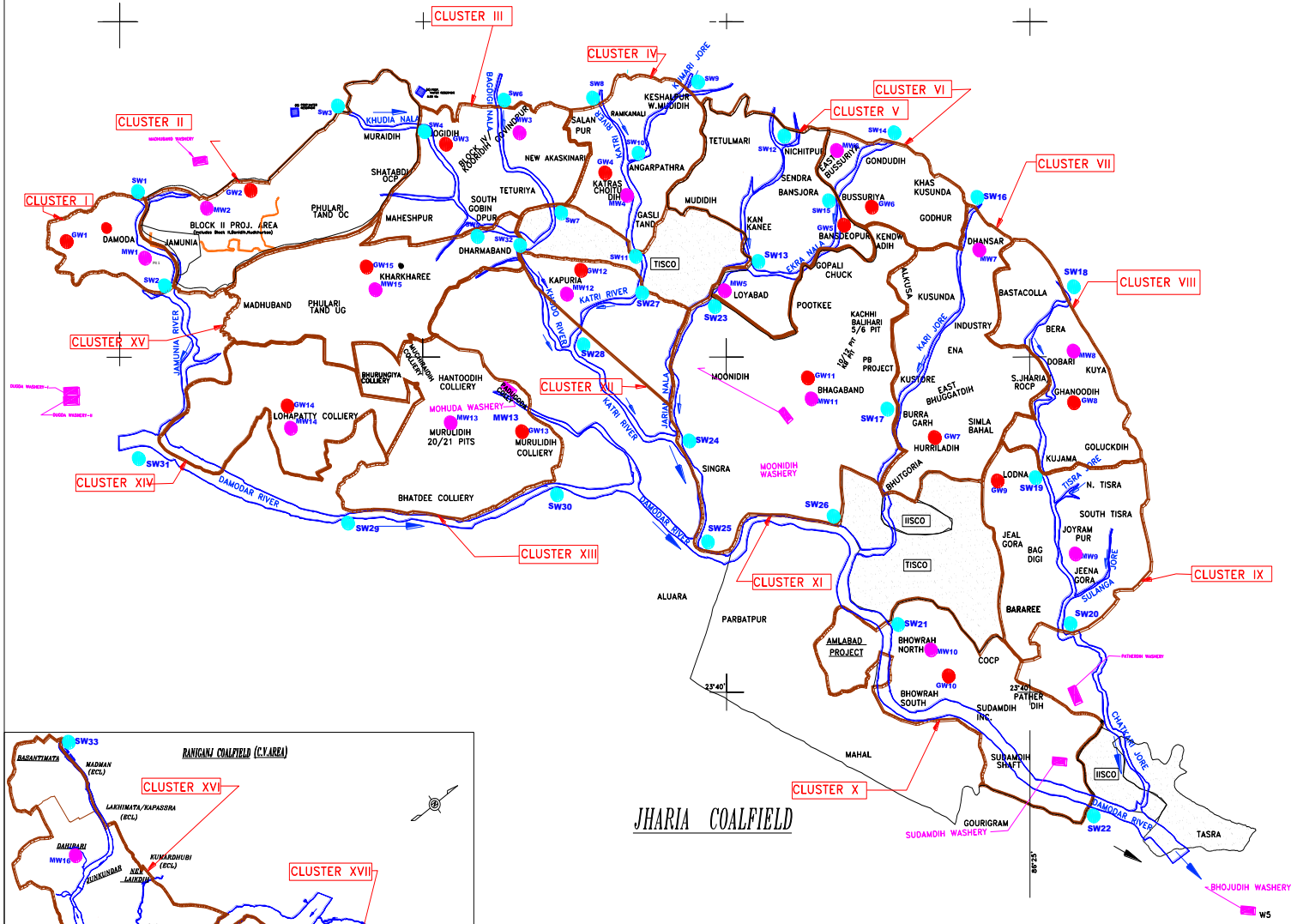
** 24 hourly or 8 hourly or 1 hourly monitored values, as applicable, shall be complied with 98% of the time in a year. 2% of the time, they JUNE exceed the limits but not on two consecutive days of monitoring.

**NOTE:**Whenever and wherever monitoring results on two consecutive days of monitoring exceed the limits specified above for the respective catego

# Location of Air & Noise Monitoring Stations in BCCL



# Water Sampling Locations in BCCL




## INDEX

| Cluster | Suface Water (U/S, D/S) | Name of River/ Nala / Jore | Mine/ Effluent Water | Sampling Location | Ground Water | Sampling Location |
|---|---|---|---|---|---|---|
| I | SW1, SW2 | Jamunia River | MW1 | Damoda Area | GW1 | Ghutway Village |
| II | SW3, SW4 | Khudia Nala | MW2 | Block II OCP | GW2 | Joyrampur Village |
| III | SW4, SW5, SW6, SW7 | Khudia Nala, Bagdigi Nala | MW3 | Govindpur Colliery | GW3 | Jogidih Village |
| IV | SW8, SW11, SW9, SW10 | Katri River, Kumari Jore | MW4 | Chotudih | GW4 | Kankanee Village |
| V | SW12, SW13, SW15 | Jarian Nala, Ekra Nala | MW5 | Mudidih | GW5 | Nichitpur |
| VI | SW14, SW15 | Ekra Nala | MW6 | East Bassuria UGP | GW6 | Bansjora Borewell |
| VII | SW16, SW17 | Kari Jore | MW7 | Dhansar UGP | GW7 | Hurriladih |
| VIII | SW18, SW19 | Kashi Jore | MW8 | Dobari UGP | GW8 | Ghanudih |
| IX | SW19, SW20 | Kashi Jore | MW9 | Jeenagora | GW9 | Lodna |
| X | SW21, SW22 | Damodar River | MW10 | Bhowrah North | GW10 | Bhowrah South |
| XI | SW23, SW24, SW25, SW26 | Jarian Nala, Damodar River | MW11 | Bhagaband h UGP | GW11 | Bhagabandh |
| XII | SW27, SW28 | Katri River | MW12 | Kapuria | GW12 | Kapuria |
| XIII | SW29, SW30 | Damodar River | MW13 | Murulidih (20/21) | GW13 | Murilidih |
| XIV | SW31, SW29 | Damodar River | MW14 | Lohapatti | GW14 | Lohapatti |
| XV | SW5, SW32 | Khudia Nala | MW15 | Kharkharee UGP | GW15 | Kharkharee |
| XVI | SW33, SW34 | Khudia River | MW16 | Dahibari OCP | GW16 | Patlabari Village |
| XVII | SW35, SW36 | Barakar River | MW17 | Damagoria Colliery | GW17 | Chaptoria |

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# ENVIRONMENTAL MONITORING REPORT OF BHARAT COKING COAL LIMITED, CLUSTER – XI

**(FOR THE MONTH JULY, 2025)**

**E. C. no. J-11015/77/2011-IA.II (M) dated 26.07.2019.**

# CMPDI

ISO 9001 Company

**Regional Institute-II**

**Dhanbad, Jharkhand**

# CONTENTS


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| 4. | CHAPTER-IV | STANDARDS AND PLANS | 20-21 |

# 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 $23^0$37' N to $23^0$52' N latitudes and $86^0$09' E to $86^0$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 ($PM_{10}$), Fine Particulate Matter ($PM_{2.5}$), Sulphur Di-oxide ($SO_2$) and

Nitrogen Oxides ($NO_X$). Respirable Dust Samplers (RDS) and Fine Dust Sampler ($PM_{2.5}$ sampler) were used for sampling of $PM_{10,}$ $SO_2$, & $NO_X$ 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 $PM_{10,}$ $PM_{2.5}$, $SO_2$ 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 $PM_{10}$& $PM_{2.5}$ 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 Standards for Coal Mines were within permissible limits.

### 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-XI is in the Western & Southern part of the Jharia coalfield. It includes a group of 8 Mines (viz. Gopalichak UG&OC Mine**,** Kachhi Balihari 10/12 Pit UG Mine**,** PB UG Project,Bhagabandh UG Mine, Kenwadih UG, Pootkee UG, Kachi Balihari 5/6Pit UG, Moonidih UG mine). The Cluster – XI is situated about 25 - 30 kms from Dhanbad Railway Station. The mines of this Cluster – XI 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 Jarian nala & Damodar River.

1.2 The Project has Environmental Clearance from Ministry of Environment, Forests and Climate Change (MoEF&CC) for a rated capacity 5.08 MTPA (normative) and 6.604 MTPA (peak) capacity of coal production vide letter no. J-11015/77/2011-IA.II (M) dated 26$^{th}$ July, 2019.

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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 $PM_{10}$, $PM_{2.5}$, $SO_2$, NOx 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) Pootkee Balihari Office (A16): Industrial Area**

The location of the sampling station is 23°45'17.23"N 86°21'46.27"E. The sampler was placed at an elevated platform approx. 1.5m above ground level at Project 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 sampler was placed at an elevated platform approx. 1.5m above ground level at project office.

**iii) Moonidih Washery (A29): Industrial Area**

The location of the sampling station is 23°44'26.00"N 86°21'16.00"E. The sampler was placed at a height of approx. 1.5m above ground level at Project office.

**II.BUFFER ZONE Monitoring Location**

**I) Kusunda OCP (A10)**

The location of the sampling station is 23°46'49.07"N 86°24'15.71"E. The sampler was placed at a height of approx. 1.5m above ground level at Safety Office.

# AMBIENT AIR QUALITY DATA

TC-14321

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** | **07/2025** | **Cluster** | **Cluster XI** | **ULR No.** | TC1432125000001954F |
| **Customer** | **Environment Department, Bharat Coking Coal Limited (BCCL), Koyla Bhawan, Dhanbad (E-mail: gmenv.bccl@coalindia.in)** | | | **Date of Issue** | **21.08.2025** |
| **Project** | **Pootkee Balihari Office** | **Sample Ref. No.** | **REM/BCCL/2025/07** | **Sampling Method** | **CMPDI/RI-II/LPM 13 , ( IS 5182)** |
| **Date of Sampling** | 10.07.25 | 25.07.25 | **Period of Analysis** | 10.07025 to 20.08.2025 | **Zone of Station:** **Core Zone** |

| **Sl. No.** | **Parameter** | **Method of Analysis** | **Observed Values ( in µg/m³)** | | **Range Of Testing** | **LDL** | **MoEF Standards Notification dated 25th September,2000 (GSR 742 E )** | **NAAQS, 2009** |
|---|---|---|---|---|---|---|---|---|
| | | | **A4212** | **A4296** | | | | |
| 1 | $PM_{10}$ | IS -5182(Part 23):2006, R-2017 | 72 | 68 | 10 µg/m³ - 1000 µg/m³ | 10 µg/m³ | 300 | 100 |
| 2 | $PM_{2.5}$ | IS -5182(Part 24):2019 | 32 | 29 | 10 µg/m³ - 400 µg/m³ | 10 µg/m³ | Not Specified | 60 |
| 3 | $SO_2$ | IS-5182(Part-2): 2001 , R-2017 | 10 | 10 | 10 µg/m³ - 1050 µg/m³ | 10 µg/m³ | 120 | 80 |
| 4 | $NO_2$ | IS-5182 (Part-6): 2006 , R-2017 | 34 | 36 | 06 µg/m³ - 420 µg/m³ | 06 µg/m³ | 120 | 80 |

*Environmental Condition : Sunny*

** LDL indicates Lower Detection Limit,*

***All units are in µg/m3, 24 hourly Average,*

***ANALYSED BY***

(Gaurav Kant)
***CHECKED BY***

(Amit Raj Mishra)
***Authorised Signatory***

***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 Air Quality Test Report

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DHANBAD. -826005
Phone:0326-223-850
email: rdri2cmpdi@coalindia.in

**Test Report for Ambient Air Samples**

| | | | | | |
|---|---|---|---|---|---|
| **Month & Year** | **07/2025** | **Cluster** | **Cluster XI** | **ULR No.** | TC1432125000001954F |
| **Customer** | **Environment Department, Bharat Coking Coal Limited (BCCL), Koyla Bhawan, Dhanbad (E-mail: gmenv.bccl@coalindia.in)** | | | **Date of Issue** | **21.08.2025** |
| **Project** | **Moonidih UGP** | **Sample Ref. No.** | **REM/BCCL/2025/07** | **Sampling Method** | **CMPDI/RI-II/LPM 13 , ( IS 5182)** |
| **Date of Sampling** | 10.07.25 | 28.07.25 | **Period of Analysis** | 10.07.25 to 20.08.25 | **Zone of Station:** **Core Zone** |

| **Sl. No.** | **Parameter** | **Method of Analysis** | **Observed Values ( in µg/m³)** | | **Range Of Testing** | **LDL** | **MoEF Standards Notification dated 25th September,2000 (GSR 742 E )** | **NAAQS, 2009** |
|---|---|---|---|---|---|---|---|---|
| | | | **A4217** | **A4305** | | | | |
| 1 | $PM_{10}$ | IS -5182(Part 23):2006, R-2017 | 83 | 81 | 10 µg/m³ - 1000 µg/m³ | 10 µg/m³ | 300 | 100 |
| 2 | $PM_{2.5}$ | IS -5182(Part 24):2019 | 37 | 33 | 10 µg/m³ - 400 µg/m³ | 10 µg/m³ | Not Specified | 60 |
| 3 | $SO_2$ | IS-5182(Part-2): 2001 , R-2017 | <10 | 10 | 10 µg/m³ - 1050 µg/m³ | 10 µg/m³ | 120 | 80 |
| 4 | $NO_2$ | IS-5182 (Part-6): 2006 , R-2017 | 33 | 29 | 06 µg/m³ - 420 µg/m³ | 06 µg/m³ | 120 | 80 |

*Environmental Condition : Sunny*

** LDL indicates Lower Detection Limit,*

***All units are in µg/m3, 24 hourly Average,*

***ANALYSED BY***

(Gaurav Kant)
***CHECKED BY***

(Amit Raj Mishra)
***Authorised Signatory***

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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

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KOYLA BHAWAN COMPLEX
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email: rdri2cmpdi@coalindia.in

**Test Report for Ambient Air Samples**

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| **Month & Year** | **07/2025** | **Cluster** | **Cluster XI** | | | **ULR No.** | TC1432125000001954F |
| **Customer** | **Environment Department, Bharat Coking Coal Limited (BCCL), Koyla Bhawan, Dhanbad (E-mail: gmenv.bccl@coalindia.in)** | | | | | **Date of Issue** | **21.08.2025** |
| **Project** | **Moonidih Washery** | | **Sample Ref. No.** | **REM/BCCL/2025/07** | **Sampling Method** | **CMPDI/RI-II/LPM 13 , ( IS 5182)** | |
| **Date of Sampling** | 10.07.25 | | 28.07.25 | **Period of Analysis** | 10.07.25 to 20.08.25 | **Zone of Station:** | **Core Zone** |

| **Sl. No.** | **Parameter** | **Method of Analysis** | **Observed Values ( in µg/m³)** | | **Range Of Testing** | **LDL** | **MoEF Standards Notification dated 25th September,2000 (GSR 742 E )** | **NAAQS, 2009** |
|---|---|---|---|---|---|---|---|---|
| | | | **A4218** | **A4306** | | | | |
| 1 | $PM_{10}$ | IS -5182(Part 23):2006, R-2017 | 70 | 65 | 10 µg/m³ - 1000 µg/m³ | 10 µg/m³ | 300 | 100 |
| 2 | $PM_{2.5}$ | IS -5182(Part 24):2019 | 32 | 31 | 10 µg/m³ - 400 µg/m³ | 10 µg/m³ | Not Specified | 60 |
| 3 | $SO_2$ | IS-5182(Part-2): 2001 , R-2017 | <10 | <10 | 10 µg/m³ - 1050 µg/m³ | 10 µg/m³ | 120 | 80 |
| 4 | $NO_2$ | IS-5182 (Part-6): 2006 , R-2017 | 37 | 34 | 06 µg/m³ - 420 µg/m³ | 06 µg/m³ | 120 | 80 |

*Environmental Condition : Sunny*

** LDL indicates Lower Detection Limit,*

***All units are in µg/m3, 24 hourly Average,*

***ANALYSED BY***

(Gaurav Kant)
***CHECKED BY***

(Amit Raj Mishra)
***Authorised Signatory***

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

*Page -1 of 1*

TC-14321

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

CMPDIL, RI-II
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email: rdri2cmpdi@coalindia.in

**Test Report for Ambient Air Samples**

| | | | | | |
|---|---|---|---|---|---|
| **Month & Year** | **07/2025** | **Cluster** | **Cluster XI** | **ULR No.** | TC1432125000001954F |
| **Customer** | **Environment Department, Bharat Coking Coal Limited (BCCL), Koyla Bhawan, Dhanbad (E-mail: gmenv.bccl@coalindia.in)** | | | **Date of Issue** | **21.08.2025** |
| **Project** | **Kusunda** | **Sample Ref. No.** | **REM/BCCL/2025/07** | **Sampling Method** | **CMPDI/RI-II/LPM 13 , ( IS 5182)** |
| **Date of Sampling** | 11.07.25 | 29.07.25 | **Period of Analysis** | 11.07.25 to 20.08.25 | **Zone of Station:** **Buffer Zone** |

| **Sl. No.** | **Parameter** | **Method of Analysis** | **Observed Values ( in µg/m³)** | | **Range Of Testing** | **LDL** | **MoEF Standards Notification dated 25th September,2000 (GSR 742 E )** | **NAAQS, 2009** |
|---|---|---|---|---|---|---|---|---|
| | | | **A4227** | **A4312** | | | | |
| 1 | $PM_{10}$ | IS -5182(Part 23):2006, R-2017 | 63 | 65 | 10 µg/m³ - 1000 µg/m³ | 10 µg/m³ | 300 | 100 |
| 2 | $PM_{2.5}$ | IS -5182(Part 24):2019 | 26 | 27 | 10 µg/m³ - 400 µg/m³ | 10 µg/m³ | Not Specified | 60 |
| 3 | $SO_2$ | IS-5182(Part-2): 2001 , R-2017 | 13 | <10 | 10 µg/m³ - 1050 µg/m³ | 10 µg/m³ | 120 | 80 |
| 4 | $NO_2$ | IS-5182 (Part-6): 2006 , R-2017 | 38 | 35 | 06 µg/m³ - 420 µg/m³ | 06 µg/m³ | 120 | 80 |

*Environmental Condition : Sunny*

** LDL indicates Lower Detection Limit,*

***All units are in µg/m3, 24 hourly Average,*

***ANALYSED BY***

(Gaurav Kant)
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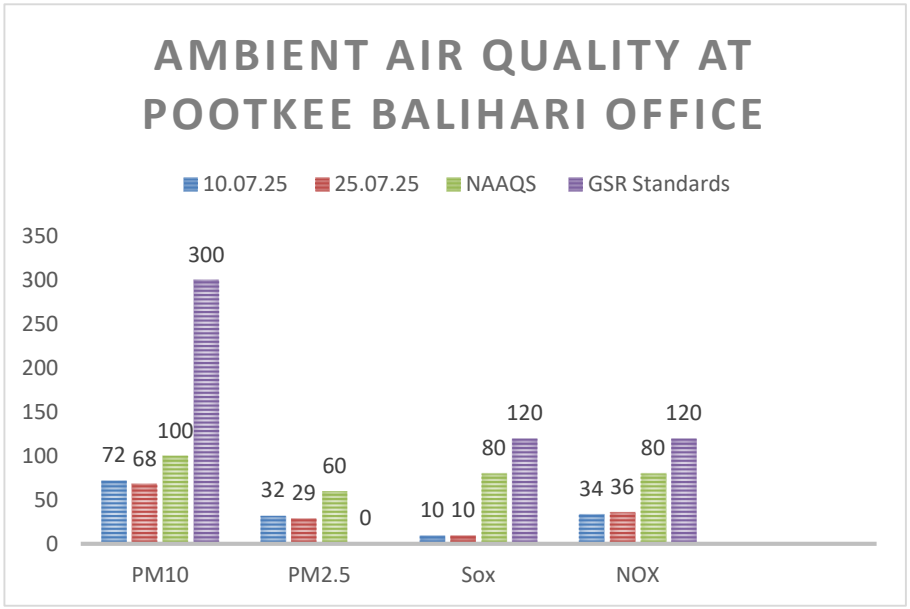
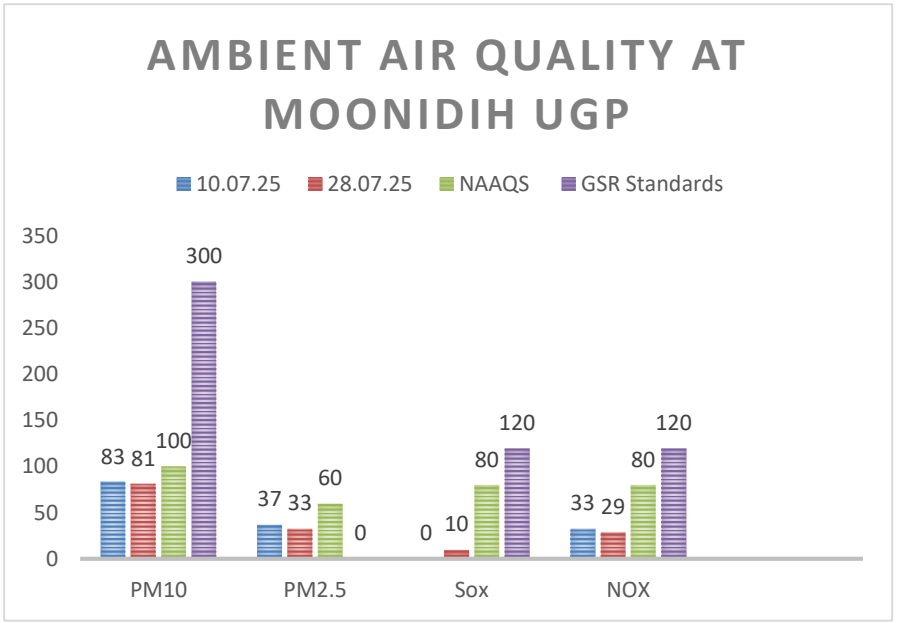
(Amit Raj Mishra)
***Authorised Signatory***

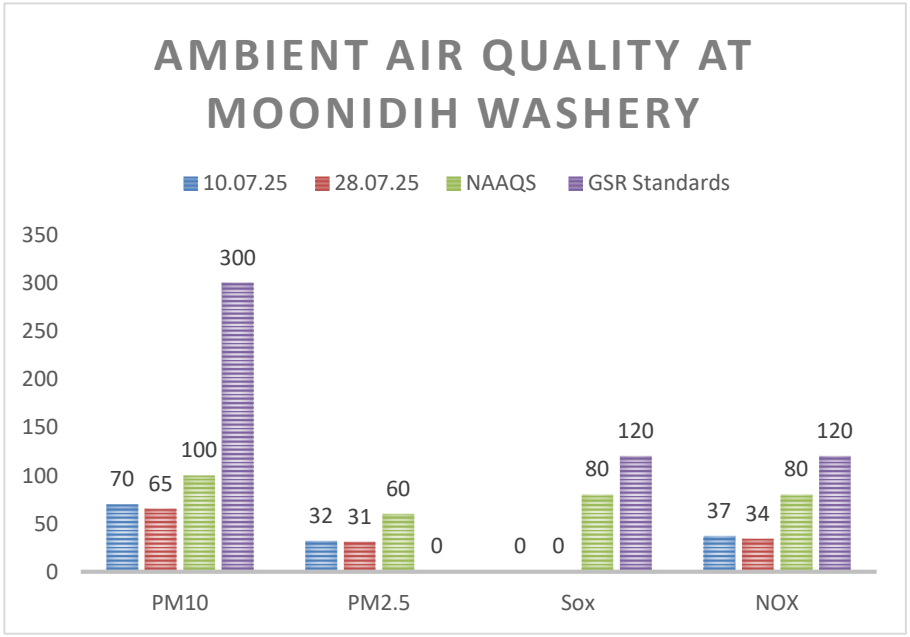
***Note**: The results above relate to the samples tested as received. This report can not be reproduced in part or full without the written permission of the HOD(Env) , CMPDI, RI-II.*

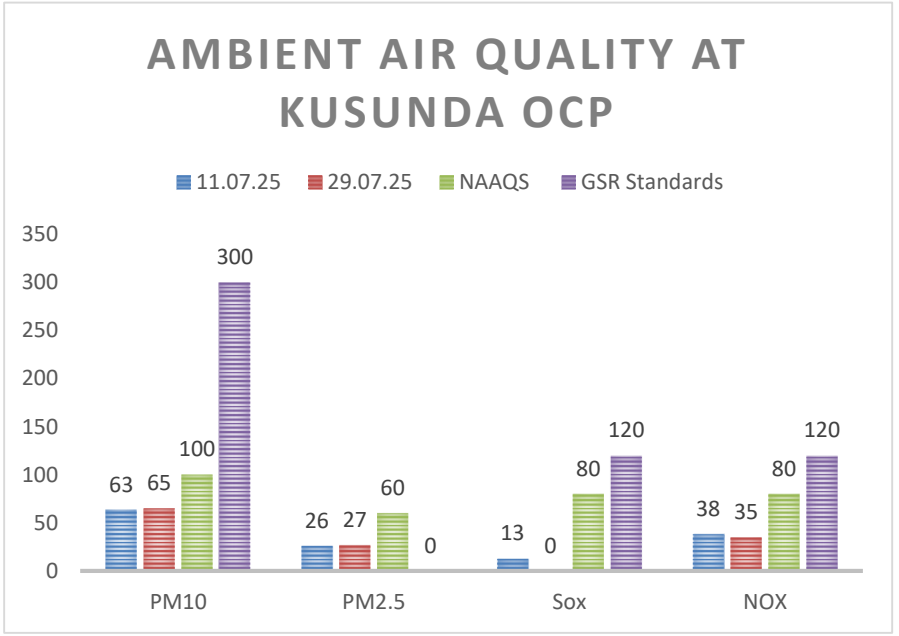
*---- End of Report ----*

*Page -1 of 1*


AMBIENT AIR QUALITY AT POOTKEE BALIHARI OFFICE
10.07.25
25.07.25
NAAQS
GSR Standards
350
300
250
200
150
100
50
0
72 68 100 300
32 29 60 0
10 10 80 120
34 36 80 120
PM10
PM2.5
Sox
NOX


AMBIENT AIR QUALITY AT MOONIDIH UGP
10.07.25
28.07.25
NAAQS
GSR Standards
350
300
250
200
150
100
50
0
83 81 100 300
37 33 60 0
0 10 80 120
33 29 80 120
PM10
PM2.5
Sox
NOX


AMBIENT AIR QUALITY AT MOONIDIH WASHERY
10.07.25
28.07.25
NAAQS
GSR Standards
350
300
250
200
150
100
50
0
70 65 100 300
32 31 60 0
0 0 80 120
37 34 80 120
PM10
PM2.5
Sox
NOX


AMBIENT AIR QUALITY AT KUSUNDA OCP
11.07.25
29.07.25
NAAQS
GSR Standards
350
300
250
200
150
100
50
0
63 65 100 300
26 27 60 0
13 0 80 120
38 35 80 120
PM10
PM2.5
Sox
NOX

# WATER QUALITY MONITORING

## 3.1 Location of sampling sites

(Refer **Plate No. – II**)

i) **Mine Discharge of Bhagabandh (MW11)**

A sampling point is fixed to assess the effluent quality of Mine discharge. This location is selected to monitor effluent discharge in to Kari jore.

## 3.2 Methodology of sampling and analysis

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

## 3.3 Results & Interpretations

The results are given in tabular form along with the applicable standards. Results are compared with Schedule - VI, effluent prescribed by MoEF&CC. Results show that most of the parameters are within the permissible limits.

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

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

**Test Report for Mine Effluent samples**

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| **Month & Year** | **07/2025** | **Cluster** | **Cluster XI** | **ULR No.** | | TC1432125000001972F | |
| **Customer** | **Environment Department, Bharat Coking Coal Limited (BCCL), Koyla Bhawan, Dhanbad (E-mail: gmenv.bccl@coalindia.in)** | | | | | **Date of Issue** | **21.08.25** |
| **Project** | | **Sampling Ref. No.** | **REM/BCCL/2025/ 07** | **Sampling Method** | **IS 3025 (Part-1)** | | **CMPDI/RI-II/LPM 13** |
| **Sampling Stations** | **(i)** | **Bhagabandh** | **Sample Collected in 2.5 Ltr Jerricane , Color as observed is transparent** | | | **Period of Analysis** | 01.07.25 to 20.08.25 |
| | | | **Date of Sampling** | 01.07.25 | 16.07.2025 | | |

| **Sl. No.** | **Parameter** | **Method of Analysis** | **Observed Values** | | **STANDARDS FOR COAL MINES (Stipulated by Ministry of Environment and Forests (MoEF), Vide Notification No. GSR 742(E), Dt: 25.09.2000)** | **LDL** |
|---|---|---|---|---|---|---|
| | | | **M1611** | **M1638** | | |
| 1 | Total Suspended Solids | IS 3025/17:1984, R :2017, Gravimetric | 42 | 40 | *100 (Max)* | 10 |
| 2 | pH | IS-3025/11:1983, R-2017, Electrometric | 7.85 | 7.8 | *5.5 - 9.0* | 0.2 |
| 3 | Oil & Grease | IS 3025/39:1991, R : 2019, Partition Gravimetric | <4.0 | <4.0 | *10 (Max)* | 2 |
| 4 | COD | APHA 23rd Edition 5220 C Titrimetric Method | 40 | 32 | *250 (Max)* | 4 |

***Grab sampling carried out for water samples **All units in mg/L unless specified otherwise *LDL indicates Lower Detection Limit & BDL indicates Below Detection Limit,*

***ANALYSED BY***

(Kumar Vaibhav)
***CHECKED BY***

(Amit Raj Mishra)
***Authorised Signatory***

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

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

# NOISE LEVEL QUALITY MONITORING

## 4.1Location of sampling sites

1. **Pootkee Balihari Office (N16)**
2. **Moonidih UGP (N17)**
3. **Moonidih Washery (N29)**
4. **Kusunda OCP (N10)**

**4.2**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

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

TC-14321

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| **Month & Year** | **07/2025** | **Cluster** | **Cluster XI** | | | **ULR No.** | TC14321250000019 88F |
| **Customer** | **Environment Department, Bharat Coking Coal Limited (BCCL), Koyla Bhawan, Dhanbad (E-mail: gmenv.bccl@coalindia.in)** | | | | | **Date of Issue** | **21.08.2025** |
| **Project** | | **Sample Ref. No.** | **REM/BCCL/2025/ 07** | | **Sampling Method** | **CMPDI/RI-II/LPM 22** | |
| **Sampling Stations** | **i** | **Pootki Balihari Office** | **Date of Sampling** | 10.07.25 | 25.07.25 | **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** | **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 | 46.2 | 47.1 | CPCB, Protocol for Ambient Level Noise Monitoring -2015 | 35 dB-135 dB | 35 Db (A) | Industrial<br>Commercial<br>Residential<br>Silence | 75<br>65<br>55<br>50 |
| 2 | | 07:00 - 08:00 | 46.9 | 47.2 | | | | | |
| 3 | | 08:00 - 09:00 | 48.6 | 49.5 | | | | | |
| 4 | | 09:00 – 10:00 | 51.8 | 50.9 | | | | | |
| 5 | | 10:00 - 11:00 | 53.8 | 57.5 | | | | | |
| 6 | | 11:00 - 12:00 | 54.3 | 55.7 | | | | | |
| 7 | | 12:00 - 13:00 | 62.8 | 63.5 | | | | | |
| 8 | | 13:00 - 14:00 | 63.2 | 58.1 | | | | | |
| 9 | | 14:00 - 15:00 | 62.2 | 62.9 | | | | | |
| 10 | | 15:00 - 16:00 | 55.3 | 55.7 | | | | | |
| 11 | | 16:00 - 17:00 | 71.4 | 70.5 | | | | | |
| 12 | | 17:00 - 18:00 | 51.1 | 49.9 | | | | | |
| 13 | | 18:00 - 19:00 | 48.7 | 48.7 | | | | | |
| 14 | | 19:00 - 20:00 | 47.4 | 47.2 | | | | | |
| 15 | | 20:00 - 21:00 | 46.2 | 45.2 | | | | | |
| 16 | | 21:00 - 22:00 | 46.5 | 46.6 | | | | | |
| | | Leq Day | 61.2 | 60.5 | | | | | |
| 1 | Noise Level dB(A)Leq -Night | 22:00-23:00 | 41.9 | 42.3 | CPCB, Protocol for Ambient Level Noise Monitoring -2015 | 35 dB-135 dB | 35 dB (A) | Industrial<br>Commercial<br>Residential<br>Silence | 70<br>55<br>45<br>50 |
| 2 | | 23:00- 00:00 | 41.3 | 42 | | | | | |
| 3 | | 00:00- 01:00 | 43.3 | 44.1 | | | | | |
| 4 | | 01.00-02.00 | 43.2 | 44 | | | | | |
| 5 | | 02.00-03.00 | 42.6 | 42.8 | | | | | |
| 6 | | 03.00-04.00 | 42.4 | 42.3 | | | | | |
| 7 | | 04.00-05.00 | 43.3 | 43.4 | | | | | |
| 8 | | 05:00-06:00 | 43.8 | 43.6 | | | | | |
| | | Leq Night | 42.8 | 43.1 | | | | | |

**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) | | (Amit Raj Mishra) |
| ANALYSED BY | CHECKED BY | | Authorised Signatory |

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

---- End of Report ----

CMPDIL, RI-II
KOYLA BHAWAN OMPLEX
DHANBAD. -826005
Phone:0326-223-850
email:i2cmpdi@coalindia.in

# CENTRAL MINE PLANNING AND DESIGN INSTITUTE LIMITED

## Environment Laboratory, Regional Institute-II

## Ambient Noise Level Test Report

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| **Month & Year** | **07/2025** | **Cluster** | **Cluster XI** | | | **ULR No.** | TC1432125000001988F |
| **Customer** | **Environment Department, Bharat Coking Coal Limited (BCCL), Koyla Bhawan, Dhanbad (E-mail: gmenv.bccl@coalindia.in)** | | | | | **Date of Issue** | **21.08.2025** |
| **Project** | | **Sample Ref. No.** | **REM/BCCL/2025/07** | **Sampling Method** | | **CMPDI/RI-II/LPM 22** | |
| **Sampling Stations** | **i** | **Moonidih UGP** | **Date of Sampling** | 10.07.25 | 28.07.25 | **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 | 46.9 | 47.1 | CPCB, Protocol for Ambient Level Noise Monitoring -2015 | 35 dB-135 dB | 35 dB(A) | Industrial<br>Commercial<br>Residential<br>Silence | 75<br>65<br>55<br>50 |
| 2 | | 07:00 - 08:00 | 46.8 | 46.3 | | | | | |
| 3 | | 08:00 - 09:00 | 47.4 | 48.9 | | | | | |
| 4 | | 09:00 – 10:00 | 52.8 | 52.1 | | | | | |
| 5 | | 10:00 - 11:00 | 54.3 | 52.8 | | | | | |
| 6 | | 11:00 - 12:00 | 57.5 | 55.7 | | | | | |
| 7 | | 12:00 - 13:00 | 63.7 | 61.5 | | | | | |
| 8 | | 13:00 - 14:00 | 58.2 | 59.4 | | | | | |
| 9 | | 14:00 - 15:00 | 62.3 | 62.9 | | | | | |
| 10 | | 15:00 - 16:00 | 56.3 | 55.7 | | | | | |
| 11 | | 16:00 - 17:00 | 71 | 72.9 | | | | | |
| 12 | | 17:00 - 18:00 | 48.9 | 47.5 | | | | | |
| 13 | | 18:00 - 19:00 | 48.1 | 46.6 | | | | | |
| 14 | | 19:00 - 20:00 | 48.6 | 47.1 | | | | | |
| 15 | | 20:00 - 21:00 | 46 | 47.1 | | | | | |
| 16 | | 21:00 - 22:00 | 47.1 | 48.6 | | | | | |
| | | **Leq Day** | 60.8 | 62.0 | | | | | |
| 1 | Noise Level dB(A)Leq -Night | 22:00-23:00 | 42.2 | 42 | CPCB, Protocol for Ambient Level Noise Monitoring -2015 | 35 dB-135 dB | 35 dB(A) | Industrial<br>Commercial<br>Residential<br>Silence | 70<br>55<br>45<br>50 |
| 2 | | 23:00- 00:00 | 42 | 41.7 | | | | | |
| 3 | | 00:00- 01:00 | 42.3 | 43.3 | | | | | |
| 4 | | 01.00-02.00 | 41.5 | 42.1 | | | | | |
| 5 | | 02.00-03.00 | 41.3 | 41.4 | | | | | |
| 6 | | 03.00-04.00 | 41.3 | 41.5 | | | | | |
| 7 | | 04.00-05.00 | 42.7 | 42.8 | | | | | |
| 8 | | 05:00-06:00 | 43.1 | 43.3 | | | | | |
| | | **Leq Night** | 42.1 | 42.3 | | | | | |

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

| | | | | | |
|---|---|---|---|---|---|
| Sampling Assistants | | (Gaurav Kant) | | | (Amit Raj Mishra) |
| ***ANALYSED BY*** | | ***CHECKED BY*** | | | ***Authorised Signatory*** |

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*Page -1 of 1*

TC-14321

cmpdi A Mini Ratna Company

# 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** | **07/2025** | **Cluster** | **Cluster XI** | **ULR No.** | TC1432125000001988F |
| **Customer** | **Environment Department, Bharat Coking Coal Limited (BCCL), Koyla Bhawan, Dhanbad (E-mail: gmenv.bccl@coalindia.in)** | | | **Date of Issue** | **21.08.2025** |
| **Project** | | **Sample Ref. No.** | **REM/BCCL/2025/07** | **Sampling Method** | **CMPDI/RI-II/LPM 22** |
| **Sampling Stations** | **i** | **Moonidih Washery** | **Date of Sampling** | 10.07.25 – 28.07.25 | **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 | 46.8 | 48.4 | CPCB, Protocol for Ambient Level Noise Monitoring -2015 | 35 dB-135 dB | 35 dB(A) | Industrial<br>Commercial<br>Residential<br>Silence | 75<br>65<br>55<br>50 |
| 2 | | 07:00 - 08:00 | 46.8 | 48.4 | | | | | |
| 3 | | 08:00 - 09:00 | 50 | 49 | | | | | |
| 4 | | 09:00 – 10:00 | 63 | 61.8 | | | | | |
| 5 | | 10:00 - 11:00 | 61.8 | 62.9 | | | | | |
| 6 | | 11:00 - 12:00 | 62.9 | 61.8 | | | | | |
| 7 | | 12:00 - 13:00 | 65 | 65.6 | | | | | |
| 8 | | 13:00 - 14:00 | 65.6 | 65.7 | | | | | |
| 9 | | 14:00 - 15:00 | 67.1 | 68.6 | | | | | |
| 10 | | 15:00 - 16:00 | 66.7 | 66 | | | | | |
| 11 | | 16:00 - 17:00 | 57 | 58.9 | | | | | |
| 12 | | 17:00 - 18:00 | 55.6 | 58.3 | | | | | |
| 13 | | 18:00 - 19:00 | 53.3 | 56.9 | | | | | |
| 14 | | 19:00 - 20:00 | 52.5 | 54.7 | | | | | |
| 15 | | 20:00 - 21:00 | 52.1 | 53.3 | | | | | |
| 16 | | 21:00 - 22:00 | 51.3 | 50.7 | | | | | |
| | | | 61.7 | 62.2 | | | | | |
| 1 | Noise Level dB(A)Leq -Night | 22:00-23:00 | 47.1 | 46.4 | CPCB, Protocol for Ambient Level Noise Monitoring -2015 | 35 dB-135 dB | 35 dB(A) | Industrial<br>Commercial<br>Residential<br>Silence | 70<br>55<br>45<br>50 |
| 2 | | 23:00- 00:00 | 45.8 | 45.1 | | | | | |
| 3 | | 00:00- 01:00 | 41.8 | 41.7 | | | | | |
| 4 | | 01.00-02.00 | 41.5 | 41.5 | | | | | |
| 5 | | 02.00-03.00 | 41.2 | 40.2 | | | | | |
| 6 | | 03.00-04.00 | 40.7 | 41.4 | | | | | |
| 7 | | 04.00-05.00 | 42.7 | 43.1 | | | | | |
| 8 | | 05:00-06:00 | 43.1 | 43.3 | | | | | |
| | | **Leq Night** | 43.6 | 43.3 | | | | | |

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

| | | | |
|---|---|---|---|
| Sampling Assistants | (Gaurav Kant) | | (Amit Raj Mishra) |
| ***ANALYSED BY*** | ***CHECKED BY*** | | ***Authorised Signatory*** |

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

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

*Page -1 of 1*

TC-14321

# 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** | 07/2025 | **Cluster** | Cluster XI | **ULR No.** | TC1432125000001988F |
| **Customer** | Environment Department, Bharat Coking Coal Limited (BCCL), Koyla Bhawan, Dhanbad (E-mail: gmenv.bccl@coalindia.in) | | | **Date of Issue** | 21.08.2025 |
| **Project** | | **Sample Ref. No.** | REM/BCCL/2025/ 07 | **Sampling Method** | CMPDI/RI-II/LPM 22 |
| **Sampling Stations** | i | **Kusunda OCP** | **Date of Sampling** | 11.07.25 – 29.07.25 | **Zone Category of Station:** Bufferr 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 | 46.8 | 47.1 | CPCB, Protocol for Ambient Level Noise Monitoring -2015 | 35 dB-135 dB | 35 dB(A) | Industrial<br>Commercial<br>Residential<br>Silence | 75<br>65<br>55<br>50 |
| 2 | | 07:00 - 08:00 | 48.6 | 47.4 | | | | | |
| 3 | | 08:00 - 09:00 | 48.9 | 49.4 | | | | | |
| 4 | | 09:00 – 10:00 | 51.3 | 50.9 | | | | | |
| 5 | | 10:00 - 11:00 | 54.6 | 52.8 | | | | | |
| 6 | | 11:00 - 12:00 | 54.8 | 55.8 | | | | | |
| 7 | | 12:00 - 13:00 | 63.7 | 62.2 | | | | | |
| 8 | | 13:00 - 14:00 | 62.3 | 61.2 | | | | | |
| 9 | | 14:00 - 15:00 | 62.3 | 62.9 | | | | | |
| 10 | | 15:00 - 16:00 | 63.3 | 62.8 | | | | | |
| 11 | | 16:00 - 17:00 | 62.1 | 63.5 | | | | | |
| 12 | | 17:00 - 18:00 | 50.9 | 51.2 | | | | | |
| 13 | | 18:00 - 19:00 | 50.9 | 50 | | | | | |
| 14 | | 19:00 - 20:00 | 48.1 | 47.5 | | | | | |
| 15 | | 20:00 - 21:00 | 46.3 | 44.8 | | | | | |
| 16 | | 21:00 - 22:00 | 46.6 | 48.1 | | | | | |
| | | **Leq Day** | 58.3 | 58.1 | | | | | |
| 1 | Noise Level dB(A)Leq -Night | 22:00-23:00 | 42.5 | 43.8 | CPCB, Protocol for Ambient Level Noise Monitoring -2015 | 35 dB-135 dB | 35 dB(A) | Industrial<br>Commercial<br>Residential<br>Silence | 70<br>55<br>45<br>50 |
| 2 | | 23:00- 00:00 | 42 | 40.8 | | | | | |
| 3 | | 00:00- 01:00 | 41.4 | 39.5 | | | | | |
| 4 | | 01.00-02.00 | 41.3 | 39.4 | | | | | |
| 5 | | 02.00-03.00 | 39.9 | 40.8 | | | | | |
| 6 | | 03.00-04.00 | 39.5 | 40.2 | | | | | |
| 7 | | 04.00-05.00 | 40.7 | 39.5 | | | | | |
| 8 | | 05:00-06:00 | 41.3 | 41.7 | | | | | |
| | | Leq Night | 41.2 | 41.0 | | | | | |

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

| | | |
|---|---|---|
| Sampling Assistants | (Gaurav Kant) | (Amit Raj Mishra) |
| ***ANALYSED BY*** | ***CHECKED BY*** | ***Authorised Signatory*** |

*Note: The results above relate to the samples tested as received. This report cannot 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**<br><br>Coal mines located in the coal fields of<br>• Jharia<br>• Raniganj<br>• Bokaro | Suspended Particulate Matter (SPM) | Annual Average *<br>24 hours **| 500 µg/$m^3$<br><br>700 µg/$m^3$ | - High Volume Sampling (Average flow rate not less than 1.1 $m^3$ |
| | Respirable Particulate Matter (size less than 10 µm) (RPM) | Annual Average *<br>24 hours **| 250 µg/$m^3$<br><br>300 µg/$m^3$ | Respirable Particulate Matter sampling and analysis |
| | Sulphur Dioxide ($SO_2$) | Annual Average *<br>24 hours **| 80 µg/$m^3$<br><br>120 µg/$m^3$ | 1.Improvedwest and Gaeke method<br>2.Ultraviolet fluorescene |
| | Oxide of Nitrogen as $NO_2$ | Annual Average *<br>24 hours **| 80 µg/$m^3$<br><br>120 µg/$m^3$ | 1. Jacob & Hochheiser Modified (Na-Arsenic) Method<br>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.

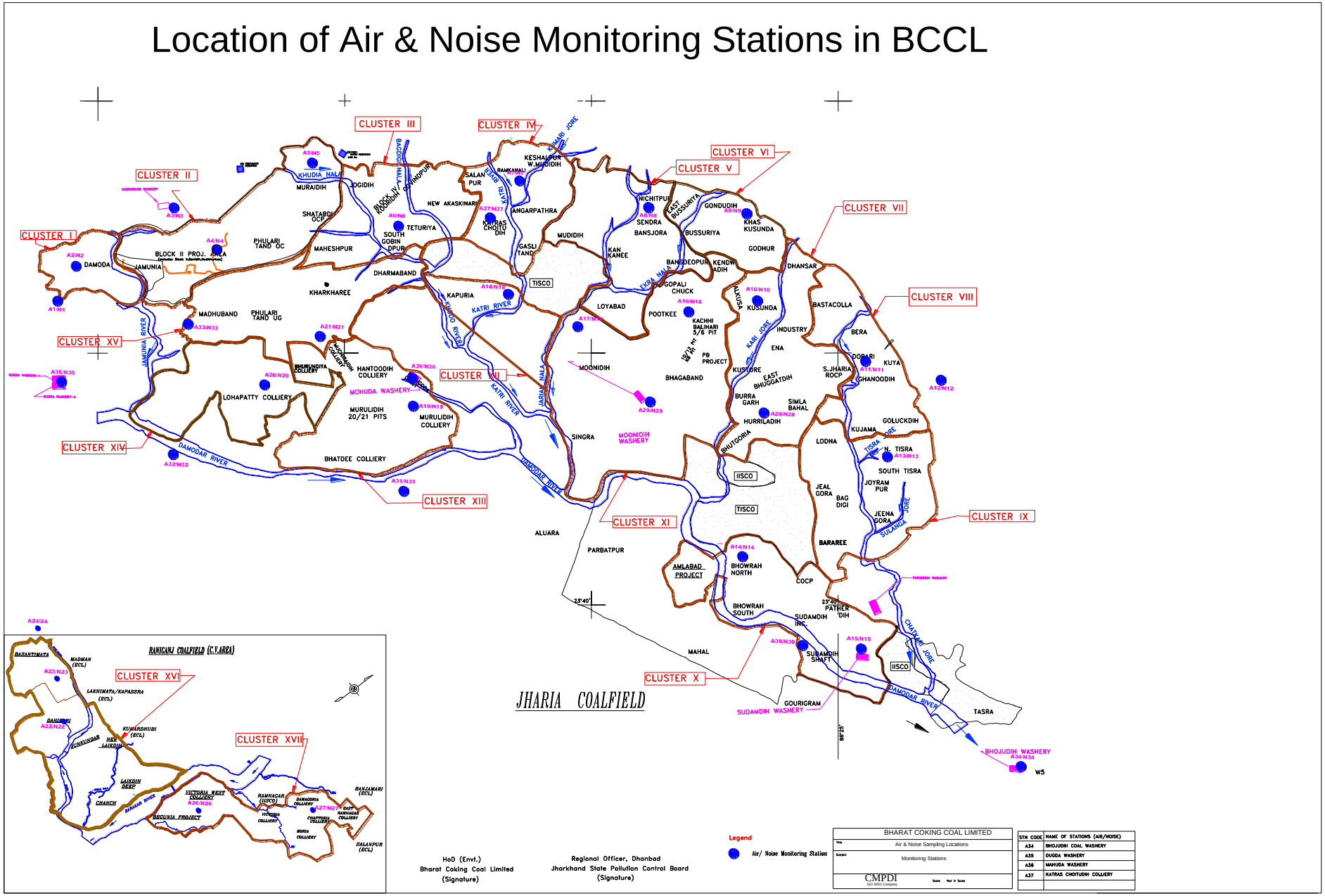
| Pollutant | Time Weighted Average | Concentration in Ambient Air | | Methods of Measurement |
|---|---|---|---|---|
| | | Industrial, Residential, Rural and other Areas | Ecologically Sensitive Area (Notified by Central Government) | |
| **Sulphur Dioxide ($SO_2$), µg/m³** | Annual *<br>24 Hours ** | 50<br>80 | 20<br>80 | -Improved West and Gaeke Method<br>-Ultraviolet Fluorescence |
| **Nitrogendioxide ($NO_2$), µg/m³** | Annual *<br>24 Hours ** | 40<br>80 | 30<br>80 | -Jacob &Hochheiser modified ($NaOH$-$NaAsO_2$) Method<br>-Gas Phase Chemiluminescence |
| **Particulate Matter (Size less than 10µm) or $PM_{10}$, µg/m³** | Annual *<br>24 Hours ** | 60<br>100 | 60<br>100 | -Gravimetric<br>-TEOM<br>-Beta attenuation |
| **Particulate Matter (Size less than 2.5µm) or $PM_{2.5}$, µg/m³** | Annual *<br>24 Hours ** | 40<br>60 | 40<br>60 | -Gravimetric<br>-TEOM<br>-Beta attenuation |
| **Ozone ($O_3$) , µg/m³** | 8 Hours *<br>1 Hour ** | 100<br>180 | 100<br>180 | -UV Photometric<br>-Chemiluminescence<br>-Chemical Method |
| **Lead (Pb) , µg/m³** | Annual *<br>24 Hours ** | 0.50<br>1.0 | 0.50<br>1.0 | -AAS/ICP Method after sampling on EPM 2000 or equivalent filter paper<br>-ED-XRF using Teflon filter |
| **Carbon Monoxide (CO), mg/m³** | 8 Hours **<br>1 Hour ** | 02<br>04 | 02<br>04 | -Non dispersive Infrared (NDIR) Spectroscopy |
| **Ammonia ($NH_3$), µg/m³** | Annual *<br>24 Hours ** | 100<br>400 | 100<br>400 | -Chemiluminescence<br>-Indophenol blue method |
| **Benzene ($C_6H_6$), µg/m³** | Annual * | 05 | 05 | -Gas Chromatography (GC) based continuous analyzer<br>-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.

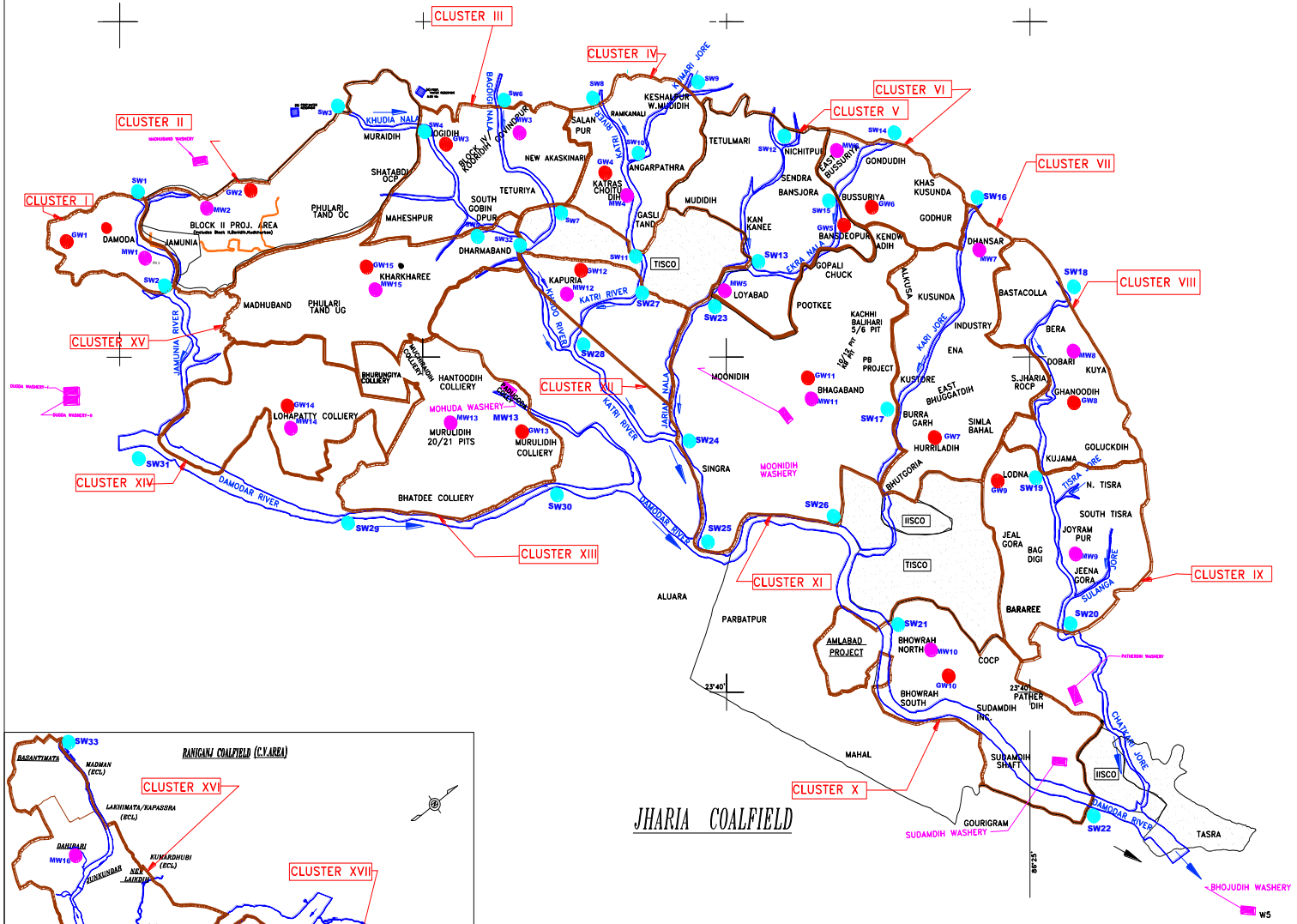
** 24 hourly or 8 hourly or 1 hourly monitored values, as applicable, shall be complied with 98% of the time in a year. 2% of the time, they JUNE exceed the limits but not on two consecutive days of monitoring.

**NOTE:**Whenever and wherever monitoring results on two consecutive days of monitoring exceed the limits specified above for the respective catego

# Location of Air & Noise Monitoring Stations in BCCL



# Water Sampling Locations in BCCL




## INDEX

| Cluster | Suface Water (U/S, D/S) | Name of River/ Nala / Jore | Mine/ Effluent Water | Sampling Location | Ground Water | Sampling Location |
|---|---|---|---|---|---|---|
| I | SW1, SW2 | Jamunia River | MW1 | Damoda Area | GW1 | Ghutway Village |
| II | SW3, SW4 | Khudia Nala | MW2 | Block II OCP | GW2 | Joyrampur Village |
| III | SW4, SW5, SW6, SW7 | Khudia Nala, Bagdigi Nala | MW3 | Govindpur Colliery | GW3 | Jogidih Village |
| IV | SW8, SW11, SW9, SW10 | Katri River, Kumari Jore | MW4 | Chotudih | GW4 | Kankanee Village |
| V | SW12, SW13, SW15 | Jarian Nala, Ekra Nala | MW5 | Mudidih | GW5 | Nichitpur |
| VI | SW14, SW15 | Ekra Nala | MW6 | East Bassuria UGP | GW6 | Bansjora Borewell |
| VII | SW16, SW17 | Kari Jore | MW7 | Dhansar UGP | GW7 | Hurriladih |
| VIII | SW18, SW19 | Kashi Jore | MW8 | Dobari UGP | GW8 | Ghanudih |
| IX | SW19, SW20 | Kashi Jore | MW9 | Jeenagora | GW9 | Lodna |
| X | SW21, SW22 | Damodar River | MW10 | Bhowrah North | GW10 | Bhowrah South |
| XI | SW23, SW24, SW25, SW26 | Jarian Nala, Damodar River | MW11 | Bhagaband h UGP | GW11 | Bhagabandh |
| XII | SW27, SW28 | Katri River | MW12 | Kapuria | GW12 | Kapuria |
| XIII | SW29, SW30 | Damodar River | MW13 | Murulidih (20/21) | GW13 | Murilidih |
| XIV | SW31, SW29 | Damodar River | MW14 | Lohapatti | GW14 | Lohapatti |
| XV | SW5, SW32 | Khudia Nala | MW15 | Kharkharee UGP | GW15 | Kharkharee |
| XVI | SW33, SW34 | Khudia River | MW16 | Dahibari OCP | GW16 | Patlabari Village |
| XVII | SW35, SW36 | Barakar River | MW17 | Damagoria Colliery | GW17 | Chaptoria |

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# ENVIRONMENTAL MONITORING REPORT OF BHARAT COKING COAL LIMITED, CLUSTER – XI

**(FOR THE MONTH JULY, 2025)**

**E. C. no. J-11015/77/2011-IA.II (M) dated 26.07.2019.**

# CMPDI

ISO 9001 Company

**Regional Institute-II**

**Dhanbad, Jharkhand**

# CONTENTS


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| 4. | CHAPTER-IV | STANDARDS AND PLANS | 20-21 |

# 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 $23^0$37' N to $23^0$52' N latitudes and $86^0$09' E to $86^0$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 ($PM_{10}$), Fine Particulate Matter ($PM_{2.5}$), Sulphur Di-oxide ($SO_2$) and Nitrogen Oxides ($NO_X$). Respirable Dust Samplers (RDS) and Fine Dust Sampler ($PM_{2.5}$ sampler) were used for sampling of $PM_{10}$, $SO_2$, & $NO_X$ 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 $PM_{10}$, $PM_{2.5}$, $SO_2$ 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 $PM_{10}$& $PM_{2.5}$ 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 Standards for Coal Mines were within permissible limits.

### 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-XI is in the Western & Southern part of the Jharia coalfield. It includes a group of 8 Mines (viz. Gopalichak UG&OC Mine**,** Kachhi Balihari 10/12 Pit UG Mine**,** PB UG Project,Bhagabandh UG Mine, Kenwadih UG, Pootkee UG, Kachi Balihari 5/6Pit UG, Moonidih UG mine). The Cluster – XI is situated about 25 - 30 kms from Dhanbad Railway Station. The mines of this Cluster – XI 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 Jarian nala & Damodar River.

1.2 The Project has Environmental Clearance from Ministry of Environment, Forests and Climate Change (MoEF&CC) for a rated capacity 5.08 MTPA (normative) and 6.604 MTPA (peak) capacity of coal production vide letter no. J-11015/77/2011-IA.II (M) dated 26$^{th}$ July, 2019.

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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 $PM_{10}$, $PM_{2.5}$, $SO_2$, NOx 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) Pootkee Balihari Office (A16): Industrial Area**

The location of the sampling station is 23°45'17.23"N 86°21'46.27"E. The sampler was placed at an elevated platform approx. 1.5m above ground level at Project 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 sampler was placed at an elevated platform approx. 1.5m above ground level at project office.

**iii) Moonidih Washery (A29): Industrial Area**

The location of the sampling station is 23°44'26.00"N 86°21'16.00"E. The sampler was placed at a height of approx. 1.5m above ground level at Project office.

**II.BUFFER ZONE Monitoring Location**

**I) Kusunda OCP (A10)**

The location of the sampling station is 23°46'49.07"N 86°24'15.71"E. The sampler was placed at a height of approx. 1.5m above ground level at Safety 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** | **07/2025** | **Cluster** | **Cluster XI** | | | **ULR No.** | TC1432125000002006F |
| **Customer** | **Environment Department, Bharat Coking Coal Limited (BCCL), Koyla Bhawan, Dhanbad (E-mail: gmenv.bccl@coalindia.in)** | | | | | **Date of Issue** | 05.09.2025 |
| **Project** | **Pootkee Balihari Office** | **Sample Ref. No.** | **REM/BCCL/2025/07** | | **Sampling Method** | **CMPDI/RI-II/LPM 13 , ( IS 5182)** | |
| **Date of Sampling** | 12.08.25 | 21.08.25 | **Period of Analysis** | 12.08.25 | 02.09.25 | **Zone of Station:** | **Core Zone** |

| **Sl. No.** | **Parameter** | **Method of Analysis** | **Observed Values ( in µg/m³)** | | **Range Of Testing** | **LDL** | **MoEF Standards Notification dated 25th September,2000 (GSR 742 E )** | **NAAQS, 2009** |
|---|---|---|---|---|---|---|---|---|
| | | | **A4379** | **A4416** | | | | |
| 1 | $PM_{10}$ | IS -5182(Part 23):2006, R-2017 | 81 | 76 | 10 µg/m³ - 1000 µg/m³ | 10 µg/m³ | 300 | 100 |
| 2 | $PM_{2.5}$ | IS -5182(Part 24):2019 | 35 | 35 | 10 µg/m³ - 400 µg/m³ | 10 µg/m³ | Not Specified | 60 |
| 3 | $SO_2$ | IS-5182(Part-2): 2001 , R-2017 | 10 | 10 | 10 µg/m³ - 1050 µg/m³ | 10 µg/m³ | 120 | 80 |
| 4 | $NO_2$ | IS-5182 (Part-6): 2006 , R-2017 | 31 | 36 | 06 µg/m³ - 420 µg/m³ | 06 µg/m³ | 120 | 80 |

*Environmental Condition : Sunny*

** LDL indicates Lower Detection Limit,*

***All units are in µg/m3, 24 hourly Average,*

***ANALYSED BY*** (Gaurav Kant) ***CHECKED BY*** (Kumar Vaibhav) ***Authorised Signatory***

***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 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** | **07/2025** | **Cluster** | **Cluster XI** | **ULR No.** | TC1432125000002006F |
| **Customer** | **Environment Department, Bharat Coking Coal Limited (BCCL), Koyla Bhawan, Dhanbad (E-mail: gmenv.bccl@coalindia.in)** | | | **Date of Issue** | 05.09.2025 |
| **Project** | **Moonidih UGP** | **Sample Ref. No.** | **REM/BCCL/2025/07** | **Sampling Method** | **CMPDI/RI-II/LPM 13 , ( IS 5182)** |
| **Date of Sampling** | 12.08.25 | 22.08.25 | **Period of Analysis** | 12.08.25 – 02.09.25 | **Zone of Station:** **Core Zone** |

| **Sl. No.** | **Parameter** | **Method of Analysis** | **Observed Values ( in µg/m³)** | | **Range Of Testing** | **LDL** | **MoEF Standards Notification dated 25th September,2000 (GSR 742 E )** | **NAAQS, 2009** |
|---|---|---|---|---|---|---|---|---|
| | | | **A4381** | **A4423** | | | | |
| 1 | $PM_{10}$ | IS -5182(Part 23):2006, R-2017 | 86 | 84 | 10 µg/m³ - 1000 µg/m³ | 10 µg/m³ | 300 | 100 |
| 2 | $PM_{2.5}$ | IS -5182(Part 24):2019 | 39 | 36 | 10 µg/m³ - 400 µg/m³ | 10 µg/m³ | Not Specified | 60 |
| 3 | $SO_2$ | IS-5182(Part-2): 2001 , R-2017 | <10 | <10 | 10 µg/m³ - 1050 µg/m³ | 10 µg/m³ | 120 | 80 |
| 4 | $NO_2$ | IS-5182 (Part-6): 2006 , R-2017 | 28 | 32 | 06 µg/m³ - 420 µg/m³ | 06 µg/m³ | 120 | 80 |

*Environmental Condition : Sunny*

** LDL indicates Lower Detection Limit,*

***All units are in µg/m3, 24 hourly Average,*

***ANALYSED BY*** | (Gaurav Kant) ***CHECKED BY*** | (Kumar Vaibhav) ***Authorised Signatory***

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*Page -1 of 1*

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email: rdri2cmpdi@coalindia.in

**Test Report for Ambient Air Samples**

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| **Month & Year** | **07/2025** | **Cluster** | **Cluster XI** | | | **ULR No.** | TC1432125000002006F |
| **Customer** | **Environment Department, Bharat Coking Coal Limited (BCCL), Koyla Bhawan, Dhanbad (E-mail: gmenv.bccl@coalindia.in)** | | | | | **Date of Issue** | 05.09.2025 |
| **Project** | **Moonidih Washery** | | **Sample Ref. No.** | **REM/BCCL/2025/07** | **Sampling Method** | **CMPDI/RI-II/LPM 13 , ( IS 5182)** | |
| **Date of Sampling** | 12.08.25 | | 22.08.25 | **Period of Analysis** | 12.08.25 02.09.25 | **Zone of Station:** | **Core Zone** |

| **Sl. No.** | **Parameter** | **Method of Analysis** | **Observed Values ( in µg/m³)** | | **Range Of Testing** | **LDL** | **MoEF Standards Notification dated 25th September,2000 (GSR 742 E )** | **NAAQS, 2009** |
|---|---|---|---|---|---|---|---|---|
| | | | **A4380** | **A4422** | | | | |
| 1 | $PM_{10}$ | IS -5182(Part 23):2006, R-2017 | 74 | 75 | 10 µg/m³ - 1000 µg/m³ | 10 µg/m³ | 300 | 100 |
| 2 | $PM_{2.5}$ | IS -5182(Part 24):2019 | 32 | 33 | 10 µg/m³ - 400 µg/m³ | 10 µg/m³ | Not Specified | 60 |
| 3 | $SO_2$ | IS-5182(Part-2): 2001 , R-2017 | <10 | <10 | 10 µg/m³ - 1050 µg/m³ | 10 µg/m³ | 120 | 80 |
| 4 | $NO_2$ | IS-5182 (Part-6): 2006 , R-2017 | 36 | 33 | 06 µg/m³ - 420 µg/m³ | 06 µg/m³ | 120 | 80 |

*Environmental Condition : Sunny*

** LDL indicates Lower Detection Limit,*

***All units are in µg/m3, 24 hourly Average,*

***ANALYSED BY*** (Gaurav Kant) ***CHECKED BY*** (Kumar Vaibhav) ***Authorised Signatory***

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*Page -1 of 1*

TC-14321

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

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**Test Report for Ambient Air Samples**

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| **Month & Year** | **07/2025** | **Cluster** | **Cluster XI** | | | **ULR No.** | TC1432125000002006F |
| **Customer** | **Environment Department, Bharat Coking Coal Limited (BCCL), Koyla Bhawan, Dhanbad (E-mail: gmenv.bccl@coalindia.in)** | | | | | **Date of Issue** | 05.09.2025 |
| **Project** | **Kusunda** | | **Sample Ref. No.** | **REM/BCCL/2025/07** | **Sampling Method** | **CMPDI/RI-II/LPM 13 , ( IS 5182)** | |
| **Date of Sampling** | 08.08.25 | | 20.08.25 | **Period of Analysis** | 08.08.25 02.09.25 | **Zone of Station:** | **Buffer Zone** |

| **Sl. No.** | **Parameter** | **Method of Analysis** | **Observed Values ( in µg/m³)** | | **Range Of Testing** | **LDL** | **MoEF Standards Notification dated 25th September,2000 (GSR 742 E )** | **NAAQS, 2009** |
|---|---|---|---|---|---|---|---|---|
| | | | **A4335** | **A4404** | | | | |
| 1 | $PM_{10}$ | IS -5182(Part 23):2006, R-2017 | 75 | 73 | 10 µg/m³ - 1000 µg/m³ | 10 µg/m³ | 300 | 100 |
| 2 | $PM_{2.5}$ | IS -5182(Part 24):2019 | 31 | 31 | 10 µg/m³ - 400 µg/m³ | 10 µg/m³ | Not Specified | 60 |
| 3 | $SO_2$ | IS-5182(Part-2): 2001 , R-2017 | 11 | <10 | 10 µg/m³ - 1050 µg/m³ | 10 µg/m³ | 120 | 80 |
| 4 | $NO_2$ | IS-5182 (Part-6): 2006 , R-2017 | 36 | 34 | 06 µg/m³ - 420 µg/m³ | 06 µg/m³ | 120 | 80 |

*Environmental Condition : Sunny*

** LDL indicates Lower Detection Limit,*

***All units are in µg/m3, 24 hourly Average,*

***ANALYSED BY***

(Gaurav Kant)
***CHECKED BY***

(Kumar Vaibhav)
***Authorised Signatory***

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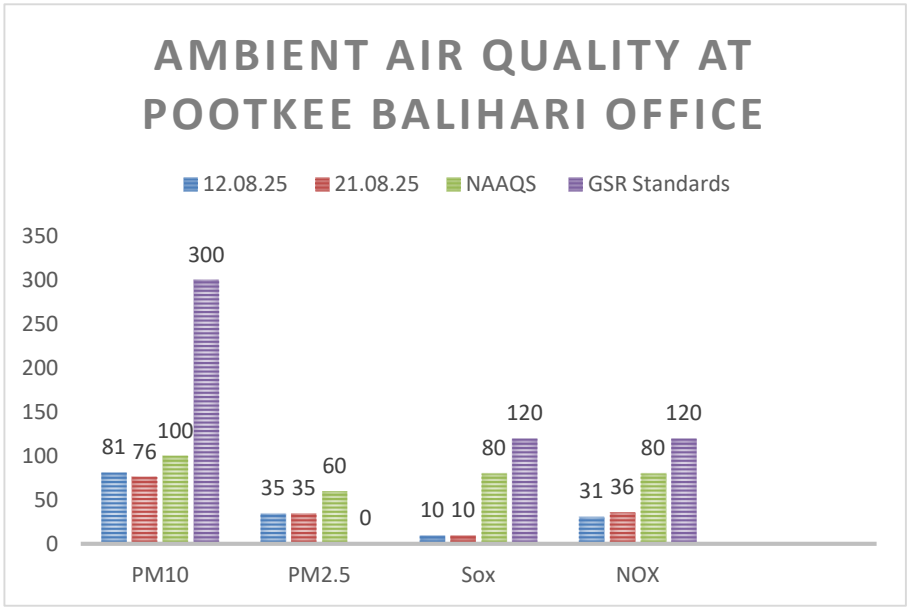
*Page -1 of 1*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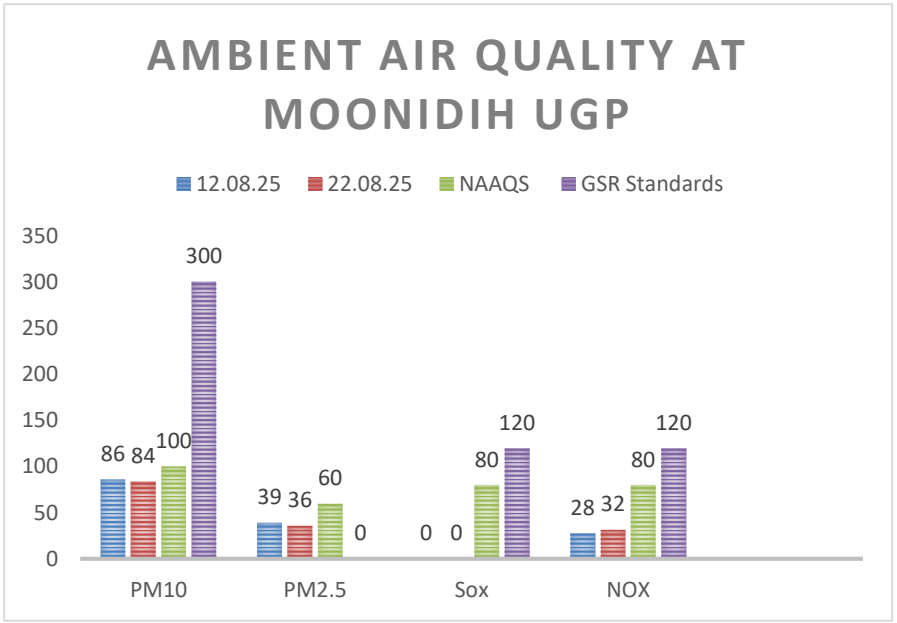
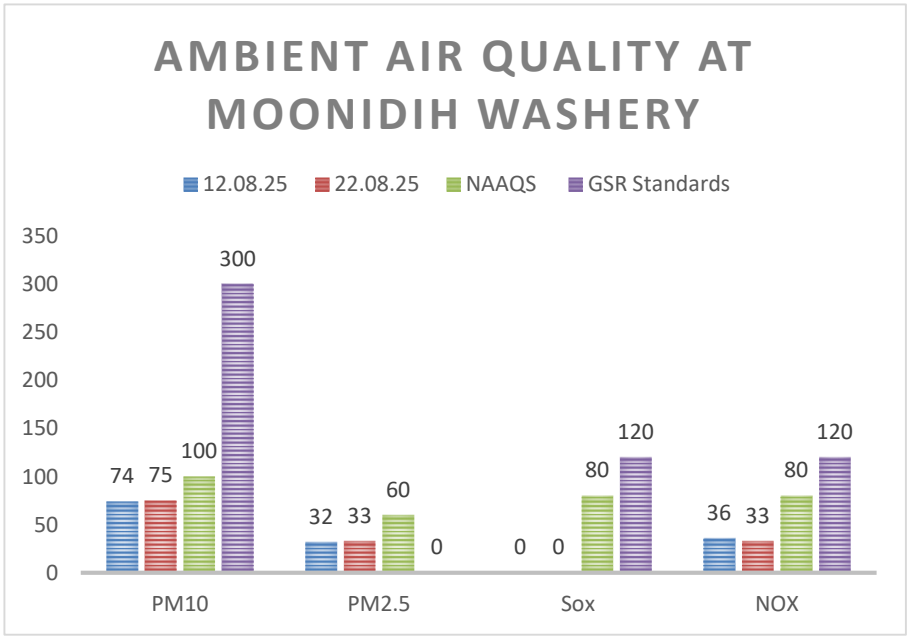
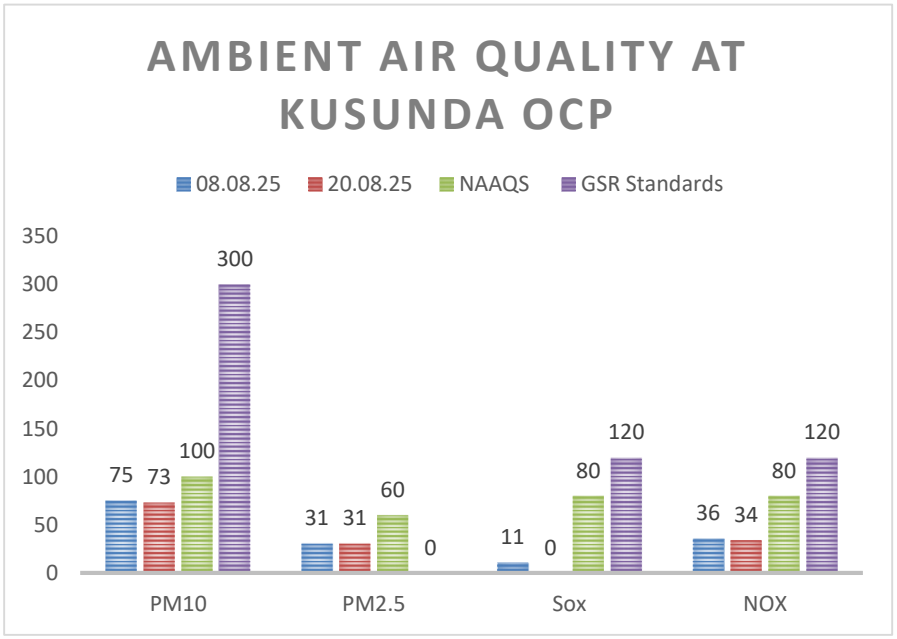
12.08.25
21.08.25
NAAQS
GSR Standards
350
300
250
200
150
100
50
0
81 76 100 300
35 35 60 0
10 10 80 120
31 36 80 120
PM10
PM2.5
Sox
NOX


AMBIENT AIR QUALITY AT MOONIDIH UGP
12.08.25
22.08.25
NAAQS
GSR Standards
350
300
250
200
150
100
50
0
86 84 100 300
39 36 60 0
0 0 80 120
28 32 80 120
PM10
PM2.5
Sox
NOX


AMBIENT AIR QUALITY AT MOONIDIH WASHERY
12.08.25
22.08.25
NAAQS
GSR Standards
350
300
250
200
150
100
50
0
74 75 100 300
32 33 60 0
0 0 80 120
36 33 80 120
PM10
PM2.5
Sox
NOX


AMBIENT AIR QUALITY AT KUSUNDA OCP
08.08.25
20.08.25
NAAQS
GSR Standards
350
300
250
200
150
100
50
0
75 73 100 300
31 31 60 0
11 0 80 120
36 34 80 120
PM10
PM2.5
Sox
NOX

# WATER QUALITY MONITORING

## 3.1 Location of sampling sites

(Refer **Plate No. – II**)

### i) Mine Discharge of Bhagabandh (MW11)

A sampling point is fixed to assess the effluent quality of Mine discharge. This location is selected to monitor effluent discharge in to Kari jore.

## 3.2 Methodology of sampling and analysis

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

## 3.3 Results & Interpretations

The results are given in tabular form along with the applicable standards. Results are compared with Schedule - VI, effluent prescribed by MoEF&CC. Results show that most of the parameters are within the permissible limits.

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

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

**Test Report for Mine Effluent samples**

| | | | | | | |
|---|---|---|---|---|---|---|
| **Month & Year** | **07/2025** | **Cluster** | **Cluster XI** | **ULR No.** | | TC1432125000002024F |
| **Customer** | **Environment Department, Bharat Coking Coal Limited (BCCL), Koyla Bhawan, Dhanbad (E-mail: gmenv.bccl@coalindia.in)** | | | | **Date of Issue** | 05.09.2025 |
| **Project** | | **Sampling Ref. No.** | **REM/BCCL/2025/ 07** | **Sampling Method** | **IS 3025 (Part-1)** | **CMPDI/RI-II/LPM 13** |
| **Sampling Stations** | **(i)** | **Bhagabandh** | **Sample Collected in 2.5 Ltr Jerricane , Color as observed is transparent** | | **Period of Analysis** | 11.08.2025 to 05.09.25 |
| | | | **Date of Sampling** | 11.08.2025 | 25.08.2025 | |

| **Sl. No.** | **Parameter** | **Method of Analysis** | **Observed Values** | | **STANDARDS FOR COAL MINES (Stipulated by Ministry of Environment and Forests (MoEF), Vide Notification No. GSR 742(E), Dt: 25.09.2000)** | **LDL** |
|---|---|---|---|---|---|---|
| | | | M1676 | M1703 | | |
| 1 | Total Suspended Solids | IS 3025/17:1984, R :2017, Gravimetric | 38 | 41 | *100 (Max)* | 10 |
| 2 | pH | IS-3025/11:1983, R-2017, Electrometric | 7.91 | 7.99 | *5.5 - 9.0* | 0.2 |
| 3 | Oil & Grease | IS 3025/39:1991, R : 2019, Partition Gravimetric | <4.0 | <4.0 | *10 (Max)* | 2 |
| 4 | COD | APHA 23rd Edition 5220 C Titrimetric Method | 40 | 36 | *250 (Max)* | 4 |

***Grab sampling carried out for water samples **All units in mg/L unless specified otherwise *LDL indicates Lower Detection Limit & BDL indicates Below Detection Limit,*

***ANALYSED BY***

(Gaurav Kant)
***CHECKED BY***

(Kumar Vaibhav)
***Authorised Signatory***

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

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

# NOISE LEVEL QUALITY MONITORING

## 4.1Location of sampling sites

1. **Pootkee Balihari Office (N16)**
2. **Moonidih UGP (N17)**
3. **Moonidih Washery (N29)**
4. **Kusunda OCP (N10)**

**4.2**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

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

TC-14321

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| **Month & Year** | **07/2025** | **Cluster** | **Cluster XI** | | | **ULR No.** | TC14321250000002040F |
| **Customer** | **Environment Department, Bharat Coking Coal Limited (BCCL), Koyla Bhawan, Dhanbad (E-mail: gmenv.bccl@coalindia.in)** | | | | | **Date of Issue** | 05.09.2025 |
| **Project** | | **Sample Ref. No.** | **REM/BCCL/2025/ 07** | | **Sampling Method** | **CMPDI/RI-II/LPM 22** | |
| **Sampling Stations** | **i** | **Pootki Balihari Office** | **Date of Sampling** | 12.08.25 | 21.08.25 | **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 | 44.7 | 45.7 | CPCB, Protocol for Ambient Level Noise Monitoring -2015 | 35 dB-135 dB | 35 Db (A) | Industrial<br>Commercial<br>Residential<br>Silence | 75<br>65<br>55<br>50 |
| 2 | | 07:00 - 08:00 | 47.6 | 48.1 | | | | | |
| 3 | | 08:00 - 09:00 | 49.8 | 50.4 | | | | | |
| 4 | | 09:00 – 10:00 | 55.4 | 55.9 | | | | | |
| 5 | | 10:00 - 11:00 | 56.7 | 57.5 | | | | | |
| 6 | | 11:00 - 12:00 | 52.5 | 53.1 | | | | | |
| 7 | | 12:00 - 13:00 | 51.1 | 50.5 | | | | | |
| 8 | | 13:00 - 14:00 | 48.8 | 48.6 | | | | | |
| 9 | | 14:00 - 15:00 | 49 | 45.9 | | | | | |
| 10 | | 15:00 - 16:00 | 45.3 | 45.6 | | | | | |
| 11 | | 16:00 - 17:00 | 44.7 | 44.2 | | | | | |
| 12 | | 17:00 - 18:00 | 44.3 | 44.9 | | | | | |
| 13 | | 18:00 - 19:00 | 44.3 | 44.8 | | | | | |
| 14 | | 19:00 - 20:00 | 42.8 | 44 | | | | | |
| 15 | | 20:00 - 21:00 | 42.7 | 42.9 | | | | | |
| 16 | | 21:00 - 22:00 | 42.6 | 42.2 | | | | | |
| | | Leq Day | 50.1 | 50.5 | | | | | |
| 1 | Noise Level dB(A)Leq -Night | 22:00-23:00 | 43.7 | 43.9 | CPCB, Protocol for Ambient Level Noise Monitoring -2015 | 35 dB-135 dB | 35 dB (A) | Industrial<br>Commercial<br>Residential<br>Silence | 70<br>55<br>45<br>50 |
| 2 | | 23:00- 00:00 | 43.1 | 43.3 | | | | | |
| 3 | | 00:00- 01:00 | 42.1 | 43 | | | | | |
| 4 | | 01.00-02.00 | 42 | 42.8 | | | | | |
| 5 | | 02.00-03.00 | 41.4 | 41.6 | | | | | |
| 6 | | 03.00-04.00 | 43 | 41.2 | | | | | |
| 7 | | 04.00-05.00 | 42.1 | 42.2 | | | | | |
| 8 | | 05:00-06:00 | 42.6 | 42.4 | | | | | |
| | | Leq Night | 42.6 | 42.6 | | | | | |

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

| | | | |
|---|---|---|---|
| Sampling Assistants | (Gaurav Kant) | | (Kumar Vaibhav) |
| ANALYSED BY | CHECKED BY | | Authorised Signatory |

Note: The results above relate to the samples tested as received. This report cannot 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
CMPDIL, RI-II
KOYLA BHAWAN OMPLEX
DHANBAD. -826005
Phone:0326-223-850
email:i2cmpdi@coalindia.in

# Ambient Noise Level Test Report

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| **Month & Year** | **07/2025** | **Cluster** | **Cluster XI** | | | **ULR No.** | TC1432125000002040F |
| **Customer** | **Environment Department, Bharat Coking Coal Limited (BCCL), Koyla Bhawan, Dhanbad (E-mail: gmenv.bccl@coalindia.in)** | | | | | **Date of Issue** | 05.09.2025 |
| **Project** | | **Sample Ref. No.** | **REM/BCCL/2025/07** | **Sampling Method** | | **CMPDI/RI-II/LPM 22** | |
| **Sampling Stations** | **i** | **Moonidih UGP** | **Date of Sampling** | 12.08.25 | 22.08.25 | **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 | 44.5 | 45.1 | CPCB, Protocol for Ambient Level Noise Monitoring -2015 | 35 dB-135 dB | 35 dB(A) | Industrial<br>Commercial<br>Residential<br>Silence | 75<br>65<br>55<br>50 |
| 2 | | 07:00 - 08:00 | 40.6 | 41.4 | | | | | |
| 3 | | 08:00 - 09:00 | 47.3 | 48.7 | | | | | |
| 4 | | 09:00 – 10:00 | 45.6 | 43.5 | | | | | |
| 5 | | 10:00 - 11:00 | 48.3 | 47.4 | | | | | |
| 6 | | 11:00 - 12:00 | 51.3 | 52 | | | | | |
| 7 | | 12:00 - 13:00 | 49.7 | 49.4 | | | | | |
| 8 | | 13:00 - 14:00 | 51.1 | 50.2 | | | | | |
| 9 | | 14:00 - 15:00 | 47.7 | 47.4 | | | | | |
| 10 | | 15:00 - 16:00 | 46.2 | 45.6 | | | | | |
| 11 | | 16:00 - 17:00 | 45.8 | 49 | | | | | |
| 12 | | 17:00 - 18:00 | 45.5 | 46 | | | | | |
| 13 | | 18:00 - 19:00 | 44.8 | 45.1 | | | | | |
| 14 | | 19:00 - 20:00 | 45.3 | 44.9 | | | | | |
| 15 | | 20:00 - 21:00 | 44 | 43.9 | | | | | |
| 16 | | 21:00 - 22:00 | 43.6 | 43.8 | | | | | |
| | | **Leq Day** | 47.2 | 47.4 | | | | | |
| 1 | Noise Level dB(A)Leq -Night | 22:00-23:00 | 42.5 | 42.5 | CPCB, Protocol for Ambient Level Noise Monitoring -2015 | 35 dB-135 dB | 35 dB(A) | Industrial<br>Commercial<br>Residential<br>Silence | 70<br>55<br>45<br>50 |
| 2 | | 23:00- 00:00 | 41.9 | 42.1 | | | | | |
| 3 | | 00:00- 01:00 | 41.2 | 42.1 | | | | | |
| 4 | | 01.00-02.00 | 40.4 | 41 | | | | | |
| 5 | | 02.00-03.00 | 40.2 | 40.3 | | | | | |
| 6 | | 03.00-04.00 | 40.2 | 40.4 | | | | | |
| 7 | | 04.00-05.00 | 41.5 | 41.6 | | | | | |
| 8 | | 05:00-06:00 | 41.9 | 42.1 | | | | | |
| | | **Leq Night** | 41.3 | 41.6 | | | | | |

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

| Sampling Assistants | (Gaurav Kant) | (Kumar Vaibhav) |
|---|---|---|
| ***ANALYSED BY*** | ***CHECKED BY*** | ***Authorised Signatory*** |

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

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

*Page -1 of 1*

TC-14321

cmpdi A Mini Ratna Company

# 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** | 07/2025 | **Cluster** | Cluster XI | **ULR No.** | TC1432125000002040F |
| **Customer** | Environment Department, Bharat Coking Coal Limited (BCCL), Koyla Bhawan, Dhanbad (E-mail: gmenv.bccl@coalindia.in) | | | **Date of Issue** | 05.09.2025 |
| **Project** | | **Sample Ref. No.** | REM/BCCL/2025/07 | **Sampling Method** | CMPDI/RI-II/LPM 22 |
| **Sampling Stations** | i | **Moonidih Washery** | **Date of Sampling** | 12.08.25 – 22.08.25 | **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 | 43.6 | 43.8 | CPCB, Protocol for Ambient Level Noise Monitoring -2015 | 35 dB-135 dB | 35 dB(A) | Industrial | 75 |
| 2 | | 07:00 - 08:00 | 45.6 | 46 | | | | Commercial | 65 |
| 3 | | 08:00 - 09:00 | 49 | 48.5 | | | | Residential | 55 |
| 4 | | 09:00 – 10:00 | 52.1 | 52.2 | | | | Silence | 50 |
| 5 | | 10:00 - 11:00 | 54 | 54 | | | | | |
| 6 | | 11:00 - 12:00 | 55 | 52.9 | | | | | |
| 7 | | 12:00 - 13:00 | 56.4 | 58.1 | | | | | |
| 8 | | 13:00 - 14:00 | 55.9 | 55.9 | | | | | |
| 9 | | 14:00 - 15:00 | 51.5 | 52.2 | | | | | |
| 10 | | 15:00 - 16:00 | 52.2 | 51.2 | | | | | |
| 11 | | 16:00 - 17:00 | 50.6 | 49.8 | | | | | |
| 12 | | 17:00 - 18:00 | 49.7 | 49 | | | | | |
| 13 | | 18:00 - 19:00 | 48.3 | 48.2 | | | | | |
| 14 | | 19:00 - 20:00 | 47.3 | 47.8 | | | | | |
| 15 | | 20:00 - 21:00 | 46.5 | 44.9 | | | | | |
| 16 | | 21:00 - 22:00 | 44.5 | 45.1 | | | | | |
| | | **Leq Day** | 51.8 | 51.8 | | | | | |
| 1 | Noise Level dB(A)Leq -Night | 22:00-23:00 | 45.7 | 46.3 | CPCB, Protocol for Ambient Level Noise Monitoring -2015 | 35 dB-135 dB | 35 dB(A) | Industrial | 70 |
| 2 | | 23:00- 00:00 | 44.6 | 43.9 | | | | Commercial | 55 |
| 3 | | 00:00- 01:00 | 40.7 | 40.6 | | | | Residential | 45 |
| 4 | | 01.00-02.00 | 40.4 | 40.4 | | | | Silence | 50 |
| 5 | | 02.00-03.00 | 40.1 | 39.1 | | | | | |
| 6 | | 03.00-04.00 | 40.7 | 41.4 | | | | | |
| 7 | | 04.00-05.00 | 42.7 | 43.1 | | | | | |
| 8 | | 05:00-06:00 | 43.1 | 43.3 | | | | | |
| | | **Leq Night** | 43.6 | 43.3 | | | | | |

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

| | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| Sampling Assistants | | | (Gaurav Kant) | | | | | | (Kumar Vaibhav) |
| | ***ANALYSED BY*** | | ***CHECKED BY*** | | | | | | ***Authorised Signatory*** |

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

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

*Page -1 of 1*

CMPDIL, RI-II
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TC-14321

# CENTRAL MINE PLANNING AND DESIGN INSTITUTE LIMITED

## Environment Laboratory, Regional Institute-II

## Ambient Noise Level Test Report

| | | | | | |
|---|---|---|---|---|---|
| **Month & Year** | 07/2025 | **Cluster** | Cluster XI | **ULR No.** | TC1432125000002040F |
| **Customer** | Environment Department, Bharat Coking Coal Limited (BCCL), Koyla Bhawan, Dhanbad (E-mail: gmenv.bccl@coalindia.in) | | | **Date of Issue** | 05.09.2025 |
| **Project** | | **Sample Ref. No.** | REM/BCCL/2025/ 07 | **Sampling Method** | CMPDI/RI-II/LPM 22 |
| **Sampling Stations** | i | **Kusunda OCP** | **Date of Sampling** | 08.08.25 – 20.08.25 | **Zone Category of Station:** Bufferr 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 | 43.6 | 43.9 | CPCB, Protocol for Ambient Level Noise Monitoring -2015 | 35 dB-135 dB | 35 dB(A) | Industrial<br>Commercial<br>Residential<br>Silence | 75<br>65<br>55<br>50 |
| 2 | | 07:00 - 08:00 | 46.5 | 46 | | | | | |
| 3 | | 08:00 - 09:00 | 49.4 | 45.9 | | | | | |
| 4 | | 09:00 – 10:00 | 54 | 52.5 | | | | | |
| 5 | | 10:00 - 11:00 | 55.9 | 54.9 | | | | | |
| 6 | | 11:00 - 12:00 | 54.8 | 53.5 | | | | | |
| 7 | | 12:00 - 13:00 | 57.4 | 56 | | | | | |
| 8 | | 13:00 - 14:00 | 58.6 | 56.6 | | | | | |
| 9 | | 14:00 - 15:00 | 58.6 | 52.4 | | | | | |
| 10 | | 15:00 - 16:00 | 52 | 51.5 | | | | | |
| 11 | | 16:00 - 17:00 | 52.2 | 58.3 | | | | | |
| 12 | | 17:00 - 18:00 | 51.7 | 50.5 | | | | | |
| 13 | | 18:00 - 19:00 | 50.3 | 49.8 | | | | | |
| 14 | | 19:00 - 20:00 | 50.4 | 49 | | | | | |
| 15 | | 20:00 - 21:00 | 49.2 | 48.3 | | | | | |
| 16 | | 21:00 - 22:00 | 49.6 | 48.4 | | | | | |
| | | **Leq Day** | 53.9 | 52.9 | | | | | |
| 1 | Noise Level dB(A)Leq -Night | 22:00-23:00 | 50.2 | 36.9 | CPCB, Protocol for Ambient Level Noise Monitoring -2015 | 35 dB-135 dB | 35 dB(A) | Industrial<br>Commercial<br>Residential<br>Silence | 70<br>55<br>45<br>50 |
| 2 | | 23:00- 00:00 | 49.4 | 36.9 | | | | | |
| 3 | | 00:00- 01:00 | 48.4 | 36.5 | | | | | |
| 4 | | 01.00-02.00 | 44.7 | 36.4 | | | | | |
| 5 | | 02.00-03.00 | 43.1 | 36 | | | | | |
| 6 | | 03.00-04.00 | 42.2 | 35.5 | | | | | |
| 7 | | 04.00-05.00 | 41.1 | 35.2 | | | | | |
| 8 | | 05:00-06:00 | 42.7 | 35 | | | | | |
| | | Leq Night | 46.5 | 36.1 | | | | | |

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

| | | | |
|---|---|---|---|
| Sampling Assistants | (Gaurav Kant) | | (Kumar Vaibhav) |
| ***ANALYSED BY*** | ***CHECKED BY*** | | ***Authorised Signatory*** |

*Note: The results above relate to the samples tested as received. This report cannot 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**<br><br>Coal mines located in the coal fields of<br>• Jharia<br>• Raniganj<br>• Bokaro | Suspended Particulate Matter (SPM) | Annual Average *<br>24 hours **| 500 µg/$m^3$<br><br>700 µg/$m^3$ | - High Volume Sampling (Average flow rate not less than 1.1 $m^3$ |
| | Respirable Particulate Matter (size less than 10 µm) (RPM) | Annual Average *<br>24 hours **| 250 µg/$m^3$<br><br>300 µg/$m^3$ | Respirable Particulate Matter sampling and analysis |
| | Sulphur Dioxide ($SO_2$) | Annual Average *<br>24 hours **| 80 µg/$m^3$<br><br>120 µg/$m^3$ | 1.Improvedwest and Gaeke method<br>2.Ultraviolet fluorescene |
| | Oxide of Nitrogen as $NO_2$ | Annual Average *<br>24 hours **| 80 µg/$m^3$<br><br>120 µg/$m^3$ | 1. Jacob & Hochheiser Modified (Na-Arsenic) Method<br>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.

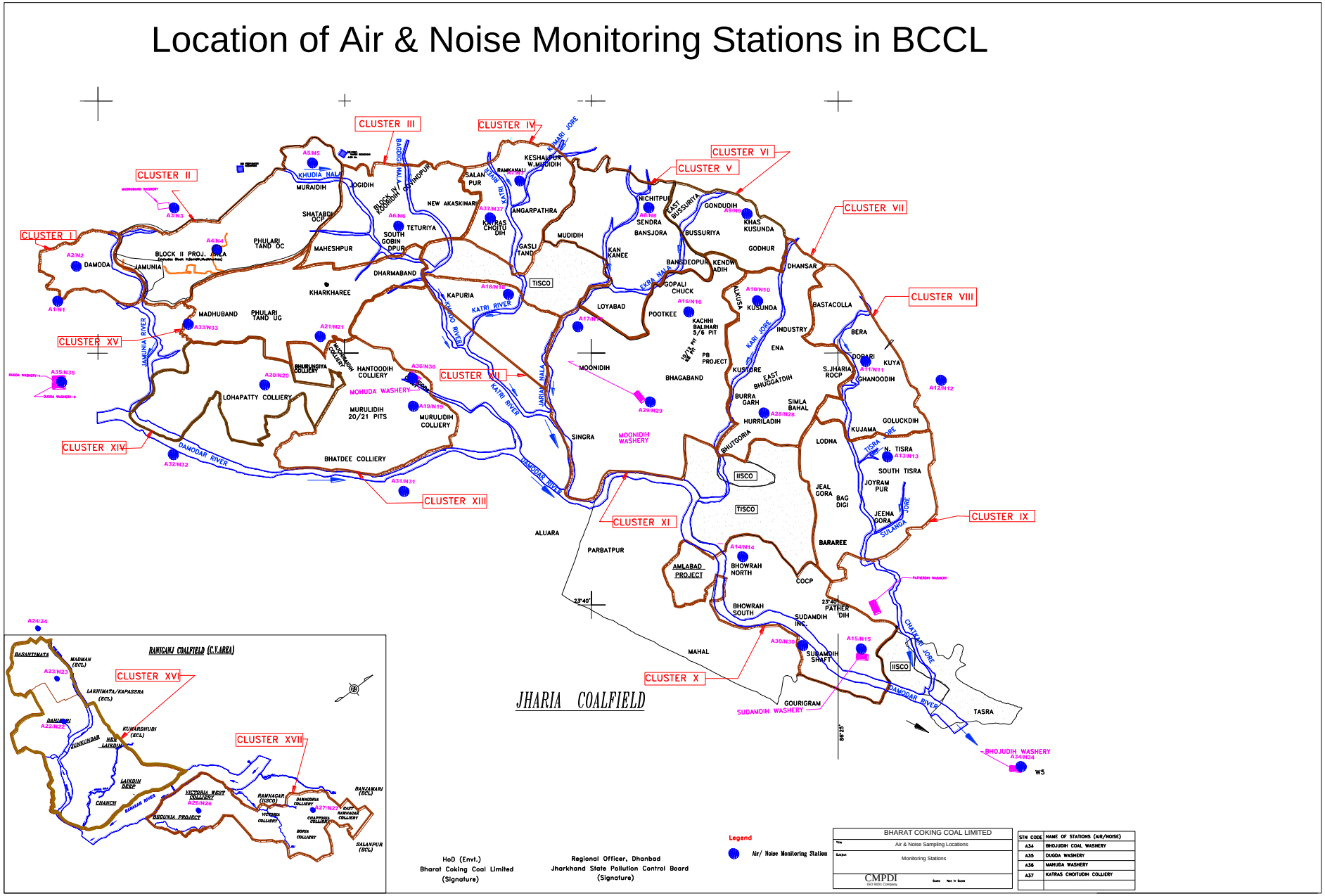
| Pollutant | Time Weighted Average | Concentration in Ambient Air | | Methods of Measurement |
|---|---|---|---|---|
| | | Industrial, Residential, Rural and other Areas | Ecologically Sensitive Area (Notified by Central Government) | |
| **Sulphur Dioxide ($SO_2$), µg/m³** | Annual *<br>24 Hours ** | 50<br>80 | 20<br>80 | -Improved West and Gaeke Method<br>-Ultraviolet Fluorescence |
| **Nitrogendioxide ($NO_2$), µg/m³** | Annual *<br>24 Hours ** | 40<br>80 | 30<br>80 | -Jacob &Hochheiser modified ($NaOH$-$NaAsO_2$) Method<br>-Gas Phase Chemiluminescence |
| **Particulate Matter (Size less than 10µm) or $PM_{10}$, µg/m³** | Annual *<br>24 Hours ** | 60<br>100 | 60<br>100 | -Gravimetric<br>-TEOM<br>-Beta attenuation |
| **Particulate Matter (Size less than 2.5µm) or $PM_{2.5}$, µg/m³** | Annual *<br>24 Hours ** | 40<br>60 | 40<br>60 | -Gravimetric<br>-TEOM<br>-Beta attenuation |
| **Ozone ($O_3$) , µg/m³** | 8 Hours *<br>1 Hour ** | 100<br>180 | 100<br>180 | -UV Photometric<br>-Chemiluminescence<br>-Chemical Method |
| **Lead (Pb) , µg/m³** | Annual *<br>24 Hours ** | 0.50<br>1.0 | 0.50<br>1.0 | -AAS/ICP Method after sampling on EPM 2000 or equivalent filter paper<br>-ED-XRF using Teflon filter |
| **Carbon Monoxide (CO), mg/m³** | 8 Hours **<br>1 Hour ** | 02<br>04 | 02<br>04 | -Non dispersive Infrared (NDIR) Spectroscopy |
| **Ammonia ($NH_3$), µg/m³** | Annual *<br>24 Hours ** | 100<br>400 | 100<br>400 | -Chemiluminescence<br>-Indophenol blue method |
| **Benzene ($C_6H_6$), µg/m³** | Annual * | 05 | 05 | -Gas Chromatography (GC) based continuous analyzer<br>-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.

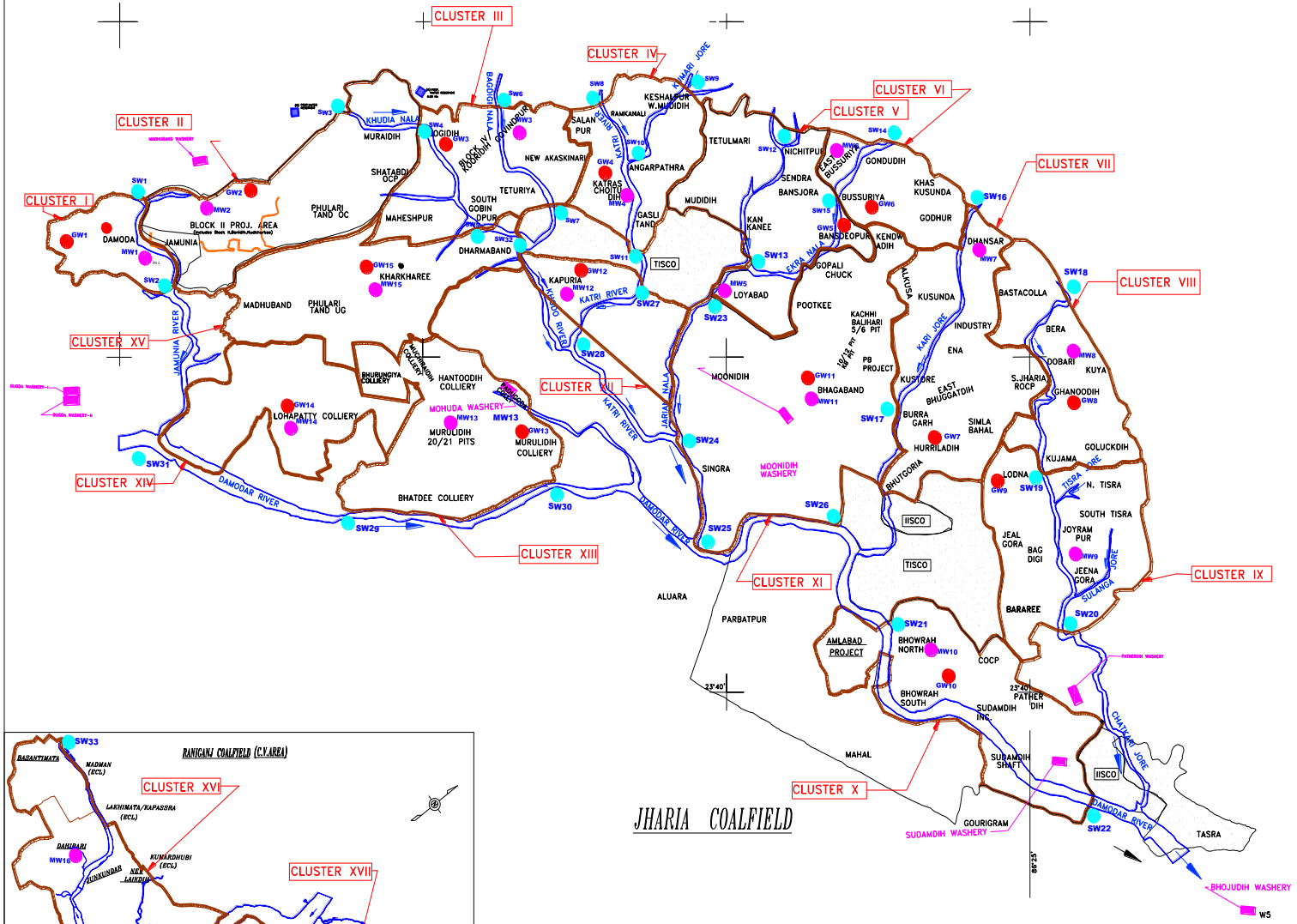
** 24 hourly or 8 hourly or 1 hourly monitored values, as applicable, shall be complied with 98% of the time in a year. 2% of the time, they JUNE exceed the limits but not on two consecutive days of monitoring.

**NOTE:**Whenever and wherever monitoring results on two consecutive days of monitoring exceed the limits specified above for the respective catego

# Location of Air & Noise Monitoring Stations in BCCL



# Water Sampling Locations in BCCL




## INDEX

| Cluster | Suface Water (U/S, D/S) | Name of River/ Nala / Jore | Mine/ Effluent Water | Sampling Location | Ground Water | Sampling Location |
|---|---|---|---|---|---|---|
| I | SW1, SW2 | Jamunia River | MW1 | Damoda Area | GW1 | Ghutway Village |
| II | SW3, SW4 | Khudia Nala | MW2 | Block II OCP | GW2 | Joyrampur Village |
| III | SW4, SW5, SW6, SW7 | Khudia Nala, Bagdigi Nala | MW3 | Govindpur Colliery | GW3 | Jogidih Village |
| IV | SW8, SW11, SW9, SW10 | Katri River, Kumari Jore | MW4 | Chotudih | GW4 | Kankanee Village |
| V | SW12, SW13, SW15 | Jarian Nala, Ekra Nala | MW5 | Mudidih | GW5 | Nichitpur |
| VI | SW14, SW15 | Ekra Nala | MW6 | East Bassuria UGP | GW6 | Bansjora Borewell |
| VII | SW16, SW17 | Kari Jore | MW7 | Dhansar UGP | GW7 | Hurriladih |
| VIII | SW18, SW19 | Kashi Jore | MW8 | Dobari UGP | GW8 | Ghanudih |
| IX | SW19, SW20 | Kashi Jore | MW9 | Jeenagora | GW9 | Lodna |
| X | SW21, SW22 | Damodar River | MW10 | Bhowrah North | GW10 | Bhowrah South |
| XI | SW23, SW24, SW25, SW26 | Jarian Nala, Damodar River | MW11 | Bhagaband h UGP | GW11 | Bhagabandh |
| XII | SW27, SW28 | Katri River | MW12 | Kapuria | GW12 | Kapuria |
| XIII | SW29, SW30 | Damodar River | MW13 | Murulidih (20/21) | GW13 | Murilidih |
| XIV | SW31, SW29 | Damodar River | MW14 | Lohapatti | GW14 | Lohapatti |
| XV | SW5, SW32 | Khudia Nala | MW15 | Kharkharee UGP | GW15 | Kharkharee |
| XVI | SW33, SW34 | Khudia River | MW16 | Dahibari OCP | GW16 | Patlabari Village |
| XVII | SW35, SW36 | Barakar River | MW17 | Damagoria Colliery | GW17 | Chaptoria |

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# ENVIRONMENTAL MONITORING REPORT OF BHARAT COKING COAL LIMITED, CLUSTER – XI

**(FOR THE MONTH SEPTEMBER, 2025)**

**E. C. no. J-11015/77/2011-IA.II (M) dated 26.07.2019.**

# 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 $23^0$37' N to $23^0$52' N latitudes and $86^0$09' E to $86^0$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 ($PM_{10}$), Fine Particulate Matter ($PM_{2.5}$), Sulphur Di-oxide ($SO_2$) and Nitrogen Oxides ($NO_X$). Respirable Dust Samplers (RDS) and Fine Dust Sampler ($PM_{2.5}$ sampler) were used for sampling of $PM_{10}$, $SO_2$, & $NO_X$ 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 $PM_{10}$, $PM_{2.5}$, $SO_2$ 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 $PM_{10}$& $PM_{2.5}$ 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 Standards for Coal Mines were within permissible limits.

### 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-XI is in the Western & Southern part of the Jharia coalfield. It includes a group of 8 Mines (viz. Gopalichak UG&OC Mine**,** Kachhi Balihari 10/12 Pit UG Mine**,** PB UG Project,Bhagabandh UG Mine, Kenwadih UG, Pootkee UG, Kachi Balihari 5/6Pit UG, Moonidih UG mine). The Cluster – XI is situated about 25 - 30 kms from Dhanbad Railway Station. The mines of this Cluster – XI 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 Jarian nala & Damodar River.

1.2 The Project has Environmental Clearance from Ministry of Environment, Forests and Climate Change (MoEF&CC) for a rated capacity 5.08 MTPA (normative) and 6.604 MTPA (peak) capacity of coal production vide letter no. J-11015/77/2011-IA.II (M) dated 26$^{th}$ July, 2019.

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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 $PM_{10}$, $PM_{2.5}$, $SO_2$, NOx 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) Pootkee Balihari Office (A16): Industrial Area**

The location of the sampling station is 23°45'17.23"N 86°21'46.27"E. The sampler was placed at an elevated platform approx. 1.5m above ground level at Project 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 sampler was placed at an elevated platform approx. 1.5m above ground level at project office.

**iii) Moonidih Washery (A29): Industrial Area**

The location of the sampling station is 23°44'26.00"N 86°21'16.00"E. The sampler was placed at a height of approx. 1.5m above ground level at Project office.

**II.BUFFER ZONE Monitoring Location**

**I) Kusunda OCP (A10)**

The location of the sampling station is 23°46'49.07"N 86°24'15.71"E. The sampler was placed at a height of approx. 1.5m above ground level at Safety 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** | **09/2025** | **Cluster** | **Cluster XI** | | | **ULR No.** | TC1432125000002142F |
| **Customer** | **Environment Department, Bharat Coking Coal Limited (BCCL), Koyla Bhawan, Dhanbad (E-mail: gmenv.bccl@coalindia.in)** | | | | | **Date of Issue** | 31.10.2025 |
| **Project** | **Pootkee Balihari Office** | **Sample Ref. No.** | **REM/BCCL/2025/09** | | **Sampling Method** | **CMPDI/RI-II/LPM 13 , ( IS 5182)** | |
| **Date of Sampling** | 03.09.25 | 16.09.25 | **Period of Analysis** | 03.09.25 | 25.10.2025 | **Zone of Station:** | **Core Zone** |

| **Sl. No.** | **Parameter** | **Method of Analysis** | **Observed Values ( in µg/m³)** | | **Range Of Testing** | **LDL** | **MoEF Standards Notification dated 25th September,2000 (GSR 742 E )** | **NAAQS, 2009** |
|---|---|---|---|---|---|---|---|---|
| | | | **A4487** | **A4553** | | | | |
| 1 | $PM_{10}$ | IS -5182(Part 23):2006, R-2017 | 81 | 76 | 10 µg/m³ - 1000 µg/m³ | 10 µg/m³ | 300 | 100 |
| 2 | $PM_{2.5}$ | IS -5182(Part 24):2019 | 35 | 35 | 10 µg/m³ - 400 µg/m³ | 10 µg/m³ | Not Specified | 60 |
| 3 | $SO_2$ | IS-5182(Part-2): 2001 , R-2017 | 10 | 10 | 10 µg/m³ - 1050 µg/m³ | 10 µg/m³ | 120 | 80 |
| 4 | $NO_2$ | IS-5182 (Part-6): 2006 , R-2017 | 31 | 36 | 06 µg/m³ - 420 µg/m³ | 06 µg/m³ | 120 | 80 |

*Environmental Condition : Sunny*

** LDL indicates Lower Detection Limit,*

***All units are in µg/m3, 24 hourly Average,*

***ANALYSED BY***

(Gaurav Kant)
***CHECKED BY***

(Kumar Vaibhav)
***Authorised Signatory***

***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 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** | **09/2025** | **Cluster** | **Cluster XI** | | | **ULR No.** | TC1432125000002142F |
| **Customer** | **Environment Department, Bharat Coking Coal Limited (BCCL), Koyla Bhawan, Dhanbad (E-mail: gmenv.bccl@coalindia.in)** | | | | | **Date of Issue** | 31.10.2025 |
| **Project** | **Moonidih UGP** | **Sample Ref. No.** | **REM/BCCL/2025/09** | | **Sampling Method** | **CMPDI/RI-II/LPM 13 , ( IS 5182)** | |
| **Date of Sampling** | 03.09.25 | 16.09.25 | **Period of Analysis** | 03.09.25 | 25.10.2025 | **Zone of Station:** | **Core Zone** |

| **Sl. No.** | **Parameter** | **Method of Analysis** | **Observed Values ( in µg/m³)** | | **Range Of Testing** | **LDL** | **MoEF Standards Notification dated 25th September,2000 (GSR 742 E )** | **NAAQS, 2009** |
|---|---|---|---|---|---|---|---|---|
| | | | **A4489** | **A4551** | | | | |
| 1 | $PM_{10}$ | IS -5182(Part 23):2006, R-2017 | 86 | 84 | 10 µg/m³ - 1000 µg/m³ | 10 µg/m³ | 300 | 100 |
| 2 | $PM_{2.5}$ | IS -5182(Part 24):2019 | 39 | 36 | 10 µg/m³ - 400 µg/m³ | 10 µg/m³ | Not Specified | 60 |
| 3 | $SO_2$ | IS-5182(Part-2): 2001 , R-2017 | <10 | <10 | 10 µg/m³ - 1050 µg/m³ | 10 µg/m³ | 120 | 80 |
| 4 | $NO_2$ | IS-5182 (Part-6): 2006 , R-2017 | 28 | 32 | 06 µg/m³ - 420 µg/m³ | 06 µg/m³ | 120 | 80 |

*Environmental Condition : Sunny*

** LDL indicates Lower Detection Limit,*

***All units are in µg/m3, 24 hourly Average,*

***ANALYSED BY*** (Gaurav Kant) ***CHECKED BY*** (Kumar Vaibhav) ***Authorised Signatory***

***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*

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

**Test Report for Ambient Air Samples**

| | | | | | |
|---|---|---|---|---|---|
| **Month & Year** | **09/2025** | **Cluster** | **Cluster XI** | **ULR No.** | TC1432125000002142F |
| **Customer** | **Environment Department, Bharat Coking Coal Limited (BCCL), Koyla Bhawan, Dhanbad (E-mail: gmenv.bccl@coalindia.in)** | | | **Date of Issue** | 31.10.2025 |
| **Project** | **Moonidih Washery** | **Sample Ref. No.** | **REM/BCCL/2025/09** | **Sampling Method** | **CMPDI/RI-II/LPM 13 , ( IS 5182)** |
| **Date of Sampling** | 03.09.25 | 16.09.25 | **Period of Analysis** | 03.09.2025 – 25.10.2025 | **Zone of Station:** **Core Zone** |

| **Sl. No.** | **Parameter** | **Method of Analysis** | **Observed Values ( in µg/m³)** | | **Range Of Testing** | **LDL** | **MoEF Standards Notification dated 25th September,2000 (GSR 742 E )** | **NAAQS, 2009** |
|---|---|---|---|---|---|---|---|---|
| | | | **A4488** | **A4552** | | | | |
| 1 | $PM_{10}$ | IS -5182(Part 23):2006, R-2017 | 74 | 75 | 10 µg/m³ - 1000 µg/m³ | 10 µg/m³ | 300 | 100 |
| 2 | $PM_{2.5}$ | IS -5182(Part 24):2019 | 32 | 33 | 10 µg/m³ - 400 µg/m³ | 10 µg/m³ | Not Specified | 60 |
| 3 | $SO_2$ | IS-5182(Part-2): 2001 , R-2017 | <10 | <10 | 10 µg/m³ - 1050 µg/m³ | 10 µg/m³ | 120 | 80 |
| 4 | $NO_2$ | IS-5182 (Part-6): 2006 , R-2017 | 36 | 33 | 06 µg/m³ - 420 µg/m³ | 06 µg/m³ | 120 | 80 |

*Environmental Condition : Sunny*

** LDL indicates Lower Detection Limit,*

***All units are in µg/m3, 24 hourly Average,*

***ANALYSED BY*** | (Gaurav Kant) ***CHECKED BY*** | (Kumar Vaibhav) ***Authorised Signatory***

***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

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Phone:0326-223-850
email: rdri2cmpdi@coalindia.in

**Test Report for Ambient Air Samples**

| | | | | | |
|---|---|---|---|---|---|
| **Month & Year** | **09/2025** | **Cluster** | **Cluster XI** | **ULR No.** | TC1432125000002142F |
| **Customer** | **Environment Department, Bharat Coking Coal Limited (BCCL), Koyla Bhawan, Dhanbad (E-mail: gmenv.bccl@coalindia.in)** | | | **Date of Issue** | 31.10.2025 |
| **Project** | **Kusunda** | **Sample Ref. No.** | **REM/BCCL/2025/09** | **Sampling Method** | **CMPDI/RI-II/LPM 13 , ( IS 5182)** |
| **Date of Sampling** | 15.09.25 | 19.09.25 | **Period of Analysis** | 15.09.2025 – 31.10.2025 | **Zone of Station:** **Buffer Zone** |

| **Sl. No.** | **Parameter** | **Method of Analysis** | **Observed Values ( in µg/m³)** | | **Range Of Testing** | **LDL** | **MoEF Standards Notification dated 25th September,2000 (GSR 742 E )** | **NAAQS, 2009** |
|---|---|---|---|---|---|---|---|---|
| | | | **A4545** | **A4574** | | | | |
| 1 | $PM_{10}$ | IS -5182(Part 23):2006, R-2017 | 75 | 73 | 10 µg/m³ - 1000 µg/m³ | 10 µg/m³ | 300 | 100 |
| 2 | $PM_{2.5}$ | IS -5182(Part 24):2019 | 31 | 31 | 10 µg/m³ - 400 µg/m³ | 10 µg/m³ | Not Specified | 60 |
| 3 | $SO_2$ | IS-5182(Part-2): 2001 , R-2017 | 11 | <10 | 10 µg/m³ - 1050 µg/m³ | 10 µg/m³ | 120 | 80 |
| 4 | $NO_2$ | IS-5182 (Part-6): 2006 , R-2017 | 36 | 34 | 06 µg/m³ - 420 µg/m³ | 06 µg/m³ | 120 | 80 |

*Environmental Condition : Sunny*

** LDL indicates Lower Detection Limit,*

***All units are in µg/m3, 24 hourly Average,*

***ANALYSED BY*** (Gaurav Kant) ***CHECKED BY*** (Kumar Vaibhav) ***Authorised Signatory***

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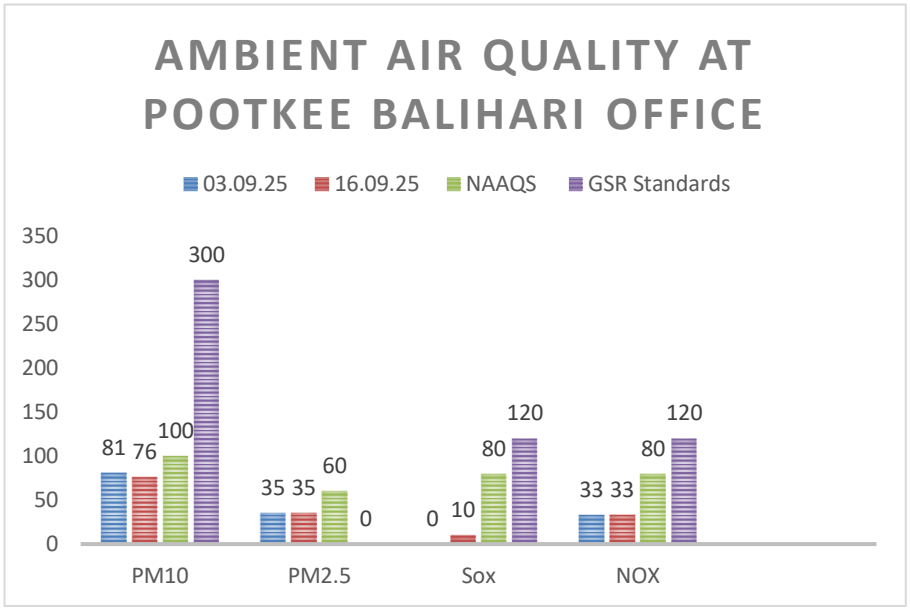
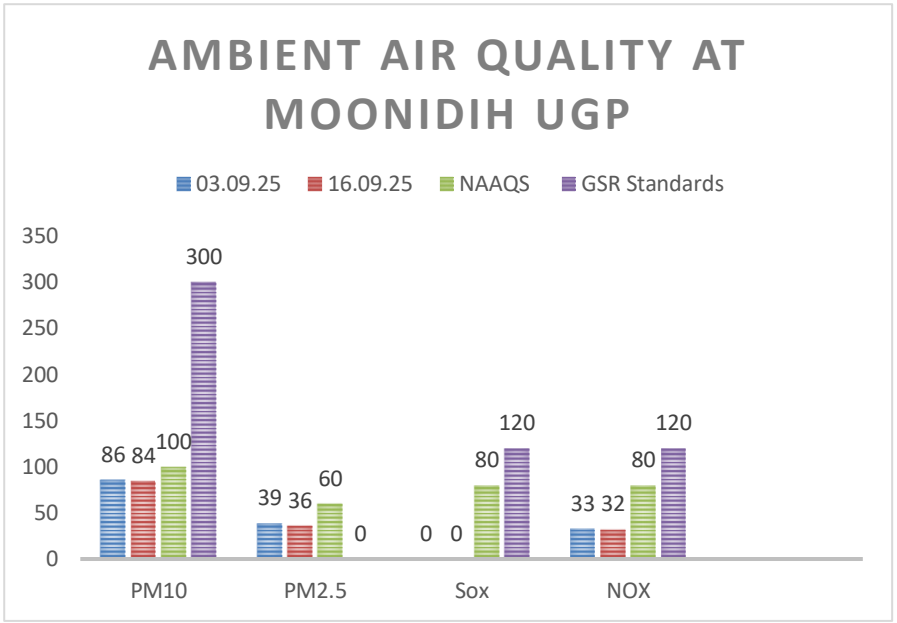
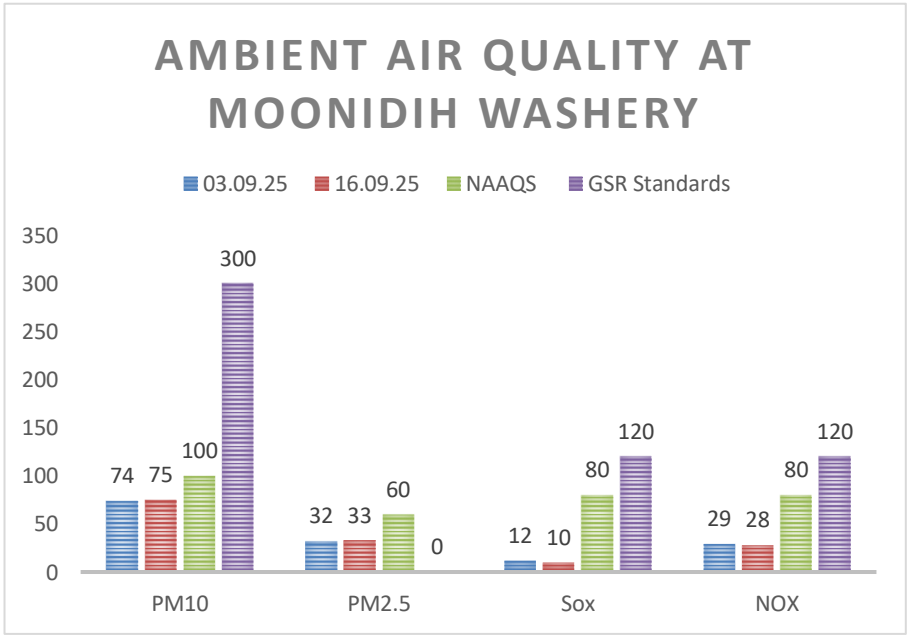
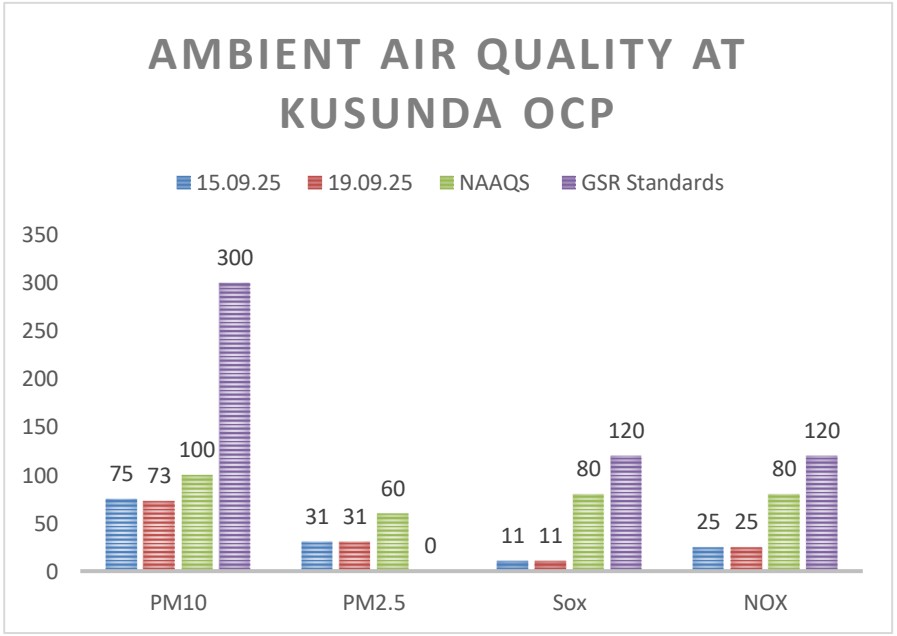
*---- End of Report ----*

*Page -1 of 1*


AMBIENT AIR QUALITY AT POOTKEE BALIHARI OFFICE
03.09.25
16.09.25
NAAQS
GSR Standards
350
300
250
200
150
100
50
0
81 76 100 300
35 35 60 0
0 10 80 120
33 33 80 120
PM10
PM2.5
Sox
NOX


AMBIENT AIR QUALITY AT MOONIDIH UGP
03.09.25
16.09.25
NAAQS
GSR Standards
350
300
250
200
150
100
50
0
86 84 100 300
39 36 60 0
0 0 80 120
33 32 80 120
PM10
PM2.5
Sox
NOX


AMBIENT AIR QUALITY AT MOONIDIH WASHERY
03.09.25
16.09.25
NAAQS
GSR Standards
350
300
250
200
150
100
50
0
74 75 100 300
32 33 60 0
12 10 80 120
29 28 80 120
PM10
PM2.5
Sox
NOX


AMBIENT AIR QUALITY AT KUSUNDA OCP
15.09.25
19.09.25
NAAQS
GSR Standards
350
300
250
200
150
100
50
0
75 73 100 300
31 31 60 0
11 11 80 120
25 25 80 120
PM10
PM2.5
Sox
NOX

# WATER QUALITY MONITORING

## 3.1 Location of sampling sites

(Refer **Plate No. – II**)

### i) Mine Discharge of Bhagabandh (MW11)

A sampling point is fixed to assess the effluent quality of Mine discharge. This location is selected to monitor effluent discharge in to Kari jore.

## 3.2 Methodology of sampling and analysis

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

## 3.3 Results & Interpretations

The results are given in tabular form along with the applicable standards. Results are compared with Schedule - VI, effluent prescribed by MoEF&CC. Results show that most of the parameters are within the permissible limits.

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

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

**Test Report for Mine Effluent samples**

| | | | | | | |
|---|---|---|---|---|---|---|
| **Month & Year** | **09/2025** | **Cluster** | **Cluster XI** | **ULR No.** | TC1432125000002160F | |
| **Customer** | **Environment Department, Bharat Coking Coal Limited (BCCL), Koyla Bhawan, Dhanbad (E-mail: gmenv.bccl@coalindia.in)** | | | | **Date of Issue** | 31.10.2025 |
| **Project** | | **Sampling Ref. No.** | **REM/BCCL/2025/ 09** | **Sampling Method** **IS 3025 (Part-1)** | | **CMPDI/RI-II/LPM 13** |
| **Sampling Stations** | **(i)** | **Bhagabandh** | **Sample Collected in 2.5 Ltr Jerricane , Color as observed is transparent** | | **Period of Analysis** | **15.09.25 to 30.09.2025** |
| | | | **Date of Sampling** | 15.09.25 29.09.25 | | |

| Sl. No. | Parameter | Method of Analysis | Observed Values | | STANDARDS FOR COAL MINES (Stipulated by Ministry of Environment and Forests (MoEF), Vide Notification No. GSR 742(E), Dt: 25.09.2000) | LDL |
|---|---|---|---|---|---|---|
| | | | **M1727** | **M1754** | | |
| 1 | Total Suspended Solids | IS 3025/17:1984, R :2017, Gravimetric | 48 | 49 | *100 (Max)* | 10 |
| 2 | pH | IS-3025/11:1983, R-2017, Electrometric | 8.01 | 8.02 | *5.5 - 9.0* | 0.2 |
| 3 | Oil & Grease | IS 3025/39:1991, R : 2019, Partition Gravimetric | <4.0 | <4.0 | *10 (Max)* | 2 |
| 4 | COD | APHA 23rd Edition 5220 C Titrimetric Method | 36 | 40 | *250 (Max)* | 4 |

***Grab sampling carried out for water samples **All units in mg/L unless specified otherwise *LDL indicates Lower Detection Limit & BDL indicates Below Detection Limit,*

***ANALYSED BY*** (Gaurav Kant) ***CHECKED BY*** (Kumar Vaibhav) ***Authorised Signatory***

*Note: The results above relate to the samples tested as received. This report cannot 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
MINE EFFLUENT TEST REPORT

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

**Test Report for Mine Effluent samples**

| | | | | | | |
|---|---|---|---|---|---|---|
| **Month & Year** | **09/2025** | **Cluster** | **Cluster XI** | **ULR No.** | TC1432125000002160F | |
| **Customer** | **Environment Department, Bharat Coking Coal Limited (BCCL), Koyla Bhawan, Dhanbad (E-mail: gmenv.bccl@coalindia.in)** | | | | **Date of Issue** | 31.10.2025 |
| **Project** | | **Sampling Ref. No.** | **REM/BCCL/2025/ 09** | **Sampling Method** **IS 3025 (Part-1)** | | **CMPDI/RI-II/LPM 13** |
| **Sampling Stations** | **(i)** | **Moonidih UGP** | **Sample Collected in 2.5 Ltr Jerricane , Color as observed is transparent** | | **Period of Analysis** | **15.09.25 to 30.09.2025** |
| | | | **Date of Sampling** | 15.09.25 29.09.25 | | |

| **Sl. No.** | **Parameter** | **Method of Analysis** | **Observed Values** | | **STANDARDS FOR COAL MINES (Stipulated by Ministry of Environment and Forests (MoEF), Vide Notification No. GSR 742(E), Dt: 25.09.2000)** | **LDL** |
|---|---|---|---|---|---|---|
| | | | **M1739** | **M1766** | | |
| 1 | Total Suspended Solids | IS 3025/17:1984, R :2017, Gravimetric | 38 | 33 | *100 (Max)* | 10 |
| 2 | pH | IS-3025/11:1983, R-2017, Electrometric | 8.02 | 8 | *5.5 - 9.0* | 0.2 |
| 3 | Oil & Grease | IS 3025/39:1991, R : 2019, Partition Gravimetric | <4.0 | <4.0 | *10 (Max)* | 2 |
| 4 | COD | APHA 23rd Edition 5220 C Titrimetric Method | 32 | 36 | *250 (Max)* | 4 |

***Grab sampling carried out for water samples **All units in mg/L unless specified otherwise *LDL indicates Lower Detection Limit & BDL indicates Below Detection Limit,*

***ANALYSED BY*** (Gaurav Kant) ***CHECKED BY*** (Kumar Vaibhav) ***Authorised Signatory***

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

*Page -1 of 1*

# NOISE LEVEL QUALITY MONITORING

## 4.1Location of sampling sites

1. **Pootkee Balihari Office (N16)**
2. **Moonidih UGP (N17)**
3. **Moonidih Washery (N29)**
4. **Kusunda OCP (N10)**

**4.2**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

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

TC-14321

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| **Month & Year** | **09/2025** | **Cluster** | **Cluster XI** | | | **ULR No.** | TC1432125000002176F |
| **Customer** | **Environment Department, Bharat Coking Coal Limited (BCCL), Koyla Bhawan, Dhanbad (E-mail: gmenv.bccl@coalindia.in)** | | | | | **Date of Issue** | 31.10.2025 |
| **Project** | | **Sample Ref. No.** | **REM/BCCL/2025/ 09** | | **Sampling Method** | **CMPDI/RI-II/LPM 22** | |
| **Sampling Stations** | **i** | **Pootki Balihari Office** | **Date of Sampling** | 03.09.25 | 16.09.25 | **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 | 46.2 | 47.1 | CPCB, Protocol for Ambient Level Noise Monitoring -2015 | 35 dB-135 dB | 35 Db (A) | Industrial<br>Commercial<br>Residential<br>Silence | 75<br>65<br>55<br>50 |
| 2 | | 07:00 - 08:00 | 46.9 | 47.2 | | | | | |
| 3 | | 08:00 - 09:00 | 48.6 | 49.5 | | | | | |
| 4 | | 09:00 – 10:00 | 51.8 | 50.9 | | | | | |
| 5 | | 10:00 - 11:00 | 53.8 | 57.5 | | | | | |
| 6 | | 11:00 - 12:00 | 54.3 | 55.7 | | | | | |
| 7 | | 12:00 - 13:00 | 62.8 | 63.5 | | | | | |
| 8 | | 13:00 - 14:00 | 63.2 | 58.1 | | | | | |
| 9 | | 14:00 - 15:00 | 62.2 | 62.9 | | | | | |
| 10 | | 15:00 - 16:00 | 55.3 | 55.7 | | | | | |
| 11 | | 16:00 - 17:00 | 71.4 | 70.5 | | | | | |
| 12 | | 17:00 - 18:00 | 51.1 | 49.9 | | | | | |
| 13 | | 18:00 - 19:00 | 48.7 | 48.7 | | | | | |
| 14 | | 19:00 - 20:00 | 47.4 | 47.2 | | | | | |
| 15 | | 20:00 - 21:00 | 46.2 | 45.2 | | | | | |
| 16 | | 21:00 - 22:00 | 46.5 | 46.6 | | | | | |
| | | Leq Day | 61.2 | 60.5 | | | | | |
| 1 | Noise Level dB(A)Leq -Night | 22:00-23:00 | 47.2 | 47.4 | CPCB, Protocol for Ambient Level Noise Monitoring -2015 | 35 dB-135 dB | 35 dB (A) | Industrial<br>Commercial<br>Residential<br>Silence | 70<br>55<br>45<br>50 |
| 2 | | 23:00- 00:00 | 46.5 | 46.8 | | | | | |
| 3 | | 00:00- 01:00 | 45.5 | 46.4 | | | | | |
| 4 | | 01.00-02.00 | 45.5 | 46.1 | | | | | |
| 5 | | 02.00-03.00 | 44.9 | 45.1 | | | | | |
| 6 | | 03.00-04.00 | 44.6 | 44.5 | | | | | |
| 7 | | 04.00-05.00 | 45.5 | 45.5 | | | | | |
| 8 | | 05:00-06:00 | 45.9 | 45.7 | | | | | |
| | | Leq Night | 45.8 | 46.0 | | | | | |

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

| | | | |
|---|---|---|---|
| Sampling Assistants | (Gaurav Kant) | | (Kumar Vaibhav) |
| ANALYSED BY | CHECKED BY | | Authorised Signatory |

Note: The results above relate to the samples tested as received. This report cannot 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 OMPLEX
DHANBAD. -826005
Phone:0326-223-850
email:i2cmpdi@coalindia.in

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| **Month & Year** | **09/2025** | **Cluster** | **Cluster XI** | | | **ULR No.** | TC1432125000002176F |
| **Customer** | **Environment Department, Bharat Coking Coal Limited (BCCL), Koyla Bhawan, Dhanbad (E-mail: gmenv.bccl@coalindia.in)** | | | | | **Date of Issue** | 31.10.2025 |
| **Project** | | **Sample Ref. No.** | **REM/BCCL/2025/09** | | **Sampling Method** | **CMPDI/RI-II/LPM 22** | |
| **Sampling Stations** | **i** | **Moonidih UGP** | **Date of Sampling** | 03.09.25 – 16.09.25 | **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 | 46.9 | 47.1 | CPCB, Protocol for Ambient Level Noise Monitoring -2015 | 35 dB-135 dB | 35 dB(A) | Industrial | 75 |
| 2 | | 07:00 - 08:00 | 46.8 | 46.3 | | | | Commercial | 65 |
| 3 | | 08:00 - 09:00 | 47.4 | 48.9 | | | | Residential | 55 |
| 4 | | 09:00 – 10:00 | 52.8 | 52.1 | | | | Silence | 50 |
| 5 | | 10:00 - 11:00 | 54.3 | 52.8 | | | | | |
| 6 | | 11:00 - 12:00 | 57.5 | 55.7 | | | | | |
| 7 | | 12:00 - 13:00 | 63.7 | 61.5 | | | | | |
| 8 | | 13:00 - 14:00 | 58.2 | 59.4 | | | | | |
| 9 | | 14:00 - 15:00 | 62.3 | 62.9 | | | | | |
| 10 | | 15:00 - 16:00 | 56.3 | 55.7 | | | | | |
| 11 | | 16:00 - 17:00 | 71 | 72.9 | | | | | |
| 12 | | 17:00 - 18:00 | 48.9 | 47.5 | | | | | |
| 13 | | 18:00 - 19:00 | 48.1 | 46.6 | | | | | |
| 14 | | 19:00 - 20:00 | 48.6 | 47.1 | | | | | |
| 15 | | 20:00 - 21:00 | 46 | 47.1 | | | | | |
| 16 | | 21:00 - 22:00 | 47.1 | 48.6 | | | | | |
| | | **Leq Day** | 60.8 | 62.0 | | | | | |
| 1 | Noise Level dB(A)Leq -Night | 22:00-23:00 | 45.8 | 45.8 | CPCB, Protocol for Ambient Level Noise Monitoring -2015 | 35 dB-135 dB | 35 dB(A) | Industrial | 70 |
| 2 | | 23:00- 00:00 | 45.4 | 45.5 | | | | Commercial | 55 |
| 3 | | 00:00- 01:00 | 44.5 | 45.5 | | | | Residential | 45 |
| 4 | | 01.00-02.00 | 43.5 | 44.3 | | | | Silence | 50 |
| 5 | | 02.00-03.00 | 43.3 | 43.4 | | | | | |
| 6 | | 03.00-04.00 | 43.3 | 43.5 | | | | | |
| 7 | | 04.00-05.00 | 45 | 45.1 | | | | | |
| 8 | | 05:00-06:00 | 45.4 | 45.5 | | | | | |
| | | **Leq Night** | 44.6 | 44.9 | | | | | |

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

| | | |
|---|---|---|
| Sampling Assistants | (Gaurav Kant) | (Kumar Vaibhav) |
| ***ANALYSED BY*** | ***CHECKED BY*** | ***Authorised Signatory*** |

*Note: The results above relate to the samples tested as received. This report cannot 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*

TC-14321

cmpdi A Mini Ratna Company

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** | **09/2025** | **Cluster** | **Cluster XI** | **ULR No.** | TC1432125000002176F |
| **Customer** | **Environment Department, Bharat Coking Coal Limited (BCCL), Koyla Bhawan, Dhanbad (E-mail: gmenv.bccl@coalindia.in)** | | | **Date of Issue** | 31.10.2025 |
| **Project** | | **Sample Ref. No.** | **REM/BCCL/2025/09** | **Sampling Method** | **CMPDI/RI-II/LPM 22** |
| **Sampling Stations** | **i** | **Moonidih Washery** | **Date of Sampling** 03.09.25 – 16.09.25 | **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 | 46.8 | 48.4 | CPCB, Protocol for Ambient Level Noise Monitoring -2015 | 35 dB-135 dB | 35 dB(A) | Industrial<br>Commercial<br>Residential<br>Silence | 75<br>65<br>55<br>50 |
| 2 | | 07:00 - 08:00 | 46.8 | 48.4 | | | | | |
| 3 | | 08:00 - 09:00 | 50 | 49 | | | | | |
| 4 | | 09:00 – 10:00 | 63 | 61.8 | | | | | |
| 5 | | 10:00 - 11:00 | 61.8 | 62.9 | | | | | |
| 6 | | 11:00 - 12:00 | 62.9 | 61.8 | | | | | |
| 7 | | 12:00 - 13:00 | 65 | 65.6 | | | | | |
| 8 | | 13:00 - 14:00 | 65.6 | 65.7 | | | | | |
| 9 | | 14:00 - 15:00 | 67.1 | 68.6 | | | | | |
| 10 | | 15:00 - 16:00 | 66.7 | 66 | | | | | |
| 11 | | 16:00 - 17:00 | 57 | 58.9 | | | | | |
| 12 | | 17:00 - 18:00 | 55.6 | 58.3 | | | | | |
| 13 | | 18:00 - 19:00 | 53.3 | 56.9 | | | | | |
| 14 | | 19:00 - 20:00 | 52.5 | 54.7 | | | | | |
| 15 | | 20:00 - 21:00 | 52.1 | 53.3 | | | | | |
| 16 | | 21:00 - 22:00 | 51.3 | 50.7 | | | | | |
| | | **Leq Day** | 61.7 | 62.2 | | | | | |
| 1 | Noise Level dB(A)Leq -Night | 22:00-23:00 | 49.5 | 50 | CPCB, Protocol for Ambient Level Noise Monitoring -2015 | 35 dB-135 dB | 35 dB(A) | Industrial<br>Commercial<br>Residential<br>Silence | 70<br>55<br>45<br>50 |
| 2 | | 23:00- 00:00 | 48.1 | 47.4 | | | | | |
| 3 | | 00:00- 01:00 | 43.9 | 43.8 | | | | | |
| 4 | | 01.00-02.00 | 43.5 | 43.5 | | | | | |
| 5 | | 02.00-03.00 | 43.2 | 42.4 | | | | | |
| 6 | | 03.00-04.00 | 42.8 | 43.4 | | | | | |
| 7 | | 04.00-05.00 | 45 | 45.4 | | | | | |
| 8 | | 05:00-06:00 | 45.4 | 45.5 | | | | | |
| | | **Leq Night** | 45.8 | 45.9 | | | | | |

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

| | | | | |
|---|---|---|---|---|
| Sampling Assistants | | (Gaurav Kant) | | (Kumar Vaibhav) |
| ***ANALYSED BY*** | | ***CHECKED BY*** | | ***Authorised Signatory*** |

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*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** | **09/2025** | **Cluster** | **Cluster XI** | **ULR No.** | TC1432125000002176F |
| **Customer** | **Environment Department, Bharat Coking Coal Limited (BCCL), Koyla Bhawan, Dhanbad (E-mail: gmenv.bccl@coalindia.in)** | | | **Date of Issue** | 31.10.2025 |
| **Project** | | **Sample Ref. No.** | **REM/BCCL/2025/ 09** | **Sampling Method** | **CMPDI/RI-II/LPM 22** |
| **Sampling Stations** | **i** | **Kusunda OCP** | **Date of Sampling** | 15.09.25 – 19.09.25 | **Zone Category of Station:** **Bufferr 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 | 46.8 | 47.1 | CPCB, Protocol for Ambient Level Noise Monitoring -2015 | 35 dB-135 dB | 35 dB(A) | Industrial<br>Commercial<br>Residential<br>Silence | 75<br>65<br>55<br>50 |
| 2 | | 07:00 - 08:00 | 48.6 | 47.4 | | | | | |
| 3 | | 08:00 - 09:00 | 48.9 | 49.4 | | | | | |
| 4 | | 09:00 – 10:00 | 51.3 | 50.9 | | | | | |
| 5 | | 10:00 - 11:00 | 54.6 | 52.8 | | | | | |
| 6 | | 11:00 - 12:00 | 54.8 | 55.8 | | | | | |
| 7 | | 12:00 - 13:00 | 63.7 | 62.2 | | | | | |
| 8 | | 13:00 - 14:00 | 62.3 | 61.2 | | | | | |
| 9 | | 14:00 - 15:00 | 62.3 | 62.9 | | | | | |
| 10 | | 15:00 - 16:00 | 63.3 | 62.8 | | | | | |
| 11 | | 16:00 - 17:00 | 62.1 | 63.5 | | | | | |
| 12 | | 17:00 - 18:00 | 50.9 | 51.2 | | | | | |
| 13 | | 18:00 - 19:00 | 50.9 | 50 | | | | | |
| 14 | | 19:00 - 20:00 | 48.1 | 47.5 | | | | | |
| 15 | | 20:00 - 21:00 | 46.3 | 44.8 | | | | | |
| 16 | | 21:00 - 22:00 | 46.6 | 48.1 | | | | | |
| | | **Leq Day** | 58.3 | 58.1 | | | | | |
| 1 | Noise Level dB(A)Leq -Night | 22:00-23:00 | 48.5 | 46.5 | CPCB, Protocol for Ambient Level Noise Monitoring -2015 | 35 dB-135 dB | 35 dB(A) | Industrial<br>Commercial<br>Residential<br>Silence | 70<br>55<br>45<br>50 |
| 2 | | 23:00- 00:00 | 45.5 | 45.5 | | | | | |
| 3 | | 00:00- 01:00 | 44.2 | 42.4 | | | | | |
| 4 | | 01.00-02.00 | 42.4 | 42.1 | | | | | |
| 5 | | 02.00-03.00 | 41.6 | 41.2 | | | | | |
| 6 | | 03.00-04.00 | 35.7 | 41.1 | | | | | |
| 7 | | 04.00-05.00 | 37.2 | 42.7 | | | | | |
| 8 | | 05:00-06:00 | 39.2 | 43.9 | | | | | |
| | | Leq Night | 43.6 | 43.6 | | | | | |

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

| | | |
|---|---|---|
| Sampling Assistants | (Gaurav Kant) | (Kumar Vaibhav) |
| ***ANALYSED BY*** | ***CHECKED BY*** | ***Authorised Signatory*** |

*Note: The results above relate to the samples tested as received. This report cannot 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*

**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**<br><br>Coal mines located in the coal fields of<br>• Jharia<br>• Raniganj<br>• Bokaro | Suspended Particulate Matter (SPM) | Annual Average *<br>24 hours **| 500 µg/$m^3$<br><br>700 µg/$m^3$ | - High Volume Sampling (Average flow rate not less than 1.1 |
| | Respirable Particulate Matter (size less than 10 µm) (RPM) | Annual Average *<br>24 hours ** | 250 µg/$m^3$<br><br>300 µg/$m^3$ | Respirable Particulate Matter sampling and analysis |
| | Sulphur Dioxide ($SO_2$) | Annual Average *<br>24 hours ** | 80 µg/$m^3$<br><br>120 µg/$m^3$ | 1.Improvedwest and Gaeke method<br>2.Ultraviolet fluorescene |
| | Oxide of Nitrogen as $NO_2$ | Annual Average *<br>24 hours ** | 80 µg/$m^3$<br><br>120 µg/$m^3$ | 1. Jacob & Hochheiser Modified (Na-Arsenic) Method<br>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.

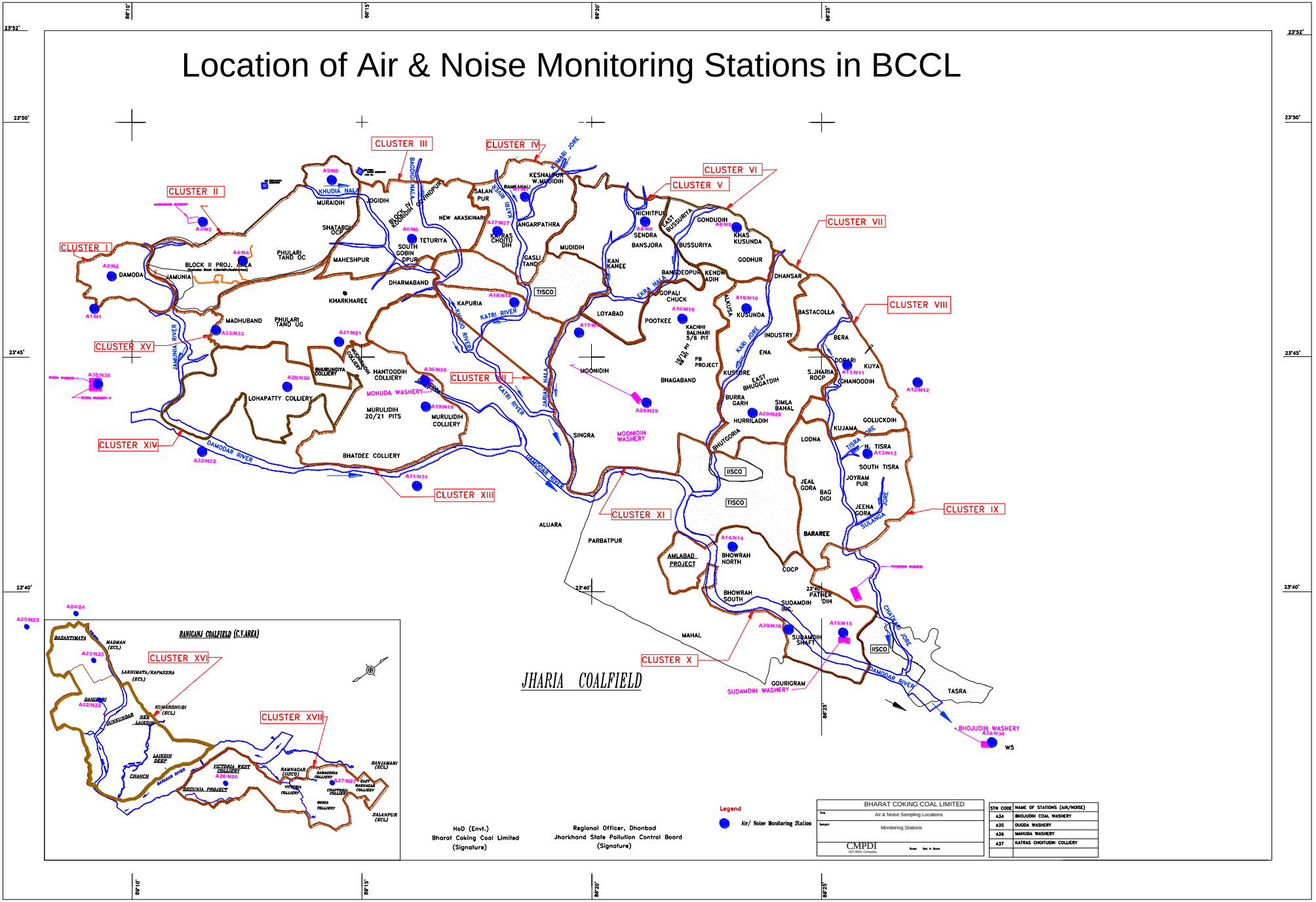
| Pollutant | Time Weighted Average | Concentration in Ambient Air | | Methods of Measurement |
|---|---|---|---|---|
| | | Industrial, Residential, Rural and other Areas | Ecologically Sensitive Area (Notified by Central Government) | |
| **Sulphur Dioxide ($SO_2$), µg/m³** | Annual *<br>24 Hours ** | 50<br>80 | 20<br>80 | -Improved West and Gaeke Method<br>-Ultraviolet Fluorescence |
| **Nitrogendioxide ($NO_2$), µg/m³** | Annual *<br>24 Hours ** | 40<br>80 | 30<br>80 | -Jacob &Hochheiser modified ($NaOH$-$NaAsO_2$) Method<br>-Gas Phase Chemiluminescence |
| **Particulate Matter (Size less than 10µm) or $PM_{10}$, µg/m³** | Annual *<br>24 Hours ** | 60<br>100 | 60<br>100 | -Gravimetric<br>-TEOM<br>-Beta attenuation |
| **Particulate Matter (Size less than 2.5µm) or $PM_{2.5}$, µg/m³** | Annual *<br>24 Hours ** | 40<br>60 | 40<br>60 | -Gravimetric<br>-TEOM<br>-Beta attenuation |
| **Ozone ($O_3$) , µg/m³** | 8 Hours *<br>1 Hour ** | 100<br>180 | 100<br>180 | -UV Photometric<br>-Chemiluminescence<br>-Chemical Method |
| **Lead (Pb) , µg/m³** | Annual *<br>24 Hours ** | 0.50<br>1.0 | 0.50<br>1.0 | -AAS/ICP Method after sampling on EPM 2000 or equivalent filter paper<br>-ED-XRF using Teflon filter |
| **Carbon Monoxide (CO), mg/m³** | 8 Hours **<br>1 Hour ** | 02<br>04 | 02<br>04 | -Non dispersive Infrared (NDIR) Spectroscopy |
| **Ammonia ($NH_3$), µg/m³** | Annual *<br>24 Hours ** | 100<br>400 | 100<br>400 | -Chemiluminescence<br>-Indophenol blue method |
| **Benzene ($C_6H_6$), µg/m³** | Annual * | 05 | 05 | -Gas Chromatography (GC) based continuous analyzer<br>-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.

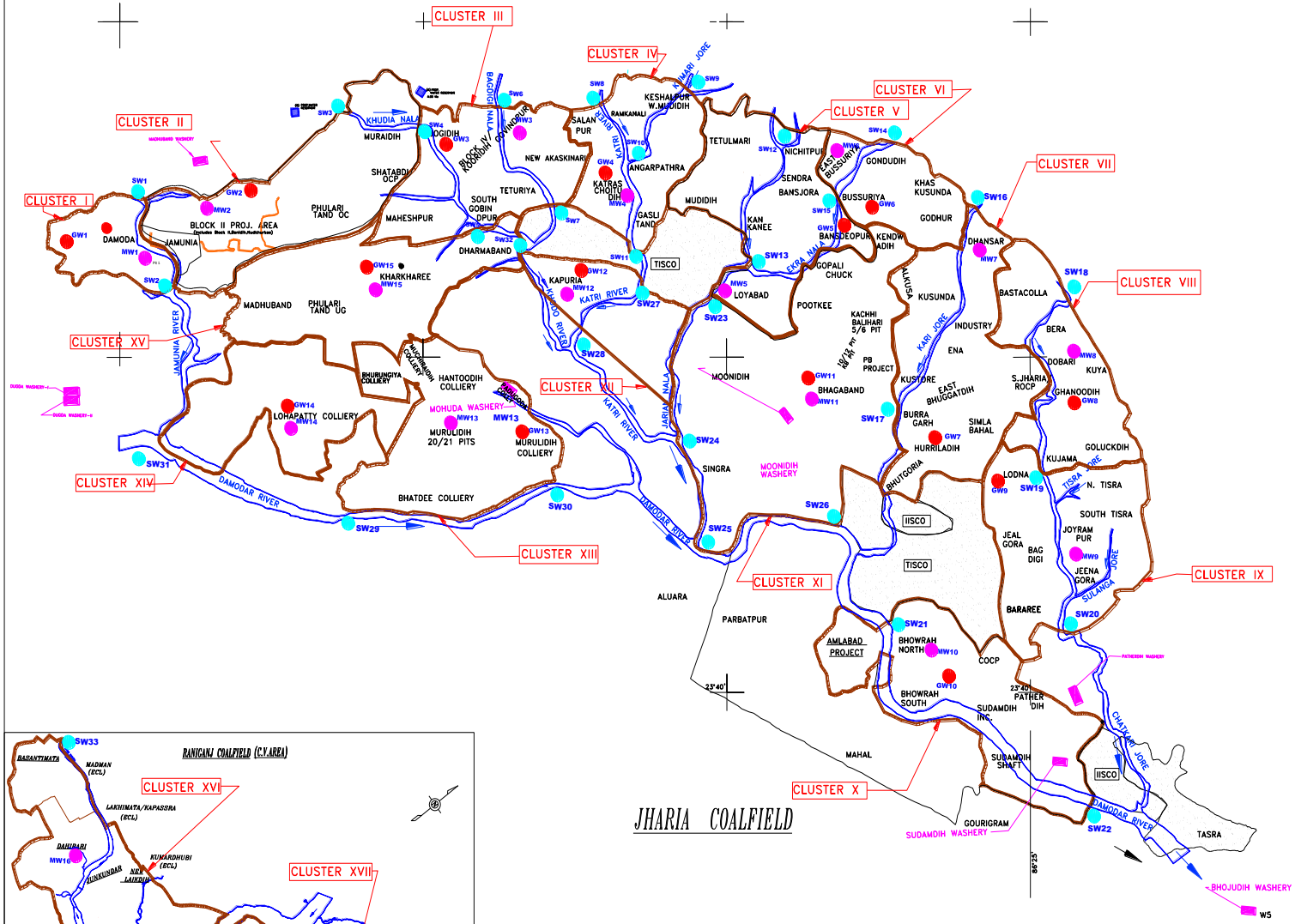
** 24 hourly or 8 hourly or 1 hourly monitored values, as applicable, shall be complied with 98% of the time in a year. 2% of the time, they JUNE exceed the limits but not on two consecutive days of monitoring.

**NOTE:**Whenever and wherever monitoring results on two consecutive days of monitoring exceed the limits specified above for the respective catego

# Location of Air & Noise Monitoring Stations in BCCL



# Water Sampling Locations in BCCL

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| Cluster | Suface Water (U/S, D/S) | Name of River/ Nala / Jore | Mine/ Effluent Water | Sampling Location | Ground Water | Sampling Location |
|---|---|---|---|---|---|---|
| I | SW1, SW2 | Jamunia River | MW1 | Damoda Area | GW1 | Ghutway Village |
| II | SW3, SW4 | Khudia Nala | MW2 | Block II OCP | GW2 | Joyrampur Village |
| III | SW4, SW5, SW6, SW7 | Khudia Nala, Bagdigi Nala | MW3 | Govindpur Colliery | GW3 | Jogidih Village |
| IV | SW8, SW11, SW9, SW10 | Katri River, Kumari Jore | MW4 | Chotudih | GW4 | Kankanee Village |
| V | SW12, SW13, SW15 | Jarian Nala, Ekra Nala | MW5 | Mudidih | GW5 | Nichitpur |
| VI | SW14, SW15 | Ekra Nala | MW6 | East Bassuria UGP | GW6 | Bansjora Borewell |
| VII | SW16, SW17 | Kari Jore | MW7 | Dhansar UGP | GW7 | Hurriladih |
| VIII | SW18, SW19 | Kashi Jore | MW8 | Dobari UGP | GW8 | Ghanudih |
| IX | SW19, SW20 | Kashi Jore | MW9 | Jeenagora | GW9 | Lodna |
| X | SW21, SW22 | Damodar River | MW10 | Bhowrah North | GW10 | Bhowrah South |
| XI | SW23, SW24, SW25, SW26 | Jarian Nala, Damodar River | MW11 | Bhagaband h UGP | GW11 | Bhagabandh |
| XII | SW27, SW28 | Katri River | MW12 | Kapuria | GW12 | Kapuria |
| XIII | SW29, SW30 | Damodar River | MW13 | Murulidih (20/21) | GW13 | Murulidih |
| XIV | SW31, SW29 | Damodar River | MW14 | Lohapatti | GW14 | Lohapatti |
| XV | SW5, SW32 | Khudia Nala | MW15 | Kharkharee UGP | GW15 | Kharkharee |
| XVI | SW33, SW34 | Khudia River | MW16 | Dahibari OCP | GW16 | Patlabari Village |
| XVII | SW35, SW36 | Barakar River | MW17 | Damagoria Colliery | GW17 | Chaptoria |

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

Regional Officer, Dhanbad
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

Customer: BHARAT COKING COAL LIMITED
Title: WATER SAMPLING LOCATIONS
Subject: MONITORING STATIONS
CMPDI (ISO 9001 Company)
Scale: Not to Scale

Annexure-XXI

**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.

# GROUNDWATER LEVEL & QUALITY REPORT

# FOR CLUSTERS OF MINES, BCCL

**(Assessment year – 2024-25)**

## [CLUSTER – I, II, III, IV, V, VI, VII, VIII, IX, X, XI, XIII, XIV, XV, XVI & XVII 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**

**Geology Department**

**Regional Institute-II**

**CMPDI, Dhanbad**


## MARCH – 2025

Job no - 200424005

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**HYDROGEOLOGY SECTION, EXPLORATION DEPARTMENT**
**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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**Annexure – I**

## DETAILS OF THE REPORT

| Sl No. | ITEMS | INFORMATIONS |
|---|---|---|
| 1 | Geographical Area | Jharia Coalfield (JCF): 453.0 sq. km.<br>Raniganj Coalfield (BCCL area): 19.64 sq. km. |
| 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 part |
| 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.<br>Damodar River, Barakar River is the master drainage of the part of RCF area (CV Area). |
| 4 | Annual Rainfall (IMD-report) | Jharkhand State: 1185.40 mm (year 2024)<br>Rainfall data given in **Annexure-IV**. |
| 5 | Geological Formations | Gondwana Formation<br>(Talchir Formation, Barakar Formation, Barren Measure Formation & Raniganj Formation) |
| 6 | Aquifer System | Unconfined/Phreatic Aquifer – thickness 25 m (Avg.)<br>Semi-confined to confined Aquifer – thickness from 50 m upto 650 m |
| 7 | Hydrogeological properties (Aquifer Pump Test) | Unconfined Aquifer:<br>Hydraulic Conductivity – 0.50 - 0.90 m/day<br>Transmissivity – 10 - 42 $m^2$/day |
| | | Semi-confined to confined Aquifer:<br>Hydraulic Conductivity – 0.0006-1.44 (0.05 avg.) m/day<br>Transmissivity – 0.06 – 15.0 $m^2$/day |
| 8 | Groundwater Level Monitoring Network | Out of total 139 nos. of monitoring stations 73 nos. located within core mining area and rest comes within Buffers zone.<br>55 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 18 Nos. of Groundwater monitoring well (Dug Wells) in RCF (CV Area). |
| 9 | Groundwater Levels Below Ground Level (bgl) | JCF area:<br>Pre-monsoon – 1.70 to 11.38 m (Avg. 6.33 m bgl) in '2023-24<br>Post-monsoon – 0.60 to 8.03 m (Avg. 3.77 m bgl) in '2023-24<br>RCF area (part):<br>Pre-monsoon – 2.10 to 9.50 m (Avg. 5.22 m bgl) in '2023-24<br>Post-monsoon – 1.50 to 5.18 m (Avg. 3.06 m bgl) in '2023-24 |
| 10 | Groundwater Quality | Potable as per BIS (**Annexure- VIII**) |
| 11 | 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<br>(GWRE:2023-24) |

# GROUNDWATER LEVEL & QUALITY REPORT FOR CLUSTER OF MINES OF BCCL

## 1.0 INTRODUCTION

## 1.1 LOCATION DETAILS AND BRIEF ABOUT THE PROJECT

The 16 nos. Cluster of mines (Cluster-I, II, III, IV, V, VI, VII, VIII, IX, X, XI, XIII, XIV, XV XVI and XVII) 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. (CV area). 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 16 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/e 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-/18/1086-1088/H) दिनांक : 14.06.2018

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 (5$^{th}$ order), Khudia nala (3$^{rd}$ order), Katri River (4$^{th}$) and Chatkari nala (3$^{rd}$ 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$^{o}$ C and falls between 10$^{o}$ C to 5$^{o}$ 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:

Coefficient of variation (CV) = [Standard Deviation / Mean] × 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).

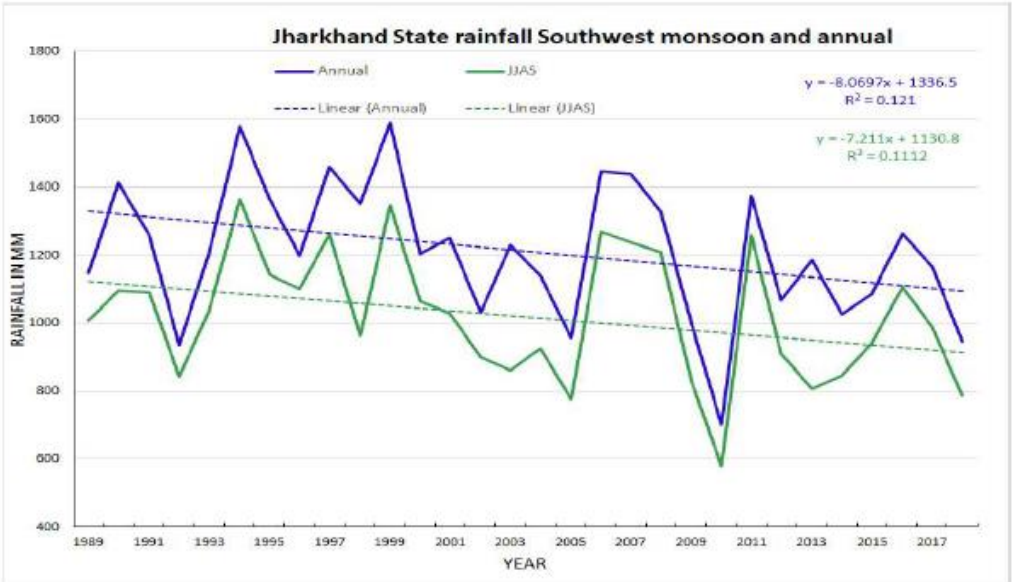



***Fig-1.***

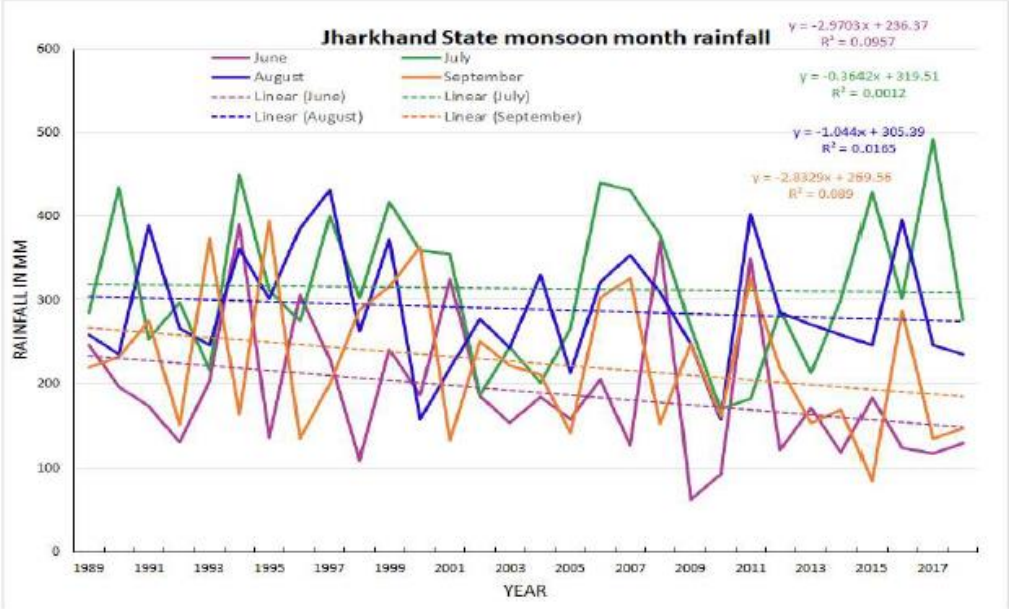



***Fig-2.***

## 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 Formaton | 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 | 50 to 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 to 0.90 m/day as computed from pumping tests on the wells. The transmissivity of the unconfined aquifer ranges from 10.68 $m^2$ /day to 41.48 $m^2$ /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) and also various piezometers within Cluster of mines BCCL during 2022-23. 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 determined from piezometers constructed in BCCL**

| Sl no. | Piezometer No. | Aquifer / Formation | Depth of the well (Meters) | Aquifer thickness (Meters) | Static Water Level (Meters) | Discharge (LPS) | Test duration (Minutes) | **K** (m/day) | **T** ($m^2$/day) |
|---|---|---|---|---|---|---|---|---|---|
| 1 | PZ-1A | Phreatic Aquifer | 40 | 15 | 12.15 | 4.70 | 275 | $9.71 \times 10^{-1}$ | 14.6 |
| 2 | PZ-1B | Barakar Formation (JCF) | 115 | 30 | 27 | 2.85 | 275 | $6.33 \times 10^{-2}$ | 1.9 |
| 3 | PZ-2A | | 87 | 15 | 28.1 | 1.5 | 960 | $5.88 \times 10^{-2}$ | 0.88 |
| 4 | PZ-3A | | 172 | 42 | 17.55 | 3.0 | 157 | $4.04 \times 10^{-2}$ | 1.70 |
| 5 | PZ-4A | | 70 | 18 | 15.55 | 1.65 | 167 | $5.00 \times 10^{-2}$ | 0.89 |
| 6 | PZ-8A | | 140 | 24 | 68.72 | 1.05 | 275 | $6.53 \times 10^{-2}$ | 1.57 |
| 7 | PZ-9B | | 100 | 30 | 34.68 | 2.45 | 390 | $6.68 \times 10^{-2}$ | 2.00 |
| 8 | PZ-10A | | 135 | 30 | 5 | 4.7 | 865 | $1.52 \times 10^{-1}$ | 4.55 |
| 9 | PZ-11A | Barren Measure Formation (JCF) | 300 | 66 | 60.60 | 3.05 | 300 | $3.9 \times 10^{-2}$ | 2.57 |
| 10 | PZ-13A | Ranigunj Formation (JCF) | 80 | 24 | 30.9 | 1.75 | 400 | $6.37 \times 10^{-2}$ | 1.53 |
| 11 | PZ-14B | | 162 | 24 | 12.15 | 2.75 | 475 | $7.48 \times 10^{-2}$ | 1.80 |
| 12 | PZ-16A | Barakar Formation (part of RCF) | 90 | 18 | 31.5 | 2.0 | 385 | $5.59 \times 10^{-2}$ | 1.01 |

## 3.0 GROUND WATER LEVEL MONITORING

To collect the representative groundwater levels in the study area, CMPDI has established a monitoring network of total 139 monitoring stations out of which 73 located within core zone and rest falls in Buffer zone. Total 105 nos. dug well within JCF and 34 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 on quarterly basis (May'24, Aug'24, Nov'24 and Jan'25).

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 2024 (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 |
| | 2023 | 1.70 | 11.38 | 6.33 | 0.60 | 8.03 | 3.77 | 0.10 | 6.55 | 2.56 |
| | 2024 | 1.95 | 12.50 | 6.73 | 0.65 | 8.22 | 3.80 | 1.30 | 4.28 | 2.93 |
| | | | | | | | | | | |
| 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 |
| | 2023 | 2.10 | 9.50 | 5.22 | 1.50 | 5.18 | 3.06 | 0.60 | 4.32 | 2.16 |
| | 2024 | 2.14 | 10.26 | 5.17 | 1.14 | 7.34 | 3.10 | 1.00 | 2.92 | 2.07 |

## 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: Avg. Depth to water table**

| *Formation* | *Area* | *DTW (bgl, m) [Year-2024-25]* | |
|---|---|---|---|
| | | *Pre-monsoon (May'24)* | *Post-monsoon (Nov'24)* |
| Sedimentary (Gondwana Formation / Core Zone) | Non-mining | 1.95-11.90 | 0.65-8.22 |
| | Mining | 1.95-10.6 | 0.65-7.34 |
| Metamorphics (Hard rock) | Peripheral part of the Coalfield | 3.17-12.5 | 1.14-7.77 |

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**

| *Sl. No* | *Formation* | *Area* | *Average hydraulic gradient* |
|---|---|---|---|
| 1 | Sedimentary (Gondwana Formation / Core Zone) | Non-Mining | $1.0 \times 10^{-3}$ to $2 \times 10^{-3}$ |
| | | Mining | $1.0 \times 10^{-2}$ to $1.5 \times 10^{-3}$ |
| 2 | Metamorphics (Buffer Zone) | Peripheral part of the Coalfield | $1.0 \times 10^{-3}$ to $3.5 \times 10^{-3}$ |

## 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.

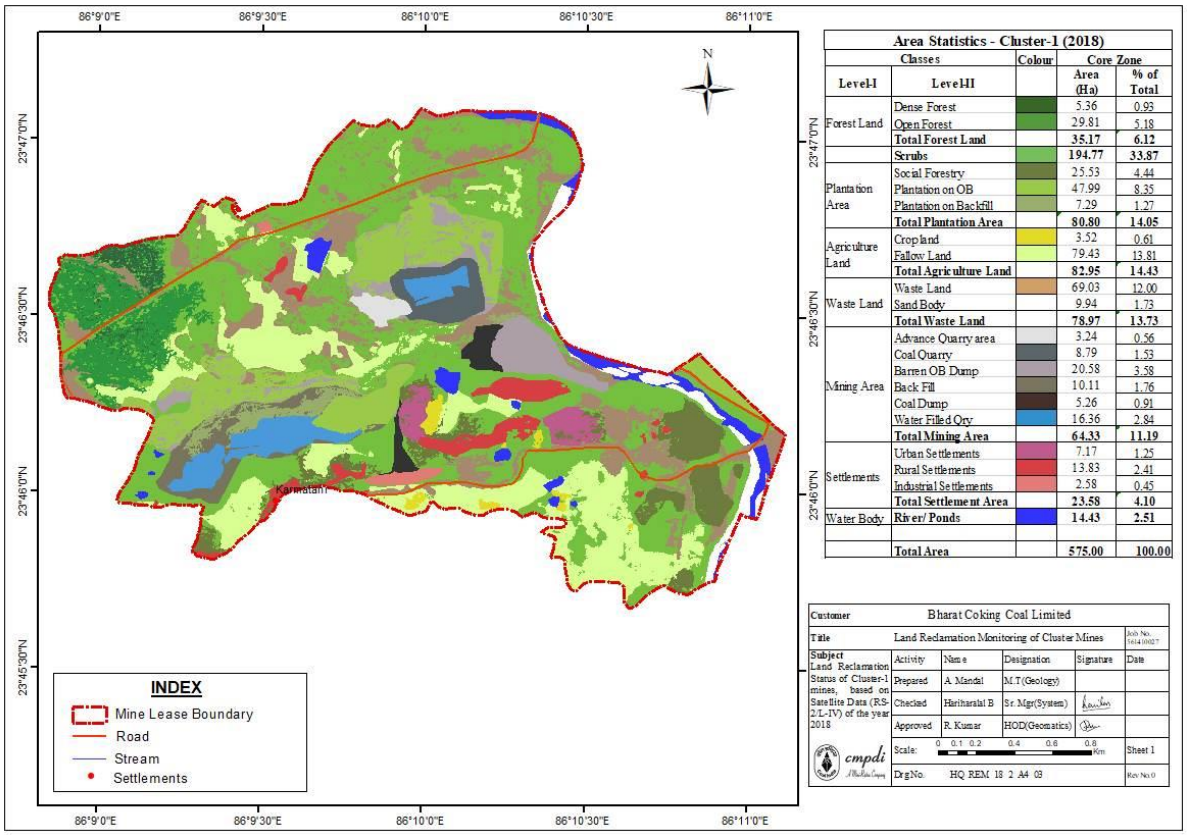
Monitoring stations (**B015, B051 and B053**) are located in the core zone of the mine area. Water level monitoring in these monitoring stations has done in the months of May'23, August'23, and Nov'23 and January'24. The Ground water level data is presented in the table below:

| Sl | Well | Location | Water level (bgl in meters) | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| No. | No. | | 2024-25 | | | | 2023-24 | | | | 2022-23 | | | |
| | | | May | Aug | Nov | Jan | May | Aug | Nov | Jan | May | Aug | Nov | Jan |
| 1 | B015 | Bera Basti | 3.35 | 0.70 | 0.91 | 1.54 | 3.20 | 0.80 | 1.00 | 2.72 | 3.67 | 0.45 | 1.02 | 2.30 |
| 2 | B051 | Taranga | 6.40 | 2.66 | 4.47 | 5.05 | 5.20 | 2.51 | 4.45 | 4.95 | 5.06 | 0.00 | 4.57 | 2.87 |
| 3 | B053 | Karmatanr | 3.10 | 1.02 | 1.21 | 1.45 | 2.62 | 1.33 | 1.13 | 1.66 | 4.42 | 1.78 | 3.54 | 1.68 |
| ***Average WL (bgl)*** | | | 4.28 | 1.46 | 2.20 | 2.68 | 3.67 | 1.55 | 2.19 | 3.11 | 4.38 | 0.74 | 3.04 | 2.28 |

LAST THREE-YEAR ASSESSMENT:

Pre-monsoon GW Level (m): Min – 2.62 m Max –6.40 m
Post-monsoon GW Level (m): Min – 0.91 m Max – 4.57 m

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




**Area Statistics - Cluster-1 (2018)**

| Classes | | Colour | Core Zone | |
|---|---|---|---|---|
| Level-I | Level-II | | Area (Ha) | % of Total |
| Forest Land | Dense Forest | | 5.36 | 0.93 |
| | Open Forest | | 29.81 | 5.18 |
| | **Total Forest Land** | | **35.17** | **6.12** |
| | **Scrubs** | | **194.77** | **33.87** |
| Plantation Area | Social Forestry | | 25.53 | 4.44 |
| | Plantation on OB | | 47.99 | 8.35 |
| | Plantation on Backfill | | 7.29 | 1.27 |
| | **Total Plantation Area** | | **80.80** | **14.05** |
| Agriculture Land | Cropland | | 3.52 | 0.61 |
| | Fallow Land | | 79.43 | 13.81 |
| | **Total Agriculture Land** | | **82.95** | **14.43** |
| Waste Land | Waste Land | | 69.03 | 12.00 |
| | Sand Body | | 9.94 | 1.73 |
| | **Total Waste Land** | | **78.97** | **13.73** |
| Mining Area | Advance Quarry area | | 3.24 | 0.56 |
| | Coal Quarry | | 8.79 | 1.53 |
| | Barren OB Dump | | 20.58 | 3.58 |
| | Back Fill | | 10.11 | 1.76 |
| | Coal Dump | | 5.26 | 0.91 |
| | Water Filled Qry | | 16.36 | 2.84 |
| | **Total Mining Area** | | **64.33** | **11.19** |
| Settlements | Urban Settlements | | 7.17 | 1.25 |
| | Rural Settlements | | 13.83 | 2.41 |
| | Industrial Settlements | | 2.58 | 0.45 |
| | **Total Settlement Area** | | **23.58** | **4.10** |
| Water Body | River/ Ponds | | 14.43 | 2.51 |
| | | | | |
| | **Total Area** | | **575.00** | **100.00** |

| Customer | Bharat Coking Coal Limited | | | | |
|---|---|---|---|---|---|
| Title | Land Reclamation Monitoring of Cluster Mines | | | | Job No. 5614.0002 |
| Subject | Activity | Name | Designation | Signature | Date |
| Land Reclamation Status of Cluster-I mines, based on Satellite Data (RS-2/L-IV) of the year 2018 | Prepared | A. Mandal | M.T(Geology) | | |
| | Checked | Hariharalal B | Sr. Mgr(System) | | |
| | Approved | R. Kumar | HOD(Geomatics) | | |
| cmpdi | Scale: 0 0.1 0.2 0.4 0.6 0.8 Km | | | | Sheet 1 |
| | Drg No. HQ REM 18 2 A4 03 | | | | Rev No 0 |

| 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.

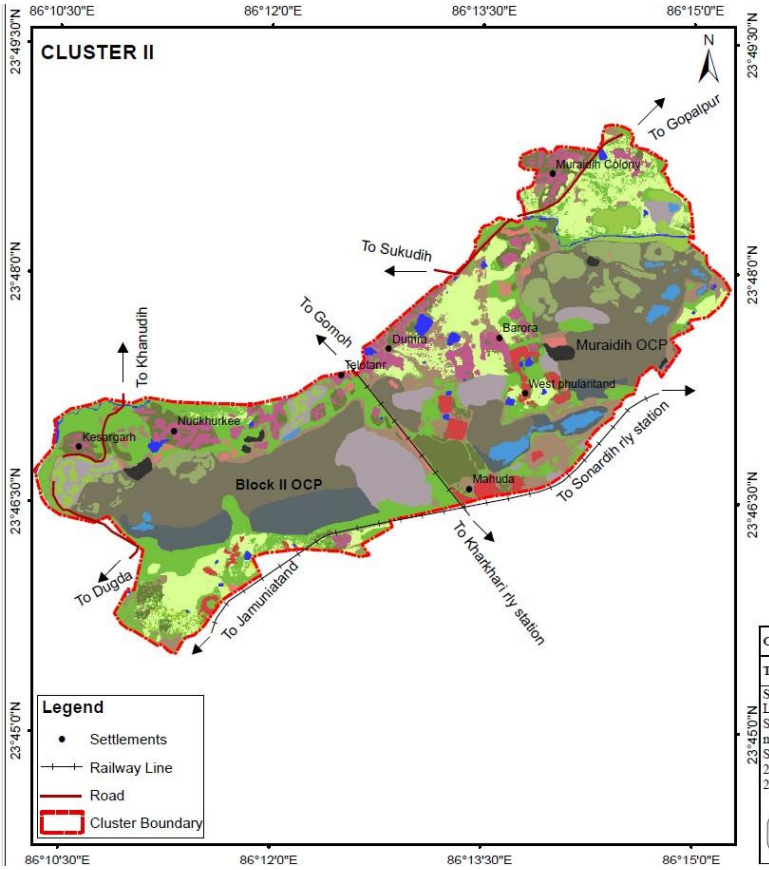
Monitoring stations (**B001, B059, B060 and B062**) are located in the core zone of the mine area. Water level monitoring in these monitoring stations has done in the months of May'23, August'23, and Nov'23 and January'24. The Ground water level data is presented in the table below:

| Sl | Well | Location | Water level (bgl in meters) | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| No. | No. | | 2024-25 | | | | 2023-24 | | | | 2022-23 | | | |
| | | | May | Aug | Nov | Jan | May | Aug | Nov | Jan | May | Aug | Nov | Jan |
| 1 | B001 | Muraidih | 4.12 | 1.82 | 2.58 | 2.83 | 3.22 | 1.25 | 2.45 | 2.7 | 2.1 | 1.65 | 1.81 | 2.73 |
| 2 | B059 | Khodovaly | 2.98 | 0.50 | 0.65 | 1.12 | 1.88 | 0.5 | 0.7 | 1.12 | 4.5 | 0.44 | 1.14 | 1.04 |
| 3 | B060 | Bahiyardih | 9.10 | 2.70 | 5.77 | 9.04 | 10.73 | 5.31 | 5.73 | 9.51 | 10.53 | 1.08 | 5.8 | 9.38 |
| 4 | B062 | Sadiyardih | 4.97 | 3.01 | 3.19 | 3.80 | 4.8 | 2.35 | 3.1 | 4 | 6.45 | 1.77 | 4.91 | 5.15 |
| ***Average WL (bgl)*** | | | 5.29 | 2.01 | 3.05 | 4.20 | 5.16 | 2.35 | 3 | 4.33 | 5.9 | 1.24 | 3.42 | 4.58 |

LAST THREE-YEAR ASSESSMENT:

Pre-monsoon GW Level (m): Min – 1.88m Max – 10.73 m
Post-monsoon GW Level (m): Min – 0.65 m Max – 5.80 m

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




| Area Statistics - Cluster-II (2022) | | | | |
|---|---|---|---|---|
| Classes | | Colour | Core Zone | |
| Level-I | Level-II | | Area (Ha) | % of Total |
| Forests | Dense Forest | | 0.00 | 0.00 |
| | Open Forest | | 0.00 | 0.00 |
| | **Total Forest (A)** | | **0.00** | **0.00** |
| | **Scrubs (B)** | | **381.65** | **18.84** |
| Plantation Area | Social Forestry | | 128.03 | 6.32 |
| | Plantation on OB | | 47.29 | 2.33 |
| | Plantation on Backfill | | 87.42 | 4.32 |
| | **Total Plantation (C)** | | **262.74** | **12.97** |
| | **Total Vegetation (A+B+C)** | | **644.39** | **31.81** |
| Agriculture Land | Crop land | | 2.51 | 0.12 |
| | Fallow Land | | 254.68 | 12.57 |
| | **Total Agriculture Land** | | **257.19** | **12.70** |
| Waste Land | Waste Land | | 191.19 | 9.44 |
| | Sand Body | | 2.01 | 0.10 |
| | **Total Waste Land** | | **193.20** | **9.54** |
| Mining Area | Advance Quarry Site | | 0.00 | 0.00 |
| | Coal Quarry | | 116.08 | 5.73 |
| | Barren OB Dump | | 146.93 | 7.25 |
| | Back Fill | | 422.00 | 20.83 |
| | Coal Dump | | 15.58 | 0.77 |
| | Water Filled Qry | | 32.77 | 1.62 |
| | **Total Mining Area** | | **733.36** | **36.20** |
| Settlements | Urban Settlements | | 111.11 | 5.48 |
| | Rural Settlements | | 41.15 | 2.03 |
| | Industrial Settlements | | 19.35 | 0.96 |
| | **Total Settlement Area** | | **171.61** | **8.47** |
| Water Body | **River/ Ponds** | | **25.96** | **1.28** |
| | **Total Area** | | **2025.71** | **100.00** |

| | | | | | |
|---|---|---|---|---|---|
| Customer | Bharat Coking Coal Limited | | | | |
| Title | Land Reclamation Monitoring of Cluster Mines | | | | Job No. 564922120 |
| Subject: Land Reclamation Status of Cluster-II mines, based on Satellite Data (RS-2A/L-IV) of the year 2022 | Activity | Name | Designation | Signature | Date |
| | Prepared | A. Parida | Dy. Mgr(Geol) | | |
| | Checked | Hariharalal B | Ch. Mgr(System) | | |
| | Approved | R. Kumar | GM(Geomatics) | | |
| cmpdi | Scale: 0 0.5 1 2 Km | | | | Sheet 1 |
| | Drg No. HQ REM 22 2 A4 02 | | | | RevNo 0 |

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

## 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.

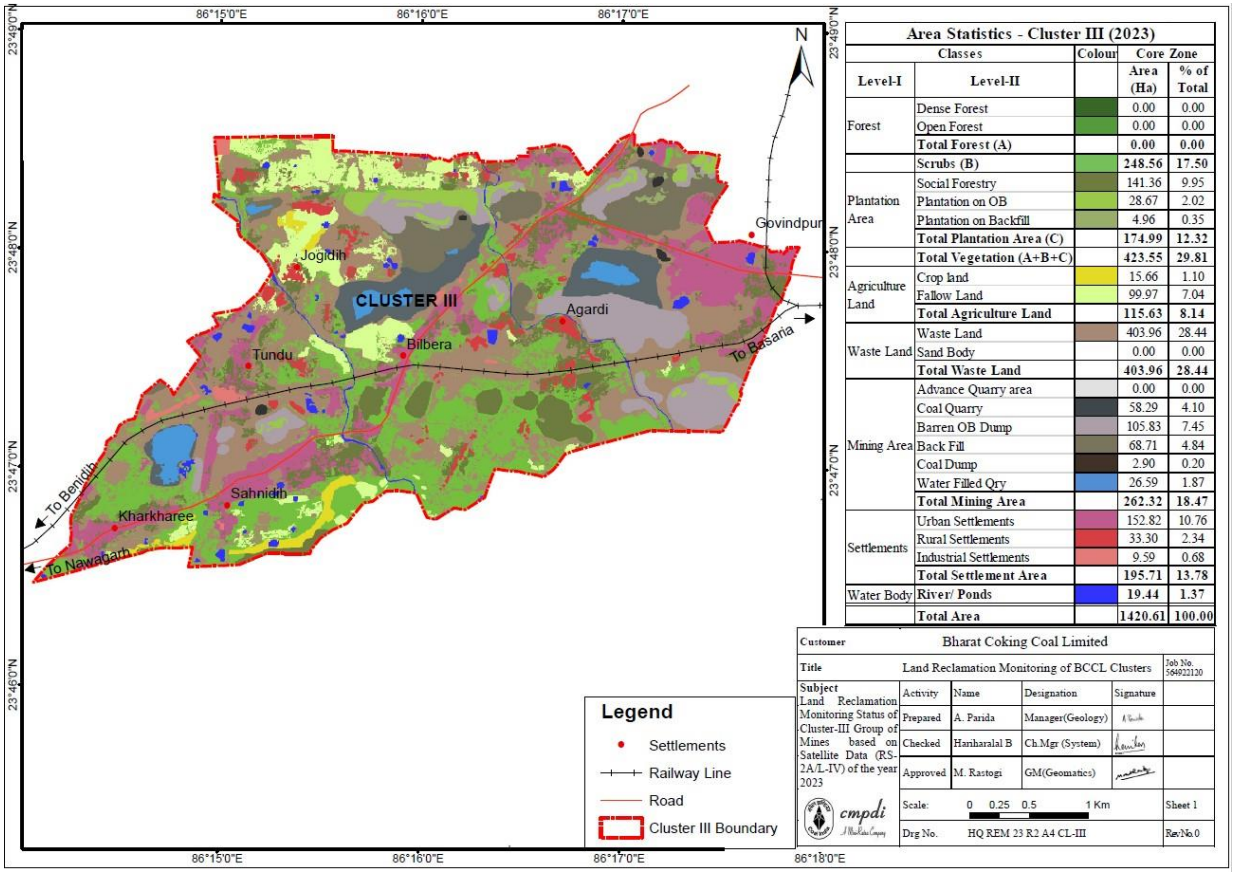
Monitoring stations (**A025, A029, B014 and B060**) are located in the core zone of the mine area. Water level monitoring in these monitoring stations has been done in the months of May'23, August'23, and Nov'23 and January'24. The Ground water level data is presented in the table below:

| Sl No. | Well No. | Location | Water level (bgl in meters) | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | 2024-25 | | | | 2023-24 | | | | 2022-23 | | | |
| | | | | | | | May | Aug | Nov | Jan | May | Aug | Nov | Jan |
| 1 | A025 | Sinidih | 4.85 | 1.39 | 2.65 | 2.98 | 2.93 | 1.09 | 2.6 | 2.7 | 3.31 | 1.33 | 2.08 | 2.51 |
| 2 | A029 | Dharmaband | 3.06 | 1.01 | 2.80 | 2.88 | 5.6 | 2.1 | 3.2 | 4.08 | 4.6 | 1.2 | 1.15 | 1.12 |
| 3 | B014 | Mathadih | 3.40 | 0.93 | 2.27 | 2.45 | 2.84 | 1.12 | 2.34 | 2.42 | 3.24 | 0.09 | 2.6 | 2.55 |
| 4 | B060 | Sonardih | 9.10 | 2.70 | 5.77 | 9.04 | 10.73 | 5.31 | 5.73 | 9.51 | 10.53 | 1.08 | 5.8 | 9.38 |
| ***Average WL (bgl)*** | | | 5.10 | 1.51 | 3.37 | 4.34 | 5.53 | 2.41 | 3.47 | 4.68 | 5.42 | 0.93 | 2.91 | 3.89 |

LAST THREE-YEAR ASSESSMENT:

Pre-monsoon GW Level (m): Min – 2.84 m Max – 10.73 m
Post-monsoon GW Level (m): Min – 1.15 m Max – 5.80 m

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




**Area Statistics - Cluster III (2023)**

| 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)** | | **248.56** | **17.50** |
| | Social Forestry | | 141.36 | 9.95 |
| | Plantation on OB | | 28.67 | 2.02 |
| | Plantation on Backfill | | 4.96 | 0.35 |
| | **Total Plantation Area (C)** | | **174.99** | **12.32** |
| | **Total Vegetation (A+B+C)** | | **423.55** | **29.81** |
| Agriculture Land | Crop land | | 15.66 | 1.10 |
| | Fallow Land | | 99.97 | 7.04 |
| | **Total Agriculture Land** | | **115.63** | **8.14** |
| Waste Land | Waste Land | | 403.96 | 28.44 |
| | Sand Body | | 0.00 | 0.00 |
| | **Total Waste Land** | | **403.96** | **28.44** |
| Mining Area | Advance Quarry area | | 0.00 | 0.00 |
| | Coal Quarry | | 58.29 | 4.10 |
| | Barren OB Dump | | 105.83 | 7.45 |
| | Back Fill | | 68.71 | 4.84 |
| | Coal Dump | | 2.90 | 0.20 |
| | Water Filled Qry | | 26.59 | 1.87 |
| | **Total Mining Area** | | **262.32** | **18.47** |
| Settlements | Urban Settlements | | 152.82 | 10.76 |
| | Rural Settlements | | 33.30 | 2.34 |
| | Industrial Settlements | | 9.59 | 0.68 |
| | **Total Settlement Area** | | **195.71** | **13.78** |
| Water Body | **River/ Ponds** | | **19.44** | **1.37** |
| | **Total Area** | | **1420.61** | **100.00** |

| | | | | | |
|---|---|---|---|---|---|
| Customer | Bharat Coking Coal Limited | | | | |
| Title | Land Reclamation Monitoring of BCCL Clusters | | | | Job No. 564922120 |
| Subject: Land Reclamation Monitoring Status of Cluster-III Group of Mines based on Satellite Data (RS-2A/L-IV) of the year 2023 | Activity | Name | Designation | Signature | |
| | Prepared | A. Parida | Manager(Geology) | | |
| | Checked | Hariharalal B | Ch.Mgr (System) | | |
| | Approved | M. Rastogi | GM(Geomatics) | | |
| cmpdi | Scale: | 0 0.25 0.5 1 Km | | | Sheet 1 |
| | Drg No. | HQ REM 23 R2 A4 CL-III | | | Rev No 0 |

| 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.

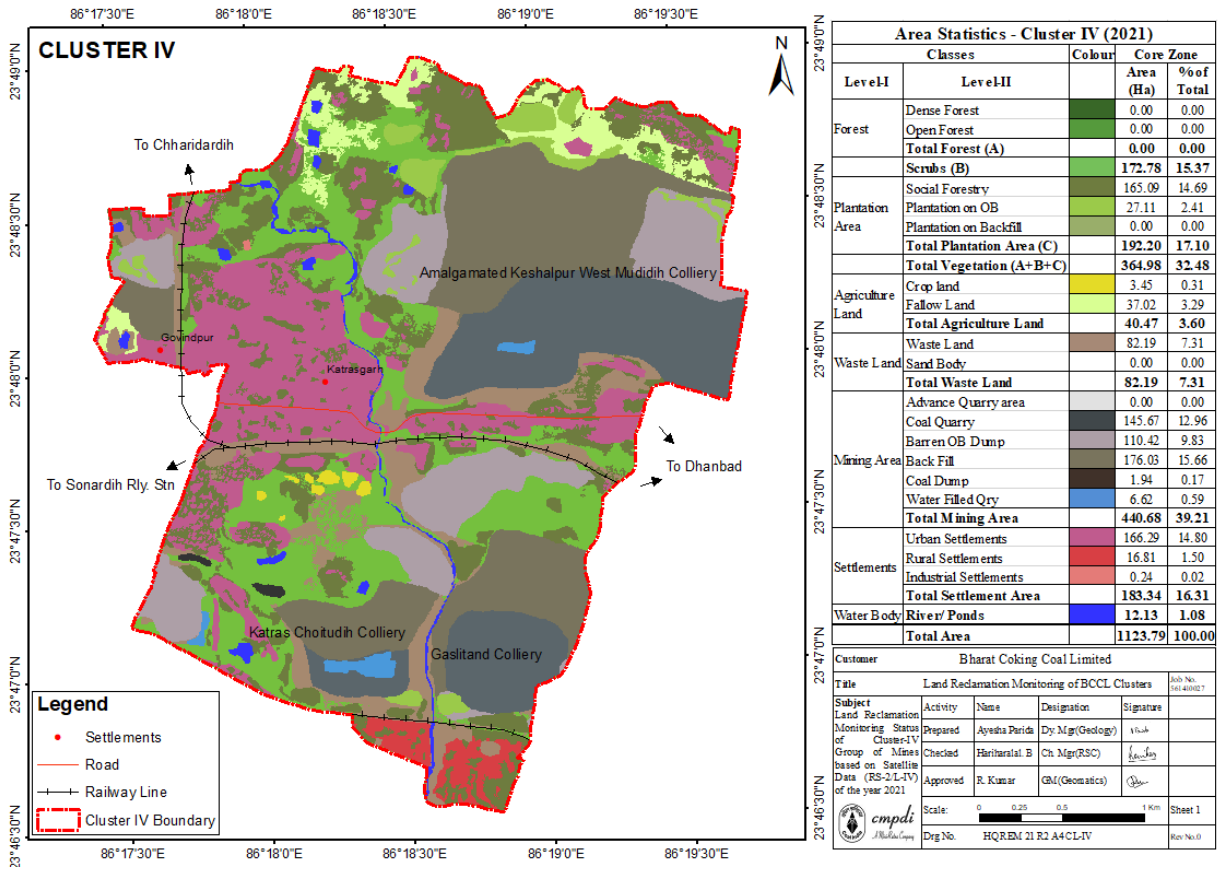
Monitoring stations (**A026, A028 and B065**) are located in the core zone of the mine area. Water level monitoring in these monitoring stations has been done in the months of May'23, August'23, and Nov'23 and January'24. The Ground water level data is presented in the table below:

| Sl No. | Well No. | Location | Water level (bgl in meters) | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | 2024-25 | | | | 2023-24 | | | | 2022-23 | | | |
| | | | May | Aug | Nov | Jan | May | Aug | Nov | Jan | May | Aug | Nov | Jan |
| 1 | A026 | Malkhera | 7.00 | 3.18 | 3.72 | 4.35 | 8.4 | 3.87 | 3.83 | 5.5 | 6.42 | 2.83 | 4.31 | 3.62 |
| 2 | A028 | Lakarka | 4.30 | 3.30 | 3.49 | 3.78 | 3.45 | 3.13 | 3.35 | 3.4 | 4.23 | 2.85 | 3.3 | 3.57 |
| 3 | B065 | Jhinjipahari | 10.60 | 2.22 | 2.45 | 4.01 | 8.45 | 1.95 | 2.35 | 4.93 | 7.45 | 0.5 | 2.27 | 3.45 |
| ***Average WL (bgl)*** | | | 7.30 | 2.90 | 3.22 | 4.05 | 6.77 | 2.98 | 3.18 | 4.61 | 6.03 | 2.06 | 3.29 | 3.55 |

LAST THREE-YEAR ASSESSMENT:

Pre-monsoon GW Level (m): Min – 3.45 m Max – 10.60 m
Post-monsoon GW Level (m): Min – 2.27 m Max – 4.31 m

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




**Area Statistics - Cluster IV (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** |
| | **Scrubs (B)** | | **172.78** | **15.37** |
| Plantation Area | Social Forestry | | 165.09 | 14.69 |
| | Plantation on OB | | 27.11 | 2.41 |
| | Plantation on Backfill | | 0.00 | 0.00 |
| | **Total Plantation Area (C)** | | **192.20** | **17.10** |
| | **Total Vegetation (A+B+C)** | | **364.98** | **32.48** |
| Agriculture Land | Crop land | | 3.45 | 0.31 |
| | Fallow Land | | 37.02 | 3.29 |
| | **Total Agriculture Land** | | **40.47** | **3.60** |
| Waste Land | Waste Land | | 82.19 | 7.31 |
| | Sand Body | | 0.00 | 0.00 |
| | **Total Waste Land** | | **82.19** | **7.31** |
| Mining Area | Advance Quarry area | | 0.00 | 0.00 |
| | Coal Quarry | | 145.67 | 12.96 |
| | Barren OB Dump | | 110.42 | 9.83 |
| | Back Fill | | 176.03 | 15.66 |
| | Coal Dump | | 1.94 | 0.17 |
| | Water Filled Qry | | 6.62 | 0.59 |
| | **Total Mining Area** | | **440.68** | **39.21** |
| Settlements | Urban Settlements | | 166.29 | 14.80 |
| | Rural Settlements | | 16.81 | 1.50 |
| | Industrial Settlements | | 0.24 | 0.02 |
| | **Total Settlement Area** | | **183.34** | **16.31** |
| Water Body | **River/ Ponds** | | **12.13** | **1.08** |
| | **Total Area** | | **1123.79** | **100.00** |

| | | | | | |
|---|---|---|---|---|---|
| Customer | Bharat Coking Coal Limited | | | | |
| Title | Land Reclamation Monitoring of BCCL Clusters | | | | Job No. 541400027 |
| Subject | Activity | Name | Designation | Signature | |
| Land Reclamation Monitoring Status of Cluster-IV Group of Mines based on Satellite Data (RS-2/L-IV) of the year 2021 | Prepared | Ayesha Parida | Dy. Mgr(Geology) | | |
| | Checked | Hariharalal. B | Ch. Mgr(RSC) | | |
| | Approved | R. Kumar | GM(Geomatics) | | |
| cmpdi | Scale: 0 0.25 0.5 1 Km | | | | Sheet 1 |
| | Drg No. HQ/REM/21/R2/A4/CL-IV | | | | Rev No.0 |

| 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.

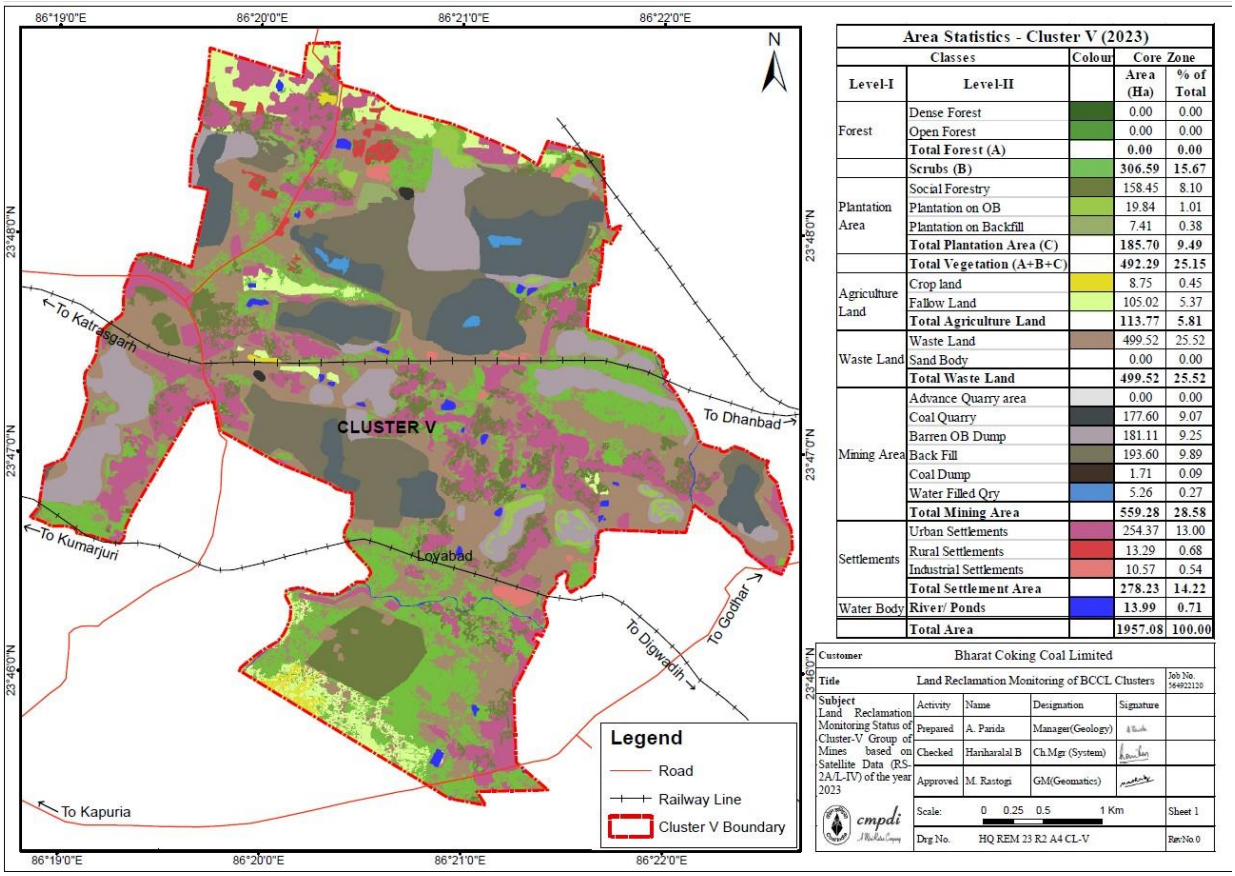
Monitoring stations (**A016 and A027**) are located in the core zone of the mine area. Water level monitoring in these monitoring stations has been done in the months of May'23, August'23, and Nov'23 and January'24. The Ground water level data is presented in the table below:

| Sl No. | Well No. | Location | Water level (bgl in meters) | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | 2024-25 | | | | 2023-24 | | | | 2022-23 | | | |
| | | | May | Aug | Nov | Jan | May | Aug | Nov | Jan | May | Aug | Nov | Jan |
| 1 | A016 | Ekra | 4.56 | 3.29 | 3.49 | 3.81 | 5.55 | 1.35 | 3.52 | 4.3 | 5.8 | 1.35 | 3.08 | 2.99 |
| 2 | A027 | Tetulmari | 7.00 | 3.18 | 3.72 | 4.35 | 1.7 | 0.55 | 1.6 | 1.8 | 1.9 | 0.1 | 1.33 | 1.5 |
| ***Average WL (bgl)*** | | | 5.78 | 3.24 | 3.61 | 4.08 | 3.63 | 0.95 | 2.56 | 3.05 | 3.85 | 0.73 | 2.21 | 2.25 |

LAST THREE-YEAR ASSESSMENT:

Pre-monsoon GW Level (m): Min – 1.70 m Max – 7.00 m
Post-monsoon GW Level (m): Min – 1.33 m Max – 3.72 m

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




**Area Statistics - Cluster V (2023)**

| 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** |
| | **Scrubs (B)** | | **306.59** | **15.67** |
| Plantation Area | Social Forestry | | 158.45 | 8.10 |
| | Plantation on OB | | 19.84 | 1.01 |
| | Plantation on Backfill | | 7.41 | 0.38 |
| | **Total Plantation Area (C)** | | **185.70** | **9.49** |
| | **Total Vegetation (A+B+C)** | | **492.29** | **25.15** |
| Agriculture Land | Crop land | | 8.75 | 0.45 |
| | Fallow Land | | 105.02 | 5.37 |
| | **Total Agriculture Land** | | **113.77** | **5.81** |
| Waste Land | Waste Land | | 499.52 | 25.52 |
| | Sand Body | | 0.00 | 0.00 |
| | **Total Waste Land** | | **499.52** | **25.52** |
| Mining Area | Advance Quarry area | | 0.00 | 0.00 |
| | Coal Quarry | | 177.60 | 9.07 |
| | Barren OB Dump | | 181.11 | 9.25 |
| | Back Fill | | 193.60 | 9.89 |
| | Coal Dump | | 1.71 | 0.09 |
| | Water Filled Qry | | 5.26 | 0.27 |
| | **Total Mining Area** | | **559.28** | **28.58** |
| Settlements | Urban Settlements | | 254.37 | 13.00 |
| | Rural Settlements | | 13.29 | 0.68 |
| | Industrial Settlements | | 10.57 | 0.54 |
| | **Total Settlement Area** | | **278.23** | **14.22** |
| Water Body | **River/ Ponds** | | **13.99** | **0.71** |
| | **Total Area** | | **1957.08** | **100.00** |

| | | | | | |
|---|---|---|---|---|---|
| Customer | Bharat Coking Coal Limited | | | | |
| Title | Land Reclamation Monitoring of BCCL Clusters | | | | Job No. 564922120 |
| Subject: Land Reclamation Monitoring Status of Cluster-V Group of Mines based on Satellite Data (RS-2A/L-IV) of the year 2023 | Activity | Name | Designation | Signature | |
| | Prepared | A. Parida | Manager(Geology) | | |
| | Checked | Hariharalal B | Ch.Mgr (System) | | |
| | Approved | M. Rastogi | GM(Geomatics) | | |
| cmpdi | Scale: | 0 0.25 0.5 1 Km | | | Sheet 1 |
| | Drg No. | HQ REM 23 R2 A4 CL-V | | | Rev No 0 |

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

## 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.

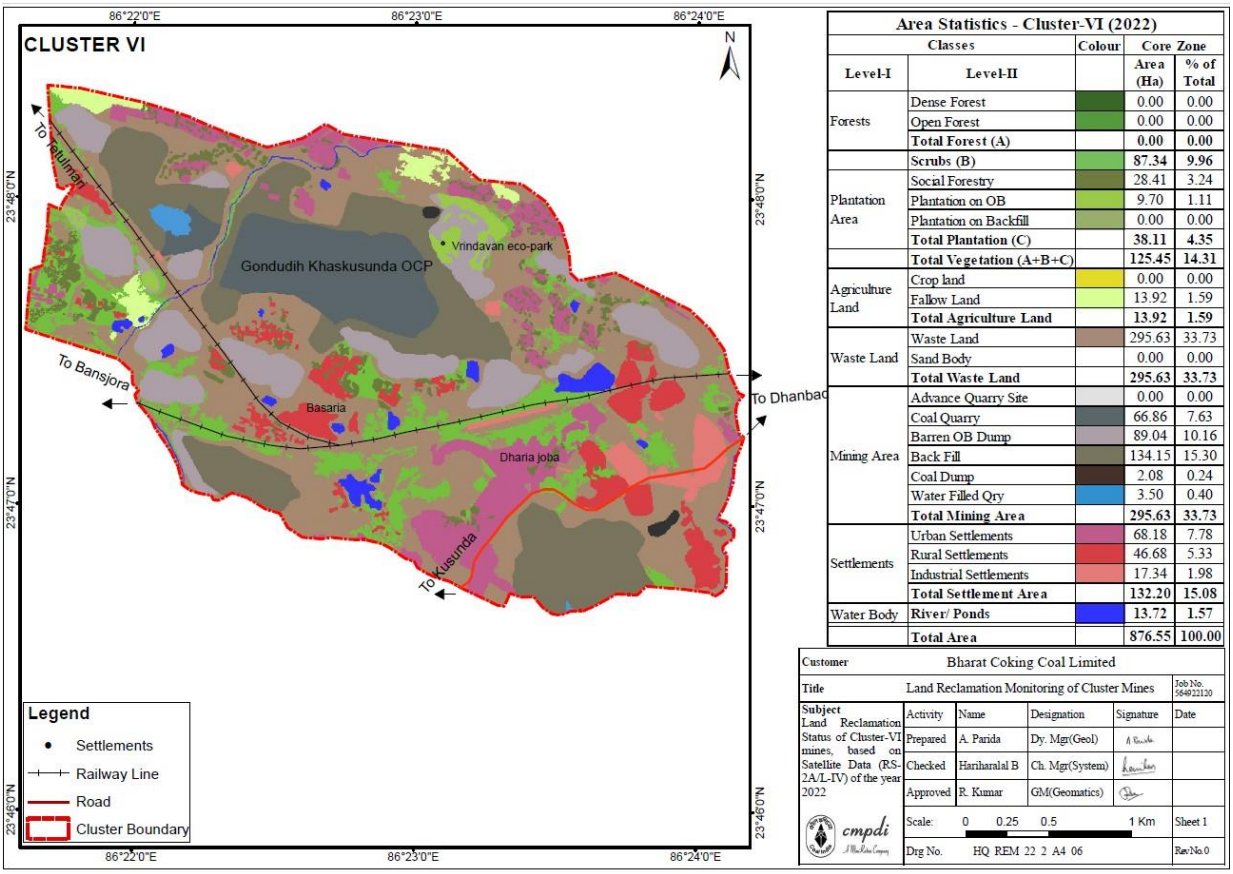
Monitoring stations (**D025, D030 and D034**) are located in the core zone of the mine area. Water level monitoring in these monitoring stations has been done in the months of May'23, August'23, and Nov'23 and January'24. The Ground water level data is presented in the table below:

| Sl No. | Well No. | Location | Water level (bgl in meters) | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | 2024-25 | | | | 2023-24 | | | | 2022-23 | | | |
| | | | May | Aug | Nov | Jan | May | Aug | Nov | Jan | May | Aug | Nov | Jan |
| 1 | D025 | Godhur | 6.33 | 3.24 | 3.47 | 5.20 | 4.40 | 1.80 | 3.40 | 4.20 | 11.90 | 2.58 | 4.70 | 5.30 |
| 2 | D030 | Borkiboa | 4.12 | 1.39 | 2.28 | 2.88 | 4.08 | 2.10 | 2.20 | 3.44 | 4.37 | 1.80 | 2.29 | 4.15 |
| 3 | D034 | Kusunda | 4.30 | 2.12 | 2.63 | 2.99 | 3.80 | 1.80 | 2.50 | 2.89 | 5.00 | 2.15 | 3.15 | 3.22 |
| ***Average WL (bgl)*** | | | 4.92 | 2.25 | 2.79 | 3.69 | 4.09 | 1.90 | 2.70 | 3.51 | 7.09 | 2.18 | 3.38 | 4.22 |

LAST THREE-YEAR ASSESSMENT:

Pre-monsoon GW Level (m): Min – 3.80 m Max – 11.90 m
Post-monsoon GW Level (m): Min – 2.20 m Max – 4.70 m

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




| Area Statistics - Cluster-VI (2022) | | | | |
|---|---|---|---|---|
| Classes | | Colour | Core Zone | |
| Level-I | Level-II | | Area (Ha) | % of Total |
| Forests | Dense Forest | | 0.00 | 0.00 |
| | Open Forest | | 0.00 | 0.00 |
| | **Total Forest (A)** | | **0.00** | **0.00** |
| Plantation Area | Scrubs (B) | | 87.34 | 9.96 |
| | Social Forestry | | 28.41 | 3.24 |
| | Plantation on OB | | 9.70 | 1.11 |
| | Plantation on Backfill | | 0.00 | 0.00 |
| | **Total Plantation (C)** | | **38.11** | **4.35** |
| | **Total Vegetation (A+B+C)** | | **125.45** | **14.31** |
| Agriculture Land | Crop land | | 0.00 | 0.00 |
| | Fallow Land | | 13.92 | 1.59 |
| | **Total Agriculture Land** | | **13.92** | **1.59** |
| Waste Land | Waste Land | | 295.63 | 33.73 |
| | Sand Body | | 0.00 | 0.00 |
| | **Total Waste Land** | | **295.63** | **33.73** |
| Mining Area | Advance Quarry Site | | 0.00 | 0.00 |
| | Coal Quarry | | 66.86 | 7.63 |
| | Barren OB Dump | | 89.04 | 10.16 |
| | Back Fill | | 134.15 | 15.30 |
| | Coal Dump | | 2.08 | 0.24 |
| | Water Filled Qry | | 3.50 | 0.40 |
| | **Total Mining Area** | | **295.63** | **33.73** |
| Settlements | Urban Settlements | | 68.18 | 7.78 |
| | Rural Settlements | | 46.68 | 5.33 |
| | Industrial Settlements | | 17.34 | 1.98 |
| | **Total Settlement Area** | | **132.20** | **15.08** |
| Water Body | **River/ Ponds** | | **13.72** | **1.57** |
| | **Total Area** | | **876.55** | **100.00** |

| | | | | | |
|---|---|---|---|---|---|
| Customer | Bharat Coking Coal Limited | | | | |
| Title | Land Reclamation Monitoring of Cluster Mines | | | | Job No. 5640/22120 |
| Subject: Land Reclamation Status of Cluster-VI mines, based on Satellite Data (RS-2A/L-IV) of the year 2022 | Activity | Name | Designation | Signature | Date |
| | Prepared | A. Parida | Dy. Mgr(Geol) | | |
| | Checked | Hariharalal B | Ch. Mgr(System) | | |
| | Approved | R. Kumar | GM(Geomatics) | | |
| cmpdi | Scale: 0 0.25 0.5 1 Km | | | | Sheet 1 |
| | Drg No. HQ REM 22 2 A4 06 | | | | Rev/No.0 |

| 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, Hurriladih 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.

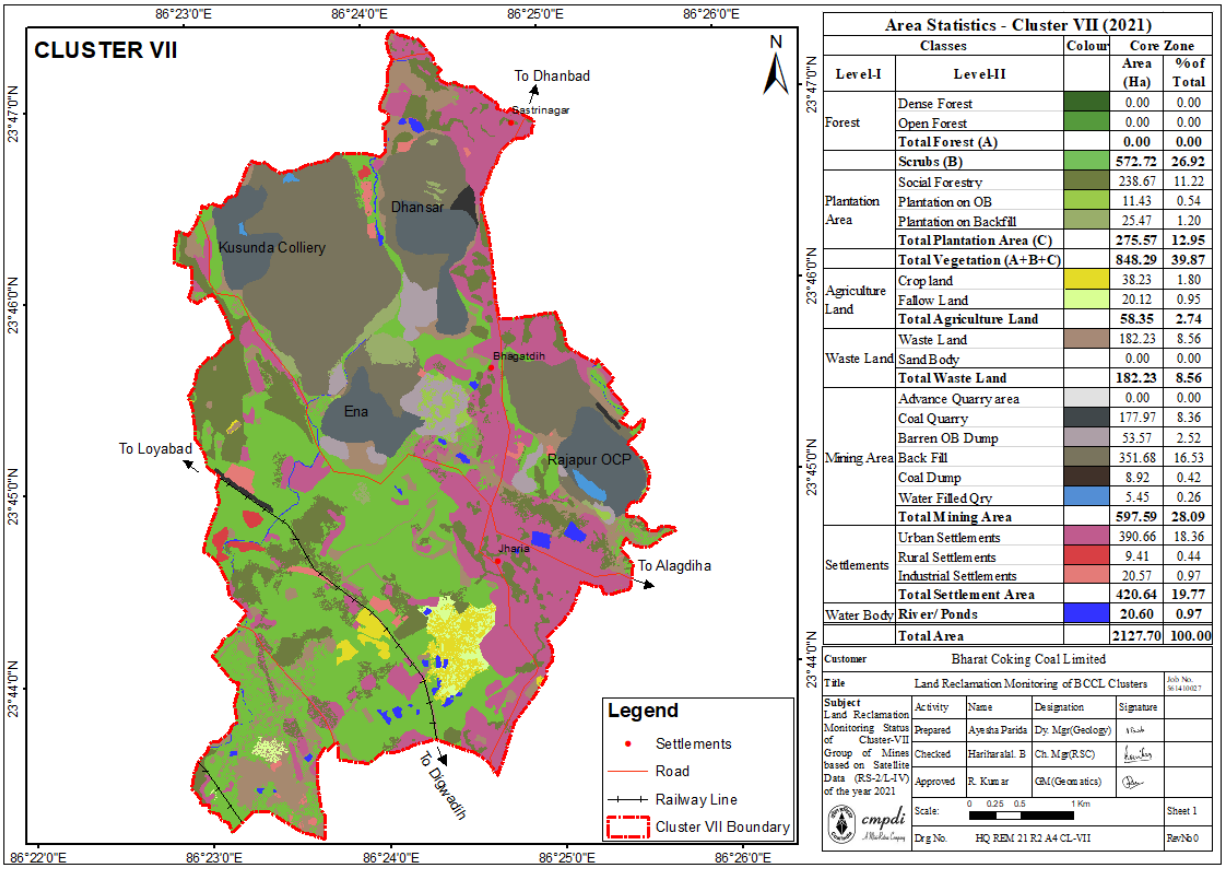
Monitoring stations (**D003, D034, D047 and D080**) are located in the core zone of the mine area. Water level monitoring in these monitoring stations has been done in the months of May'23, August'23, and Nov'23 and January'24. The Ground water level data is presented in the table below:

| Sl No. | Well No. | Location | Water level (bgl in meters) | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | 2024-25 | | | | 2023-24 | | | | 2022-23 | | | |
| | | | May | Aug | Nov | Jan | May | Aug | Nov | Jan | May | Aug | Nov | Jan |
| 1 | D003 | Dhansar | 1.95 | 0.87 | 1.71 | 1.88 | 3.15 | 1.22 | 1.85 | 2.28 | 5.96 | 0.55 | 1.32 | 1.34 |
| 2 | D034 | Kusunda | 4.30 | 2.12 | 2.63 | 2.99 | 3.8 | 1.8 | 2.5 | 2.89 | 5 | 2.15 | 3.15 | 3.22 |
| 3 | D047 | Parastanr | 4.32 | 2.14 | 3.38 | 3.65 | 4.45 | 2.57 | 3.27 | 3.85 | 6.55 | 5.32 | 5.85 | 11.4 |
| 4 | D080 | Bastacolla | 3.66 | 2.14 | 2.55 | 2.71 | 4.75 | 1.75 | 2.6 | 3.42 | 3.3 | 2.4 | 3.08 | 1.8 |
| ***Average WL (bgl)*** | | | 3.56 | 1.82 | 2.57 | 2.81 | 4.04 | 1.84 | 2.56 | 3.11 | 5.2 | 2.61 | 3.35 | 4.44 |

LAST THREE-YEAR ASSESSMENT:

Pre-monsoon GW Level (m): Min – 1.95 m Max – 6.55 m
Post-monsoon GW Level (m): Min – 1.32 m Max – 5.85 m

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




**Area Statistics - Cluster VII (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** |
| | **Scrubs (B)** | | **572.72** | **26.92** |
| Plantation Area | Social Forestry | | 238.67 | 11.22 |
| | Plantation on OB | | 11.43 | 0.54 |
| | Plantation on Backfill | | 25.47 | 1.20 |
| | **Total Plantation Area (C)** | | **275.57** | **12.95** |
| | **Total Vegetation (A+B+C)** | | **848.29** | **39.87** |
| Agriculture Land | Crop land | | 38.23 | 1.80 |
| | Fallow Land | | 20.12 | 0.95 |
| | **Total Agriculture Land** | | **58.35** | **2.74** |
| Waste Land | Waste Land | | 182.23 | 8.56 |
| | Sand Body | | 0.00 | 0.00 |
| | **Total Waste Land** | | **182.23** | **8.56** |
| Mining Area | Advance Quarry area | | 0.00 | 0.00 |
| | Coal Quarry | | 177.97 | 8.36 |
| | Barren OB Dump | | 53.57 | 2.52 |
| | Back Fill | | 351.68 | 16.53 |
| | Coal Dump | | 8.92 | 0.42 |
| | Water Filled Qry | | 5.45 | 0.26 |
| | **Total Mining Area** | | **597.59** | **28.09** |
| Settlements | Urban Settlements | | 390.66 | 18.36 |
| | Rural Settlements | | 9.41 | 0.44 |
| | Industrial Settlements | | 20.57 | 0.97 |
| | **Total Settlement Area** | | **420.64** | **19.77** |
| Water Body | **River/ Ponds** | | **20.60** | **0.97** |
| | **Total Area** | | **2127.70** | **100.00** |

| | | | | | |
|---|---|---|---|---|---|
| Customer | Bharat Coking Coal Limited | | | | |
| Title | Land Reclamation Monitoring of BCCL Clusters | | | | Job No. 36/14/0027 |
| Subject: Land Reclamation Monitoring Status of Cluster-VII Group of Mines based on Satellite Data (RS-2/L-IV) of the year 2021 | Activity | Name | Designation | Signature | |
| | Prepared | Ayesha Parida | Dy. Mgr(Geology) | | |
| | Checked | Hariharalal. B | Ch. Mgr(RSC) | | |
| | Approved | R. Kumar | GM(Geomatics) | | |
| cmpdi | Scale: 0 0.25 0.5 1 Km | | | | Sheet 1 |
| | Drg No. HQ REM 21 R2 A4 CL-VII | | | | Rev No 0 |

| 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.

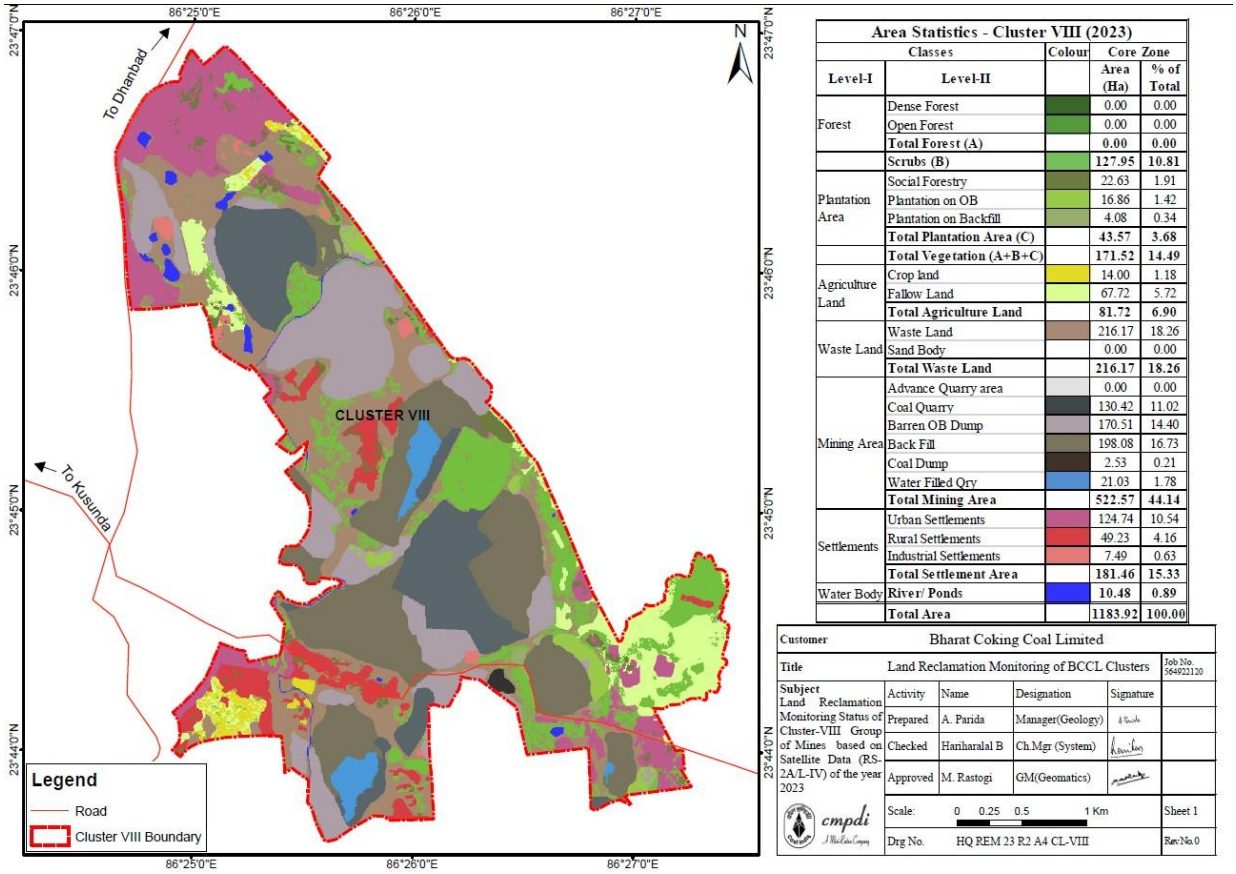
Monitoring stations (**D008 and D039**) are located in the core zone of the mine area. Water level monitoring in these monitoring stations has been done in the months of May'23, August'23, and Nov'23 and January'24. The Ground water level data is presented in the table below:

| Sl No. | Well No. | Location | Water level (bgl in meters) | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | 2024-25 | | | | 2023-24 | | | | 2022-23 | | | |
| | | | May | Aug | Nov | Jan | May | Aug | Nov | Jan | May | Aug | Nov | Jan |
| 1 | D008 | Alokdiha | 8.90 | 2.74 | 4.82 | 5.47 | 7.70 | 4.42 | 4.82 | 6.75 | 6.32 | 4.25 | 5.42 | 6.34 |
| 2 | D039 | Tilaboni | 3.20 | 2.51 | 2.77 | 2.87 | 8.52 | 2.52 | 3.28 | 5.75 | 7.50 | 1.85 | 3.05 | 1.75 |
| ***Average WL (bgl)*** | | | 6.05 | 2.63 | 3.80 | 4.17 | 8.11 | 3.47 | 4.05 | 6.25 | 6.91 | 3.05 | 4.24 | 4.05 |

LAST THREE-YEAR ASSESSMENT:

Pre-monsoon GW Level (m): Min – 3.20 m Max – 8.90 m
Post-monsoon GW Level (m): Min – 2.77 m Max – 5.42 m

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




| Area Statistics - Cluster VIII (2023) | | | | |
|---|---|---|---|---|
| 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** |
| | **Scrubs (B)** | | **127.95** | **10.81** |
| Plantation Area | Social Forestry | | 22.63 | 1.91 |
| | Plantation on OB | | 16.86 | 1.42 |
| | Plantation on Backfill | | 4.08 | 0.34 |
| | **Total Plantation Area (C)** | | **43.57** | **3.68** |
| | **Total Vegetation (A+B+C)** | | **171.52** | **14.49** |
| Agriculture Land | Crop land | | 14.00 | 1.18 |
| | Fallow Land | | 67.72 | 5.72 |
| | **Total Agriculture Land** | | **81.72** | **6.90** |
| Waste Land | Waste Land | | 216.17 | 18.26 |
| | Sand Body | | 0.00 | 0.00 |
| | **Total Waste Land** | | **216.17** | **18.26** |
| Mining Area | Advance Quarry area | | 0.00 | 0.00 |
| | Coal Quarry | | 130.42 | 11.02 |
| | Barren OB Dump | | 170.51 | 14.40 |
| | Back Fill | | 198.08 | 16.73 |
| | Coal Dump | | 2.53 | 0.21 |
| | Water Filled Qry | | 21.03 | 1.78 |
| | **Total Mining Area** | | **522.57** | **44.14** |
| Settlements | Urban Settlements | | 124.74 | 10.54 |
| | Rural Settlements | | 49.23 | 4.16 |
| | Industrial Settlements | | 7.49 | 0.63 |
| | **Total Settlement Area** | | **181.46** | **15.33** |
| Water Body | **River/ Ponds** | | **10.48** | **0.89** |
| | **Total Area** | | **1183.92** | **100.00** |

| | | | | | |
|---|---|---|---|---|---|
| Customer | Bharat Coking Coal Limited | | | | |
| Title | Land Reclamation Monitoring of BCCL Clusters | | | | Job No. 564922120 |
| Subject: Land Reclamation Monitoring Status of Cluster-VIII Group of Mines based on Satellite Data (RS-2A/L-IV) of the year 2023 | Activity | Name | Designation | Signature | |
| | Prepared | A. Parida | Manager(Geology) | | |
| | Checked | Hariharalal B | Ch.Mgr (System) | | |
| | Approved | M. Rastogi | GM(Geomatics) | | |
| cmpdi | Scale: 0 0.25 0.5 1 Km | | | | Sheet 1 |
| | Drg No. HQ REM 23 R2 A4 CL-VIII | | | | Rev No.0 |

| 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.

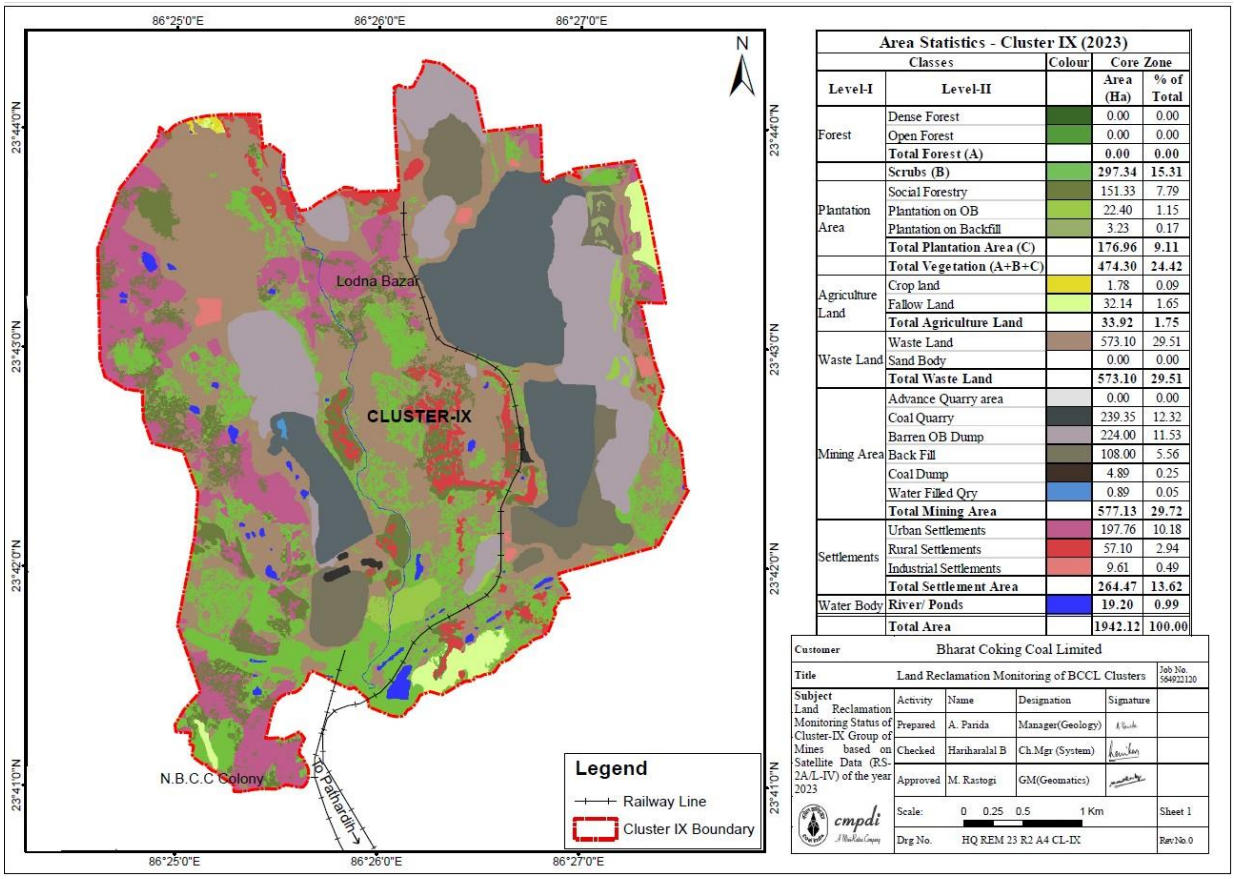
Monitoring stations (**D005, D007, D039 and D074**) are located in the core zone of the mine area. Water level monitoring in these monitoring stations has been done in the months of May'23, August'23, and Nov'23 and January'24. The Ground water level data is presented in the table below:

| Sl No. | Well No. | Location | Water level (bgl in meters) | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | 2024-25 | | | | 2023-24 | | | | 2022-23 | | | |
| | | | May | Aug | Nov | Jan | May | Aug | Nov | Jan | May | Aug | Nov | Jan |
| 1 | D005 | Jiyalgora | 8.70 | 4.53 | 6.02 | 7.35 | 8.20 | 4.08 | 5.90 | 6.54 | 8.40 | 3.36 | 7.01 | 8.95 |
| 2 | D007 | Golden Pahari | 9.82 | 2.70 | 3.52 | 5.67 | 9.03 | 1.88 | 3.64 | 5.18 | 9.03 | 2.17 | 5.67 | 6.57 |
| 3 | D039 | Tilaboni | 3.20 | 2.51 | 2.77 | 2.87 | 8.52 | 2.52 | 3.28 | 5.75 | 7.50 | 1.85 | 3.05 | 1.75 |
| 4 | D074 | BhulanBararee | 4.74 | 2.65 | 3.73 | 3.89 | 4.57 | 3.10 | 3.54 | 4.09 | 6.17 | 3.20 | 5.77 | 7.90 |
| ***Average WL (bgl)*** | | | 6.62 | 3.10 | 4.01 | 4.95 | 7.58 | 2.90 | 4.09 | 5.39 | 7.78 | 2.65 | 5.38 | 6.29 |

LAST THREE-YEAR ASSESSMENT:

Pre-monsoon GW Level (m): Min – 3.20 m Max – 9.82 m
Post-monsoon GW Level (m): Min – 2.77 m Max – 7.01 m

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




**Area Statistics - Cluster IX (2023)**

| 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** |
| | **Scrubs (B)** | | **297.34** | **15.31** |
| Plantation Area | Social Forestry | | 151.33 | 7.79 |
| | Plantation on OB | | 22.40 | 1.15 |
| | Plantation on Backfill | | 3.23 | 0.17 |
| | **Total Plantation Area (C)** | | **176.96** | **9.11** |
| | **Total Vegetation (A+B+C)** | | **474.30** | **24.42** |
| Agriculture Land | Crop land | | 1.78 | 0.09 |
| | Fallow Land | | 32.14 | 1.65 |
| | **Total Agriculture Land** | | **33.92** | **1.75** |
| Waste Land | Waste Land | | 573.10 | 29.51 |
| | Sand Body | | 0.00 | 0.00 |
| | **Total Waste Land** | | **573.10** | **29.51** |
| Mining Area | Advance Quarry area | | 0.00 | 0.00 |
| | Coal Quarry | | 239.35 | 12.32 |
| | Barren OB Dump | | 224.00 | 11.53 |
| | Back Fill | | 108.00 | 5.56 |
| | Coal Dump | | 4.89 | 0.25 |
| | Water Filled Qry | | 0.89 | 0.05 |
| | **Total Mining Area** | | **577.13** | **29.72** |
| Settlements | Urban Settlements | | 197.76 | 10.18 |
| | Rural Settlements | | 57.10 | 2.94 |
| | Industrial Settlements | | 9.61 | 0.49 |
| | **Total Settlement Area** | | **264.47** | **13.62** |
| Water Body | **River/ Ponds** | | **19.20** | **0.99** |
| | **Total Area** | | **1942.12** | **100.00** |

| | | | | | |
|---|---|---|---|---|---|
| Customer | Bharat Coking Coal Limited | | | | |
| Title | Land Reclamation Monitoring of BCCL Clusters | | | | Job No. 584922120 |
| Subject: Land Reclamation Monitoring Status of Cluster-IX Group of Mines based on Satellite Data (RS-2A/L-IV) of the year 2023 | Activity | Name | Designation | Signature | |
| | Prepared | A. Parida | Manager(Geology) | | |
| | Checked | Hariharalal B | Ch.Mgr (System) | | |
| | Approved | M. Rastogi | GM(Geomatics) | | |
| | Scale: 0 0.25 0.5 1 Km | | | | Sheet 1 |
| | Drg No. HQ REM 23 R2 A4 CL-IX | | | | Rev No.0 |

| 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.

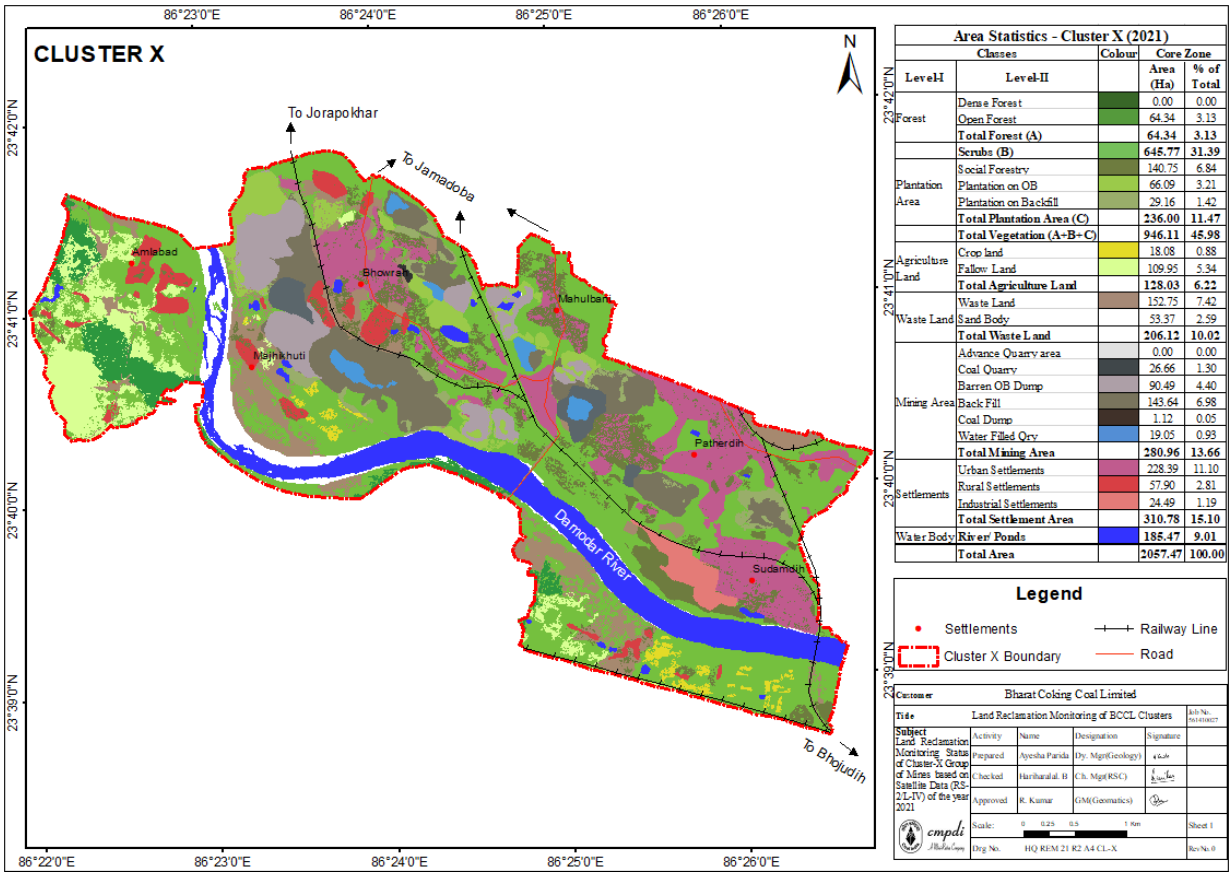
Monitoring stations (**A019, D035, D036 and D077**) are located in the core zone of the mine area. Water level monitoring in these monitoring stations has been done in the months of May'23, August'23, and Nov'23 and January'24, the Ground water level data is presented in the table below:

| Sl No. | Well No. | Location | Water level (bgl in meters) | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | 2024-25 | | | | 2023-24 | | | | 2022-23 | | | |
| | | | May | Aug | Nov | Jan | May | Aug | Nov | Jan | May | Aug | Nov | Jan |
| 1 | A019 | Bhowrah | 3.12 | 2.49 | 2.51 | 2.77 | 2.90 | 2.10 | 2.60 | 2.73 | 4.10 | 1.82 | 2.54 | 1.79 |
| 2 | D035 | Patherdih | 5.16 | 3.28 | 4.10 | 4.70 | 5.23 | 3.45 | 3.90 | 4.10 | 6.10 | 3.70 | 4.68 | 5.50 |
| 3 | D036 | Sudamdih | 2.64 | 0.45 | 0.74 | 1.13 | 1.85 | 0.50 | 0.60 | 1.00 | 3.25 | 0.15 | 0.60 | 1.44 |
| 4 | D077 | Amlabad | 6.15 | 3.80 | 4.01 | 4.76 | 5.98 | 3.90 | 3.93 | 5.07 | 6.50 | 3.40 | 4.70 | 6.00 |
| ***Average WL (bgl)*** | | | 4.27 | 2.51 | 2.84 | 3.34 | 3.99 | 2.49 | 2.76 | 3.23 | 4.99 | 2.27 | 3.13 | 3.68 |

LAST THREE-YEAR ASSESSMENT:

Pre-monsoon GW Level (m): Min – 1.85 m Max – 6.50 m
Post-monsoon GW Level (m): Min – 0.60 m Max – 4.70 m

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




**Area Statistics - Cluster X (2021)**

| Classes | | Colour | Core Zone | |
|---|---|---|---|---|
| Level-I | Level-II | | Area (Ha) | % of Total |
| Forest | Dense Forest | | 0.00 | 0.00 |
| | Open Forest | | 64.34 | 3.13 |
| | **Total Forest (A)** | | **64.34** | **3.13** |
| | **Scrubs (B)** | | **648.77** | **31.39** |
| Plantation Area | Social Forestry | | 140.75 | 6.84 |
| | Plantation on OB | | 66.09 | 3.21 |
| | Plantation on Backfill | | 29.16 | 1.42 |
| | **Total Plantation Area (C)** | | **236.00** | **11.47** |
| | **Total Vegetation (A+B+C)** | | **946.11** | **45.98** |
| Agriculture Land | Crop land | | 18.08 | 0.88 |
| | Fallow Land | | 109.95 | 5.34 |
| | **Total Agriculture Land** | | **128.03** | **6.22** |
| Waste Land | Waste Land | | 152.75 | 7.42 |
| | Sand Body | | 53.37 | 2.59 |
| | **Total Waste Land** | | **206.12** | **10.02** |
| Mining Area | Advance Quarry area | | 0.00 | 0.00 |
| | Coal Quarry | | 26.66 | 1.30 |
| | Barren OB Dump | | 90.49 | 4.40 |
| | Back Fill | | 143.64 | 6.98 |
| | Coal Dump | | 1.12 | 0.05 |
| | Water Filled Qry | | 19.05 | 0.93 |
| | **Total Mining Area** | | **280.96** | **13.66** |
| Settlements | Urban Settlements | | 228.39 | 11.10 |
| | Rural Settlements | | 57.90 | 2.81 |
| | Industrial Settlements | | 24.49 | 1.19 |
| | **Total Settlement Area** | | **310.78** | **15.10** |
| Water Body | **River/ Ponds** | | **185.47** | **9.01** |
| | **Total Area** | | **2057.47** | **100.00** |

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

## K. GROUND WATER LEVEL OF CLUSTER-XI

Cluster–XI consists of eight coal mines; Moonidih UG, Gopalichak UG Project, Kachi Balihari 10/12 Pit UG, Pootkee Balihari Project UG, Bhagaband UG, Kendwadih UG (closed), Pootkee UG (closed), Kachi Balihari 5/6 Pit UG (closed) 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 up to 50 years considering annual production target of 6.604 MTPA (toposheet no. no. 73 I/5 7 73 I/6).

The present leasehold area of Cluster-XI is 3527.58 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.

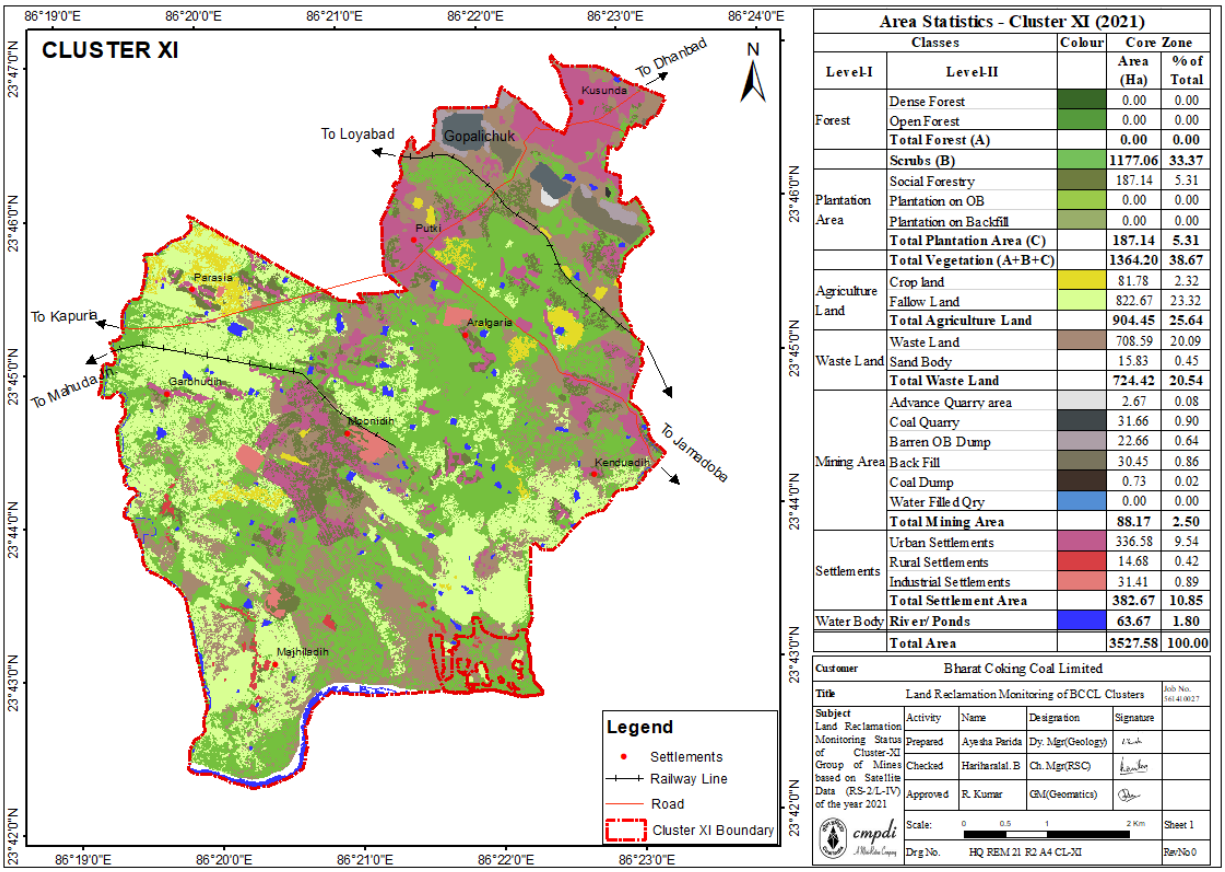
Monitoring stations (**A017, A020 and A032**) are located in the core zone of the mine area. Water level monitoring in these monitoring stations has been done in the months of May'23, August'23, and Nov'23 and January'24. The Ground water level data is presented in the table below:

| Sl No. | Well No. | Location | Water level (bgl in meters) | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | 2024-25 | | | | 2023-24 | | | | 2022-23 | | | |
| | | | May | Aug | Nov | Jan | May | Aug | Nov | Jan | May | Aug | Nov | Jan |
| 1 | A017 | Kachi Balihari | 3.18 | 2.11 | 2.26 | 2.51 | 2.41 | 1.78 | 2.19 | 2.57 | 2.62 | 2.06 | 2.59 | 2.64 |
| 2 | A020 | Gorbudih | 7.90 | 4.15 | 4.30 | 5.10 | 8.02 | 4.05 | 4.20 | 7.27 | 5.59 | 3.18 | 3.54 | 5.27 |
| 3 | A032 | Baludih | 3.51 | 1.59 | 1.72 | 2.15 | 3.83 | 0.95 | 1.60 | 2.09 | 2.25 | 0.65 | 1.75 | 2.79 |
| ***Average WL (bgl)*** | | | 4.86 | 2.62 | 2.76 | 3.25 | 4.75 | 2.26 | 2.66 | 3.98 | 3.49 | 1.96 | 2.63 | 3.57 |

LAST THREE-YEAR ASSESSMENT:

Pre-monsoon GW Level (m): Min – 2.25 m Max – 8.02 m
Post-monsoon GW Level (m): Min – 1.60 m Max – 4.30 m

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




**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** |
| | **Scrubs (B)** | | **1177.06** | **33.37** |
| Plantation Area | 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 |
| | Back Fill | | 30.45 | 0.86 |
| | Coal Dump | | 0.73 | 0.02 |
| | Water Filled Qry | | 0.00 | 0.00 |
| | **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 | | | Job No. 561410027 |
| Subject: Land Reclamation Monitoring Status of Cluster-XI Group of Mines based on Satellite Data (RS-2/L-IV) of the year 2021 | Activity | Name | Designation | Signature |
| | Prepared | Ayesha Parida | Dy. Mgr(Geology) | |
| | Checked | Hariharalal. B | Ch. Mgr(RSC) | |
| | Approved | R. Kumar | GM(Geomatics) | |
| cmpdi | Scale: 0 0.5 1 2 Km | | | Sheet 1 |
| | Drg No. HQ REM 21 R2 A4 CL-XI | | | Rev No 0 |

| Sl no | Land Use Details | Existing (sq. meter) | Proposed (sq. meter) | Grand Total (sq. meter) |
|---|---|---|---|---|
| 1 | Green Belt Area | 1060.61 x $10^4$ | 0.0 | 1293.46 x $10^4$ |
| 2 | Open Land | 1518.33 x $10^4$ | 0.0 | 1509.06 x $10^4$ |
| 3 | Road/ Paved Area | 171.08 x $10^4$ | 0.0 | 171.08 x $10^4$ |
| 4 | Rooftop area of building/ sheds | 777.56 x $10^4$ | 0.0 | 563.06 x $10^4$ |
| 5 | Total | 3527.58 x $10^4$ | 0.0 | 3527.58 x $10^4$ |

## 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.

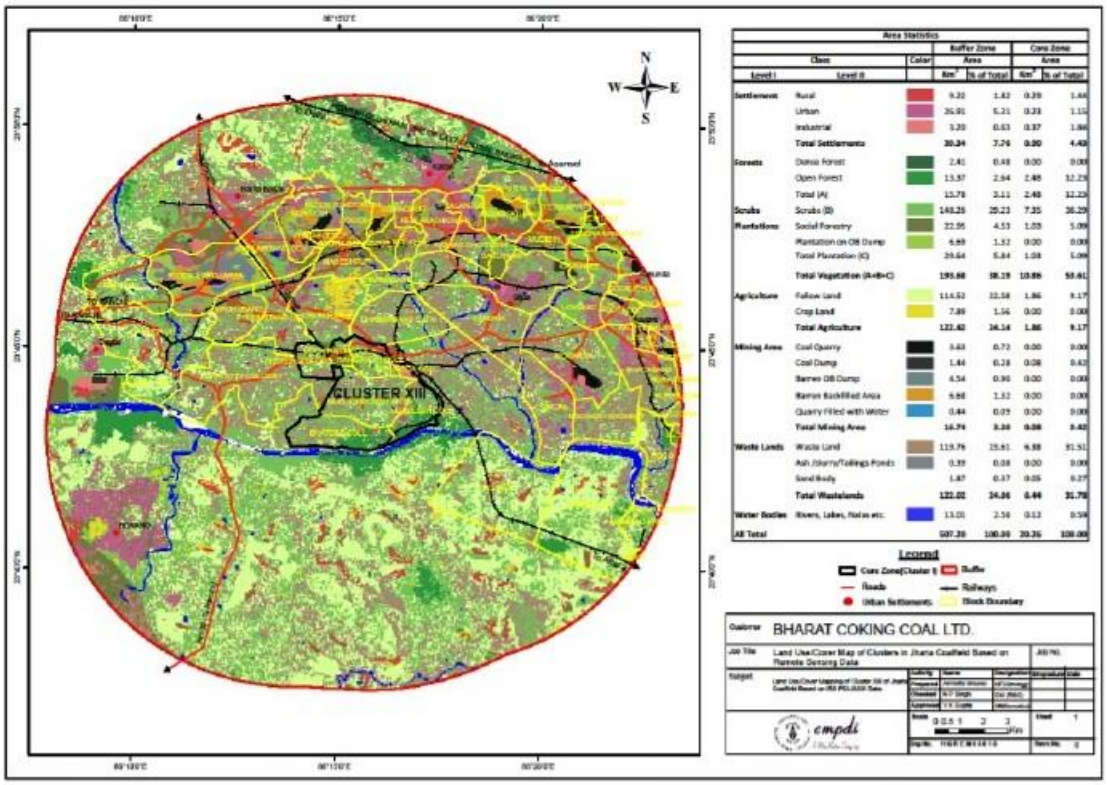
Monitoring stations (**A023, A034 and B048**) are located in the core zone of the mine area. Water level monitoring in these monitoring stations has been done in the months of May'23, August'23, Nov'23 and January'24. The Ground water level data is presented in the table below:

| Sl No. | Well No. | Location | Water level (bgl in meters) | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | 2024-25 | | | | 2023-24 | | | | 2022-23 | | | |
| | | | May | Aug | Nov | Jan | May | Aug | Nov | Jan | May | Aug | Nov | Jan |
| 1 | A023 | Machhayara | 10.44 | 2.72 | 5.72 | 6.95 | 9.00 | 5.10 | 5.71 | 7.90 | 7.97 | 1.14 | 4.79 | 6.67 |
| 2 | A034 | Mahuda vil. | 6.54 | 1.82 | 3.90 | 4.92 | 6.54 | 2.98 | 4.01 | 4.85 | 8.20 | 3.65 | 6.35 | 6.95 |
| 3 | B048 | Mahuda | 5.99 | 4.58 | 4.95 | 5.23 | 6.13 | 4.55 | 5.05 | 5.57 | 6.85 | 0.65 | 6.25 | 5.80 |
| ***Average WL (bgl)*** | | | 7.66 | 3.04 | 4.86 | 5.70 | 7.22 | 4.21 | 4.92 | 6.11 | 7.67 | 1.81 | 5.80 | 6.47 |

LAST THREE-YEAR ASSESSMENT:

Pre-monsoon GW Level (m): Min – 5.99 m Max – 10.44 m
Post-monsoon GW Level (m): Min – 3.90 m Max – 6.35 m

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




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

## 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.

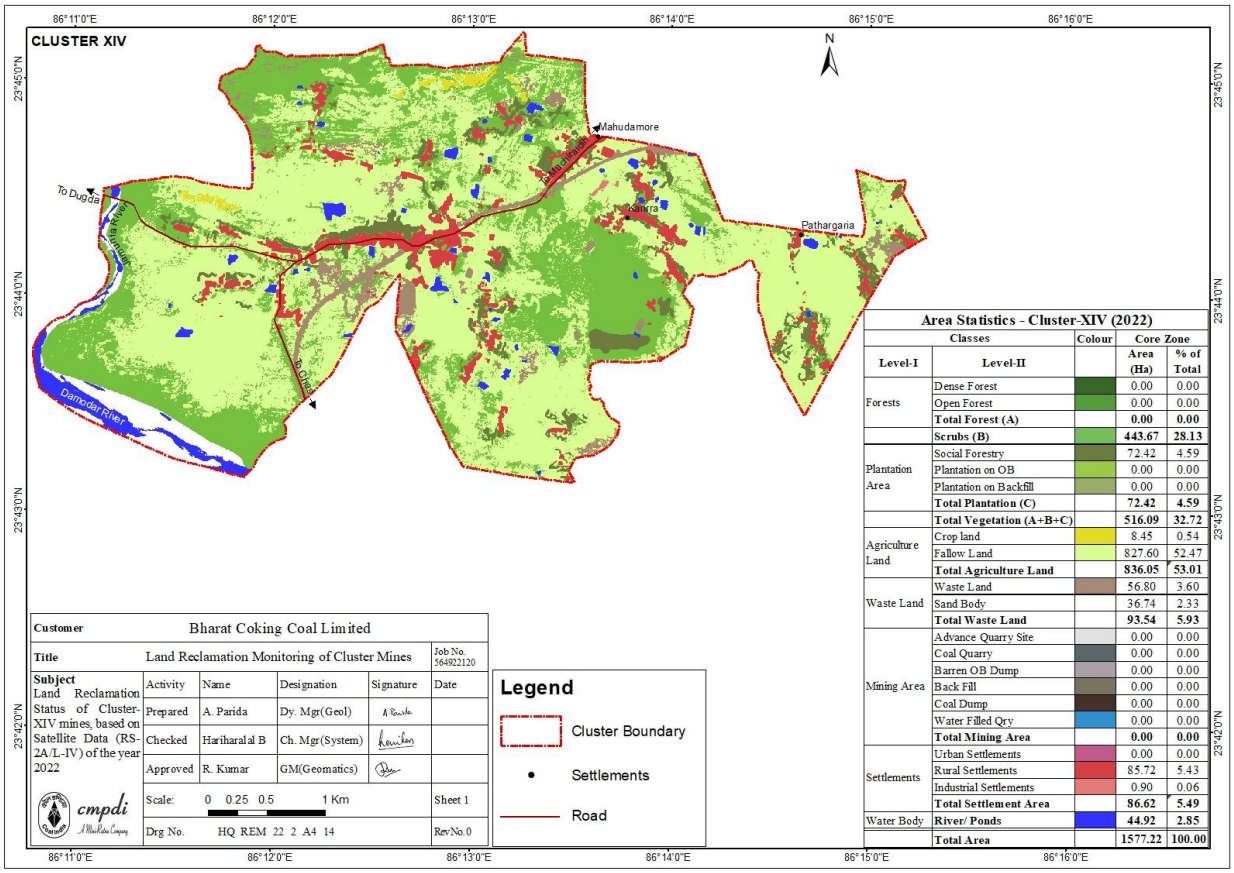
Monitoring stations (**B024 and B067**) are located in the core zone of the mine area. Water level monitoring in these monitoring stations has been done in the months of May'23, August'23, and Nov'23 and January'24. The Ground water level data is presented in the table below:

| Sl No. | Well No. | Location | Water level (bgl in meters) | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | 2023-24 | | | | 2022-23 | | | | 2021-22 | | | |
| | | | May | Aug | Nov | Jan | May | Aug | Nov | Jan | May | Aug | Nov | Jan |
| 1 | B024 | Telmuchu | 4.63 | 3.13 | 3.24 | 3.93 | 5.53 | 1.34 | 3.46 | 4.23 | 5.68 | 1.55 | 2.08 | 3.07 |
| 2 | B067 | Simatanr | 8.05 | 3.85 | 5.32 | 6.27 | 8.50 | 3.55 | 6.30 | 7.35 | 8.95 | 2.45 | 2.95 | 3.65 |
| ***Average WL (bgl)*** | | | 6.34 | 3.49 | 4.28 | 5.1 | 7.02 | 2.45 | 4.88 | 5.79 | 7.32 | 2.00 | 2.52 | 3.36 |

LAST THREE-YEAR ASSESSMENT:

Pre-monsoon GW Level (m): Min – 4.63 m Max – 8.50 m
Post-monsoon GW Level (m): Min – 3.22 m Max – 6.30 m

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




**Area Statistics - Cluster-XIV (2022)**

| Classes | | Colour | Core Zone | |
|---|---|---|---|---|
| Level-I | Level-II | | Area (Ha) | % of Total |
| Forests | Dense Forest | | 0.00 | 0.00 |
| | Open Forest | | 0.00 | 0.00 |
| | **Total Forest (A)** | | **0.00** | **0.00** |
| | **Scrubs (B)** | | **443.67** | **28.13** |
| Plantation Area | Social Forestry | | 72.42 | 4.59 |
| | Plantation on OB | | 0.00 | 0.00 |
| | Plantation on Backfill | | 0.00 | 0.00 |
| | **Total Plantation (C)** | | **72.42** | **4.59** |
| | **Total Vegetation (A+B+C)** | | **516.09** | **32.72** |
| Agriculture Land | Crop land | | 8.45 | 0.54 |
| | Fallow Land | | 827.60 | 52.47 |
| | **Total Agriculture Land** | | **836.05** | **53.01** |
| Waste Land | Waste Land | | 56.80 | 3.60 |
| | Sand Body | | 36.74 | 2.33 |
| | **Total Waste Land** | | **93.54** | **5.93** |
| Mining Area | Advance Quarry Site | | 0.00 | 0.00 |
| | Coal Quarry | | 0.00 | 0.00 |
| | Barren OB Dump | | 0.00 | 0.00 |
| | Back Fill | | 0.00 | 0.00 |
| | Coal Dump | | 0.00 | 0.00 |
| | Water Filled Qry | | 0.00 | 0.00 |
| | **Total Mining Area** | | **0.00** | **0.00** |
| Settlements | Urban Settlements | | 0.00 | 0.00 |
| | Rural Settlements | | 85.72 | 5.43 |
| | Industrial Settlements | | 0.90 | 0.06 |
| | **Total Settlement Area** | | **86.62** | **5.49** |
| Water Body | **River/ Ponds** | | **44.92** | **2.85** |
| | **Total Area** | | **1577.22** | **100.00** |

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

## 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.

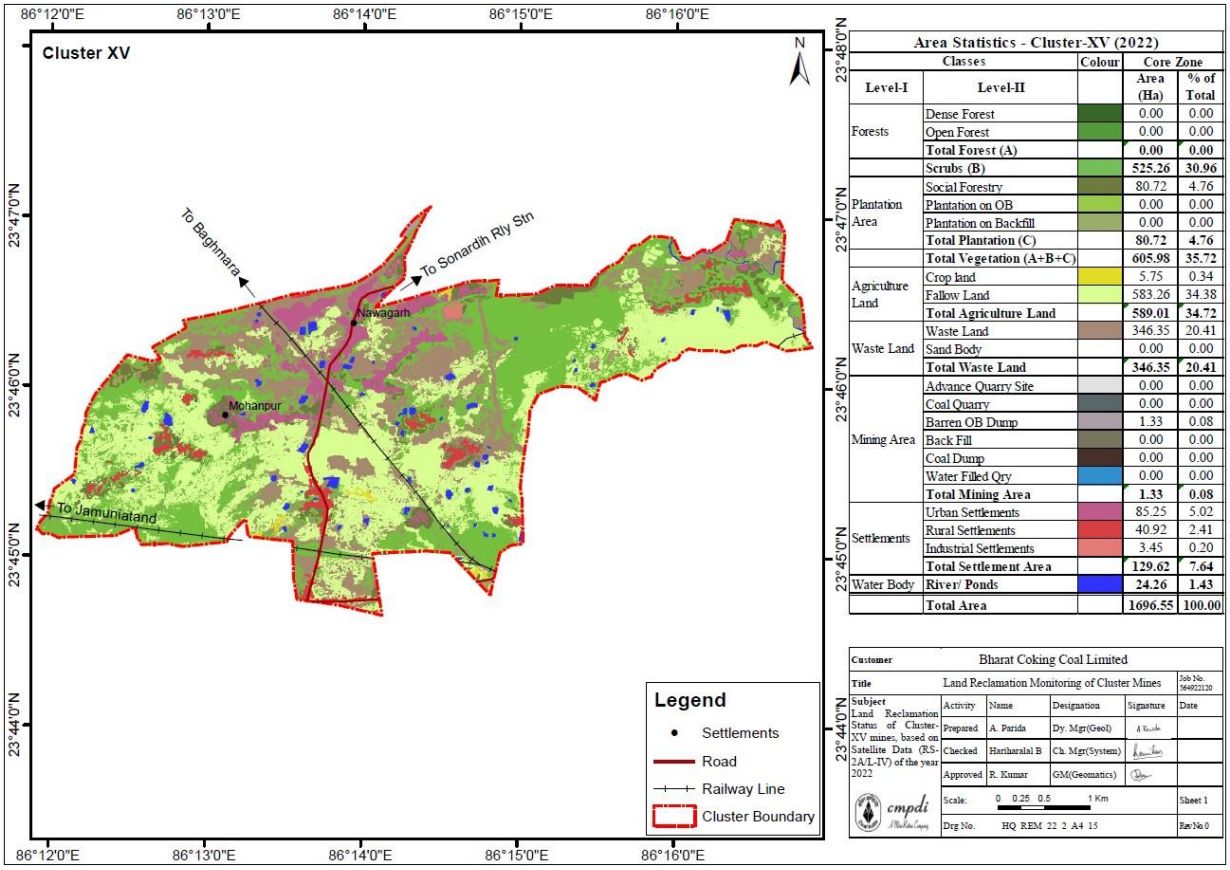
Monitoring stations (**A024, B032 and B062**) are located in the core zone of the mine area. Water level monitoring in these monitoring stations has been done in the months of May'23, August'23, and Nov'23 and January'24. The Ground water level data is presented in the table below:

| Sl No. | Well No. | Location | Water level (bgl in meters) | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | 2024-25 | | | | 2023-24 | | | | 2022-23 | | | |
| | | | May | Aug | Nov | Jan | May | Aug | Nov | Jan | May | Aug | Nov | Jan |
| 1 | A024 | Pipratanr | 5.43 | 3.71 | 3.96 | 4.12 | 5.38 | 3.60 | 3.90 | 5.00 | 7.28 | 2.55 | 4.33 | 5.32 |
| 2 | B032 | Madhuband | 6.60 | 2.10 | 3.60 | 4.82 | 5.35 | 3.93 | 3.60 | 5.42 | 4.15 | 0.70 | 2.56 | 4.15 |
| 3 | B062 | Sadiyardih | 4.97 | 3.01 | 3.19 | 3.80 | 4.80 | 2.35 | 3.10 | 4.00 | 6.45 | 1.77 | 4.91 | 5.15 |
| ***Average WL (bgl)*** | | | 5.67 | 2.94 | 3.58 | 4.25 | 5.18 | 3.29 | 3.53 | 4.81 | 5.96 | 1.67 | 3.93 | 4.87 |

LAST THREE-YEAR ASSESSMENT:

Pre-monsoon GW Level (m): Min – 4.15 m Max – 7.28 m
Post-monsoon GW Level (m): Min – 2.56 m Max – 4.91 m

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




**Area Statistics - Cluster-XV (2022)**

| Classes | | Colour | Core Zone | |
|---|---|---|---|---|
| Level-I | Level-II | | Area (Ha) | % of Total |
| Forests | Dense Forest | | 0.00 | 0.00 |
| | Open Forest | | 0.00 | 0.00 |
| | **Total Forest (A)** | | **0.00** | **0.00** |
| | **Scrubs (B)** | | **525.26** | **30.96** |
| Plantation Area | Social Forestry | | 80.72 | 4.76 |
| | Plantation on OB | | 0.00 | 0.00 |
| | Plantation on Backfill | | 0.00 | 0.00 |
| | **Total Plantation (C)** | | **80.72** | **4.76** |
| | **Total Vegetation (A+B+C)** | | **605.98** | **35.72** |
| Agriculture Land | Crop land | | 5.75 | 0.34 |
| | Fallow Land | | 583.26 | 34.38 |
| | **Total Agriculture Land** | | **589.01** | **34.72** |
| Waste Land | Waste Land | | 346.35 | 20.41 |
| | Sand Body | | 0.00 | 0.00 |
| | **Total Waste Land** | | **346.35** | **20.41** |
| Mining Area | Advance Quarry Site | | 0.00 | 0.00 |
| | Coal Quarry | | 0.00 | 0.00 |
| | Barren OB Dump | | 1.33 | 0.08 |
| | Back Fill | | 0.00 | 0.00 |
| | Coal Dump | | 0.00 | 0.00 |
| | Water Filled Qry | | 0.00 | 0.00 |
| | **Total Mining Area** | | **1.33** | **0.08** |
| Settlements | Urban Settlements | | 85.25 | 5.02 |
| | Rural Settlements | | 40.92 | 2.41 |
| | Industrial Settlements | | 3.45 | 0.20 |
| | **Total Settlement Area** | | **129.62** | **7.64** |
| Water Body | **River/ Ponds** | | **24.26** | **1.43** |
| | **Total Area** | | **1696.55** | **100.00** |

| | | | | | |
|---|---|---|---|---|---|
| Customer | Bharat Coking Coal Limited | | | | |
| Title | Land Reclamation Monitoring of Cluster Mines | | | | Job No. 564922120 |
| Subject | Activity | Name | Designation | Signature | Date |
| Land Reclamation Status of Cluster-XV mines, based on Satellite Data (RS-2A/L-IV) of the year 2022 | Prepared | A. Parida | Dy. Mgr(Geol) | | |
| | Checked | Hariharalal B | Ch. Mgr(System) | | |
| | Approved | R. Kumar | GM(Geomatics) | | |
| cmpdi | Scale: 0 0.25 0.5 1 Km | | | | Sheet 1 |
| | Drg No. HQ REM 22 2 A4 15 | | | | Rev No 0 |

| 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.

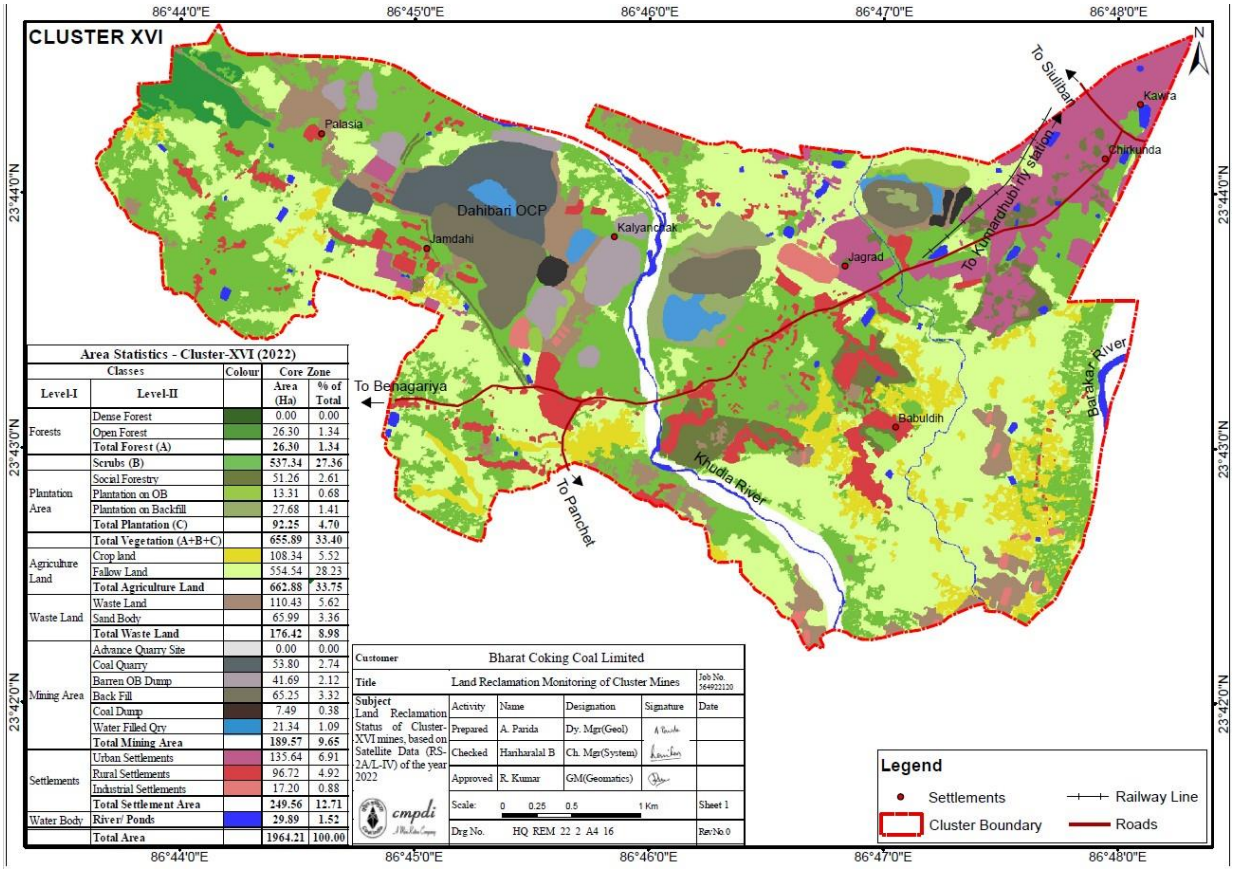
Monitoring stations (**DB022, DB023, DB024 & DB025**) are located in the core zone of the mine area. Water level monitoring in these monitoring stations has been done in the months of May'23, August'23, and Nov'23 and January'24. The Ground water level data is presented in the table below:

| Sl No. | Well No. | Location | Water level (bgl in meters) | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | 2024-25 | | | | 2023-24 | | | | 2022-23 | | | |
| | | | May | Aug | Nov | Jan | May | Aug | Nov | Jan | May | Aug | Nov | Jan |
| 1 | DB022 | Dahibari, Basti | 4.08 | 1.63 | 2.33 | 3.07 | 4.25 | 2.07 | 2.43 | 3.31 | 3.72 | 1.47 | 1.99 | 1.58 |
| 2 | DB023 | Dahibari OC | 4.56 | 1.24 | 2.79 | 3.07 | 4.80 | 2.61 | 2.94 | 4.24 | 3.56 | 1.71 | 2.60 | 2.40 |
| 3 | DB024 | Dahibari | 7.84 | 3.73 | 6.92 | 6.98 | 8.25 | 3.50 | 4.18 | 6.87 | 7.08 | | 3.91 | |
| ***Average WL (bgl)*** | | | 5.49 | 2.20 | 4.02 | 4.37 | 5.77 | 2.73 | 3.18 | 4.81 | 4.79 | 1.59 | 2.83 | 1.99 |

LAST THREE-YEAR ASSESSMENT:

Pre-monsoon GW Level (m): Min – 3.56 m Max – 8.25 m
Post-monsoon GW Level (m): Min – 1.99 m Max – 6.92 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 $10^4$ |

## P. GROUND WATER LEVEL OF CLUSTER-XVII

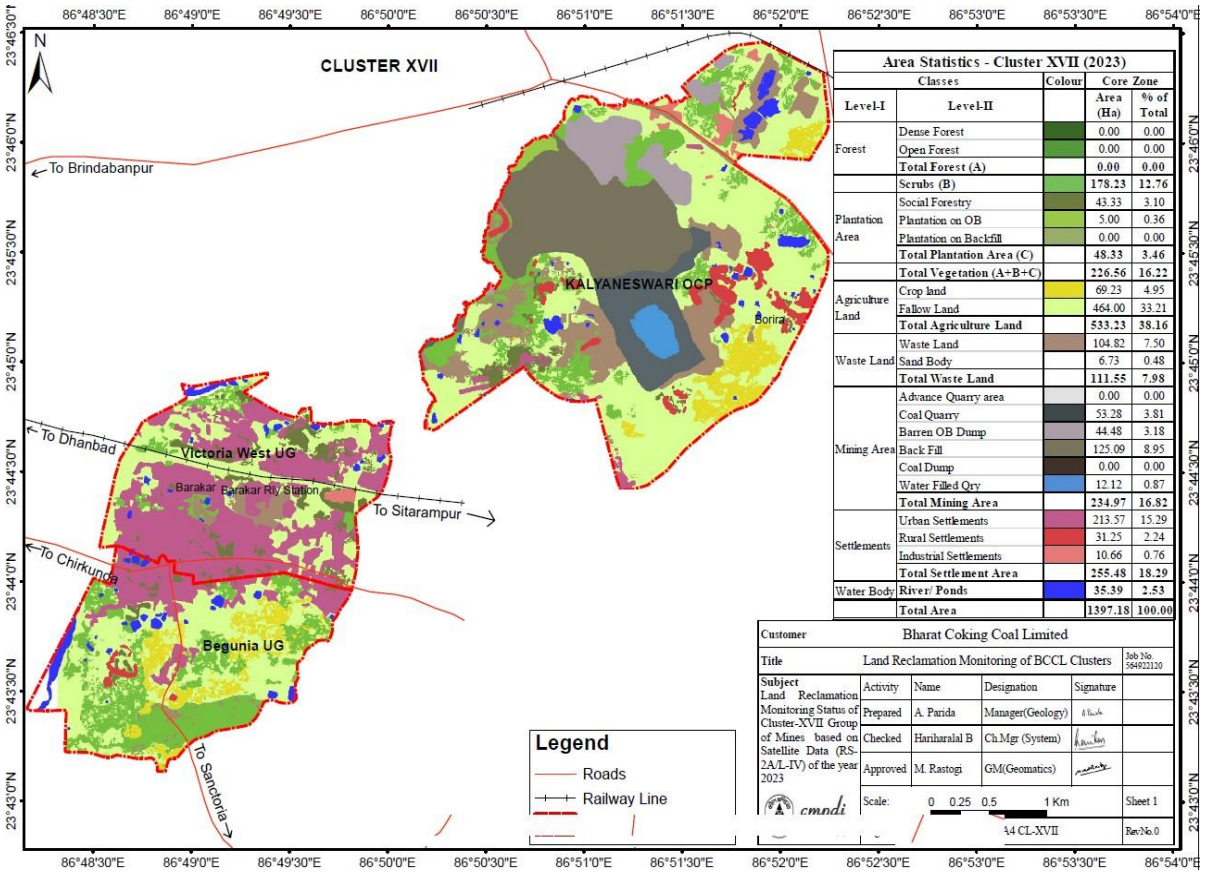
Cluster-XVII mines are under administrative control of Chanch Victoria Area, BCCL, located in western part of Raniganj coalfield in Dhanbad district of Jharkhand. Cluster–XVII consists of two closed Underground (UG) coal mines (Begunia Colliery and Victoria-West Colliery) and one opencast mines [Kalyaneshwari OCP]. The Leasehold area of the Cluster is located between latitude $23^0$ 43' 08" to $23^0$ 46' 26" N and longitude $86^0$ 47' 46" to $85^0$ 52' 11" E. All the above mines are contiguous in nature and the environmental impact is overlapping in the ambient due to cumulative effect of the mining activities. Leasehold area of the Cluster is 1397.18 ha and the capacity of the project is 4.0 MTPA using opencast method. Cluster-XVII mines is covered in Survey of India toposheet no. 73 I/13. The cluster is approachable both by rail and road. Salanpur and Kulti railway stations of Eastern Railways are at a distance of about 0.6 km from the eastern and southwestern boundary of the cluster respectively. The National Highway No.19 (NH-19) passes through the north eastern part of the cluster and the National Highway No.419 (NH-419) passes along the eastern boundary of the cluster while the Kulti and Barakar townships are about 2 km by road to the south east of the area.The study area has an undulating topography with gentle slope towards south and south west. The buffer zone is predominantly characterized by plain land, with highlands located in parts of the northwest, northeast, and southwest. The area comes under the watershed area of Barakar River.

| Sl No. | Well No. | Location | Water level (bgl in meters) | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | 2024-25 | | | | 2023-24 | | | | 2022-23 | | | |
| | | | May | Aug | Nov | Jan | May | Aug | Nov | Jan | May | Aug | Nov | Jan |
| 1 | DB8 | Chungei | 5.40 | 3.06 | 4.10 | 4.76 | 4.50 | 2.55 | 3.42 | 3.97 | 4.67 | | 2.86 | |
| 2 | DB9 | Barakar | 10.26 | 6.42 | 7.34 | 8.93 | 9.50 | 4.17 | 5.18 | 6.47 | 9.68 | | 4.85 | |
| 3 | DB12 | Sabanpur | 5.60 | 2.07 | 2.37 | 3.27 | 5.44 | 2.01 | 2.30 | 3.17 | 4.56 | | 1.89 | |
| 4 | K26 | | 2.14 | 1.36 | 1.53 | 1.58 | 2.10 | 1.33 | 1.50 | 1.55 | 1.93 | | 1.29 | |
| ***Average WL (bgl)*** | | | 5.85 | 3.23 | 3.84 | 4.64 | 5.39 | 2.52 | 3.10 | 3.79 | 5.21 | | 2.72 | |

LAST THREE-YEAR ASSESSMENT:

Pre-monsoon GW Level (m): Min – 1.93 m Max – 10.26 m
Post-monsoon GW Level (m): Min – 1.29 m Max – 7.34 m

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




| Sl no | Land Use Details | Existing (sq. meter) | Proposed (sq. meter) | Grand Total (sq. meter) |
|---|---|---|---|---|
| 1 | Green Belt Area | 336.55 x $10^4$ | 0.0 | 336.5 x $10^4$ |
| 2 | Open Land | 1008.81 x $10^4$ | 0.0 | 1008.81 x $10^4$ |
| 3 | Road/ Paved Area | 26.81 x $10^4$ | 0.0 | 26.81 x $10^4$ |
| 4 | Rooftop area of building/ sheds | 25.06 x $10^4$ | 0.0 | 25.06 x $10^4$ |
| 5 | Total | 1397.23 x $10^4$ | 0.0 | 1397.23 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'24 & Jan'25) | Avg. Fluctuation (in meters) during 2024 | Geological Formation |
|---|---|---|---|---|---|
| 1 | I | 3 nos. | 0.80 to 5.20 m | 1.48 m | Barakar |
| 2 | II | 4 nos. | 0.50 to 10.73 m | 2.16 m | Barakar |
| 3 | III | 4 nos. | 1.09 to 10.73 m | 2.06m | Barakar |
| 4 | IV | 3 nos. | 1.95 to 8.45 m | 3.59 m | Barakar |
| 5 | V | 2 nos. | 0.55 to 5.55 m | 1.07 m | Barakar |
| 6 | VI | 3 nos. | 1.80 to 4.40 m | 1.39 m | Barakar |
| 7 | VII | 4 nos. | 1.22 to 4.75 m | 1.48 m | Barakar |
| 8 | VIII | 2 nos. | 2.52 to 8.52 m | 4.06 m | Barakar |
| 9 | IX | 4 nos. | 1.88 to 9.03 m | 3.49 m | Barakar |
| 10 | X | 4 nos. | 0.50 to 5.98 m | 1.23 m | Barakar |
| 11 | XI | 3 nos. | 0.95 to 8.02 m | 2.09 m | Barakar & Barren Measure |
| 12 | XIII | 3 nos. | 2.98 to 9.00 m | 2.30 m | Raniganj |
| 13 | XIV | 2 nos. | 3.13 to 8.05 m | 2.06 m | Raniganj |
| 14 | XV | 3 nos. | 2.35 to 5.42 m | 1.64 m | Barakar & Barren Measure |
| 15 | XVI | 3 nos. | 2.07 to 8.25 m | 2.50 m | Barakar |

Depth to water level (in bgl) values describe that water level goes down to maximum 10.73 m during summer season and minimum up to 0.50 m during monsoon season of 2023. 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, Cluster-VIII and Cluster-XIII 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 DETAILS OF PIEZOMETERS

A piezometer network is useful for monitoring the impact of mining activity on groundwater regime. Total 23 nos. of Piezometers were constructed during 2022-23 within JCF and RCF to monitor GW level (**Plate-III**). The depth of piezometers varies from 30m to 300m below ground level.

Water level in the piezometers from May23 to Jan24 are furnished below in **Table-8** and the hydrographs (May22 to Jan24) are given in the Annexure VIB.

**Table –8: Groundwater level data in Piezometers (Cluster-wise)**

| PZ ID | Cluster | Lat. | Long. | Depth (m) | May 23 | June23 | July23 | Aug23 | Sept 23 | Oct 23 | Nov 23 | Dec 23 | Jan24 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| PZ1A | I | 23.7692 | 86.1754 | 40 | 12.26 | 13.20 | 8.80 | 6.75 | 6.50 | 7.50 | 8.65 | 9.90 | 11.98 |
| PZ1B | I | 23.7692 | 86.1753 | 115 | 30.20 | 29.10 | 24.04 | 19.00 | 19.90 | 21.90 | 24.05 | 26.90 | 30.40 |
| PZ2A | II | 23.7672 | 86.1890 | 87 | 30.90 | 31.60 | 22.50 | 17.50 | 16.50 | 18.90 | 22.50 | 25.50 | 28.33 |
| PZ2B | II | 23.7908 | 86.2470 | 77 | 8.02 | 7.30 | 5.10 | 3.50 | 3.90 | 4.30 | 4.50 | 4.40 | 4.6 |
| PZ3A | III | 23.8015 | 86.2824 | 172 | 89.5 | 89.1 | 83.73 | 76.50 | 78.85 | 81.00 | 82.64 | 84.00 | 86.42 |
| PZ3B | III | 23.7798 | 86.2418 | 30 | 24.72 | 23.72 | 18.0 | 14.1 | 13.2 | 15.12 | 18.3 | 20.4 | 23.23 |
| PZ3C | III | 23.8016 | 86.2824 | 124 | - | - | - | - | - | - | - | - | - |
| PZ4A | IV | 23.7764 | 86.3123 | 70 | 38.1 | 37.5 | 32.2 | 26.5 | 27.39 | 29.5 | 31.3 | 33.5 | 34.9 |
| PZ4B | IV | 23.7765 | 86.3125 | 240 | 100.9 | 98.2 | 94.6 | 89.9 | 90.8 | 91.3 | 91.6 | 92.1 | 92.7 |
| PZ5A | V | 23.7817 | 86.3569 | 35 | 8.5 | 7.8 | 5.8 | 2.5 | 3.5 | 4.4 | 4.8 | 5 | 5.31 |
| PZ5B | V | 23.7999 | 86.3619 | 94 | 90.94 | 85.5 | 80.1 | 75.08 | 73.2 | 78.04 | 82.0 | 86.1 | 90.32 |
| PZ7A | VII | 23.7701 | 86.4110 | 159 | 109.9 | 110.1 | 105.02 | 98.5 | 92.9 | 96.8 | 98.1 | 101.8 | 104.86 |

| | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| PZ7B | VII | 23.7400 | 86.3997 | 35 | 29.36 | 30.02 | 21.38 | 16.63 | 15.68 | 17.96 | 21.38 | 24.23 | 26.18 |
| PZ7C | VII | 23.7342 | 86.4433 | 105 | 92.27 | 90.88 | 85.40 | 78.03 | 80.43 | 82.62 | 84.29 | 85.68 | 85.2 |
| PZ8A | VIII | 23.7556 | 86.4271 | 140 | 49.23 | 49.01 | 46.05 | 40.08 | 38.37 | 42.55 | 43.45 | 44.20 | 46 |
| PZ9A | IX | 23.7305 | 86.4464 | 84 | 43.85 | 44.55 | 41.87 | 38.25 | 39.43 | 40.50 | 41.32 | 42.00 | 40.32 |
| PZ9B | IX | 23.6962 | 86.4159 | 100 | 72.6 | 71.05 | 67.5 | 57.2 | 58.9 | 59.8 | 61.3 | 63.35 | 63.7 |
| PZ10A | X | 23.6880 | 86.4051 | 134 | 6.9 | 6.2 | 4.01 | 3.1 | 3.6 | 4.05 | 4.6 | 5.1 | 6.35 |
| PZ11A | XI | 23.7264 | 86.3419 | 300 | 52.7 | 47.5 | 37.2 | 28.09 | 34.6 | 37.1 | 39.05 | 40.9 | 53.15 |
| PZ13A | XII | 23.7138 | 86.2516 | 80 | 39.9 | 36.3 | 32.1 | 23.6 | 25.8 | 26.5 | 28.1 | 30.1 | 31.81 |
| PZ14A | XIV | 23.7415 | 86.2139 | 30 | 12.8 | 10.1 | 7.9 | 4.6 | 5.5 | 6.1 | 7.3 | 7.9 | 8.39 |
| PZ14B | XIV | 23.7415 | 86.2139 | 162 | 14.6 | 13.5 | 9.8 | 5.05 | 6.3 | 7.5 | 9.1 | 10.5 | 12.56 |
| PZ16A | XVI | 23.7308 | 86.7605 | 90 | 35.58 | 35.64 | 32.49 | 29.60 | 28.54 | 30.40 | 31.06 | 32.0 | 32.24 |

## 6.0 GROUND WATER QUALITY

The ground water samples of the study area (16 nos. of Cluster of mines, BCCL) were collected from dug wells and analyzed. Thirty-five ground water samples were analyzed during the month of May'2024 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:

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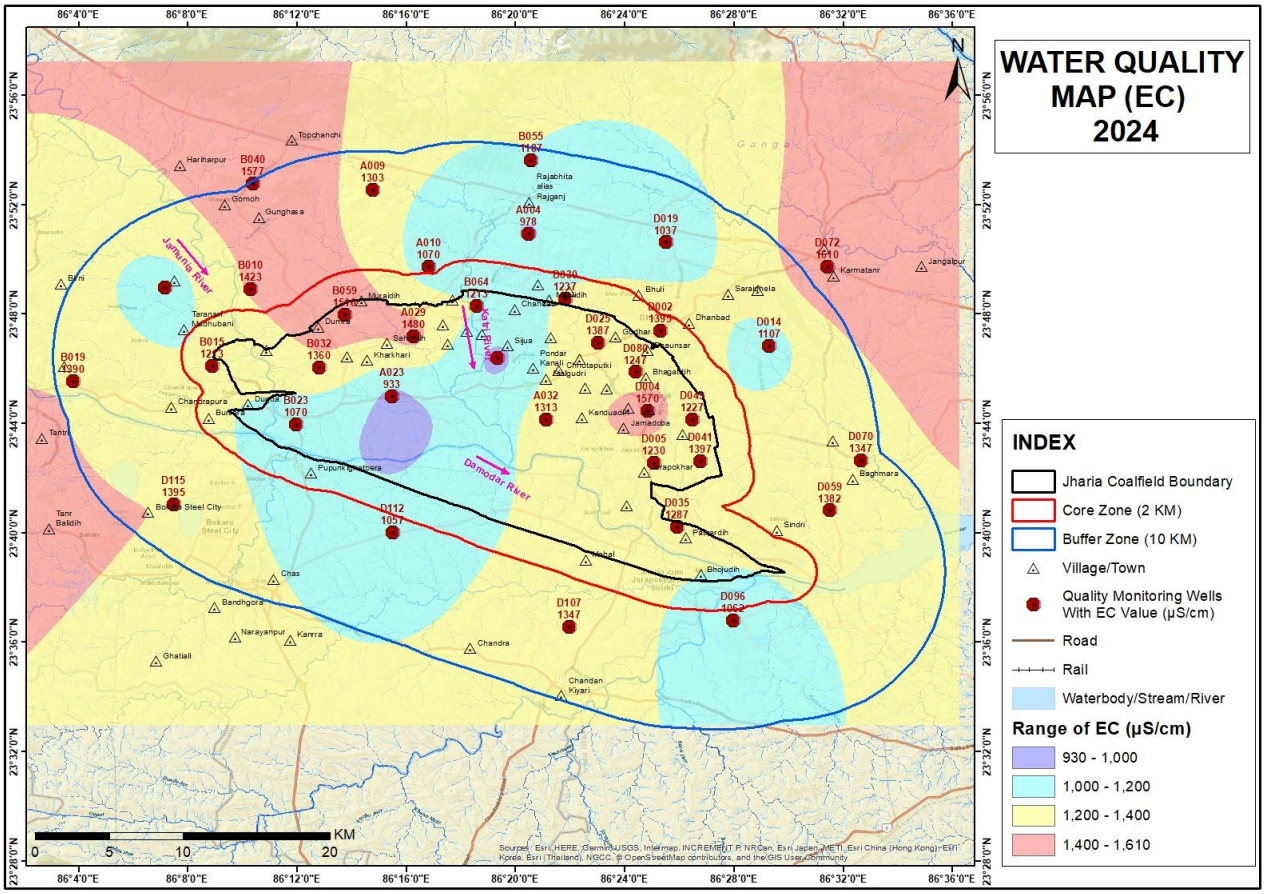
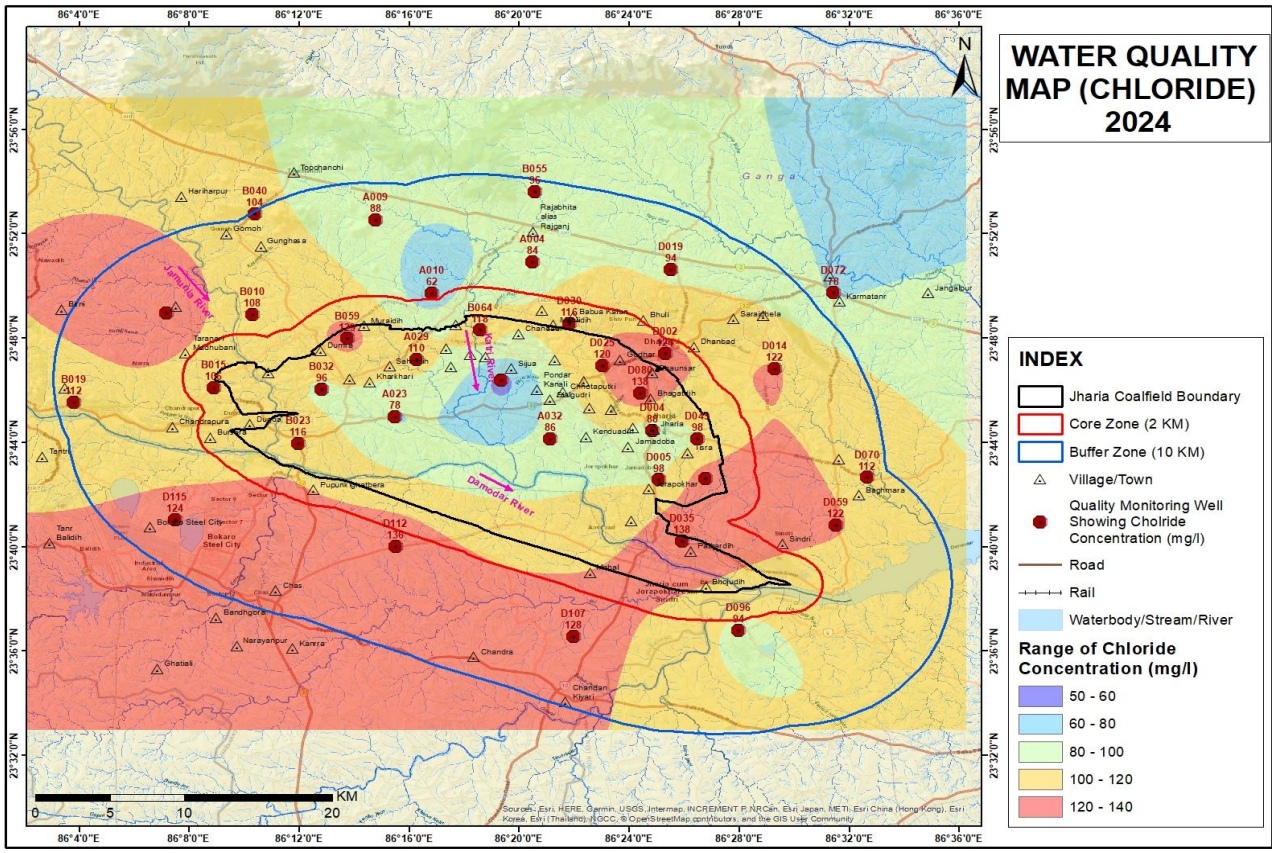
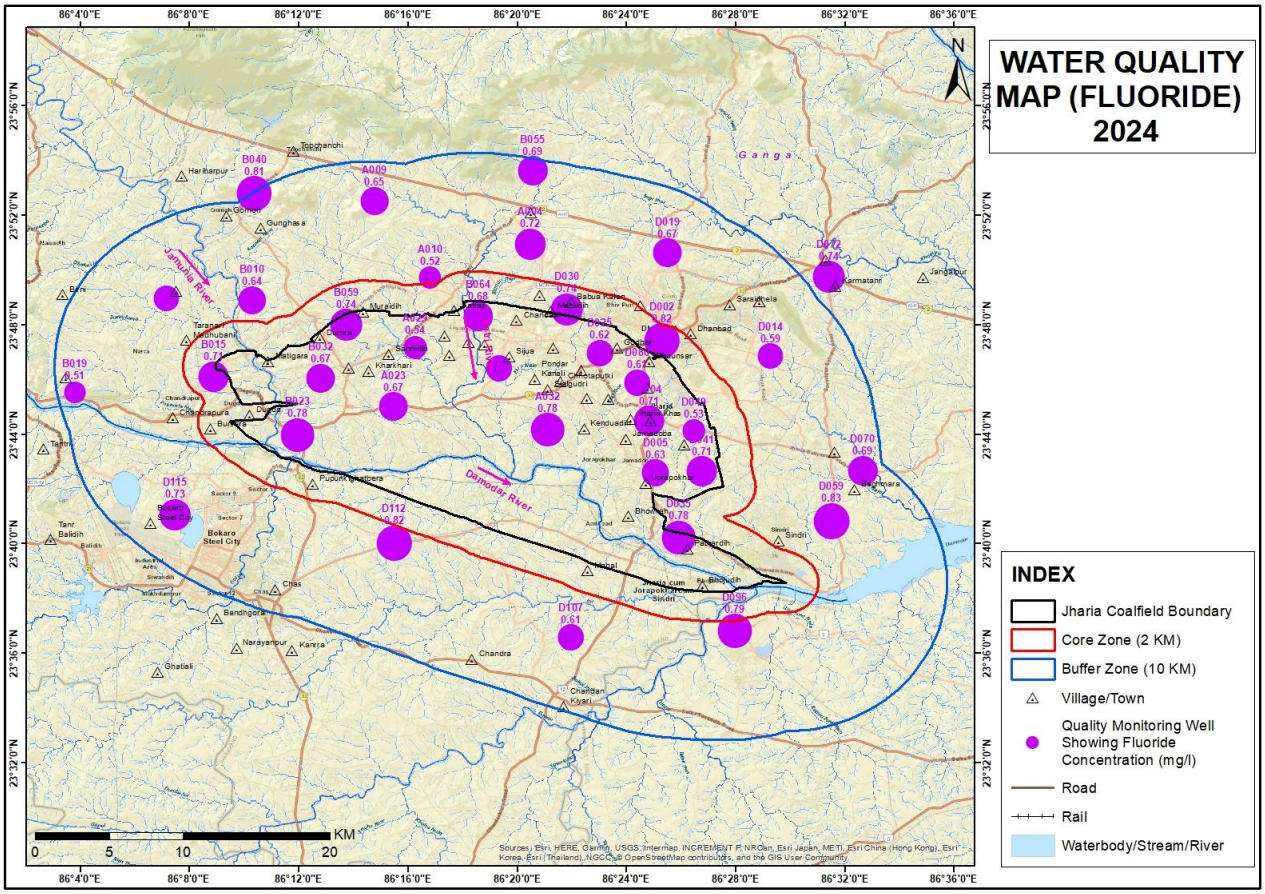
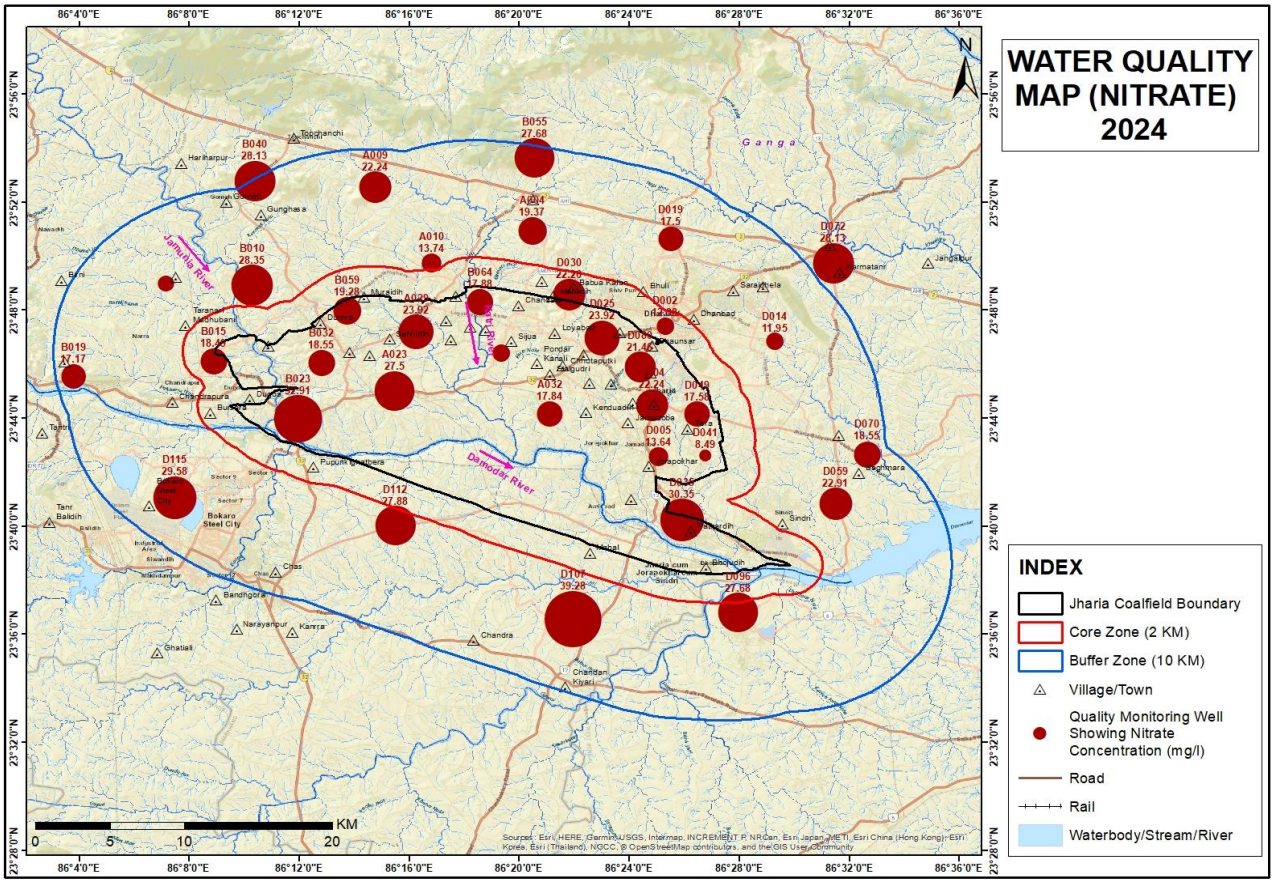
In wells of JCF concentration of magnesium in the water samples varies 103 (D-70) to 125 mg/l (D-4) and is above the permissible limit (100 mg/l) of drinking water standards. The total hardness mg/l ranges from 614 (A-09) to 824 mg/L (D-72) and is above the permissible limit of (600 mg/L) of drinking water standards The Iron, Manganese, Zinc and Chromium concentration in the water samples found to be below the upper IS 10500:2012 limits for drinking water.

In RCF part of BCCL Command area At a few locations, the total hardness value of the analyzed samples exceeds the permissible limit of 600 mg/L, specifically at DB2A (650 mg/L), DB4 (680 mg/L), DB30 (648 mg/L), DB38 (705 mg/L), and DB39 (602 mg/L). The rest of the groundwater quality data indicates that the values are well within the permissible limits as per the IS 10500:2012 drinking water standards.


WATER QUALITY MAP (EC) 2024
INDEX
Jharia Coalfield Boundary
Core Zone (2 KM)
Buffer Zone (10 KM)
Village/Town
Quality Monitoring Wells With EC Value (µS/cm)
Road
Rail
Waterbody/Stream/River
Range of EC (µS/cm)
930 - 1,000
1,000 - 1,200
1,200 - 1,400
1,400 - 1,610
Jamunia River
Damodar River
Barakar River
KM
0 5 10 20


WATER QUALITY MAP (CHLORIDE) 2024
INDEX
Jharia Coalfield Boundary
Core Zone (2 KM)
Buffer Zone (10 KM)
Village/Town
Quality Monitoring Well Showing Cholride Concentration (mg/l)
Road
Rail
Waterbody/Stream/River
Range of Chloride Concentration (mg/l)
50 - 60
60 - 80
80 - 100
100 - 120
120 - 140
Jamunia River
Damodar River
Barakar River
KM
0 5 10 20


WATER QUALITY MAP (FLUORIDE) 2024
INDEX
Jharia Coalfield Boundary
Core Zone (2 KM)
Buffer Zone (10 KM)
Village/Town
Quality Monitoring Well Showing Fluoride Concentration (mg/l)
Road
Rail
Waterbody/Stream/River
Damodar River
Jamunia River
Ganga
Bokaro Steel City
KM


WATER QUALITY MAP (NITRATE) 2024
INDEX
Jharia Coalfield Boundary
Core Zone (2 KM)
Buffer Zone (10 KM)
Village/Town
Quality Monitoring Well Showing Nitrate Concentration (mg/l)
Road
Rail
Waterbody/Stream/River
Damodar River
Jamunia River
Ganga
Bokaro Steel City
KM

## 7.0 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 74.34% (as per GWRE 2023-24, INGRES Portal). The highest stage of development is in Baliapur Block (110.03%) & Dhanbad Urban Block (95.65%) and lowest stage of development is in Purbi Tundi Block (26.15%) and Chirkunda Block (34.53%) as per GWRA-2023-24 (Source: Ingres Portal). 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. Block wise data of Dhanbad District given below:

**Table–9A: Block wise Stage of Groundwater development**

| Sl No. | Administrative Unit | | | Category (GWRA-2017) | Category (GWRA-2022) | Category (GWRA-2023-24) |
|---|---|---|---|---|---|---|
| | State | District | Block | | | |
| 1 | Jharkhand | DHANBAD | BAGHMARA | **Over-exploited** | **Over-exploited** | Semi-Critical |
| 2 | Jharkhand | DHANBAD | BALIAPUR | Critical | Safe | **Over Exploited** |
| 3 | Jharkhand | DHANBAD | DHANBAD | Semi-Critical | **Over-exploited** | Semi-Critical |
| 4 | Jharkhand | DHANBAD | DHANBAD URBAN | **Over-exploited** | Semi-critical | Critical |
| 5 | Jharkhand | DHANBAD | JHARIA | **Over-exploited** | Critical | Hilly Area |
| 6 | Jharkhand | BOKARO | CHANDRAPURA | Critical | Critical | Safe |
| 7 | West Bengal | PASCHIM BARDHAMAN | SALANPUR | Safe | Safe | Safe |

- **Dynamic Groundwater Resource Assessment, CGWB as per 2017, 2022 and 2023-24.**

**Table–9B: 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) 2024-25 | | GW level declining trend 2005-2023 | | 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 | Chandrapura (SOD: Safe) | 2173 (2065+108) | NIL | 2112 (1698+414) | 61 | 4.28 | 2.20 | YES | YES | Recharge structure needed |
| Cluster-II | Baghmara (SOD: Semi Critical) | 8350 | Jamunia river | 6737 (2755+3982) | 1613 | 5.29 | 3.05 | NO | NO | Excess mine water needed to be utilized |
| Cluster-III | | 12760 (10960+1800) | NIL | 8946 (7849+1097) | 3814 | 5.10 | 3.37 | YES | NO | |
| Cluster-IV | | 5900 | MADA | 5100 (3605+1495) | 800 | 7.30 | 3.22 | YES | NO | |
| Cluster-V | | 12690 (11025+1665) | MADA | 11063 (5710+5353) | 1897 | 5.78 | 3.61 | YES | YES | |
| Cluster-VI | Dhanbad (SOD: Critical) | 4150 | MADA | 4150 (1664+2486) | 0.0 | 4.92 | 2.79 | YES | NO | -- |
| Cluster-VII | | 21565 | MADA | 20826 (17596+3230) | 739 | 3.56 | 2.57 | YES | YES | Excess mine water needed to be utilized |
| Cluster-VIII | | 9320 | MADA | 5294 (3730+1564) | 4026 | 6.05 | 3.80 | YES | NO | |
| Cluster-IX | | 12980 | MADA | 9358 (4549+4809) | 3622 | 6.62 | 4.01 | NO | NO | |
| Cluster-X | | 11825 | Damodar river | 6201 (4255+1946) | 5624 | 4.27 | 2.84 | NO | NO | |
| Cluster-XI | Dhanbad (SOD: Critical) | 24960 | MADA & DVC | 19425 (14015+5410) | 5535 | 4.86 | 2.76 | YES | NO | |
| Cluster-XIII | Baghmara (SOD: Critical) | 750 | Damodar river | 692 | 58.0 | 7.66 | 4.86 | NO | NO | -- |
| Cluster-XIV | | 943 | NA | 668 | 275 | 6.34 | 4.28 | NO | NO | -- |
| Cluster-XV | | 6200 | NA | 5941 (4600+1341) | 259 | 5.67 | 3.58 | NO | NO | -- |
| Cluster-XVI | Chirkunda (SOD: Safe) | 1910 | DVC (Barakar river) | 1730 (1380+350) | 180 | 5.49 | 4.02 | NO | NO | -- |
| Cluster-XVII | Salanpur (SOD: Safe) | 5091 * | DVC (Barakar river) | 5091 (1470+1405) | 2216 | 5.85 | 3.84 | NO | NO | - |

*EAC awaited

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

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

## 8.0 IMPACT OF MINING ON GROUND WATER REGIME

## 8.1 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.

## 8.2 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 steep 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.

## 8.3 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.

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

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 $5.7 \times 10^{-7}$ 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.

## 9.0 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).
- 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).

## 10.0 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 / ABANDONDED IN THE JCF MINE AREA**

**Fig-9 to 10.**

**RECHARGE POND / ABANDONDED IN THE JCF MINE AREA**

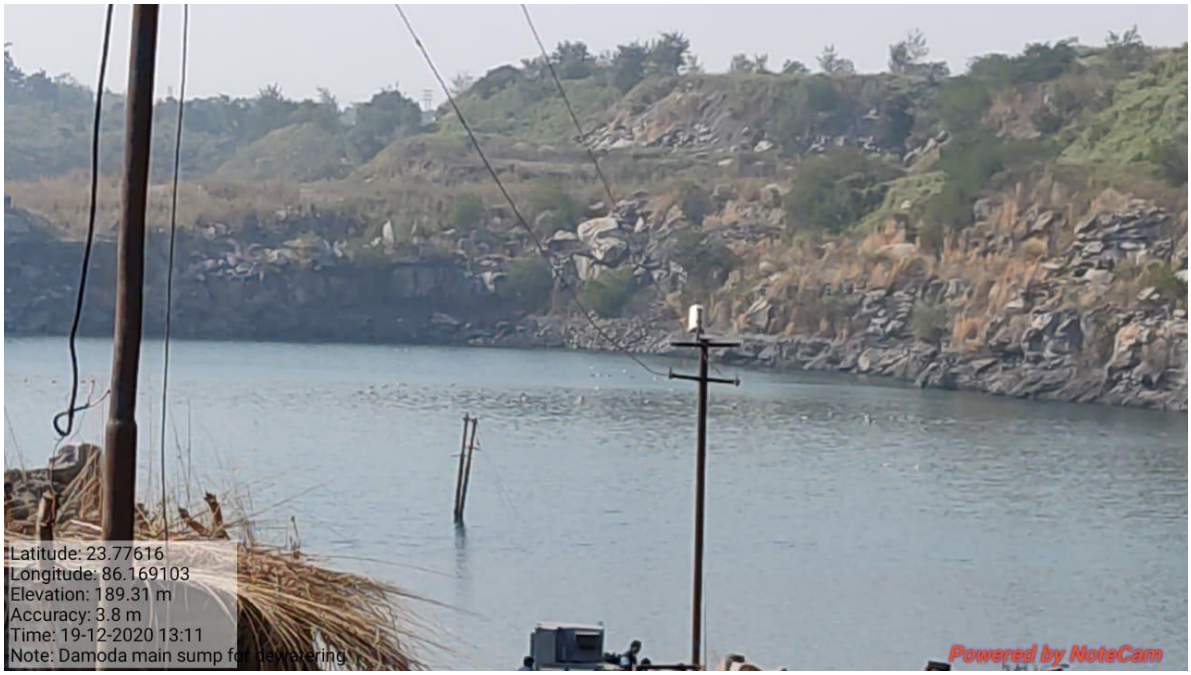
**FILTER PLANT IN THE MINE AREA**

**Fig-11 to 12.**

**RECHARGE POND / ABANDONDED IN THE JCF MINE AREA**

**RECHARGE POND / ABANDONDED IN THE JCF MINE AREA**

**Fig-13 to 14.**




**RECHARGE POND / ABANDONDED IN THE JCF MINE AREA**

**Annexure – IV**

## 25 Year Normal Rainfall Data (in mm) for Dhanbad District (Source: WRIS Grided Data)

| Yearly Rainfall (25 Years Normal: 1998-2022) | |
|---|---|
| **Year** | **Rainfall (in mm)** |
| 1998 | 1578 |
| 1999 | 1903 |
| 2000 | 1481 |
| 2001 | 1648 |
| 2002 | 1584 |
| 2003 | 1546 |
| 2004 | 1401 |
| 2005 | 1149 |
| 2006 | 1390 |
| 2007 | 1773 |
| 2008 | 1173 |
| 2009 | 1303 |
| 2010 | 1027 |
| 2011 | 1296 |
| 2012 | 1152 |
| 2013 | 1203 |
| 2014 | 1002 |
| 2015 | 996 |
| 2016 | 1398 |
| 2017 | 1385 |
| 2018 | 1144 |
| 2019 | 1357 |
| 2020 | 1116 |
| 2021 | 1745 |
| 2022 | 982 |

| Monthly Rainfall (25 Years Normal: 1998-2022) | |
|---|---|
| **Month** | **Rainfall (in mm)** |
| January | 8.2 |
| February | 15.1 |
| March | 19.8 |
| April | 32.1 |
| May | 77.6 |
| June | 204.6 |
| July | 329.6 |
| August | 285.8 |
| September | 259.9 |
| October | 105.5 |
| November | 6.4 |
| December | 4.5 |
| Total | 1349.1 |

| Monthly Rainfall (16 Years Normal: 2008-2023)<br>Bardhaman District, RCF | |
|---|---|
| **Month** | **Rainfall (in mm)** |
| January | 7.55 |
| February | 16.06 |
| March | 17.69 |
| April | 37.68 |
| May | 131.88 |
| June | 198.95 |
| July | 254.46 |
| August | 240.09 |
| September | 180.82 |
| October | 92.15 |
| November | 9.44 |
| December | 14.95 |
| Total | 1201.72 |

**Annexure – IV**

## Block wise Rainfall Data as per GWRE 2023-24 (Source: INGRES Portal)

| State | District | Block | Category (GWRE 2023-24) | Rainfall in mm |
|---|---|---|---|---|
| Jharkhand | DHANBAD | BAGHMARA | SEMI-CRITICAL | 1393.60 |
| Jharkhand | DHANBAD | BALIAPUR | OVER EXPLOITED | 1393.60 |
| Jharkhand | DHANBAD | DHANBAD | SEMI-CRITICAL | 1393.60 |
| Jharkhand | DHANBAD | DHANBAD URBAN | CRITICAL | 1393.60 |
| Jharkhand | DHANBAD | JHARIA | HILLY AREA | 0.00 |
| Jharkhand | BOKARO | CHANDRAPURA | SAFE | 1211.50 |
| West Bengal | PASCHIM BARDHAMAN | SALANPUR | SAFE | 1348.20 |

**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 |
| 2023 | 0.00 | 0.00 | 19.40 | 47.20 | 128.00 | 61.20 | 128.50 | 424.20 | 289.80 | 211.20 | 0.00 | 49.20 | 1358.7 |
| 2024 | 6.60 | 11.00 | 90.00 | 0.00 | 80.20 | 80.60 | 284.00 | 678.20 | 404.60 | 105.60 | 0.00 | 0.00 | 1740.8 |

**Annexure – V**

## Location of Hydrograph Stations (Dug Wells)

| Well No | Latitude | Longitude | Well No | Latitude | Longitude |
|---|---|---|---|---|---|
| A002 | 86.2586 | 23.8181 | D029 | 86.3742 | 23.8208 |
| A004 | 86.3417 | 23.8492 | D030 | 86.3640 | 23.8096 |
| A006 | 86.3149 | 23.8498 | D034 | 86.3837 | 23.7733 |
| A007 | 86.2982 | 23.8287 | D035 | 86.4321 | 23.6705 |
| A008 | 86.2635 | 23.8527 | D036 | 86.4360 | 23.6564 |
| A009 | 86.2462 | 23.8758 | D039 | 86.4371 | 23.7195 |
| A010 | 86.2805 | 23.8290 | D046 | 86.5211 | 23.7377 |
| A013 | 86.3226 | 23.7735 | D047 | 86.4076 | 23.7539 |
| A015 | 86.3425 | 23.8249 | D052 | 86.4473 | 23.7538 |
| A016 | 86.3598 | 23.7807 | D054 | 86.3751 | 23.7222 |
| A017 | 86.3672 | 23.7520 | D056 | 86.4600 | 23.6590 |
| A019 | 86.4004 | 23.6847 | D057 | 86.4999 | 23.6467 |
| A020 | 86.3272 | 23.7481 | D059 | 86.5253 | 23.6806 |
| A023 | 86.2581 | 23.7502 | D062 | 86.4805 | 23.7029 |
| A024 | 86.2275 | 23.7535 | D063 | 86.4636 | 23.6760 |
| A025 | 86.2540 | 23.7830 | D065 | 86.4929 | 23.7442 |
| A026 | 86.3005 | 23.7787 | D068 | 86.4623 | 23.7054 |
| A027 | 86.3402 | 23.8090 | D070 | 86.5443 | 23.7112 |
| A028 | 86.2979 | 23.7900 | D071 | 86.5248 | 23.7922 |
| A029 | 86.2713 | 23.7865 | D072 | 86.5238 | 23.8293 |
| A032 | 86.3521 | 23.7360 | D074 | 86.4255 | 23.7015 |
| A034 | 86.2537 | 23.7136 | D075 | 86.3985 | 23.6509 |
| B001 | 86.2402 | 23.8164 | D077 | 86.3707 | 23.6802 |
| B002 | 86.2091 | 23.7950 | D080 | 86.4067 | 23.7650 |
| B009 | 86.1797 | 23.8387 | D088 | 86.3950 | 23.6230 |
| B010 | 86.1718 | 23.8153 | D089 | 86.3872 | 23.5968 |
| B011 | 86.2063 | 23.8256 | D090 | 86.4209 | 23.6058 |
| B012 | 86.2049 | 23.8094 | D091 | 86.4378 | 23.5621 |
| B014 | 86.2704 | 23.8008 | D096 | 86.4663 | 23.6135 |
| B015 | 86.1484 | 23.7685 | D105 | 86.3295 | 23.6436 |
| B017 | 86.1194 | 23.7514 | D109 | 86.1983 | 23.6554 |
| B018 | 86.0918 | 23.7459 | D112 | ```86.2586 | 23.6670 |
| B024 | 86.2161 | 23.7410 | D113 | 86.2785 | 23.6948 |
| B027 | 86.3418 | 23.7562 | D115 | 86.1250 | 23.6843 |
| B029 | 86.2076 | 23.6992 | D117 | 86.1787 | 23.7136 |
| B032 | 86.2135 | 23.7676 | DB001 | 86.7902 | 23.7303 |
| B033 | 86.2053 | 23.8552 | DB002 | 86.7794 | 23.75 |
| B038 | 86.2135 | 23.8834 | DB003 | 86.7638 | 23.6555 |
| B040 | 86.1731 | 23.8799 | DB004 | 86.8062 | 23.6541 |
| B041 | 86.1611 | 23.9121 | DB005 | 86.8216 | 23.6785 |
| B043 | 86.2420 | 23.8949 | DB008 | 86.81519 | 23.73067 |
| B044 | 86.1276 | 23.8735 | DB009 | 86.8135 | 23.7354 |
| B046 | 86.1195 | 23.8163 | DB010 | 86.8561 | 23.7085 |
| B047 | 86.1233 | 23.7702 | DB012 | 86.8713 | 23.7638 |
| B048 | 86.2783 | 23.7259 | DB013 | 86.8687 | 23.7814 |

| | | | | | |
|---|---|---|---|---|---|
| B051 | 86.1521 | 23.7941 | DB018 | 86.7915 | 23.7394 |
| B053 | 86.1636 | 23.7683 | DB019 | 86.7483 | 23.7194 |
| B054 | 86.3639 | 23.8660 | DB022 | 86.7571 | 23.7237 |
| B055 | 86.3427 | 23.8940 | DB023 | 86.7514 | 23.7291 |
| B057 | 86.2860 | 23.8738 | DB024 | 86.7509 | 23.7309 |
| B059 | 86.2293 | 23.8000 | DB025 | 86.7399 | 23.7337 |
| B060 | 86.2541 | 23.8059 | DB026 | 86.75 | 23.7194 |
| B062 | 86.1929 | 23.7628 | DB027 | 86.7232 | 23.7298 |
| B065 | 86.3076 | 23.8083 | DB028 | 86.6836 | 23.7472 |
| B067 | 86.2325 | 23.7233 | DB029 | 86.6548 | 23.7462 |
| B068 | 86.0873 | 23.7225 | DB030 | 86.6654 | 23.795 |
| B071 | 86.0799 | 23.8088 | DB033 | 86.8126 | 23.7645 |
| D003 | 86.4149 | 23.7804 | DB034 | 86.7877 | 23.7785 |
| D005 | 86.4180 | 23.7098 | DB036 | 86.7546 | 23.798 |
| D007 | 86.4574 | 23.7220 | DB038 | 86.7361 | 23.8346 |
| D008 | 86.1915 | 23.8340 | DB039 | 86.715 | 23.7996 |
| D010 | 86.4947 | 23.7252 | DB047 | 86.7509 | 23.7557 |
| D012 | 86.4484 | 23.7771 | K010 | 86.9157 | 23.7059 |
| D014 | 86.4884 | 23.7808 | K012 | 86.9277 | 23.7267 |
| D018 | 86.4317 | 23.8189 | K015 | 86.9103 | 23.8177 |
| D019 | 86.4253 | 23.8440 | K020 | 86.8824 | 23.8514 |
| D020 | 86.4023 | 23.8527 | K021 | 86.9277 | 23.7267 |
| D022 | 86.4021 | 23.8015 | K026 | 86.8808 | 23.7414 |
| D025 | 86.3837 | 23.7828 | K030 | 86.8472 | 23.7396 |
| D028 | 86.4016 | 23.8223 | | | |

**Annexure – VA**

## 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 |
|---|---|---|---|---|---|---|---|
| A002 | Beharekudur | 0.63 | 3.00 | 12.93 | Metamorphic | Nona Das | Domestic |
| A004 | Daldoli | 0.52 | 3.12 | 6.00 | Metamorphic | Govt. | Domestic |
| A006 | Barwadi,Kanko | 0.75 | 3.15 | 9.10 | Metamorphic | Govt. | Domestic |
| A007 | Chaddriderdih | 0.45 | 1.80 | 9.95 | Metamorphic | Hazi | Domestic |
| A008 | Siskari | 0.60 | 1.95 | 12.50 | Metamorphic | Govt. | Domestic |
| A009 | Srirampur | 0.43 | 2.10 | 9.80 | Metamorphic | Mosque | Domestic |
| A010 | Phulwar | 0.63 | 1.90 | 10.90 | Metamorphic | Govt. | Domestic |
| A013 | Sijua | 0.40 | 2.35 | 6.90 | Barakar | Rajen | Domestic |
| A015 | Tetulmari | 0.90 | 1.85 | 9.00 | Metamorphic | Dharmendar | Domestic |
| A016 | Ekra, Kalali | 0.45 | 3.10 | 6.50 | Barakar | Govt. | Domestic |
| A017 | Kachi Balihari | 0.56 | 1.60 | 5.30 | Barakar | Govt. | Domestic |
| A019 | Bhaura | 0.54 | 3.15 | 11.65 | Barakar | Govt. | Domestic |
| A020 | Gorbhudih | 0.43 | 3.30 | 8.30 | BM | Govt. | Domestic |
| A023 | Machhyara | 0.43 | 1.85 | 12.40 | Raniganj | Govt | Domestic |
| A024 | Pipra Tanr | 0.22 | 1.80 | 19.55 | Raniganj | Govt | Domestic |
| A025 | Sinidih | 0.22 | 2.00 | 11.30 | Barakar | Govt | Domestic |
| A026 | Pasitanr | 0.32 | 1.80 | 9.65 | Barakar | Govt | Domestic |
| A027 | Chandor | 0.60 | 2.50 | 5.50 | Barakar | Govt | Domestic |
| A028 | Lakarka 6 no. | 0.65 | 1.30 | 5.25 | Barakar | BCCL | Domestic |
| A029 | Aambagan | 0.10 | 2.60 | 9.15 | Barakar | Govt | Domestic |
| A032 | Baludih | 0.55 | 2.30 | 6.85 | BM | Govt | Domestic |
| A034 | Bhatdih | 0.55 | 3.50 | 24.50 | Raniganj | BCCL | Domestic |
| B001 | Muraidih | 0.47 | 1.80 | 5.35 | Talchir | Govt | Domestic |
| B002 | Baghmara Tola | 0.32 | 1.85 | 11.25 | Metamorphic | Govt | Domestic |
| B009 | Jari Tanr | 0.60 | 2.57 | 9.00 | Metamorphic | Hariram Majhi | Domestic |
| B010 | Narayanpur | 0.23 | 4.57 | 8.60 | Metamorphic | Mukteswar | Domestic |
| B011 | Nischitpur | 0.60 | 2.08 | 11.30 | Metamorphic | Babulal Das | Domestic |
| B012 | Harina | 0.37 | 2.20 | 10.87 | Metamorphic | Ramayan | Domestic |
| B014 | Mathadih | 0.76 | 2.15 | 3.75 | Barakar | Govt | Domestic |
| B015 | Bera Basti | 0.55 | 1.60 | 2.50 | Talchir | Dhanu Roy | Domestic |
| B017 | Chandrapura | 0.40 | 1.85 | 11.40 | Barakar | Govt | Domestic |
| B018 | Khanoodih | 0.66 | 2.30 | 13.25 | Metamorphic | Govt | Domestic |
| B024 | Telmuchu | 0.67 | 4.35 | 10.83 | Raniganj | Govt | Domestic |
| B027 | Chirudih Basti | 0.08 | 1.40 | 11.00 | BM | Govt | Domestic |
| B029 | Popanki | 0.50 | 1.70 | 6.50 | Metamorphic | Govt | Domestic |
| B032 | Madhuband | 0.80 | 4.30 | 8.60 | Barakar | BCCL | Domestic |
| B033 | Ramakunda | 0.75 | 3.20 | 9.65 | Metamorphic | Liluram Mahato | Domestic |

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| B038 | Tantri | 0.4 | 1.80 | 11.3 | Metamorphic | Panchayat | Domestic |
| B040 | BhuiwarChita | 0.4 | 1.80 | 9.15 | Metamorphic | Govt | Domestic |
| B041 | Pawapur | 0.45 | 3.00 | 6.7 | Metamorphic | Govt | Domestic |
| B043 | Chatatanr | 0.5 | 1.50 | 9.2 | Metamorphic | Govt | Domestic |
| B044 | Lachmipur | 0.35 | 3.35 | 10.1 | Metamorphic | Govt | Irrigation |
| B046 | Telo | 0.2 | 1.50 | 8.1 | Metamorphic | Govt | Domestic |
| B047 | Madanpur | 0.7 | 1.80 | 10.8 | Metamorphic | DVC | Domestic |
| B048 | Mahuda | 0.65 | 2.10 | 11.50 | Raniganj | Mosque | Domestic |
| B051 | Taranga | 0.00 | 2.50 | 5.75 | Metamorphic | Bisun | Irrigation |
| B053 | Karmatanr | 0.58 | 2.70 | 13.25 | Barakar | Govt | Domestic |
| B054 | Domanpur | 0.45 | 3.30 | 9.55 | Metamorphic | Govt | Domestic |
| B055 | Rantanr | 0.50 | 3.40 | 5.25 | Metamorphic | Govt | Domestic |
| B057 | Kotaldih | 0.60 | 3.20 | 7.5 | Metamorphic | Govt | Domestic |
| B059 | Khodovaly | 0.60 | 2.40 | 9.30 | Barakar | BCCL | Domestic |
| B060 | Bahiyardih | 0.77 | 3.00 | 15.60 | Barakar | BCCL | Domestic |
| B062 | Sadariyadih | 0.15 | 3.10 | 9.50 | Barakar | Govt | Domestic |
| B065 | Jhinjipahari | 0.95 | 2.20 | 12.4 | Metamorphic | Private | Domestic |
| B067 | Simatanr | 0.55 | 2.20 | 11.8 | Raniganj | Govt | Domestic |
| B068 | Sibutanr | 0.4 | 2.20 | 6 | Metamorphic | DVC | Domestic |
| B071 | Bandiyo | 0.55 | 3.50 | 7.1 | Metamorphic | Govt | Irrigation |
| D003 | Dhansar | 0.6 | 1.70 | 8.7 | Barakar | Govt | Domestic |
| D005 | Jiyalgora PO | 0.7 | 2.80 | 10.55 | Metamorphic | Govt | Domestic |
| D007 | Golden Pahari | 0.67 | 2.85 | 10.05 | Barakar | BCCL | Domestic |
| D008 | Alokdiha | 0.35 | 1.75 | 8.15 | Metamorphic | Govt | Domestic |
| D010 | Rakhisitpur | 0.55 | 1.65 | 4.6 | Metamorphic | Govt | Domestic |
| D012 | Dhowatanr | 0.75 | 1.85 | 13.2 | Metamorphic | Govt | Domestic |
| D014 | Karmatanr | 0.48 | 1.90 | 11.55 | Metamorphic | Nepal | Domestic |
| D018 | Dhaiya | 0.44 | 2.00 | 8.1 | Metamorphic | Govt | Domestic |
| D019 | Memko More | 0.42 | 3.80 | 7.57 | Metamorphic | Govt | Domestic |
| D020 | Dhanbad | 0.22 | 3.10 | 11.45 | Metamorphic | | Domestic |
| D022 | Shyamnagar | 0.35 | 1.70 | 6.3 | Metamorphic | Govt | Domestic |
| D025 | Godhar More | 0.6 | 2.75 | 5.8 | Barakar | Govt | Domestic |
| D028 | Nawadih | 0.46 | 2.00 | 10.6 | Metamorphic | Gitarani Paul | Domestic |
| D029 | Karamara | 0.5 | 3.10 | 10.5 | Metamorphic | Govt | Domestic |
| D030 | Borkiboa | 0.7 | 2.00 | 5.6 | Metamorphic | Haru | Domestic |
| D034 | Kusunda | 0.6 | 1.50 | 3.45 | Barakar | BCCL | Domestic |
| D035 | Patherdih | 0.4 | 2.00 | 11.2 | Metamorphic | Govt | Domestic |
| D036 | Sudamdih | 0.9 | 2.00 | 6.2 | Metamorphic | BCCL | Domestic |
| D039 | Tilabani | 0.85 | 2.00 | 20 | Barakar | BCCL | Domestic |
| D046 | Sindupur | 0.74 | 3.00 | 8.75 | Metamorphic | Govt | Domestic |
| D047 | Ena colliery | 0.45 | 3.20 | 23.8 | Barakar | BCCL | Domestic |
| D052 | Goluckdih | 0.47 | 3.10 | 5 | Metamorphic | Govt | Domestic |
| D054 | Amtal | 0.65 | 6.40 | 10.8 | Barakar | Govt | Domestic |
| D056 | Bhutgoria | 0.5 | 1.80 | 12.75 | Metamorphic | Govt | Domestic |
| D057 | Kandra | 0.37 | 2.10 | 6.55 | Metamorphic | Govt | Domestic |

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| D059 | Belghutu Tola | 0.5 | 3.60 | 9.3 | Metamorphic | Govt | Domestic |
| D062 | Bendachuna | 0.65 | 2.80 | 12.1 | Metamorphic | Saheb Ram | Domestic |
| D063 | Chatabad | 0.2 | 1.90 | 10.7 | Metamorphic | Govt | Domestic |
| D065 | Nischitpur | 0.15 | 3.15 | 10.6 | Metamorphic | Govt | Domestic |
| D068 | Surunga | 0.53 | 3.00 | 10.25 | Metamorphic | Govt | Domestic |
| D070 | Jaladih | 0.7 | 1.80 | 9.5 | Metamorphic | Govt | Domestic |
| D071 | Domandih | 0.65 | 2.00 | 13.5 | Metamorphic | Govt | Domestic |
| D072 | Gobindpur | 0.4 | 1.70 | 6.7 | Metamorphic | Govt | Domestic |
| D074 | Bhulan-Barari | 0.1 | 1.60 | 12.8 | Barakar | Govt | Domestic |
| D075 | Manpur | 0.6 | 2.90 | 10.2 | BM | Govt | Domestic |
| D077 | Rohoniatanr | 0.4 | 3.15 | 6.9 | BM | Govt | Domestic |
| D080 | Bastacolla | 0.7 | 2.50 | 24.95 | Barakar | Govt | Domestic |
| D088 | Laghla more | 0.35 | 2.00 | 7.75 | Metamorphic | Govt | Domestic |
| D089 | Machatanr | 0.6 | 1.60 | 9.15 | Metamorphic | Govt | Domestic |
| D090 | Marradih | 0.42 | 3.10 | 8.8 | Metamorphic | Govt | Domestic |
| D091 | Asurbandh | 0.65 | 1.80 | 8.1 | Metamorphic | Govt | Domestic |
| D096 | Paradih | 0.85 | 1.30 | 9.2 | BM | Private | Domestic |
| D105 | Bandhwatanr | 0.55 | 3.00 | 9.15 | Metamorphic | Dasarath Mahato | Domestic |
| D109 | Domatanr | 0.65 | 9.15 | 9 | Metamorphic | Shiv Charan Mahato | Domestic |
| D112 | Bansra | 0.45 | 1.38 | 7.75 | Metamorphic | | Domestic |
| D113 | Dumarda | 0.7 | 3.00 | 11 | Metamorphic | Govt | Domestic |
| D115 | Mahuar | 0.15 | 2.00 | 6.45 | Metamorphic | Private | Domestic |
| D117 | Bhatua | 0.23 | 2.70 | 10 | Metamorphic | Govt | Domestic |
| DB001 | Laikadih | 1 | 2.55 | 14.96 | Barakar | BCCL | Domestic |
| DB010 | Kulti College | 0.6 | 1.8 | 13.88 | BM | Govt | Domestic |
| DB012 | Sabanpur | 0.85 | 1.8 | 9.6 | Barakar | Govt | Domestic |
| DB013 | Dendua More | 0.5 | 2 | 7.85 | - | Govt | Domestic |
| DB018 | Sarsapahari | 0.75 | 1.6 | 7 | Barakar | Govt | Domestic |
| DB019 | Luchibad | 0.73 | 1.8 | 6.45 | Talchir | Govt | Domestic |
| DB002 | Sulibari | 0.42 | 1.8 | 9.63 | Barakar | Govt | Domestic |
| DB022 | Dahibari Majhi Basti | 0.9 | 1.85 | 16.25 | Barakar | Govt | Domestic |
| DB023 | BCCL Substation,Dahibari | 0.67 | 1.42 | 5.75 | Barakar | Govt | Domestic |
| DB-24 | Dahibari,LHS | 0.58 | 2 | 12.8 | Barakar | Govt | Domestic |
| DB026 | Patlabari | 0.7 | 4 | 9.8 | Metamorphic | DVC | Domestic |
| DB027 | Ledaharia Village | 0.67 | 2.4 | 10.65 | Metamorphic | Govt | Domestic |
| DB028 | Patharkua | 0.7 | 2.3 | 8 | Barakar | BCCL | Domestic |
| DB029 | Kelyasol | 0.6 | 3.6 | 13.7 | Barakar | BCCL | Domestic |
| DB003 | Puapur | 0.37 | 1.55 | 5.25 | Raniganj | Govt | Domestic |

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| DB030 | Ramkanali Village | 0.6 | 3.1 | 10.55 | Metamorphic | Govt | Domestic |
| DB033 | Barajor/Amkura | 0.7 | 2 | 9.2 | Talchir | Kajal Chatterjee | Domestic |
| DB034 | Tetuldanga | 0.6 | 3.6 | 11.6 | Talchir | Govt | Domestic |
| DB036 | Madanpur | 0.55 | 2.4 | 8 | Talchir | Chhotka Marandi | Domestic |
| DB038 | Lukuidih | 0.55 | 3.8 | 7.8 | Metamorphic | Govt | Domestic |
| DB039 | Pandra | 0.65 | 3 | 6.9 | Talchir | Forest Dept. | Domestic |
| DB004 | Sarbari | 0.62 | 2.22 | 8.98 | Raniganj | DVC | Domestic |
| DB047 | Mugma | 0.65 | 3.2 | 8.3 | Barakar | Govt | Irrigation |
| DB005 | Parbelia | 0.48 | 3.2 | 7.8 | Raniganj | Govt | Domestic |
| DB008 | Chungei | 0.8 | 2.2 | 5.75 | BM | Govt | Domestic |
| DB009 | Begunia Temple | 0.68 | 3 | 19.25 | Barakar | Govt | Domestic |
| K010 | Phatepur | 0.8 | 2.02 | 28.3 | Raniganj | Govt | Domestic |
| K012 | Ethora | 0.81 | 2 | 15.9 | Raniganj | Govt | Domestic |
| K015 | Kankurkunda | 0.55 | 2.1 | 12.5 | - | Govt | Domestic |
| K020 | Majhladih | 0.79 | 1.22 | 11.77 | - | Govt | Domestic |
| K021 | Pratappur | 0.6 | 1.4 | 10.94 | - | Govt | Domestic |
| K026 | Bodra | 0.9 | 2.1 | 10 | BM | Govt | Domestic |
| K030 | Kulti Station | 0.31 | 0.75 | 4.25 | BM | Govt | Domestic |

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

**Annexure – VB**

## Historical Water Level data of Hydrograph Stations

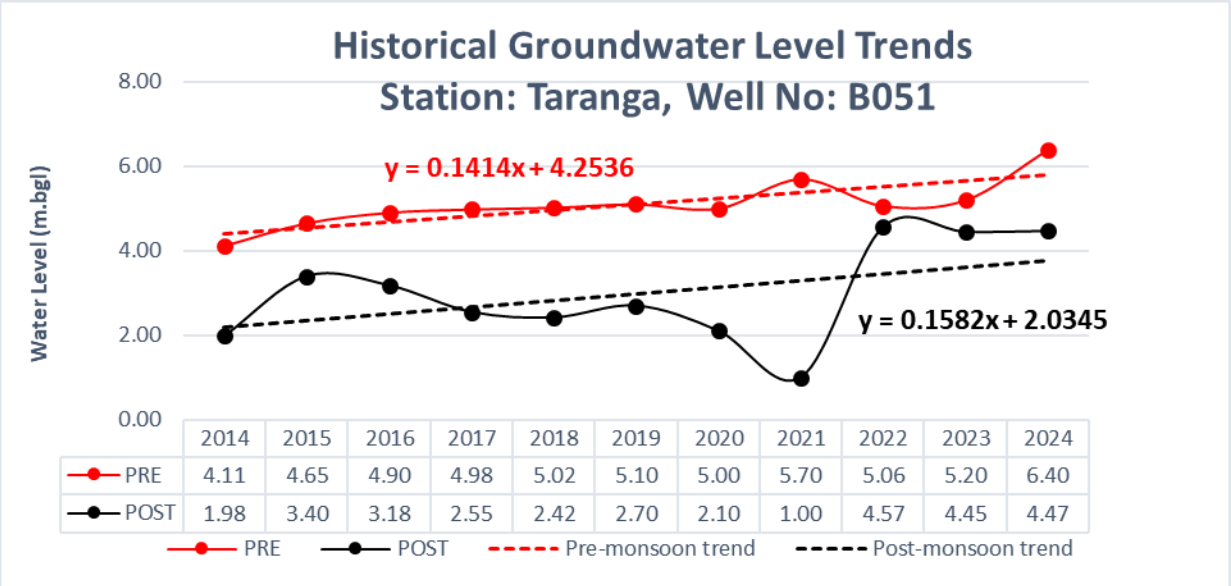
| Well No | Water level below ground level (bgl) in meters | | | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | May 15 | Nov 15 | May 16 | Nov 16 | May 17 | Nov 17 | May 18 | Nov 18 | May 19 | Nov 19 | May 20 | Nov 20 | May 21 | Nov 21 | May 22 | Nov 22 | May 23 | Nov 23 |
| JCF | | | | | | | | | | | | | | | | | | |
| A002 | 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 | 4.80 | 3.10 |
| A004 | 4.56 | 1.78 | 5.20 | 1.48 | 3.48 | 0.91 | 4.48 | 1.73 | 3.38 | 1.78 | 4.63 | 2.28 | 3.51 | 1.83 | 4.40 | 1.80 | 3.51 | 1.90 |
| A006 | 8.25 | 6.25 | 8.25 | 3.95 | 6.95 | 3.35 | 8.40 | 5.35 | 4.90 | 4.25 | 7.75 | 5.30 | 7.00 | 4.07 | 8.40 | 5.30 | 7.35 | 4.72 |
| A007 | 7.79 | 4.57 | 9.45 | 5.27 | 7.55 | 2.55 | 7.40 | 3.75 | 9.45 | 4.10 | 7.35 | 3.70 | 6.63 | 3.66 | 7.40 | 3.75 | 8.15 | 5.65 |
| A008 | | 9.73 | 11.85 | 3.20 | 9.90 | 1.38 | | | 11.30 | | | | 8.99 | 4.30 | 8.80 | 4.20 | 10.70 | 5.03 |
| A009 | 6.70 | 5.47 | 7.23 | 4.44 | 7.77 | 2.42 | 6.42 | 5.22 | 8.87 | 5.07 | 6.12 | 4.62 | 7.42 | 4.55 | 6.30 | 5.05 | 7.42 | 4.76 |
| A010 | 9.61 | 8.37 | | 2.42 | 7.47 | 2.27 | 7.72 | 5.47 | 8.17 | 5.57 | 7.57 | 5.29 | 8.92 | 5.60 | 7.70 | 5.40 | 8.92 | 5.05 |
| A013 | 3.60 | 5.30 | 5.20 | 3.85 | 4.40 | | | | 5.10 | | | | 4.63 | 2.60 | 4.60 | 2.50 | 4.63 | 2.31 |
| A015 | 7.15 | 7.00 | 7.95 | 5.20 | 6.50 | 3.95 | | | 7.00 | | | | 6.93 | 3.76 | 6.70 | 3.50 | 6.93 | 3.62 |
| A016 | 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 | 5.80 | 3.08 | 5.55 | 3.52 |
| A017 | 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 | 2.41 | 2.19 |
| A019 | | | 7.81 | 4.11 | 6.38 | 2.46 | 5.55 | 2.45 | 4.86 | 3.44 | 6.06 | 3.26 | 3.31 | 1.91 | 4.10 | 2.54 | 2.90 | 2.60 |
| A020 | 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 | 8.02 | 4.20 |
| A023 | 11.37 | 9.37 | 11.87 | 8.13 | 11.87 | 6.97 | 11.15 | 7.17 | 11.97 | 3.77 | 8.92 | 5.62 | 9.52 | 2.82 | 7.97 | 4.79 | 9.00 | 5.71 |
| A024 | 17.20 | 14.58 | 16.62 | 12.43 | 16.28 | 4.18 | 14.58 | 6.88 | 15.88 | 2.48 | 4.88 | 4.28 | 10.13 | 2.78 | 7.28 | 4.33 | 5.38 | 3.90 |
| A025 | 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 | 2.93 | 2.60 |
| A026 | 7.33 | 3.18 | 8.93 | 4.48 | 5.28 | 2.53 | 6.23 | 3.88 | 6.58 | 3.33 | 6.98 | 3.18 | 5.66 | 2.73 | 6.42 | 4.31 | 8.40 | 3.83 |
| A027 | 4.40 | 3.99 | 4.85 | 1.80 | 2.90 | 1.25 | 2.90 | 1.00 | 2.40 | 0.92 | 2.40 | 1.10 | 1.67 | 0.90 | 1.90 | 1.33 | 1.70 | 1.60 |
| A028 | 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 | 3.45 | 3.35 |
| A029 | 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 | 5.60 | 3.20 |
| A032 | 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 | 3.83 | 1.60 |
| A034 | 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 | 6.54 | 4.01 |
| B001 | 3.28 | 2.75 | 3.58 | 1.93 | 2.33 | 1.63 | 2.88 | 2.08 | 3.18 | 1.73 | 3.28 | 1.63 | 2.58 | 1.91 | 2.10 | 1.81 | 3.22 | 2.45 |
| B002 | - | - | 10.93 | 6.99 | 10.9 | 6.8 | - | - | 10.88 | 6.58 | - | - | 10.13 | 6.5 | 9.8 | 6.4 | 10.55 | 4.47 |
| B009 | 8.82 | 3.50 | 8.90 | 3.90 | 7.80 | 2.30 | 8.40 | 3.40 | 6.56 | 3.25 | 8.51 | 3.27 | 7.61 | 3.16 | 7.40 | 4.60 | 6.75 | 3.20 |
| B010 | 7.12 | 3.63 | 6.77 | 4.69 | 7.97 | 4.42 | 6.97 | 2.79 | 8.02 | 2.77 | 6.92 | 2.80 | 7.12 | 3.35 | 6.80 | 2.70 | 7.47 | 4.42 |
| B011 | 9.49 | 3.45 | 9.20 | 4.55 | 10.60 | 2.80 | 9.90 | 4.68 | 9.38 | 4.65 | 10.05 | 4.90 | 8.24 | 4.02 | 9.50 | 4.60 | 10.30 | 3.75 |
| B012 | 8.78 | 7.31 | 7.17 | 8.63 | 9.03 | 5.33 | 8.37 | 4.83 | 8.98 | 8.63 | 8.63 | 5.66 | 8.68 | 6.99 | 6.4 | 4.7 | 8.88 | 5.63 |
| B014 | 2.94 | 2.29 | 2.44 | 0.47 | 2.94 | 1.84 | 3.64 | 2.84 | 2.24 | 2.74 | 2.44 | 1.04 | 2.84 | 2.04 | 3.24 | 2.6 | 2.84 | 2.34 |
| B015 | 1.5 | 0.45 | 1.85 | 0.55 | 1.85 | | 1.85 | 0.85 | 1.9 | 0.95 | 3.7 | 1.47 | 1.46 | 0.35 | 3.67 | 1.02 | 3.2 | 1 |
| B017 | 6.65 | 2.9 | 4.8 | 3.15 | 3 | 2.65 | 6.61 | 4.4 | 7.4 | 4.6 | 6.69 | 4.15 | 6.5 | 4.25 | 6.5 | 4.2 | 7.95 | 4.33 |
| B018 | 9.01 | 6.16 | 6.39 | 5.19 | 6.24 | 1.99 | 8.56 | 3.39 | 8.34 | 3.34 | 8.54 | 3.52 | 7.84 | 3.62 | 8.5 | 3.2 | 7.36 | 3.9 |
| B024 | 10.05 | 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 | 4.63 | 3.24 |
| B027 | 9.87 | 5.47 | 6.07 | 4.22 | 8.12 | 3.87 | 9.97 | 5.67 | 7.52 | 5.42 | 8.87 | 5.47 | 8.89 | 4.73 | 10.1 | 4.8 | 8.89 | 4.16 |
| B029 | 5.58 | 5.15 | 5.95 | 3.05 | 5.5 | | | | 4.8 | 2.65 | | | 5.26 | 2.48 | 5.5 | 2.15 | 3.6 | 1.9 |
| B032 | 7.55 | 3.32 | 6.95 | 3.07 | 6.95 | 2.8 | 6.75 | 3.9 | 5.55 | 1.7 | 3.3 | 2 | 5.6 | 1.7 | 4.15 | 2.56 | 7.3 | 3.54 |
| B033 | 6.53 | 4.13 | 5.45 | 4.05 | 5.3 | 4.15 | 6.5 | 3.45 | 6.65 | 3.3 | 6.29 | 3.3 | 6.38 | 3.43 | 4.75 | 3.1 | 7.3 | 3.54 |
| B038 | 10.65 | 7.95 | 10.82 | 4.2 | 7.6 | 4.5 | 10.3 | 5.1 | 10.8 | 4.85 | 9.17 | 4.85 | 9.34 | 4.18 | 8.1 | 5.2 | 8.17 | 5.2 |
| B040 | 5.63 | 4.45 | 7.05 | 3.45 | 4.7 | 3.4 | 6.1 | 4.6 | 8.7 | 4.9 | 5.68 | 4.15 | 5.58 | 3.24 | 5.3 | 3.1 | 3.5 | 1.96 |
| B041 | 5.9 | 2.85 | 5.25 | 3.75 | 5.35 | 2.9 | 5.25 | 2.05 | | 1.95 | 5.37 | 2.25 | 5.36 | 2.4 | 5.05 | 3.6 | 6.45 | 4.02 |
| B043 | 7.65 | 5.5 | 7.75 | 3.82 | 7.6 | 2.4 | 7.5 | 4.2 | | 4.55 | 7.35 | 3.7 | 7.26 | 3.78 | 6.5 | 4.6 | 7.26 | 3.93 |
| B044 | 9.15 | 5.54 | 7.7 | 4.79 | 6.6 | 2.75 | 9.68 | 5.05 | | 4.6 | 8.58 | 4.73 | 7.51 | 3.83 | 9.1 | 6.3 | 9.35 | 7.63 |
| B046 | 6.85 | 4.62 | 5.05 | 4.82 | 5.6 | 3.8 | 5.6 | 3.6 | | | 5.55 | 3.35 | 5.5 | 3.65 | 6.05 | 3.75 | 7.25 | 3.9 |
| B047 | 9.33 | 8.6 | 8.85 | 6.7 | 10 | 4.37 | 8.2 | 5.3 | | 5.1 | 8.02 | 4.66 | 7.15 | 4.73 | 8.75 | 5.6 | 7.8 | 4.95 |
| B048 | 7.9 | 5.42 | 9.35 | 4.6 | 7.7 | 4.15 | 7.33 | 3.97 | 7.05 | 4.35 | 8.2 | 3.85 | 7.23 | 6.05 | 6.85 | 6.25 | 6.13 | 5.05 |
| B051 | 4.65 | 3.4 | 4.9 | 3.18 | 4.98 | 2.55 | 5.02 | 2.42 | 5.1 | 2.7 | 5 | 2.1 | 5.7 | 1 | 5.06 | 4.57 | 5.2 | 4.45 |
| B053 | 5.58 | 2.82 | | 2.07 | 4.02 | 1.92 | 3.92 | 1.42 | 3.22 | 1.42 | 3.12 | 1.4 | 4.85 | 1.87 | 4.42 | 3.54 | 2.62 | 1.13 |

| | | | | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| B054 | 7.62 | 4.56 | 9.25 | 5.55 | 7.2 | 4.1 | 7.55 | 3.65 | 9.05 | 3.55 | 7.7 | 3.87 | 7.4 | 3.43 | 7.3 | 4.75 | 7.65 | 5.8 |
| B055 | 3.46 | 2.25 | 4.45 | 2.2 | 4.6 | 5.52 | 3.6 | 2.48 | | 2.5 | 4.15 | 2.58 | 3.73 | 2.52 | 3.3 | 2 | 3.73 | 2.2 |
| B057 | 6.18 | 3.35 | 6.9 | 3.45 | 5.9 | 3.6 | 6.2 | 3.1 | | 2.95 | 6.4 | 3.05 | 5.36 | 2.92 | 6.1 | 3.5 | 5.36 | 3.26 |
| B059 | 4.12 | 1.6 | 4.4 | 0.5 | 5.4 | 0.6 | 3.9 | 0.9 | 6.2 | 0.9 | 5.25 | 1.4 | 5.49 | 0.9 | 4.5 | 1.14 | 1.88 | 0.7 |
| B060 | 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 | 5.8 | 10.73 | 5.73 |
| B062 | 9.1 | 5.21 | 9.3 | 4.95 | 8.15 | 4.35 | 8.27 | 4.78 | 7.55 | 3.25 | 6.95 | 3 | 6.87 | 4.5 | 6.45 | 4.91 | 4.8 | 3.1 |
| B065 | 7.82 | 5.87 | 7.15 | 2.68 | 9.05 | 1.25 | 10.03 | 2.4 | 11.05 | 0.95 | 9.25 | 2.3 | 9.03 | 1.42 | 7.45 | 2.27 | 8.45 | 2.35 |
| B067 | 9.23 | 5.53 | 9.53 | 4.3 | 10 | 2.15 | 9.55 | 4 | 8.57 | 4.35 | 7.55 | 3.95 | 8.95 | 2.95 | 8.5 | 6.3 | 8.05 | 5.32 |
| B068 | 5.05 | 3.42 | 5.25 | 2.8 | 4.35 | | 5.2 | 3.85 | | 3.65 | 5.1 | 3.44 | 4.18 | 3.76 | 5.5 | 4.6 | 7.92 | 4.6 |
| B071 | 5.48 | 3.2 | 6.15 | | | | 5.5 | 3.47 | | 3.45 | | | 5.43 | 3.25 | 5.3 | 2.5 | 10.28 | 5.64 |
| D003 | 4.25 | 2.25 | 2.35 | 1.9 | 2.15 | 2.3 | 3.43 | 2.45 | 1.75 | 1.3 | 5.4 | 1.38 | 3.41 | 0.85 | 5.96 | 1.32 | 3.15 | 1.85 |
| D005 | 9.37 | 8.33 | 9.4 | 6.4 | 7.9 | 5.2 | 7.8 | 5.3 | 8.25 | 4.85 | 8.6 | 7.7 | 7.28 | 4 | 8.4 | 7.01 | 8.4 | 7.01 |
| D007 | 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 | 9.03 | 3.64 |
| D008 | 6.24 | 4.38 | 8 | 3.43 | 5.15 | 1.85 | 5.65 | 1.85 | 4.8 | 2.85 | 5.83 | 2.75 | 4.55 | 2.27 | 5.8 | 3.5 | 7.7 | 4.82 |
| D010 | 3.77 | 2.9 | 3.77 | 1.6 | 3.65 | 1.6 | 3.95 | 2.6 | 3.5 | 2.73 | 3.78 | 2.45 | 3.55 | 1.47 | 3.5 | 1.9 | 5.4 | 2 |
| D012 | 12.25 | 7.9 | 12.25 | 8.8 | 12.45 | 8.55 | 11.25 | 7.7 | 12.25 | 7.2 | 10.82 | 8.07 | 11.38 | 7.28 | 12 | 9.9 | 11.38 | 7.76 |
| D014 | 11.02 | 9.47 | 10.77 | 8.12 | 10.22 | 7.47 | 10.52 | 7.42 | 10.32 | 7.07 | 9.47 | 5.65 | 9.57 | 7.02 | 10.3 | 7.1 | 9.57 | 6.18 |
| D018 | 7.01 | 4.45 | 3.36 | 1.56 | 3.56 | 3.76 | 7.06 | 3.06 | | 3.06 | | | 3.66 | 3.11 | 4.5 | 2.3 | 3.66 | 2.35 |
| D019 | 8.43 | 5.12 | 8.33 | 5.5 | 7.76 | 4.65 | 7.53 | 4.83 | 7.45 | 4.85 | 7.21 | 4.25 | 7.47 | 4.4 | 7.05 | 4.4 | 7.68 | 5.48 |
| D020 | 7.42 | 6.58 | 8.02 | 5.88 | 7.88 | 4.43 | 7.38 | 3.88 | 8.18 | 4.33 | 7.29 | 3.81 | 7.66 | 3.88 | 6.4 | 5.5 | 6.48 | 4.28 |
| D022 | 5.78 | 2.67 | 5.45 | 4.75 | 4.15 | 1.15 | 5.8 | 1.75 | | 2.5 | 5.75 | 1.7 | 3.8 | 0.5 | 4.6 | 1.7 | 3.8 | 1.36 |
| D025 | 4.48 | 2.45 | 2.4 | 1.9 | 2.4 | 1.2 | 2.6 | 2.4 | 3.9 | 5.38 | 6.5 | 3.38 | 8.68 | 3.8 | 10.5 | 4.7 | 4.4 | 3.4 |
| D028 | 9.38 | 7.22 | 9.27 | 3.57 | 8.64 | 2.79 | 9.04 | 5.74 | 8.52 | 5.59 | 7.44 | 4.62 | 8.75 | 5.51 | 7.9 | 5.6 | 8.75 | 4.87 |
| D029 | 9.62 | 4.35 | 8.35 | 4.2 | 6.3 | 3.45 | 9.6 | 5.2 | 9.35 | 5 | 8.69 | 5 | 9.55 | 5.1 | 9.75 | 7.1 | 9.55 | 5.87 |
| D030 | 4.55 | 3.15 | 4.45 | 3.2 | 4.4 | 1.25 | 4.58 | 1.1 | 4.6 | 0.75 | 4.5 | 1.35 | 4.23 | 0.84 | 4.37 | 2.29 | 4.08 | 2.2 |
| D034 | 2.55 | 1.45 | 2.3 | 0.3 | 0.8 | 0.55 | 2.8 | 0.45 | 2.4 | 2 | 2.9 | 2.4 | 3.38 | 2.5 | 5 | 3.15 | 3.8 | 2.5 |
| D035 | 9.8 | 7.9 | 9.52 | 6.45 | 8.8 | 3.6 | 8.4 | 4.45 | 8 | 3.8 | 8.2 | 5.4 | 6.6 | 2.9 | 6.1 | 4.68 | 5.23 | 3.9 |
| D036 | 1.66 | 1.13 | 0.78 | 0.95 | 1.3 | 0.7 | 1.2 | 0.6 | 1.2 | 0.55 | 2.1 | 1 | 2.02 | 0.55 | 3.25 | 0.6 | 1.85 | 0.6 |
| D039 | 5 | 2.61 | 2.18 | 2.65 | 5.05 | 4.75 | 4.95 | 4.35 | 4.95 | 5.6 | 9.05 | 5.7 | 10.35 | 4.75 | 7.5 | 3.05 | 8.52 | 3.28 |
| D046 | 6.14 | 3.31 | 7.46 | 3.26 | 7.16 | 3.01 | 6.06 | 3.24 | 7.61 | 3.36 | 6.01 | 3.21 | | | 7.05 | 4.6 | 7.66 | 4.18 |
| D047 | 9.6 | 3.6 | 3.18 | 2.95 | 3.15 | 2.85 | 5.33 | 2.55 | 4.55 | 4.35 | 9.45 | 5.45 | 4.05 | 2.45 | 2.2 | 1.5 | 4.45 | 3.27 |
| D052 | | | 4.23 | 1.63 | 3.53 | 1.56 | 4.63 | 3.33 | 2.08 | 3.54 | 4.58 | 3.28 | | | 3.6 | 2 | 3.2 | 1.95 |
| D054 | 8.78 | 6.7 | 9.5 | 3.55 | 8.65 | 5.35 | 8.85 | 3.45 | 9.35 | 3.15 | 7.33 | 2.88 | | | 9.5 | 6.9 | 8.03 | 6.3 |
| D056 | 10.6 | 6.9 | 8.46 | 5.25 | 7.1 | 5 | 10.48 | 5.8 | 6.2 | 5.55 | 10 | 5.75 | 6.85 | 4.86 | 9.4 | 5.9 | 5.6 | 3.73 |
| D057 | 5.94 | 5.33 | 6.1 | 5.41 | 5.23 | 3.43 | 6.03 | 4.63 | 5.23 | 4.43 | 6.13 | 3.98 | 5.42 | 3.5 | 5.2 | 4.05 | 5.18 | 3.65 |
| D059 | 6.98 | 3.32 | 7.7 | 4.88 | 7.35 | 3.55 | | | 7.3 | | | | 7.3 | 3.6 | 7.38 | 3.95 | 7.3 | 4.02 |
| D062 | 7.43 | 4.12 | 6.33 | 3.5 | 7.76 | 3.65 | 7.35 | 4 | 7.45 | 3.85 | 7.21 | 3.85 | 7.47 | 3.4 | 7.75 | 4.4 | 7.47 | 3.74 |
| D063 | 8.41 | 4.9 | 9.8 | 3.74 | 7.85 | 3.15 | 8.3 | 5.3 | 7.58 | 5.3 | 8.43 | 5.17 | 7.75 | 3.14 | 9.8 | 5.7 | 7.75 | 4.55 |
| D065 | 7.48 | 4.36 | 8.85 | 2.35 | 6.95 | 4.95 | 7.45 | 3.9 | 8.35 | 3.85 | 7.68 | 3.85 | 7.41 | 4.83 | 7.9 | 5.7 | 6.4 | 4.65 |
| D068 | 8.49 | 4.9 | 6.45 | 3.54 | 8.42 | 4.27 | 7.27 | 3.27 | | 2.97 | 6.97 | 3.03 | 7.92 | 4.22 | 8.2 | 5.2 | 7.92 | 4.6 |
| D070 | 7.1 | 4.25 | 7.55 | 3.08 | 6.5 | 4.28 | 7.2 | 5.1 | 5.1 | 4.8 | 7.12 | 4.8 | 6.13 | 3.78 | 7.5 | 5.05 | 8.6 | 4.63 |
| D071 | 10.85 | 6.55 | 11.35 | 5.45 | 10.35 | 4.05 | 10.55 | 6.89 | 10.93 | 6.85 | 10.6 | 7 | 10.28 | 3.35 | 10.15 | 7.5 | 10.28 | 5.64 |
| D072 | 4.62 | 2.6 | 3.41 | 2.3 | 2.5 | | 5.65 | 3.6 | | 3.75 | 6.92 | 3.86 | 4.36 | 2.69 | 3.3 | 2.2 | 5 | 2.9 |
| D074 | 10.05 | 7.2 | 7.73 | 5 | 9.25 | 3.85 | 8.6 | 4.8 | 5.8 | 3.57 | 4.3 | 3.93 | 6.93 | 2.9 | 6.17 | 5.77 | 4.57 | 3.54 |
| D075 | 7.42 | 4.5 | 5.75 | 1.4 | 3.2 | 1.3 | 7.4 | 3.4 | 5.25 | 4 | 7.45 | 3.27 | | | 5.8 | 2.3 | 5.75 | 2.8 |
| D077 | 6.44 | 5.6 | 4.6 | 2.9 | 6.5 | 4.9 | 6.3 | 5.2 | 6.5 | 3.2 | 6.4 | 3.5 | 5.98 | 4.69 | 6.5 | 4.7 | 5.98 | 3.93 |
| D080 | 10.97 | 3.35 | 6.55 | 4.15 | 8.65 | 3.7 | 9.35 | 4.2 | 5 | 3.05 | 4.3 | 4.9 | 7.1 | 2.55 | 6 | 3.3 | 4.75 | 2.6 |
| D088 | 5.93 | 3.65 | | 4.2 | 6.55 | 2.75 | 6.15 | 3.66 | | 3.45 | 6.12 | 4.03 | 6.55 | 2.52 | 5.6 | 2.8 | 6.55 | 3.1 |
| D089 | 5.2 | 3.22 | | 4.7 | 6 | 2.7 | 5.3 | 3.7 | | 3.6 | 5.45 | 3.63 | 4.41 | 2.55 | 5.7 | 4.2 | 4.41 | 3.55 |
| D090 | 6.66 | 3.88 | | 3.68 | 4.03 | 2.58 | 6.63 | 3.83 | | 3.68 | 5.82 | 3.46 | 5.63 | 2.66 | 7 | 4.5 | 5.63 | 3.68 |
| D091 | 6.85 | 4.95 | | 4.15 | 5.65 | 2.65 | 6.85 | 3.15 | | 3.4 | 6.4 | 3.4 | 5.18 | 3.02 | 5.2 | 3.1 | 5.18 | 3.2 |
| D096 | 6.9 | 3.13 | | 3.15 | 6 | | 6.85 | 3.05 | | | | | 5.97 | 2.71 | 7.75 | 4.05 | 6.1 | 3.2 |
| D105 | 7.57 | 3.1 | 8.15 | | 7.95 | 4.3 | 4.1 | 4.2 | 7.7 | 4.48 | 6.7 | | 8.2 | 6 | 7.05 | 4.92 | | |
| D109 | 8.15 | 6.55 | 5.8 | 4.15 | 7.51 | | 7.78 | 3.5 | 6.35 | 3.85 | 7.9 | 3.22 | 7.33 | 3.1 | 5.2 | 3 | 7.33 | 2.88 |
| D112 | 6.4 | 3.75 | 5.95 | 3.4 | 7.05 | 2.5 | 6.63 | 4.11 | 7.25 | 4.57 | 6.74 | 4.63 | 6.9 | 4.05 | 7.15 | 3.35 | 6.9 | 3.35 |

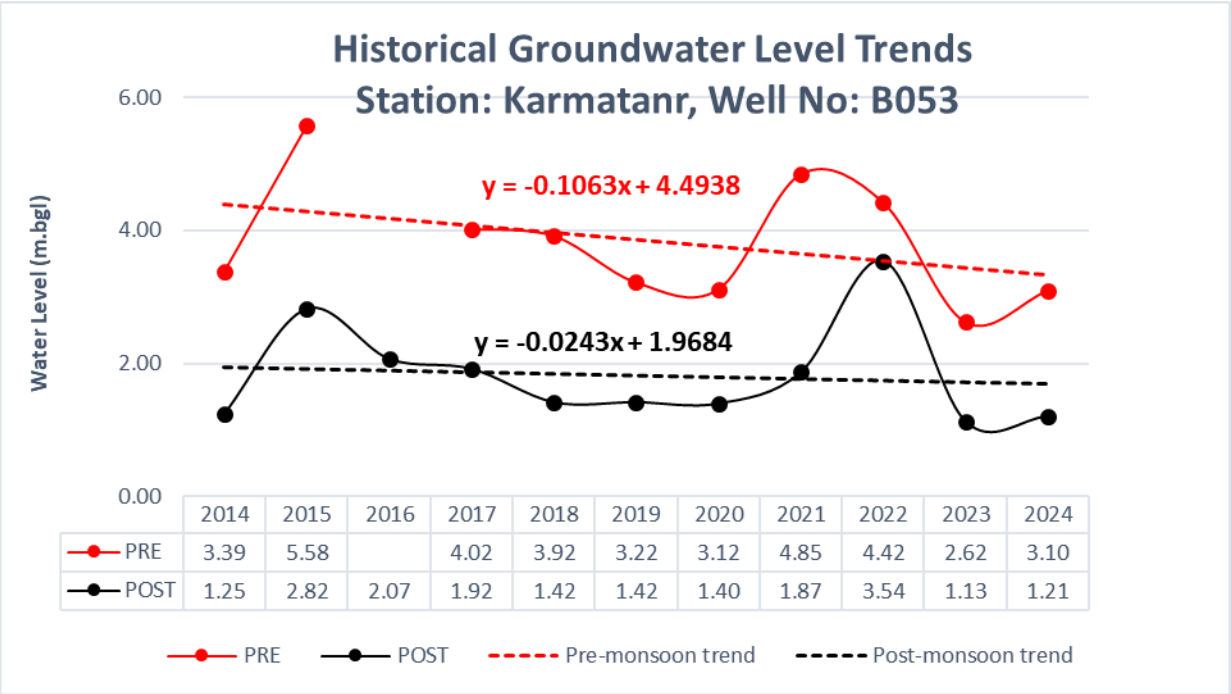
| | | | | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| D113 | 6.6 | 3.85 | | 3.95 | 7.28 | 2.35 | 6.85 | 3.3 | | 3.5 | 6.1 | 3.45 | 6.8 | 2.99 | 7.3 | 4.3 | 5.75 | 3.48 |
| D115 | | 4.85 | | 5.22 | 6.05 | 2.7 | 7.1 | 3.05 | | 2.95 | 7.45 | 2.4 | 7.65 | 3.43 | 5.5 | 4.6 | 6.38 | 3.83 |
| D117 | 7.86 | 5.34 | | 5.67 | 8.8 | 4.37 | 7.92 | 5.02 | | 5.02 | 7.52 | 4.79 | 7.87 | 5.11 | 8.7 | 5.5 | 7.27 | 5.25 |
| RCF (Part) | | | | | | | | | | | | | | | | | | |
| DB001 | 5.4 | 4.08 | 4.17 | 3.7 | 4.5 | 3.8 | 4.35 | 4.2 | 4.85 | 4.3 | 5.08 | 4.08 | 4.88 | 3.88 | 4.73 | 3.76 | 3.94 | 2.77 |
| DB002 | 3 | 1.8 | 3.2 | 1.98 | 3.42 | 2 | 3.19 | 2.02 | 3.6 | 2.62 | 3.97 | 2.43 | 3.30 | 2.31 | 3.20 | 2.24 | 2.9 | 2.25 |
| DB003 | 4.8 | 3 | 5.3 | 3.22 | 5.32 | 2.42 | 5.6 | 3.1 | 5.67 | 3.12 | 4.72 | 3.37 | 4.53 | 3.20 | 4.40 | 3.11 | 4.55 | 2.98 |
| DB004 | 7.5 | 4 | 7.32 | 3.12 | 6.59 | 3.42 | 6.8 | 4.1 | 5.8 | 3.55 | 5.17 | 3.01 | 4.96 | 2.98 | 4.81 | 2.89 | 6.1 | 4.80 |
| DB005 | 6.88 | 3.26 | 6.48 | 3.8 | 5.48 | 3.8 | 4.98 | 3.13 | 5.08 | 2.78 | 5.1 | 3.26 | 4.90 | 3.10 | 4.75 | 3.00 | 5.52 | 3.50 |
| DB008 | 4.6 | 2.8 | 4.57 | 3.02 | 4.17 | 2.13 | 4.17 | 2.89 | 4.27 | 3.07 | 5.01 | 3.1 | 4.81 | 2.95 | 4.67 | 2.86 | 4.5 | 3.42 |
| DB009 | 9.45 | 4.5 | 10.5 | 5.26 | 11.5 | 6.26 | 9.26 | 5.22 | 11.01 | 6.26 | 10.4 | 6.44 | 9.98 | 5.00 | 9.68 | 4.85 | 9.5 | 5.18 |
| DB010 | 5.68 | 4.07 | 4.75 | 3.75 | 4.4 | 2.5 | 4.8 | 2.9 | 4.55 | 2.95 | 5.28 | 3.07 | 5.07 | 2.92 | 4.92 | 2.83 | 4.6 | 3.12 |
| DB012 | 6.5 | 2.05 | 6.76 | 2.78 | 6.3 | 2.73 | 5.18 | 2.55 | 5.08 | 2.73 | 4.9 | 2.05 | 4.70 | 1.95 | 4.56 | 1.89 | 5.44 | 2.30 |
| DB013 | 3.55 | 6.5 | 3.25 | 5.8 | 3.72 | 5.5 | 3.1 | 5.3 | 2.92 | 5.4 | 3 | 4.5 | 4.88 | 2.98 | 4.73 | 2.89 | 4.5 | 2.70 |
| DB018 | 5.48 | 3.65 | 4.6 | 3.2 | 4.2 | 3.3 | 4.2 | 2.99 | 4.6 | 2.55 | 3.8 | 2.9 | 3.65 | 2.76 | 3.54 | 2.67 | 4.25 | 2.61 |
| DB019 | 5.26 | 3.02 | 5.5 | 3.93 | 5.53 | 3.18 | 4.98 | 3.03 | 5.33 | 3.98 | 4.9 | 3.02 | 4.70 | 2.87 | 4.56 | 2.78 | 4.8 | 2.96 |
| DB022 | 4.87 | 3.1 | 4.63 | 2.23 | 4.83 | 2.53 | 3.16 | 1.83 | 3.8 | 2 | 3.99 | 2.16 | 3.83 | 2.05 | 3.72 | 1.99 | 4.25 | 2.43 |
| DB023 | 4.05 | 2.82 | 4.17 | 2.97 | 3.9 | 2.57 | 4.4 | 2.17 | 4.67 | 2.27 | 3.82 | 2.82 | 3.67 | 2.68 | 3.56 | 2.60 | 4.8 | 2.94 |
| DB024 | 9.47 | 6.3 | 9.48 | 4.08 | 7.38 | 4.3 | 8.88 | 4.98 | 8.93 | 4.46 | 7.6 | 3 | 7.30 | 2.85 | 7.08 | 3.91 | 8.25 | 4.18 |
| DB025 | 8.1 | 3.5 | 7.73 | 3.63 | 6.88 | 3.23 | 6.68 | 2.65 | 6.4 | 2.78 | 5.25 | 3.05 | 5.04 | 2.90 | 4.89 | 2.81 | 5.15 | 2.90 |
| DB026 | 5.9 | 3.77 | 6.14 | 3.53 | 6.6 | 3.52 | 7.3 | 4.86 | 7.6 | 4.6 | 6.93 | 3.77 | 6.65 | 3.58 | 6.45 | 3.47 | 6.9 | 3.66 |
| DB027 | 6.26 | 3.2 | 5.77 | 2.92 | 6.02 | 3.35 | 5.97 | 3.69 | 5.57 | 3.37 | 6 | 3.59 | 5.76 | 3.41 | 5.59 | 3.31 | 6.85 | 3.63 |
| DB028 | 3.08 | 3.74 | 1.9 | 4.1 | 2.1 | 3.9 | 1.88 | 4.3 | 2.6 | 3.8 | 1.9 | 3.35 | 3.80 | 2.03 | 3.69 | 1.97 | 4.2 | 2.39 |
| DB029 | 9.1 | 4.8 | 8.6 | 4.6 | 8.1 | 3.98 | 7.6 | 4.1 | 7.1 | 4.25 | 6.9 | 4.3 | 6.62 | 4.09 | 6.43 | 3.96 | 8.5 | 4.67 |
| DB030 | 7.02 | 3.6 | 7.6 | 3.8 | 6.8 | 3.98 | 7.1 | 3.8 | 6.85 | 3.5 | 6.01 | 4.25 | 5.77 | 4.04 | 5.60 | 3.92 | 7.5 | 3.89 |
| DB031 | 7.84 | 3.78 | 7.44 | 3.6 | 6.8 | 3.8 | 5.45 | 3.8 | 5.55 | 3.55 | 4.91 | 3.78 | 4.71 | 3.59 | 4.57 | 3.48 | 5.7 | 2.98 |
| DB033 | 6.05 | 4 | 6.85 | 3.95 | 5.07 | 3.65 | 5.55 | 2.9 | 5.6 | 3.15 | 4.69 | 3 | 4.50 | 2.85 | 4.37 | 2.76 | 5.6 | 3.10 |
| DB034 | 9.2 | 4.02 | 7.93 | 3.3 | 6.95 | 3.88 | 6.4 | 3.3 | 5.9 | 3.18 | 5.33 | 3.8 | 6.12 | 3.61 | 5.94 | 3.50 | 5.5 | 3.08 |
| DB036 | 6.48 | 4.15 | 8.1 | 4.8 | 6.75 | 3.98 | 7.85 | 3.9 | 8.4 | 4.25 | 6.46 | 3.8 | 6.20 | 3.61 | 6.02 | 3.50 | 5.04 | 3.24 |
| DB038 | 4 | 2.95 | 4.2 | 2.05 | 3.8 | 2.8 | 3.95 | 2.43 | 3.55 | 2.31 | 3.68 | 2.95 | 3.53 | 2.80 | 3.43 | 2.72 | 3.73 | 2.66 |
| DB039 | 5.45 | 3.31 | 6 | 3.6 | 5.8 | 3.8 | 5.62 | 3.47 | 5.1 | 3.5 | 5.74 | 3.31 | 5.51 | 3.14 | 5.35 | 3.05 | 6.67 | 3.90 |
| DB047 | 7.62 | 4.8 | 8.77 | 3.27 | 6.77 | 3.62 | 8.97 | 3.63 | 9.07 | 3.77 | 6.56 | 3.8 | 6.30 | 3.61 | 6.11 | 3.50 | 7.02 | 4.30 |
| K010 | 3.1 | 1.9 | 3.05 | 1.85 | 3 | 1.8 | 2.95 | 1.86 | 3.01 | 2.01 | 3.11 | 1.98 | 2.99 | 1.88 | 2.90 | 1.82 | 3.5 | 1.98 |
| K012 | 4.16 | 1.98 | 4.8 | 2.5 | 3.9 | 1.75 | 4.05 | 1.9 | 3.75 | 1.8 | 3.65 | 1.95 | 3.50 | 1.85 | 3.40 | 1.80 | 3.7 | 2.00 |
| K015 | 4.75 | 2.46 | 4.32 | 2.3 | 4 | 2.1 | 4.5 | 2.35 | 4.3 | 2.22 | 4.1 | 2.2 | 3.94 | 2.09 | 3.82 | 2.03 | 4.8 | 2.10 |
| K020 | 7.25 | 2.85 | 7.1 | 2.7 | 6.5 | 2.8 | 6.75 | 2.98 | 6.3 | 2.5 | 6.2 | 2.4 | 5.95 | 2.28 | 5.77 | 2.21 | 5.44 | 2.50 |
| K021 | 5.45 | 2.98 | 5.3 | 2.8 | 5.4 | 3.09 | 5.1 | 3 | 4.88 | 2.8 | 4.9 | 2.7 | 4.70 | 2.57 | 4.56 | 2.49 | 4.6 | 3.00 |
| K026 | 2.2 | 1.46 | 2.7 | 1.8 | 2.1 | 1.6 | 2.08 | 1.65 | 2.1 | 1.55 | 2.07 | 1.4 | 1.99 | 1.33 | 1.93 | 1.29 | 2.1 | 1.50 |
| K030 | 2.5 | 1.4 | 2.4 | 1.4 | 2.22 | 1.53 | 2.4 | 1.63 | 2.6 | 1.1 | 2.22 | 1.3 | 2.13 | 1.24 | 2.07 | 1.20 | 2.4 | 1.50 |

**Annexure – VI**

HYDROGRAPHS OF CLUSTER-I



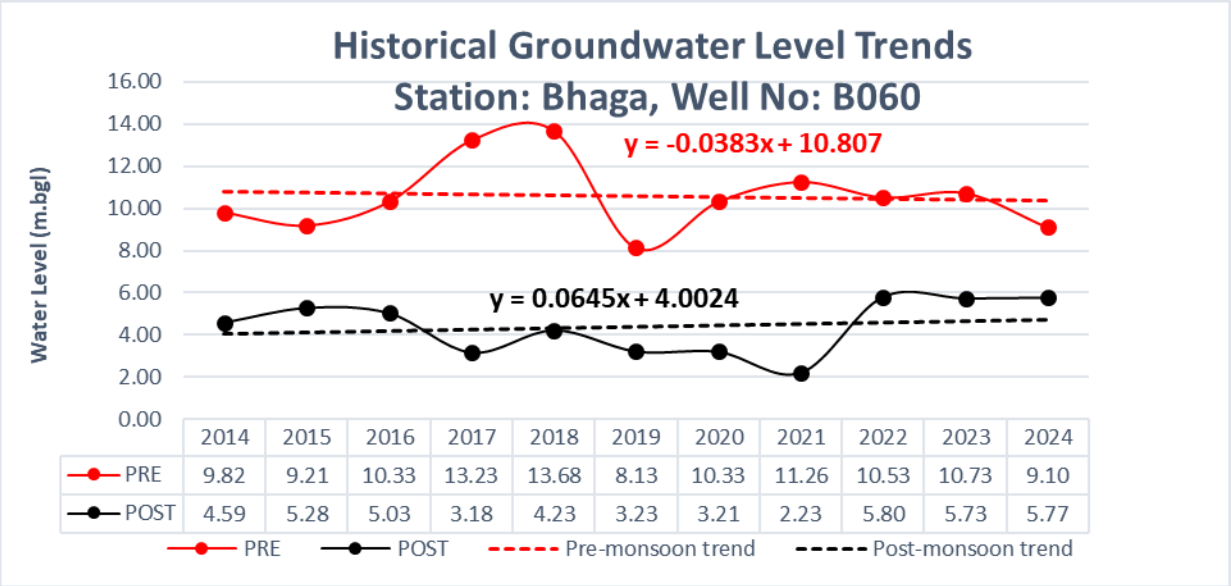

| | 2014 | 2015 | 2016 | 2017 | 2018 | 2019 | 2020 | 2021 | 2022 | 2023 | 2024 |
|---|---|---|---|---|---|---|---|---|---|---|---|
| PRE | 4.11 | 4.65 | 4.90 | 4.98 | 5.02 | 5.10 | 5.00 | 5.70 | 5.06 | 5.20 | 6.40 |
| POST | 1.98 | 3.40 | 3.18 | 2.55 | 2.42 | 2.70 | 2.10 | 1.00 | 4.57 | 4.45 | 4.47 |



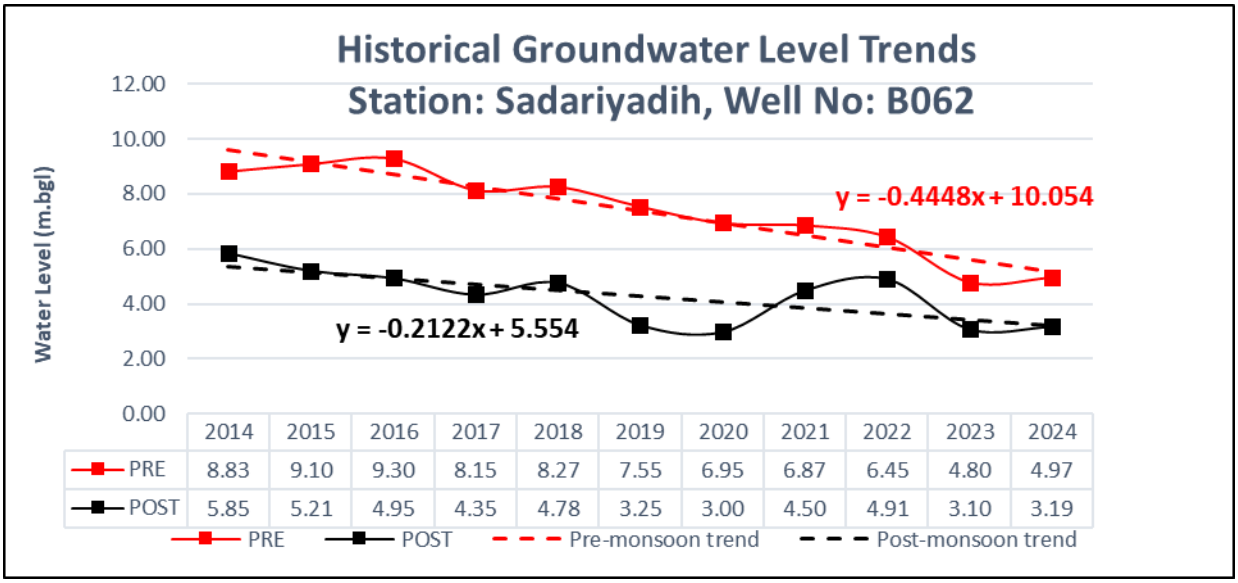

| | 2014 | 2015 | 2016 | 2017 | 2018 | 2019 | 2020 | 2021 | 2022 | 2023 | 2024 |
|---|---|---|---|---|---|---|---|---|---|---|---|
| PRE | 3.39 | 5.58 | | 4.02 | 3.92 | 3.22 | 3.12 | 4.85 | 4.42 | 2.62 | 3.10 |
| POST | 1.25 | 2.82 | 2.07 | 1.92 | 1.42 | 1.42 | 1.40 | 1.87 | 3.54 | 1.13 | 1.21 |

**Annexure – VI**

HYDROGRAPHS OF CLUSTER-II



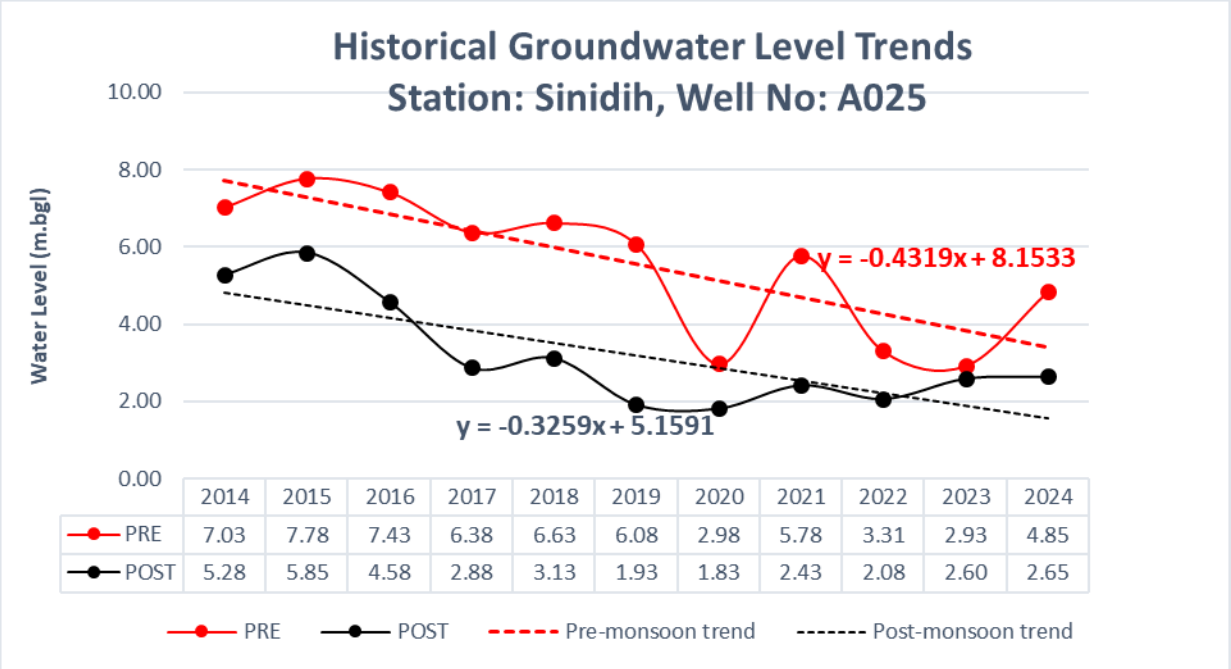

| | 2014 | 2015 | 2016 | 2017 | 2018 | 2019 | 2020 | 2021 | 2022 | 2023 | 2024 |
|---|---|---|---|---|---|---|---|---|---|---|---|
| PRE | 9.82 | 9.21 | 10.33 | 13.23 | 13.68 | 8.13 | 10.33 | 11.26 | 10.53 | 10.73 | 9.10 |
| POST | 4.59 | 5.28 | 5.03 | 3.18 | 4.23 | 3.23 | 3.21 | 2.23 | 5.80 | 5.73 | 5.77 |



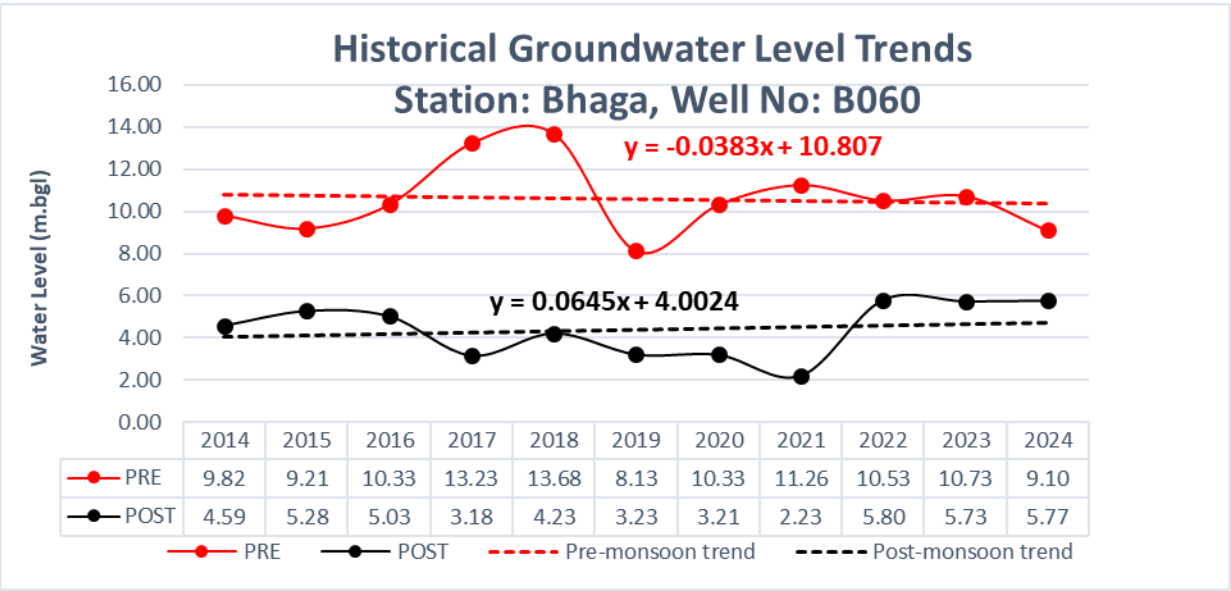

| | 2014 | 2015 | 2016 | 2017 | 2018 | 2019 | 2020 | 2021 | 2022 | 2023 | 2024 |
|---|---|---|---|---|---|---|---|---|---|---|---|
| PRE | 8.83 | 9.10 | 9.30 | 8.15 | 8.27 | 7.55 | 6.95 | 6.87 | 6.45 | 4.80 | 4.97 |
| POST | 5.85 | 5.21 | 4.95 | 4.35 | 4.78 | 3.25 | 3.00 | 4.50 | 4.91 | 3.10 | 3.19 |

**Annexure – VI**

HYDROGRAPHS OF CLUSTER-III



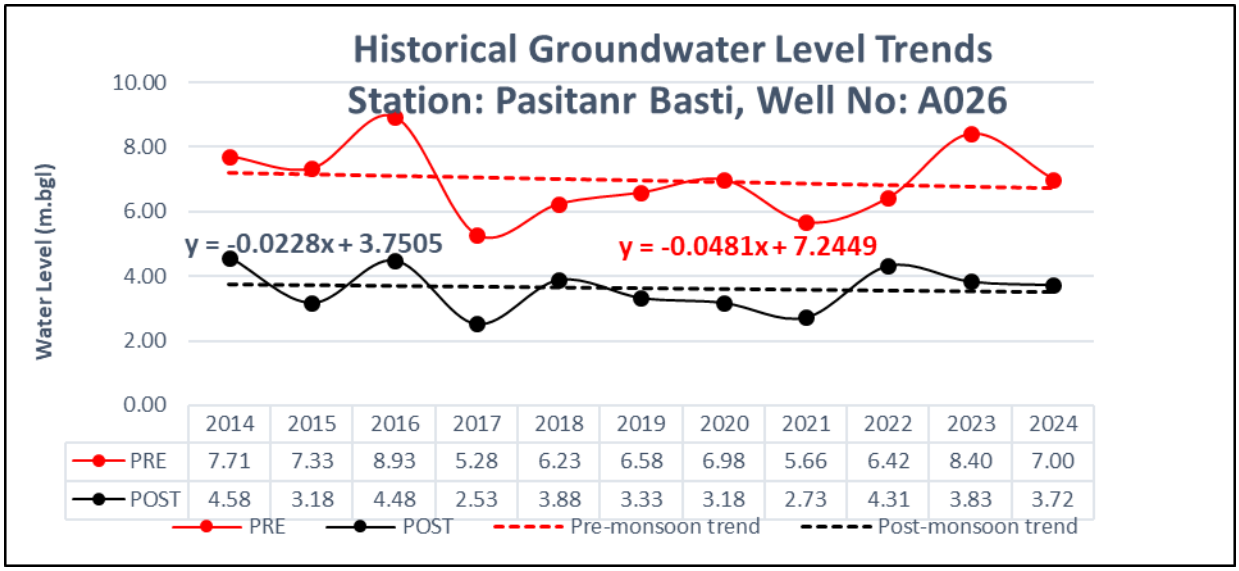

| | 2014 | 2015 | 2016 | 2017 | 2018 | 2019 | 2020 | 2021 | 2022 | 2023 | 2024 |
|---|---|---|---|---|---|---|---|---|---|---|---|
| PRE | 7.03 | 7.78 | 7.43 | 6.38 | 6.63 | 6.08 | 2.98 | 5.78 | 3.31 | 2.93 | 4.85 |
| POST | 5.28 | 5.85 | 4.58 | 2.88 | 3.13 | 1.93 | 1.83 | 2.43 | 2.08 | 2.60 | 2.65 |

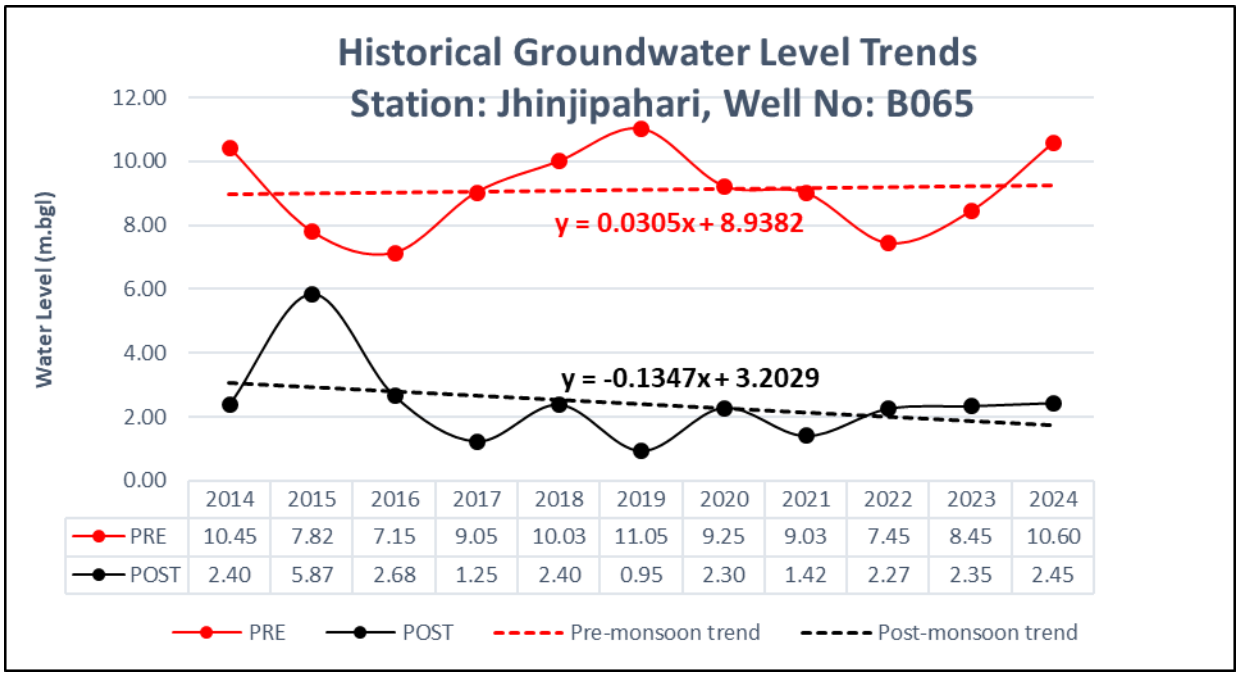



| | 2014 | 2015 | 2016 | 2017 | 2018 | 2019 | 2020 | 2021 | 2022 | 2023 | 2024 |
|---|---|---|---|---|---|---|---|---|---|---|---|
| PRE | 9.82 | 9.21 | 10.33 | 13.23 | 13.68 | 8.13 | 10.33 | 11.26 | 10.53 | 10.73 | 9.10 |
| POST | 4.59 | 5.28 | 5.03 | 3.18 | 4.23 | 3.23 | 3.21 | 2.23 | 5.80 | 5.73 | 5.77 |

**Annexure – VI**

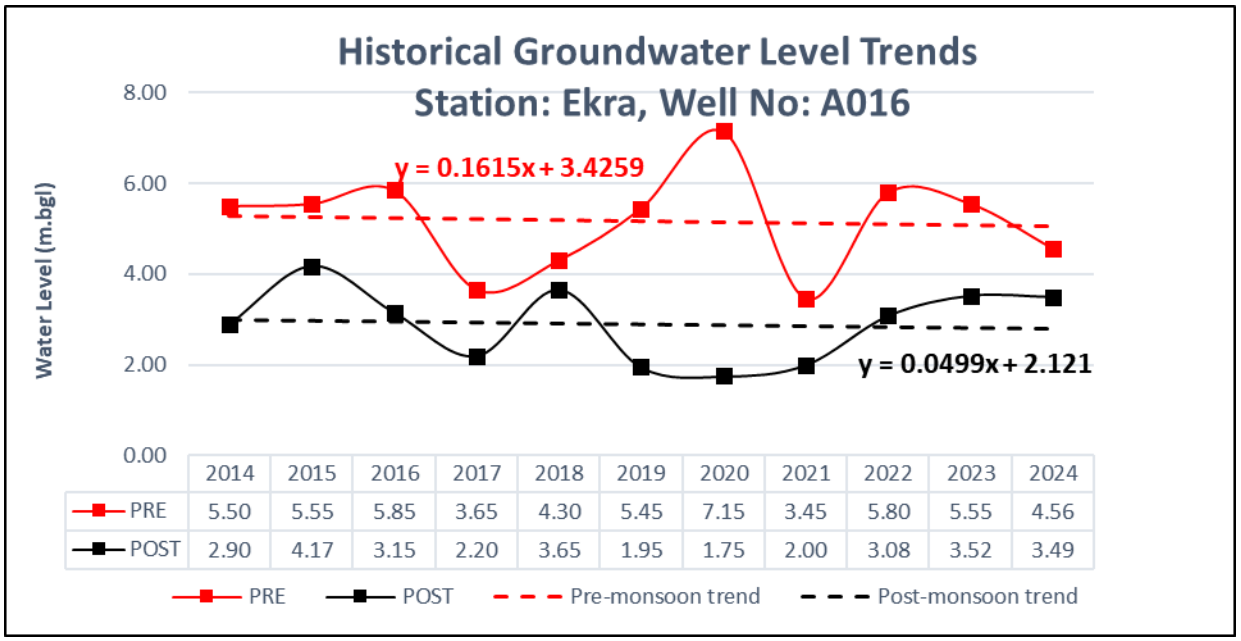
HYDROGRAPHS OF CLUSTER-IV

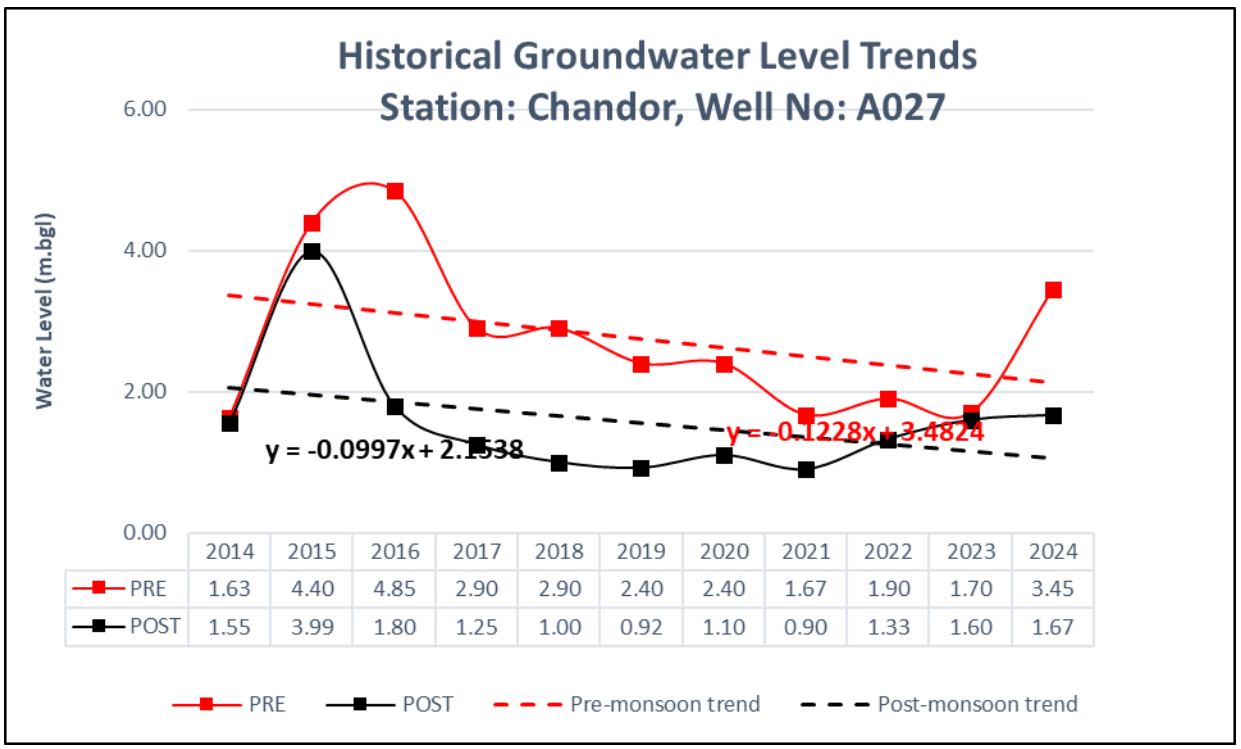


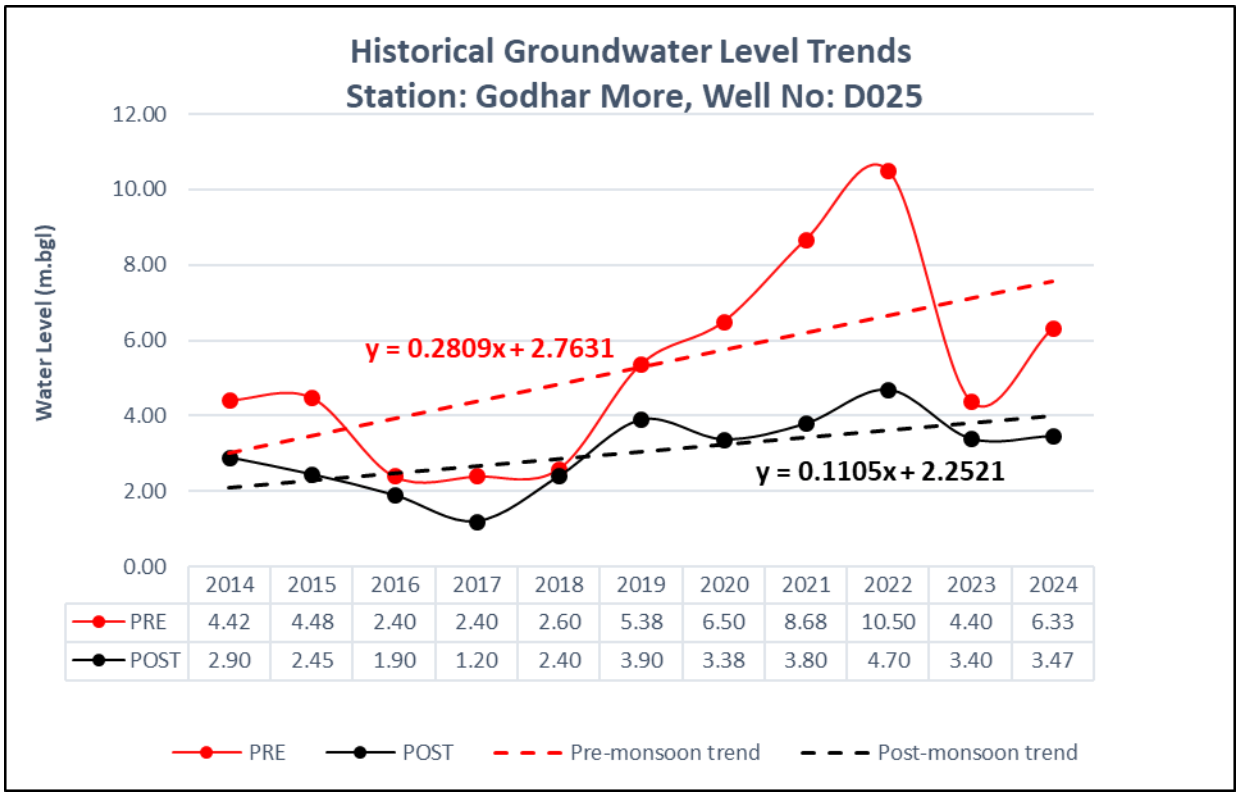
**Annexure – VI**

HYDROGRAPHS OF CLUSTER-V

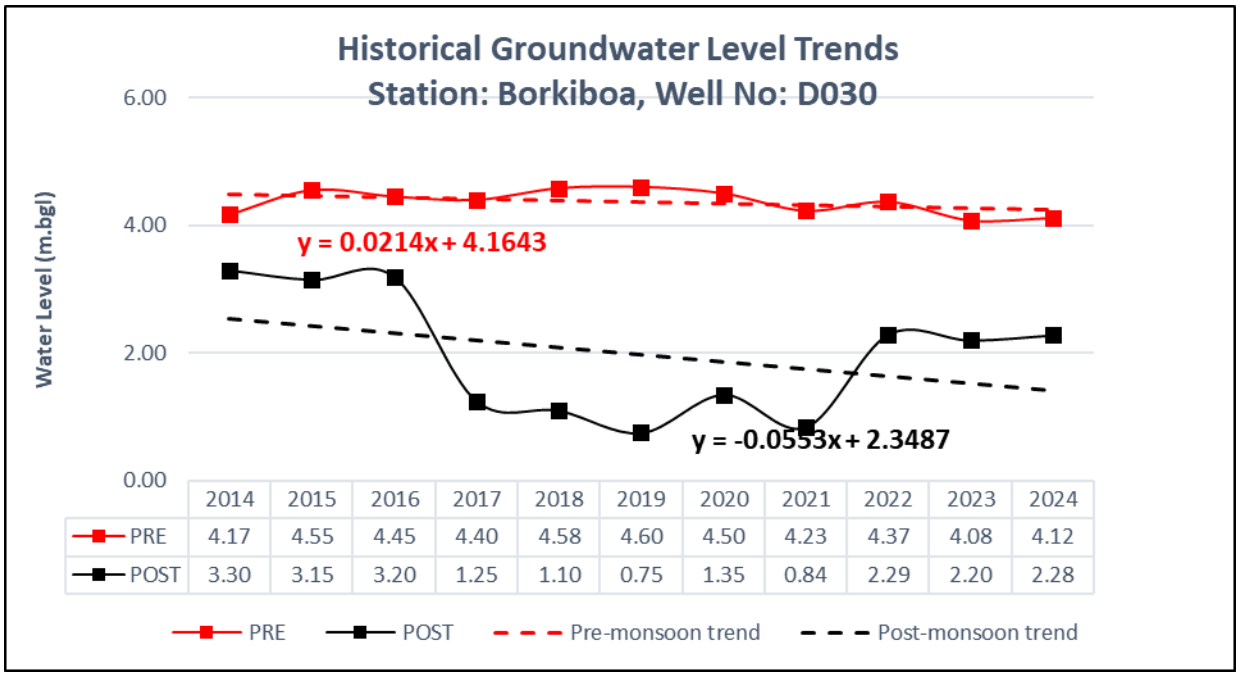


HYDROGRAPHS OF CLUSTER-VI



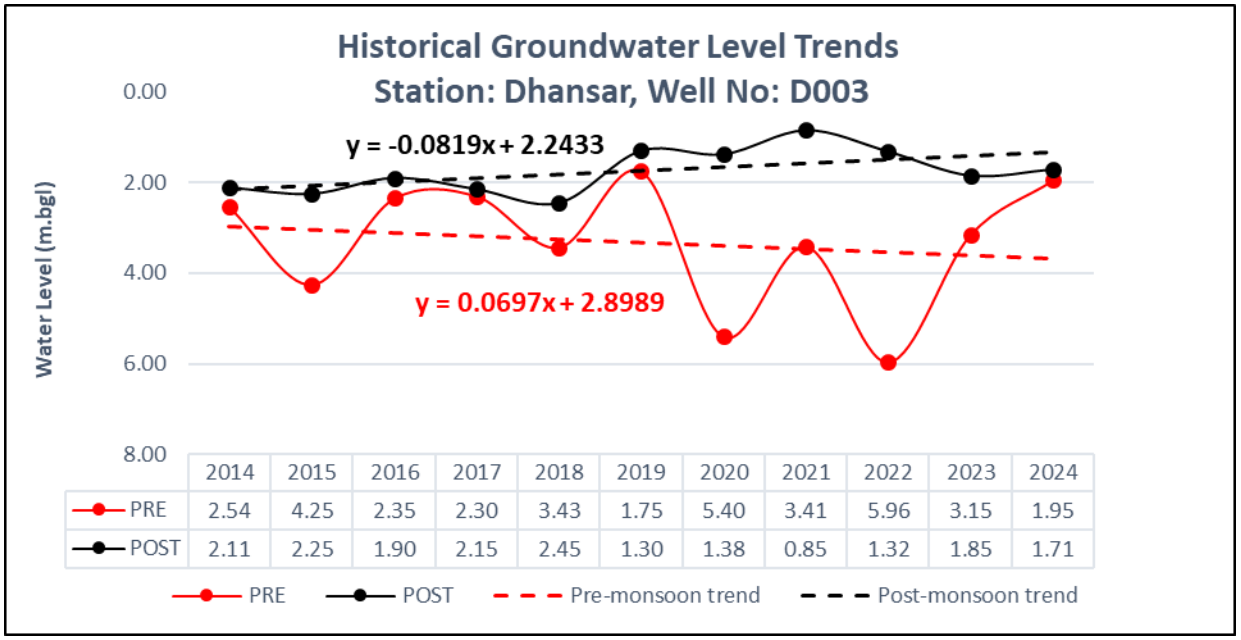

| | 2014 | 2015 | 2016 | 2017 | 2018 | 2019 | 2020 | 2021 | 2022 | 2023 | 2024 |
|---|---|---|---|---|---|---|---|---|---|---|---|
| PRE | 4.42 | 4.48 | 2.40 | 2.40 | 2.60 | 5.38 | 6.50 | 8.68 | 10.50 | 4.40 | 6.33 |
| POST | 2.90 | 2.45 | 1.90 | 1.20 | 2.40 | 3.90 | 3.38 | 3.80 | 4.70 | 3.40 | 3.47 |



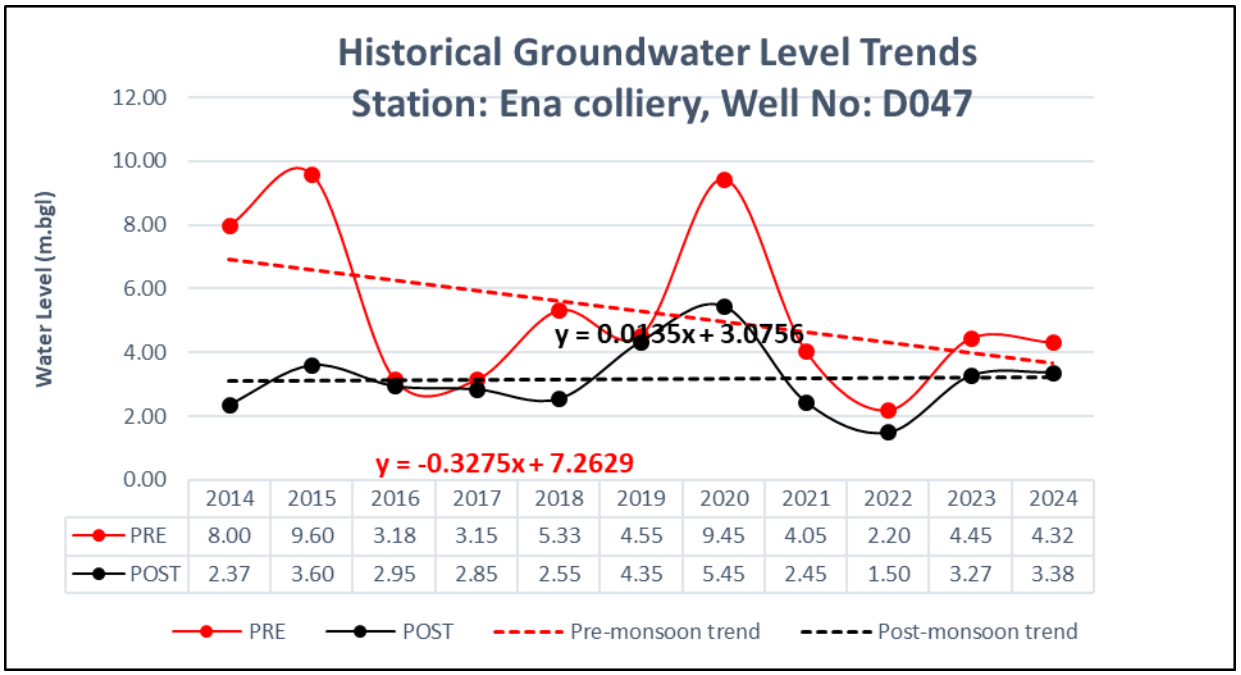

| | 2014 | 2015 | 2016 | 2017 | 2018 | 2019 | 2020 | 2021 | 2022 | 2023 | 2024 |
|---|---|---|---|---|---|---|---|---|---|---|---|
| PRE | 4.17 | 4.55 | 4.45 | 4.40 | 4.58 | 4.60 | 4.50 | 4.23 | 4.37 | 4.08 | 4.12 |
| POST | 3.30 | 3.15 | 3.20 | 1.25 | 1.10 | 0.75 | 1.35 | 0.84 | 2.29 | 2.20 | 2.28 |

**Annexure – VI**

HYDROGRAPHS OF CLUSTER-VII



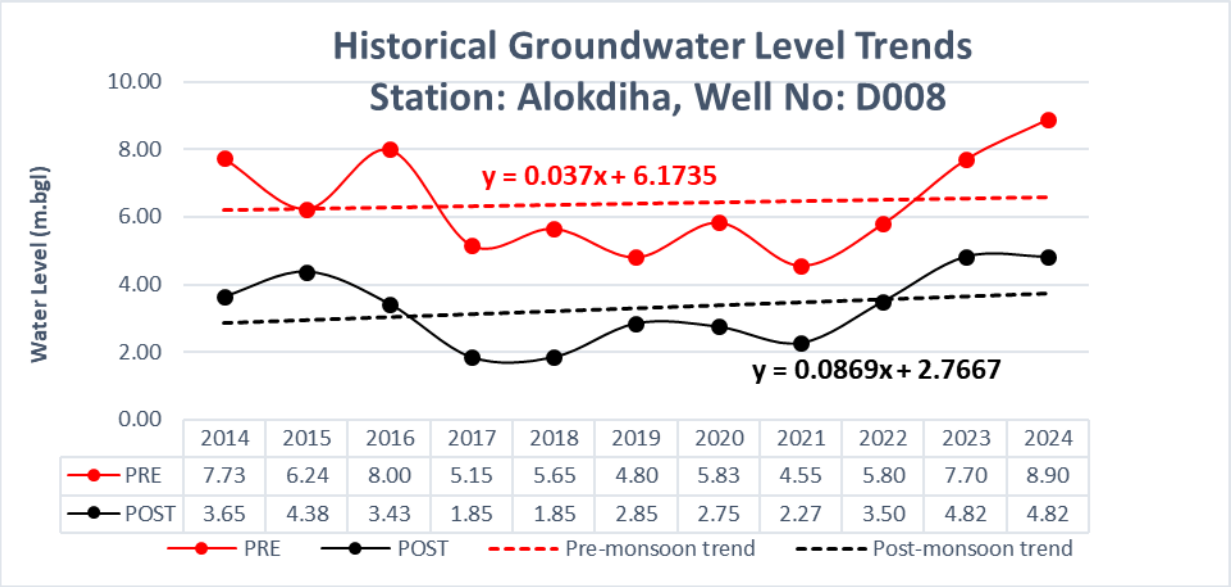

| | 2014 | 2015 | 2016 | 2017 | 2018 | 2019 | 2020 | 2021 | 2022 | 2023 | 2024 |
|---|---|---|---|---|---|---|---|---|---|---|---|
| PRE | 2.54 | 4.25 | 2.35 | 2.30 | 3.43 | 1.75 | 5.40 | 3.41 | 5.96 | 3.15 | 1.95 |
| POST | 2.11 | 2.25 | 1.90 | 2.15 | 2.45 | 1.30 | 1.38 | 0.85 | 1.32 | 1.85 | 1.71 |



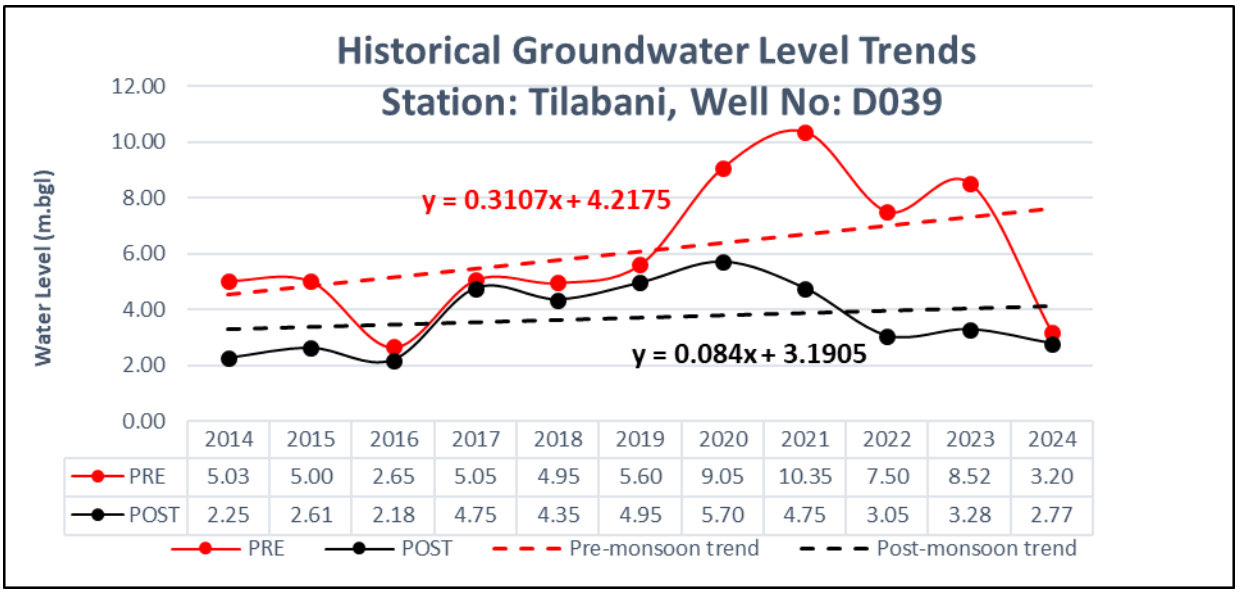

| | 2014 | 2015 | 2016 | 2017 | 2018 | 2019 | 2020 | 2021 | 2022 | 2023 | 2024 |
|---|---|---|---|---|---|---|---|---|---|---|---|
| PRE | 8.00 | 9.60 | 3.18 | 3.15 | 5.33 | 4.55 | 9.45 | 4.05 | 2.20 | 4.45 | 4.32 |
| POST | 2.37 | 3.60 | 2.95 | 2.85 | 2.55 | 4.35 | 5.45 | 2.45 | 1.50 | 3.27 | 3.38 |

**Annexure – VI**

HYDROGRAPHS OF CLUSTER-VIII



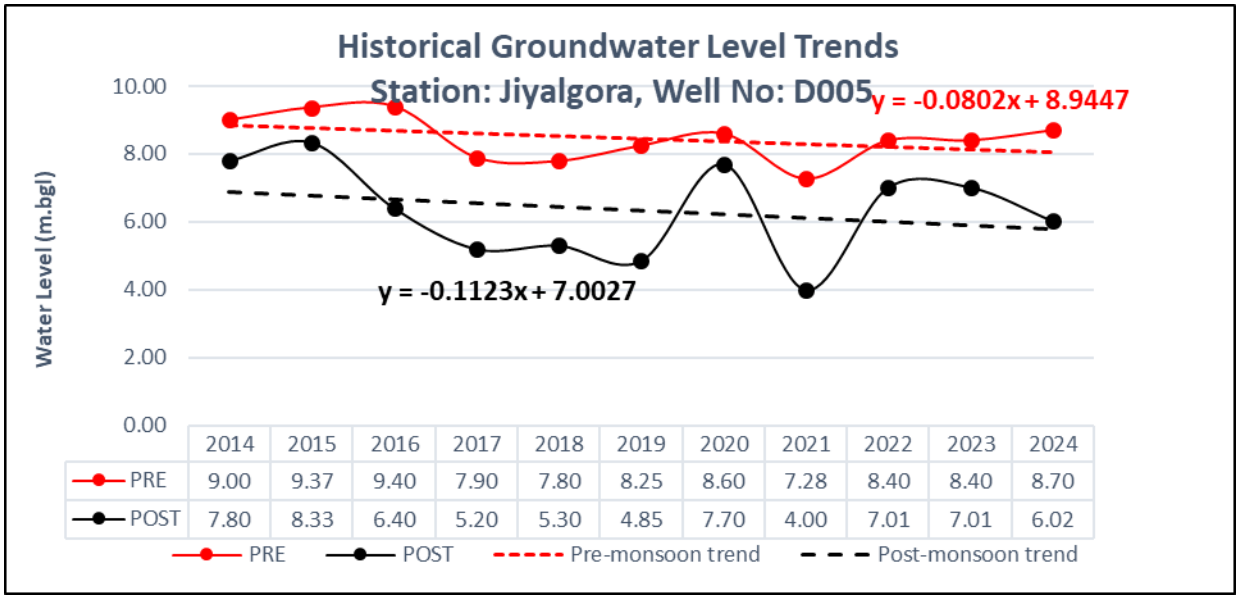

| | 2014 | 2015 | 2016 | 2017 | 2018 | 2019 | 2020 | 2021 | 2022 | 2023 | 2024 |
|---|---|---|---|---|---|---|---|---|---|---|---|
| PRE | 7.73 | 6.24 | 8.00 | 5.15 | 5.65 | 4.80 | 5.83 | 4.55 | 5.80 | 7.70 | 8.90 |
| POST | 3.65 | 4.38 | 3.43 | 1.85 | 1.85 | 2.85 | 2.75 | 2.27 | 3.50 | 4.82 | 4.82 |



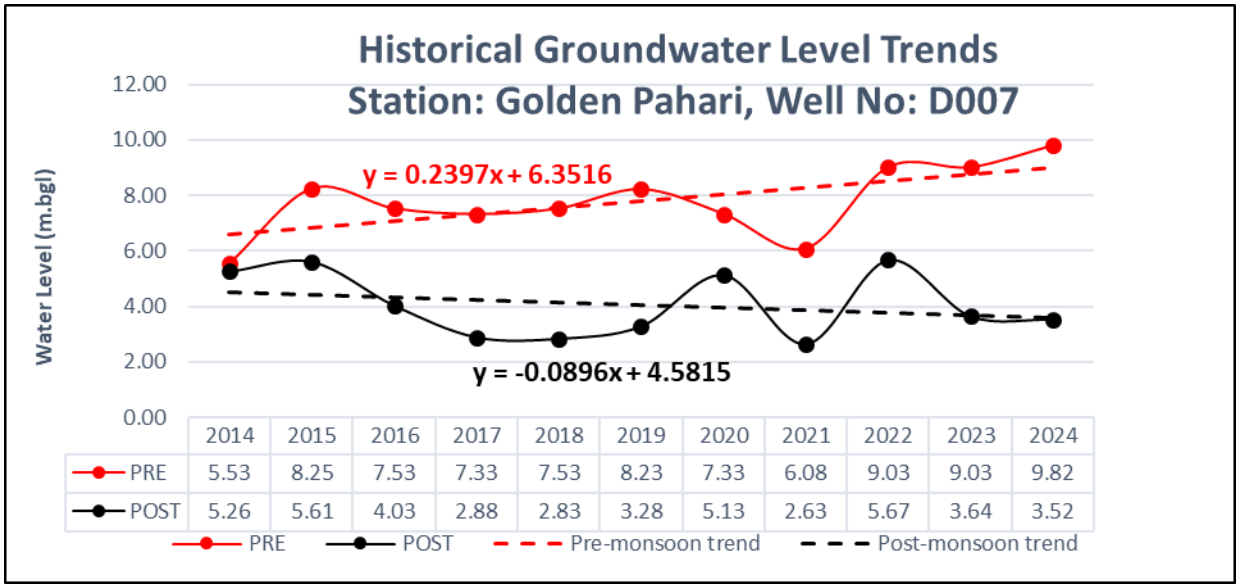

| | 2014 | 2015 | 2016 | 2017 | 2018 | 2019 | 2020 | 2021 | 2022 | 2023 | 2024 |
|---|---|---|---|---|---|---|---|---|---|---|---|
| PRE | 5.03 | 5.00 | 2.65 | 5.05 | 4.95 | 5.60 | 9.05 | 10.35 | 7.50 | 8.52 | 3.20 |
| POST | 2.25 | 2.61 | 2.18 | 4.75 | 4.35 | 4.95 | 5.70 | 4.75 | 3.05 | 3.28 | 2.77 |

**Annexure – VI**

HYDROGRAPHS OF CLUSTER-IX



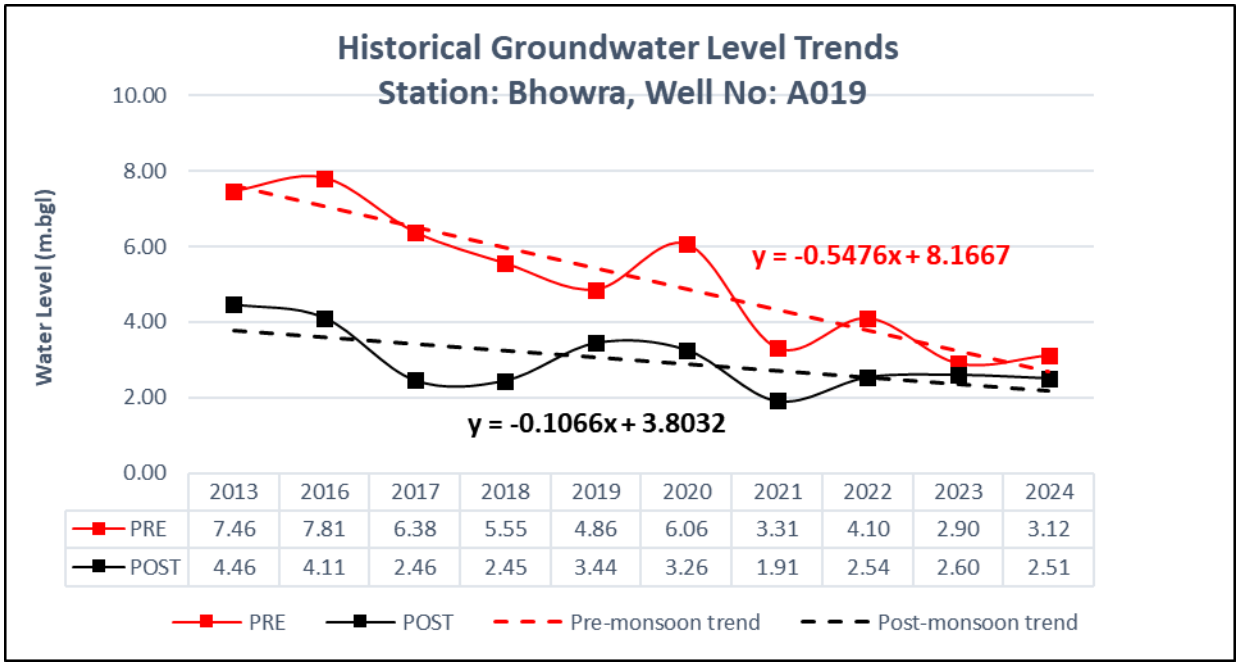

| | 2014 | 2015 | 2016 | 2017 | 2018 | 2019 | 2020 | 2021 | 2022 | 2023 | 2024 |
|---|---|---|---|---|---|---|---|---|---|---|---|
| PRE | 9.00 | 9.37 | 9.40 | 7.90 | 7.80 | 8.25 | 8.60 | 7.28 | 8.40 | 8.40 | 8.70 |
| POST | 7.80 | 8.33 | 6.40 | 5.20 | 5.30 | 4.85 | 7.70 | 4.00 | 7.01 | 7.01 | 6.02 |



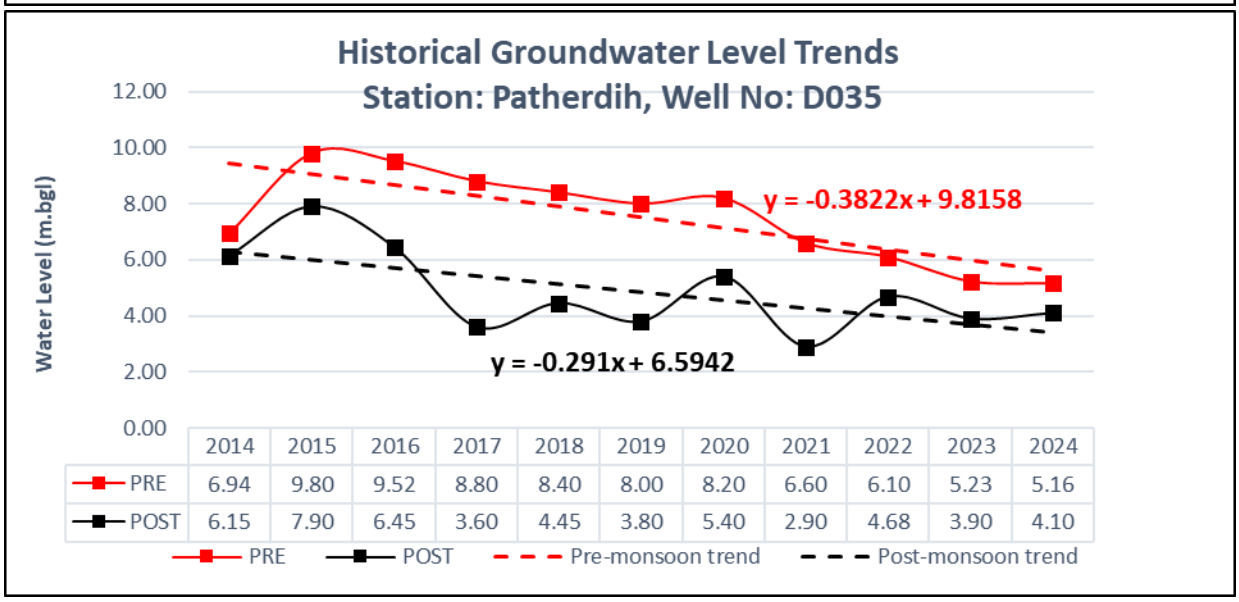

| | 2014 | 2015 | 2016 | 2017 | 2018 | 2019 | 2020 | 2021 | 2022 | 2023 | 2024 |
|---|---|---|---|---|---|---|---|---|---|---|---|
| PRE | 5.53 | 8.25 | 7.53 | 7.33 | 7.53 | 8.23 | 7.33 | 6.08 | 9.03 | 9.03 | 9.82 |
| POST | 5.26 | 5.61 | 4.03 | 2.88 | 2.83 | 3.28 | 5.13 | 2.63 | 5.67 | 3.64 | 3.52 |

**Annexure – VI**

HYDROGRAPHS OF CLUSTER-X



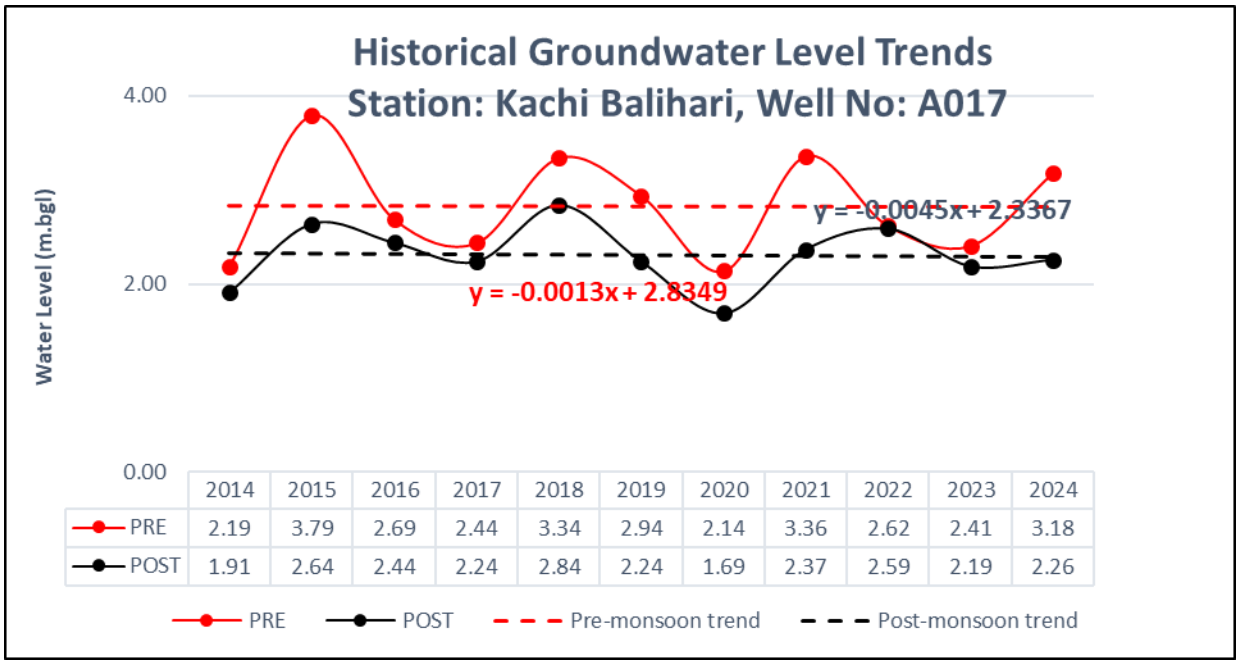

| | 2013 | 2016 | 2017 | 2018 | 2019 | 2020 | 2021 | 2022 | 2023 | 2024 |
|---|---|---|---|---|---|---|---|---|---|---|
| PRE | 7.46 | 7.81 | 6.38 | 5.55 | 4.86 | 6.06 | 3.31 | 4.10 | 2.90 | 3.12 |
| POST | 4.46 | 4.11 | 2.46 | 2.45 | 3.44 | 3.26 | 1.91 | 2.54 | 2.60 | 2.51 |



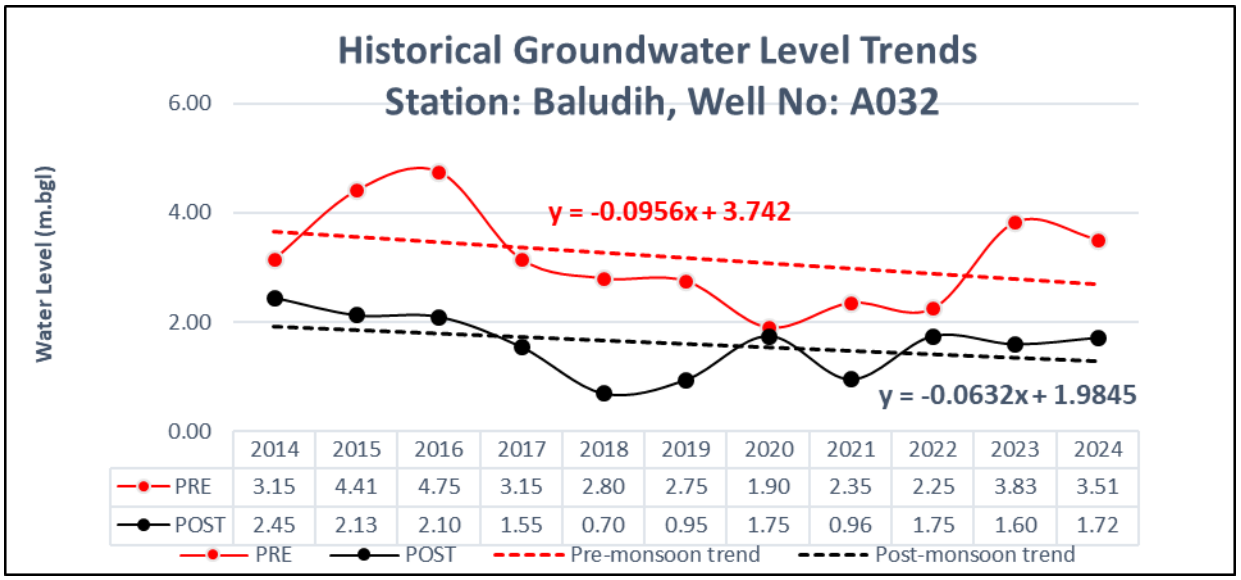

| | 2014 | 2015 | 2016 | 2017 | 2018 | 2019 | 2020 | 2021 | 2022 | 2023 | 2024 |
|---|---|---|---|---|---|---|---|---|---|---|---|
| PRE | 6.94 | 9.80 | 9.52 | 8.80 | 8.40 | 8.00 | 8.20 | 6.60 | 6.10 | 5.23 | 5.16 |
| POST | 6.15 | 7.90 | 6.45 | 3.60 | 4.45 | 3.80 | 5.40 | 2.90 | 4.68 | 3.90 | 4.10 |

**Annexure – VI**

HYDROGRAPHS OF CLUSTER-XI



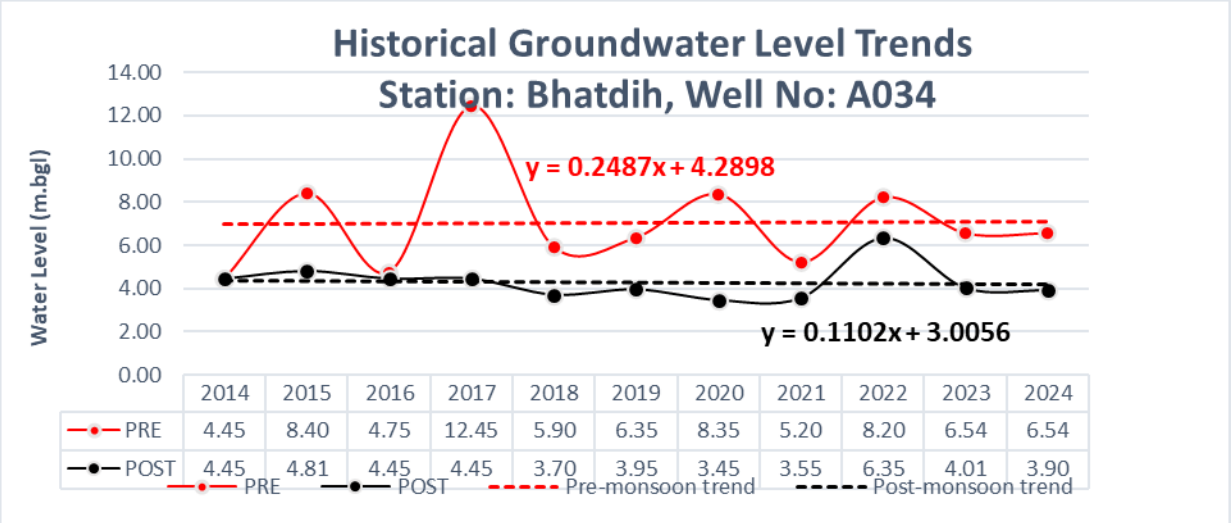

| | 2014 | 2015 | 2016 | 2017 | 2018 | 2019 | 2020 | 2021 | 2022 | 2023 | 2024 |
|---|---|---|---|---|---|---|---|---|---|---|---|
| PRE | 2.19 | 3.79 | 2.69 | 2.44 | 3.34 | 2.94 | 2.14 | 3.36 | 2.62 | 2.41 | 3.18 |
| POST | 1.91 | 2.64 | 2.44 | 2.24 | 2.84 | 2.24 | 1.69 | 2.37 | 2.59 | 2.19 | 2.26 |

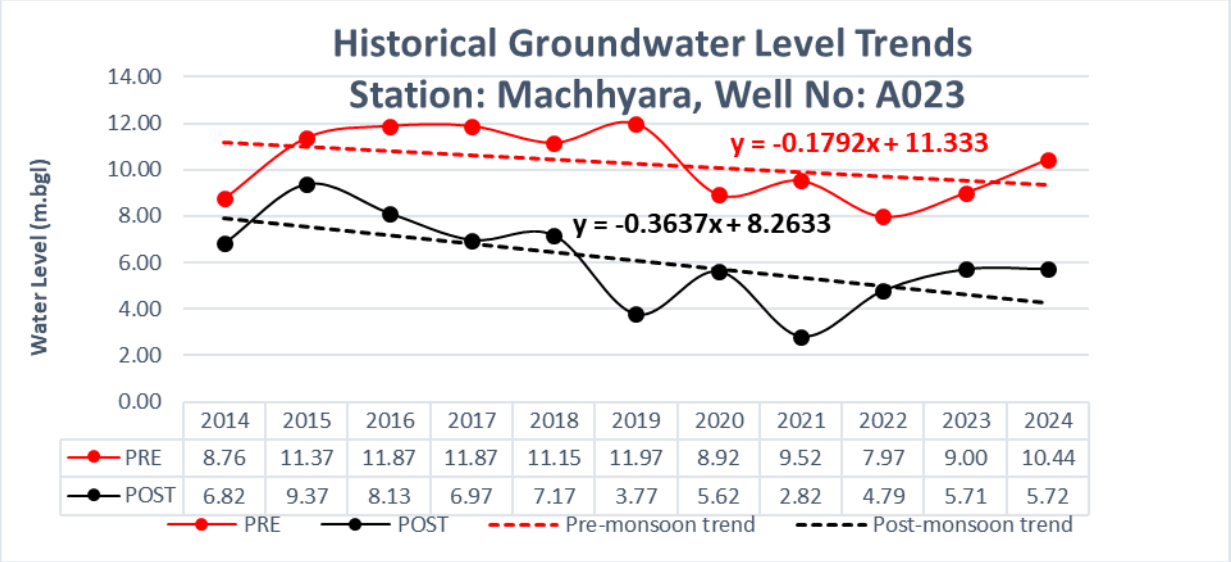



| | 2014 | 2015 | 2016 | 2017 | 2018 | 2019 | 2020 | 2021 | 2022 | 2023 | 2024 |
|---|---|---|---|---|---|---|---|---|---|---|---|
| PRE | 3.15 | 4.41 | 4.75 | 3.15 | 2.80 | 2.75 | 1.90 | 2.35 | 2.25 | 3.83 | 3.51 |
| POST | 2.45 | 2.13 | 2.10 | 1.55 | 0.70 | 0.95 | 1.75 | 0.96 | 1.75 | 1.60 | 1.72 |

**Annexure – VI**

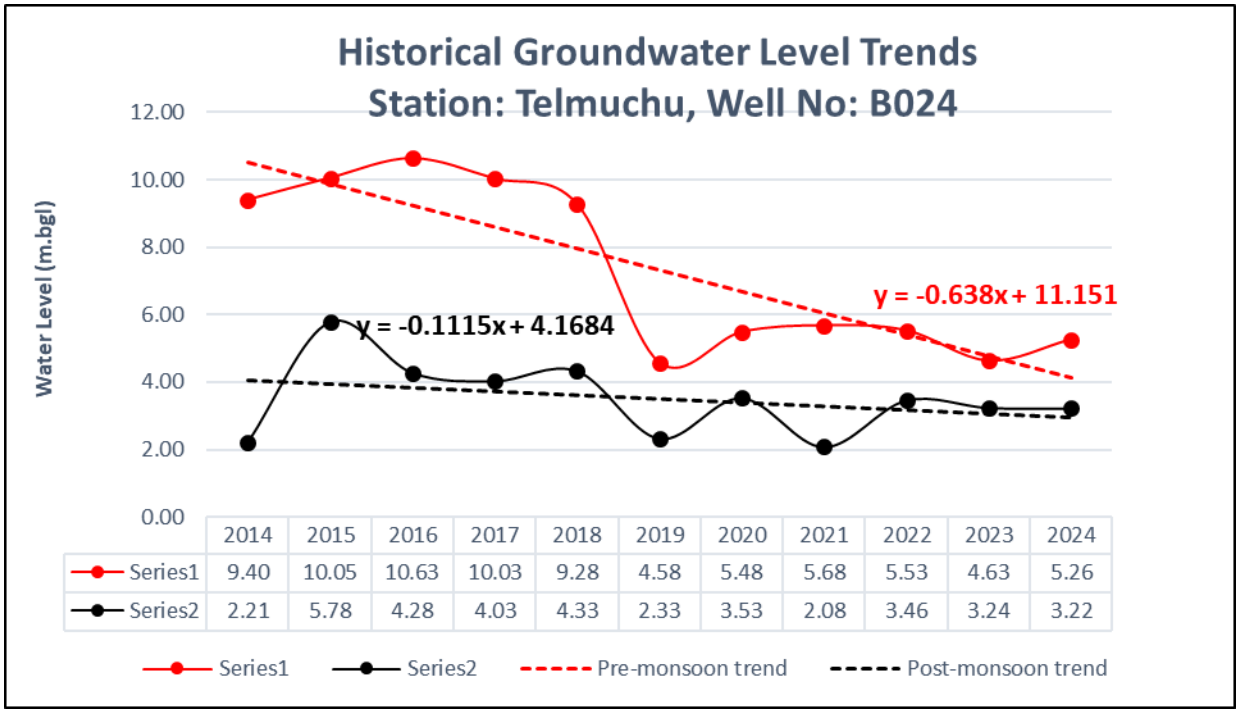
HYDROGRAPHS OF CLUSTER-XIII

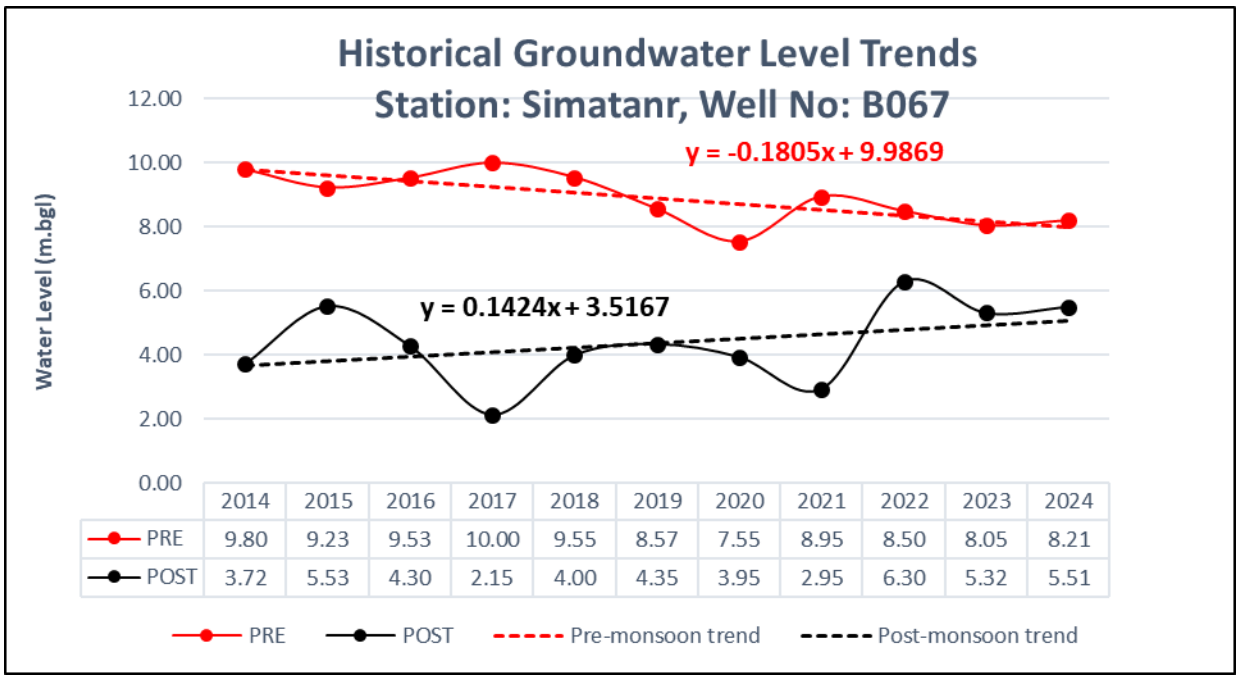


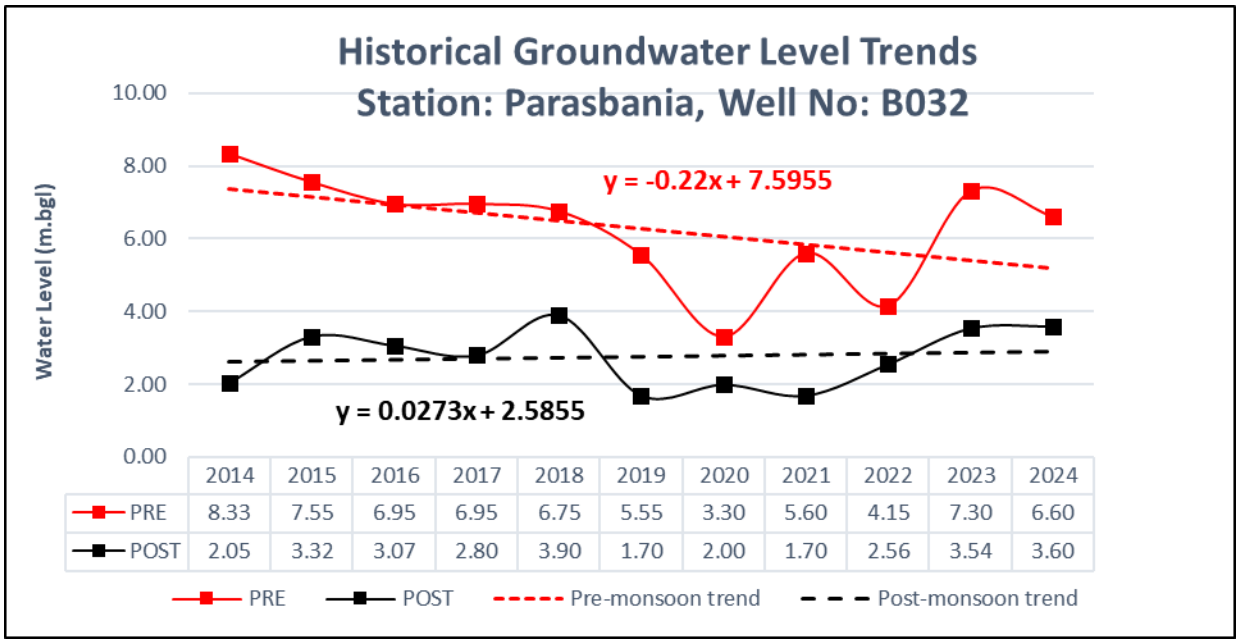
**Annexure – VI**

HYDROGRAPHS OF CLUSTER-XIV

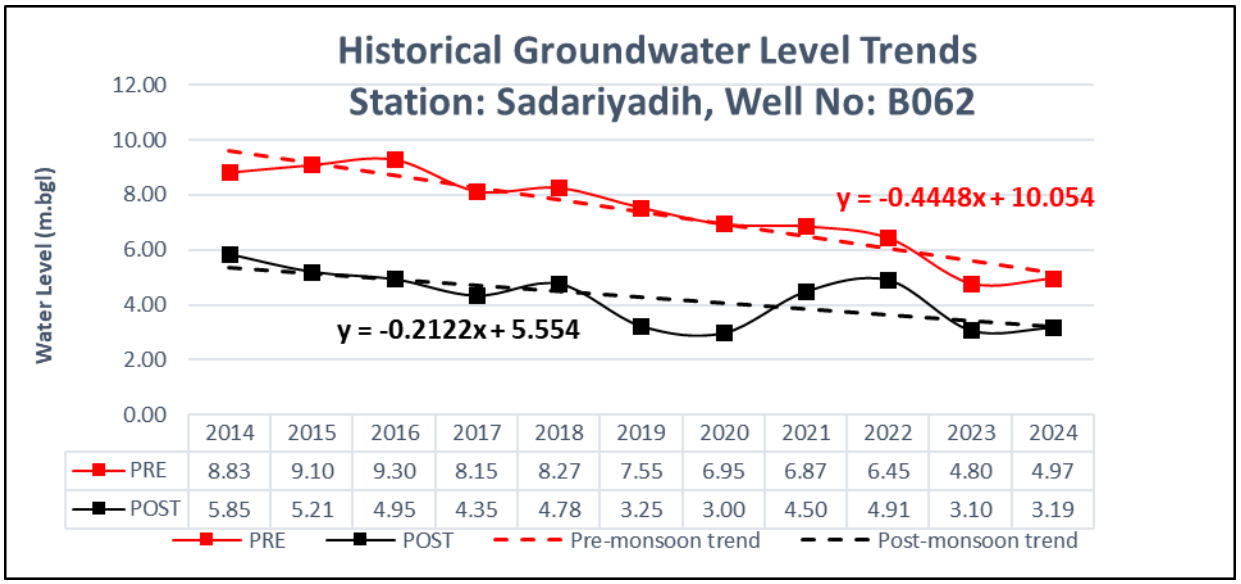


HYDROGRAPHS OF CLUSTER-XV



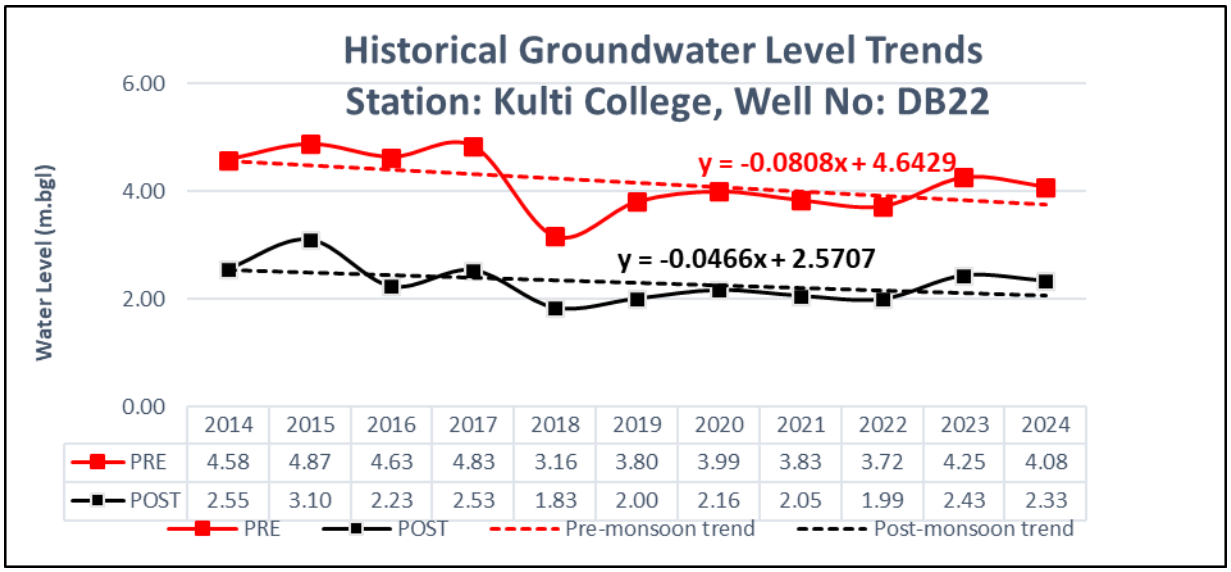

| | 2014 | 2015 | 2016 | 2017 | 2018 | 2019 | 2020 | 2021 | 2022 | 2023 | 2024 |
|---|---|---|---|---|---|---|---|---|---|---|---|
| PRE | 8.33 | 7.55 | 6.95 | 6.95 | 6.75 | 5.55 | 3.30 | 5.60 | 4.15 | 7.30 | 6.60 |
| POST | 2.05 | 3.32 | 3.07 | 2.80 | 3.90 | 1.70 | 2.00 | 1.70 | 2.56 | 3.54 | 3.60 |



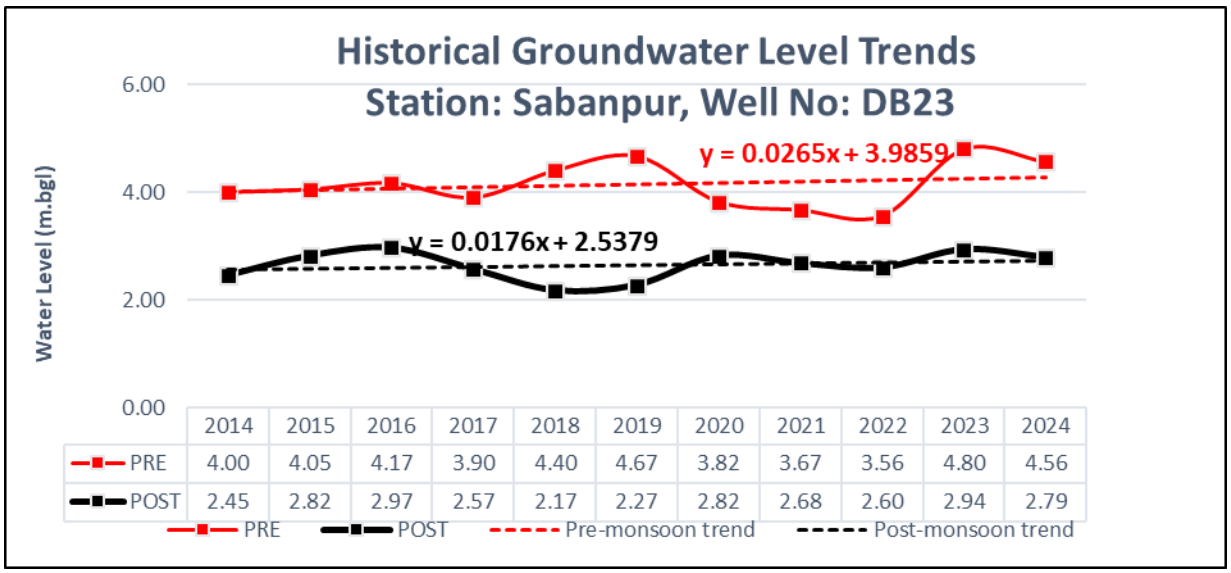

| | 2014 | 2015 | 2016 | 2017 | 2018 | 2019 | 2020 | 2021 | 2022 | 2023 | 2024 |
|---|---|---|---|---|---|---|---|---|---|---|---|
| PRE | 8.83 | 9.10 | 9.30 | 8.15 | 8.27 | 7.55 | 6.95 | 6.87 | 6.45 | 4.80 | 4.97 |
| POST | 5.85 | 5.21 | 4.95 | 4.35 | 4.78 | 3.25 | 3.00 | 4.50 | 4.91 | 3.10 | 3.19 |

**Annexure – VI**

HYDROGRAPHS OF CLUSTER-XVI

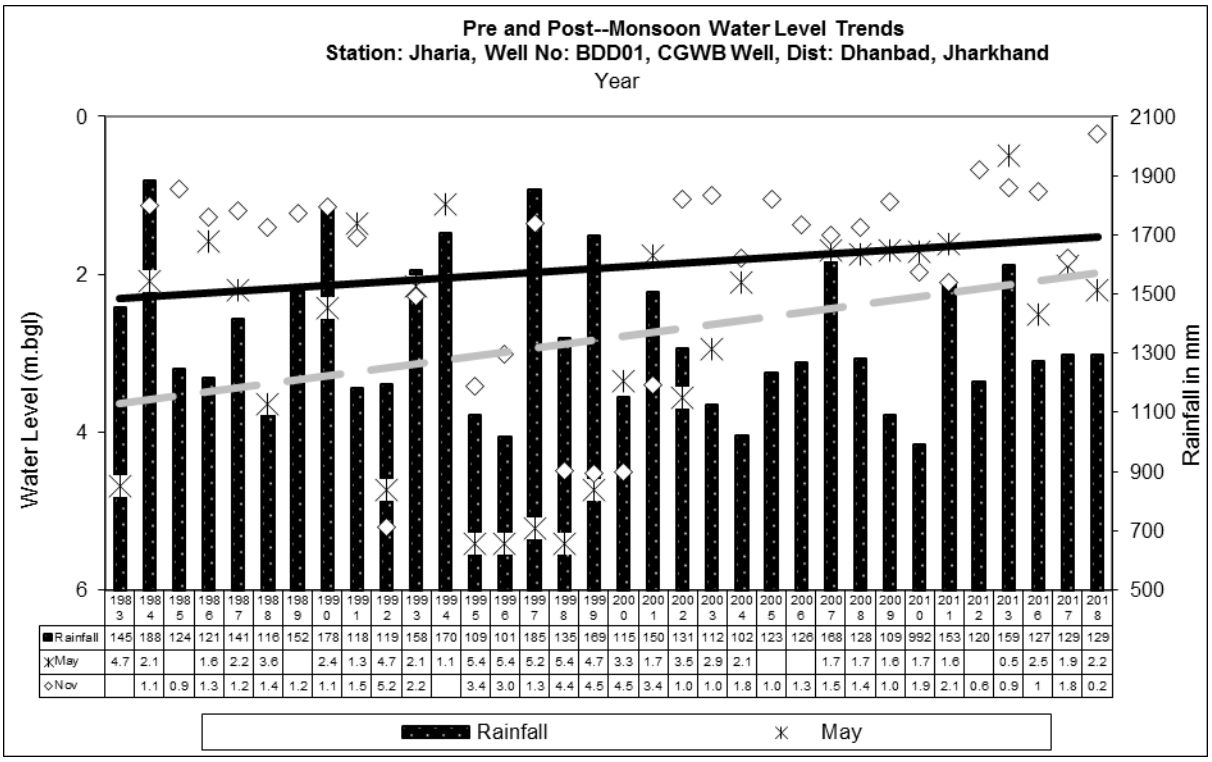



| | 2014 | 2015 | 2016 | 2017 | 2018 | 2019 | 2020 | 2021 | 2022 | 2023 | 2024 |
|---|---|---|---|---|---|---|---|---|---|---|---|
| PRE | 4.58 | 4.87 | 4.63 | 4.83 | 3.16 | 3.80 | 3.99 | 3.83 | 3.72 | 4.25 | 4.08 |
| POST | 2.55 | 3.10 | 2.23 | 2.53 | 1.83 | 2.00 | 2.16 | 2.05 | 1.99 | 2.43 | 2.33 |

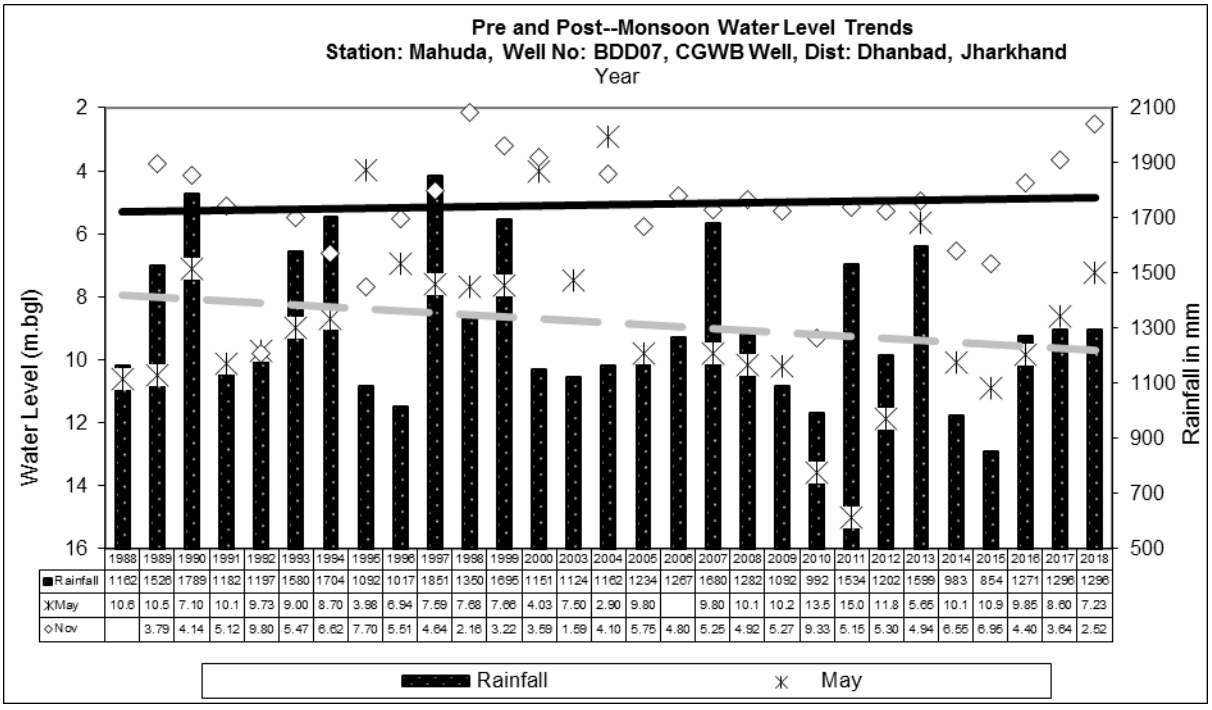



| | 2014 | 2015 | 2016 | 2017 | 2018 | 2019 | 2020 | 2021 | 2022 | 2023 | 2024 |
|---|---|---|---|---|---|---|---|---|---|---|---|
| PRE | 4.00 | 4.05 | 4.17 | 3.90 | 4.40 | 4.67 | 3.82 | 3.67 | 3.56 | 4.80 | 4.56 |
| POST | 2.45 | 2.82 | 2.97 | 2.57 | 2.17 | 2.27 | 2.82 | 2.68 | 2.60 | 2.94 | 2.79 |

## HYDROGRAPHS OF CGWB PERMANENT OBSERVATION STATIONS

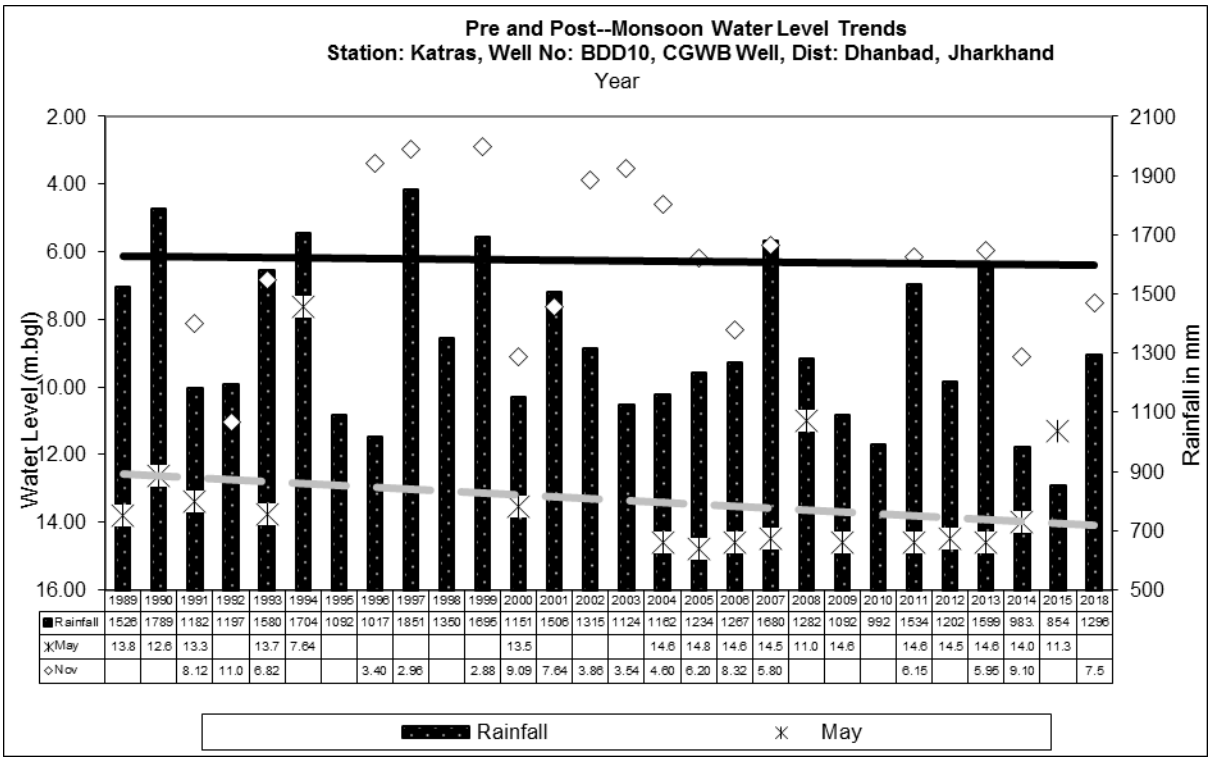



| | 1983 | 1984 | 1985 | 1986 | 1987 | 1988 | 1989 | 1990 | 1991 | 1992 | 1993 | 1994 | 1995 | 1996 | 1997 | 1998 | 1999 | 2000 | 2001 | 2002 | 2003 | 2004 | 2005 | 2006 | 2007 | 2008 | 2009 | 2010 | 2011 | 2012 | 2013 | 2014 | 2015 | 2016 | 2017 | 2018 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Rainfall | 145 | 188 | 124 | 121 | 141 | 116 | 152 | 178 | 118 | 119 | 158 | 170 | 109 | 101 | 185 | 135 | 169 | 115 | 150 | 131 | 112 | 102 | 123 | 126 | 168 | 128 | 109 | 992 | 153 | 120 | 159 | 127 | 129 | 129 | | |
| May | 4.7 | 2.1 | | 1.6 | 2.2 | 3.6 | | 2.4 | 1.3 | 4.7 | 2.1 | 1.1 | 5.4 | 5.4 | 5.2 | 5.4 | 4.7 | 3.3 | 1.7 | 3.5 | 2.9 | 2.1 | | | 1.7 | 1.7 | 1.6 | 1.7 | 1.6 | | 0.5 | 2.5 | 1.9 | 2.2 | | |
| Nov | | 1.1 | 0.9 | 1.3 | 1.2 | 1.4 | 1.2 | 1.1 | 1.5 | 5.2 | 2.2 | | 3.4 | 3.0 | 1.3 | 4.4 | 4.5 | 4.5 | 3.4 | 1.0 | 1.0 | 1.8 | 1.0 | 1.3 | 1.5 | 1.4 | 1.0 | 1.9 | 2.1 | 0.6 | 0.9 | 1 | 1.8 | 0.2 | | |

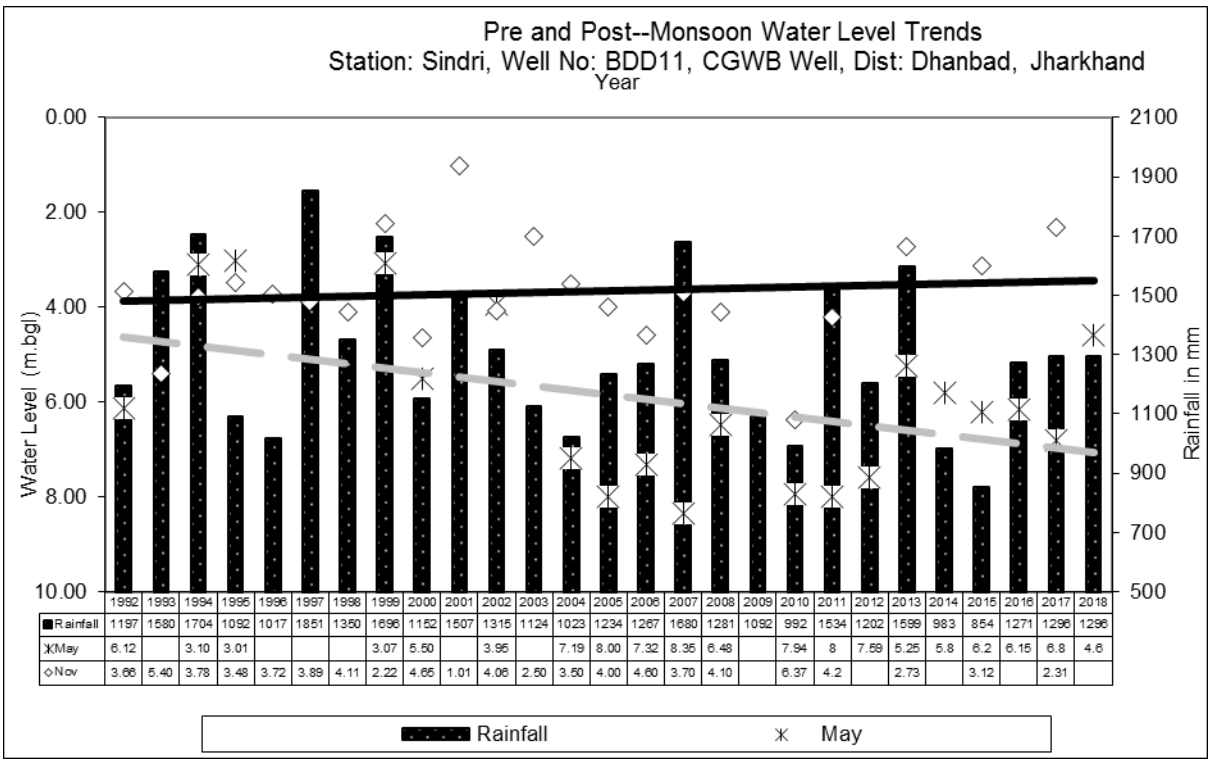



| | 1988 | 1989 | 1990 | 1991 | 1992 | 1993 | 1994 | 1996 | 1996 | 1997 | 1998 | 1999 | 2000 | 2003 | 2004 | 2005 | 2006 | 2007 | 2008 | 2009 | 2010 | 2011 | 2012 | 2013 | 2014 | 2015 | 2016 | 2017 | 2018 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Rainfall | 1162 | 1526 | 1789 | 1182 | 1197 | 1580 | 1704 | 1092 | 1017 | 1851 | 1350 | 1695 | 1151 | 1124 | 1162 | 1234 | 1267 | 1680 | 1282 | 1092 | 992 | 1534 | 1202 | 1599 | 983 | 854 | 1271 | 1296 | 1296 |
| May | 10.6 | 10.5 | 7.10 | 10.1 | 9.73 | 9.00 | 8.70 | 3.98 | 6.94 | 7.59 | 7.68 | 7.66 | 4.03 | 7.50 | 2.90 | 9.80 | | 9.80 | 10.1 | 10.2 | 13.5 | 15.0 | 11.8 | 5.65 | 10.1 | 10.9 | 9.85 | 8.60 | 7.23 |
| Nov | | 3.79 | 4.14 | 5.12 | 9.80 | 5.47 | 6.62 | 7.70 | 5.51 | 4.64 | 2.16 | 3.22 | 3.59 | 1.59 | 4.10 | 5.75 | 4.80 | 5.25 | 4.92 | 5.27 | 9.33 | 5.15 | 5.30 | 4.94 | 6.55 | 6.95 | 4.40 | 3.64 | 2.52 |

## HYDROGRAPHS OF CGWB PERMANENT OBSERVATION STATIONS

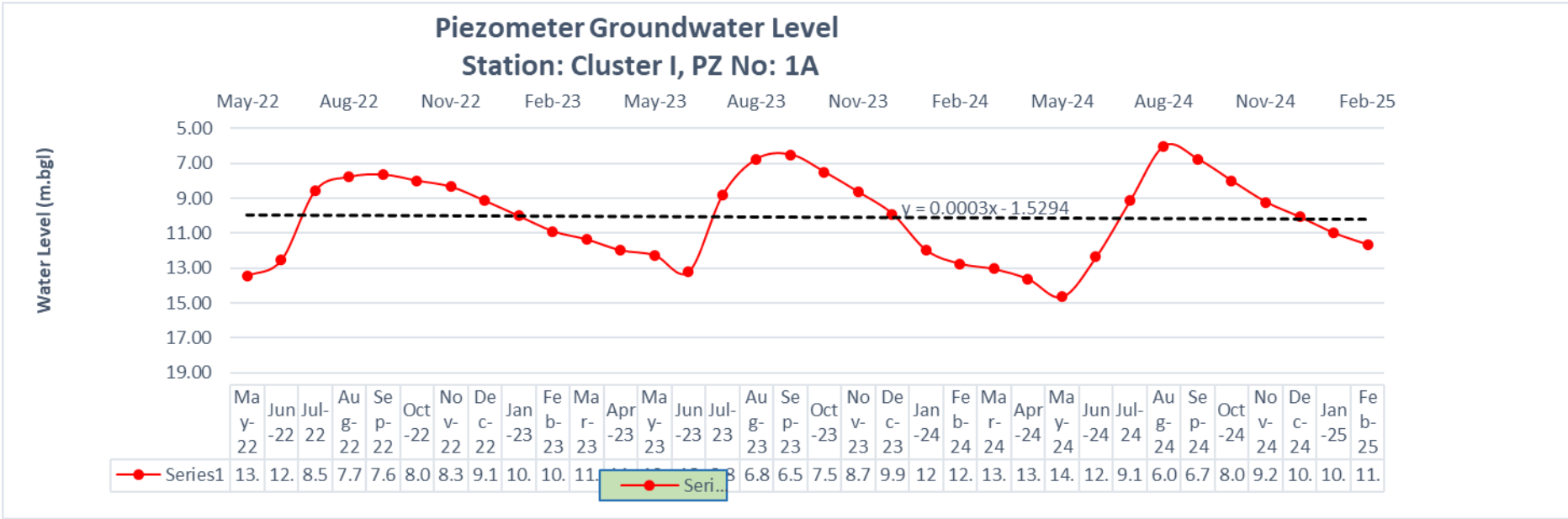



| | 1989 | 1990 | 1991 | 1992 | 1993 | 1994 | 1995 | 1996 | 1997 | 1998 | 1999 | 2000 | 2001 | 2002 | 2003 | 2004 | 2005 | 2006 | 2007 | 2008 | 2009 | 2010 | 2011 | 2012 | 2013 | 2014 | 2015 | 2018 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Rainfall | 1526 | 1789 | 1182 | 1197 | 1580 | 1704 | 1092 | 1017 | 1851 | 1350 | 1695 | 1151 | 1506 | 1315 | 1124 | 1162 | 1234 | 1267 | 1680 | 1282 | 1092 | 992 | 1534 | 1202 | 1599 | 983. | 854 | 1296 |
| May | 13.8 | 12.6 | 13.3 | | 13.7 | 7.64 | | | | | | 13.5 | | | | 14.6 | 14.8 | 14.6 | 14.5 | 11.0 | 14.6 | | 14.6 | 14.5 | 14.6 | 14.0 | 11.3 | |
| Nov | | | 8.12 | 11.0 | 6.82 | | | 3.40 | 2.96 | | 2.88 | 9.09 | 7.64 | 3.86 | 3.54 | 4.60 | 6.20 | 8.32 | 5.80 | | | | 6.15 | | 5.95 | 9.10 | | 7.5 |



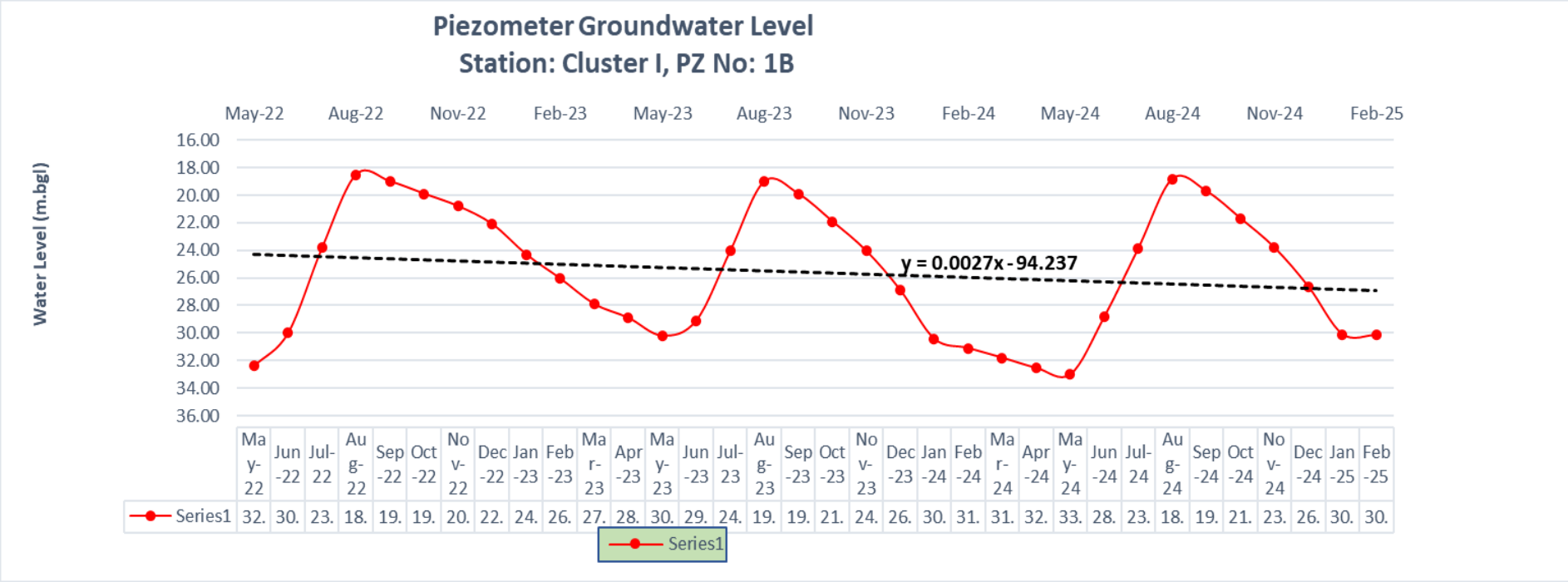

| | 1992 | 1993 | 1994 | 1995 | 1996 | 1997 | 1998 | 1999 | 2000 | 2001 | 2002 | 2003 | 2004 | 2005 | 2006 | 2007 | 2008 | 2009 | 2010 | 2011 | 2012 | 2013 | 2014 | 2015 | 2016 | 2017 | 2018 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Rainfall | 1197 | 1580 | 1704 | 1092 | 1017 | 1851 | 1350 | 1696 | 1152 | 1507 | 1315 | 1124 | 1023 | 1234 | 1267 | 1680 | 1281 | 1092 | 992 | 1534 | 1202 | 1599 | 983 | 854 | 1271 | 1296 | 1296 |
| May | 6.12 | | 3.10 | 3.01 | | | | 3.07 | 5.50 | | 3.95 | | 7.19 | 8.00 | 7.32 | 8.35 | 6.48 | | 7.94 | 8 | 7.59 | 5.25 | 5.8 | 6.2 | 6.15 | 6.8 | 4.6 |
| Nov | 3.66 | 5.40 | 3.78 | 3.48 | 3.72 | 3.89 | 4.11 | 2.22 | 4.65 | 1.01 | 4.06 | 2.50 | 3.50 | 4.00 | 4.60 | 3.70 | 4.10 | | 6.37 | 4.2 | | 2.73 | | 3.12 | | 2.31 | |

## PIEZOMETER HYDROGRAPHS

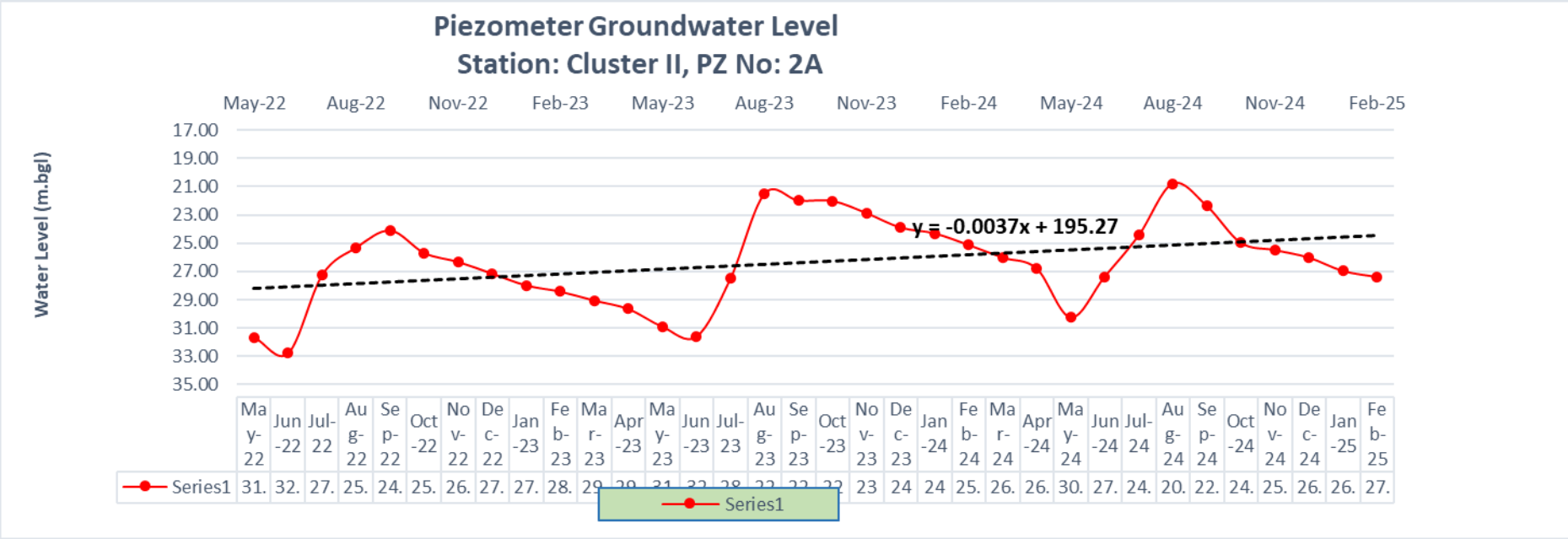


**Annexure – VIA**

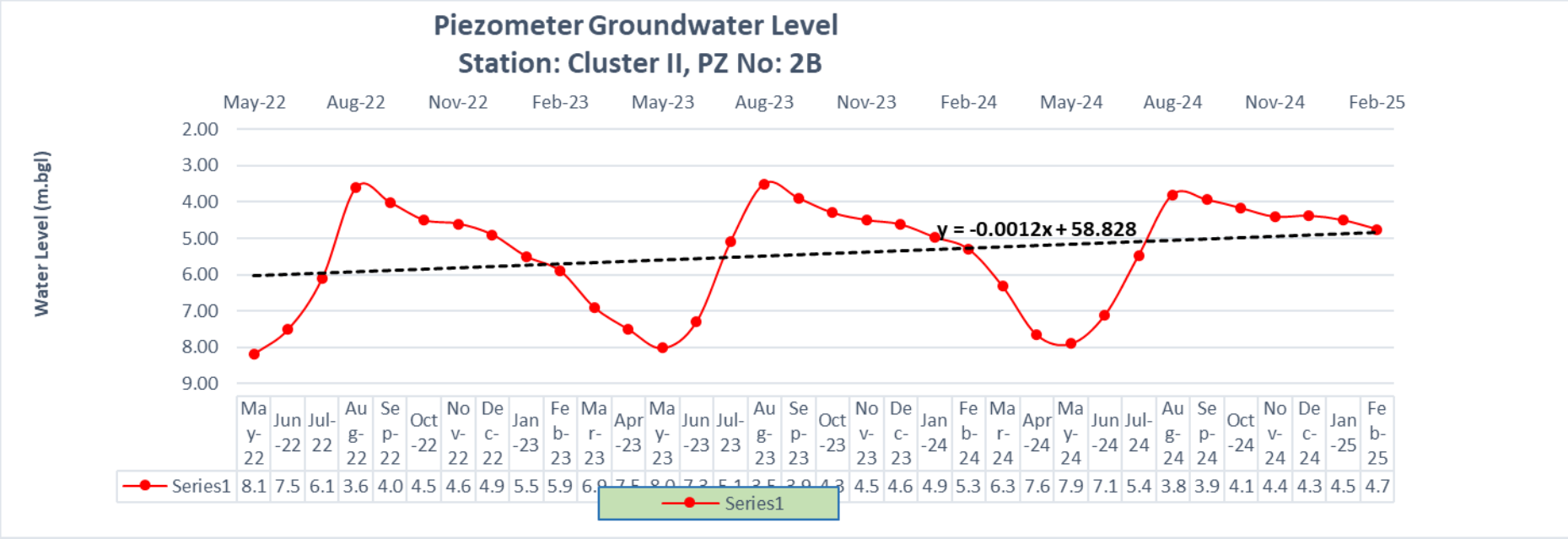
## PIEZOMETER HYDROGRAPHS



## PIEZOMETER HYDROGRAPHS

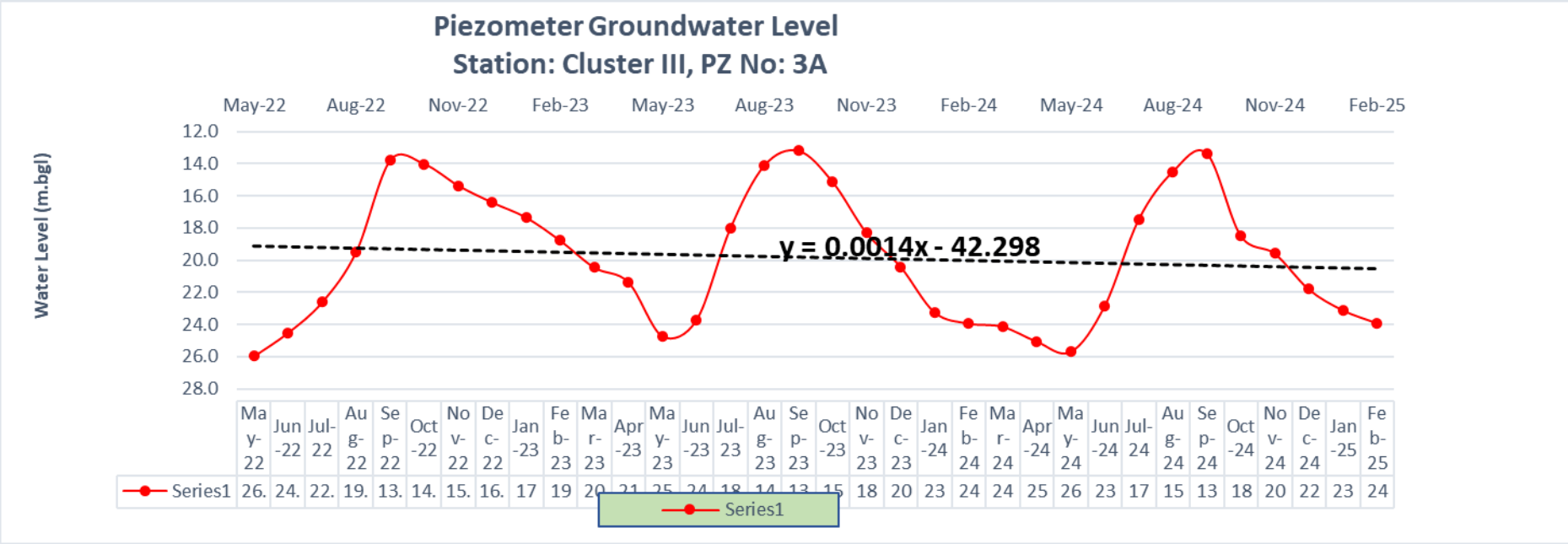


## PIEZOMETER HYDROGRAPHS



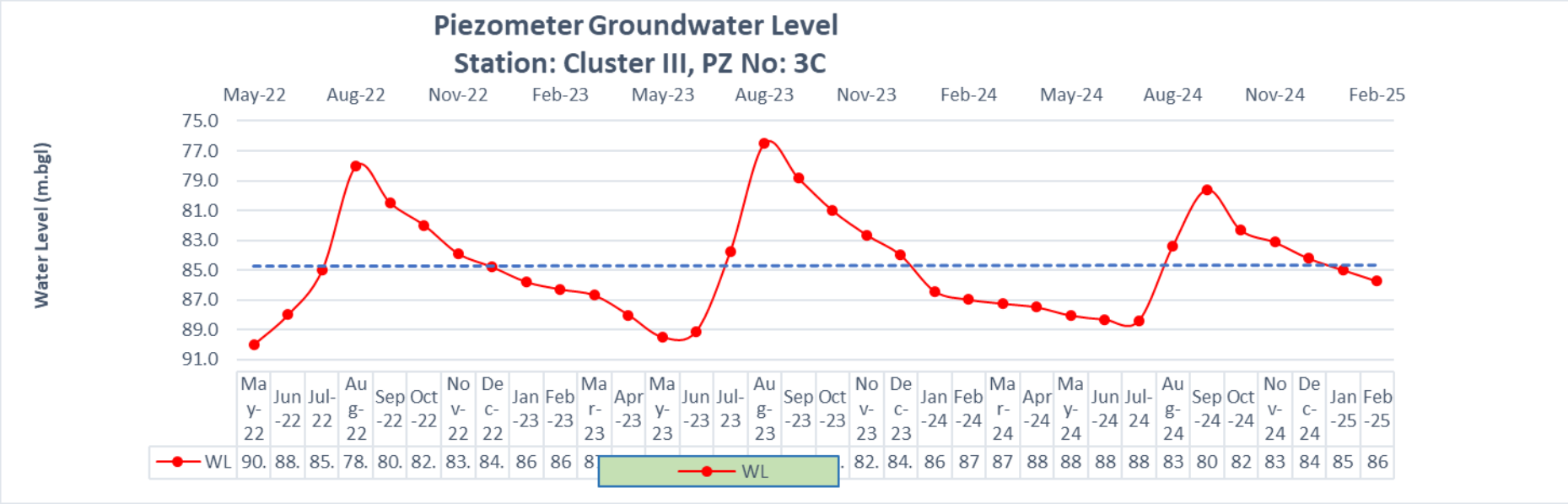
**Annexure – VIA**

## PIEZOMETER HYDROGRAPHS

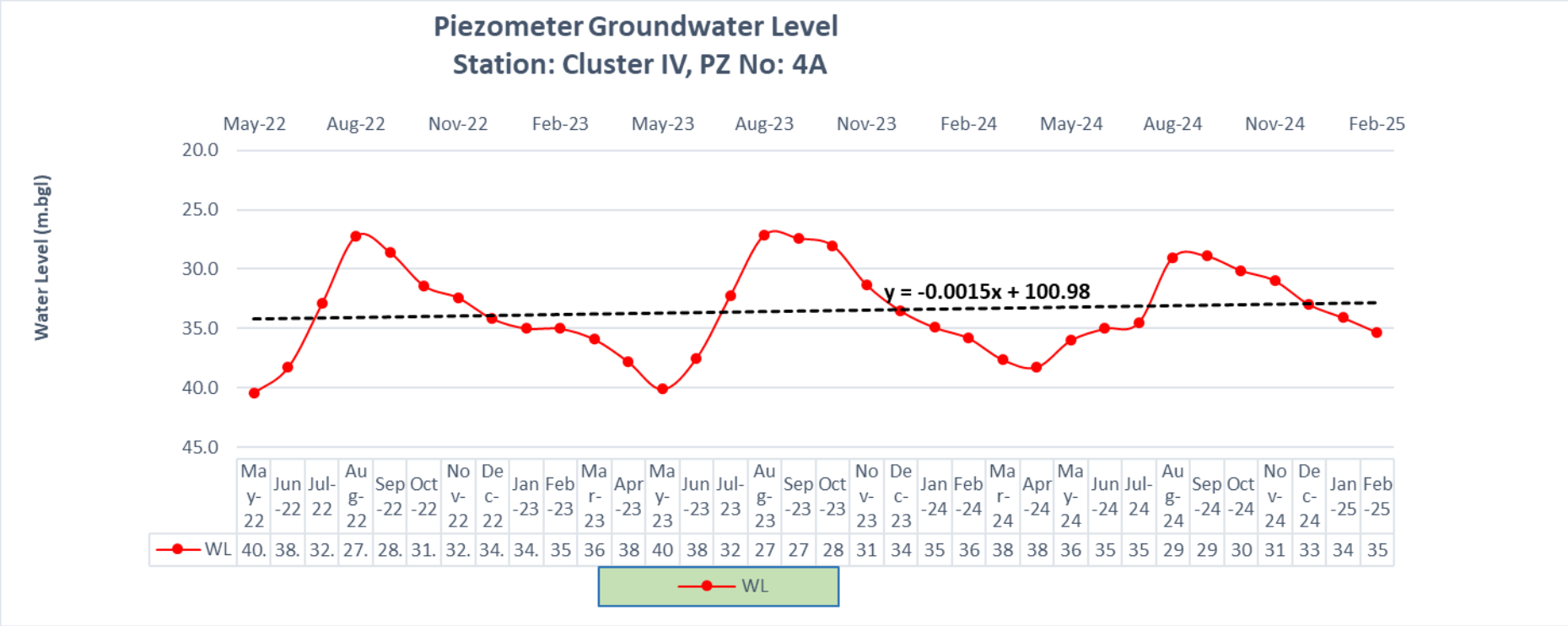


**Annexure – VIA**

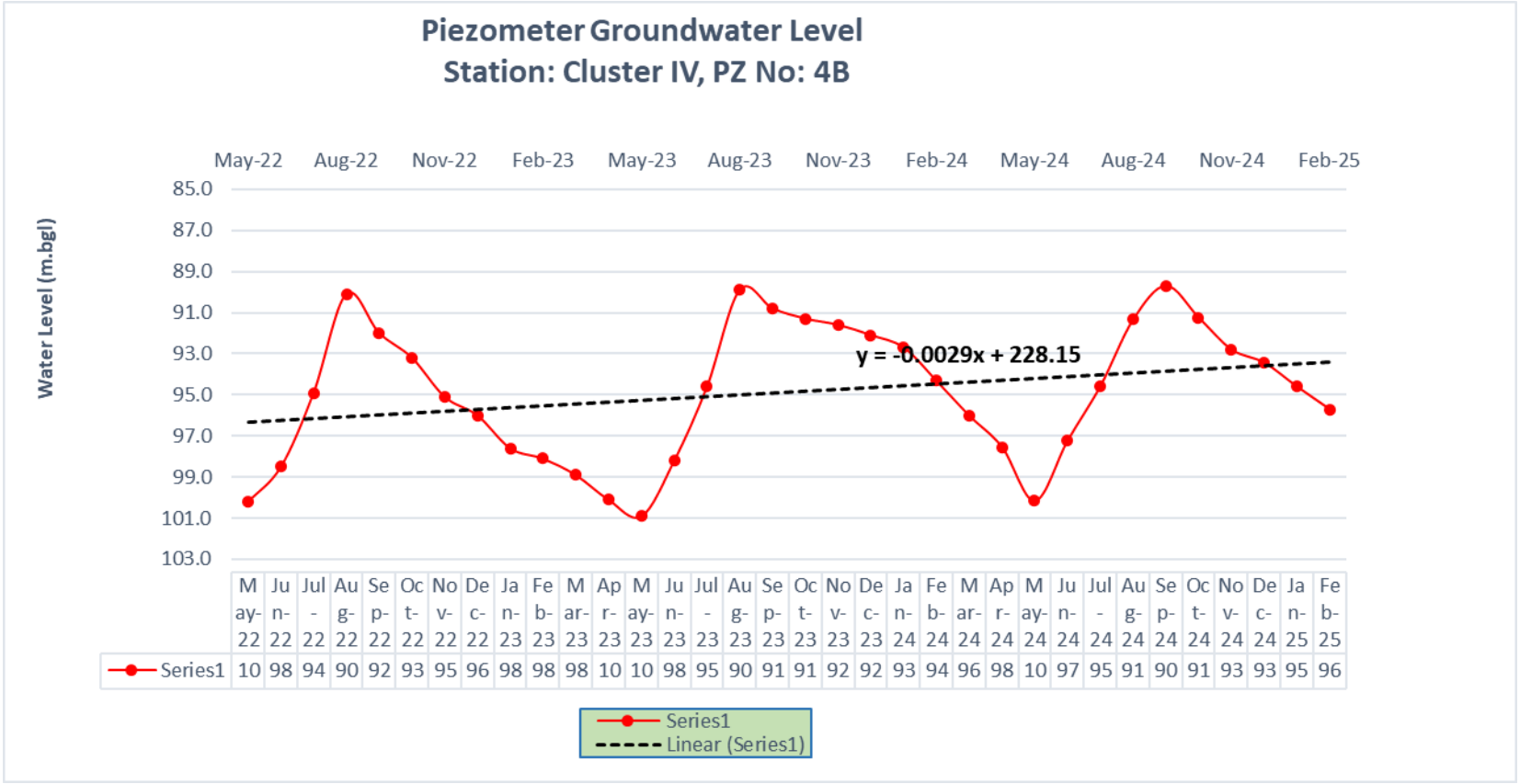
## PIEZOMETER HYDROGRAPHS



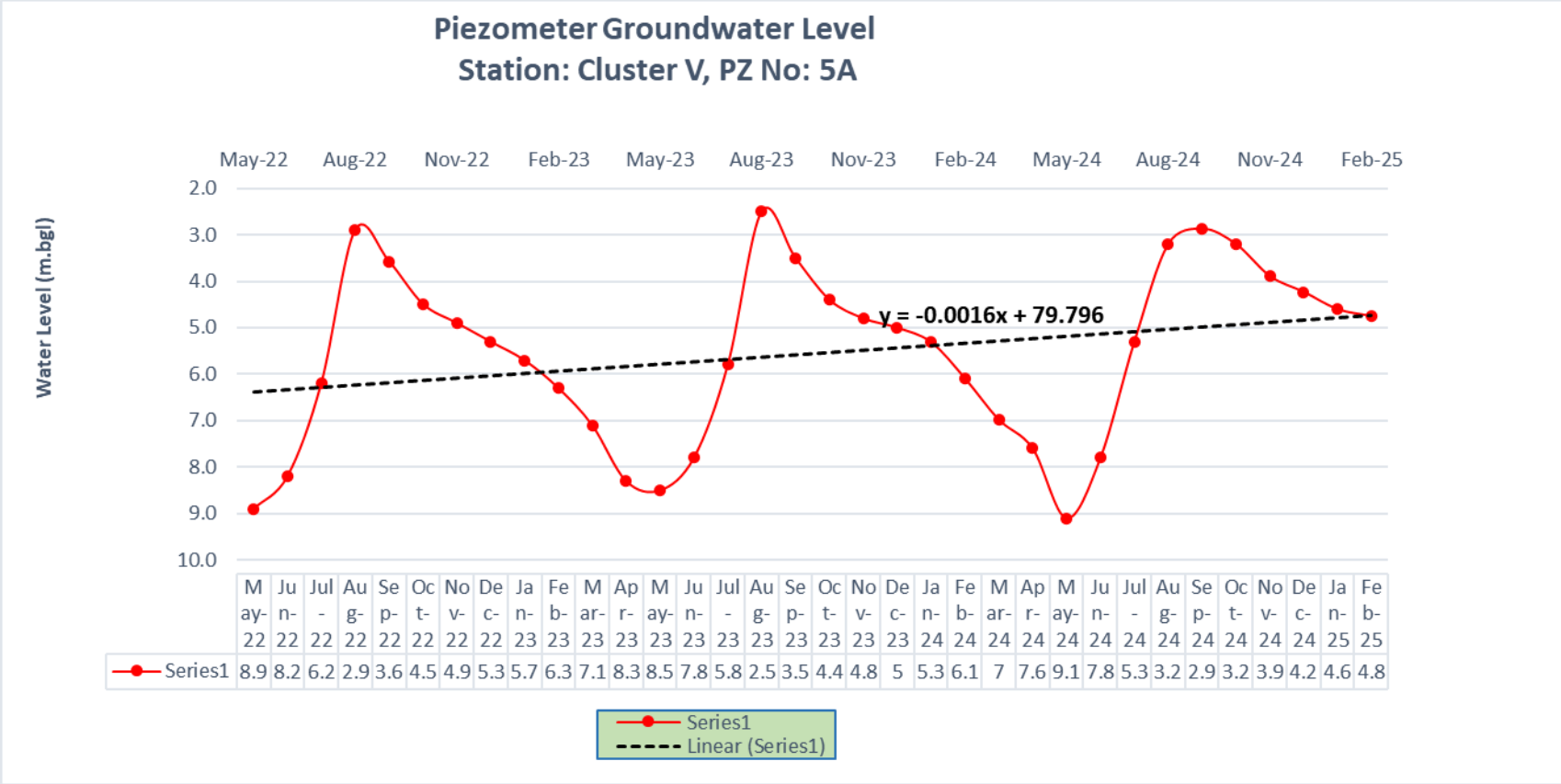
## PIEZOMETER HYDROGRAPHS



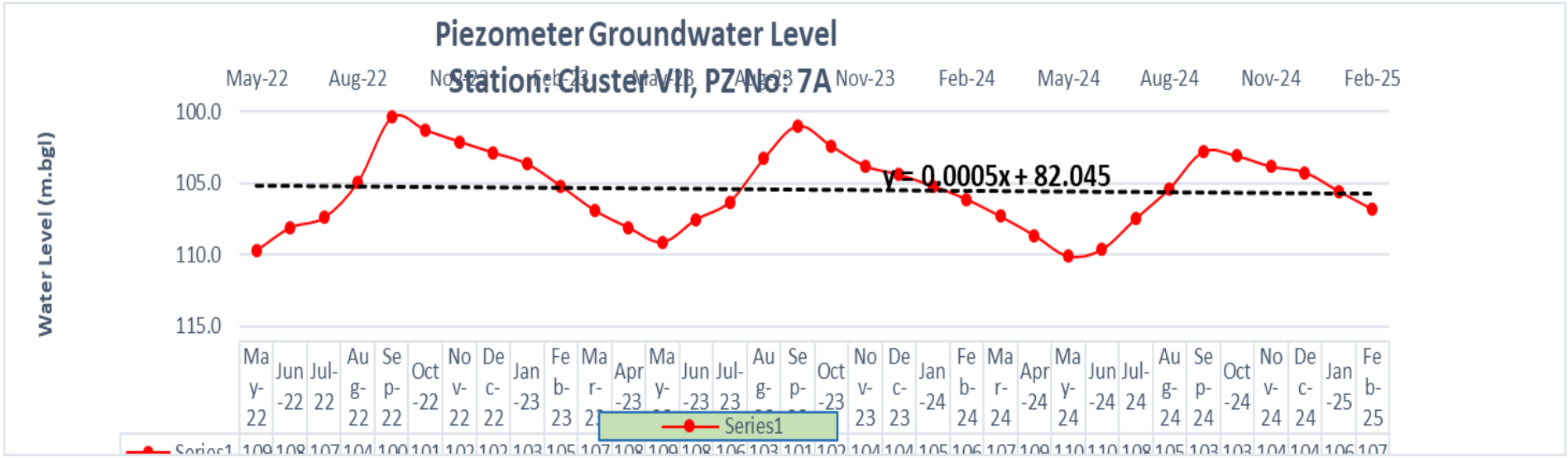
## PIEZOMETER HYDROGRAPHS



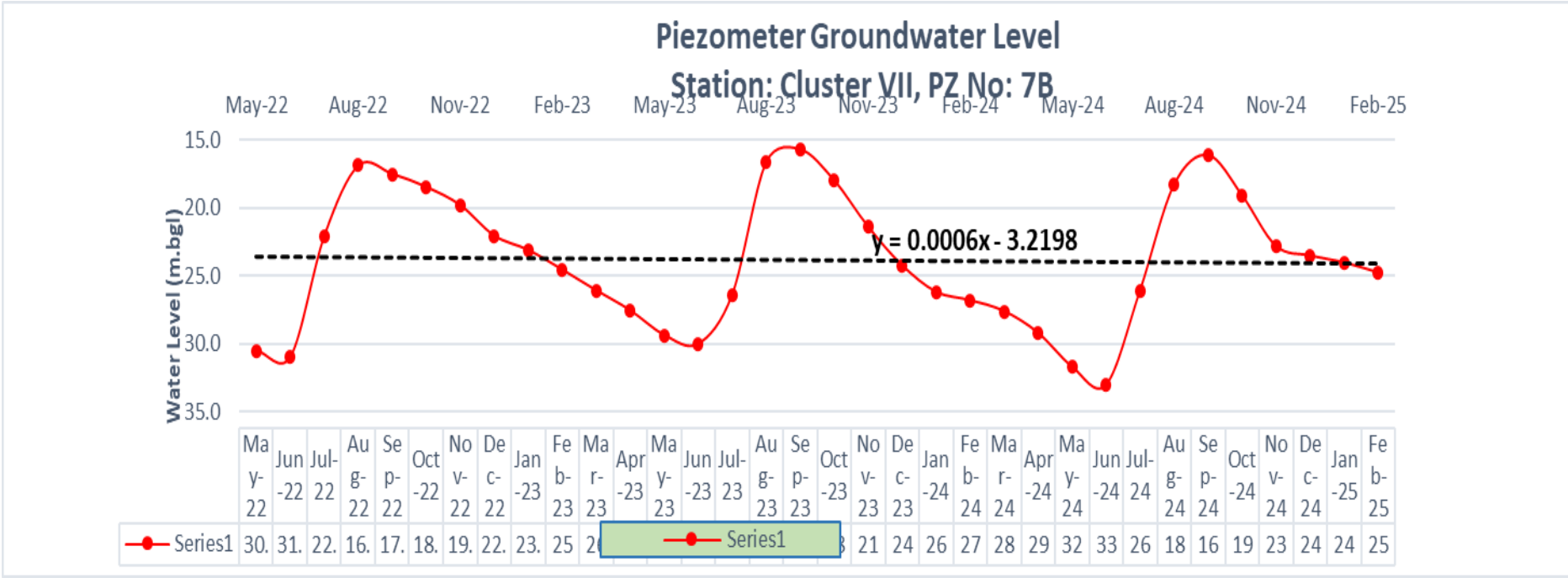
## PIEZOMETER HYDROGRAPHS



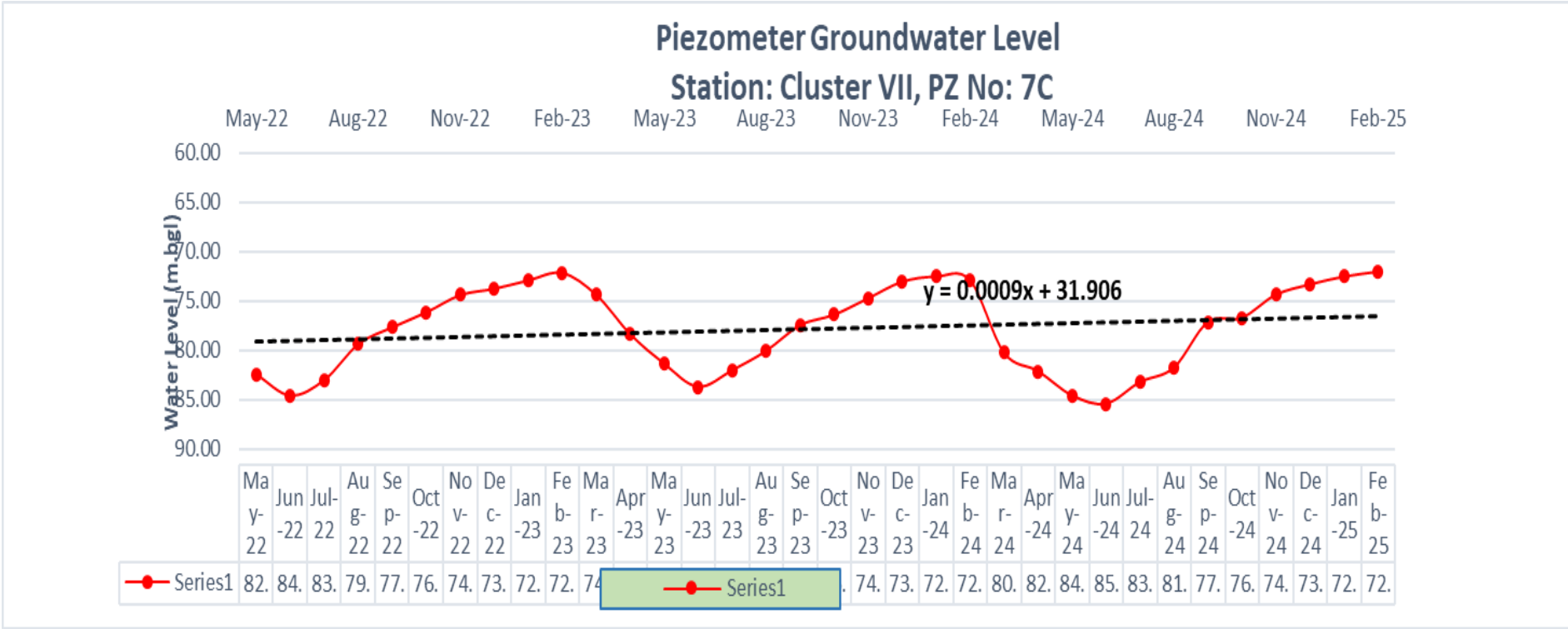
## PIEZOMETER HYDROGRAPHS



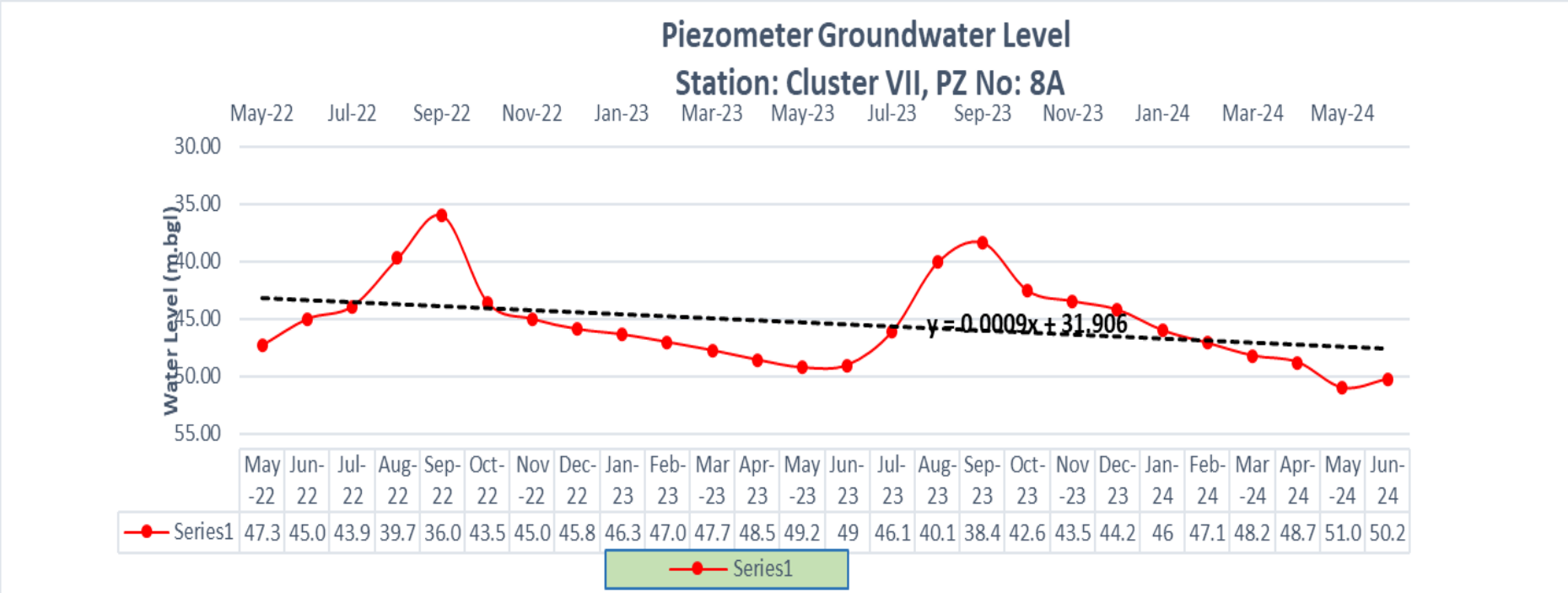
## PIEZOMETER HYDROGRAPHS



## PIEZOMETER HYDROGRAPHS



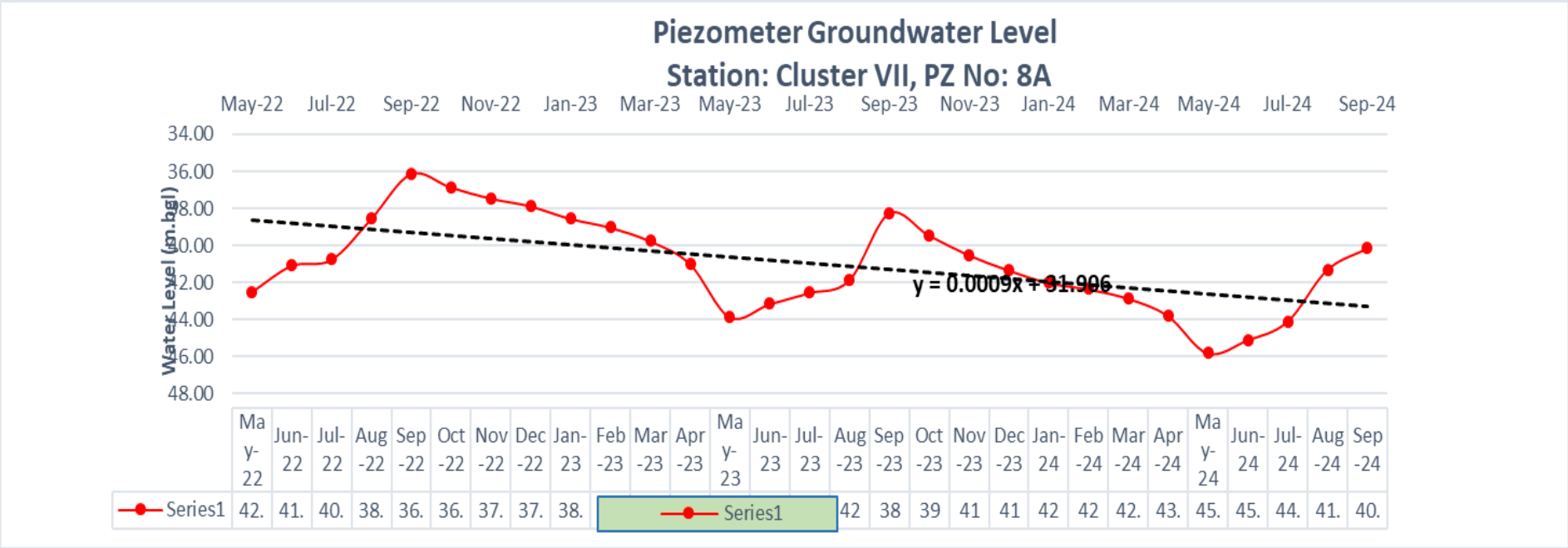
## PIEZOMETER HYDROGRAPHS



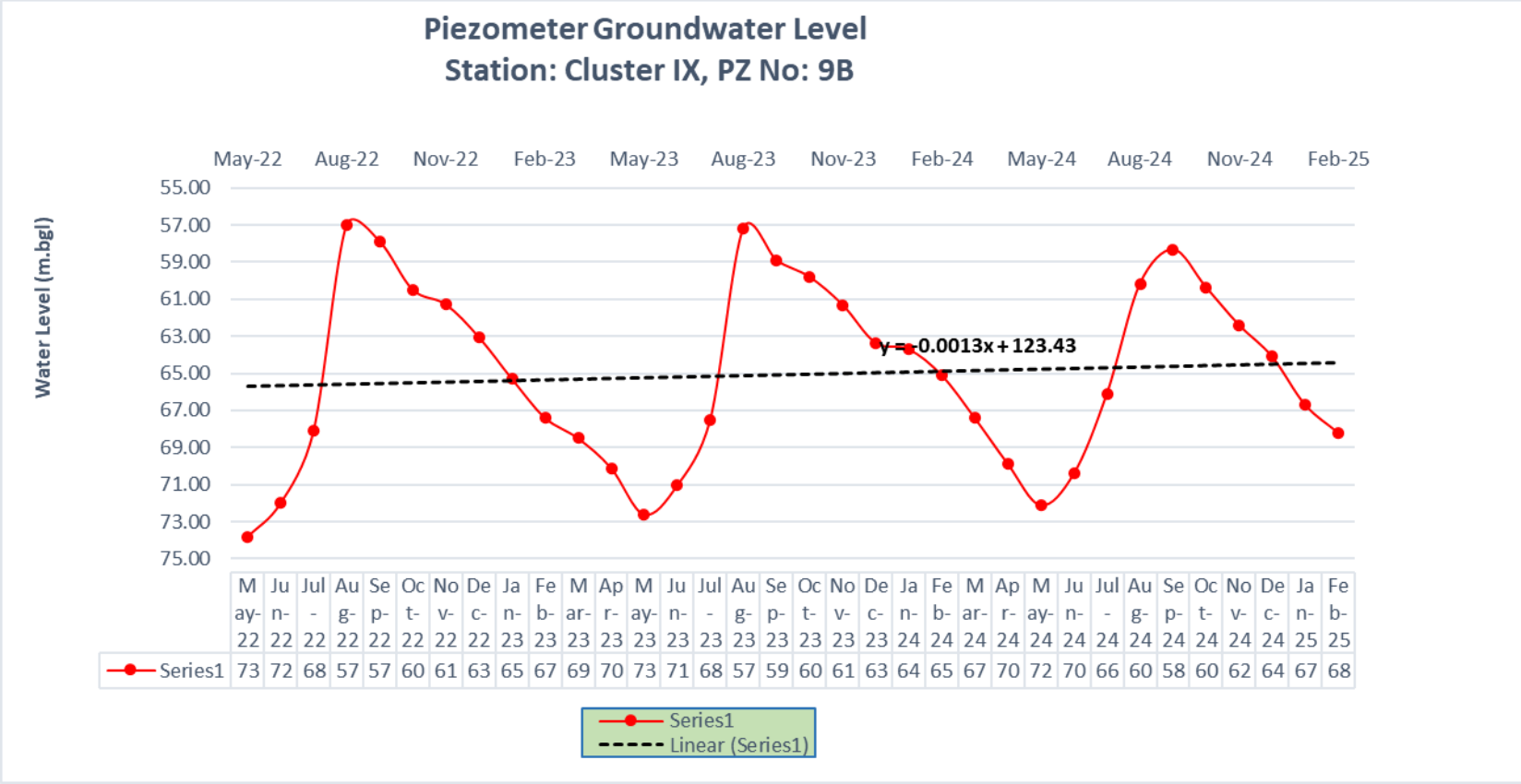

| | May -22 | Jun-22 | Jul-22 | Aug-22 | Sep-22 | Oct-22 | Nov -22 | Dec-22 | Jan-23 | Feb-23 | Mar -23 | Apr-23 | May -23 | Jun-23 | Jul-23 | Aug-23 | Sep-23 | Oct-23 | Nov -23 | Dec-23 | Jan-24 | Feb-24 | Mar -24 | Apr-24 | May -24 | Jun-24 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Series1 | 47.3 | 45.0 | 43.9 | 39.7 | 36.0 | 43.5 | 45.0 | 45.8 | 46.3 | 47.0 | 47.7 | 48.5 | 49.2 | 49 | 46.1 | 40.1 | 38.4 | 42.6 | 43.5 | 44.2 | 46 | 47.1 | 48.2 | 48.7 | 51.0 | 50.2 |

**Annexure – VIA**

## PIEZOMETER HYDROGRAPHS

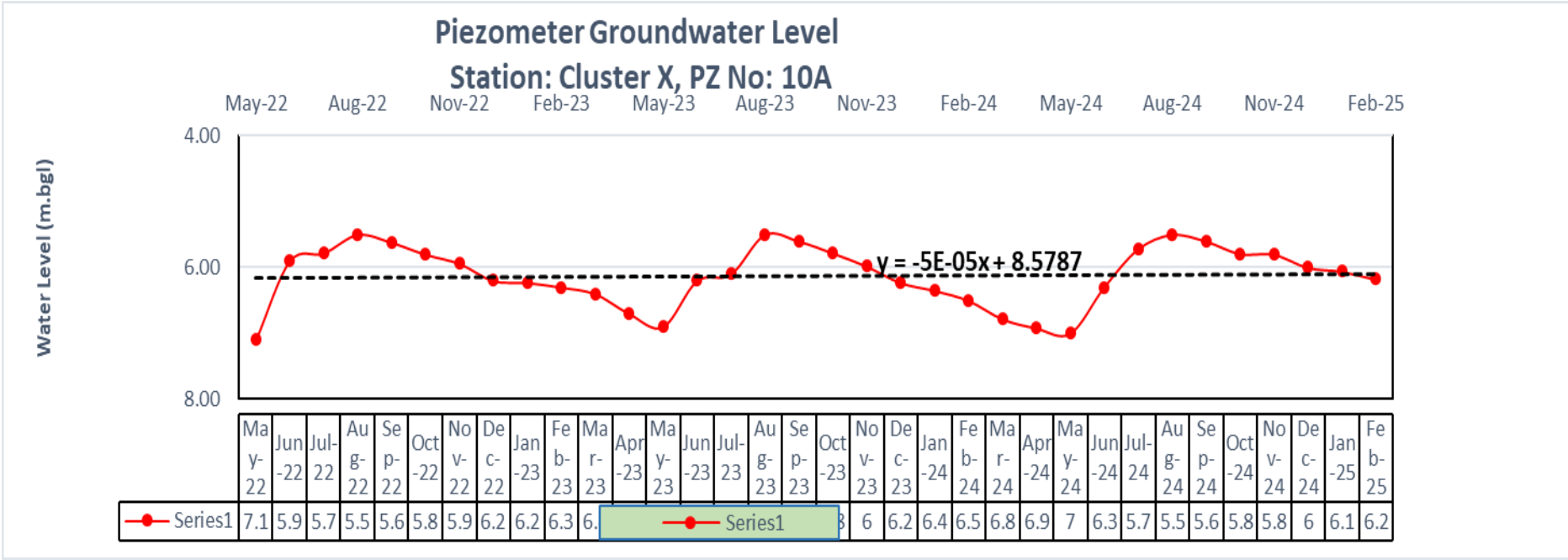


## PIEZOMETER HYDROGRAPHS

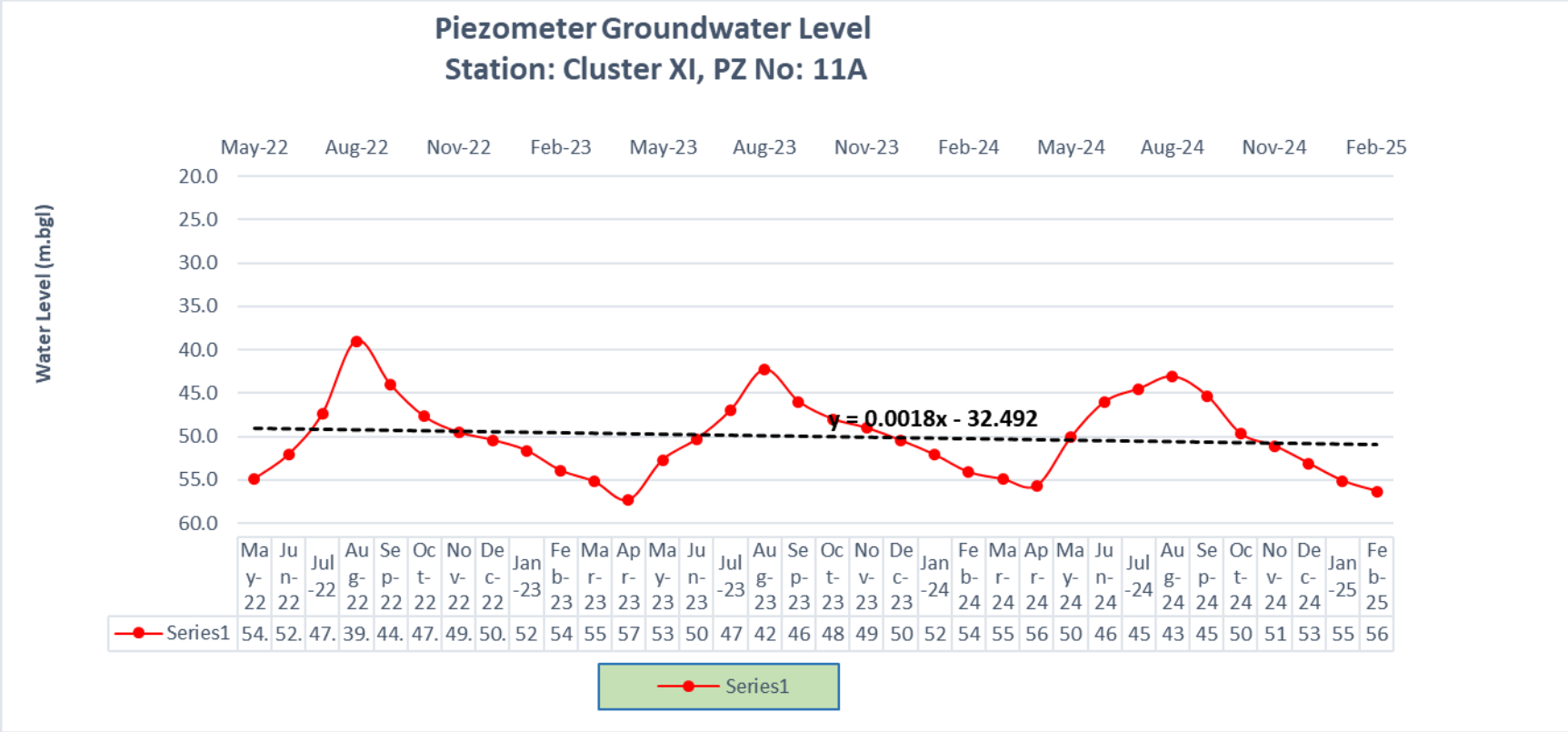



| | May-22 | Jun-22 | Jul-22 | Aug-22 | Sep-22 | Oct-22 | Nov-22 | Dec-22 | Jan-23 | Feb-23 | Mar-23 | Apr-23 | May-23 | Jun-23 | Jul-23 | Aug-23 | Sep-23 | Oct-23 | Nov-23 | Dec-23 | Jan-24 | Feb-24 | Mar-24 | Apr-24 | May-24 | Jun-24 | Jul-24 | Aug-24 | Sep-24 | Oct-24 | Nov-24 | Dec-24 | Jan-25 | Feb-25 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Series1 | 73 | 72 | 68 | 57 | 57 | 60 | 61 | 63 | 65 | 67 | 69 | 70 | 73 | 71 | 68 | 57 | 59 | 60 | 61 | 63 | 64 | 65 | 67 | 70 | 72 | 70 | 66 | 60 | 58 | 60 | 62 | 64 | 67 | 68 |

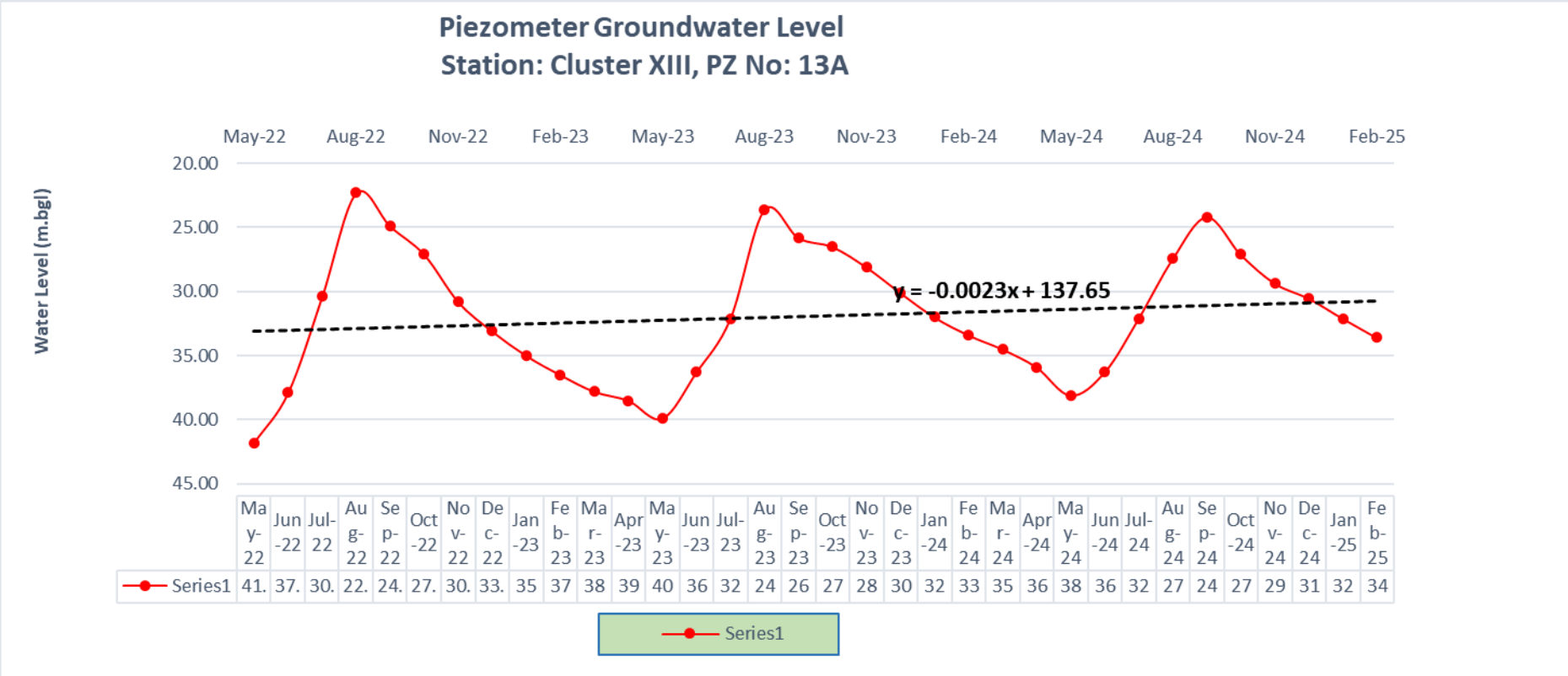
## PIEZOMETER HYDROGRAPHS



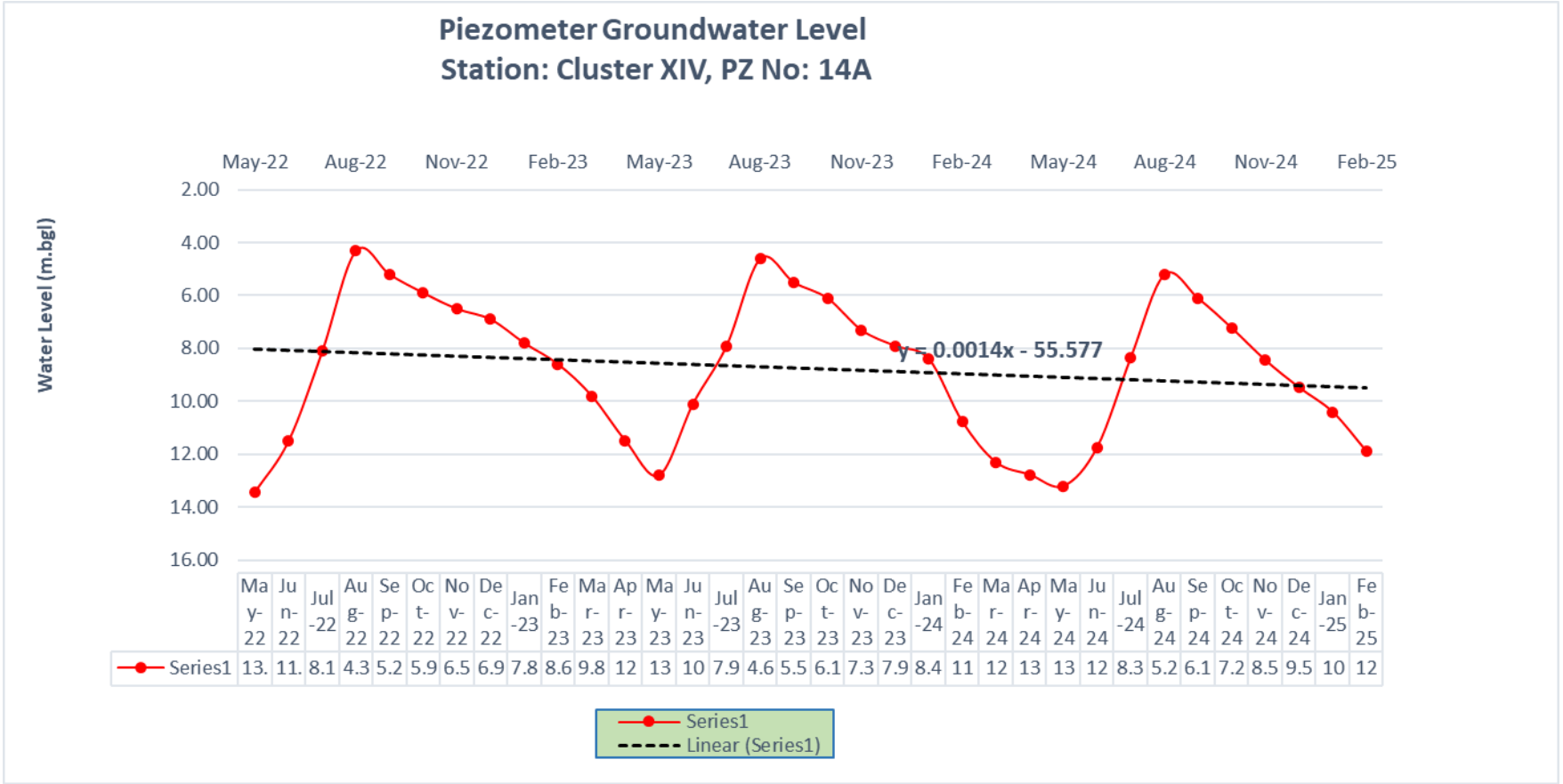
## PIEZOMETER HYDROGRAPHS



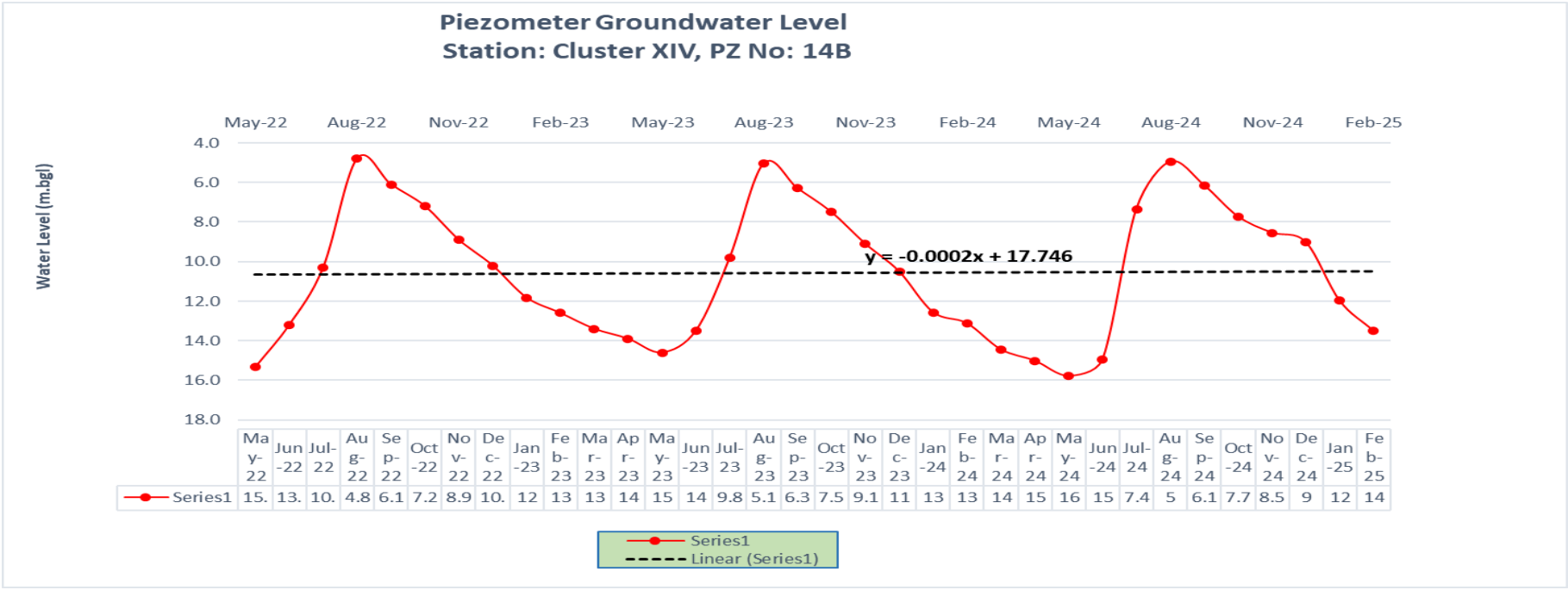
## PIEZOMETER HYDROGRAPHS



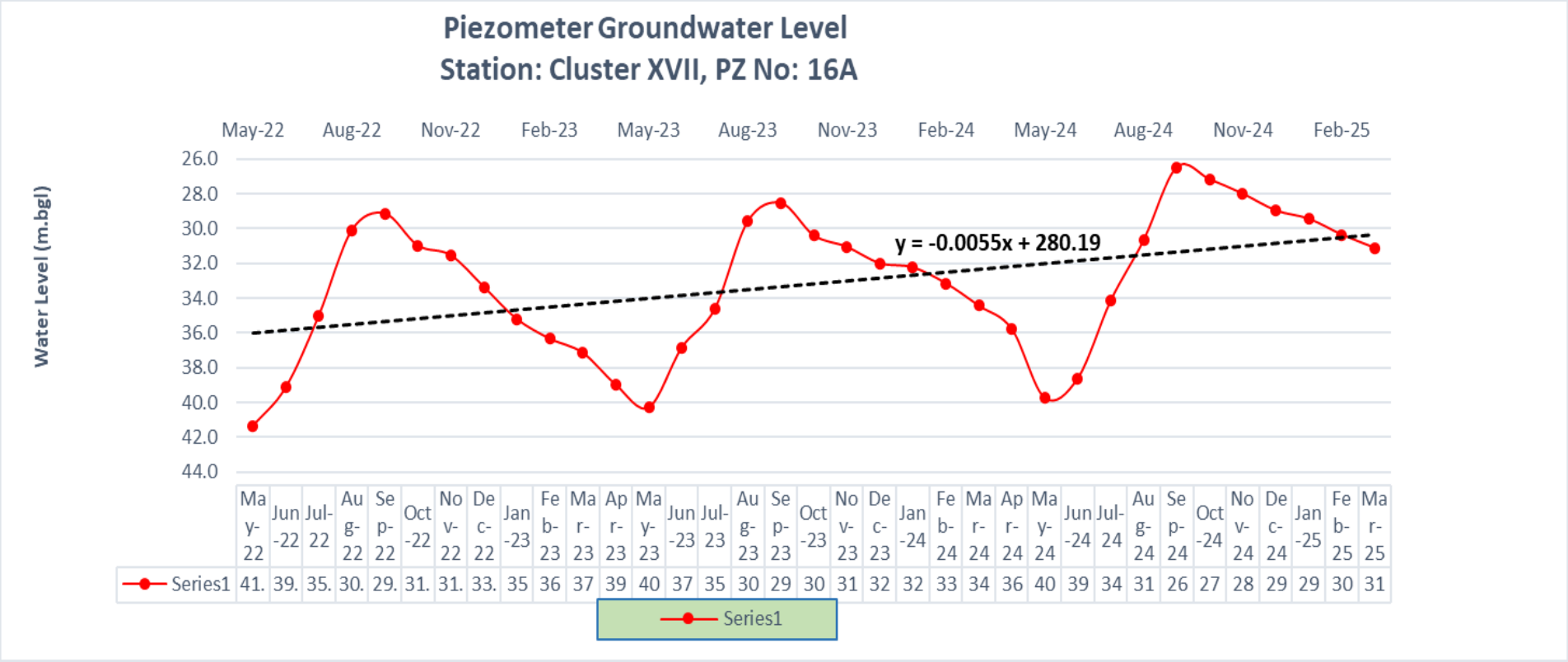
## PIEZOMETER HYDROGRAPHS



# PIEZOMETER HYDROGRAPHS



## PIEZOMETER HYDROGRAPHS



**Annexure – VII**

## GROUNDWATER SAMPLE LOCATION DETAILS

**Sampling month:** June month of the assessment year of 2023-24

| Sl No | Dug well (CMPDI) | Location | Sampling Date |
|---|---|---|---|
| | | | June'2024 |
| **Jharia Coalfield** | | | |
| 1 | **A4** | DALDOLI | 12.06.24 |
| 2 | **A9** | SRIRAMPUR | 12.06.24 |
| 3 | **A10** | PHULWAR | 12.06.24 |
| 4 | **A13** | BHELATANR | 11.06.24 |
| 5 | **A23** | MACHHAYARA | 05.06.24 |
| 6 | **A29** | GOVINDPUR, AMBAGAN VILLAGE | 06.06.24 |
| 7 | **A32** | MOONIDIH BAZAR | 05.06.24 |
| 8 | **B10** | AMDIH NARAYANPUR | 06.06.24 |
| 9 | **B15** | BERA VILLAGE | 07.06.24 |
| 10 | **B19** | BHANDARIDAH | 07.06.24 |
| 11 | **B23** | LOHAPATTI VILLAGE | 05.06.24 |
| 12 | **B32** | MADHUBAND VILLAGE | 06.06.24 |
| 13 | **B40** | BHUIANCHITRO | 07.06.24 |
| 14 | **B46** | TELO | 07.06.24 |
| 15 | **B55** | RANTANR VILLAGE | 12.06.24 |
| 16 | **B59** | KHODOVALY VILLAGE | 06.06.24 |
| 17 | **B64** | KESHALPUR, BATIGHAR | 06.06.24 |
| 18 | **D2** | BIRSA MUNDA CHAWK, BANKMORE | 03.06.24 |
| 19 | **D4** | JHARIA THANA | 03.06.24 |
| 20 | **D5** | JIYALGORA (NEAR P.O.) | 03.06.24 |
| 21 | **D14** | KARMATANR | 13.06.24 |
| 22 | **D19** | MEMKO MORE | 06.06.24 |
| 23 | **D25** | GODHUR MORE | 05.06.24 |
| 24 | **D30** | BORKIBOA VILLAGE | 06.06.24 |
| 25 | **D35** | PATHERDIH RAILWAY COLONY | 06.07.24 |
| 26 | **D41** | JOYRAMPUR | 03.06.24 |
| 27 | **D49** | TISRA THANA | 03.06.24 |
| 28 | **D59** | SITALPUR | 04.06.24 |
| 29 | **D70** | JALADIH | 04.06.24 |
| 30 | **D72** | CHATI GOVINDPUR | 07.06.24 |
| 31 | **D80** | DHANSAR MINE RESCUE STATION | 03.06.24 |
| 32 | **D96** | BANSHRA | 04.06.24 |
| 33 | **D107** | BOGULA | 04.06.24 |
| 34 | **D112** | DEMUDI (DOMATANR) | 05.06.24 |
| 35 | **D115** | TELMUCHU | 06.07.24 |

| Sl No | Dug well (CMPDI) | Location | Sampling Date |
|---|---|---|---|
| | | | June'2024 |
| **Raniganj Coalfield** | | | |
| 1 | DB-2A | Sulibari | 13.06.24 |
| 2 | DB-4 | Sarbari | 14.06.24 |
| 3 | DB-8 | Chungei | 14.06.24 |
| 4 | DB-10 | Kulti | 14.06.24 |
| 5 | DB-12 | Sabanpur | 14.06.24 |
| 6 | DB-13 | Dendua More | 14.06.24 |
| 7 | DB-18 | Luchibad | 13.06.24 |
| 8 | DB-26 | Ledaharia | 13.06.24 |
| 9 | DB-27 | Hodla | 13.06.24 |
| 10 | DB-29 | Kelyasol | 13.06.24 |
| 11 | DB-30 | Ramkanali | 14.06.24 |
| 12 | DB-38 | Lukudih | 14.06.24 |
| 13 | DB-39 | Pandra | 14.06.24 |
| 14 | K-12 | Ethora | 14.06.24 |
| 15 | K-20 | Majhladih | 14.06.24 |

## PHYSICO-CHEMICAL CHARACTERISTICS OF GROUND WATER SAMPLES

*(Wherever not specified, characteristics are expressed in mg/l, maximum)*

*1. Ground Water Sampling at Monitoring Station Code : - A10 , PHULWAR*

**Date of Sampling at Station: June 2024**

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| **Month & Year** | **June 2024** | **Dug Well No.** | **A10** | | | | |
| **Customer** | **Environment Department, Bharat Coking Coal Limited (BCCL), Koyla Bhawan, Dhanbad (E-mail: gmenv.bccl@coalindia.in)** | | | | | **Date of Issue** | **19.09.2024** |
| **Project** | **Jharia Coalfield** | | **Sample Ref. No.** | **REM/BCCL/22-23/GW** | **Sampling Method** | **CMPDI/RI-II/LPM 13,(IS 3025:Part -1)** | |
| **Sampling Stations** | **PHULWAR** | **Date of Sampling** | | **Sample Collected in 5 Ltr Jerricane , Color as observed is transparent** | | | |
| | | | **Period of Analysis** | | | **TO** | |

| **Sl. No.** | **Parameter** | **Method of Analysis** | **Observed Values** | | | **IS 10500: 2012** | |
|---|---|---|---|---|---|---|---|
| | | | **GW3** | **Range Of Testing** | **LDL** | **Acceptable Limit (Max)*** | **Permissible Limit in the Absence of Alternate Source (Max)** |
| 1 | Boron (as B), mg/l, Max | APHA, 24th 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, 24th edition, AAS-GTA | <0.01 | 0.01-10.0 | 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, 24th edition, AAS-GTA | <0.005 | 0.005-10 | 0.005 | 0.01 | No relaxation |
| 5 | Phenolic compounds (as C6H5OH), mg/l, Max | APHA, 24th Edition,4-Amino Autipyrine | <0.001 | 0.001-10 | 0.001 | 0.002 | 0.002 |
| 6 | Selenium, mg/l, Max | APHA 24th 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 24th 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, 24th edition, AAS-GTA | <0.01 | 0.01-10.0 | 0.01 | 0.05 | No relaxation |
| 9 | Nickel as Ni, mg/l Max | IS 3025 Part 54 : 2003,R : 2019, AAS-Flame APHA, 24th edition, AAS-GTA | <0.005 | 0.005-10 | 0.005 | 0.02 | No relaxation |
| 10 | Manganese as Mn, mg/l, Max | APHA, 24TH Edition:2023 AAS-GTA Method | <0.02 | 0.02-10.0 | 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,*

## PHYSICO-CHEMICAL CHARACTERISTICS OF GROUND WATER SAMPLES

*(Wherever not specified, characteristics are expressed in mg/l, maximum)*

1. *Ground Water Sampling at Monitoring Station Code: - A13, BHELATANR*

**Date of Sampling at Station: June 2024**

| | | | | | |
|---|---|---|---|---|---|
| **Month & Year** | **June 2024** | **Dug Well No.** | **A13** | | |
| **Customer** | **Environment Department, Bharat Coking Coal Limited (BCCL), Koyla Bhawan, Dhanbad (E-mail: gmenv.bccl@coalindia.in)** | | | **Date of Issue** | **19.09.2024** |
| **Project** | **Jharia Coalfield** | **Sample Ref. No.** | **RI-II/HYDROGEOLOGY/24-25/GW** | **Sampling Method** | **CMPDI/RI-II/LPM 13,(IS 3025:Part -1)** |
| **Sampling Stations** | **BHELATANR** | **Date of Sampling** | | **Sample Collected in 5 Ltr Jerricane , Color as observed is transparent** | |
| | | | **Period of Analysis** | | **TO** |

| **Sl. No.** | **Parameter** | **Method of Analysis** | **Observed Values** | | | **IS 10500: 2012** | |
|---|---|---|---|---|---|---|---|
| | | | **GW4** | **Range Of Testing** | **LDL** | **Acceptable Limit (Max)*** | **Permissible Limit in the Absence of Alternate Source (Max)** |
| 1 | Boron (as B), mg/l, Max | APHA, 24th 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, 24th edition, AAS-GTA | <0.01 | 0.01-10.0 | 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, 24th edition, AAS-GTA | <0.005 | 0.005-10 | 0.005 | 0.01 | No relaxation |
| 5 | Phenolic compounds (as C6H5OH), mg/l, Max | APHA, 24th Edition,4-Amino Autipyrine | <0.001 | 0.001-10 | 0.001 | 0.002 | 0.002 |
| 6 | Selenium, mg/l, Max | APHA 24th 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 24th 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, 24th edition, AAS-GTA | <0.01 | 0.01-10.0 | 0.01 | 0.05 | No relaxation |
| 9 | Nickel as Ni, mg/l Max | IS 3025 Part 54 : 2003,R : 2019, AAS-Flame APHA, 24th edition, AAS-GTA | <0.005 | 0.005-10 | 0.005 | 0.02 | No relaxation |
| 10 | Manganese as Mn, mg/l, Max | APHA, 24TH Edition:2023 AAS-GTA Method | <0.02 | 0.02-10.0 | 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,*

## PHYSICO-CHEMICAL CHARACTERISTICS OF GROUND WATER SAMPLES

*(Wherever not specified, characteristics are expressed in mg/l, maximum)*

1. *Ground Water Sampling at Monitoring Station Code: - A23(MACHHAYARA)*

**Date of Sampling at Station: June 2024**

| | | | | | |
|---|---|---|---|---|---|
| **Month & Year** | **June 2024** | **Dug Well No.** | **A23** | | |
| **Customer** | **Environment Department, Bharat Coking Coal Limited (BCCL), Koyla Bhawan, Dhanbad (E-mail: gmenv.bccl@coalindia.in)** | | | **Date of Issue** | **19.09.2024** |
| **Project** | **Jharia Coalfield** | **Sample Ref. No.** | **RI-II/HYDROGEOLOGY/24-25/GW** | **Sampling Method** | **CMPDI/RI-II/LPM 13,(IS 3025:Part -1)** |
| **Sampling Stations** | **MACHHAYARA** | **Date of Sampling** | | **Sample Collected in 5 Ltr Jerricane , Color as observed is transparent** | |
| | | | **Period of Analysis** | | **TO** |

| **Sl. No.** | **Parameter** | **Method of Analysis** | **Observed Values** | | | **IS 10500: 2012** | |
|---|---|---|---|---|---|---|---|
| | | | **GW5** | **Range Of Testing** | **LDL** | **Acceptable Limit (Max)*** | **Permissible Limit in the Absence of Alternate Source (Max)** |
| 1 | Boron (as B), mg/l, Max | APHA, 24th 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, 24th edition, AAS-GTA | <0.01 | 0.01-10.0 | 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, 24th edition, AAS-GTA | <0.005 | 0.005-10 | 0.005 | 0.01 | No relaxation |
| 5 | Phenolic compounds (as C6H5OH), mg/l, Max | APHA, 24th Edition,4-Amino Autipyrine | <0.001 | 0.001-10 | 0.001 | 0.002 | 0.002 |
| 6 | Selenium, mg/l, Max | APHA 24th 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 24th 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, 24th edition, AAS-GTA | <0.01 | 0.01-10.0 | 0.01 | 0.05 | No relaxation |
| 9 | Nickel as Ni, mg/l Max | IS 3025 Part 54 : 2003,R : 2019, AAS-Flame APHA, 24th 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 | <0.02 | 0.02-10.0 | 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,*

## PHYSICO-CHEMICAL CHARACTERISTICS OF GROUND WATER SAMPLES

*(Wherever not specified, characteristics are expressed in mg/l, maximum)*

1. *Ground Water Sampling at Monitoring Station Code: - A29, GOVINDPUR,AMBAGAN VILLAGE*

**Date of Sampling at Station:** June 2024

| | | | | | |
|---|---|---|---|---|---|
| **Month & Year** | **June 2024** | **Dug Well No.** | **A29** | | |
| **Customer** | **Environment Department, Bharat Coking Coal Limited (BCCL), Koyla Bhawan, Dhanbad (E-mail: gmenv.bccl@coalindia.in)** | | | **Date of Issue** | **19.09.2024** |
| **Project** | **Jharia Coalfield** | **Sample Ref. No.** | **RI-II/HYDROGEOLOGY/24-25/GW** | **Sampling Method** | **CMPDI/RI-II/LPM 13,(IS 3025:Part -1)** |
| **Sampling Stations** | **GOVINDPUR, AMABAGAN VILLAGE** | **Date of Sampling** | | **Sample Collected in 5 Ltr Jerricane , Color as observed is transparent** | |
| | | **Period of Analysis** | | **TO** | |

| **Sl. No.** | **Parameter** | **Method of Analysis** | **Observed Values** | | | **IS 10500: 2012** | |
|---|---|---|---|---|---|---|---|
| | | | **GW6** | **Range Of Testing** | **LDL** | **Acceptable Limit (Max)*** | **Permissible Limit in the Absence of Alternate Source (Max)** |
| 1 | Boron (as B), mg/l, Max | APHA, 24th 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, 24th edition, AAS-GTA | <0.01 | 0.01-10.0 | 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, 24th edition, AAS-GTA | <0.005 | 0.005-10 | 0.005 | 0.01 | No relaxation |
| 5 | Phenolic compounds (as C6H5OH), mg/l, Max | APHA, 24th Edition,4-Amino Autipyrine | <0.001 | 0.001-10 | 0.001 | 0.002 | 0.002 |
| 6 | Selenium, mg/l, Max | APHA 24th 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 24th 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, 24th edition, AAS-GTA | <0.01 | 0.01-10.0 | 0.01 | 0.05 | No relaxation |
| 9 | Nickel as Ni, mg/l Max | IS 3025 Part 54 : 2003,R : 2019, AAS-Flame APHA, 24th edition, AAS-GTA | <0.005 | 0.005-10 | 0.005 | 0.02 | No relaxation |
| 10 | Manganese as Mn, mg/l, Max | APHA, 24TH Edition:2023 AAS-GTA Method | <0.02 | 0.02-10.0 | 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,*

## PHYSICO-CHEMICAL CHARACTERISTICS OF GROUND WATER SAMPLES

*(Wherever not specified, characteristics are expressed in mg/l, maximum)*

*1. Ground Water Sampling at Monitoring Station Code : - A32 , MOONIDIH BAZAR*

**Date of Sampling at Station: June 2024**

| | | | | | | |
|---|---|---|---|---|---|---|
| **Month & Year** | **June 2024** | **Dug Well No.** | **A32** | | | |
| **Customer** | **Environment Department, Bharat Coking Coal Limited (BCCL), Koyla Bhawan, Dhanbad (E-mail: gmenv.bccl@coalindia.in)** | | | | **Date of Issue** | **19.09.2024** |
| **Project** | **Jharia Coalfield** | **Sample Ref. No.** | **RI-II/HYDROGEOLOGY/24-25/GW** | **Sampling Method** | **CMPDI/RI-II/LPM 13,(IS 3025:Part -1)** | |
| **Sampling Stations** | **MOONIDIH BAZAR** | **Date of Sampling** | | **Sample Collected in 5 Ltr Jerricane , Color as observed is transparent** | | |
| | | | **Period of Analysis** | | **TO** | |

| **Sl. No.** | **Parameter** | **Method of Analysis** | **Observed Values** | | | **IS 10500: 2012** | |
|---|---|---|---|---|---|---|---|
| | | | **GW7** | **Range Of Testing** | **LDL** | **Acceptable Limit (Max)*** | **Permissible Limit in the Absence of Alternate Source (Max)** |
| 1 | Boron (as B), mg/l, Max | APHA, 24th 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, 24th edition, AAS-GTA | <0.01 | 0.01-10.0 | 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, 24th edition, AAS-GTA | <0.005 | 0.005-10 | 0.005 | 0.01 | No relaxation |
| 5 | Phenolic compounds (as C6H5OH), mg/l, Max | APHA, 24th Edition,4-Amino Autipyrine | <0.001 | 0.001-10 | 0.001 | 0.002 | 0.002 |
| 6 | Selenium, mg/l, Max | APHA 24th 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 24th 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, 24th edition, AAS-GTA | <0.01 | 0.01-10.0 | 0.01 | 0.05 | No relaxation |
| 9 | Nickel as Ni, mg/l Max | IS 3025 Part 54 : 2003,R : 2019, AAS-Flame APHA, 24th edition, AAS-GTA | <0.005 | 0.005-10 | 0.005 | 0.02 | No relaxation |
| 10 | Manganese as Mn, mg/l, Max | APHA, 24TH Edition:2023 AAS-GTA Method | <0.02 | 0.02-10.0 | 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,*

## PHYSICO-CHEMICAL CHARACTERISTICS OF GROUND WATER SAMPLES

*(Wherever not specified, characteristics are expressed in mg/l, maximum)*

1. *Ground Water Sampling at Monitoring Station Code : - A4, DALDOLI*

**Date of Sampling at Station:** June 2024

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| **Month & Year** | **June 2024** | **Dug Well No.** | **A4** | | | | |
| **Customer** | **Environment Department, Bharat Coking Coal Limited (BCCL), Koyla Bhawan, Dhanbad (E-mail: gmenv.bccl@coalindia.in)** | | | | | **Date of Issue** | **19.09.2024** |
| **Project** | **Jharia Coalfield** | | **Sample Ref. No.** | **RI-II/HYDROGEOLOGY/24-25/GW** | **Sampling Method** | **CMPDI/RI-II/LPM 13,(IS 3025:Part -1)** | |
| **Sampling Stations** | **DALDOLI** | **Date of Sampling** | | **Sample Collected in 5 Ltr Jerricane , Color as observed is transparent** | | | |
| | | | **Period of Analysis** | | | **TO** | |

| **Sl. No.** | **Parameter** | **Method of Analysis** | **Observed Values** | | | **IS 10500: 2012** | |
|---|---|---|---|---|---|---|---|
| | | | **GW-1** | **Range Of Testing** | **LDL** | **Acceptable Limit (Max)*** | **Permissible Limit in the Absence of Alternate Source (Max)** |
| 1 | Boron (as B), mg/l, Max | APHA, 24th d Edition ,Carmine,2023 | <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, 24th edition, AAS-GTA | <0.01 | 0.01-10.0 | 0.01 | 0.05 | 1.5 |
| 3 | Free Residual Chlorine, mg/l, Min | APHA, 24th Edition, , 4500-Cl-B. (Iodometric Method-I),2023 | <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, 24th edition, AAS-GTA | <0.005 | 0.005-10 | 0.005 | 0.01 | No relaxation |
| 5 | Phenolic compounds (as C6H5OH), mg/l, Max | APHA, 24th Edition,4-Amino Autipyrine | <0.001 | 0.001-10 | 0.001 | 0.002 | 0.002 |
| 6 | Selenium, mg/l, Max | APHA 24th Edition IS-3025,part 56:2003, R-2019/, AAS-VGA,2023 | <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 24th 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, 24th Edition, AAS-GTA,2023 | <0.01 | 0.01-10.0 | 0.01 | 0.05 | No relaxation |
| 9 | Nickel as Ni, mg/l Max | IS 3025 Part 54 : 2003,R : 2019, AAS-Flame APHA, 24th Edition, AAS-GTA,2023 | <0.005 | 0.005-10 | 0.005 | 0.02 | No relaxation |
| 10 | Manganese as Mn, mg/l, Max | APHA, 24TH Edition:2023 AAS-GTA Method | <0.02 | 0.02-10.0 | 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,*

## PHYSICO-CHEMICAL CHARACTERISTICS OF GROUND WATER SAMPLES

*(Wherever not specified, characteristics are expressed in mg/l, maximum)*

1. *Ground Water Sampling at Monitoring Station Code: - A9, SRIRAMPUR*

**Date of Sampling at Station: June 2024**

| | | | | | |
|---|---|---|---|---|---|
| **Month & Year** | **June 2024** | **Dug Well No.** | **A9** | **ULR No.** | |
| **Customer** | **Environment Department, Bharat Coking Coal Limited (BCCL), Koyla Bhawan, Dhanbad (E-mail: gmenv.bccl@coalindia.in)** | | | **Date of Issue** | **19.09.2024** |
| **Project** | **Jharia Coalfield** | **Sample Ref. No.** | **RI-II/HYDROGEOLOGY/24-25/GW** | **Sampling Method** | **CMPDI/RI-II/LPM 13,(IS 3025:Part -1)** |
| **Sampling Stations** | **SRIRAMPUR** | **Date of Sampling** | | **Sample Collected in 5 Ltr Jerricane , Color as observed is transparent** | |
| | | | **Period of Analysis** | | **TO** |

| **Sl. No.** | **Parameter** | **Method of Analysis** | **Observed Values** | | | **IS 10500: 2012** | |
|---|---|---|---|---|---|---|---|
| | | | **GW2** | **Range Of Testing** | **LDL** | **Acceptable Limit (Max)*** | **Permissible Limit in the Absence of Alternate Source (Max)** |
| 1 | Colour, Hazen unit | APHA, 24th edition ,2120-c-Spectrophotometric Single Wavelength Method ,2023 | 2 | 1-500.0 | 1 | 5 | 15 |
| 2 | Calcium, mg/l | IS 3025, (Part 40): 1991 R:2019,AAS-Flame Method & EDTA Method | 114 | 2.0-800.0 | 2 | 75 | 200 |
| 3 | Chlorides, mg/l | IS-3025(Part 32):1988, R-2019 , Argentometric Method | 88 | 2.0-1500.0 | 5 | 250 | 1000 |
| 4 | Fluoride, mg/l | APHA, 24th Edition, SPADNS Method | 0.65 | 0.2-2.00 | 0.2 | 1 | 1.5 |
| 5 | Iron, mg/l | IS 3025 (Part 53) : 2003, R : 2019 , AAS-Flame Method | <0.2 | 0.2-10 | 0.2 | 1 | No relaxation |
| 6 | Magnesium | APHA 24th edition, 3500-Mg B: Calculation Method | 80 | 6.0-700 | 6 | 30 | 100 |
| 7 | Nitrate , mg/l | APHA, 24th edition, UV-Spectrophotometric Method | 22.24 | 0.5-45.0 | 0.5 | 45 | No relaxation |
| 8 | Odour | APHA, 23rd Edition, , 2150-C | Agreeable | Qualitative | Qualitative | Agreeable | Agreeable |
| 9 | pH value | IS 3025, Part 11 : 1983 R 2023 Electrometric( pH Meter) Method | 7.44 | 1-14 | 0.1 | 6.5-8.5 | No relaxation |
| 10 | Sulphate, mg/l | APHA –24th edition, 4500 S , Turbidity Method | 128 | 10.0-400.0 | 10 | 200 | 400 |
| 11 | Taste | APHA,24th edition, 2160-C | Acceptable | Qualitative | Qualitative | Acceptable | Agreeable |
| 12 | Total Alkalinity ($c_ac_{O3}$), mg/l, Max | IS 3025, Part 23: 1986 R 2019 Titration Method | 266 | 4.0-2000.0 | 4 | 200 | 600 |
| 13 | Total Dissolved Solids, mg/l | IS 3025, Part 16: 1984 R 2023 Gravimetric method | 782 | 25.0-5000.0 | 25 | 500 | 2000 |
| 14 | Total Hardness, mg/l | IS 3025, (Part 21): 2019 EDTA Method | 614 | 4.0-2000.0 | 4 | 200 | 600 |
| 15 | Turbidity, NTU | IS 3025, (Part 10):1984, R-2023 Nephelometric/Turbiditimetric Method | 1.8 | 1-800 | 0.1 | 1 | 5 |
| 16 | Zinc, mg/l | IS 3025(Part 49) : 1994,R:2019, AAS-Flame Method | <0.1 | 0.10 – 10.0 | 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,*

## PHYSICO-CHEMICAL CHARACTERISTICS OF GROUND WATER SAMPLES

*(Wherever not specified, characteristics are expressed in mg/l, maximum)*

*1. Ground Water Sampling at Monitoring Station Code : - B10, AMDIH NARAYANPUR*

**Date of Sampling at Station:** June 2024

| | | | | | |
|---|---|---|---|---|---|
| **Month & Year** | **June 2024** | **Dug Well No.** | **B10** | **ULR No.** | |
| **Customer** | **Environment Department, Bharat Coking Coal Limited (BCCL), Koyla Bhawan, Dhanbad (E-mail: gmenv.bccl@coalindia.in)** | | | **Date of Issue** | **19.09.2024** |
| **Project** | **Jharia Coalfield** | **Sample Ref. No.** | **RI-II/HYDROGEOLOGY/24-25/GW** | **Sampling Method** | **CMPDI/RI-II/LPM 13,(IS 3025:Part -1)** |
| **Sampling Stations** | **AMDIH NARAYANPUR** | **Date of Sampling** | | **Sample Collected in 5 Ltr Jerricane , Color as observed is transparent** | |
| | | | **Period of Analysis** | | **TO** |

| **Sl. No.** | **Parameter** | **Method of Analysis** | **Observed Values** | | | **IS 10500: 2012** | |
|---|---|---|---|---|---|---|---|
| | | | **GW8** | **Range Of Testing** | **LDL** | **Acceptable Limit (Max)*** | **Permissible Limit in the Absence of Alternate Source (Max)** |
| 1 | Colour, Hazen unit | APHA, 24th edition ,2120-c-Spectrophotometric Single Wavelength Method ,2023 | 2 | 1-500.0 | 1 | 5 | 15 |
| 2 | Calcium, mg/l | IS 3025, (Part 40): 1991 R:2019,AAS-Flame Method & EDTA Method | 132 | 2.0-800.0 | 2 | 75 | 200 |
| 3 | Chlorides, mg/l | IS-3025(Part 32):1988, R-2019 , Argentometric Method | 108 | 2.0-1500.0 | 5 | 250 | 1000 |
| 4 | Fluoride, mg/l | APHA, 24th Edition, SPADNS Method | 0.64 | 0.2-2.00 | 0.2 | 1 | 1.5 |
| 5 | Iron, mg/l | IS 3025 (Part 53) : 2003, R : 2019 , AAS-Flame Method | <0.2 | 0.2-10 | 0.2 | 1 | No relaxation |
| 6 | Magnesium | APHA 24th edition, 3500-Mg B: Calculation Method | 86 | 6.0-700 | 6 | 30 | 100 |
| 7 | Nitrate , mg/l | APHA, 24th edition, UV-Spectrophotometric Method | 28.35 | 0.5-45.0 | 0.5 | 45 | No relaxation |
| 8 | Odour | APHA, 23rd Edition, , 2150-C | Agreeable | Qualitative | Qualitative | Agreeable | Agreeable |
| 9 | pH value | IS 3025, Part 11 : 1983 R 2023 Electrometric( pH Meter) Method | 7.44 | 1-14 | 0.1 | 6.5-8.5 | No relaxation |
| 10 | Sulphate, mg/l | APHA –24th edition, 4500 S , Turbidity Method | 93 | 10.0-400.0 | 10 | 200 | 400 |
| 11 | Taste | APHA,24th edition, 2160-C | Acceptable | Qualitative | Qualitative | Acceptable | Agreeable |
| 12 | Total Alkalinity ($c_ac_{O_3}$), 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 2023 Gravimetric method | 854 | 25.0-5000.0 | 25 | 500 | 2000 |
| 14 | Total Hardness, mg/l | IS 3025, (Part 21): 2019 EDTA Method | 682 | 4.0-2000.0 | 4 | 200 | 600 |
| 15 | Turbidity, NTU | IS 3025, (Part 10):1984, R-2023 Nephelometric/Turbiditimetric Method | 1.8 | 1-800 | 0.1 | 1 | 5 |
| 16 | Zinc, mg/l | IS 3025(Part 49) : 1994,R:2019, AAS-Flame Method | <0.1 | 0.10 – 10.0 | 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,*

## PHYSICO-CHEMICAL CHARACTERISTICS OF GROUND WATER SAMPLES

*(Wherever not specified, characteristics are expressed in mg/l, maximum)*

*1. Ground Water Sampling at Monitoring Station Code : - B15, BERA VILLAGE*

**Date of Sampling at Station: June 2024**

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| **Month & Year** | **June 2024** | **Dug Well No.** | **B15** | | | **ULR No.** | |
| **Customer** | **Environment Department, Bharat Coking Coal Limited (BCCL), Koyla Bhawan, Dhanbad (E-mail: gmenv.bccl@coalindia.in)** | | | | | **Date of Issue** | **19.09.2024** |
| **Project** | **Jharia Coalfield** | | **Sample Ref. No.** | **RI-II/HYDROGEOLOGY/24-25/GW** | **Sampling Method** | **CMPDI/RI-II/LPM 13,(IS 3025:Part -1)** | |
| **Sampling Stations** | **BERA VILLAGE** | **Date of Sampling** | | **Sample Collected in 5 Ltr Jerricane , Color as observed is transparent** | | | |
| | | | **Period of Analysis** | | **to** | | |

| **Sl. No.** | **Parameter** | **Method of Analysis** | **Observed Values** | | | **IS 10500: 2012** | |
|---|---|---|---|---|---|---|---|
| | | | **GW9** | **Range Of Testing** | **LDL** | **Acceptable Limit (Max)*** | **Permissible Limit in the Absence of Alternate Source (Max)** |
| 1 | Colour, Hazen unit | APHA, 24th edition ,2120-c-Spectrophotometric Single Wavelength Method ,2023 | 1 | 1-500.0 | 1 | 5 | 15 |
| 2 | Calcium, mg/l | IS 3025, (Part 40): 1991 R:2019,AAS-Flame Method & EDTA Method | 144 | 2.0-800.0 | 2 | 75 | 200 |
| 3 | Chlorides, mg/l | IS-3025(Part 32):1988, R-2019 , Argentometric Method | 106 | 2.0-1500.0 | 5 | 250 | 1000 |
| 4 | Fluoride, mg/l | APHA, 24th Edition, SPADNS Method | 0.71 | 0.2-2.00 | 0.2 | 1 | 1.5 |
| 5 | Iron, mg/l | IS 3025 (Part 53) : 2003, R : 2019 , AAS-Flame Method | <0.2 | 0.2-10 | 0.2 | 1 | No relaxation |
| 6 | Magnesium | APHA 24th edition, 3500-Mg B: Calculation Method | 59 | 6.0-700 | 6 | 30 | 100 |
| 7 | Nitrate , mg/l | APHA, 24th edition, UV-Spectrophotometric Method | 18.49 | 0.5-45.0 | 0.5 | 45 | No relaxation |
| 8 | Odour | APHA, 23rd Edition, , 2150-C | Agreeable | Qualitative | Qualitative | Agreeable | Agreeable |
| 9 | pH value | IS 3025, Part 11 : 1983 R 2023 Electrometric( pH Meter) Method | 7.52 | 1-14 | 0.1 | 6.5-8.5 | No relaxation |
| 10 | Sulphate, mg/l | APHA –24th edition, 4500 S , Turbidity Method | 125 | 10.0-400.0 | 10 | 200 | 400 |
| 11 | Taste | APHA,24th edition, 2160-C | Acceptable | Qualitative | Qualitative | Acceptable | Agreeable |
| 12 | Total Alkalinity ($c_a co_3$), mg/l, Max | IS 3025, Part 23: 1986 R 2019 Titration Method | 265 | 4.0-2000.0 | 4 | 200 | 600 |
| 13 | Total Dissolved Solids, mg/l | IS 3025, Part 16: 1984 R 2023 Gravimetric method | 728 | 25.0-5000.0 | 25 | 500 | 2000 |
| 14 | Total Hardness, mg/l | IS 3025, (Part 21): 2019 EDTA Method | 604 | 4.0-2000.0 | 4 | 200 | 600 |
| 15 | Turbidity, NTU | IS 3025, (Part 10):1984, R-2023 Nephelometric/Turbiditimetric Method | 2.6 | 1-800 | 0.1 | 1 | 5 |
| 16 | Zinc, mg/l | IS 3025(Part 49) : 1994,R:2019, AAS-Flame Method | <0.1 | 0.10 – 10.0 | 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,*

## PHYSICO-CHEMICAL CHARACTERISTICS OF GROUND WATER SAMPLES

*(Wherever not specified, characteristics are expressed in mg/l, maximum)*

*1. Ground Water Sampling at Monitoring Station Code : - B19 , BHANDARIDIH*

**Date of Sampling at Station: June 2024**

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| **Month & Year** | **June 2024** | **Dug Well No.** | **B19** | | | **ULR No.** | |
| **Customer** | **Environment Department, Bharat Coking Coal Limited (BCCL), Koyla Bhawan, Dhanbad (E-mail: gmenv.bccl@coalindia.in)** | | | | | **Date of Issue** | **19.09.2024** |
| **Project** | **Jharia Coalfield** | | **Sample Ref. No.** | **RI-II/HYDROGEOLOGY/24-25/GW** | **Sampling Method** | **CMPDI/RI-II/LPM 13,(IS 3025:Part -1)** | |
| **Sampling Stations** | **BHANDARIDAH** | **Date of Sampling** | **06.05.2024** | **Sample Collected in 5 Ltr Jerricane , Color as observed is transparent** | | | |
| | | | **Period of Analysis** | | **to** | | |

| **Sl. No.** | **Parameter** | **Method of Analysis** | **Observed Values** | | | **IS 10500: 2012** | |
|---|---|---|---|---|---|---|---|
| | | | **GW10** | **Range Of Testing** | **LDL** | **Acceptable Limit (Max)*** | **Permissible Limit in the Absence of Alternate Source (Max)** |
| 1 | Colour, Hazen unit | APHA, 24th edition ,2120-c-Spectrophotometric Single Wavelength Method ,2023 | 2 | 1-500.0 | 1 | 5 | 15 |
| 2 | Calcium, mg/l | IS 3025, (Part 40): 1991 R:2019,AAS-Flame Method & EDTA Method | 136 | 2.0-800.0 | 2 | 75 | 200 |
| 3 | Chlorides, mg/l | IS-3025(Part 32):1988, R-2019 , Argentometric Method | 112 | 2.0-1500.0 | 5 | 250 | 1000 |
| 4 | Fluoride, mg/l | APHA, 24th Edition, SPADNS Method | 0.51 | 0.2-2.00 | 0.2 | 1 | 1.5 |
| 5 | Iron, mg/l | IS 3025 (Part 53) : 2003, R : 2019 , AAS-Flame Method | <0.2 | 0.2-10 | 0.2 | 1 | No relaxation |
| 6 | Magnesium | APHA 24th edition, 3500-Mg B: Calculation Method | 90 | 6.0-700 | 6 | 30 | 100 |
| 7 | Nitrate , mg/l | APHA, 24th edition, UV-Spectrophotometric Method | 17.17 | 0.5-45.0 | 0.5 | 45 | No relaxation |
| 8 | Odour | APHA, 23rd Edition, , 2150-C | Agreeable | Qualitative | Qualitative | Agreeable | Agreeable |
| 9 | pH value | IS 3025, Part 11 : 1983 R 2023 Electrometric( pH Meter) Method | 7.31 | 1-14 | 0.1 | 6.5-8.5 | No relaxation |
| 10 | Sulphate, mg/l | APHA –24th edition, 4500 S , Turbidity Method | 140 | 10.0-400.0 | 10 | 200 | 400 |
| 11 | Taste | APHA,24th edition, 2160-C | Acceptable | Qualitative | Qualitative | Acceptable | Agreeable |
| 12 | Total Alkalinity ($c_a co_3$), mg/l, Max | IS 3025, Part 23: 1986 R 2019 Titration Method | 242 | 4.0-2000.0 | 4 | 200 | 600 |
| 13 | Total Dissolved Solids, mg/l | IS 3025, Part 16: 1984 R 2023 Gravimetric method | 834 | 25.0-5000.0 | 25 | 500 | 2000 |
| 14 | Total Hardness, mg/l | IS 3025, (Part 21): 2019 EDTA Method | 712 | 4.0-2000.0 | 4 | 200 | 600 |
| 15 | Turbidity, NTU | IS 3025, (Part 10):1984, R-2023 Nephelometric/Turbiditimetric Method | 2.3 | 1-800 | 0.1 | 1 | 5 |
| 16 | Zinc, mg/l | IS 3025(Part 49) : 1994,R:2019, AAS-Flame Method | <0.1 | 0.10 – 10.0 | 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,*

## PHYSICO-CHEMICAL CHARACTERISTICS OF GROUND WATER SAMPLES

*(Wherever not specified, characteristics are expressed in mg/l, maximum)*

*1. Ground Water Sampling at Monitoring Station Code: - B23 , LOHAPATTI VILLAGE*

**Date of Sampling at Station: June 2024**

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| **Month & Year** | **June 2024** | **Dug Well No.** | **B23** | | | **ULR No.** | |
| **Customer** | **Environment Department, Bharat Coking Coal Limited (BCCL), Koyla Bhawan, Dhanbad (E-mail: gmenv.bccl@coalindia.in)** | | | | | **Date of Issue** | **19.09.2024** |
| **Project** | **Jharia Coalfield** | | **Sample Ref. No.** | **RI-II/HYDROGEOLOGY/24-25/GW/** | **Sampling Method** | **CMPDI/RI-II/LPM 13,(IS 3025:Part -1)** | |
| **Sampling Stations** | **LOHAPATTI VILLAGE** | **Date of Sampling** | | **Sample Collected in 5 Ltr Jerricane , Color as observed is transparent** | | | |
| | | | **Period of Analysis** | | **to** | | |

| **Sl. No.** | **Parameter** | **Method of Analysis** | **Observed Values** | | | **IS 10500: 2012** | |
|---|---|---|---|---|---|---|---|
| | | | **GW11** | **Range Of Testing** | **LDL** | **Acceptable Limit (Max)*** | **Permissible Limit in the Absence of Alternate Source (Max)** |
| 1 | Colour, Hazen unit | APHA, 24th edition ,2120-c-Spectrophotometric Single Wavelength Method ,2023 | 2 | 1-500.0 | 1 | 5 | 15 |
| 2 | Calcium, mg/l | IS 3025, (Part 40): 1991 R:2019,AAS-Flame Method & EDTA Method | 102 | 2.0-800.0 | 2 | 75 | 200 |
| 3 | Chlorides, mg/l | IS-3025(Part 32):1988, R-2019 , Argentometric Method | 116 | 2.0-1500.0 | 5 | 250 | 1000 |
| 4 | Fluoride, mg/l | APHA, 24th Edition, SPADNS Method | 0.78 | 0.2-2.00 | 0.2 | 1 | 1.5 |
| 5 | Iron, mg/l | IS 3025 (Part 53) : 2003, R : 2019 , AAS-Flame Method | <0.2 | 0.2-10 | 0.2 | 1 | No relaxation |
| 6 | Magnesium | APHA 24th edition, 3500-Mg B: Calculation Method | 66 | 6.0-700 | 6 | 30 | 100 |
| 7 | Nitrate , mg/l | APHA, 24th edition, UV-Spectrophotometric Method | 32.91 | 0.5-45.0 | 0.5 | 45 | No relaxation |
| 8 | Odour | APHA, 23rd Edition, , 2150-C | Agreeable | Qualitative | Qualitative | Agreeable | Agreeable |
| 9 | pH value | IS 3025, Part 11 : 1983 R 2023 Electrometric( pH Meter) Method | 7.85 | 1-14 | 0.1 | 6.5-8.5 | No relaxation |
| 10 | Sulphate, mg/l | APHA –24th edition, 4500 S , Turbidity Method | 119 | 10.0-400.0 | 10 | 200 | 400 |
| 11 | Taste | APHA,24th edition, 2160-C | Acceptable | Qualitative | Qualitative | Acceptable | Agreeable |
| 12 | Total Alkalinity ($c_a co_3$), mg/l, Max | IS 3025, Part 23: 1986 R 2019 Titration Method | 208 | 4.0-2000.0 | 4 | 200 | 600 |
| 13 | Total Dissolved Solids, mg/l | IS 3025, Part 16: 1984 R 2023 Gravimetric method | 642 | 25.0-5000.0 | 25 | 500 | 2000 |
| 14 | Total Hardness, mg/l | IS 3025, (Part 21): 2019 EDTA Method | 528 | 4.0-2000.0 | 4 | 200 | 600 |
| 15 | Turbidity, NTU | IS 3025, (Part 10):1984, R-2023 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 | 0.17 | 0.10 – 10.0 | 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,*

## PHYSICO-CHEMICAL CHARACTERISTICS OF GROUND WATER SAMPLES

*(Wherever not specified, characteristics are expressed in mg/l, maximum)*

*1. Ground Water Sampling at Monitoring Station Code : - B32, MADHUBANDAH*

**Date of Sampling at Station : June 2024**

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| **Month & Year** | **June 2024** | **Dug Well No.** | **B32** | | | **ULR No.** | |
| **Customer** | **Environment Department, Bharat Coking Coal Limited (BCCL), Koyla Bhawan, Dhanbad (E-mail: gmenv.bccl@coalindia.in)** | | | | | **Date of Issue** | **19.09.2024** |
| **Project** | **Jharia Coalfield** | | **Sample Ref. No.** | **RI-II/HYDROGEOLOGY/24-25/GW/** | **Sampling Method** | **CMPDI/RI-II/LPM 13,(IS 3025:Part -1)** | |
| **Sampling Stations** | **MADHUBNAD VILLAGE** | **Date of Sampling** | | | | | |
| | | | **Period of Analysis** | | **to** | | |

| **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, 24th edition ,2120-c-Spectrophotometric Single Wavelength Method ,2023 | 2 | 1-500.0 | 1 | 5 | 15 |
| 2 | Calcium, mg/l | IS 3025, (Part 40): 1991 R:2019,AAS-Flame Method & EDTA Method | 122 | 2.0-800.0 | 2 | 75 | 200 |
| 3 | Chlorides, mg/l | IS-3025(Part 32):1988, R-2019 , Argentometric Method | 96 | 2.0-1500.0 | 5 | 250 | 1000 |
| 4 | Fluoride, mg/l | APHA, 24th Edition, SPADNS Method | 0.67 | 0.2-2.00 | 0.2 | 1 | 1.5 |
| 5 | Iron, mg/l | IS 3025 (Part 53) : 2003, R : 2019 , AAS-Flame Method | 0.2 | 0.2-10 | 0.2 | 1 | No relaxation |
| 6 | Magnesium | APHA 24th edition, 3500-Mg B: Calculation Method | 80 | 6.0-700 | 6 | 30 | 100 |
| 7 | Nitrate , mg/l | APHA, 24th edition, UV-Spectrophotometric Method | 18.55 | 0.5-45.0 | 0.5 | 45 | No relaxation |
| 8 | Odour | APHA, 23rd Edition, , 2150-C | Agreeable | Qualitative | Qualitative | Agreeable | Agreeable |
| 9 | pH value | IS 3025, Part 11 : 1983 R 2023 Electrometric( pH Meter) Method | 7.41 | 1-14 | 0.1 | 6.5-8.5 | No relaxation |
| 10 | Sulphate, mg/l | APHA –24th edition, 4500 S , Turbidity Method | 151 | 10.0-400.0 | 10 | 200 | 400 |
| 11 | Taste | APHA,24th edition, 2160-C | Acceptable | Qualitative | Qualitative | Acceptable | Agreeable |
| 12 | Total Alkalinity ($c_ac_{o_3}$), mg/l, Max | IS 3025, Part 23: 1986 R 2019 Titration Method | 188 | 4.0-2000.0 | 4 | 200 | 600 |
| 13 | Total Dissolved Solids, mg/l | IS 3025, Part 16: 1984 R 2023 Gravimetric method | 816 | 25.0-5000.0 | 25 | 500 | 2000 |
| 14 | Total Hardness, mg/l | IS 3025, (Part 21): 2019 EDTA Method | 636 | 4.0-2000.0 | 4 | 200 | 600 |
| 15 | Turbidity, NTU | IS 3025, (Part 10):1984, R-2023 Nephelometric/Turbiditimetric Method | 2.1 | 1-800 | 0.1 | 1 | 5 |
| 16 | Zinc, mg/l | IS 3025(Part 49) : 1994,R:2019, AAS-Flame Method | 0.25 | 0.10 – 10.0 | 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,*

## PHYSICO-CHEMICAL CHARACTERISTICS OF GROUND WATER SAMPLES

*(Wherever not specified, characteristics are expressed in mg/l, maximum)*

*1. Ground Water Sampling at Monitoring Station Code : - B40 , BHUIANCHITRO*

**Date of Sampling at Station: June 2024**

| | | | | | |
|---|---|---|---|---|---|
| **Month & Year** | **June 2024** | **Dug Well No.** | **B40** | **ULR No.** | |
| **Customer** | **Environment Department, Bharat Coking Coal Limited (BCCL), Koyla Bhawan, Dhanbad (E-mail: gmenv.bccl@coalindia.in)** | | | **Date of Issue** | **19.09.2024** |
| **Project** | **Jharia Coalfield** | **Sample Ref. No.** | **RI-II/HYDROGEOLOGY/24-25/GW/** | **Sampling Method** | **CMPDI/RI-II/LPM 13,(IS 3025:Part -1)** |
| **Sampling Stations** | **BHUIANCHITRO** | **Date of Sampling** | | **Sample Collected in 5 Ltr Jerricane , Color as observed is transparent** | |
| | | | **Period of Analysis** | | **to** |

| **Sl. No.** | **Parameter** | **Method of Analysis** | **Observed Values** | | | **IS 10500: 2012** | |
|---|---|---|---|---|---|---|---|
| | | | **GW13** | **Range Of Testing** | **LDL** | **Acceptable Limit (Max)*** | **Permissible Limit in the Absence of Alternate Source (Max)** |
| 1 | Colour, Hazen unit | APHA, 24th edition ,2120-c-Spectrophotometric Single Wavelength Method ,2023 | 1 | 1-500.0 | 1 | 5 | 15 |
| 2 | Calcium, mg/l | IS 3025, (Part 40): 1991 R:2019,AAS-Flame Method & EDTA Method | 144 | 2.0-800.0 | 2 | 75 | 200 |
| 3 | Chlorides, mg/l | IS-3025(Part 32):1988, R-2019 , Argentometric Method | 104 | 2.0-1500.0 | 5 | 250 | 1000 |
| 4 | Fluoride, mg/l | APHA, 24th Edition, SPADNS Method | 0.81 | 0.2-2.00 | 0.2 | 1 | 1.5 |
| 5 | Iron, mg/l | IS 3025 (Part 53) : 2003, R : 2019 , AAS-Flame Method | <0.2 | 0.2-10 | 0.2 | 1 | No relaxation |
| 6 | Magnesium | APHA 24th edition, 3500-Mg B: Calculation Method | 92 | 6.0-700 | 6 | 30 | 100 |
| 7 | Nitrate , mg/l | APHA, 24th edition, UV-Spectrophotometric Method | 28.13 | 0.5-45.0 | 0.5 | 45 | No relaxation |
| 8 | Odour | APHA, 23rd Edition, , 2150-C | Agreeable | Qualitative | Qualitative | Agreeable | Agreeable |
| 9 | pH value | IS 3025, Part 11 : 1983 R 2023 Electrometric( pH Meter) Method | 7.38 | 1-14 | 0.1 | 6.5-8.5 | No relaxation |
| 10 | Sulphate, mg/l | APHA –24th edition, 4500 S , Turbidity Method | 181 | 10.0-400.0 | 10 | 200 | 400 |
| 11 | Taste | APHA,24th edition, 2160-C | Acceptable | Qualitative | Qualitative | Acceptable | Agreeable |
| 12 | Total Alkalinity ($c_ac_{o_3}$), mg/l, Max | IS 3025, Part 23: 1986 R 2019 Titration Method | 256 | 4.0-2000.0 | 4 | 200 | 600 |
| 13 | Total Dissolved Solids, mg/l | IS 3025, Part 16: 1984 R 2023 Gravimetric method | 946 | 25.0-5000.0 | 25 | 500 | 2000 |
| 14 | Total Hardness, mg/l | IS 3025, (Part 21): 2019 EDTA Method | 738 | 4.0-2000.0 | 4 | 200 | 600 |
| 15 | Turbidity, NTU | IS 3025, (Part 10):1984, R-2023 Nephelometric/Turbiditimetric Method | 2.5 | 1-800 | 0.1 | 1 | 5 |
| 16 | Zinc, mg/l | IS 3025(Part 49) : 1994,R:2019, AAS-Flame Method | <0.1 | 0.10 – 10.0 | 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,*

## PHYSICO-CHEMICAL CHARACTERISTICS OF GROUND WATER SAMPLES

*(Wherever not specified, characteristics are expressed in mg/l, maximum)*

1. *Ground Water Sampling at Monitoring Station Code : - B46 , TELO*

**Date of Sampling at Station: June 2024**

| | | | | | |
|---|---|---|---|---|---|
| **Month & Year** | **June 2024** | **Dug Well No.** | **B46** | **ULR No.** | |
| **Customer** | **Environment Department, Bharat Coking Coal Limited (BCCL), Koyla Bhawan, Dhanbad (E-mail: gmenv.bccl@coalindia.in)** | | | **Date of Issue** | **19.09.2024** |
| **Project** | **Jharia Coalfield** | **Sample Ref. No.** | **RI-II/HYDROGEOLOGY/24-25/GW/** | **Sampling Method** | **CMPDI/RI-II/LPM 13,(IS 3025:Part -1)** |
| **Sampling Stations** | **TELO** | **Date of Sampling** | | **Sample Collected in 5 Ltr Jerricane , Color as observed is transparent** | |
| | | | **Period of Analysis** | | **to** |

| **Sl. No.** | **Parameter** | **Method of Analysis** | **Observed Values** | | | **IS 10500: 2012** | |
|---|---|---|---|---|---|---|---|
| | | | **GW14** | **Range Of Testing** | **LDL** | **Acceptable Limit (Max)*** | **Permissible Limit in the Absence of Alternate Source (Max)** |
| 1 | Colour, Hazen unit | APHA, 24th edition ,2120-c-Spectrophotometric Single Wavelength Method ,2023 | 1 | 1-500.0 | 1 | 5 | 15 |
| 2 | Calcium, mg/l | IS 3025, (Part 40): 1991 R:2019,AAS-Flame Method & EDTA Method | 72 | 2.0-800.0 | 2 | 75 | 200 |
| 3 | Chlorides, mg/l | IS-3025(Part 32):1988, R-2019 , Argentometric Method | 135 | 2.0-1500.0 | 5 | 250 | 1000 |
| 4 | Fluoride, mg/l | APHA, 24th Edition, SPADNS Method | 0.59 | 0.2-2.00 | 0.2 | 1 | 1.5 |
| 5 | Iron, mg/l | IS 3025 (Part 53) : 2003, R : 2019 , AAS-Flame Method | <0.2 | 0.2-10 | 0.2 | 1 | No relaxation |
| 6 | Magnesium | APHA 24th edition, 3500-Mg B: Calculation Method | 80 | 6.0-700 | 6 | 30 | 100 |
| 7 | Nitrate , mg/l | APHA, 24th edition, UV-Spectrophotometric Method | 11.46 | 0.5-45.0 | 0.5 | 45 | No relaxation |
| 8 | Odour | APHA, 23rd Edition, , 2150-C | Agreeable | Qualitative | Qualitative | Agreeable | Agreeable |
| 9 | pH value | IS 3025, Part 11 : 1983 R 2023 Electrometric( pH Meter) Method | 7.56 | 1-14 | 0.1 | 6.5-8.5 | No relaxation |
| 10 | Sulphate, mg/l | APHA –24th edition, 4500 S , Turbidity Method | 96 | 10.0-400.0 | 10 | 200 | 400 |
| 11 | Taste | APHA,24th edition, 2160-C | Acceptable | Qualitative | Qualitative | Acceptable | Agreeable |
| 12 | Total Alkalinity ($c_ac_{O_3}$), mg/l, Max | IS 3025, Part 23: 1986 R 2019 Titration Method | 222 | 4.0-2000.0 | 4 | 200 | 600 |
| 13 | Total Dissolved Solids, mg/l | IS 3025, Part 16: 1984 R 2023 Gravimetric method | 652 | 25.0-5000.0 | 25 | 500 | 2000 |
| 14 | Total Hardness, mg/l | IS 3025, (Part 21): 2019 EDTA Method | 508 | 4.0-2000.0 | 4 | 200 | 600 |
| 15 | Turbidity, NTU | IS 3025, (Part 10):1984, R-2023 Nephelometric/Turbiditimetric Method | 2.0 | 1-800 | 0.1 | 1 | 5 |
| 16 | Zinc, mg/l | IS 3025(Part 49) : 1994,R:2019, AAS-Flame Method | 0.1 | 0.10 – 10.0 | 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,*

## PHYSICO-CHEMICAL CHARACTERISTICS OF GROUND WATER SAMPLES

*(Wherever not specified, characteristics are expressed in mg/l, maximum)*

*1. Ground Water Sampling at Monitoring Station Code : -B55 , RANTANR VILLAGE*

**Date of Sampling at Station: June 2024**

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| **Month & Year** | **June 2024** | **Dug Well No.** | **B55** | | | **ULR No.** | |
| **Customer** | **Environment Department, Bharat Coking Coal Limited (BCCL), Koyla Bhawan, Dhanbad (E-mail: gmenv.bccl@coalindia.in)** | | | | | **Date of Issue** | **19.09.2024** |
| **Project** | **Jharia Coalfield** | **Sample Ref. No.** | **RI-II/HYDROGEOLOGY/24-25/GW/** | | **Sampling Method** | **CMPDI/RI-II/LPM 13,(IS 3025:Part -1)** | |
| **Sampling Stations** | **RANTANR VILLAGE** | **Date of Sampling** | | **Sample Collected in 5 Ltr Jerricane , Color as observed is transparent** | | | |
| | | | **Period of Analysis** | | | **to** | |

| **Sl. No.** | **Parameter** | **Method of Analysis** | **Observed Values** | | | **IS 10500: 2012** | |
|---|---|---|---|---|---|---|---|
| | | | **GW15** | **Range Of Testing** | **LDL** | **Acceptable Limit (Max)*** | **Permissible Limit in the Absence of Alternate Source (Max)** |
| 1 | Colour, Hazen unit | APHA, 24th edition ,2120-c-Spectrophotometric Single Wavelength Method ,2023 | 1 | 1-500.0 | 1 | 5 | 15 |
| 2 | Calcium, mg/l | IS 3025, (Part 40): 1991 R:2019,AAS-Flame Method & EDTA Method | 110 | 2.0-800.0 | 2 | 75 | 200 |
| 3 | Chlorides, mg/l | IS-3025(Part 32):1988, R-2019 , Argentometric Method | 96 | 2.0-1500.0 | 5 | 250 | 1000 |
| 4 | Fluoride, mg/l | APHA, 24th Edition, SPADNS Method | 0.69 | 0.2-2.00 | 0.2 | 1 | 1.5 |
| 5 | Iron, mg/l | IS 3025 (Part 53) : 2003, R : 2019 , AAS-Flame Method | <0.2 | 0.2-10 | 0.2 | 1 | No relaxation |
| 6 | Magnesium | APHA 24th edition, 3500-Mg B: Calculation Method | 70 | 6.0-700 | 6 | 30 | 100 |
| 7 | Nitrate , mg/l | APHA, 24th edition, UV-Spectrophotometric Method | 27.68 | 0.5-45.0 | 0.5 | 45 | No relaxation |
| 8 | Odour | APHA, 23rd Edition, , 2150-C | Agreeable | Qualitative | Qualitative | Agreeable | Agreeable |
| 9 | pH value | IS 3025, Part 11 : 1983 R 2023 Electrometric( pH Meter) Method | 7.44 | 1-14 | 0.1 | 6.5-8.5 | No relaxation |
| 10 | Sulphate, mg/l | APHA –24th edition, 4500 S , Turbidity Method | 122 | 10.0-400.0 | 10 | 200 | 400 |
| 11 | Taste | APHA,24th edition, 2160-C | Acceptable | Qualitative | Qualitative | Acceptable | Agreeable |
| 12 | Total Alkalinity ($c_aco_3$), mg/l, Max | IS 3025, Part 23: 1986 R 2019 Titration Method | 258 | 4.0-2000.0 | 4 | 200 | 600 |
| 13 | Total Dissolved Solids, mg/l | IS 3025, Part 16: 1984 R 2023 Gravimetric method | 712 | 25.0-5000.0 | 25 | 500 | 2000 |
| 14 | Total Hardness, mg/l | IS 3025, (Part 21): 2019 EDTA Method | 566 | 4.0-2000.0 | 4 | 200 | 600 |
| 15 | Turbidity, NTU | IS 3025, (Part 10):1984, R-2023 Nephelometric/Turbiditimetric Method | 2.8 | 1-800 | 0.1 | 1 | 5 |
| 16 | Zinc, mg/l | IS 3025(Part 49) : 1994,R:2019, AAS-Flame Method | <0.1 | 0.10 – 10.0 | 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,*

## PHYSICO-CHEMICAL CHARACTERISTICS OF GROUND WATER SAMPLES

*(Wherever not specified, characteristics are expressed in mg/l, maximum)*

*1. Ground Water Sampling at Monitoring Station Code : - B59, KHODOVALY VILLAGE*

**Date of Sampling at Station: June 2024**

| | | | | | |
|---|---|---|---|---|---|
| **Month & Year** | **June 2024** | **Dug Well No.** | **B59** | **ULR No.** | |
| **Customer** | **Environment Department, Bharat Coking Coal Limited (BCCL), Koyla Bhawan, Dhanbad (E-mail: gmenv.bccl@coalindia.in)** | | | **Date of Issue** | **19.09.2024** |
| **Project** | **Jharia Coalfield** | **Sample Ref. No.** | **RI-II/HYDROGEOLOGY/24-25/GW/** | **Sampling Method** | **CMPDI/RI-II/LPM 13,(IS 3025:Part -1)** |
| **Sampling Stations** | **KHODOVALY** | **Date of Sampling** | | **Sample Collected in 5 Ltr Jerricane , Color as observed is transparent** | |
| | | | **Period of Analysis** | | **to** |

| **Sl. No.** | **Parameter** | **Method of Analysis** | **Observed Values** | | | **IS 10500: 2012** | |
|---|---|---|---|---|---|---|---|
| | | | **GW16** | **Range Of Testing** | **LDL** | **Acceptable Limit (Max)*** | **Permissible Limit in the Absence of Alternate Source (Max)** |
| 1 | Colour, Hazen unit | APHA, 24th edition ,2120-c-Spectrophotometric Single Wavelength Method ,2023 | 2 | 1-500.0 | 1 | 5 | 15 |
| 2 | Calcium, mg/l | IS 3025, (Part 40): 1991 R:2019,AAS-Flame Method & EDTA Method | 116 | 2.0-800.0 | 2 | 75 | 200 |
| 3 | Chlorides, mg/l | IS-3025(Part 32):1988, R-2019 , Argentometric Method | 128 | 2.0-1500.0 | 5 | 250 | 1000 |
| 4 | Fluoride, mg/l | APHA, 24th Edition, SPADNS Method | 0.74 | 0.2-2.00 | 0.2 | 1 | 1.5 |
| 5 | Iron, mg/l | IS 3025 (Part 53) : 2003, R : 2019 , AAS-Flame Method | <0.2 | 0.2-10 | 0.2 | 1 | No relaxation |
| 6 | Magnesium | APHA 24th edition, 3500-Mg B: Calculation Method | 95 | 6.0-700 | 6 | 30 | 100 |
| 7 | Nitrate , mg/l | APHA, 24th edition, UV-Spectrophotometric Method | 19.28 | 0.5-45.0 | 0.5 | 45 | No relaxation |
| 8 | Odour | APHA, 23rd Edition, , 2150-C | Agreeable | Qualitative | Qualitative | Agreeable | Agreeable |
| 9 | pH value | IS 3025, Part 11 : 1983 R 2023 Electrometric( pH Meter) Method | 7.72 | 1-14 | 0.1 | 6.5-8.5 | No relaxation |
| 10 | Sulphate, mg/l | APHA –24th edition, 4500 S , Turbidity Method | 103 | 10.0-400.0 | 10 | 200 | 400 |
| 11 | Taste | APHA,24th edition, 2160-C | Acceptable | Qualitative | Qualitative | Acceptable | Agreeable |
| 12 | Total Alkalinity ($c_ac_{o_3}$), mg/l, Max | IS 3025, Part 23: 1986 R 2019 Titration Method | 268 | 4.0-2000.0 | 4 | 200 | 600 |
| 13 | Total Dissolved Solids, mg/l | IS 3025, Part 16: 1984 R 2023 Gravimetric method | 906 | 25.0-5000.0 | 25 | 500 | 2000 |
| 14 | Total Hardness, mg/l | IS 3025, (Part 21): 2019 EDTA Method | 682 | 4.0-2000.0 | 4 | 200 | 600 |
| 15 | Turbidity, NTU | IS 3025, (Part 10):1984, R-2023 Nephelometric/Turbiditimetric Method | 3.0 | 1-800 | 0.1 | 1 | 5 |
| 16 | Zinc, mg/l | IS 3025(Part 49) : 1994,R:2019, AAS-Flame Method | <0.1 | 0.10 – 10.0 | 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,*

## PHYSICO-CHEMICAL CHARACTERISTICS OF GROUND WATER SAMPLES

*(Wherever not specified, characteristics are expressed in mg/l, maximum)*

*Ground Water Sampling at Monitoring Station Code : - B64 , KESHALPUR,BATIGHAR*

**Date of Sampling at Station: June 2024**

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| **Month & Year** | **June 2024** | **Dug Well No.** | **B64** | | | **ULR No.** | |
| **Customer** | **Environment Department, Bharat Coking Coal Limited (BCCL), Koyla Bhawan, Dhanbad (E-mail: gmenv.bccl@coalindia.in)** | | | | | **Date of Issue** | **19.09.2024** |
| **Project** | **Jharia Coalfield** | | **Sample Ref. No.** | **RI-II/HYDROGEOLOGY/24-25/GW/** | **Sampling Method** | **CMPDI/RI-II/LPM 13,(IS 3025:Part -1)** | |
| **Sampling Stations** | **KESHALPUR , BATIGHAR** | **Date of Sampling** | | **Sample Collected in 5 Ltr Jerricane , Color as observed is transparent** | | | |
| | | | **Period of Analysis** | | **to** | | |

| **Sl. No.** | **Parameter** | **Method of Analysis** | **Observed Values** | | | **IS 10500: 2012** | |
|---|---|---|---|---|---|---|---|
| | | | **GW17** | **Range Of Testing** | **LDL** | **Acceptable Limit (Max)*** | **Permissible Limit in the Absence of Alternate Source (Max)** |
| 1 | Colour, Hazen unit | APHA, 24th edition ,2120-c-Spectrophotometric Single Wavelength Method ,2023 | 3 | 1-500.0 | 1 | 5 | 15 |
| 2 | Calcium, mg/l | IS 3025, (Part 40): 1991 R:2019,AAS-Flame Method & EDTA Method | 96 | 2.0-800.0 | 2 | 75 | 200 |
| 4 | Chlorides, mg/l | IS-3025(Part 32):1988, R-2019 , Argentometric Method | 118 | 2.0-1500.0 | 5 | 250 | 1000 |
| 5 | Fluoride, mg/l | APHA, 24th Edition, SPADNS Method | 0.68 | 0.2-2.00 | 0.2 | 1 | 1.5 |
| 6 | Iron, mg/l | IS 3025 (Part 53) : 2003, R : 2019 , AAS-Flame Method | <0.2 | 0.2-10 | 0.2 | 1 | No relaxation |
| 7 | Magnesium | APHA 24th edition, 3500-Mg B: Calculation Method | 83 | 6.0-700 | 6 | 30 | 100 |
| 8 | Nitrate , mg/l | APHA, 24th edition, UV-Spectrophotometric Method | 17.88 | 0.5-45.0 | 0.5 | 45 | No relaxation |
| 9 | Odour | APHA, 23rd Edition, , 2150-C | Agreeable | Qualitative | Qualitative | Agreeable | Agreeable |
| 10 | pH value | IS 3025, Part 11 : 1983 R 2023 Electrometric( pH Meter) Method | 7.63 | 1-14 | 0.1 | 6.5-8.5 | No relaxation |
| 11 | Sulphate, mg/l | APHA –24th edition, 4500 S , Turbidity Method | 109 | 10.0-400.0 | 10 | 200 | 400 |
| 12 | Taste | APHA,24th edition, 2160-C | Acceptable | Qualitative | Qualitative | Acceptable | Agreeable |
| 13 | Total Alkalinity ($c_ac_{03}$), mg/l, Max | IS 3025, Part 23: 1986 R 2019 Titration Method | 244 | 4.0-2000.0 | 4 | 200 | 600 |
| 14 | Total Dissolved Solids, mg/l | IS 3025, Part 16: 1984 R 2023 Gravimetric method | 728 | 25.0-5000.0 | 25 | 500 | 2000 |
| 15 | Total Hardness, mg/l | IS 3025, (Part 21): 2019 EDTA Method | 582 | 4.0-2000.0 | 4 | 200 | 600 |
| 16 | Turbidity, NTU | IS 3025, (Part 10):1984, R-2023 Nephelometric/Turbiditimetric Method | 2.8 | 1-800 | 0.1 | 1 | 5 |
| 17 | Zinc, mg/l | IS 3025(Part 49) : 1994,R:2019, AAS-Flame Method | 0.19 | 0.10 – 10.0 | 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,*

## PHYSICO-CHEMICAL CHARACTERISTICS OF GROUND WATER SAMPLES

*(Wherever not specified, characteristics are expressed in mg/l, maximum)*

*1. Ground Water Sampling at Monitoring Station Code : - D107, BOGULA*

**Date of Sampling at Station: June 2024**

| | | | | | |
|---|---|---|---|---|---|
| **Month & Year** | **June 2024** | **Dug Well No.** | **D107** | **ULR No.** | |
| **Customer** | **Environment Department, Bharat Coking Coal Limited (BCCL), Koyla Bhawan, Dhanbad (E-mail: gmenv.bccl@coalindia.in)** | | | **Date of Issue** | **19.09.2024** |
| **Project** | **Jharia Coalfield** | **Sample Ref. No.** | **RI-II/HYDROGEOLOGY/24-25/GW/** | **Sampling Method** | **CMPDI/RI-II/LPM 13,(IS 3025:Part -1)** |
| **Sampling Stations** | **BOGULA** | **Date of Sampling** | | **Sample Collected in 5 Ltr Jerricane , Color as observed is transparent** | |
| | | | **Period of Analysis** | | **to** |

| **Sl. No.** | **Parameter** | **Method of Analysis** | **Observed Values** | | | **IS 10500: 2012** | |
|---|---|---|---|---|---|---|---|
| | | | **GW33** | **Range Of Testing** | **LDL** | **Acceptable Limit (Max)*** | **Permissible Limit in the Absence of Alternate Source (Max)** |
| 1 | Colour, Hazen unit | APHA, 24th edition ,2120-c-Spectrophotometric Single Wavelength Method ,2023 | 4 | 1-500.0 | 1 | 5 | 15 |
| 2 | Calcium, mg/l | IS 3025, (Part 40): 1991 R:2019,AAS-Flame Method & EDTA Method | 112 | 2.0-800.0 | 2 | 75 | 200 |
| 3 | Chlorides, mg/l | IS-3025(Part 32):1988, R-2019 , Argentometric Method | 128 | 2.0-1500.0 | 5 | 250 | 1000 |
| 4 | Fluoride, mg/l | APHA, 24th Edition, SPADNS Method | 0.61 | 0.2-2.00 | 0.2 | 1 | 1.5 |
| 5 | Iron, mg/l | IS 3025 (Part 53) : 2003, R : 2019 , AAS-Flame Method | <0.2 | 0.2-10 | 0.2 | 1 | No relaxation |
| 6 | Magnesium | APHA 24th edition, 3500-Mg B: Calculation Method | 88 | 6.0-700 | 6 | 30 | 100 |
| 7 | Nitrate , mg/l | APHA, 24th edition, UV-Spectrophotometric Method | 39.28 | 0.5-45.0 | 0.5 | 45 | No relaxation |
| 8 | Odour | APHA, 23rd Edition, , 2150-C | Agreeable | Qualitative | Qualitative | Agreeable | Agreeable |
| 9 | pH value | IS 3025, Part 11 : 1983 R 2023 Electrometric( pH Meter) Method | 7.72 | 1-14 | 0.1 | 6.5-8.5 | No relaxation |
| 10 | Sulphate, mg/l | APHA –24th edition, 4500 S , Turbidity Method | 178 | 10.0-400.0 | 10 | 200 | 400 |
| 11 | Taste | APHA,24th edition, 2160-C | Acceptable | Qualitative | Qualitative | Acceptable | Agreeable |
| 12 | Total Alkalinity ($c_ac_{o_3}$), mg/l, Max | IS 3025, Part 23: 1986 R 2019 Titration Method | 275 | 4.0-2000.0 | 4 | 200 | 600 |
| 13 | Total Dissolved Solids, mg/l | IS 3025, Part 16: 1984 R 2023 Gravimetric method | 808 | 25.0-5000.0 | 25 | 500 | 2000 |
| 14 | Total Hardness, mg/l | IS 3025, (Part 21): 2019 EDTA Method | 642 | 4.0-2000.0 | 4 | 200 | 600 |
| 15 | Turbidity, NTU | IS 3025, (Part 10):1984, R-2023 Nephelometric/Turbiditimetric Method | 3.0 | 1-800 | 0.1 | 1 | 5 |
| 16 | Zinc, mg/l | IS 3025(Part 49) : 1994,R:2019, AAS-Flame Method | <0.1 | 0.10 – 10.0 | 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,*

## PHYSICO-CHEMICAL CHARACTERISTICS OF GROUND WATER SAMPLES

*(Wherever not specified, characteristics are expressed in mg/l, maximum)*

*1. Ground Water Sampling at Monitoring Station Code : - D112, DEMUDI(DOMATANR)*

**Date of Sampling at Station: June 2024**

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| **Month & Year** | **June 2024** | **Dug Well No.** | **D112** | | | **ULR No.** | |
| **Customer** | **Environment Department, Bharat Coking Coal Limited (BCCL), Koyla Bhawan, Dhanbad (E-mail: gmenv.bccl@coalindia.in)** | | | | | **Date of Issue** | **19.09.2024** |
| **Project** | **Jharia Coalfield** | | **Sample Ref. No.** | **RI-II/HYDROGEOLOGY/24-25/GW/** | **Sampling Method** | **CMPDI/RI-II/LPM 13,(IS 3025:Part -1)** | |
| **Sampling Stations** | **DEMUDI(DOMATANR)** | **Date of Sampling** | | **Sample Collected in 5 Ltr Jerricane , Color as observed is transparent** | | | |
| | | | **Period of Analysis** | | | **to** | |

| **Sl. No.** | **Parameter** | **Method of Analysis** | **Observed Values** | | | **IS 10500: 2012** | |
|---|---|---|---|---|---|---|---|
| | | | **GW34** | **Range Of Testing** | **LDL** | **Acceptable Limit (Max)*** | **Permissible Limit in the Absence of Alternate Source (Max)** |
| 1 | Colour, Hazen unit | APHA, 24th edition ,2120-c-Spectrophotometric Single Wavelength Method ,2023 | 2 | 1-500.0 | 1 | 5 | 15 |
| 2 | Calcium, mg/l | IS 3025, (Part 40): 1991 R:2019,AAS-Flame Method & EDTA Method | 86 | 2.0-800.0 | 2 | 75 | 200 |
| 4 | Chlorides, mg/l | IS-3025(Part 32):1988, R-2019 , Argentometric Method | 136 | 2.0-1500.0 | 5 | 250 | 1000 |
| 5 | Fluoride, mg/l | APHA, 24th Edition, SPADNS Method | 0.82 | 0.2-2.00 | 0.2 | 1 | 1.5 |
| 6 | Iron, mg/l | IS 3025 (Part 53) : 2003, R : 2019 , AAS-Flame Method | <0.2 | 0.2-10 | 0.2 | 1 | No relaxation |
| 7 | Magnesium | APHA 24th edition, 3500-Mg B: Calculation Method | 69 | 6.0-700 | 6 | 30 | 100 |
| 8 | Nitrate , mg/l | APHA, 24th edition, UV-Spectrophotometric Method | 27.88 | 0.5-45.0 | 0.5 | 45 | No relaxation |
| 9 | Odour | APHA, 23rd Edition, , 2150-C | Agreeable | Qualitative | Qualitative | Agreeable | Agreeable |
| 10 | pH value | IS 3025, Part 11 : 1983 R 2023 Electrometric( pH Meter) Method | 7.63 | 1-14 | 0.1 | 6.5-8.5 | No relaxation |
| 11 | Sulphate, mg/l | APHA –24th edition, 4500 S , Turbidity Method | 119 | 10.0-400.0 | 10 | 200 | 400 |
| 12 | Taste | APHA,24th edition, 2160-C | Acceptable | Qualitative | Qualitative | Acceptable | Agreeable |
| 13 | Total Alkalinity ($c_ac_{O3}$), mg/l, Max | IS 3025, Part 23: 1986 R 2019 Titration Method | 210 | 4.0-2000.0 | 4 | 200 | 600 |
| 14 | Total Dissolved Solids, mg/l | IS 3025, Part 16: 1984 R 2023 Gravimetric method | 634 | 25.0-5000.0 | 25 | 500 | 2000 |
| 15 | Total Hardness, mg/l | IS 3025, (Part 21): 2019 EDTA Method | 498 | 4.0-2000.0 | 4 | 200 | 600 |
| 16 | Turbidity, NTU | IS 3025, (Part 10):1984, R-2023 Nephelometric/Turbiditimetric Method | 2.8 | 1-800 | 0.1 | 1 | 5 |
| 17 | Zinc, mg/l | IS 3025(Part 49) : 1994,R:2019, AAS-Flame Method | 0.1 | 0.10 – 10.0 | 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,*

## PHYSICO-CHEMICAL CHARACTERISTICS OF GROUND WATER SAMPLES

*(Wherever not specified, characteristics are expressed in mg/l, maximum)*

*1. Ground Water Sampling at Monitoring Station Code : - D115 , TELMUCHU*

**Date of Sampling at Station: June 2024**

| | | | | | | |
|---|---|---|---|---|---|---|
| **Month & Year** | **June 2024** | **Dug Well No.** | **D115** | | **ULR No.** | |
| **Customer** | **Environment Department, Bharat Coking Coal Limited (BCCL), Koyla Bhawan, Dhanbad (E-mail: gmenv.bccl@coalindia.in)** | | | | **Date of Issue** | **19.09.2024** |
| **Project** | **Jharia Coalfield** | **Sample Ref. No.** | **RI-II/HYDROGEOLOGY/24-25/GW** | **Sampling Method** | **CMPDI/RI-II/LPM 13,(IS 3025:Part -1)** | |
| **Sampling Stations** | **TELMUCHU** | **Date of Sampling** | | **Sample Collected in 5 Ltr Jerricane , Color as observed is transparent** | | |
| | | | **Period of Analysis** | | **TO** | |

| **Sl. No.** | **Parameter** | **Method of Analysis** | **Observed Values** | | | **IS 10500: 2012** | |
|---|---|---|---|---|---|---|---|
| | | | **GW35** | **Range Of Testing** | **LDL** | **Acceptable Limit (Max)*** | **Permissible Limit in the Absence of Alternate Source (Max)** |
| | Colour, Hazen unit | APHA, 24th Edition ,2120-c-Spectrophotometric Single Wavelength Method ,2023 | 3 | 1-500.0 | 1 | 5 | 15 |
| 2 | Calcium, mg/l | IS 3025, (Part 40): 1991 R:2019,AAS-Flame Method & EDTA Method | 106 | 2.0-800.0 | 2 | 75 | 200 |
| 3 | Chlorides, mg/l | IS-3025(Part 32):1988, R-2019 , Argentometric Method | 124 | 2.0-1500.0 | 5 | 250 | 1000 |
| 4 | Fluoride, mg/l | APHA, 24th Edition, SPADNS Method,2023 | 0.73 | 0.2-2.00 | 0.2 | 1 | 1.5 |
| 5 | Iron, mg/l | IS 3025 (Part 53) : 2003, R : 2019 , AAS-Flame Method | 0.26 | 0.2-10 | 0.2 | 1 | No relaxation |
| 6 | Magnesium | APHA 24th Edition, 3500-Mg B: Calculation Method,2023 | 97 | 6.0-700 | 6 | 30 | 100 |
| 7 | Nitrate , mg/l | APHA, 24th Edition, UV-Spectrophotometric Method,2023 | 29.58 | 0.5-45.0 | 0.5 | 45 | No relaxation |
| 8 | Odour | APHA, 24th Edition, , 2150-C,2023 | Agreeable | Qualitative | Qualitative | Agreeable | Agreeable |
| 9 | pH value | IS 3025, Part 11 : 1983 R 2023 Electrometric( pH Meter) Method | 7.56 | 1-14 | 0.1 | 6.5-8.5 | No relaxation |
| 10 | Sulphate, mg/l | APHA –24th Edition, 4500 S , Turbidity Method,2023 | 159 | 10.0-400.0 | 10 | 200 | 400 |
| 11 | Taste | APHA,24th Edition, 2160-C , 2023 | Acceptable | Qualitative | Qualitative | Acceptable | Agreeable |
| 12 | Total Alkalinity ($c_a co_3$), mg/l, Max | IS 3025, Part 23: 1986 R 2019 Titration Method | 236 | 4.0-2000.0 | 4 | 200 | 600 |
| 13 | Total Dissolved Solids, mg/l | IS 3025, Part 16: 1984 R 2023 Gravimetric method | 837 | 25.0-5000.0 | 25 | 500 | 2000 |
| 14 | Total Hardness, mg/l | IS 3025, (Part 21): 2019 EDTA Method | 665 | 4.0-2000.0 | 4 | 200 | 600 |
| 15 | Turbidity, NTU | IS 3025, (Part 10):1984, R-2023 Nephelometric/Turbiditimetric Method | 2.1 | 1-800 | 0.1 | 1 | 5 |
| 16 | Zinc, mg/l | IS 3025(Part 49) : 1994,R:2019, AAS-Flame Method | <0.1 | 0.10 – 10.0 | 0.1 | 5 | 15 |

*17***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,*

## PHYSICO-CHEMICAL CHARACTERISTICS OF GROUND WATER SAMPLES

*(Wherever not specified, characteristics are expressed in mg/l, maximum)*

*1. Ground Water Sampling at Monitoring Station Code : - D14 , KARMATANR*

**Date of Sampling at Station: June 2024**

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| **Month & Year** | **June 2024** | **Dug Well No.** | **D14** | | | **ULR No.** | |
| **Customer** | **Environment Department, Bharat Coking Coal Limited (BCCL), Koyla Bhawan, Dhanbad (E-mail: gmenv.bccl@coalindia.in)** | | | | | **Date of Issue** | **19.09.2024** |
| **Project** | **Jharia Coalfield** | **Sample Ref. No.** | **RI-II/HYDROGEOLOGY/24-25/GW** | **Sampling Method** | **CMPDI/RI-II/LPM 13,(IS 3025:Part -1)** | | |
| **Sampling Stations** | **KARMATANR** | **Date of Sampling** | | **Sample Collected in 5 Ltr Jerricane , Color as observed is transparent** | | | |
| | | | **Period of Analysis** | | **TO** | | |

| **Sl. No.** | **Parameter** | **Method of Analysis** | **Observed Values** | | | **IS 10500: 2012** | |
|---|---|---|---|---|---|---|---|
| | | | **GW21** | **Range Of Testing** | **LDL** | **Acceptable Limit (Max)*** | **Permissible Limit in the Absence of Alternate Source (Max)** |
| 1 | Colour, Hazen unit | APHA, 24th edition ,2120-c-Spectrophotometric Single Wavelength Method ,2023 | 2 | 1-500.0 | 1 | 5 | 15 |
| 2 | Calcium, mg/l | IS 3025, (Part 40): 1991 R:2019,AAS-Flame Method & EDTA Method | 128 | 2.0-800.0 | 2 | 75 | 200 |
| 3 | Chlorides, mg/l | IS-3025(Part 32):1988, R-2019 , Argentometric Method | 122 | 2.0-1500.0 | 5 | 250 | 1000 |
| 4 | Fluoride, mg/l | APHA, 24th Edition, SPADNS Method | 0.59 | 0.2-2.00 | 0.2 | 1 | 1.5 |
| 5 | Iron, mg/l | IS 3025 (Part 53) : 2003, R : 2019 , AAS-Flame Method | <0.2 | 0.2-10 | 0.2 | 1 | No relaxation |
| 6 | Magnesium | APHA 24th edition, 3500-Mg B: Calculation Method | 58 | 6.0-700 | 6 | 30 | 100 |
| 7 | Nitrate , mg/l | APHA, 24th edition, UV-Spectrophotometric Method | 11.95 | 0.5-45.0 | 0.5 | 45 | No relaxation |
| 8 | Odour | APHA, 23rd Edition, , 2150-C | Agreeable | Qualitative | Qualitative | Agreeable | Agreeable |
| 9 | pH value | IS 3025, Part 11 : 1983 R 2023 Electrometric( pH Meter) Method | 7.38 | 1-14 | 0.1 | 6.5-8.5 | No relaxation |
| 10 | Sulphate, mg/l | APHA –24th edition, 4500 S , Turbidity Method | 114 | 10.0-400.0 | 10 | 200 | 400 |
| 11 | Taste | APHA,24th edition, 2160-C | Acceptable | Qualitative | Qualitative | Acceptable | Agreeable |
| 12 | Total Alkalinity ($c_ac_{O_3}$), 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 2023 Gravimetric method | 664 | 25.0-5000.0 | 25 | 500 | 2000 |
| 14 | Total Hardness, mg/l | IS 3025, (Part 21): 2019 EDTA Method | 560 | 4.0-2000.0 | 4 | 200 | 600 |
| 15 | Turbidity, NTU | IS 3025, (Part 10):1984, R-2023 Nephelometric/Turbiditimetric Method | 2.9 | 1-800 | 0.1 | 1 | 5 |
| 16 | Zinc, mg/l | IS 3025(Part 49) : 1994,R:2019, AAS-Flame Method | <0.1 | 0.10 – 10.0 | 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,*

## PHYSICO-CHEMICAL CHARACTERISTICS OF GROUND WATER SAMPLES

*(Wherever not specified, characteristics are expressed in mg/l, maximum)*

*1. Ground Water Sampling at Monitoring Station Code : - D19, MEMKO MORE*

**Date of Sampling at Station: June 2024**

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| **Month & Year** | **June 2024** | **Dug Well No.** | **D19** | | | **ULR No.** | |
| **Customer** | **Environment Department, Bharat Coking Coal Limited (BCCL), Koyla Bhawan, Dhanbad (E-mail: gmenv.bccl@coalindia.in)** | | | | | **Date of Issue** | **19.09.2024** |
| **Project** | **Jharia Coalfield** | **Sample Ref. No.** | **RI-II/HYDROGEOLOGY/24-25/GW** | **Sampling Method** | | **CMPDI/RI-II/LPM 13,(IS 3025:Part -1)** | |
| **Sampling Stations** | **MEMKO MORE** | **Date of Sampling** | | **Sample Collected in 5 Ltr Jerricane , Color as observed is transparent** | | | |
| | | | **Period of Analysis** | | **TO** | | |

| **Sl. No.** | **Parameter** | **Method of Analysis** | **Observed Values** | | | **IS 10500: 2012** | |
|---|---|---|---|---|---|---|---|
| | | | **GW-22** | **Range Of Testing** | **LDL** | **Acceptable Limit (Max)*** | **Permissible Limit in the Absence of Alternate Source (Max)** |
| 1 | Colour, Hazen unit | APHA, 24th edition ,2120-c-Spectrophotometric Single Wavelength Method ,2023 | 3 | 1-500.0 | 1 | 5 | 15 |
| 2 | Calcium, mg/l | IS 3025, (Part 40): 1991 R:2019,AAS-Flame Method & EDTA Method | 88 | 2.0-800.0 | 2 | 75 | 200 |
| 3 | Chlorides, mg/l | IS-3025(Part 32):1988, R-2019 , Argentometric Method | 94 | 2.0-1500.0 | 5 | 250 | 1000 |
| 4 | Fluoride, mg/l | APHA, 24th Edition, SPADNS Method | 0.67 | 0.2-2.00 | 0.2 | 1 | 1.5 |
| 5 | Iron, mg/l | IS 3025 (Part 53) : 2003, R : 2019 , AAS-Flame Method | 0.46 | 0.2-10 | 0.2 | 1 | No relaxation |
| 6 | Magnesium | APHA 24th edition, 3500-Mg B: Calculation Method | 51 | 6.0-700 | 6 | 30 | 100 |
| 7 | Nitrate , mg/l | APHA, 24th edition, UV-Spectrophotometric Method | 17.50 | 0.5-45.0 | 0.5 | 45 | No relaxation |
| 8 | Odour | APHA, 23rd Edition, , 2150-C | Agreeable | Qualitative | Qualitative | Agreeable | Agreeable |
| 9 | pH value | IS 3025, Part 11 : 1983 R 2023 Electrometric( pH Meter) Method | 7.52 | 1-14 | 0.1 | 6.5-8.5 | No relaxation |
| 10 | Sulphate, mg/l | APHA –24th edition, 4500 S , Turbidity Method | 91 | 10.0-400.0 | 10 | 200 | 400 |
| 11 | Taste | APHA,24th edition, 2160-C | Acceptable | Qualitative | Qualitative | Acceptable | Agreeable |
| 12 | Total Alkalinity ($c_ac_{O_3}$), mg/l, Max | IS 3025, Part 23: 1986 R 2019 Titration Method | 242 | 4.0-2000.0 | 4 | 200 | 600 |
| 13 | Total Dissolved Solids, mg/l | IS 3025, Part 16: 1984 R 2023 Gravimetric method | 622 | 25.0-5000.0 | 25 | 500 | 2000 |
| 14 | Total Hardness, mg/l | IS 3025, (Part 21): 2019 EDTA Method | 428 | 4.0-2000.0 | 4 | 200 | 600 |
| 15 | Turbidity, NTU | IS 3025, (Part 10):1984, R-2023 Nephelometric/Turbiditimetric Method | 2.8 | 1-800 | 0.1 | 1 | 5 |
| 16 | Zinc, mg/l | IS 3025(Part 49) : 1994,R:2019, AAS-Flame Method | <0.1 | 0.10 – 10.0 | 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,*

***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,*

## PHYSICO-CHEMICAL CHARACTERISTICS OF GROUND WATER SAMPLES

*(Wherever not specified, characteristics are expressed in mg/l, maximum)*

1. *Ground Water Sampling at Monitoring Station Code : - D2 , BIRSA MUNDA CHAWK,BANKMORE*

**Date of Sampling at Station:** June 2024

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| **Month & Year** | **June 2024** | **Dug Well No.** | **D2** | | | **ULR No.** | |
| **Customer** | **Environment Department, Bharat Coking Coal Limited (BCCL), Koyla Bhawan, Dhanbad (E-mail: gmenv.bccl@coalindia.in)** | | | | | **Date of Issue** | **19.09.2024** |
| **Project** | **Jharia Coalfield** | | **Sample Ref. No.** | **RI-II/HYDROGEOLOGY/24-25/GW** | **Sampling Method** | **CMPDI/RI-II/LPM 13,(IS 3025:Part -1)** | |
| **Sampling Stations** | **BIRSA MUNDA CHAWK , BANKMORE** | **Date of Sampling** | | **Sample Collected in 5 Ltr Jerricane , Color as observed is transparent** | | | |
| | | | **Period of Analysis** | | | **TO** | |

| **Sl. No.** | **Parameter** | **Method of Analysis** | **Observed Values** | | | **IS 10500: 2012** | |
|---|---|---|---|---|---|---|---|
| | | | **GW-18** | **Range Of Testing** | **LDL** | **Acceptable Limit (Max)*** | **Permissible Limit in the Absence of Alternate Source (Max)** |
| | Colour, Hazen unit | APHA, 24th Edition ,2120-c-Spectrophotometric Single Wavelength Method ,2023 | 1 | 1-500.0 | 1 | 5 | 15 |
| 2 | Calcium, mg/l | IS 3025, (Part 40): 1991 R:2019,AAS-Flame Method & EDTA Method | 114 | 2.0-800.0 | 2 | 75 | 200 |
| 3 | Chlorides, mg/l | IS-3025(Part 32):1988, R-2019 , Argentometric Method | 124 | 2.0-1500.0 | 5 | 250 | 1000 |
| 4 | Fluoride, mg/l | APHA, 24th Edition, SPADNS Method,2023 | 0.82 | 0.2-2.00 | 0.2 | 1 | 1.5 |
| 5 | Iron, mg/l | IS 3025 (Part 53) : 2003, R : 2019 , AAS-Flame Method | 0.2 | 0.2-10 | 0.2 | 1 | No relaxation |
| 6 | Magnesium | APHA 24th Edition, 3500-Mg B: Calculation Method,2023 | 92 | 6.0-700 | 6 | 30 | 100 |
| 7 | Nitrate , mg/l | APHA, 24th Edition, UV-Spectrophotometric Method,2023 | 12.38 | 0.5-45.0 | 0.5 | 45 | No relaxation |
| 8 | Odour | APHA, 24th Edition, , 2150-C,2023 | Agreeable | Qualitative | Qualitative | Agreeable | Agreeable |
| 9 | pH value | IS 3025, Part 11 : 1983 R 2023 Electrometric( pH Meter) Method | 7.56 | 1-14 | 0.1 | 6.5-8.5 | No relaxation |
| 10 | Sulphate, mg/l | APHA –24th Edition, 4500 S , Turbidity Method,2023 | 95 | 10.0-400.0 | 10 | 200 | 400 |
| 11 | Taste | APHA,24th Edition, 2160-C , 2023 | Acceptable | Qualitative | Qualitative | Acceptable | Agreeable |
| 12 | Total Alkalinity ($c_a co_3$), mg/l, Max | IS 3025, Part 23: 1986 R 2019 Titration Method | 230 | 4.0-2000.0 | 4 | 200 | 600 |
| 13 | Total Dissolved Solids, mg/l | IS 3025, Part 16: 1984 R 2023 Gravimetric method | 837 | 25.0-5000.0 | 25 | 500 | 2000 |
| 14 | Total Hardness, mg/l | IS 3025, (Part 21): 2019 EDTA Method | 665 | 4.0-2000.0 | 4 | 200 | 600 |
| 15 | Turbidity, NTU | IS 3025, (Part 10):1984, R-2023 Nephelometric/Turbiditimetric Method | 1.9 | 1-800 | 0.1 | 1 | 5 |
| 16 | Zinc, mg/l | IS 3025(Part 49) : 1994,R:2019, AAS-Flame Method | <0.1 | 0.10 – 10.0 | 0.1 | 5 | 15 |

*17***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,*

## PHYSICO-CHEMICAL CHARACTERISTICS OF GROUND WATER SAMPLES

*(Wherever not specified, characteristics are expressed in mg/l, maximum)*

*1. Ground Water Sampling at Monitoring Station Code : - D25 , GODHUR MORE*

**Date of Sampling at Station: June 2024**

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| **Month & Year** | **June 2024** | **Dug Well No.** | **D25** | | | **ULR No.** | |
| **Customer** | **Environment Department, Bharat Coking Coal Limited (BCCL), Koyla Bhawan, Dhanbad (E-mail: gmenv.bccl@coalindia.in)** | | | | | **Date of Issue** | **19.09.2024** |
| **Project** | **Jharia Coalfield** | | **Sample Ref. No.** | **RI-II/HYDROGEOLOGY/24-25/GW** | **Sampling Method** | **CMPDI/RI-II/LPM 13,(IS 3025:Part -1)** | |
| **Sampling Stations** | **GODHUR MORE** | **Date of Sampling** | | **Sample Collected in 5 Ltr Jerricane , Color as observed is transparent** | | | |
| | | | **Period of Analysis** | | **TO** | | |

| **Sl. No.** | **Parameter** | **Method of Analysis** | **Observed Values** | | | **IS 10500: 2012** | |
|---|---|---|---|---|---|---|---|
| | | | **GW23** | **Range Of Testing** | **LDL** | **Acceptable Limit (Max)*** | **Permissible Limit in the Absence of Alternate Source (Max)** |
| 1 | Colour, Hazen unit | APHA, 24th edition ,2120-c-Spectrophotometric Single Wavelength Method ,2023 | 2 | 1-500.0 | 1 | 5 | 15 |
| 2 | Calcium, mg/l | IS 3025, (Part 40): 1991 R:2019,AAS-Flame Method & EDTA Method | 128 | 2.0-800.0 | 2 | 75 | 200 |
| 3 | Chlorides, mg/l | IS-3025(Part 32):1988, R-2019 , Argentometric Method | 120 | 2.0-1500.0 | 5 | 250 | 1000 |
| 4 | Fluoride, mg/l | APHA, 24th Edition, SPADNS Method | 0.62 | 0.2-2.00 | 0.2 | 1 | 1.5 |
| 5 | Iron, mg/l | IS 3025 (Part 53) : 2003, R : 2019 , AAS-Flame Method | 0.2 | 0.2-10 | 0.2 | 1 | No relaxation |
| 6 | Magnesium | APHA 24th edition, 3500-Mg B: Calculation Method | 100 | 6.0-700 | 6 | 30 | 100 |
| 7 | Nitrate , mg/l | APHA, 24th edition, UV-Spectrophotometric Method | 23.92 | 0.5-45.0 | 0.5 | 45 | No relaxation |
| 8 | Odour | APHA, 23rd Edition, , 2150-C | Agreeable | Qualitative | Qualitative | Agreeable | Agreeable |
| 9 | pH value | IS 3025, Part 11 : 1983 R 2023 Electrometric( pH Meter) Method | 7.61 | 1-14 | 0.1 | 6.5-8.5 | No relaxation |
| 10 | Sulphate, mg/l | APHA –24th edition, 4500 S , Turbidity Method | 138 | 10.0-400.0 | 10 | 200 | 400 |
| 11 | Taste | APHA,24th edition, 2160-C | Acceptable | Qualitative | Qualitative | Acceptable | Agreeable |
| 12 | Total Alkalinity ($c_ac_{O_3}$), mg/l, Max | IS 3025, Part 23: 1986 R 2019 Titration Method | 292 | 4.0-2000.0 | 4 | 200 | 600 |
| 13 | Total Dissolved Solids, mg/l | IS 3025, Part 16: 1984 R 2023 Gravimetric method | 832 | 25.0-5000.0 | 25 | 500 | 2000 |
| 14 | Total Hardness, mg/l | IS 3025, (Part 21): 2019 EDTA Method | 732 | 4.0-2000.0 | 4 | 200 | 600 |
| 15 | Turbidity, NTU | IS 3025, (Part 10):1984, R-2023 Nephelometric/Turbiditimetric Method | 2.6 | 1-800 | 0.1 | 1 | 5 |
| 16 | Zinc, mg/l | IS 3025(Part 49) : 1994,R:2019, AAS-Flame Method | 0.24 | 0.10 – 10.0 | 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,*

***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,*

## PHYSICO-CHEMICAL CHARACTERISTICS OF GROUND WATER SAMPLES

*(Wherever not specified, characteristics are expressed in mg/l, maximum)*

*1. Ground Water Sampling at Monitoring Station Code : - D30 , BORKIBOA VILLAGE*

**Date of Sampling at Station: June 2024**

| | | | | | |
|---|---|---|---|---|---|
| **Month & Year** | **June 2024** | **Dug Well No.** | **D30** | **ULR No.** | |
| **Customer** | **Environment Department, Bharat Coking Coal Limited (BCCL), Koyla Bhawan, Dhanbad (E-mail: gmenv.bccl@coalindia.in)** | | | **Date of Issue** | **19.09.2024** |
| **Project** | **Jharia Coalfield** | **Sample Ref. No.** | **RI-II/HYDROGEOLOGY/24-25/GW** | **Sampling Method** | **CMPDI/RI-II/LPM 13,(IS 3025:Part -1)** |
| **Sampling Stations** | **BORKIBOA VILLAGE** | **Date of Sampling** | | **Sample Collected in 5 Ltr Jerricane , Color as observed is transparent** | |
| | | | **Period of Analysis** | | **TO** |

| **Sl. No.** | **Parameter** | **Method of Analysis** | **Observed Values** | | | **IS 10500: 2012** | |
|---|---|---|---|---|---|---|---|
| | | | **GW24** | **Range Of Testing** | **LDL** | **Acceptable Limit (Max)*** | **Permissible Limit in the Absence of Alternate Source (Max)** |
| 1 | Colour, Hazen unit | APHA, 24th edition ,2120-c-Spectrophotometric Single Wavelength Method ,2023 | 1 | 1-500.0 | 1 | 5 | 15 |
| 2 | Calcium, mg/l | IS 3025, (Part 40): 1991 R:2019,AAS-Flame Method & EDTA Method | 104 | 2.0-800.0 | 2 | 75 | 200 |
| 3 | Chlorides, mg/l | IS-3025(Part 32):1988, R-2019 , Argentometric Method | 116 | 2.0-1500.0 | 5 | 250 | 1000 |
| 4 | Fluoride, mg/l | APHA, 24th Edition, SPADNS Method | 0.74 | 0.2-2.00 | 0.2 | 1 | 1.5 |
| 5 | Iron, mg/l | IS 3025 (Part 53) : 2003, R : 2019 , AAS-Flame Method | <0.2 | 0.2-10 | 0.2 | 1 | No relaxation |
| 6 | Magnesium | APHA 24th edition, 3500-Mg B: Calculation Method | 68 | 6.0-700 | 6 | 30 | 100 |
| 7 | Nitrate , mg/l | APHA, 24th edition, UV-Spectrophotometric Method | 22.26 | 0.5-45.0 | 0.5 | 45 | No relaxation |
| 8 | Odour | APHA, 23rd Edition, , 2150-C | Agreeable | Qualitative | Qualitative | Agreeable | Agreeable |
| 9 | pH value | IS 3025, Part 11 : 1983 R 2023 Electrometric( pH Meter) Method | 7.56 | 1-14 | 0.1 | 6.5-8.5 | No relaxation |
| 10 | Sulphate, mg/l | APHA –24th edition, 4500 S , Turbidity Method | 144 | 10.0-400.0 | 10 | 200 | 400 |
| 11 | Taste | APHA,24th edition, 2160-C | Acceptable | Qualitative | Qualitative | Acceptable | Agreeable |
| 12 | Total Alkalinity ($c_ac_{O3}$), mg/l, Max | IS 3025, Part 23: 1986 R 2019 Titration Method | 232 | 4.0-2000.0 | 4 | 200 | 600 |
| 13 | Total Dissolved Solids, mg/l | IS 3025, Part 16: 1984 R 2023 Gravimetric method | 742 | 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-2023 Nephelometric/Turbiditimetric Method | 1.8 | 1-800 | 0.1 | 1 | 5 |
| 16 | Zinc, mg/l | IS 3025(Part 49) : 1994,R:2019, AAS-Flame Method | 0.1 | 0.10 – 10.0 | 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,*

## PHYSICO-CHEMICAL CHARACTERISTICS OF GROUND WATER SAMPLES

*(Wherever not specified, characteristics are expressed in mg/l, maximum)*

*Ground Water Sampling at Monitoring Station Code : - D35 ,* PATHERDIH RAILWAY COLONY

*1.*

**Date of Sampling at Station: June 2024**

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| **Month & Year** | **June 2024** | **Dug Well No.** | **D35** | | | **ULR No.** | |
| **Customer** | **Environment Department, Bharat Coking Coal Limited (BCCL), Koyla Bhawan, Dhanbad (E-mail: gmenv.bccl@coalindia.in)** | | | | | **Date of Issue** | **19.09.2024** |
| **Project** | **Jharia Coalfield** | | **Sample Ref. No.** | **RI-II/HYDROGEOLOGY/24-25/GW** | **Sampling Method** | **CMPDI/RI-II/LPM 13,(IS 3025:Part -1)** | |
| **Sampling Stations** | **PATHERDIH RAILWAY COLONY** | **Date of Sampling** | | **Sample Collected in 5 Ltr Jerricane , Color as observed is transparent** | | | |
| | | | **Period of Analysis** | | | **TO** | |

| **Sl. No.** | **Parameter** | **Method of Analysis** | **Observed Values** | | | **IS 10500: 2012** | |
|---|---|---|---|---|---|---|---|
| | | | **GW25** | **Range Of Testing** | **LDL** | **Acceptable Limit (Max)*** | **Permissible Limit in the Absence of Alternate Source (Max)** |
| 1 | Colour, Hazen unit | APHA, 24th edition ,2120-c-Spectrophotometric Single Wavelength Method ,2023 | 3 | 1-500.0 | 1 | 5 | 15 |
| 2 | Calcium, mg/l | IS 3025, (Part 40): 1991 R:2019,AAS-Flame Method & EDTA Method | 124 | 2.0-800.0 | 2 | 75 | 200 |
| 3 | Chlorides, mg/l | IS-3025(Part 32):1988, R-2019 , Argentometric Method | 138 | 2.0-1500.0 | 5 | 250 | 1000 |
| 4 | Fluoride, mg/l | APHA, 24th Edition, SPADNS Method | 0.78 | 0.2-2.00 | 0.2 | 1 | 1.5 |
| 5 | Iron, mg/l | IS 3025 (Part 53) : 2003, R : 2019 , AAS-Flame Method | <0.2 | 0.2-10 | 0.2 | 1 | No relaxation |
| 6 | Magnesium | APHA 24th edition, 3500-Mg B: Calculation Method | 74 | 6.0-700 | 6 | 30 | 100 |
| 7 | Nitrate , mg/l | APHA, 24th edition, UV-Spectrophotometric Method | 30.35 | 0.5-45.0 | 0.5 | 45 | No relaxation |
| 8 | Odour | APHA, 23rd Edition, , 2150-C | Agreeable | Qualitative | Qualitative | Agreeable | Agreeable |
| 9 | pH value | IS 3025, Part 11 : 1983 R 2023 Electrometric( pH Meter) Method | 7.44 | 1-14 | 0.1 | 6.5-8.5 | No relaxation |
| 10 | Sulphate, mg/l | APHA –24th edition, 4500 S , Turbidity Method | 167 | 10.0-400.0 | 10 | 200 | 400 |
| 11 | Taste | APHA,24th edition, 2160-C | Acceptable | Qualitative | Qualitative | Acceptable | Agreeable |
| 12 | Total Alkalinity ($c_ac_{o_3}$), mg/l, Max | IS 3025, Part 23: 1986 R 2019 Titration Method | 264 | 4.0-2000.0 | 4 | 200 | 600 |
| 13 | Total Dissolved Solids, mg/l | IS 3025, Part 16: 1984 R 2023 Gravimetric method | 772 | 25.0-5000.0 | 25 | 500 | 2000 |
| 14 | Total Hardness, mg/l | IS 3025, (Part 21): 2019 EDTA Method | 615 | 4.0-2000.0 | 4 | 200 | 600 |
| 15 | Turbidity, NTU | IS 3025, (Part 10):1984, R-2023 Nephelometric/Turbiditimetric Method | 2.5 | 1-800 | 0.1 | 1 | 5 |
| 16 | Zinc, mg/l | IS 3025(Part 49) : 1994,R:2019, AAS-Flame Method | <0.1 | 0.10 – 10.0 | 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,*

## PHYSICO-CHEMICAL CHARACTERISTICS OF GROUND WATER SAMPLES

*(Wherever not specified, characteristics are expressed in mg/l, maximum)*

*Ground Water Sampling at Monitoring Station Code : - D4 ,* JHARIA THANA

*1.*

**Date of Sampling at Station:** June 2024

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| **Month & Year** | **June 2024** | **Dug Well No.** | **D4** | | | **ULR No.** | |
| **Customer** | **Environment Department, Bharat Coking Coal Limited (BCCL), Koyla Bhawan, Dhanbad (E-mail: gmenv.bccl@coalindia.in)** | | | | | **Date of Issue** | **19.09.2024** |
| **Project** | **Jharia Coalfield** | | **Sample Ref. No.** | **RI-II/HYDROGEOLOGY/24-25/GW** | **Sampling Method** | **CMPDI/RI-II/LPM 13,(IS 3025:Part -1)** | |
| **Sampling Stations** | **JHARIA THANA** | **Date of Sampling** | | **Sample Collected in 5 Ltr Jerricane , Color as observed is transparent** | | | |
| | | | **Period of Analysis** | | | **TO** | |

| **Sl. No.** | **Parameter** | **Method of Analysis** | **Observed Values** | | | **IS 10500: 2012** | |
|---|---|---|---|---|---|---|---|
| | | | **GW19** | **Range Of Testing** | **LDL** | **Acceptable Limit (Max)*** | **Permissible Limit in the Absence of Alternate Source (Max)** |
| 1 | Colour, Hazen unit | APHA, 24th edition ,2120-c-Spectrophotometric Single Wavelength Method ,2023 | 2 | 1-500.0 | 1 | 5 | 15 |
| 2 | Calcium, mg/l | IS 3025, (Part 40): 1991 R:2019,AAS-Flame Method & EDTA Method | 110 | 2.0-800.0 | 2 | 75 | 200 |
| 3 | Chlorides, mg/l | IS-3025(Part 32):1988, R-2019 , Argentometric Method | 88 | 2.0-1500.0 | 5 | 250 | 1000 |
| 4 | Fluoride, mg/l | APHA, 24th Edition, SPADNS Method | 0.71 | 0.2-2.00 | 0.2 | 1 | 1.5 |
| 5 | Iron, mg/l | IS 3025 (Part 53) : 2003, R : 2019 , AAS-Flame Method | <0.2 | 0.2-10 | 0.2 | 1 | No relaxation |
| 6 | Magnesium | APHA 24th edition, 3500-Mg B: Calculation Method | 125 | 6.0-700 | 6 | 30 | 100 |
| 7 | Nitrate , mg/l | APHA, 24th edition, UV-Spectrophotometric Method | 22.24 | 0.5-45.0 | 0.5 | 45 | No relaxation |
| 8 | Odour | APHA, 23rd Edition, , 2150-C | Agreeable | Qualitative | Qualitative | Agreeable | Agreeable |
| 9 | pH value | IS 3025, Part 11 : 1983 R 2023 Electrometric( pH Meter) Method | 7.44 | 1-14 | 0.1 | 6.5-8.5 | No relaxation |
| 10 | Sulphate, mg/l | APHA –24th edition, 4500 S , Turbidity Method | 168 | 10.0-400.0 | 10 | 200 | 400 |
| 11 | Taste | APHA,24th edition, 2160-C | Acceptable | Qualitative | Qualitative | Acceptable | Agreeable |
| 12 | Total Alkalinity ($c_ac_{O_3}$), mg/l, Max | IS 3025, Part 23: 1986 R 2019 Titration Method | 296 | 4.0-2000.0 | 4 | 200 | 600 |
| 13 | Total Dissolved Solids, mg/l | IS 3025, Part 16: 1984 R 2023 Gravimetric method | 942 | 25.0-5000.0 | 25 | 500 | 2000 |
| 14 | Total Hardness, mg/l | IS 3025, (Part 21): 2019 EDTA Method | 790 | 4.0-2000.0 | 4 | 200 | 600 |
| 15 | Turbidity, NTU | IS 3025, (Part 10):1984, R-2023 Nephelometric/Turbiditimetric Method | 2.5 | 1-800 | 0.1 | 1 | 5 |
| 16 | Zinc, mg/l | IS 3025(Part 49) : 1994,R:2019, AAS-Flame Method | <0.1 | 0.10 – 10.0 | 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,*

## PHYSICO-CHEMICAL CHARACTERISTICS OF GROUND WATER SAMPLES

*(Wherever not specified, characteristics are expressed in mg/l, maximum)*

*Ground Water Sampling at Monitoring Station Code : - D41 ,* JOYRAMPUR

*1.*

**Date of Sampling at Station: June 2024**

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| **Month & Year** | **June 2024** | **Dug Well No.** | **D41** | | | **ULR No.** | |
| **Customer** | **Environment Department, Bharat Coking Coal Limited (BCCL), Koyla Bhawan, Dhanbad (E-mail: gmenv.bccl@coalindia.in)** | | | | | **Date of Issue** | **19.09.2024** |
| **Project** | **Jharia Coalfield** | | **Sample Ref. No.** | **RI-II/HYDROGEOLOGY/24-25/GW** | **Sampling Method** | **CMPDI/RI-II/LPM 13,(IS 3025:Part -1)** | |
| **Sampling Stations** | **JOYRAMPUR** | **Date of Sampling** | | **Sample Collected in 5 Ltr Jerricane , Color as observed is transparent** | | | |
| | | | **Period of Analysis** | | **to** | | |

| **Sl. No.** | **Parameter** | **Method of Analysis** | **Observed Values** | | | **IS 10500: 2012** | |
|---|---|---|---|---|---|---|---|
| | | | **GW26** | **Range Of Testing** | **LDL** | **Acceptable Limit (Max)*** | **Permissible Limit in the Absence of Alternate Source (Max)** |
| 1 | Colour, Hazen unit | APHA, 24th edition ,2120-c-Spectrophotometric Single Wavelength Method ,2023 | 1 | 1-500.0 | 1 | 5 | 15 |
| 2 | Calcium, mg/l | IS 3025, (Part 40): 1991 R:2019,AAS-Flame Method & EDTA Method | 164 | 2.0-800.0 | 2 | 75 | 200 |
| 3 | Chlorides, mg/l | IS-3025(Part 32):1988, R-2019 , Argentometric Method | 132 | 2.0-1500.0 | 5 | 250 | 1000 |
| 4 | Fluoride, mg/l | APHA, 24th Edition, SPADNS Method | 0.71 | 0.2-2.00 | 0.2 | 1 | 1.5 |
| 5 | Iron, mg/l | IS 3025 (Part 53) : 2003, R : 2019 , AAS-Flame Method | <0.2 | 0.2-10 | 0.2 | 1 | No relaxation |
| 6 | Magnesium | APHA 24th edition, 3500-Mg B: Calculation Method | 51 | 6.0-700 | 6 | 30 | 100 |
| 7 | Nitrate , mg/l | APHA, 24th edition, UV-Spectrophotometric Method | 8.49 | 0.5-45.0 | 0.5 | 45 | No relaxation |
| 8 | Odour | APHA, 23rd Edition, , 2150-C | Agreeable | Qualitative | Qualitative | Agreeable | Agreeable |
| 9 | pH value | IS 3025, Part 11 : 1983 R 2023 Electrometric( pH Meter) Method | 7.52 | 1-14 | 0.1 | 6.5-8.5 | No relaxation |
| 10 | Sulphate, mg/l | APHA –24th edition, 4500 S , Turbidity Method | 67 | 10.0-400.0 | 10 | 200 | 400 |
| 11 | Taste | APHA,24th edition, 2160-C | Acceptable | Qualitative | Qualitative | Acceptable | Agreeable |
| 12 | Total Alkalinity ($c_aco_3$), mg/l, Max | IS 3025, Part 23: 1986 R 2019 Titration Method | 265 | 4.0-2000.0 | 4 | 200 | 600 |
| 13 | Total Dissolved Solids, mg/l | IS 3025, Part 16: 1984 R 2023 Gravimetric method | 838 | 25.0-5000.0 | 25 | 500 | 2000 |
| 14 | Total Hardness, mg/l | IS 3025, (Part 21): 2019 EDTA Method | 620 | 4.0-2000.0 | 4 | 200 | 600 |
| 15 | Turbidity, NTU | IS 3025, (Part 10):1984, R-2023 Nephelometric/Turbiditimetric Method | 2.3 | 1-800 | 0.1 | 1 | 5 |
| 16 | Zinc, mg/l | IS 3025(Part 49) : 1994,R:2019, AAS-Flame Method | <0.1 | 0.10 – 10.0 | 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,*

## PHYSICO-CHEMICAL CHARACTERISTICS OF GROUND WATER SAMPLES

*(Wherever not specified, characteristics are expressed in mg/l, maximum)*

*Ground Water Sampling at Monitoring Station Code : - D49 ,* TISRA THANA

### Date of Sampling at Station: June 2024

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| **Month & Year** | **June 2024** | **Dug Well No.** | **D49** | | | **ULR No.** | |
| **Customer** | **Environment Department, Bharat Coking Coal Limited (BCCL), Koyla Bhawan, Dhanbad (E-mail: gmenv.bccl@coalindia.in)** | | | | | **Date of Issue** | **19.09.2024** |
| **Project** | **Jharia Coalfield** | | **Sample Ref. No.** | **RI-II/HYDROGEOLOGY/24-25/GW** | **Sampling Method** | **CMPDI/RI-II/LPM 13,(IS 3025:Part -1)** | |
| **Sampling Stations** | **TISRA THANA** | **Date of Sampling** | | **Sample Collected in 5 Ltr Jerricane , Color as observed is transparent** | | | |
| | | | **Period of Analysis** | | **to** | | |

| **Sl. No.** | **Parameter** | **Method of Analysis** | **Observed Values** | | | **IS 10500: 2012** | |
|---|---|---|---|---|---|---|---|
| | | | **GW27** | **Range Of Testing** | **LDL** | **Acceptable Limit (Max)*** | **Permissible Limit in the Absence of Alternate Source (Max)** |
| 1 | Colour, Hazen unit | APHA, 24th edition ,2120-c-Spectrophotometric Single Wavelength Method ,2023 | 2 | 1-500.0 | 1 | 5 | 15 |
| 2 | Calcium, mg/l | IS 3025, (Part 40): 1991 R:2019,AAS-Flame Method & EDTA Method | 118 | 2.0-800.0 | 2 | 75 | 200 |
| 3 | Chlorides, mg/l | IS-3025(Part 32):1988, R-2019 , Argentometric Method | 98 | 2.0-1500.0 | 5 | 250 | 1000 |
| 4 | Fluoride, mg/l | APHA, 24th Edition, SPADNS Method | 0.53 | 0.2-2.00 | 0.2 | 1 | 1.5 |
| 5 | Iron, mg/l | IS 3025 (Part 53) : 2003, R : 2019 , AAS-Flame Method | <0.2 | 0.2-10 | 0.2 | 1 | No relaxation |
| 6 | Magnesium | APHA 24th edition, 3500-Mg B: Calculation Method | 79 | 6.0-700 | 6 | 30 | 100 |
| 7 | Nitrate , mg/l | APHA, 24th edition, UV-Spectrophotometric Method | 17.58 | 0.5-45.0 | 0.5 | 45 | No relaxation |
| 8 | Odour | APHA, 23rd Edition, , 2150-C | Agreeable | Qualitative | Qualitative | Agreeable | Agreeable |
| 9 | pH value | IS 3025, Part 11 : 1983 R 2023 Electrometric( pH Meter) Method | 7.31 | 1-14 | 0.1 | 6.5-8.5 | No relaxation |
| 10 | Sulphate, mg/l | APHA –24th edition, 4500 S , Turbidity Method | 126 | 10.0-400.0 | 10 | 200 | 400 |
| 11 | Taste | APHA,24th edition, 2160-C | Acceptable | Qualitative | Qualitative | Acceptable | Agreeable |
| 12 | Total Alkalinity ($c_a co_3$), mg/l, Max | IS 3025, Part 23: 1986 R 2019 Titration Method | 229 | 4.0-2000.0 | 4 | 200 | 600 |
| 13 | Total Dissolved Solids, mg/l | IS 3025, Part 16: 1984 R 2023 Gravimetric method | 736 | 25.0-5000.0 | 25 | 500 | 2000 |
| 14 | Total Hardness, mg/l | IS 3025, (Part 21): 2019 EDTA Method | 620 | 4.0-2000.0 | 4 | 200 | 600 |
| 15 | Turbidity, NTU | IS 3025, (Part 10):1984, R-2023 Nephelometric/Turbiditimetric Method | 1.9 | 1-800 | 0.1 | 1 | 5 |
| 16 | Zinc, mg/l | IS 3025(Part 49) : 1994,R:2019, AAS-Flame Method | <0.1 | 0.10 – 10.0 | 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,*

## PHYSICO-CHEMICAL CHARACTERISTICS OF GROUND WATER SAMPLES

*(Wherever not specified, characteristics are expressed in mg/l, maximum)*

*Ground Water Sampling at Monitoring Station Code : - D5,* JIYALGORA (NEAR P.O.)

**Date of Sampling at Station: June 2024**

| | | | | | |
|---|---|---|---|---|---|
| **Month & Year** | **June 2024** | **Dug Well No.** | **D5** | **ULR No.** | |
| **Customer** | **Environment Department, Bharat Coking Coal Limited (BCCL), Koyla Bhawan, Dhanbad (E-mail: gmenv.bccl@coalindia.in)** | | | **Date of Issue** | **19.09.2024** |
| **Project** | **Jharia Coalfield** | **Sample Ref. No.** | **RI-II/HYDROGEOLOGY/24-25/GW** | **Sampling Method** | **CMPDI/RI-II/LPM 13,(IS 3025:Part -1)** |
| **Sampling Stations** | **JIYALGORA (NEAR P.O)** | **Date of Sampling** | | **Sample Collected in 5 Ltr Jerricane , Color as observed is transparent** | |
| | | | **Period of Analysis** | | **TO** |

| **Sl. No.** | **Parameter** | **Method of Analysis** | **Observed Values** | | | **IS 10500: 2012** | |
|---|---|---|---|---|---|---|---|
| | | | **GW 20** | **Range Of Testing** | **LDL** | **Acceptable Limit (Max)*** | **Permissible Limit in the Absence of Alternate Source (Max)** |
| 1 | Colour, Hazen unit | APHA, 24th edition ,2120-c-Spectrophotometric Single Wavelength Method ,2023 | 2 | 1-500.0 | 1 | 5 | 15 |
| 2 | Calcium, mg/l | IS 3025, (Part 40): 1991 R:2019,AAS-Flame Method & EDTA Method | 126 | 2.0-800.0 | 2 | 75 | 200 |
| 3 | Chlorides, mg/l | IS-3025(Part 32):1988, R-2019 , Argentometric Method | 98 | 2.0-1500.0 | 5 | 250 | 1000 |
| 4 | Fluoride, mg/l | APHA, 24th Edition, SPADNS Method | 0.63 | 0.2-2.00 | 0.2 | 1 | 1.5 |
| 5 | Iron, mg/l | IS 3025 (Part 53) : 2003, R : 2019 , AAS-Flame Method | <0.2 | 0.2-10 | 0.2 | 1 | No relaxation |
| 6 | Magnesium | APHA 24th edition, 3500-Mg B: Calculation Method | 66 | 6.0-700 | 6 | 30 | 100 |
| 7 | Nitrate , mg/l | APHA, 24th edition, UV-Spectrophotometric Method | 13.64 | 0.5-45.0 | 0.5 | 45 | No relaxation |
| 8 | Odour | APHA, 23rd Edition, , 2150-C | Agreeable | Qualitative | Qualitative | Agreeable | Agreeable |
| 9 | pH value | IS 3025, Part 11 : 1983 R 2023 Electrometric( pH Meter) Method | 7.52 | 1-14 | 0.1 | 6.5-8.5 | No relaxation |
| 10 | Sulphate, mg/l | APHA –24th edition, 4500 S , Turbidity Method | 135 | 10.0-400.0 | 10 | 200 | 400 |
| 11 | Taste | APHA,24th edition, 2160-C | Acceptable | Qualitative | Qualitative | Acceptable | Agreeable |
| 12 | Total Alkalinity ($c_ac_{03}$), mg/l, Max | IS 3025, Part 23: 1986 R 2019 Titration Method | 265 | 4.0-2000.0 | 4 | 200 | 600 |
| 13 | Total Dissolved Solids, mg/l | IS 3025, Part 16: 1984 R 2023 Gravimetric method | 738 | 25.0-5000.0 | 25 | 500 | 2000 |
| 14 | Total Hardness, mg/l | IS 3025, (Part 21): 2019 EDTA Method | 586 | 4.0-2000.0 | 4 | 200 | 600 |
| 15 | Turbidity, NTU | IS 3025, (Part 10):1984, R-2023 Nephelometric/Turbiditimetric Method | 2.9 | 1-800 | 0.1 | 1 | 5 |
| 16 | Zinc, mg/l | IS 3025(Part 49) : 1994,R:2019, AAS-Flame Method | <0.1 | 0.10 – 10.0 | 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,*

## PHYSICO-CHEMICAL CHARACTERISTICS OF GROUND WATER SAMPLES

*(Wherever not specified, characteristics are expressed in mg/l, maximum)*

*Ground Water Sampling at Monitoring Station Code : - D59,* SITALPUR

**Date of Sampling at Station: June 2024**

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| **Month & Year** | **June 2024** | **Dug Well No.** | **D59** | | | **ULR No.** | |
| **Customer** | **Environment Department, Bharat Coking Coal Limited (BCCL), Koyla Bhawan, Dhanbad (E-mail: gmenv.bccl@coalindia.in)** | | | | | **Date of Issue** | **19.09.2024** |
| **Project** | **Jharia Coalfield** | | **Sample Ref. No.** | **RI-II/HYDROGEOLOGY/24-25/GW/** | **Sampling Method** | **CMPDI/RI-II/LPM 13,(IS 3025:Part -1)** | |
| **Sampling Stations** | **SITALPUR** | **Date of Sampling** | | **Sample Collected in 5 Ltr Jerricane , Color as observed is transparent** | | | |
| | | | **Period of Analysis** | | **to** | | |

| **Sl. No.** | **Parameter** | **Method of Analysis** | **Observed Values** | | | **IS 10500: 2012** | |
|---|---|---|---|---|---|---|---|
| | | | **GW28** | **Range Of Testing** | **LDL** | **Acceptable Limit (Max)*** | **Permissible Limit in the Absence of Alternate Source (Max)** |
| 1 | Colour, Hazen unit | APHA, 24th edition ,2120-c-Spectrophotometric Single Wavelength Method ,2023 | 2 | 1-500.0 | 1 | 5 | 15 |
| 2 | Calcium, mg/l | IS 3025, (Part 40): 1991 R:2019,AAS-Flame Method & EDTA Method | 118 | 2.0-800.0 | 2 | 75 | 200 |
| 3 | Chlorides, mg/l | IS-3025(Part 32):1988, R-2019 , Argentometric Method | 122 | 2.0-1500.0 | 5 | 250 | 1000 |
| 4 | Fluoride, mg/l | APHA, 24th Edition, SPADNS Method | 0.83 | 0.2-2.00 | 0.2 | 1 | 1.5 |
| 5 | Iron, mg/l | IS 3025 (Part 53) : 2003, R : 2019 , AAS-Flame Method | <0.2 | 0.2-10 | 0.2 | 1 | No relaxation |
| 6 | Magnesium | APHA 24th edition, 3500-Mg B: Calculation Method | 81 | 6.0-700 | 6 | 30 | 100 |
| 7 | Nitrate , mg/l | APHA, 24th edition, UV-Spectrophotometric Method | 22.91 | 0.5-45.0 | 0.5 | 45 | No relaxation |
| 8 | Odour | APHA, 23rd Edition, , 2150-C | Agreeable | Qualitative | Qualitative | Agreeable | Agreeable |
| 9 | pH value | IS 3025, Part 11 : 1983 R 2023 Electrometric( pH Meter) Method | 7.85 | 1-14 | 0.1 | 6.5-8.5 | No relaxation |
| 10 | Sulphate, mg/l | APHA –24th edition, 4500 S , Turbidity Method | 134 | 10.0-400.0 | 10 | 200 | 400 |
| 11 | Taste | APHA,24th edition, 2160-C | Acceptable | Qualitative | Qualitative | Acceptable | Agreeable |
| 12 | Total Alkalinity ($c_aco_3$), mg/l, Max | IS 3025, Part 23: 1986 R 2019 Titration Method | 282 | 4.0-2000.0 | 4 | 200 | 600 |
| 13 | Total Dissolved Solids, mg/l | IS 3025, Part 16: 1984 R 2023 Gravimetric method | 829 | 25.0-5000.0 | 25 | 500 | 2000 |
| 14 | Total Hardness, mg/l | IS 3025, (Part 21): 2019 EDTA Method | 630 | 4.0-2000.0 | 4 | 200 | 600 |
| 15 | Turbidity, NTU | IS 3025, (Part 10):1984, R-2023 Nephelometric/Turbiditimetric Method | 2.9 | 1-800 | 0.1 | 1 | 5 |
| 16 | Zinc, mg/l | IS 3025(Part 49) : 1994,R:2019, AAS-Flame Method | 0.1 | 0.10 – 10.0 | 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,*

## PHYSICO-CHEMICAL CHARACTERISTICS OF GROUND WATER SAMPLES

*(Wherever not specified, characteristics are expressed in mg/l, maximum)*

*Ground Water Sampling at Monitoring Station Code : - D70* JALADIH

**Date of Sampling at Station: June 2024**

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| **Month & Year** | **June 2024** | **Dug Well No.** | **D70** | | | **ULR No.** | |
| **Customer** | **Environment Department, Bharat Coking Coal Limited (BCCL), Koyla Bhawan, Dhanbad (E-mail: gmenv.bccl@coalindia.in)** | | | | | **Date of Issue** | **19.09.2024** |
| **Project** | **Jharia Coalfield** | | **Sample Ref. No.** | **RI-II/HYDROGEOLOGY/24-25/GW/** | **Sampling Method** | **CMPDI/RI-II/LPM 13,(IS 3025:Part -1)** | |
| **Sampling Stations** | **JALADIH** | **Date of Sampling** | | | | | |
| | | | **Period of Analysis** | | **to** | | |

| **Sl. No.** | **Parameter** | **Method of Analysis** | **Observed Values** | | | **IS 10500: 2012** | |
|---|---|---|---|---|---|---|---|
| | | | **GW29** | **Range Of Testing** | **LDL** | **Acceptable Limit (Max)*** | **Permissible Limit in the Absence of Alternate Source (Max)** |
| 1 | Colour, Hazen unit | APHA, 24th edition ,2120-c-Spectrophotometric Single Wavelength Method ,2023 | 1 | 1-500.0 | 1 | 5 | 15 |
| 2 | Calcium, mg/l | IS 3025, (Part 40): 1991 R:2019,AAS-Flame Method & EDTA Method | 92 | 2.0-800.0 | 2 | 75 | 200 |
| 3 | Chlorides, mg/l | IS-3025(Part 32):1988, R-2019 , Argentometric Method | 112 | 2.0-1500.0 | 5 | 250 | 1000 |
| 4 | Fluoride, mg/l | APHA, 24th Edition, SPADNS Method | 0.69 | 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 24th edition, 3500-Mg B: Calculation Method | 103 | 6.0-700 | 6 | 30 | 100 |
| 7 | Nitrate , mg/l | APHA, 24th edition, UV-Spectrophotometric Method | 18.55 | 0.5-45.0 | 0.5 | 45 | No relaxation |
| 8 | Odour | APHA, 23rd Edition, , 2150-C | Agreeable | Qualitative | Qualitative | Agreeable | Agreeable |
| 9 | pH value | IS 3025, Part 11 : 1983 R 2023 Electrometric( pH Meter) Method | 7.41 | 1-14 | 0.1 | 6.5-8.5 | No relaxation |
| 10 | Sulphate, mg/l | APHA –24th edition, 4500 S , Turbidity Method | 111 | 10.0-400.0 | 10 | 200 | 400 |
| 11 | Taste | APHA,24th edition, 2160-C | Acceptable | Qualitative | Qualitative | Acceptable | Agreeable |
| 12 | Total Alkalinity ($c_ac_{o_3}$), mg/l, Max | IS 3025, Part 23: 1986 R 2019 Titration Method | 192 | 4.0-2000.0 | 4 | 200 | 600 |
| 13 | Total Dissolved Solids, mg/l | IS 3025, Part 16: 1984 R 2023 Gravimetric method | 808 | 25.0-5000.0 | 25 | 500 | 2000 |
| 14 | Total Hardness, mg/l | IS 3025, (Part 21): 2019 EDTA Method | 654 | 4.0-2000.0 | 4 | 200 | 600 |
| 15 | Turbidity, NTU | IS 3025, (Part 10):1984, R-2023 Nephelometric/Turbiditimetric Method | 2.3 | 1-800 | 0.1 | 1 | 5 |
| 16 | Zinc, mg/l | IS 3025(Part 49) : 1994,R:2019, AAS-Flame Method | 0.23 | 0.10 – 10.0 | 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,*

## PHYSICO-CHEMICAL CHARACTERISTICS OF GROUND WATER SAMPLES

*(Wherever not specified, characteristics are expressed in mg/l, maximum)*

*Ground Water Sampling at Monitoring Station Code : - D72,* CHATI GOVINDPUR

**Date of Sampling at Station: June 2024**

| | | | | | |
|---|---|---|---|---|---|
| **Month & Year** | **June 2024** | **Dug Well No.** | **D72** | **ULR No.** | |
| **Customer** | **Environment Department, Bharat Coking Coal Limited (BCCL), Koyla Bhawan, Dhanbad (E-mail: gmenv.bccl@coalindia.in)** | | | **Date of Issue** | **19.09.2024** |
| **Project** | **Jharia Coalfield** | **Sample Ref. No.** | **RI-II/HYDROGEOLOGY/24-25/GW/** | **Sampling Method** | **CMPDI/RI-II/LPM 13,(IS 3025:Part -1)** |
| **Sampling Stations** | **CHATI GOVINDPUR** | **Date of Sampling** | **Sample Collected in 5 Ltr Jerricane , Color as observed is transparent** | | |
| | | | **Period of Analysis** | **to** | |

| **Sl. No.** | **Parameter** | **Method of Analysis** | **Observed Values** | | | **IS 10500: 2012** | |
|---|---|---|---|---|---|---|---|
| | | | **GW30** | **Range Of Testing** | **LDL** | **Acceptable Limit (Max)*** | **Permissible Limit in the Absence of Alternate Source (Max)** |
| 1 | Colour, Hazen unit | APHA, 24th edition ,2120-c-Spectrophotometric Single Wavelength Method ,2023 | 2 | 1-500.0 | 1 | 5 | 15 |
| 2 | Calcium, mg/l | IS 3025, (Part 40): 1991 R:2019,AAS-Flame Method & EDTA Method | 152 | 2.0-800.0 | 2 | 75 | 200 |
| 3 | Chlorides, mg/l | IS-3025(Part 32):1988, R-2019 , Argentometric Method | 78 | 2.0-1500.0 | 5 | 250 | 1000 |
| 4 | Fluoride, mg/l | APHA, 24th Edition, SPADNS Method | 0.74 | 0.2-2.00 | 0.2 | 1 | 1.5 |
| 5 | Iron, mg/l | IS 3025 (Part 53) : 2003, R : 2019 , AAS-Flame Method | <0.2 | 0.2-10 | 0.2 | 1 | No relaxation |
| 6 | Magnesium | APHA 24th edition, 3500-Mg B: Calculation Method | 108 | 6.0-700 | 6 | 30 | 100 |
| 7 | Nitrate , mg/l | APHA, 24th edition, UV-Spectrophotometric Method | 28.13 | 0.5-45.0 | 0.5 | 45 | No relaxation |
| 8 | Odour | APHA, 23rd Edition, , 2150-C | Agreeable | Qualitative | Qualitative | Agreeable | Agreeable |
| 9 | pH value | IS 3025, Part 11 : 1983 R 2023 Electrometric( pH Meter) Method | 7.38 | 1-14 | 0.1 | 6.5-8.5 | No relaxation |
| 10 | Sulphate, mg/l | APHA –24th edition, 4500 S , Turbidity Method | 158 | 10.0-400.0 | 10 | 200 | 400 |
| 11 | Taste | APHA,24th edition, 2160-C | Acceptable | Qualitative | Qualitative | Acceptable | Agreeable |
| 12 | Total Alkalinity ($c_ac_{03}$), mg/l, Max | IS 3025, Part 23: 1986 R 2019 Titration Method | 278 | 4.0-2000.0 | 4 | 200 | 600 |
| 13 | Total Dissolved Solids, mg/l | IS 3025, Part 16: 1984 R 2023 Gravimetric method | 966 | 25.0-5000.0 | 25 | 500 | 2000 |
| 14 | Total Hardness, mg/l | IS 3025, (Part 21): 2019 EDTA Method | 824 | 4.0-2000.0 | 4 | 200 | 600 |
| 15 | Turbidity, NTU | IS 3025, (Part 10):1984, R-2023 Nephelometric/Turbiditimetric Method | 2.5 | 1-800 | 0.1 | 1 | 5 |
| 16 | Zinc, mg/l | IS 3025(Part 49) : 1994,R:2019, AAS-Flame Method | <0.1 | 0.10 – 10.0 | 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,*

## PHYSICO-CHEMICAL CHARACTERISTICS OF GROUND WATER SAMPLES

*(Wherever not specified, characteristics are expressed in mg/l, maximum)*

*Ground Water Sampling at Monitoring Station Code : - D80* DHANSAR MINE RESCUE STATION

**Date of Sampling at Station: June 2024**

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| **Month & Year** | **June 2024** | **Dug Well No.** | **D80** | | | **ULR No.** | |
| **Customer** | **Environment Department, Bharat Coking Coal Limited (BCCL), Koyla Bhawan, Dhanbad (E-mail: gmenv.bccl@coalindia.in)** | | | | | **Date of Issue** | **19.09.2024** |
| **Project** | **Jharia Coalfield** | | **Sample Ref. No.** | **RI-II/HYDROGEOLOGY/24-25/GW/** | **Sampling Method** | **CMPDI/RI-II/LPM 13,(IS 3025:Part -1)** | |
| **Sampling Stations** | **DHANSAR MINE RESCUE STATION** | **Date of Sampling** | | **Sample Collected in 5 Ltr Jerricane , Color as observed is transparent** | | | |
| | | | **Period of Analysis** | | **to** | | |

| **Sl. No.** | **Parameter** | **Method of Analysis** | **Observed Values** | | | **IS 10500: 2012** | |
|---|---|---|---|---|---|---|---|
| | | | **GW31** | **Range Of Testing** | **LDL** | **Acceptable Limit (Max)*** | **Permissible Limit in the Absence of Alternate Source (Max)** |
| 1 | Colour, Hazen unit | APHA, 24th edition ,2120-c-Spectrophotometric Single Wavelength Method ,2023 | 1 | 1-500.0 | 1 | 5 | 15 |
| 2 | Calcium, mg/l | IS 3025, (Part 40): 1991 R:2019,AAS-Flame Method & EDTA Method | 116 | 2.0-800.0 | 2 | 75 | 200 |
| 3 | Chlorides, mg/l | IS-3025(Part 32):1988, R-2019 , Argentometric Method | 138 | 2.0-1500.0 | 5 | 250 | 1000 |
| 4 | Fluoride, mg/l | APHA, 24th Edition, SPADNS Method | 0.61 | 0.2-2.00 | 0.2 | 1 | 1.5 |
| 5 | Iron, mg/l | IS 3025 (Part 53) : 2003, R : 2019 , AAS-Flame Method | <0.2 | 0.2-10 | 0.2 | 1 | No relaxation |
| 6 | Magnesium | APHA 24th edition, 3500-Mg B: Calculation Method | 63 | 6.0-700 | 6 | 30 | 100 |
| 7 | Nitrate , mg/l | APHA, 24th edition, UV-Spectrophotometric Method | 21.46 | 0.5-45.0 | 0.5 | 45 | No relaxation |
| 8 | Odour | APHA, 23rd Edition, , 2150-C | Agreeable | Qualitative | Qualitative | Agreeable | Agreeable |
| 9 | pH value | IS 3025, Part 11 : 1983 R 2023 Electrometric( pH Meter) Method | 7.56 | 1-14 | 0.1 | 6.5-8.5 | No relaxation |
| 10 | Sulphate, mg/l | APHA –24th edition, 4500 S , Turbidity Method | 133 | 10.0-400.0 | 10 | 200 | 400 |
| 11 | Taste | APHA,24th edition, 2160-C | Acceptable | Qualitative | Qualitative | Acceptable | Agreeable |
| 12 | Total Alkalinity ($c_a co_3$), mg/l, Max | IS 3025, Part 23: 1986 R 2019 Titration Method | 278 | 4.0-2000.0 | 4 | 200 | 600 |
| 13 | Total Dissolved Solids, mg/l | IS 3025, Part 16: 1984 R 2023 Gravimetric method | 748 | 25.0-5000.0 | 25 | 500 | 2000 |
| 14 | Total Hardness, mg/l | IS 3025, (Part 21): 2019 EDTA Method | 548 | 4.0-2000.0 | 4 | 200 | 600 |
| 15 | Turbidity, NTU | IS 3025, (Part 10):1984, R-2023 Nephelometric/Turbiditimetric Method | 2.2 | 1-800 | 0.1 | 1 | 5 |
| 16 | Zinc, mg/l | IS 3025(Part 49) : 1994,R:2019, AAS-Flame Method | 0.19 | 0.10 – 10.0 | 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,*

## PHYSICO-CHEMICAL CHARACTERISTICS OF GROUND WATER SAMPLES

*(Wherever not specified, characteristics are expressed in mg/l, maximum)*

*Ground Water Sampling at Monitoring Station Code : - D96* BANSHRA

**Date of Sampling at Station: June 2024**

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| **Month & Year** | **June 2024** | **Dug Well No.** | **D96** | | | **ULR No.** | |
| **Customer** | **Environment Department, Bharat Coking Coal Limited (BCCL), Koyla Bhawan, Dhanbad (E-mail: gmenv.bccl@coalindia.in)** | | | | | **Date of Issue** | **19.09.2024** |
| **Project** | **Jharia Coalfield** | | **Sample Ref. No.** | **RI-II/HYDROGEOLOGY/24-25/GW/** | **Sampling Method** | **CMPDI/RI-II/LPM 13,(IS 3025:Part -1)** | |
| **Sampling Stations** | **BANSHRA** | **Date of Sampling** | | **Sample Collected in 5 Ltr Jerricane , Color as observed is transparent** | | | |
| | | | **Period of Analysis** | | | **to** | |

| **Sl. No.** | **Parameter** | **Method of Analysis** | **Observed Values** | | | **IS 10500: 2012** | |
|---|---|---|---|---|---|---|---|
| | | | **GW32** | **Range Of Testing** | **LDL** | **Acceptable Limit (Max)*** | **Permissible Limit in the Absence of Alternate Source (Max)** |
| 1 | Colour, Hazen unit | APHA, 24th edition ,2120-c-Spectrophotometric Single Wavelength Method ,2023 | 3 | 1-500.0 | 1 | 5 | 15 |
| 2 | Calcium, mg/l | IS 3025, (Part 40): 1991 R:2019,AAS-Flame Method & EDTA Method | 126 | 2.0-800.0 | 2 | 75 | 200 |
| 3 | Chlorides, mg/l | IS-3025(Part 32):1988, R-2019 , Argentometric Method | 94 | 2.0-1500.0 | 5 | 250 | 1000 |
| 4 | Fluoride, mg/l | APHA, 24th Edition, SPADNS Method | 0.79 | 0.2-2.00 | 0.2 | 1 | 1.5 |
| 5 | Iron, mg/l | IS 3025 (Part 53) : 2003, R : 2019 , AAS-Flame Method | <0.2 | 0.2-10 | 0.2 | 1 | No relaxation |
| 6 | Magnesium | APHA 24th edition, 3500-Mg B: Calculation Method | 50 | 6.0-700 | 6 | 30 | 100 |
| 7 | Nitrate , mg/l | APHA, 24th edition, UV-Spectrophotometric Method | 27.68 | 0.5-45.0 | 0.5 | 45 | No relaxation |
| 8 | Odour | APHA, 23rd Edition, , 2150-C | Agreeable | Qualitative | Qualitative | Agreeable | Agreeable |
| 9 | pH value | IS 3025, Part 11 : 1983 R 2023 Electrometric( pH Meter) Method | 7.44 | 1-14 | 0.1 | 6.5-8.5 | No relaxation |
| 10 | Sulphate, mg/l | APHA –24th edition, 4500 S , Turbidity Method | 165 | 10.0-400.0 | 10 | 200 | 400 |
| 11 | Taste | APHA,24th edition, 2160-C | Acceptable | Qualitative | Qualitative | Acceptable | Agreeable |
| 12 | Total Alkalinity ($c_ac_{o_3}$), mg/l, Max | IS 3025, Part 23: 1986 R 2019 Titration Method | 232 | 4.0-2000.0 | 4 | 200 | 600 |
| 13 | Total Dissolved Solids, mg/l | IS 3025, Part 16: 1984 R 2023 Gravimetric method | 637 | 25.0-5000.0 | 25 | 500 | 2000 |
| 14 | Total Hardness, mg/l | IS 3025, (Part 21): 2019 EDTA Method | 522 | 4.0-2000.0 | 4 | 200 | 600 |
| 15 | Turbidity, NTU | IS 3025, (Part 10):1984, R-2023 Nephelometric/Turbiditimetric Method | 2.6 | 1-800 | 0.1 | 1 | 5 |
| 16 | Zinc, mg/l | IS 3025(Part 49) : 1994,R:2019, AAS-Flame Method | <0.1 | 0.10 – 10.0 | 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,*

## PHYSICO-CHEMICAL CHARACTERISTICS OF GROUND WATER SAMPLES

*(Wherever not specified, characteristics are expressed in mg/l, maximum)*

*Ground Water Sampling at Monitoring Station Code : - DB2A*

**Date of Sampling at Station: June 2024**

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

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

| | | | | | |
|---|---|---|---|---|---|
| **Month & Year** | **June 2024** | **Dug Well No.** | **DB-2A** | | |
| **Customer** | **Environment Department, Bharat Coking Coal Limited (BCCL), Koyla Bhawan, Dhanbad (E-mail: gmenv.bccl@coalindia.in)** | | | **Date of Issue** | **30.08.2024** |
| **Project** | **Raniganj Coalfield** | **Sample Ref. No.** | **RI-II/HYDROGEOLOGY/24-25/GW** | **Sampling Method** | **CMPDI/RI-II/LPM 13,(IS 3025:Part -1)** |
| **Sampling Stations** | **Joyrampur Village** | **Date of Sampling** | | **Sample Collected in 5 Ltr Jerricane , Color as observed is transparent** | |
| | | | **Period of Analysis** | | **TO** |

| **Sl. No.** | **Parameter** | **Method of Analysis** | **Observed Values** | | | **IS 10500: 2012** | |
|---|---|---|---|---|---|---|---|
| | | | **GW36** | **Range Of Testing** | **LDL** | **Acceptable Limit (Max)*** | **Permissible Limit in the Absence of Alternate Source (Max)** |
| 1 | Colour, Hazen unit | APHA, 24th edition ,2120-c-Spectrophotometric Single Wavelength Method ,2023 | 3 | 1-500.0 | 1 | 5 | 15 |
| 2 | Calcium, mg/l | IS 3025, (Part 40): 1991 R:2019,AAS-Flame Method & EDTA Method | 98 | 2.0-800.0 | 2 | 75 | 200 |
| 3 | Chlorides, mg/l | IS-3025(Part 32):1988, R-2019 , Argentometric Method | 88 | 2.0-1500.0 | 5 | 250 | 1000 |
| 4 | Fluoride, mg/l | APHA, 24th Edition, SPADNS Method | 0.61 | 0.2-2.00 | 0.2 | 1 | 1.5 |
| 5 | Iron, mg/l | IS 3025 (Part 53) : 2003, R : 2019 , AAS-Flame Method | <0.2 | 0.2-10 | 0.2 | 1 | No relaxation |
| 6 | Magnesium | APHA 24th edition, 3500-Mg B: Calculation Method | 98 | 6.0-700 | 6 | 30 | 100 |
| 7 | Nitrate , mg/l | APHA, 24th edition, UV-Spectrophotometric Method | 24.31 | 0.5-45.0 | 0.5 | 45 | No relaxation |
| 8 | Odour | APHA, 23rd Edition, , 2150-C | Agreeable | Qualitative | Qualitative | Agreeable | Agreeable |
| 9 | pH value | IS 3025, Part 11 : 1983 R 2023 Electrometric( pH Meter) Method | 7.94 | 1-14 | 0.1 | 6.5-8.5 | No relaxation |
| 10 | Sulphate, mg/l | APHA –24th edition, 4500 S , Turbidity Method | 162 | 10.0-400.0 | 10 | 200 | 400 |
| 11 | Taste | APHA,24th edition, 2160-C | Acceptable | Qualitative | Qualitative | Acceptable | Agreeable |
| 12 | Total Alkalinity ($c_a co_3$), mg/l, Max | IS 3025, Part 23: 1986 R 2019 Titration Method | 245 | 4.0-2000.0 | 4 | 200 | 600 |
| 13 | Total Dissolved Solids, mg/l | IS 3025, Part 16: 1984 R 2023 Gravimetric method | 782 | 25.0-5000.0 | 25 | 500 | 2000 |
| 14 | Total Hardness, mg/l | IS 3025, (Part 21): 2019 EDTA Method | 650 | 4.0-2000.0 | 4 | 200 | 600 |
| 15 | Turbidity, NTU | IS 3025, (Part 10):1984, R-2023 Nephelometric/Turbiditimetric Method | 1.8 | 1-800 | 0.1 | 1 | 5 |
| 16 | Zinc, mg/l | IS 3025(Part 49) : 1994,R:2019, AAS-Flame Method | <0.1 | 0.10 – 10.0 | 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,*

(Amit Raj Mishra)

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# GROUND WATER ANALYSIS TEST REPORT

| | | | | | |
|---|---|---|---|---|---|
| **Month & Year** | **June 2024** | **Dug Well No.** | **DB-2A** | | |
| **Customer** | **Environment Department, Bharat Coking Coal Limited (BCCL), Koyla Bhawan, Dhanbad (E-mail: gmenv.bccl@coalindia.in)** | | | **Date of Issue** | **30.08.2024** |
| **Project** | **Raniganj Coalfield** | **Sample Ref. No.** | **RI-II/HYDROGEOLOGY/24-25/GW** | **Sampling Method** | **CMPDI/RI-II/LPM 13,(IS 3025:Part -1)** |
| **Sampling Stations** | **Joyrampur Village** | **Date of Sampling** | | **Sample Collected in 5 Ltr Jerricane , Color as observed is transparent** | |
| | | | **Period of Analysis** | | **TO** |

| **Sl. No.** | **Parameter** | **Method of Analysis** | **Observed Values** | | | **IS 10500: 2012** | |
|---|---|---|---|---|---|---|---|
| | | | **GW36** | **Range Of Testing** | **LDL** | **Acceptable Limit (Max)*** | **Permissible Limit in the Absence of Alternate Source (Max)** |
| 1 | Boron (as B), mg/l, Max | APHA, 24th 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, 24th edition, AAS-GTA | <0.01 | 0.01-10.0 | 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, 24th edition, AAS-GTA | <0.005 | 0.005-10 | 0.005 | 0.01 | No relaxation |
| 5 | Phenolic compounds (as C6H5OH), mg/l, Max | APHA, 24th Edition,4-Amino Autipyrine | <0.001 | 0.001-10 | 0.001 | 0.002 | 0.002 |
| 6 | Selenium, mg/l, Max | APHA 24th 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 24th 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, 24th edition, AAS-GTA | <0.01 | 0.01-10.0 | 0.01 | 0.05 | No relaxation |
| 9 | Nickel as Ni, mg/l Max | IS 3025 Part 54 : 2003,R : 2019, AAS-Flame APHA, 24th edition, AAS-GTA | <0.005 | 0.005-10 | 0.005 | 0.02 | No relaxation |
| 10 | Manganese as Mn, mg/l, Max | APHA, 24TH Edition:2023 AAS-GTA Method | <0.02 | 0.02-10.0 | 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*

***ANALYSED BY***

(Kumar Vaibhav)
***REVIEWED BY***

(Amit Raj Mishra)
***Authorised Signatory***

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CENTRAL MINE PLANNING AND DESIGN INSTITUTE LIMITED

## Environment Laboratory, Regional Institute-II

# GROUND WATER ANALYSIS TEST REPORT

| | | | | | |
|---|---|---|---|---|---|
| **Month & Year** | **June 2024** | **Dug Well No.** | **DB-4** | | |
| **Customer** | **Environment Department, Bharat Coking Coal Limited (BCCL), Koyla Bhawan, Dhanbad (E-mail: gmenv.bccl@coalindia.in)** | | | **Date of Issue** | **30.08.2024** |
| **Project** | **Raniganj Coalfield** | **Sample Ref. No.** | **RI-II/HYDROGEOLOGY/24-25/GW** | **Sampling Method** | **CMPDI/RI-II/LPM 13,(IS 3025:Part -1)** |
| **Sampling Stations** | **Sarbari** | **Date of Sampling** | | **Sample Collected in 5 Ltr Jerricane , Color as observed is transparent** | |
| | | | **Period of Analysis** | | **TO** |

| **Sl. No.** | **Parameter** | **Method of Analysis** | **Observed Values** | | | **IS 10500: 2012** | |
|---|---|---|---|---|---|---|---|
| | | | **GW37** | **Range Of Testing** | **LDL** | **Acceptable Limit (Max)*** | **Permissible Limit in the Absence of Alternate Source (Max)** |
| 1 | Colour, Hazen unit | APHA, 24th edition ,2120-c-Spectrophotometric Single Wavelength Method ,2023 | 1 | 1-500.0 | 1 | 5 | 15 |
| 2 | Calcium, mg/l | IS 3025, (Part 40): 1991 R:2019,AAS-Flame Method & EDTA Method | 116 | 2.0-800.0 | 2 | 75 | 200 |
| 3 | Chlorides, mg/l | IS-3025(Part 32):1988, R-2019 , Argentometric Method | 76 | 2.0-1500.0 | 5 | 250 | 1000 |
| 4 | Fluoride, mg/l | APHA, 24th Edition, SPADNS Method | 0.48 | 0.2-2.00 | 0.2 | 1 | 1.5 |
| 5 | Iron, mg/l | IS 3025 (Part 53) : 2003, R : 2019 , AAS-Flame Method | <0.2 | 0.2-10 | 0.2 | 1 | No relaxation |
| 6 | Magnesium | APHA 24th edition, 3500-Mg B: Calculation Method | 95 | 6.0-700 | 6 | 30 | 100 |
| 7 | Nitrate , mg/l | APHA, 24th edition, UV-Spectrophotometric Method | 30.19 | 0.5-45.0 | 0.5 | 45 | No relaxation |
| 8 | Odour | APHA, 23rd Edition, , 2150-C | Agreeable | Qualitative | Qualitative | Agreeable | Agreeable |
| 9 | pH value | IS 3025, Part 11 : 1983 R 2023 Electrometric( pH Meter) Method | 7.86 | 1-14 | 0.1 | 6.5-8.5 | No relaxation |
| 10 | Sulphate, mg/l | APHA –24th edition, 4500 S , Turbidity Method | 95 | 10.0-400.0 | 10 | 200 | 400 |
| 11 | Taste | APHA,24th edition, 2160-C | Acceptable | Qualitative | Qualitative | Acceptable | Agreeable |
| 12 | Total Alkalinity ($c_aco_3$), mg/l, Max | IS 3025, Part 23: 1986 R 2019 Titration Method | 265 | 4.0-2000.0 | 4 | 200 | 600 |
| 13 | Total Dissolved Solids, mg/l | IS 3025, Part 16: 1984 R 2023 Gravimetric method | 974 | 25.0-5000.0 | 25 | 500 | 2000 |
| 14 | Total Hardness, mg/l | IS 3025, (Part 21): 2019 EDTA Method | 680 | 4.0-2000.0 | 4 | 200 | 600 |
| 15 | Turbidity, NTU | IS 3025, (Part 10):1984, R-2023 Nephelometric/Turbiditimetric Method | 1.9 | 1-800 | 0.1 | 1 | 5 |
| 16 | Zinc, mg/l | IS 3025(Part 49) : 1994,R:2019, AAS-Flame Method | <0.1 | 0.10 – 10.0 | 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.*

***ANALYSED BY***

(Kumar Vaibhav)
***REVIEWED BY***

(Amit Raj Mishra)
***Authorised Signatory***

**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

# GROUND WATER ANALYSIS TEST REPORT

| | | | | | |
|---|---|---|---|---|---|
| **Month & Year** | **June 2024** | **Dug Well No.** | **DB-4** | | |
| **Customer** | **Environment Department, Bharat Coking Coal Limited (BCCL), Koyla Bhawan, Dhanbad (E-mail: gmenv.bccl@coalindia.in)** | | | **Date of Issue** | **30.08.2024** |
| **Project** | **Raniganj Coalfield** | **Sample Ref. No.** | **RI-II/HYDROGEOLOGY/24-25/GW** | **Sampling Method** | **CMPDI/RI-II/LPM 13,(IS 3025:Part -1)** |
| **Sampling Stations** | **Sarbari** | **Date of Sampling** | | **Sample Collected in 5 Ltr Jerricane , Color as observed is transparent** | |
| | | | **Period of Analysis** | | **TO** |

| **Sl. No.** | **Parameter** | **Method of Analysis** | **Observed Values** | | | **IS 10500: 2012** | |
|---|---|---|---|---|---|---|---|
| | | | **GW37** | **Range Of Testing** | **LDL** | **Acceptable Limit (Max)*** | **Permissible Limit in the Absence of Alternate Source (Max)** |
| 1 | Boron (as B), mg/l, Max | APHA, 24th 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, 24th edition, AAS-GTA | <0.01 | 0.01-10.0 | 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, 24th edition, AAS-GTA | <0.005 | 0.005-10 | 0.005 | 0.01 | No relaxation |
| 5 | Phenolic compounds (as C6H5OH), mg/l, Max | APHA, 24th Edition,4-Amino Autipyrine | <0.001 | 0.001-10 | 0.001 | 0.002 | 0.002 |
| 6 | Selenium, mg/l, Max | APHA 24th 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 24th 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, 24th edition, AAS-GTA | <0.01 | 0.01-10.0 | 0.01 | 0.05 | No relaxation |
| 9 | Nickel as Ni, mg/l Max | IS 3025 Part 54 : 2003,R : 2019, AAS-Flame APHA, 24th edition, AAS-GTA | <0.005 | 0.005-10 | 0.005 | 0.02 | No relaxation |
| 10 | Manganese as Mn, mg/l, Max | APHA, 24TH Edition:2023 AAS-GTA Method | <0.02 | 0.02-10.0 | 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.*

***ANALYSED BY***

(Kumar Vaibhav)
***REVIEWED BY***

(Amit Raj Mishra)
***Authorised Signatory***

**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

# GROUND WATER ANALYSIS TEST REPORT

| | | | | | |
|---|---|---|---|---|---|
| **Month & Year** | **June 2024** | **Dug Well No.** | **DB-8** | | |
| **Customer** | **Environment Department, Bharat Coking Coal Limited (BCCL), Koyla Bhawan, Dhanbad (E-mail: gmenv.bccl@coalindia.in)** | | | **Date of Issue** | **30.08.2024** |
| **Project** | **Raniganj Coalfield** | **Sample Ref. No.** | **RI-II/HYDROGEOLOGY/24-25/GW** | **Sampling Method** | **CMPDI/RI-II/LPM 13,(IS 3025:Part -1)** |
| **Sampling Stations** | **Chungei** | **Date of Sampling** | | **Sample Collected in 5 Ltr Jerricane , Color as observed is transparent** | |
| | | | **Period of Analysis** | | **TO** |

| Sl. No. | Parameter | Method of Analysis | Observed Values GW38 | Range Of Testing | LDL | IS 10500: 2012 Acceptable Limit (Max)* | Permissible Limit in the Absence of Alternate Source (Max) |
|---|---|---|---|---|---|---|---|
| 1 | Colour, Hazen unit | APHA, 24th edition ,2120-c-Spectrophotometric Single Wavelength Method ,2023 | 2 | 1-500.0 | 1 | 5 | 15 |
| 2 | Calcium, mg/l | IS 3025, (Part 40): 1991 R:2019,AAS-Flame Method & EDTA Method | 92 | 2.0-800.0 | 2 | 75 | 200 |
| 3 | Chlorides, mg/l | IS-3025(Part 32):1988, R-2019 , Argentometric Method | 58 | 2.0-1500.0 | 5 | 250 | 1000 |
| 4 | Fluoride, mg/l | APHA, 24th Edition, SPADNS Method | 0.48 | 0.2-2.00 | 0.2 | 1 | 1.5 |
| 5 | Iron, mg/l | IS 3025 (Part 53) : 2003, R : 2019 , AAS-Flame Method | <0.2 | 0.2-10 | 0.2 | 1 | No relaxation |
| 6 | Magnesium | APHA 24th edition, 3500-Mg B: Calculation Method | 46 | 6.0-700 | 6 | 30 | 100 |
| 7 | Nitrate , mg/l | APHA, 24th edition, UV-Spectrophotometric Method | 2.60 | 0.5-45.0 | 0.5 | 45 | No relaxation |
| 8 | Odour | APHA, 23rd Edition, , 2150-C | Agreeable | Qualitative | Qualitative | Agreeable | Agreeable |
| 9 | pH value | IS 3025, Part 11 : 1983 R 2023 Electrometric( pH Meter) Method | 8.01 | 1-14 | 0.1 | 6.5-8.5 | No relaxation |
| 10 | Sulphate, mg/l | APHA –24th edition, 4500 S , Turbidity Method | 44 | 10.0-400.0 | 10 | 200 | 400 |
| 11 | Taste | APHA,24th edition, 2160-C | Acceptable | Qualitative | Qualitative | Acceptable | Agreeable |
| 12 | Total Alkalinity ($c_a co_3$), mg/l, Max | IS 3025, Part 23: 1986 R 2019 Titration Method | 178 | 4.0-2000.0 | 4 | 200 | 600 |
| 13 | Total Dissolved Solids, mg/l | IS 3025, Part 16: 1984 R 2023 Gravimetric method | 537 | 25.0-5000.0 | 25 | 500 | 2000 |
| 14 | Total Hardness, mg/l | IS 3025, (Part 21): 2019 EDTA Method | 420 | 4.0-2000.0 | 4 | 200 | 600 |
| 15 | Turbidity, NTU | IS 3025, (Part 10):1984, R-2023 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 | <0.1 | 0.10 – 10.0 | 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.*

***ANALYSED BY***

(Kumar Vaibhav)
***REVIEWED BY***

(Amit Raj Mishra)
***Authorised Signatory***

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# GROUND WATER ANALYSIS TEST REPORT

| | | | | | |
|---|---|---|---|---|---|
| **Month & Year** | **June 2024** | **Dug Well No.** | **DB-8** | | |
| **Customer** | **Environment Department, Bharat Coking Coal Limited (BCCL), Koyla Bhawan, Dhanbad (E-mail: gmenv.bccl@coalindia.in)** | | | **Date of Issue** | **30.08.2024** |
| **Project** | **Raniganj Coalfield** | **Sample Ref. No.** | **RI-II/HYDROGEOLOGY/24-25/GW** | **Sampling Method** | **CMPDI/RI-II/LPM 13,(IS 3025:Part -1)** |
| **Sampling Stations** | **Chungei** | **Date of Sampling** | | **Sample Collected in 5 Ltr Jerricane , Color as observed is transparent** | |
| | | | **Period of Analysis** | | **TO** |

| **Sl. No.** | **Parameter** | **Method of Analysis** | **Observed Values** | | | **IS 10500: 2012** | |
|---|---|---|---|---|---|---|---|
| | | | **GW38** | **Range Of Testing** | **LDL** | **Acceptable Limit (Max)*** | **Permissible Limit in the Absence of Alternate Source (Max)** |
| 1 | Boron (as B), mg/l, Max | APHA, 24th 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, 24th edition, AAS-GTA | <0.01 | 0.01-10.0 | 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, 24th edition, AAS-GTA | <0.005 | 0.005-10 | 0.005 | 0.01 | No relaxation |
| 5 | Phenolic compounds (as C6H5OH), mg/l, Max | APHA, 24th Edition,4-Amino Autipyrine | <0.001 | 0.001-10 | 0.001 | 0.002 | 0.002 |
| 6 | Selenium, mg/l, Max | APHA 24th 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 24th 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, 24th edition, AAS-GTA | <0.01 | 0.01-10.0 | 0.01 | 0.05 | No relaxation |
| 9 | Nickel as Ni, mg/l Max | IS 3025 Part 54 : 2003,R : 2019, AAS-Flame APHA, 24th edition, AAS-GTA | <0.005 | 0.005-10 | 0.005 | 0.02 | No relaxation |
| 10 | Manganese as Mn, mg/l, Max | APHA, 24TH Edition:2023 AAS-GTA Method | <0.02 | 0.02-10.0 | 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.*

***ANALYSED BY***

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***REVIEWED BY***

(Amit Raj Mishra)
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CENTRAL MINE PLANNING AND DESIGN INSTITUTE LIMITED

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# GROUND WATER ANALYSIS TEST REPORT

| | | | | | |
|---|---|---|---|---|---|
| **Month & Year** | **June 2024** | **Dug Well No.** | **DB-10** | | |
| **Customer** | **Environment Department, Bharat Coking Coal Limited (BCCL), Koyla Bhawan, Dhanbad (E-mail: gmenv.bccl@coalindia.in)** | | | **Date of Issue** | **30.08.2024** |
| **Project** | **Raniganj Coalfield** | **Sample Ref. No.** | **RI-II/HYDROGEOLOGY/24-25/GW** | **Sampling Method** | **CMPDI/RI-II/LPM 13,(IS 3025:Part -1)** |
| **Sampling Stations** | **Kulti** | **Date of Sampling** | | **Sample Collected in 5 Ltr Jerricane , Color as observed is transparent** | |
| | | | **Period of Analysis** | | **TO** |

| **Sl. No.** | **Parameter** | **Method of Analysis** | **Observed Values** | | | **IS 10500: 2012** | |
|---|---|---|---|---|---|---|---|
| | | | **GW-39** | **Range Of Testing** | **LDL** | **Acceptable Limit (Max)*** | **Permissible Limit in the Absence of Alternate Source (Max)** |
| 1 | Colour, Hazen unit | APHA, 24th edition ,2120-c-Spectrophotometric Single Wavelength Method ,2023 | 3 | 1-500.0 | 1 | 5 | 15 |
| 2 | Calcium, mg/l | IS 3025, (Part 40): 1991 R:2019,AAS-Flame Method & EDTA Method | 74 | 2.0-800.0 | 2 | 75 | 200 |
| 3 | Chlorides, mg/l | IS-3025(Part 32):1988, R-2019 , Argentometric Method | 80 | 2.0-1500.0 | 5 | 250 | 1000 |
| 4 | Fluoride, mg/l | APHA, 24th Edition, SPADNS Method | 0.54 | 0.2-2.00 | 0.2 | 1 | 1.5 |
| 5 | Iron, mg/l | IS 3025 (Part 53) : 2003, R : 2019 , AAS-Flame Method | 0.2 | 0.2-10 | 0.2 | 1 | No relaxation |
| 6 | Magnesium | APHA 24th edition, 3500-Mg B: Calculation Method | 50 | 6.0-700 | 6 | 30 | 100 |
| 7 | Nitrate , mg/l | APHA, 24th edition, UV-Spectrophotometric Method | 27.35 | 0.5-45.0 | 0.5 | 45 | No relaxation |
| 8 | Odour | APHA, 23rd Edition, , 2150-C | Agreeable | Qualitative | Qualitative | Agreeable | Agreeable |
| 9 | pH value | IS 3025, Part 11 : 1983 R 2023 Electrometric( pH Meter) Method | 7.91 | 1-14 | 0.1 | 6.5-8.5 | No relaxation |
| 10 | Sulphate, mg/l | APHA –24th edition, 4500 S , Turbidity Method | 114 | 10.0-400.0 | 10 | 200 | 400 |
| 11 | Taste | APHA,24th edition, 2160-C | Acceptable | Qualitative | Qualitative | Acceptable | Agreeable |
| 12 | Total Alkalinity ($c_aco_3$), mg/l, Max | IS 3025, Part 23: 1986 R 2019 Titration Method | 172 | 4.0-2000.0 | 4 | 200 | 600 |
| 13 | Total Dissolved Solids, mg/l | IS 3025, Part 16: 1984 R 2023 Gravimetric method | 533 | 25.0-5000.0 | 25 | 500 | 2000 |
| 14 | Total Hardness, mg/l | IS 3025, (Part 21): 2019 EDTA Method | 390 | 4.0-2000.0 | 4 | 200 | 600 |
| 15 | Turbidity, NTU | IS 3025, (Part 10):1984, R-2023 Nephelometric/Turbiditimetric Method | 2.2 | 1-800 | 0.1 | 1 | 5 |
| 16 | Zinc, mg/l | IS 3025(Part 49) : 1994,R:2019, AAS-Flame Method | 0.14 | 0.10 – 10.0 | 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.*

***ANALYSED BY***

(Kumar Vaibhav)
***REVIEWED BY***

(Amit Raj Mishra)
***Authorised Signatory***

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# GROUND WATER ANALYSIS TEST REPORT

| | | | | | |
|---|---|---|---|---|---|
| **Month & Year** | **June 2024** | **Dug Well No.** | **DB-10** | | |
| **Customer** | **Environment Department, Bharat Coking Coal Limited (BCCL), Koyla Bhawan, Dhanbad (E-mail: gmenv.bccl@coalindia.in)** | | | **Date of Issue** | **30.08.2024** |
| **Project** | **Raniganj Coalfield** | **Sample Ref. No.** | **RI-II/HYDROGEOLOGY/24-25/GW** | **Sampling Method** | **CMPDI/RI-II/LPM 13,(IS 3025:Part -1)** |
| **Sampling Stations** | **Kulti** | **Date of Sampling** | | **Sample Collected in 5 Ltr Jerricane , Color as observed is transparent** | |
| | | | **Period of Analysis** | | **TO** |

| **Sl. No.** | **Parameter** | **Method of Analysis** | **Observed Values** | | | **IS 10500: 2012** | |
|---|---|---|---|---|---|---|---|
| | | | **GW39** | **Range Of Testing** | **LDL** | **Acceptable Limit (Max)*** | **Permissible Limit in the Absence of Alternate Source (Max)** |
| 1 | Boron (as B), mg/l, Max | APHA, 24th 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, 24th edition, AAS-GTA | <0.01 | 0.01-10.0 | 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, 24th edition, AAS-GTA | <0.005 | 0.005-10 | 0.005 | 0.01 | No relaxation |
| 5 | Phenolic compounds (as C6H5OH), mg/l, Max | APHA, 24th Edition,4-Amino Autipyrine | <0.001 | 0.001-10 | 0.001 | 0.002 | 0.002 |
| 6 | Selenium, mg/l, Max | APHA 24th 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 24th 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, 24th edition, AAS-GTA | <0.01 | 0.01-10.0 | 0.01 | 0.05 | No relaxation |
| 9 | Nickel as Ni, mg/l Max | IS 3025 Part 54 : 2003,R : 2019, AAS-Flame APHA, 24th 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 | <0.02 | 0.02-10.0 | 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.*

***ANALYSED BY***

(Kumar Vaibhav)
***REVIEWED BY***

(Amit Raj Mishra)
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CENTRAL MINE PLANNING AND DESIGN INSTITUTE LIMITED

## Environment Laboratory, Regional Institute-II

# GROUND WATER ANALYSIS TEST REPORT

| | | | | | |
|---|---|---|---|---|---|
| **Month & Year** | **June 2024** | **Dug Well No.** | **DB-12** | | |
| **Customer** | **Environment Department, Bharat Coking Coal Limited (BCCL), Koyla Bhawan, Dhanbad (E-mail: gmenv.bccl@coalindia.in)** | | | **Date of Issue** | **30.08.2024** |
| **Project** | **Raniganj Coalfield** | **Sample Ref. No.** | **RI-II/HYDROGEOLOGY/24-25/GW** | **Sampling Method** | **CMPDI/RI-II/LPM 13,(IS 3025:Part -1)** |
| **Sampling Stations** | **Sabanpur** | **Date of Sampling** | | **Sample Collected in 5 Ltr Jerricane , Color as observed is transparent** | |
| | | | **Period of Analysis** | | **TO** |

| **Sl. No.** | **Parameter** | **Method of Analysis** | **Observed Values** | | | **IS 10500: 2012** | |
|---|---|---|---|---|---|---|---|
| | | | **GW40** | **Range Of Testing** | **LDL** | **Acceptable Limit (Max)*** | **Permissible Limit in the Absence of Alternate Source (Max)** |
| 1 | Colour, Hazen unit | APHA, 24th edition ,2120-c-Spectrophotometric Single Wavelength Method ,2023 | 2 | 1-500.0 | 1 | 5 | 15 |
| 2 | Calcium, mg/l | IS 3025, (Part 40): 1991 R:2019,AAS-Flame Method & EDTA Method | 38 | 2.0-800.0 | 2 | 75 | 200 |
| 3 | Chlorides, mg/l | IS-3025(Part 32):1988, R-2019 , Argentometric Method | 42 | 2.0-1500.0 | 5 | 250 | 1000 |
| 4 | Fluoride, mg/l | APHA, 24th Edition, SPADNS Method | 0.30 | 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 24th edition, 3500-Mg B: Calculation Method | 21 | 6.0-700 | 6 | 30 | 100 |
| 7 | Nitrate , mg/l | APHA, 24th edition, UV-Spectrophotometric Method | 24.09 | 0.5-45.0 | 0.5 | 45 | No relaxation |
| 8 | Odour | APHA, 23rd Edition, , 2150-C | Agreeable | Qualitative | Qualitative | Agreeable | Agreeable |
| 9 | pH value | IS 3025, Part 11 : 1983 R 2023 Electrometric( pH Meter) Method | 8.03 | 1-14 | 0.1 | 6.5-8.5 | No relaxation |
| 10 | Sulphate, mg/l | APHA –24th edition, 4500 S , Turbidity Method | 132 | 10.0-400.0 | 10 | 200 | 400 |
| 11 | Taste | APHA,24th edition, 2160-C | Acceptable | Qualitative | Qualitative | Acceptable | Agreeable |
| 12 | Total Alkalinity ($c_aco_3$), mg/l, Max | IS 3025, Part 23: 1986 R 2019 Titration Method | 292 | 4.0-2000.0 | 4 | 200 | 600 |
| 13 | Total Dissolved Solids, mg/l | IS 3025, Part 16: 1984 R 2023 Gravimetric method | 245 | 25.0-5000.0 | 25 | 500 | 2000 |
| 14 | Total Hardness, mg/l | IS 3025, (Part 21): 2019 EDTA Method | 182 | 4.0-2000.0 | 4 | 200 | 600 |
| 15 | Turbidity, NTU | IS 3025, (Part 10):1984, R-2023 Nephelometric/Turbiditimetric Method | 2.6 | 1-800 | 0.1 | 1 | 5 |
| 16 | Zinc, mg/l | IS 3025(Part 49) : 1994,R:2019, AAS-Flame Method | 0.31 | 0.10 – 10.0 | 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.*

***ANALYSED BY***

(Kumar Vaibhav)
***REVIEWED BY***

(Amit Raj Mishra)
***Authorised Signatory***

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# GROUND WATER ANALYSIS TEST REPORT

| | | | | | |
|---|---|---|---|---|---|
| **Month & Year** | **June 2024** | **Dug Well No.** | **DB-12** | | |
| **Customer** | **Environment Department, Bharat Coking Coal Limited (BCCL), Koyla Bhawan, Dhanbad (E-mail: gmenv.bccl@coalindia.in)** | | | **Date of Issue** | **30.08.2024** |
| **Project** | **Raniganj Coalfield** | **Sample Ref. No.** | **RI-II/HYDROGEOLOGY/24-25/GW** | **Sampling Method** | **CMPDI/RI-II/LPM 13,(IS 3025:Part -1)** |
| **Sampling Stations** | **Sabanpur** | **Date of Sampling** | | **Sample Collected in 5 Ltr Jerricane , Color as observed is transparent** | |
| | | | **Period of Analysis** | | **TO** |

| **Sl. No.** | **Parameter** | **Method of Analysis** | **Observed Values** | | | **IS 10500: 2012** | |
|---|---|---|---|---|---|---|---|
| | | | **GW40** | **Range Of Testing** | **LDL** | **Acceptable Limit (Max)*** | **Permissible Limit in the Absence of Alternate Source (Max)** |
| 1 | Boron (as B), mg/l, Max | APHA, 24th 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, 24th edition, AAS-GTA | <0.01 | 0.01-10.0 | 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, 24th edition, AAS-GTA | <0.005 | 0.005-10 | 0.005 | 0.01 | No relaxation |
| 5 | Phenolic compounds (as C6H5OH), mg/l, Max | APHA, 24th Edition,4-Amino Autipyrine | <0.001 | 0.001-10 | 0.001 | 0.002 | 0.002 |
| 6 | Selenium, mg/l, Max | APHA 24th 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 24th 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, 24th edition, AAS-GTA | <0.01 | 0.01-10.0 | 0.01 | 0.05 | No relaxation |
| 9 | Nickel as Ni, mg/l Max | IS 3025 Part 54 : 2003,R : 2019, AAS-Flame APHA, 24th edition, AAS-GTA | <0.005 | 0.005-10 | 0.005 | 0.02 | No relaxation |
| 10 | Manganese as Mn, mg/l, Max | APHA, 24TH Edition:2023 AAS-GTA Method | 0.07 | 0.02-10.0 | 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,*

***ANALYSED BY***

(Kumar Vaibhav)
***REVIEWED BY***

(Amit Raj Mishra)
***Authorised Signatory***

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# GROUND WATER ANALYSIS TEST REPORT

| | | | | | |
|---|---|---|---|---|---|
| **Month & Year** | **June 2024** | **Dug Well No.** | **DB-13** | | |
| **Customer** | **Environment Department, Bharat Coking Coal Limited (BCCL), Koyla Bhawan, Dhanbad (E-mail: gmenv.bccl@coalindia.in)** | | | **Date of Issue** | **30.08.2024** |
| **Project** | **Raniganj Coalfield** | **Sample Ref. No.** | **RI-II/HYDROGEOLOGY/24-25/GW** | **Sampling Method** | **CMPDI/RI-II/LPM 13,(IS 3025:Part -1)** |
| **Sampling Stations** | **Dendua More** | **Date of Sampling** | | **Sample Collected in 5 Ltr Jerricane , Color as observed is transparent** | |
| | | | **Period of Analysis** | | **TO** |

| **Sl. No.** | **Parameter** | **Method of Analysis** | **Observed Values** | | | **IS 10500: 2012** | |
|---|---|---|---|---|---|---|---|
| | | | **GW41** | **Range Of Testing** | **LDL** | **Acceptable Limit (Max)*** | **Permissible Limit in the Absence of Alternate Source (Max)** |
| 1 | Colour, Hazen unit | APHA, 24th edition ,2120-c-Spectrophotometric Single Wavelength Method ,2023 | 3 | 1-500.0 | 1 | 5 | 15 |
| 2 | Calcium, mg/l | IS 3025, (Part 40): 1991 R:2019,AAS-Flame Method & EDTA Method | 58 | 2.0-800.0 | 2 | 75 | 200 |
| 3 | Chlorides, mg/l | IS-3025(Part 32):1988, R-2019 , Argentometric Method | 40 | 2.0-1500.0 | 5 | 250 | 1000 |
| 4 | Fluoride, mg/l | APHA, 24th Edition, SPADNS Method | 0.49 | 0.2-2.00 | 0.2 | 1 | 1.5 |
| 5 | Iron, mg/l | IS 3025 (Part 53) : 2003, R : 2019 , AAS-Flame Method | <0.2 | 0.2-10 | 0.2 | 1 | No relaxation |
| 6 | Magnesium | APHA 24th edition, 3500-Mg B: Calculation Method | 33 | 6.0-700 | 6 | 30 | 100 |
| 7 | Nitrate , mg/l | APHA, 24th edition, UV-Spectrophotometric Method | 34.4 | 0.5-45.0 | 0.5 | 45 | No relaxation |
| 8 | Odour | APHA, 23rd Edition, , 2150-C | Agreeable | Qualitative | Qualitative | Agreeable | Agreeable |
| 9 | pH value | IS 3025, Part 11 : 1983 R 2023 Electrometric( pH Meter) Method | 8.02 | 1-14 | 0.1 | 6.5-8.5 | No relaxation |
| 10 | Sulphate, mg/l | APHA –24th edition, 4500 S , Turbidity Method | 108 | 10.0-400.0 | 10 | 200 | 400 |
| 11 | Taste | APHA,24th edition, 2160-C | Acceptable | Qualitative | Qualitative | Acceptable | Agreeable |
| 12 | Total Alkalinity ($c_aco_3$), mg/l, Max | IS 3025, Part 23: 1986 R 2019 Titration Method | 158 | 4.0-2000.0 | 4 | 200 | 600 |
| 13 | Total Dissolved Solids, mg/l | IS 3025, Part 16: 1984 R 2023 Gravimetric method | 350 | 25.0-5000.0 | 25 | 500 | 2000 |
| 14 | Total Hardness, mg/l | IS 3025, (Part 21): 2019 EDTA Method | 280 | 4.0-2000.0 | 4 | 200 | 600 |
| 15 | Turbidity, NTU | IS 3025, (Part 10):1984, R-2023 Nephelometric/Turbiditimetric Method | 2.6 | 1-800 | 0.1 | 1 | 5 |
| 16 | Zinc, mg/l | IS 3025(Part 49) : 1994,R:2019, AAS-Flame Method | 0.1 | 0.10 – 10.0 | 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*

***ANALYSED BY***

(Kumar Vaibhav)
***REVIEWED BY***

(Amit Raj Mishra)
***Authorised Signatory***

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# GROUND WATER ANALYSIS TEST REPORT

| | | | | | |
|---|---|---|---|---|---|
| **Month & Year** | **June 2024** | **Dug Well No.** | **DB-13** | | |
| **Customer** | **Environment Department, Bharat Coking Coal Limited (BCCL), Koyla Bhawan, Dhanbad (E-mail: gmenv.bccl@coalindia.in)** | | | **Date of Issue** | **30.08.2024** |
| **Project** | **Hurriladih** | **Sample Ref. No.** | **RI-II/HYDROGEOLOGY/24-25/GW** | **Sampling Method** | **CMPDI/RI-II/LPM 13,(IS 3025:Part -1)** |
| **Sampling Stations** | **Dendua More** | **Date of Sampling** | **06.05.2024** | **Sample Collected in 5 Ltr Jerricane , Color as observed is transparent** | |
| | | | **Period of Analysis** | | **TO** |

| **Sl. No.** | **Parameter** | **Method of Analysis** | **Observed Values** | | | **IS 10500: 2012** | |
|---|---|---|---|---|---|---|---|
| | | | **GW41** | **Range Of Testing** | **LDL** | **Acceptable Limit (Max)*** | **Permissible Limit in the Absence of Alternate Source (Max)** |
| 1 | Boron (as B), mg/l, Max | APHA, 24th 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, 24th edition, AAS-GTA | <0.01 | 0.01-10.0 | 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, 24th edition, AAS-GTA | <0.005 | 0.005-10 | 0.005 | 0.01 | No relaxation |
| 5 | Phenolic compounds (as C6H5OH), mg/l, Max | APHA, 24th Edition,4-Amino Autipyrine | <0.001 | 0.001-10 | 0.001 | 0.002 | 0.002 |
| 6 | Selenium, mg/l, Max | APHA 24th 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 24th 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, 24th edition, AAS-GTA | <0.01 | 0.01-10.0 | 0.01 | 0.05 | No relaxation |
| 9 | Nickel as Ni, mg/l Max | IS 3025 Part 54 : 2003,R : 2019, AAS-Flame APHA, 24th edition, AAS-GTA | <0.005 | 0.005-10 | 0.005 | 0.02 | No relaxation |
| 10 | Manganese as Mn, mg/l, Max | APHA, 24TH Edition:2023 AAS-GTA Method | <0.02 | 0.02-10.0 | 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,*

***ANALYSED BY***

(Kumar Vaibhav)
***REVIEWED BY***

(Amit Raj Mishra)
***Authorised Signatory***

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# GROUND WATER ANALYSIS TEST REPORT

| | | | | | |
|---|---|---|---|---|---|
| **Month & Year** | **June 2024** | **Dug Well No.** | **DB-18** | | |
| **Customer** | **Environment Department, Bharat Coking Coal Limited (BCCL), Koyla Bhawan, Dhanbad (E-mail: gmenv.bccl@coalindia.in)** | | | **Date of Issue** | **30.08.2024** |
| **Project** | **RCF** | **Sample Ref. No.** | **RI-II/HYDROGEOLOGY/24-25/GW** | **Sampling Method** | **CMPDI/RI-II/LPM 13,(IS 3025:Part -1)** |
| **Sampling Stations** | **Luchibad** | **Date of Sampling** | | **Sample Collected in 5 Ltr Jerricane , Color as observed is transparent** | |
| | | | **Period of Analysis** | | **TO** |

| **Sl. No.** | **Parameter** | **Method of Analysis** | **Observed Values** | | | **IS 10500: 2012** | |
|---|---|---|---|---|---|---|---|
| | | | **GW42** | **Range Of Testing** | **LDL** | **Acceptable Limit (Max)*** | **Permissible Limit in the Absence of Alternate Source (Max)** |
| 1 | Colour, Hazen unit | APHA, 24th edition ,2120-c-Spectrophotometric Single Wavelength Method ,2023 | 2 | 1-500.0 | 1 | 5 | 15 |
| 2 | Calcium, mg/l | IS 3025, (Part 40): 1991 R:2019,AAS-Flame Method & EDTA Method | 62 | 2.0-800.0 | 2 | 75 | 200 |
| 3 | Chlorides, mg/l | IS-3025(Part 32):1988, R-2019 , Argentometric Method | 54 | 2.0-1500.0 | 5 | 250 | 1000 |
| 4 | Fluoride, mg/l | APHA, 24th Edition, SPADNS Method | 0.36 | 0.2-2.00 | 0.2 | 1 | 1.5 |
| 5 | Iron, mg/l | IS 3025 (Part 53) : 2003, R : 2019 , AAS-Flame Method | <0.2 | 0.2-10 | 0.2 | 1 | No relaxation |
| 6 | Magnesium | APHA 24th edition, 3500-Mg B: Calculation Method | 39 | 6.0-700 | 6 | 30 | 100 |
| 7 | Nitrate , mg/l | APHA, 24th edition, UV-Spectrophotometric Method | 8.07 | 0.5-45.0 | 0.5 | 45 | No relaxation |
| 8 | Odour | APHA, 23rd Edition, , 2150-C | Agreeable | Qualitative | Qualitative | Agreeable | Agreeable |
| 9 | pH value | IS 3025, Part 11 : 1983 R 2023 Electrometric( pH Meter) Method | 8.00 | 1-14 | 0.1 | 6.5-8.5 | No relaxation |
| 10 | Sulphate, mg/l | APHA –24th edition, 4500 S , Turbidity Method | 64 | 10.0-400.0 | 10 | 200 | 400 |
| 11 | Taste | APHA,24th edition, 2160-C | Acceptable | Qualitative | Qualitative | Acceptable | Agreeable |
| 12 | Total Alkalinity ($c_aco_3$), mg/l, Max | IS 3025, Part 23: 1986 R 2019 Titration Method | 162 | 4.0-2000.0 | 4 | 200 | 600 |
| 13 | Total Dissolved Solids, mg/l | IS 3025, Part 16: 1984 R 2023 Gravimetric method | 400 | 25.0-5000.0 | 25 | 500 | 2000 |
| 14 | Total Hardness, mg/l | IS 3025, (Part 21): 2019 EDTA Method | 316 | 4.0-2000.0 | 4 | 200 | 600 |
| 15 | Turbidity, NTU | IS 3025, (Part 10):1984, R-2023 Nephelometric/Turbiditimetric Method | 1.8 | 1-800 | 0.1 | 1 | 5 |
| 16 | Zinc, mg/l | IS 3025(Part 49) : 1994,R:2019, AAS-Flame Method | <0.1 | 0.10 – 10.0 | 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,*

***ANALYSED BY***

(Kumar Vaibhav)
***REVIEWED BY***

(Amit Raj Mishra)
***Authorised Signatory***

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## GROUND WATER ANALYSIS TEST REPORT

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| | | | | | |
|---|---|---|---|---|---|
| **Month & Year** | **June 2024** | **Dug Well No.** | **DB-18** | | |
| **Customer** | **Environment Department, Bharat Coking Coal Limited (BCCL), Koyla Bhawan, Dhanbad (E-mail: gmenv.bccl@coalindia.in)** | | | **Date of Issue** | **30.08.2024** |
| **Project** | **RCF** | **Sample Ref. No.** | **RI-II/HYDROGEOLOGY/24-25/GW** | **Sampling Method** | **CMPDI/RI-II/LPM 13,(IS 3025:Part -1)** |
| **Sampling Stations** | **Luchibad** | **Date of Sampling** | | **Sample Collected in 5 Ltr Jerricane , Color as observed is transparent** | |
| | | **Period of Analysis** | | **to** | |

| **Sl. No.** | **Parameter** | **Method of Analysis** | **Observed Values** | | | **IS 10500: 2012** | |
|---|---|---|---|---|---|---|---|
| | | | **GW42** | **Range Of Testing** | **LDL** | **Acceptable Limit (Max)*** | **Permissible Limit in the Absence of Alternate Source (Max)** |
| 1 | Boron (as B), mg/l, Max | APHA, 24th 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, 24th edition, AAS-GTA | <0.01 | 0.01-10.0 | 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, 24th edition, AAS-GTA | <0.005 | 0.005-10 | 0.005 | 0.01 | No relaxation |
| 5 | Phenolic compounds (as C6H5OH), mg/l, Max | APHA, 24th Edition,4-Amino Autipyrine | <0.001 | 0.001-10 | 0.001 | 0.002 | 0.002 |
| 6 | Selenium, mg/l, Max | APHA 24th 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 24th 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, 24th edition, AAS-GTA | <0.01 | 0.10-10.0 | 0.01 | 0.05 | No relaxation |
| 9 | Nickel as Ni, mg/l Max | IS 3025 Part 54 : 2003,R : 2019, AAS-Flame APHA, 24th edition, AAS-GTA | <0.005 | 0.005-10 | 0.005 | 0.02 | No relaxation |
| 10 | Manganese as Mn, mg/l, Max | IS APHA, 24TH Edition:2023 AAS-GTA Method | <0.02 | 0.02-10.0 | 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,*

***ANALYSED BY***

(Kumar Vaibhav)
***REVIEWED BY***

(Amit Raj Mishra)
***Authorised Signatory***

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# GROUND WATER ANALYSIS TEST REPORT

CMPDIL, RI-II
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| | | | | | |
|---|---|---|---|---|---|
| **Month & Year** | **June 2024** | **Dug Well No.** | **DB-26** | | |
| **Customer** | **Environment Department, Bharat Coking Coal Limited (BCCL), Koyla Bhawan, Dhanbad (E-mail: gmenv.bccl@coalindia.in)** | | | **Date of Issue** | **30.08.2024** |
| **Project** | **Raniganj Coalfield** | **Sample Ref. No.** | **RI-II/HYDROGEOLOGY/24-25/GW** | **Sampling Method** | **CMPDI/RI-II/LPM 13,(IS 3025:Part -1)** |
| **Sampling Stations** | **Ledaharia** | **Date of Sampling** | | **Sample Collected in 5 Ltr Jerricane , Color as observed is transparent** | |
| | | | **Period of Analysis** | | **to** |

| **Sl. No.** | **Parameter** | **Method of Analysis** | **Observed Values** | | | **IS 10500: 2012** | |
|---|---|---|---|---|---|---|---|
| | | | **GW43** | **Range Of Testing** | **LDL** | **Acceptable Limit (Max)*** | **Permissible Limit in the Absence of Alternate Source (Max)** |
| 1 | Colour, Hazen unit | APHA, 24th edition ,2120-c-Spectrophotometric Single Wavelength Method ,2023 | 1 | 1-500.0 | 1 | 5 | 15 |
| 2 | Calcium, mg/l | IS 3025, (Part 40): 1991 R:2019,AAS-Flame Method & EDTA Method | 64 | 2.0-800.0 | 2 | 75 | 200 |
| 3 | Chlorides, mg/l | IS-3025(Part 32):1988, R-2019 , Argentometric Method | 42 | 2.0-1500.0 | 5 | 250 | 1000 |
| 4 | Fluoride, mg/l | APHA, 24th Edition, SPADNS Method | 0.82 | 0.2-2.00 | 0.2 | 1 | 1.5 |
| 5 | Iron, mg/l | IS 3025 (Part 53) : 2003, R : 2019 , AAS-Flame Method | <0.2 | 0.2-10 | 0.2 | 1 | No relaxation |
| 6 | Magnesium | APHA 24th edition, 3500-Mg B: Calculation Method | 39 | 6.0-700 | 6 | 30 | 100 |
| 7 | Nitrate , mg/l | APHA, 24th edition, UV-Spectrophotometric Method | 29.30 | 0.5-45.0 | 0.5 | 45 | No relaxation |
| 8 | Odour | APHA, 23rd Edition, , 2150-C | Agreeable | Qualitative | Qualitative | Agreeable | Agreeable |
| 9 | pH value | IS 3025, Part 11 : 1983 R 2023 Electrometric( pH Meter) Method | 7.75 | 1-14 | 0.1 | 6.5-8.5 | No relaxation |
| 10 | Sulphate, mg/l | APHA –24th edition, 4500 S , Turbidity Method | 166 | 10.0-400.0 | 10 | 200 | 400 |
| 11 | Taste | APHA,24th edition, 2160-C | Acceptable | Qualitative | Qualitative | Acceptable | Agreeable |
| 12 | Total Alkalinity ($c_aco_3$), mg/l, Max | IS 3025, Part 23: 1986 R 2019 Titration Method | 155 | 4.0-2000.0 | 4 | 200 | 600 |
| 13 | Total Dissolved Solids, mg/l | IS 3025, Part 16: 1984 R 2023 Gravimetric method | 393 | 25.0-5000.0 | 25 | 500 | 2000 |
| 14 | Total Hardness, mg/l | IS 3025, (Part 21): 2019 EDTA Method | 320 | 4.0-2000.0 | 4 | 200 | 600 |
| 15 | Turbidity, NTU | IS 3025, (Part 10):1984, R-2023 Nephelometric/Turbiditimetric Method | 3.0 | 1-800 | 0.1 | 1 | 5 |
| 16 | Zinc, mg/l | IS 3025(Part 49) : 1994,R:2019, AAS-Flame Method | <0.1 | 0.10 – 10.0 | 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.*

***ANALYSED BY***

(Kumar Vaibhav)
***REVIEWED BY***

(Amit Raj Mishra)
***Authorised Signatory***

**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

# GROUND WATER ANALYSIS TEST REPORT

| | | | | | |
|---|---|---|---|---|---|
| **Month & Year** | **June 2024** | **Dug Well No.** | **DB-26** | | |
| **Customer** | **Environment Department, Bharat Coking Coal Limited (BCCL), Koyla Bhawan, Dhanbad (E-mail: gmenv.bccl@coalindia.in)** | | | **Date of Issue** | **30.08.2024** |
| **Project** | **Raniganj Coalfield** | **Sample Ref. No.** | **RI-II/HYDROGEOLOGY/24-25/GW** | **Sampling Method** | **CMPDI/RI-II/LPM 13,(IS 3025:Part -1)** |
| **Sampling Stations** | **Ledaharia** | **Date of Sampling** | | **Sample Collected in 5 Ltr Jerricane , Color as observed is transparent** | |
| | | | **Period of Analysis** | | **to** |

| **Sl. No.** | **Parameter** | **Method of Analysis** | **Observed Values** | | | **IS 10500: 2012** | |
|---|---|---|---|---|---|---|---|
| | | | **GW43** | **Range Of Testing** | **LDL** | **Acceptable Limit (Max)*** | **Permissible Limit in the Absence of Alternate Source (Max)** |
| 1 | Boron (as B), mg/l, Max | APHA, 24th 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, 24th edition, AAS-GTA | <0.01 | 0.01-10.0 | 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, 24th edition, AAS-GTA | <0.005 | 0.005-10 | 0.005 | 0.01 | No relaxation |
| 5 | Phenolic compounds (as C6H5OH), mg/l, Max | APHA, 24th Edition,4-Amino Autipyrine | <0.001 | 0.001-10 | 0.001 | 0.002 | 0.002 |
| 6 | Selenium, mg/l, Max | APHA 24th 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 24th 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, 24th edition, AAS-GTA | <0.01 | 0.01-10.0 | 0.01 | 0.05 | No relaxation |
| 9 | Nickel as Ni, mg/l Max | IS 3025 Part 54 : 2003,R : 2019, AAS-Flame APHA, 24th edition, AAS-GTA | <0.005 | 0.005-10 | 0.005 | 0.02 | No relaxation |
| 10 | Manganese as Mn, mg/l, Max | APHA, 24TH Edition:2023 AAS-GTA Method | <0.02 | 0.02-10.0 | 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.*

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(Kumar Vaibhav)
***REVIEWED BY***

(Amit Raj Mishra)
***Authorised Signatory***

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# GROUND WATER ANALYSIS TEST REPORT

| | | | | | |
|---|---|---|---|---|---|
| **Month & Year** | **June 2024** | **Dug Well No.** | **DB-27** | | |
| **Customer** | **Environment Department, Bharat Coking Coal Limited (BCCL), Koyla Bhawan, Dhanbad (E-mail: gmenv.bccl@coalindia.in)** | | | **Date of Issue** | **30.08.2024** |
| **Project** | **Raniganj Coalfield** | **Sample Ref. No.** | **RI-II/HYDROGEOLOGY/24-25/GW** | **Sampling Method** | **CMPDI/RI-II/LPM 13,(IS 3025:Part -1)** |
| **Sampling Stations** | **Hodla** | **Date of Sampling** | | **Sample Collected in 5 Ltr Jerricane , Color as observed is transparent** | |
| | | | **Period of Analysis** | **to** | |

| **Sl. No.** | **Parameter** | **Method of Analysis** | **Observed Values** | | | **IS 10500: 2012** | |
|---|---|---|---|---|---|---|---|
| | | | **GW44** | **Range Of Testing** | **LDL** | **Acceptable Limit (Max)*** | **Permissible Limit in the Absence of Alternate Source (Max)** |
| 1 | Colour, Hazen unit | APHA, 24th edition ,2120-c-Spectrophotometric Single Wavelength Method ,2023 | 2 | 1-500.0 | 1 | 5 | 15 |
| 2 | Calcium, mg/l | IS 3025, (Part 40): 1991 R:2019,AAS-Flame Method & EDTA Method | 54 | 2.0-800.0 | 2 | 75 | 200 |
| 3 | Chlorides, mg/l | IS-3025(Part 32):1988, R-2019 , Argentometric Method | 60 | 2.0-1500.0 | 5 | 250 | 1000 |
| 4 | Fluoride, mg/l | APHA, 24th Edition, SPADNS Method | 0.56 | 0.2-2.00 | 0.2 | 1 | 1.5 |
| 5 | Iron, mg/l | IS 3025 (Part 53) : 2003, R : 2019 , AAS-Flame Method | <0.2 | 0.2-10 | 0.2 | 1 | No relaxation |
| 6 | Magnesium | APHA 24th edition, 3500-Mg B: Calculation Method | 45 | 6.0-700 | 6 | 30 | 100 |
| 7 | Nitrate , mg/l | APHA, 24th edition, UV-Spectrophotometric Method | 5.16 | 0.5-45.0 | 0.5 | 45 | No relaxation |
| 8 | Odour | APHA, 23rd Edition, , 2150-C | Agreeable | Qualitative | Qualitative | Agreeable | Agreeable |
| 9 | pH value | IS 3025, Part 11 : 1983 R 2023 Electrometric( pH Meter) Method | 7.92 | 1-14 | 0.1 | 6.5-8.5 | No relaxation |
| 10 | Sulphate, mg/l | APHA –24th edition, 4500 S , Turbidity Method | 58 | 10.0-400.0 | 10 | 200 | 400 |
| 11 | Taste | APHA,24th edition, 2160-C | Acceptable | Qualitative | Qualitative | Acceptable | Agreeable |
| 12 | Total Alkalinity ($c_aco_3$), mg/l, Max | IS 3025, Part 23: 1986 R 2019 Titration Method | 228 | 4.0-2000.0 | 4 | 200 | 600 |
| 13 | Total Dissolved Solids, mg/l | IS 3025, Part 16: 1984 R 2023 Gravimetric method | 428 | 25.0-5000.0 | 25 | 500 | 2000 |
| 14 | Total Hardness, mg/l | IS 3025, (Part 21): 2019 EDTA Method | 320 | 4.0-2000.0 | 4 | 200 | 600 |
| 15 | Turbidity, NTU | IS 3025, (Part 10):1984, R-2023 Nephelometric/Turbiditimetric Method | 2.9 | 1-800 | 0.1 | 1 | 5 |
| 16 | Zinc, mg/l | IS 3025(Part 49) : 1994,R:2019, AAS-Flame Method | <0.1 | 0.10 – 10.0 | 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,*

***ANALYSED BY***

(Kumar Vaibhav)
***REVIEWED BY***

(Amit Raj Mishra)
***Authorised Signatory***

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CENTRAL MINE PLANNING AND DESIGN INSTITUTE LIMITED

## Environment Laboratory, Regional Institute-II

# GROUND WATER ANALYSIS TEST REPORT

| | | | | | |
|---|---|---|---|---|---|
| **Month & Year** | **June 2024** | **Dug Well No.** | **DB-27** | | |
| **Customer** | **Environment Department, Bharat Coking Coal Limited (BCCL), Koyla Bhawan, Dhanbad (E-mail: gmenv.bccl@coalindia.in)** | | | **Date of Issue** | **30.08.2024** |
| **Project** | **Raniganj Coalfield** | **Sample Ref. No.** | **RI-II/HYDROGEOLOGY/24-25/GW** | **Sampling Method** | **CMPDI/RI-II/LPM 13,(IS 3025:Part -1)** |
| **Sampling Stations** | **Hodla** | **Date of Sampling** | | **Sample Collected in 5 Ltr Jerricane , Color as observed is transparent** | |
| | | | **Period of Analysis** | | **to** |

| **Sl. No.** | **Parameter** | **Method of Analysis** | **Observed Values** | | | **IS 10500: 2012** | |
|---|---|---|---|---|---|---|---|
| | | | **GW44** | **Range Of Testing** | **LDL** | **Acceptable Limit (Max)*** | **Permissible Limit in the Absence of Alternate Source (Max)** |
| 1 | Boron (as B), mg/l, Max | APHA, 24th 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, 24th edition, AAS-GTA | <0.01 | 0.01-10.0 | 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, 24th edition, AAS-GTA | <0.005 | 0.005-10 | 0.005 | 0.01 | No relaxation |
| 5 | Phenolic compounds (as C6H5OH), mg/l, Max | APHA, 24th Edition,4-Amino Autipyrine | <0.001 | 0.001-10 | 0.001 | 0.002 | 0.002 |
| 6 | Selenium, mg/l, Max | APHA 24th 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 24th 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, 24th edition, AAS-GTA | <0.01 | 0.01-10.0 | 0.01 | 0.05 | No relaxation |
| 9 | Nickel as Ni, mg/l Max | IS 3025 Part 54 : 2003,R : 2019, AAS-Flame APHA, 24th edition, AAS-GTA | <0.005 | 0.005-10 | 0.005 | 0.02 | No relaxation |
| 10 | Manganese as Mn, mg/l, Max | APHA, 24TH Edition:2023 AAS-GTA Method | <0.02 | 0.02-10.0 | 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.*

***ANALYSED BY***

(Kumar Vaibhav)
***REVIEWED BY***

(Amit Raj Mishra)
***Authorised Signatory***

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# GROUND WATER ANALYSIS TEST REPORT

| | | | | | |
|---|---|---|---|---|---|
| **Month & Year** | **June 2024** | **Dug Well No.** | **DB-29** | | |
| **Customer** | **Environment Department, Bharat Coking Coal Limited (BCCL), Koyla Bhawan, Dhanbad (E-mail: gmenv.bccl@coalindia.in)** | | | **Date of Issue** | **30.08.2024** |
| **Project** | **RCF** | **Sample Ref. No.** | **RI-II/HYDROGEOLOGY/24-25/GW/** | **Sampling Method** | **CMPDI/RI-II/LPM 13,(IS 3025:Part -1)** |
| **Sampling Stations** | **Kelyasol** | **Date of Sampling** | | **Sample Collected in 5 Ltr Jerricane , Color as observed is transparent** | |
| | | | **Period of Analysis** | | **to** |

| Sl. No. | Parameter | Method of Analysis | Observed Values GW45 | Range Of Testing | LDL | IS 10500: 2012 Acceptable Limit (Max)* | Permissible Limit in the Absence of Alternate Source (Max) |
|---|---|---|---|---|---|---|---|
| 1 | Colour, Hazen unit | APHA, 24th edition ,2120-c-Spectrophotometric Single Wavelength Method ,2023 | 2 | 1-500.0 | 1 | 5 | 15 |
| 2 | Calcium, mg/l | IS 3025, (Part 40): 1991 R:2019,AAS-Flame Method & EDTA Method | 128 | 2.0-800.0 | 2 | 75 | 200 |
| 3 | Chlorides, mg/l | IS-3025(Part 32):1988, R-2019 , Argentometric Method | 164 | 2.0-1500.0 | 5 | 250 | 1000 |
| 4 | Fluoride, mg/l | APHA, 24th Edition, SPADNS Method | 0.59 | 0.2-2.00 | 0.2 | 1 | 1.5 |
| 5 | Iron, mg/l | IS 3025 (Part 53) : 2003, R : 2019 , AAS-Flame Method | <0.2 | 0.2-10 | 0.2 | 1 | No relaxation |
| 6 | Magnesium | APHA 24th edition, 3500-Mg B: Calculation Method | 51 | 6.0-700 | 6 | 30 | 100 |
| 7 | Nitrate , mg/l | APHA, 24th edition, UV-Spectrophotometric Method | 6.37 | 0.5-45.0 | 0.5 | 45 | No relaxation |
| 8 | Odour | APHA, 23rd Edition, , 2150-C | Agreeable | Qualitative | Qualitative | Agreeable | Agreeable |
| 9 | pH value | IS 3025, Part 11 : 1983 R 2023 Electrometric( pH Meter) Method | 7.93 | 1-14 | 0.1 | 6.5-8.5 | No relaxation |
| 10 | Sulphate, mg/l | APHA –24th edition, 4500 S , Turbidity Method | 74 | 10.0-400.0 | 10 | 200 | 400 |
| 11 | Taste | APHA,24th edition, 2160-C | Acceptable | Qualitative | Qualitative | Acceptable | Agreeable |
| 12 | Total Alkalinity ($c_aco_3$), mg/l, Max | IS 3025, Part 23: 1986 R 2019 Titration Method | 245 | 4.0-2000.0 | 4 | 200 | 600 |
| 13 | Total Dissolved Solids, mg/l | IS 3025, Part 16: 1984 R 2023 Gravimetric method | 692 | 25.0-5000.0 | 25 | 500 | 2000 |
| 14 | Total Hardness, mg/l | IS 3025, (Part 21): 2019 EDTA Method | 530 | 4.0-2000.0 | 4 | 200 | 600 |
| 15 | Turbidity, NTU | IS 3025, (Part 10):1984, R-2023 Nephelometric/Turbiditimetric Method | 2.6 | 1-800 | 0.1 | 1 | 5 |
| 16 | Zinc, mg/l | IS 3025(Part 49) : 1994,R:2019, AAS-Flame Method | 0.1 | 0.10 – 10.0 | 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.*

***ANALYSED BY***

(Kumar Vaibhav)
***REVIEWED BY***

(Amit Raj Mishra)
***Authorised Signatory***

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# GROUND WATER ANALYSIS TEST REPORT

| | | | | | |
|---|---|---|---|---|---|
| **Month & Year** | **June 2024** | **Dug Well No.** | **DB-29** | | |
| **Customer** | **Environment Department, Bharat Coking Coal Limited (BCCL), Koyla Bhawan, Dhanbad (E-mail: gmenv.bccl@coalindia.in)** | | | **Date of Issue** | **30.08.2024** |
| **Project** | **Raniganj Coalfield** | **Sample Ref. No.** | **RI-II/HYDROGEOLOGY/24-25/GW/** | **Sampling Method** | **CMPDI/RI-II/LPM 13,(IS 3025:Part -1)** |
| **Sampling Stations** | **Keliyasol** | **Date of Sampling** | | **Sample Collected in 5 Ltr Jerricane , Color as observed is transparent** | |
| | | | **Period of Analysis** | | **to** |

| **Sl. No.** | **Parameter** | **Method of Analysis** | **Observed Values** | | | **IS 10500: 2012** | |
|---|---|---|---|---|---|---|---|
| | | | **GW45** | **Range Of Testing** | **LDL** | **Acceptable Limit (Max)*** | **Permissible Limit in the Absence of Alternate Source (Max)** |
| 1 | Boron (as B), mg/l, Max | APHA, 24th 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, 24th edition, AAS-GTA | <0.01 | 0.01-10.0 | 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, 24th edition, AAS-GTA | <0.005 | 0.005-10 | 0.005 | 0.01 | No relaxation |
| 5 | Phenolic compounds (as C6H5OH), mg/l, Max | APHA, 24th Edition,4-Amino Autipyrine | <0.001 | 0.001-10 | 0.001 | 0.002 | 0.002 |
| 6 | Selenium, mg/l, Max | APHA 24th 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 24th 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, 24th edition, AAS-GTA | <0.01 | 0.01-10.0 | 0.01 | 0.05 | No relaxation |
| 9 | Nickel as Ni, mg/l Max | IS 3025 Part 54 : 2003,R : 2019, AAS-Flame APHA, 24th edition, AAS-GTA | <0.005 | 0.005-10 | 0.005 | 0.02 | No relaxation |
| 10 | Manganese as Mn, mg/l, Max | APHA, 24TH Edition:2023 AAS-GTA Method | <0.02 | 0.02-10.0 | 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,*

***ANALYSED BY***

(Kumar Vaibhav)
***REVIEWED BY***

(Amit Raj Mishra)
***Authorised Signatory***

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## Environment Laboratory, Regional Institute-II

# GROUND WATER ANALYSIS TEST REPORT

| | | | | | |
|---|---|---|---|---|---|
| **Month & Year** | **June 2024** | **Dug Well No.** | **DB-30** | | |
| **Customer** | **Environment Department, Bharat Coking Coal Limited (BCCL), Koyla Bhawan, Dhanbad (E-mail: gmenv.bccl@coalindia.in)** | | | **Date of Issue** | **30.08.2024** |
| **Project** | **Raniganj Coalfield** | **Sample Ref. No.** | **RI-II/HYDROGEOLOGY/24-25/GW/** | **Sampling Method** | **CMPDI/RI-II/LPM 13,(IS 3025:Part -1)** |
| **Sampling Stations** | **Ramkanali** | **Date of Sampling** | | | |
| | | **Period of Analysis** | | **to** | |

| **Sl. No.** | **Parameter** | **Method of Analysis** | **Observed Values** | | | **IS 10500: 2012** | |
|---|---|---|---|---|---|---|---|
| | | | **GW46** | **Range Of Testing** | **LDL** | **Acceptable Limit (Max)*** | **Permissible Limit in the Absence of Alternate Source (Max)** |
| 1 | Colour, Hazen unit | APHA, 24th edition ,2120-c-Spectrophotometric Single Wavelength Method ,2023 | 3 | 1-500.0 | 1 | 5 | 15 |
| 2 | Calcium, mg/l | IS 3025, (Part 40): 1991 R:2019,AAS-Flame Method & EDTA Method | 102 | 2.0-800.0 | 2 | 75 | 200 |
| 3 | Chlorides, mg/l | IS-3025(Part 32):1988, R-2019 , Argentometric Method | 72 | 2.0-1500.0 | 5 | 250 | 1000 |
| 4 | Fluoride, mg/l | APHA, 24th Edition, SPADNS Method | 0.77 | 0.2-2.00 | 0.2 | 1 | 1.5 |
| 5 | Iron, mg/l | IS 3025 (Part 53) : 2003, R : 2019 , AAS-Flame Method | 0.26 | 0.2-10 | 0.2 | 1 | No relaxation |
| 6 | Magnesium | APHA 24th edition, 3500-Mg B: Calculation Method | 95 | 6.0-700 | 6 | 30 | 100 |
| 7 | Nitrate , mg/l | APHA, 24th edition, UV-Spectrophotometric Method | 24.7 | 0.5-45.0 | 0.5 | 45 | No relaxation |
| 8 | Odour | APHA, 23rd Edition, , 2150-C | Agreeable | Qualitative | Qualitative | Agreeable | Agreeable |
| 9 | pH value | IS 3025, Part 11 : 1983 R 2023 Electrometric( pH Meter) Method | 7.98 | 1-14 | 0.1 | 6.5-8.5 | No relaxation |
| 10 | Sulphate, mg/l | APHA –24th edition, 4500 S , Turbidity Method | 111 | 10.0-400.0 | 10 | 200 | 400 |
| 11 | Taste | APHA,24th edition, 2160-C | Acceptable | Qualitative | Qualitative | Acceptable | Agreeable |
| 12 | Total Alkalinity ($c_aco_3$), mg/l, Max | IS 3025, Part 23: 1986 R 2019 Titration Method | 272 | 4.0-2000.0 | 4 | 200 | 600 |
| 13 | Total Dissolved Solids, mg/l | IS 3025, Part 16: 1984 R 2023 Gravimetric method | 718 | 25.0-5000.0 | 25 | 500 | 2000 |
| 14 | Total Hardness, mg/l | IS 3025, (Part 21): 2019 EDTA Method | 648 | 4.0-2000.0 | 4 | 200 | 600 |
| 15 | Turbidity, NTU | IS 3025, (Part 10):1984, R-2023 Nephelometric/Turbiditimetric Method | 2.3 | 1-800 | 0.1 | 1 | 5 |
| 16 | Zinc, mg/l | IS 3025(Part 49) : 1994,R:2019, AAS-Flame Method | 0.12 | 0.10 – 10.0 | 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.*

***ANALYSED BY***

(Kumar Vaibhav)
***REVIEWED BY***

(Amit Raj Mishra)
***Authorised Signatory***

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# GROUND WATER ANALYSIS TEST REPORT

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email: rdri2cmpdi@coalindia.in

| | | | | | |
|---|---|---|---|---|---|
| **Month & Year** | **June 2024** | **Dug Well No.** | **DB-30** | | |
| **Customer** | **Environment Department, Bharat Coking Coal Limited (BCCL), Koyla Bhawan, Dhanbad (E-mail: gmenv.bccl@coalindia.in)** | | | **Date of Issue** | **30.08.2024** |
| **Project** | **Raniganj Coalfield** | **Sample Ref. No.** | **RI-II/HYDROGEOLOGY/24-25/GW/** | **Sampling Method** | **CMPDI/RI-II/LPM 13,(IS 3025:Part -1)** |
| **Sampling Stations** | **Ramkanali** | **Date of Sampling** | | **Sample Collected in 5 Ltr Jerricane , Color as observed is transparent** | |
| | | | **Period of Analysis** | | **to** |

| **Sl. No.** | **Parameter** | **Method of Analysis** | **Observed Values** | | | **IS 10500: 2012** | |
|---|---|---|---|---|---|---|---|
| | | | **GW46** | **Range Of Testing** | **LDL** | **Acceptable Limit (Max)*** | **Permissible Limit in the Absence of Alternate Source (Max)** |
| 1 | Boron (as B), mg/l, Max | APHA, 24th 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, 24th edition, AAS-GTA | <0.01 | 0.01-10.0 | 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, 24th edition, AAS-GTA | <0.005 | 0.005-10 | 0.005 | 0.01 | No relaxation |
| 5 | Phenolic compounds (as C6H5OH), mg/l, Max | APHA, 24th Edition,4-Amino Autipyrine | <0.001 | 0.001-10 | 0.001 | 0.002 | 0.002 |
| 6 | Selenium, mg/l, Max | APHA 24th 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 24th 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, 24th edition, AAS-GTA | <0.01 | 0.01-10.0 | 0.01 | 0.05 | No relaxation |
| 9 | Nickel as Ni, mg/l Max | IS 3025 Part 54 : 2003,R : 2019, AAS-Flame APHA, 24th edition, AAS-GTA | <0.005 | 0.005-10 | 0.005 | 0.02 | No relaxation |
| 10 | Manganese as Mn, mg/l, Max | APHA, 24TH Edition:2023 AAS-GTA Method | 0.02 | 0.02-10.0 | 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,*

***ANALYSED BY***

(Kumar Vaibhav)
***REVIEWED BY***

(Amit Raj Mishra)
***Authorised Signatory***

**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**

# GROUND WATER ANALYSIS TEST REPORT

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

| | | | | | |
|---|---|---|---|---|---|
| **Month & Year** | **June 2024** | **Dug Well No.** | **DB-38** | | |
| **Customer** | **Environment Department, Bharat Coking Coal Limited (BCCL), Koyla Bhawan, Dhanbad (E-mail: gmenv.bccl@coalindia.in)** | | | **Date of Issue** | **30.08.2024** |
| **Project** | **Raniganj Coalfield** | **Sample Ref. No.** | **RI-II/HYDROGEOLOGY/24-25/GW/** | **Sampling Method** | **CMPDI/RI-II/LPM 13,(IS 3025:Part -1)** |
| **Sampling Stations** | **Lukudih** | **Date of Sampling** | | **Sample Collected in 5 Ltr Jerricane , Color as observed is transparent** | |
| | | **Period of Analysis** | **13.05.2024** | **to** | **07.08.2024** |

| **Sl. No.** | **Parameter** | **Method of Analysis** | **Observed Values** | | | **IS 10500: 2012** | |
|---|---|---|---|---|---|---|---|
| | | | **GW47** | **Range Of Testing** | **LDL** | **Acceptable Limit (Max)*** | **Permissible Limit in the Absence of Alternate Source (Max)** |
| 1 | Colour, Hazen unit | APHA, 24th edition ,2120-c-Spectrophotometric Single Wavelength Method ,2023 | 2 | 1-500.0 | 1 | 5 | 15 |
| 2 | Calcium, mg/l | IS 3025, (Part 40): 1991 R:2019,AAS-Flame Method & EDTA Method | 122 | 2.0-800.0 | 2 | 75 | 200 |
| 3 | Chlorides, mg/l | IS-3025(Part 32):1988, R-2019 , Argentometric Method | 68 | 2.0-1500.0 | 5 | 250 | 1000 |
| 4 | Fluoride, mg/l | APHA, 24th Edition, SPADNS Method | 0.39 | 0.2-2.00 | 0.2 | 1 | 1.5 |
| 5 | Iron, mg/l | IS 3025 (Part 53) : 2003, R : 2019 , AAS-Flame Method | <0.2 | 0.2-10 | 0.2 | 1 | No relaxation |
| 6 | Magnesium | APHA 24th edition, 3500-Mg B: Calculation Method | 97 | 6.0-700 | 6 | 30 | 100 |
| 7 | Nitrate , mg/l | APHA, 24th edition, UV-Spectrophotometric Method | 22.68 | 0.5-45.0 | 0.5 | 45 | No relaxation |
| 8 | Odour | APHA, 23rd Edition, , 2150-C | Agreeable | Qualitative | Qualitative | Agreeable | Agreeable |
| 9 | pH value | IS 3025, Part 11 : 1983 R 2023 Electrometric( pH Meter) Method | 8.06 | 1-14 | 0.1 | 6.5-8.5 | No relaxation |
| 10 | Sulphate, mg/l | APHA –24th edition, 4500 S , Turbidity Method | 142 | 10.0-400.0 | 10 | 200 | 400 |
| 11 | Taste | APHA,24th edition, 2160-C | Acceptable | Qualitative | Qualitative | Acceptable | Agreeable |
| 12 | Total Alkalinity ($c_aco_3$), mg/l, Max | IS 3025, Part 23: 1986 R 2019 Titration Method | 278 | 4.0-2000.0 | 4 | 200 | 600 |
| 13 | Total Dissolved Solids, mg/l | IS 3025, Part 16: 1984 R 2023 Gravimetric method | 826 | 25.0-5000.0 | 25 | 500 | 2000 |
| 14 | Total Hardness, mg/l | IS 3025, (Part 21): 2019 EDTA Method | 705 | 4.0-2000.0 | 4 | 200 | 600 |
| 15 | Turbidity, NTU | IS 3025, (Part 10):1984, R-2023 Nephelometric/Turbiditimetric Method | 2.5 | 1-800 | 0.1 | 1 | 5 |
| 16 | Zinc, mg/l | IS 3025(Part 49) : 1994,R:2019, AAS-Flame Method | <0.1 | 0.10 – 10.0 | 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.*

***ANALYSED BY***

(Kumar Vaibhav)
***REVIEWED BY***

(Amit Raj Mishra)
***Authorised Signatory***

**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

## GROUND WATER ANALYSIS TEST REPORT

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

| | | | | | |
|---|---|---|---|---|---|
| **Month & Year** | **June 2024** | **Dug Well No.** | **DB-38** | | |
| **Customer** | **Environment Department, Bharat Coking Coal Limited (BCCL), Koyla Bhawan, Dhanbad (E-mail: gmenv.bccl@coalindia.in)** | | | **Date of Issue** | **30.08.2024** |
| **Project** | **Raniganj Coalfield** | **Sample Ref. No.** | **RI-II/HYDROGEOLOGY/24-25/GW/** | **Sampling Method** | **CMPDI/RI-II/LPM 13,(IS 3025:Part -1)** |
| **Sampling Stations** | **Lukudih** | **Date of Sampling** | | **Sample Collected in 5 Ltr Jerricane , Color as observed is transparent** | |
| | | | **Period of Analysis** | **13.05.2024** to **07.08.2024** | |

| **Sl. No.** | **Parameter** | **Method of Analysis** | **Observed Values** | | | **IS 10500: 2012** | |
|---|---|---|---|---|---|---|---|
| | | | **GW47** | **Range Of Testing** | **LDL** | **Acceptable Limit (Max)*** | **Permissible Limit in the Absence of Alternate Source (Max)** |
| 1 | Boron (as B), mg/l, Max | APHA, 24th 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, 24th edition, AAS-GTA | <0.01 | 0.01-10.0 | 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, 24th edition, AAS-GTA | <0.005 | 0.005-10 | 0.005 | 0.01 | No relaxation |
| 5 | Phenolic compounds (as C6H5OH), mg/l, Max | APHA, 24th Edition,4-Amino Autipyrine | <0.001 | 0.001-10 | 0.001 | 0.002 | 0.002 |
| 6 | Selenium, mg/l, Max | APHA 24th 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 24th 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, 24th edition, AAS-GTA | <0.01 | 0.01-10.0 | 0.01 | 0.05 | No relaxation |
| 9 | Nickel as Ni, mg/l Max | IS 3025 Part 54 : 2003,R : 2019, AAS-Flame APHA, 24th edition, AAS-GTA | <0.005 | 0.005-10 | 0.005 | 0.02 | No relaxation |
| 10 | Manganese as Mn, mg/l, Max | APHA, 24TH Edition:2023 AAS-GTA Method | <0.02 | 0.02-10.0 | 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,*

***ANALYSED BY***

(Kumar Vaibhav)
***REVIEWED BY***

(Amit Raj Mishra)
***Authorised Signatory***

**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**

# GROUND WATER ANALYSIS TEST REPORT

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

| | | | | | |
|---|---|---|---|---|---|
| **Month & Year** | **June 2024** | **Dug Well No.** | **DB-39** | | |
| **Customer** | **Environment Department, Bharat Coking Coal Limited (BCCL), Koyla Bhawan, Dhanbad (E-mail: gmenv.bccl@coalindia.in)** | | | **Date of Issue** | **30.08.2024** |
| **Project** | **Raniganj Coalfield** | **Sample Ref. No.** | **RI-II/HYDROGEOLOGY/24-25/GW/** | **Sampling Method** | **CMPDI/RI-II/LPM 13,(IS 3025:Part -1)** |
| **Sampling Stations** | **Pandra** | **Date of Sampling** | | **Sample Collected in 5 Ltr Jerricane , Color as observed is transparent** | |
| | | | **Period of Analysis** | **06.05.2024 to 07.08.2024** | |

| **Sl. No.** | **Parameter** | **Method of Analysis** | **Observed Values** | | | **IS 10500: 2012** | |
|---|---|---|---|---|---|---|---|
| | | | **GW48** | **Range Of Testing** | **LDL** | **Acceptable Limit (Max)*** | **Permissible Limit in the Absence of Alternate Source (Max)** |
| 1 | Colour, Hazen unit | APHA, 24th edition ,2120-c-Spectrophotometric Single Wavelength Method ,2023 | 3 | 1-500.0 | 1 | 5 | 15 |
| 2 | Calcium, mg/l | IS 3025, (Part 40): 1991 R:2019,AAS-Flame Method & EDTA Method | 120 | 2.0-800.0 | 2 | 75 | 200 |
| 3 | Chlorides, mg/l | IS-3025(Part 32):1988, R-2019 , Argentometric Method | 84 | 2.0-1500.0 | 5 | 250 | 1000 |
| 4 | Fluoride, mg/l | APHA, 24th Edition, SPADNS Method | 0.86 | 0.2-2.00 | 0.2 | 1 | 1.5 |
| 5 | Iron, mg/l | IS 3025 (Part 53) : 2003, R : 2019 , AAS-Flame Method | <0.2 | 0.2-10 | 0.2 | 1 | No relaxation |
| 6 | Magnesium | APHA 24th edition, 3500-Mg B: Calculation Method | 73 | 6.0-700 | 6 | 30 | 100 |
| 7 | Nitrate , mg/l | APHA, 24th edition, UV-Spectrophotometric Method | 9.54 | 0.5-45.0 | 0.5 | 45 | No relaxation |
| 8 | Odour | APHA, 23rd Edition, , 2150-C | Agreeable | Qualitative | Qualitative | Agreeable | Agreeable |
| 9 | pH value | IS 3025, Part 11 : 1983 R 2023 Electrometric( pH Meter) Method | 8.09 | 1-14 | 0.1 | 6.5-8.5 | No relaxation |
| 10 | Sulphate, mg/l | APHA –24th edition, 4500 S , Turbidity Method | 71 | 10.0-400.0 | 10 | 200 | 400 |
| 11 | Taste | APHA,24th edition, 2160-C | Acceptable | Qualitative | Qualitative | Acceptable | Agreeable |
| 12 | Total Alkalinity ($c_aco_3$), mg/l, Max | IS 3025, Part 23: 1986 R 2019 Titration Method | 264 | 4.0-2000.0 | 4 | 200 | 600 |
| 13 | Total Dissolved Solids, mg/l | IS 3025, Part 16: 1984 R 2023 Gravimetric method | 748 | 25.0-5000.0 | 25 | 500 | 2000 |
| 14 | Total Hardness, mg/l | IS 3025, (Part 21): 2019 EDTA Method | 602 | 4.0-2000.0 | 4 | 200 | 600 |
| 15 | Turbidity, NTU | IS 3025, (Part 10):1984, R-2023 Nephelometric/Turbiditimetric Method | 2.2 | 1-800 | 0.1 | 1 | 5 |
| 16 | Zinc, mg/l | IS 3025(Part 49) : 1994,R:2019, AAS-Flame Method | 0.18 | 0.10 – 10.0 | 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.*

***ANALYSED BY***

(Kumar Vaibhav)
***REVIEWED BY***

(Amit Raj Mishra)
***Authorised Signatory***

**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**

# GROUND WATER ANALYSIS TEST REPORT

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

| | | | | | |
|---|---|---|---|---|---|
| **Month & Year** | **June 2024** | **Dug Well No.** | **DB-39** | | |
| **Customer** | **Environment Department, Bharat Coking Coal Limited (BCCL), Koyla Bhawan, Dhanbad (E-mail: gmenv.bccl@coalindia.in)** | | | **Date of Issue** | **30.08.2024** |
| **Project** | **Raniganj Coalfield** | **Sample Ref. No.** | **RI-II/HYDROGEOLOGY/24-25/GW/** | **Sampling Method** | **CMPDI/RI-II/LPM 13,(IS 3025:Part -1)** |
| **Sampling Stations** | **Pandra** | **Date of Sampling** | | **Sample Collected in 5 Ltr Jerricane , Color as observed is transparent** | |
| | | | **Period of Analysis** | **06.05.2024** to **07.08.2024** | |

| **Sl. No.** | **Parameter** | **Method of Analysis** | **Observed Values** | | | **IS 10500: 2012** | |
|---|---|---|---|---|---|---|---|
| | | | **GW48** | **Range Of Testing** | **LDL** | **Acceptable Limit (Max)*** | **Permissible Limit in the Absence of Alternate Source (Max)** |
| 1 | Boron (as B), mg/l, Max | APHA, 24th 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, 24th edition, AAS-GTA | <0.01 | 0.01-10.0 | 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, 24th edition, AAS-GTA | <0.005 | 0.005-10 | 0.005 | 0.01 | No relaxation |
| 5 | Phenolic compounds (as C6H5OH), mg/l, Max | APHA, 24th Edition,4-Amino Autipyrine | <0.001 | 0.001-10 | 0.001 | 0.002 | 0.002 |
| 6 | Selenium, mg/l, Max | APHA 24th 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 24th 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, 24th edition, AAS-GTA | <0.01 | 0.01-10.0 | 0.01 | 0.05 | No relaxation |
| 9 | Nickel as Ni, mg/l Max | IS 3025 Part 54 : 2003,R : 2019, AAS-Flame APHA, 24th edition, AAS-GTA | <0.005 | 0.005-10 | 0.005 | 0.02 | No relaxation |
| 10 | Manganese as Mn, mg/l, Max | APHA, 24TH Edition:2023 AAS-GTA Method | <0.02 | 0.02-10.0 | 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,*

***ANALYSED BY***

(Kumar Vaibhav)
***REVIEWED BY***

(Amit Raj Mishra)
***Authorised Signatory***

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**Environment Laboratory, Regional Institute-II**

# GROUND WATER ANALYSIS TEST REPORT

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

| | | | | | |
|---|---|---|---|---|---|
| **Month & Year** | **June 2024** | **Dug Well No.** | **K-12** | | |
| **Customer** | **Environment Department, Bharat Coking Coal Limited (BCCL), Koyla Bhawan, Dhanbad (E-mail: gmenv.bccl@coalindia.in)** | | | **Date of Issue** | **30.08.2024** |
| **Project** | **Raniganj Coalfield** | **Sample Ref. No.** | **RI-II/HYDROGEOLOGY/24-25/GW/** | **Sampling Method** | **CMPDI/RI-II/LPM 13,(IS 3025:Part -1)** |
| **Sampling Stations** | **Ethora** | **Date of Sampling** | | **Sample Collected in 5 Ltr Jerricane , Color as observed is transparent** | |
| | | | **Period of Analysis** | **to** | |

| **Sl. No.** | **Parameter** | **Method of Analysis** | **Observed Values** | | | **IS 10500: 2012** | |
|---|---|---|---|---|---|---|---|
| | | | **GW49** | **Range Of Testing** | **LDL** | **Acceptable Limit (Max)*** | **Permissible Limit in the Absence of Alternate Source (Max)** |
| 1 | Colour, Hazen unit | APHA, 24th edition ,2120-c-Spectrophotometric Single Wavelength Method ,2023 | 1 | 1-500.0 | 1 | 5 | 15 |
| 2 | Calcium, mg/l | IS 3025, (Part 40): 1991 R:2019,AAS-Flame Method & EDTA Method | 72 | 2.0-800.0 | 2 | 75 | 200 |
| 3 | Chlorides, mg/l | IS-3025(Part 32):1988, R-2019 , Argentometric Method | 44 | 2.0-1500.0 | 5 | 250 | 1000 |
| 4 | Fluoride, mg/l | APHA, 24th Edition, SPADNS Method | 0.73 | 0.2-2.00 | 0.2 | 1 | 1.5 |
| 5 | Iron, mg/l | IS 3025 (Part 53) : 2003, R : 2019 , AAS-Flame Method | <0.2 | 0.2-10 | 0.2 | 1 | No relaxation |
| 6 | Magnesium | APHA 24th edition, 3500-Mg B: Calculation Method | 73 | 6.0-700 | 6 | 30 | 100 |
| 7 | Nitrate , mg/l | APHA, 24th edition, UV-Spectrophotometric Method | 1.40 | 0.5-45.0 | 0.5 | 45 | No relaxation |
| 8 | Odour | APHA, 23rd Edition, , 2150-C | Agreeable | Qualitative | Qualitative | Agreeable | Agreeable |
| 9 | pH value | IS 3025, Part 11 : 1983 R 2023 Electrometric( pH Meter) Method | 8.41 | 1-14 | 0.1 | 6.5-8.5 | No relaxation |
| 10 | Sulphate, mg/l | APHA –24th edition, 4500 S , Turbidity Method | 41 | 10.0-400.0 | 10 | 200 | 400 |
| 11 | Taste | APHA,24th edition, 2160-C | Acceptable | Qualitative | Qualitative | Acceptable | Agreeable |
| 12 | Total Alkalinity ($c_ac_{O_3}$), mg/l, Max | IS 3025, Part 23: 1986 R 2019 Titration Method | 210 | 4.0-2000.0 | 4 | 200 | 600 |
| 13 | Total Dissolved Solids, mg/l | IS 3025, Part 16: 1984 R 2023 Gravimetric method | 591 | 25.0-5000.0 | 25 | 500 | 2000 |
| 14 | Total Hardness, mg/l | IS 3025, (Part 21): 2019 EDTA Method | 480 | 4.0-2000.0 | 4 | 200 | 600 |
| 15 | Turbidity, NTU | IS 3025, (Part 10):1984, R-2023 Nephelometric/Turbiditimetric Method | 2.8 | 1-800 | 0.1 | 1 | 5 |
| 16 | Zinc, mg/l | IS 3025(Part 49) : 1994,R:2019, AAS-Flame Method | <0.1 | 0.10 – 10.0 | 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,*

***ANALYSED BY***

(Kumar Vaibhav)
***REVIEWED BY***

(Amit Raj Mishra)
***Authorised Signatory***

**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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# GROUND WATER ANALYSIS TEST REPORT

| | | | | | |
|---|---|---|---|---|---|
| **Month & Year** | **June 2024** | **Dug Well No.** | **K-12** | | |
| **Customer** | **Environment Department, Bharat Coking Coal Limited (BCCL), Koyla Bhawan, Dhanbad (E-mail: gmenv.bccl@coalindia.in)** | | | **Date of Issue** | **30.08.2024** |
| **Project** | **Raniganj Coalfield** | **Sample Ref. No.** | **RI-II/HYDROGEOLOGY/24-25/GW/** | **Sampling Method** | **CMPDI/RI-II/LPM 13,(IS 3025:Part -1)** |
| **Sampling Stations** | **Ethora** | **Date of Sampling** | | **Sample Collected in 5 Ltr Jerricane , Color as observed is transparent** | |
| | | | **Period of Analysis** | | **to** |

| **Sl. No.** | **Parameter** | **Method of Analysis** | **Observed Values** | | | **IS 10500: 2012** | |
|---|---|---|---|---|---|---|---|
| | | | **GW49** | **Range Of Testing** | **LDL** | **Acceptable Limit (Max)*** | **Permissible Limit in the Absence of Alternate Source (Max)** |
| 1 | Boron (as B), mg/l, Max | APHA, 24th 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, 24th edition, AAS-GTA | <0.01 | 0.01-10.0 | 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, 24th edition, AAS-GTA | <0.005 | 0.005-10 | 0.005 | 0.01 | No relaxation |
| 5 | Phenolic compounds (as C6H5OH), mg/l, Max | APHA, 24th Edition,4-Amino Autipyrine | <0.001 | 0.001-10 | 0.001 | 0.002 | 0.002 |
| 6 | Selenium, mg/l, Max | APHA 24th 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 24th 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, 24th edition, AAS-GTA | <0.01 | 0.01-10.0 | 0.01 | 0.05 | No relaxation |
| 9 | Nickel as Ni, mg/l Max | IS 3025 Part 54 : 2003,R : 2019, AAS-Flame APHA, 24th edition, AAS-GTA | <0.005 | 0.005-10 | 0.005 | 0.02 | No relaxation |
| 10 | Manganese as Mn, mg/l, Max | APHA, 24TH Edition:2023 AAS-GTA Method | <0.02 | 0.02-10.0 | 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,*

***ANALYSED BY***

(Kumar Vaibhav)
***REVIEWED BY***

(Amit Raj Mishra)
***Authorised Signatory***

**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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email: rdri2cmpdi@coalindia.in

CENTRAL MINE PLANNING AND DESIGN INSTITUTE LIMITED

## Environment Laboratory, Regional Institute-II

# GROUND WATER ANALYSIS TEST REPORT

| | | | | | |
|---|---|---|---|---|---|
| **Month & Year** | **June 2024** | **Dug Well No.** | **K-20** | | |
| **Customer** | **Environment Department, Bharat Coking Coal Limited (BCCL), Koyla Bhawan, Dhanbad (E-mail: gmenv.bccl@coalindia.in)** | | | **Date of Issue** | **30.08.2024** |
| **Project** | **Raniganj Coalfield** | **Sample Ref. No.** | **RI-II/HYDROGEOLOGY/24-25/GW/** | **Sampling Method** | **CMPDI/RI-II/LPM 13,(IS 3025:Part -1)** |
| **Sampling Stations** | **Majhladih** | **Date of Sampling** | | **Sample Collected in 5 Ltr Jerricane , Color as observed is transparent** | |
| | | | **Period of Analysis** | | **to** |

| **Sl. No.** | **Parameter** | **Method of Analysis** | **Observed Values** | | | **IS 10500: 2012** | |
|---|---|---|---|---|---|---|---|
| | | | **GW50** | **Range Of Testing** | **LDL** | **Acceptable Limit (Max)*** | **Permissible Limit in the Absence of Alternate Source (Max)** |
| 1 | Colour, Hazen unit | APHA, 24th edition ,2120-c-Spectrophotometric Single Wavelength Method ,2023 | 2 | 1-500.0 | 1 | 5 | 15 |
| 2 | Calcium, mg/l | IS 3025, (Part 40): 1991 R:2019,AAS-Flame Method & EDTA Method | 62 | 2.0-800.0 | 2 | 75 | 200 |
| 3 | Chlorides, mg/l | IS-3025(Part 32):1988, R-2019 , Argentometric Method | 58 | 2.0-1500.0 | 5 | 250 | 1000 |
| 4 | Fluoride, mg/l | APHA, 24th Edition, SPADNS Method | 0.76 | 0.2-2.00 | 0.2 | 1 | 1.5 |
| 5 | Iron, mg/l | IS 3025 (Part 53) : 2003, R : 2019 , AAS-Flame Method | <0.2 | 0.2-10 | 0.2 | 1 | No relaxation |
| 6 | Magnesium | APHA 24th edition, 3500-Mg B: Calculation Method | 40 | 6.0-700 | 6 | 30 | 100 |
| 7 | Nitrate , mg/l | APHA, 24th edition, UV-Spectrophotometric Method | 28.55 | 0.5-45.0 | 0.5 | 45 | No relaxation |
| 8 | Odour | APHA, 23rd Edition, , 2150-C | Agreeable | Qualitative | Qualitative | Agreeable | Agreeable |
| 9 | pH value | IS 3025, Part 11 : 1983 R 2023 Electrometric( pH Meter) Method | 7.64 | 1-14 | 0.1 | 6.5-8.5 | No relaxation |
| 10 | Sulphate, mg/l | APHA –24th edition, 4500 S , Turbidity Method | 103 | 10.0-400.0 | 10 | 200 | 400 |
| 11 | Taste | APHA,24th edition, 2160-C | Acceptable | Qualitative | Qualitative | Acceptable | Agreeable |
| 12 | Total Alkalinity ($c_a co_3$), mg/l, Max | IS 3025, Part 23: 1986 R 2019 Titration Method | 235 | 4.0-2000.0 | 4 | 200 | 600 |
| 13 | Total Dissolved Solids, mg/l | IS 3025, Part 16: 1984 R 2023 Gravimetric method | 438 | 25.0-5000.0 | 25 | 500 | 2000 |
| 14 | Total Hardness, mg/l | IS 3025, (Part 21): 2019 EDTA Method | 318 | 4.0-2000.0 | 4 | 200 | 600 |
| 15 | Turbidity, NTU | IS 3025, (Part 10):1984, R-2023 Nephelometric/Turbiditimetric Method | 2.9 | 1-800 | 0.1 | 1 | 5 |
| 16 | Zinc, mg/l | IS 3025(Part 49) : 1994,R:2019, AAS-Flame Method | <0.1 | 0.10 – 10.0 | 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,*

***ANALYSED BY***

(Kumar Vaibhav)
***REVIEWED BY***

(Amit Raj Mishra)
***Authorised Signatory***

**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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Phone:0326-223-850
email: rdri2cmpdi@coalindia.in

CENTRAL MINE PLANNING AND DESIGN INSTITUTE LIMITED

## Environment Laboratory, Regional Institute-II

# GROUND WATER ANALYSIS TEST REPORT

| | | | | | |
|---|---|---|---|---|---|
| **Month & Year** | **June 2024** | **Dug Well No.** | **K-20** | | |
| **Customer** | **Environment Department, Bharat Coking Coal Limited (BCCL), Koyla Bhawan, Dhanbad (E-mail: gmenv.bccl@coalindia.in)** | | | **Date of Issue** | **30.08.2024** |
| **Project** | **RCF** | **Sample Ref. No.** | **RI-II/HYDROGEOLOGY/24-25/GW** | **Sampling Method** | **CMPDI/RI-II/LPM 13,(IS 3025:Part -1)** |
| **Sampling Stations** | **Majhladih** | **Date of Sampling** | | **Sample Collected in 5 Ltr Jerricane , Color as observed is transparent** | |
| | | | **Period of Analysis** | **13.05.2024 to 07.08.2024** | |

| **Sl. No.** | **Parameter** | **Method of Analysis** | **Observed Values** | | | **IS 10500: 2012** | |
|---|---|---|---|---|---|---|---|
| | | | **GW50** | **Range Of Testing** | **LDL** | **Acceptable Limit (Max)*** | **Permissible Limit in the Absence of Alternate Source (Max)** |
| 1 | Boron (as B), mg/l, Max | APHA, 24th 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, 24th edition, AAS-GTA | <0.01 | 0.01-10.0 | 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, 24th edition, AAS-GTA | <0.005 | 0.005-10 | 0.005 | 0.01 | No relaxation |
| 5 | Phenolic compounds (as C6H5OH), mg/l, Max | APHA, 24th Edition,4-Amino Autipyrine | <0.001 | 0.001-10 | 0.001 | 0.002 | 0.002 |
| 6 | Selenium, mg/l, Max | APHA 24th 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 24th 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, 24th edition, AAS-GTA | <0.01 | 0.01-10.0 | 0.01 | 0.05 | No relaxation |
| 9 | Nickel as Ni, mg/l Max | IS 3025 Part 54 : 2003,R : 2019, AAS-Flame APHA, 24th edition, AAS-GTA | <0.005 | 0.005-10 | 0.005 | 0.02 | No relaxation |
| 10 | Manganese as Mn, mg/l, Max | APHA, 24TH Edition:2023 AAS-GTA Method | <0.02 | 0.02-10.0 | 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,*

***ANALYSED BY***

(Kumar Vaibhav)
***REVIEWED BY***

(Amit Raj Mishra)
***Authorised Signatory***

**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 ----*

## 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: Nephlometric Turbidity unit
OC / UG: Opencast / Underground
OCP / UGP: Opencast Project / Underground Project
RL: Reduced Level
RWH: Rainwater Harvesting
FF: Fire Fighting

# PLATES

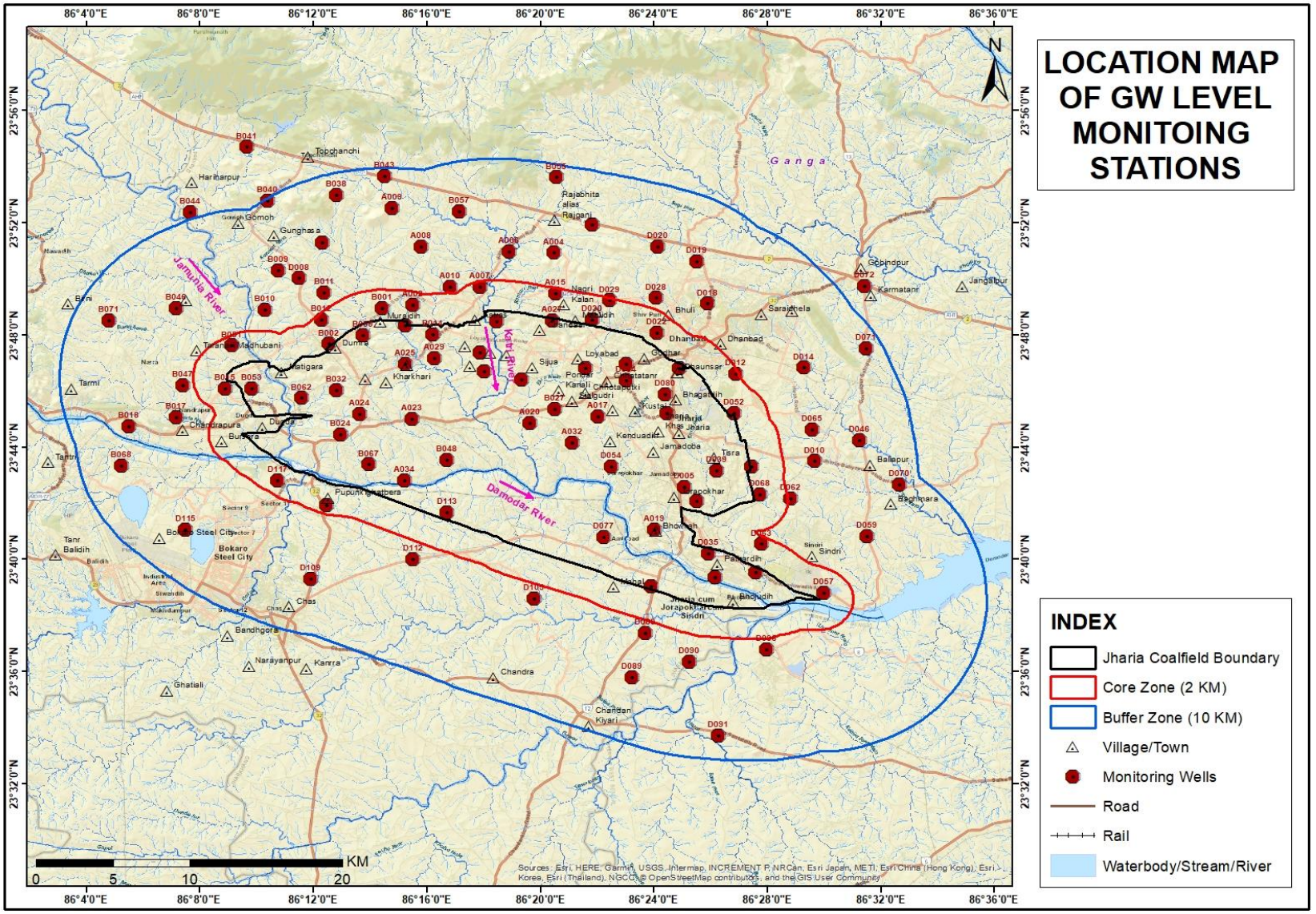


**Plate- I: Location Map of Groundwater Level Monitoring stations**

JOB NO: 200424005

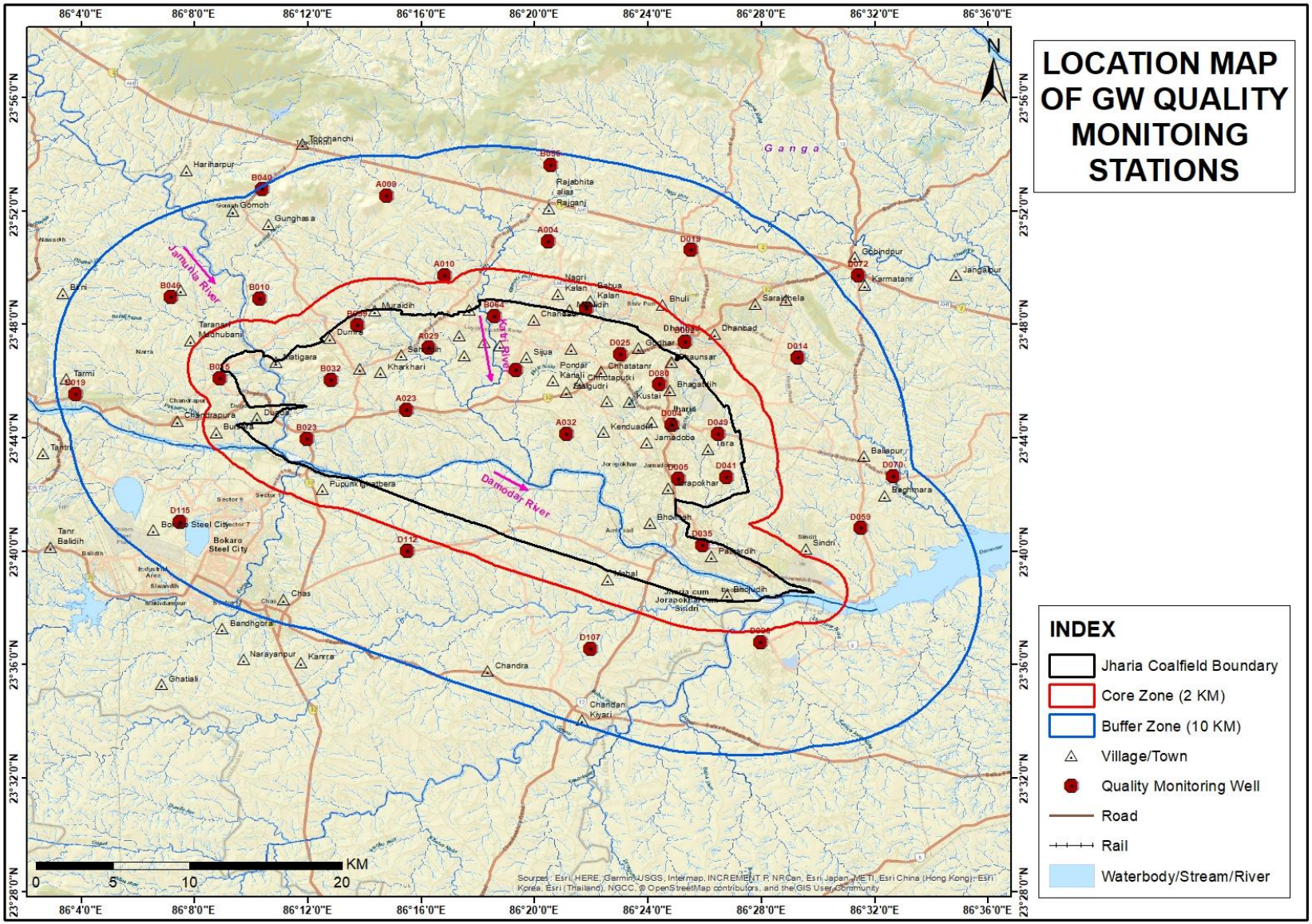


**Plate- II: Location Map of Groundwater Quality Monitoring stations**

JOB NO: 200424005

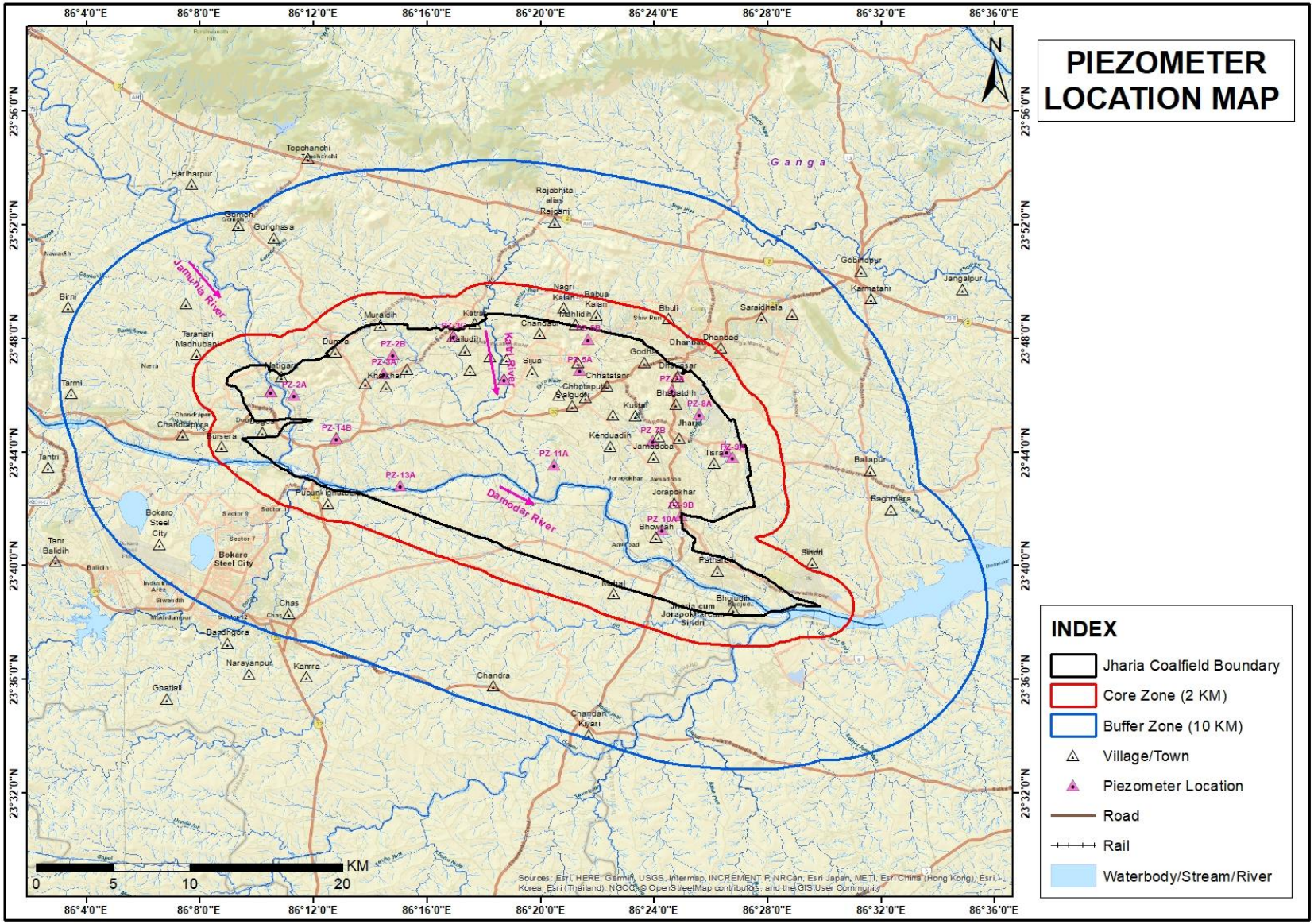


**Plate- III: Location Map of Piezometers**

JOB NO: 200424005

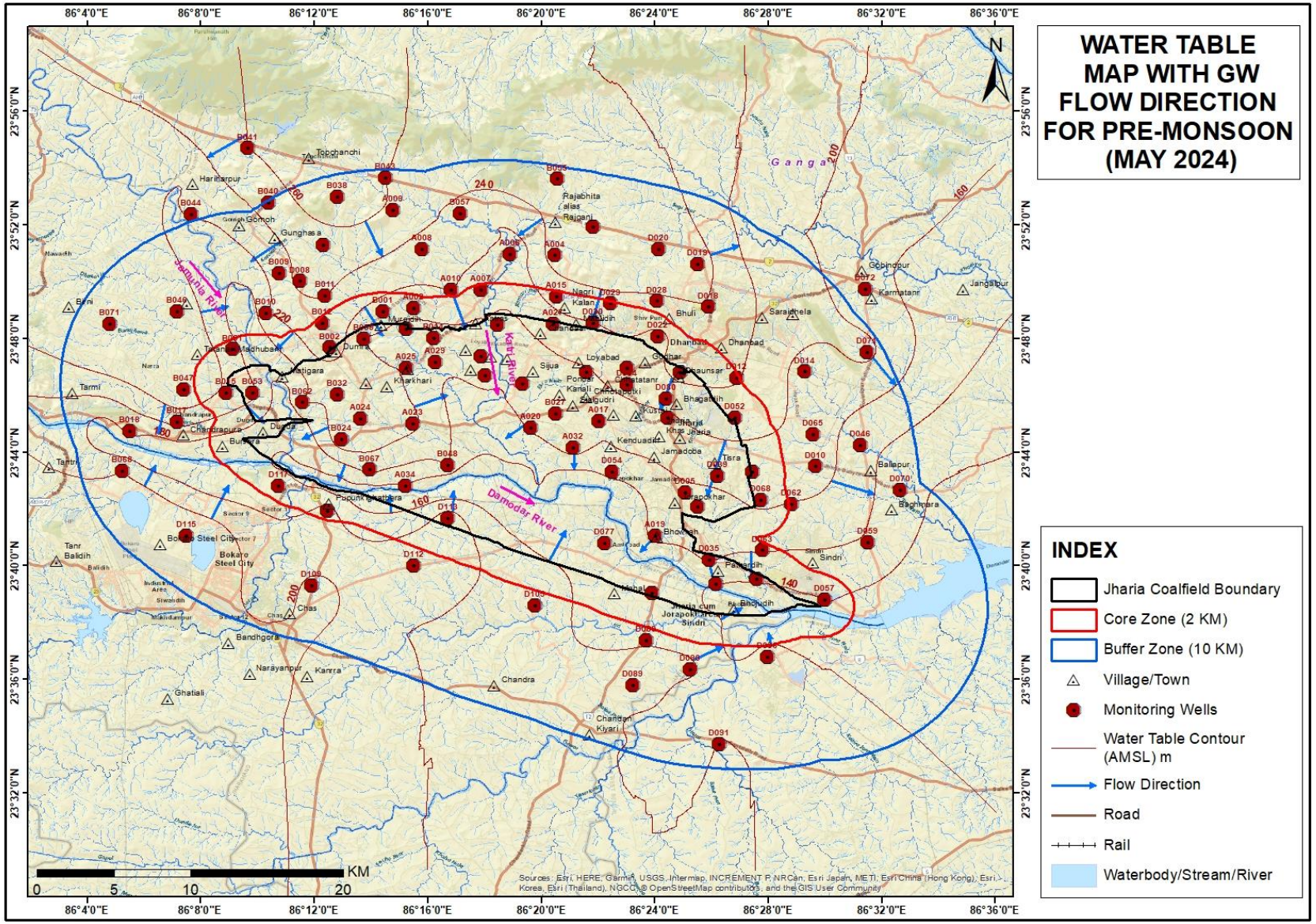


**Plate- IVA: Water table Contour Map of JCF, Pre Monsoon (May'24)**

JOB NO: 200424005

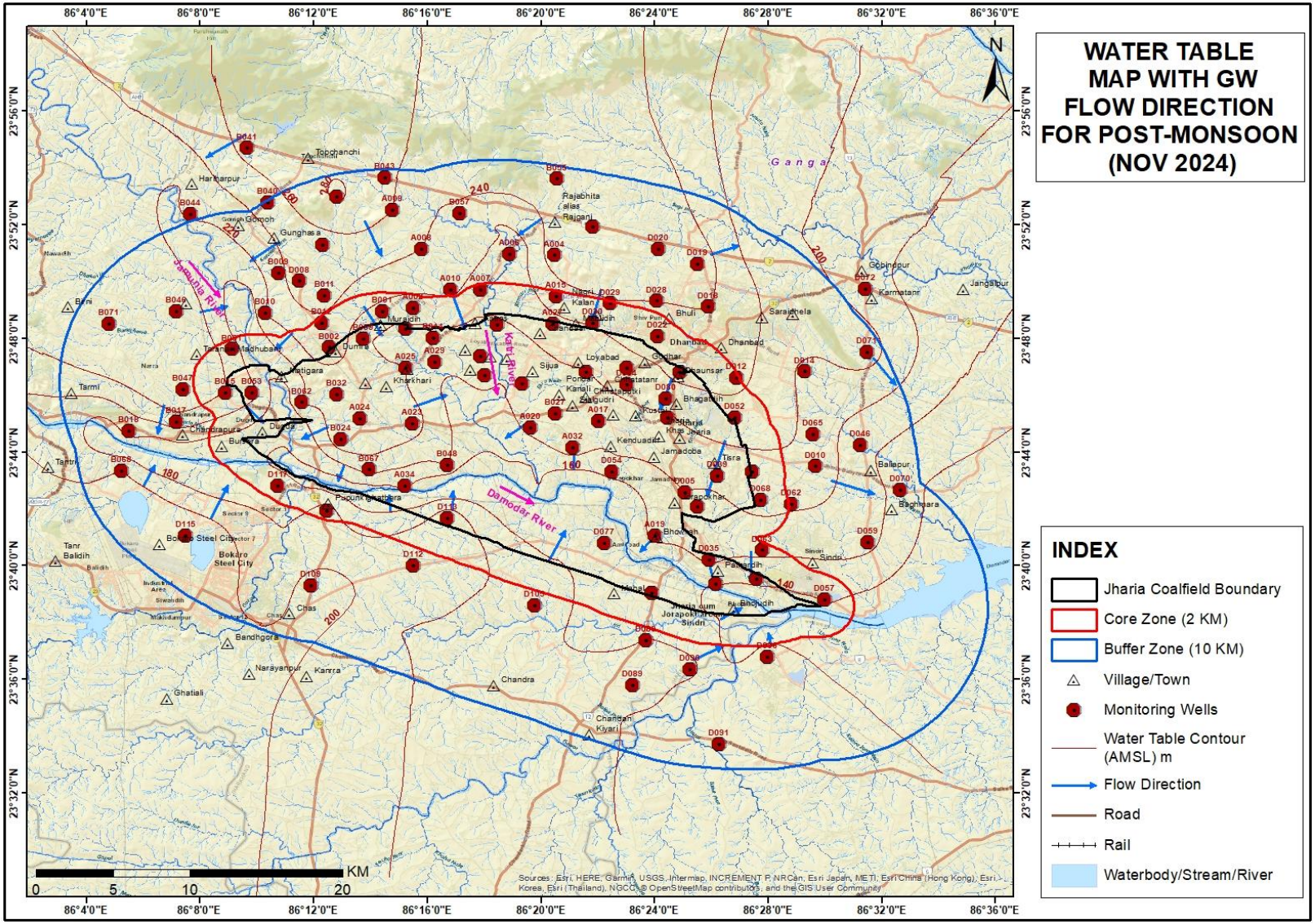


**Plate- IVB: Water table Contour Map of JCF, Post Monsoon (Nov'24)**

JOB NO: 200424005

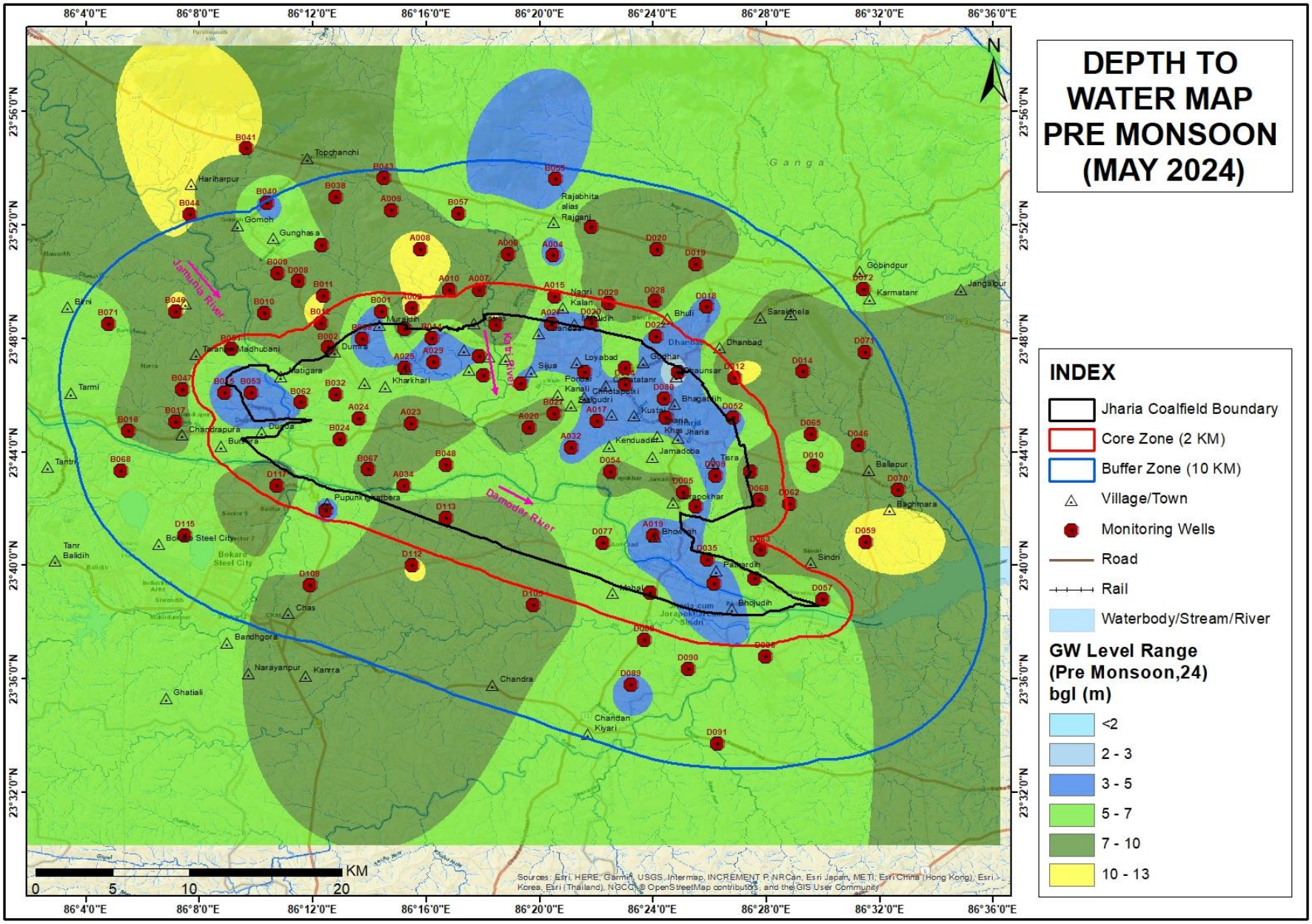


**Plate- VA: Depth to Groundwater Level map of JCF, Pre Monsoon (May'24)**

JOB NO: 200424005

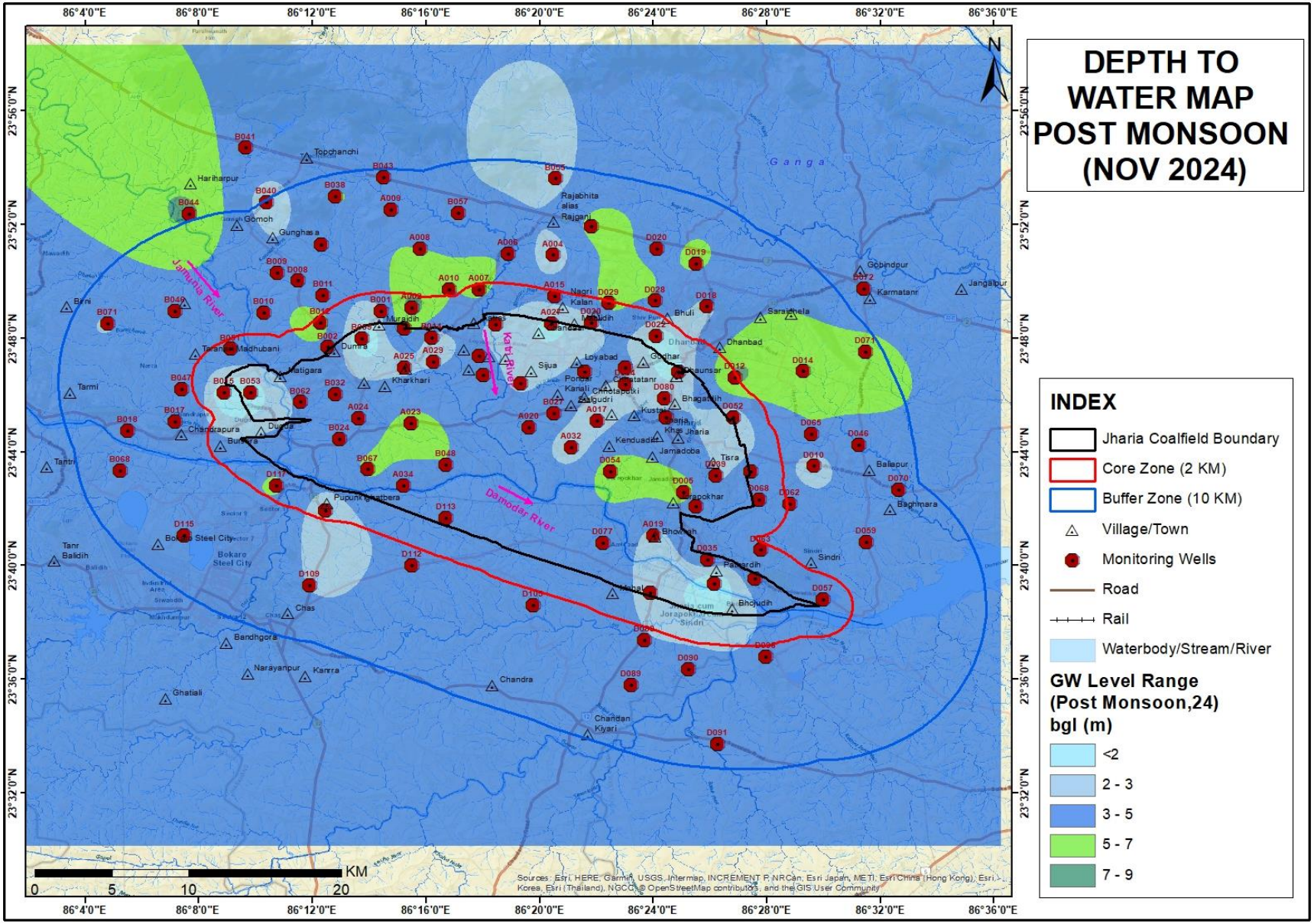


**Plate- VB: Depth to Groundwater Level map of JCF, Post Monsoon (Nov'24)**

JOB NO: 200424005

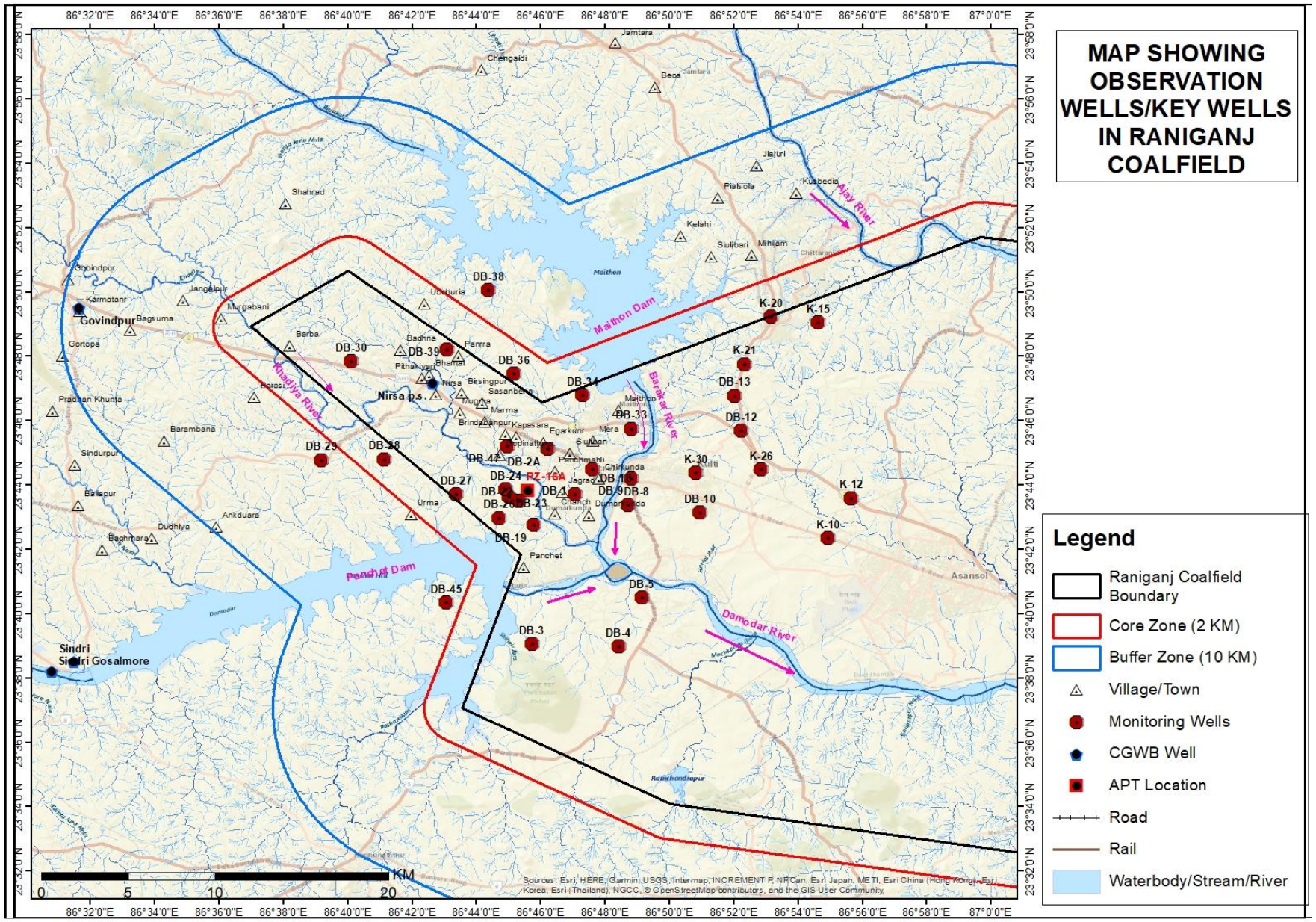


**Plate- VI: Drainage Map (Part of RCF Coalfield under BCCL Command Area)**

JOB NO: 200424005

Gmail **Environment Deptt. P.B. Area <pbenvarea7@gmail.com>**

# Submission of Ground Level and Quality Report (Assessment Year 2022-23)

3 messages

**Environment Deptt. P.B. Area** <pbenvarea7@gmail.com> Tue, May 16, 2023 at 1:37 PM
To: ro.ranchi-mef@gov.in, ccb.cpcb@nic.in, "ranchijspcb@gmail.com" <ranchijspcb@gmail.com>, dhanbadjspcb@gmail.com
Cc: HOD Environment <envbccl2020@gmail.com>

Dear Sir,
As per Specific Condition no. xliv of Environment Clearance granted on dated 26.08.2013. We are submitting herewith Ground water Level & Quality Report (Assessment Year 2022-23) in respect of Cluster XI.

This is for your kind information.

Coal India Limited
A Maharatna Company
www.coalindia.in

**Thanks & Regards,**
**Assistant Manager, Environment**
**Environment Department**
**P.B. Area, BCCL**
**Dhanbad**

***Take out Print only If it is very Important***
***"Save Paper SaVe TrEe"***

**GW QUARTERLY MONITORING 2022-23.pdf**
15234K

**Environment Deptt. P.B. Area** <pbenvarea7@gmail.com> Fri, Apr 12, 2024 at 12:05 PM
To: ro.ranchi-mef@gov.in, ccb.cpcb@nic.in, "ranchijspcb@gmail.com" <ranchijspcb@gmail.com>, dhanbadjspcb@gmail.com
Cc: HOD Environment <envbccl2020@gmail.com>, WJA ENVIRONMENT <wjaenv@gmail.com>

Dear Sir,
As per Specific Condition no. xliv of Environment Clearance granted on dated 26.08.2013. We are submitting herewith Ground water Level & Quality Report (Assessment Year 2023-24) in respect of Cluster XI.

This is for your kind information.

Coal India Limited
A Maharatna Company
www.coalindia.in

**Thanks & Regards,**
**Deputy Manager, Environment**
**Environment Department**
**P.B. Area, BCCL**
**Dhanbad**

***Take out Print only If it is very Important.***
***"Save Paper SaVe TrEe"***

[Quoted text hidden]

**Final Report_2024.pdf**
12996K

---

**Environment Deptt. P.B. Area** <pbenvarea7@gmail.com> Sat, May 10, 2025 at 10:39 AM
To: ro.ranchi-mef@gov.in, ccb.cpcb@nic.in, "ranchijspcb@gmail.com" <ranchijspcb@gmail.com>, dhanbadjspcb@gmail.com
Cc: HOD Environment <envbccl2020@gmail.com>, WJA ENVIRONMENT <wjaenv@gmail.com>

Dear Sir,
As per Specific Condition no. xliv of Environment Clearance granted on dated 26.08.2013. We are submitting herewith Ground water Level & Quality Report (Assessment Year 2024-25) in respect of Cluster XI.

This is for your kind information.

Coal India Limited
A Maharatna Company
www.coalindia.in

**Thanks & Regards,**
**Deputy Manager, Environment**
**Environment Department**
**P.B. Area, BCCL**
**Dhanbad**

***Take out Print only If it is very Important.***
***"Save Paper SaVe TrEe"***

[Quoted text hidden]

**2 attachments**

**Cover Letter_Report Submission 2025.pdf**
210K

**Groundwater Level and Quality Report for Clusters of Mines BCCL_2025.pdf**
14922K

Annexure-XXII

**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.

# WATER QUALITY REPORT
# OF
# BHARAT COKING COAL LIMITED,
# CLUSTER – XI

**(FOR THE Q.E. JUNE 2025)**

**E. C. no. J-11015/77/2011-IA.II (M) dated 26.07.2019.**

# CMPDI

ISO 9001 Company

**Regional Institute-II**

**Dhanbad, Jharkhand**

# CLUSTER - XI

**(FOR THE Q.E. JUNE 2025)**

# CONTENTS


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

# 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 $23^0$37' N to $23^0$52' N latitudes and $86^0$09' E to $86^0$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 mine effluent water, drinking 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 drinking 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 (Drinking 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 guide-lines 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-XI is in the Western & Southern part of the Jharia coalfield. It includes a group of 8 Mines (viz. Gopalichak UG&OC Mine, Kachhi Balihari 10/12 Pit UG Mine, PB UG Project, Bhagabandh UG Mine, Kenwadih OC, Pootkee UG, Kachi Balihari 5/6Pit UG, Moonidih UG mine). The Cluster – XI is situated about 25 - 30 kms from Dhanbad Railway Station. The mines of this Cluster – XI 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 Jarian nala & Damodar River.

1.2 The Project has Environmental Clearance from Ministry of Environment, Forests and Climate Change (MoEF&CC) for a rated capacity 5.08 MTPA (normative) and 6.604 MTPA (peak) capacity of coal production vide letter no. J-11015/77/2011-IA.II (M) dated 26th July, 2019.

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

# CHAPTER – II

# WATER QUALITY MONITORING

## 2.1 Location of sampling sites

(Refer **Plate No. - I**)

i) Ground Water quality at Bhagabandh (GW11)

ii) Surface Water quality at U/S in jarian Nala (SW23)

iii) Surface Water quality at D/S in Jarian Nala (SW24)

iv) Surface Water Quality at U/S in Damodar River (SW25)

v) Surface Water Quality at U/S in Damodar River (SW26)

VI) Mine Water Quality at Bhagabandh UGP (MW11)

VII) Mine Water Quality at Moonidih UGP (MW23)

## 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**

# GROUND WATER ANALYSIS TEST REPORT

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

TC-14321

| | | | | | |
|---|---|---|---|---|---|
| **Month & Year** | **QUARTER ENDING JUNE 2025** | **Name of Cluster** | **CLUSTERXI** | **ULR No.** | TC1432125000002060P |
| **Customer** | **Environment Department, Bharat Coking Coal Limited (BCCL), Koyla Bhawan, Dhanbad (E-mail: gmenv.bccl@coalindia.in)** | | | **Date of Issue** | **16.09.2025** |
| **Project** | **Bhagabandh Village** | **Sample Ref. No.** | **REM/BCCL/25-26/GW/** | **Sampling Method** | **CMPDI/RI-II/LPM 13,(IS 3025:Part -1)** |
| **Sampling Stations** | **Bhagabandh Village** | **Date of Sampling** | **20.05.25** | **Sample Collected in 5 Ltr Jerricane , Color as observed is transparent** | |
| | | **Period of Analysis** | **20.05.2025** | **to** | **20.07.2025** |

| **Sl. No.** | **Parameter** | **Method of Analysis** | **Observed Values** | | | **IS 10500: 2012** | |
|---|---|---|---|---|---|---|---|
| | | | **GW11 GO183** | **Range Of Testing** | **LDL** | **Acceptable Limit (Max)*** | **Permissible Limit in the Absence of Alternate Source (Max)** |
| 1 | Colour, Hazen unit | APHA, 24th edition ,2120-c-Spectrophotometric Single Wavelength Method ,2023 | <1 | 1-500.0 | 1 | 5 | 15 |
| 2 | Calcium, mg/l | IS 3025, (Part 40): 1991 R:2019,AAS-Flame Method & EDTA Method | 118 | 2.0-800.0 | 2 | 75 | 200 |
| 3 | Chlorides, mg/l | IS-3025(Part 32):1988, R-2019 , Argentometric Method | 84 | 2.0-1500.0 | 5 | 250 | 1000 |
| 4 | Fluoride, mg/l | APHA, 24th Edition, SPADNS Method | 0.64 | 0.2-2.00 | 0.2 | 1 | 1.5 |
| 5 | Iron, mg/l | IS 3025 (Part 53) : 2003, R : 2019 , AAS-Flame Method | <2.0 | 0.2-10 | 0.2 | 1 | No relaxation |
| 6 | Magnesium | APHA 24th edition, 3500-Mg B: Calculation Method | 148 | 6.0-700 | 6 | 30 | 100 |
| 7 | Nitrate , mg/l | APHA, 24th edition, UV-Spectrophotometric Method | 10.83 | 0.5-45.0 | 0.5 | 45 | No relaxation |
| 8 | Odour | APHA, 24th Edition, , 2150-C | Agreeable | Qualitative | Qualitative | Agreeable | Agreeable |
| 9 | pH value | IS 3025, Part 11 : 1983 R 2023 Electrometric( pH Meter) Method | 7.78 | 1-14 | 0.1 | 6.5-8.5 | No relaxation |
| 10 | Sulphate, mg/l | APHA –24th edition, 4500 S , Turbidity Method | 91 | 10.0-400.0 | 10 | 200 | 400 |
| 11 | Taste | APHA,24th edition, 2160-C | Acceptable | Qualitative | Qualitative | Acceptable | Agreeable |
| 12 | Total Alkalinity ($c_aco_3$), mg/l, Max | IS 3025, Part 23: 1986 R 2019 Titration Method | 235 | 4.0-2000.0 | 4 | 200 | 600 |
| 13 | Total Dissolved Solids, mg/l | IS 3025, Part 16: 1984 R 2023 Gravimetric method | 1010 | 25.0-5000.0 | 25 | 500 | 2000 |
| 14 | Total Hardness, mg/l | IS 3025, (Part 21): 2019 EDTA Method | 905 | 4.0-2000.0 | 4 | 200 | 600 |
| 15 | Turbidity, NTU | IS 3025, (Part 10):1984, R-2023 Nephelometric/Turbiditimetric Method | 3.4 | 1-800 | 0.1 | 1 | 5 |
| 16 | Zinc, mg/l | IS 3025(Part 49) : 1994,R:2019, AAS-Flame Method | <1.0 | 0.10 – 10.0 | 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,*

***ANALYSED BY***

(Gaurav Kant)
***REVIEWED BY***

(Kumar Vaibhav)
***Authorised Signatory***

**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

# GROUND WATER ANALYSIS TEST REPORT

| | | | | | |
|---|---|---|---|---|---|
| **Month & Year** | **QUARTER ENDING JUNE 2025** | **Name of Cluster** | **CLUSTER XI** | **ULR No.** | |
| **Customer** | **Environment Department, Bharat Coking Coal Limited (BCCL), Koyla Bhawan, Dhanbad (E-mail: gmenv.bccl@coalindia.in)** | | | **Date of Issue** | **16.09.2025** |
| **Project** | **Bhagabandh UGP** | **Sample Ref. No.** | **REM/BCCL/25-26/GW/** | **Sampling Method** | **CMPDI/RI-II/LPM 13,(IS 3025:Part -1)** |
| **Sampling Stations** | **Bhagabandh UGP** | **Date of Sampling** | **20.05.25** | **Sample Collected in 5 Ltr Jerricane , Color as observed is transparent** | |
| | | | **Period of Analysis** | **20.05.25** | **TO** **20.07.2025** |

| **Sl. No.** | **Parameter** | **Method of Analysis** | **Observed Values** | | | **IS 10500: 2012** | |
|---|---|---|---|---|---|---|---|
| | | | **GW11** | **Range Of Testing** | **LDL** | **Acceptable Limit (Max)*** | **Permissible Limit in the Absence of Alternate Source (Max)** |
| 1 | Boron (as B), mg/l, Max | APHA, 24th 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, 24th edition, AAS-GTA | <0.01 | 0.01-10.0 | 0.01 | 0.05 | 1.5 |
| 3 | Free Residual Chlorine, mg/l, Min | APHA, 24th 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, 24th edition, AAS-GTA | <0.005 | 0.005-10 | 0.005 | 0.01 | No relaxation |
| 5 | Phenolic compounds (as C6H5OH), mg/l, Max | APHA, 24th Edition,4-Amino Autipyrine | <0.001 | 0.001-10 | 0.001 | 0.002 | 0.002 |
| 6 | Selenium, mg/l, Max | APHA 24th 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 24th 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, 24th edition, AAS-GTA | <0.01 | 0.01-10.0 | 0.01 | 0.05 | No relaxation |
| 9 | Nickel as Ni, mg/l Max | IS 3025 Part 54 : 2003,R : 2019, AAS-Flame APHA, 24th edition, AAS-GTA | <0.005 | 0.005-10 | 0.005 | 0.02 | No relaxation |
| 10 | Manganese as Mn, mg/l, Max | APHA, 24TH Edition:2023 AAS-GTA Method | 0.1 | 0.02-10.0 | 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,*

***ANALYSED BY***

(Gaurav Kant)
***REVIEWED BY***

(Kumar Vaibhav)
***Authorised Signatory***

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TC-14321

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

CMPDIL, RI-II
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| | | | | | |
|---|---|---|---|---|---|
| Month & Year | QUARTE ENDI NG JUNE 2025 | **Name of Cluster** | XI | ULR No. | TC1432125000002089P TC1432125000002090P |
| Customer | Environment Department, Bharat Coking Coal Limited (BCCL), Koyla Bhawan, Dhanbad (E-mail: gmenv.bccl@coalindia.in) | | | Date of Issue | 16.092025 |

| | | | | | |
|---|---|---|---|---|---|
| Project | Sample Ref. No. | REM/BCCL/25-26/SW / | Sampling Method | (IS 3025 , Part-1) CMPDI/RI-II/LPM 13 | |
| Sampling Stations | (i) Upstream of Jarian Nala(SW23) | Date of Sampling | 30.06.2025 | Period of Analysis | |
| | (ii) Downstream of Jarian Nala(SW24) | Date of Sampling | 30.06.2025 | 30.6.2025 TO 20.08.2025 | |

| Sl. No. | Parameter | Method of Analysis | Observed Values (i) | Observed Values (ii) | IS : 2296 INLAND SURFACE WATER [1982] Class 'C | Range of Testing | LDL |
|---|---|---|---|---|---|---|---|
| 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 | 2.00-100.00 | 2 |
| 2 | Colour,Hazen Units | APHA 24th edition , 2120-B-:2023 | 2 | 2 | 10 | 1-500.0 | 1 |
| 3 | Chlorides, mg/l | IS-3025(Part 32):1988, R-2019 Argentometric Method | 69 | 72 | 600 | 2.0-1500.0 | 5 |
| 4 | Copper, mg/l | IS 3025 (Part 42) : 1992 R : 2019, AAS-Flame Method | <2.0 | <2.0 | 1.5 | 0.2-10.0 | 0.2 |
| 5 | Dissolved Oxygen, mg/L | IS 3025 (Part 38) : 1989, R:2003 Winkler Azide Method | 5.9 | 6.0 | 4 | 1.0-10.0 | 0.1 |
| 6 | Fluoride, mg/l | APHA, 24th edition, SPADNS Method | 0.49 | 0.53 | 1.5 | 0.2-2.00 | 0.2 |
| 7 | Hexavalent Chromium, mg/l | APHA 24th 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 | <2.0 | <2.0 | 50 | 0.2-10 | 0.2 |
| 9 | Nitrate , mg/l | APHA, 24th edition, UV-Spectrophotometric Method | 12.89 | 14.25 | 50 | 0.5-45.0 | 0.5 |
| 10 | pH value | IS 3025, (Part 11) : 1983 R-2023 Electrometric (Ph Meter) method | 7.64 | 7.59 | 6.5-8.5 | 1.0-14.0 | 2 |
| 11 | Sulphate, mg/l | APHA –24th edition,4500- S, Turbidity Method | 89 | 86 | 400 | 10.0-400.0 | 10 |
| 12 | Total Dissolved Solids, mg/l | IS 3025, (Part 16): 1984 R-2023 Gravimetric method | 497 | 502 | 1500 | 25.0-10000.0 | 25 |
| 13 | Zinc, mg/l | IS 3025(Part 49) : 1994, R : 2019, AAS-Flame Method | <0.1 | <1.0 | 15 | 0.10 – 10.0 | 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*

(Gaurav Kant)

(Kumar Vaibhav)

*Analysed by* *REVIEWED BY* *Authorised Signatory*

*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
## SURFACE WATER ANALYSIS TEST REPORT

| | | | | | |
|---|---|---|---|---|---|
| Month & Year | QUARTE ENDI NG JUNE 2025 | **Name of Cluster** | XI | ULR No. | |
| Customer | Environment Department, Bharat Coking Coal Limited (BCCL), Koyla Bhawan, Dhanbad (E-mail: gmenv.bccl@coalindia.in) | | | Date of Issue | 16.09.2025 |
| Project | Sample Ref. No. | | REM/BCCL/24-25/SW / | Sampling Method | (IS 3025 , Part-1) CMPDI/RI-II/LPM 13 |
| Sampling Stations | (i) | Upstream of Jarian Nala(SW23) | Date of Sampling | 30.06.2025 | Period of Analysis |
| | (ii) | Downstream of Jarian Nala(SW24) | Date of Sampling | 30.06.2025 | 30.6.2025 TO 20.08.2025 |

| Sl. No. | Parameter | Method of Analysis | Observed Values (i) | Observed Values (ii) | IS : 2296 INLAND SURFACE WATER [1982] Class 'C | Range of Testing | LDL |
|---|---|---|---|---|---|---|---|
| 1 | Arsenic (as As), mg/l, Max | IS-3025,Part 37:1988, R-2019/ APHA 24th edition AAS-VGA | <0.006 | <0.006 | 0.2 | 0.006-10 | 0.006 |
| 2 | Lead (as Pb), mg/l, Max | APHA, 24th edition, AAS-GTA | <0.005 | <0.005 | 0.1 | 0.005-10 | 0.005 |
| 3 | Phenolic compounds (as C6H5OH), mg/l, Max | APHA, 24th 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 24th 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*

(Gaurav Kant) (Kumar Vaibhav)

*Analysed by* *REVIEWED BY* *Authorised Signatory*

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

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TC-14321

| | | | | | |
|---|---|---|---|---|---|
| Month & Year | QUARTE ENDI NG june 2025 | **Name of Cluster** | XI | ULR No. | TC1432125000002091P TC1432125000002092P |
| Customer | Environment Department, Bharat Coking Coal Limited (BCCL), Koyla Bhawan, Dhanbad (E-mail: gmenv.bccl@coalindia.in) | | | Date of Issue | 16.09.2025 |
| Project | Sample Ref. No. | | REM/BCCL/25-26/SW / | Sampling Method | (IS 3025 , Part-1) CMPDI/RI-II/LPM 13 |
| Sampling Stations | (i) Upstream of Damodar River(SW25) | | Date of Sampling | 30.06.2025 | Period of Analysis |
| | (ii) Downstream of Damodar River(SW26) | | Date of Sampling | 30.06.2025 | 30.6.2025 TO 20.08.2025 |

| Sl. No. | Parameter | Method of Analysis | Observed Values (i) | Observed Values (ii) | IS : 2296 INLAND SURFACE WATER [1982] Class 'C | Range of Testing | LDL |
|---|---|---|---|---|---|---|---|
| 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 | 2.00-100.00 | 2 |
| 2 | Colour,Hazen Units | APHA 24th edition , 2120-B-:2023 | 1 | 1 | 10 | 1-500.0 | 1 |
| 3 | Chlorides, mg/l | IS-3025(Part 32):1988, R-2019 Argentometric Method | 60 | 65 | 600 | 2.0-1500.0 | 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 | 5.0 | 5.2 | 4 | 1.0-10.0 | 0.1 |
| 6 | Fluoride, mg/l | APHA, 24th edition, SPADNS Method | 0.54 | 0.49 | 1.5 | 0.2-2.00 | 0.2 |
| 7 | Hexavalent Chromium, mg/l | APHA 24th 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 | 0.23 | 0.51 | 50 | 0.2-10 | 0.2 |
| 9 | Nitrate , mg/l | APHA, 24th edition, UV-Spectrophotometric Method | 10.60 | 9.74 | 50 | 0.5-45.0 | 0.5 |
| 10 | pH value | IS 3025, (Part 11) : 1983 R-2023 Electrometric (Ph Meter) method | 7.67 | 7.66 | 6.5-8.5 | 1.0-14.0 | 2 |
| 11 | Sulphate, mg/l | APHA –24th edition,4500- S, Turbidity Method | 57 | 48 | 400 | 10.0-400.0 | 10 |
| 12 | Total Dissolved Solids, mg/l | IS 3025, (Part 16): 1984 R-2023 Gravimetric method | 520 | 520 | 1500 | 25.0-10000.0 | 25 |
| 13 | Zinc, mg/l | IS 3025(Part 49) : 1994, R : 2019, AAS-Flame Method | 0.19 | 0.22 | 15 | 0.10 – 10.0 | 0.1 |

***Grab sampling carried out for water samples. *LDL indicates Lower Detection L4imit & BDL indicates Below Detection Limit*

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

(Gaurav Kant)

(Kumar Vaibhav)

*Analysed by* *REVIEWED BY* *Authorised Signatory*

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# SURFACE WATER ANALYSIS TEST REPORT

| | | | | | |
|---|---|---|---|---|---|
| Month & Year | QUARTE ENDI NG JUNE 2025 | **Name of Cluster** | XI | ULR No. | |
| Customer | Environment Department, Bharat Coking Coal Limited (BCCL), Koyla Bhawan, Dhanbad (E-mail: gmenv.bccl@coalindia.in) | | | Date of Issue | 16.09.2025 |
| Project | Sample Ref. No. | REM/BCCL/25-26/SW / | Sampling Method | (IS 3025 , Part-1) CMPDI/RI-II/LPM 13 | |
| Sampling Stations (i) | Upstream of Damodar River(SW25) | Date of Sampling | 30.06.2025 | Period of Analysis | |
| (ii) | Downstream of Damodar River(SW26) | Date of Sampling | 30.06.2025 | 30.6.2025 TO 20.08.2025 | |

| Sl. No. | Parameter | Method of Analysis | Observed Values (i) | Observed Values (ii) | IS : 2296 INLAND SURFACE WATER [1982] Class 'C | Range of Testing | LDL |
|---|---|---|---|---|---|---|---|
| 1 | Arsenic (as As), mg/l, Max | IS-3025,Part 37:1988, R-2019/ APHA 24th edition AAS-VGA | <0.006 | <0.006 | 0.2 | 0.006-10 | 0.006 |
| 2 | Lead (as Pb), mg/l, Max | APHA, 24th edition, AAS-GTA | <0.005 | <0.005 | 0.1 | 0.005-10 | 0.005 |
| 3 | Phenolic compounds (as C6H5OH), mg/l, Max | APHA, 24th 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 24th 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*

(Gaurav Kant) (Kumar Vaibhav)

*Analysed by* *REVIEWED BY* *Authorised Signatory*

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# MINE EFFLUENT ANALYSIS TEST REPORT

| | | | | | |
|---|---|---|---|---|---|
| **Month & Year** | **QUARTER ENDING JUNE 2025** | **Name of Cluster** | **CLUSTER XI** | **ULR No.** | **TC143212500000211 9P** |
| **Customer** | **Environment Department, Bharat Coking Coal Limited (BCCL), Koyla Bhawan, Dhanbad (E-mail: gmenv.bccl@coalindia.in)** | | | **Date of Issue** | **16.09.2025** |
| **Project** | **Bhagaband UGP** | **Sample Ref. No.** | **REM/BCCL/25-26/MW/** | **Sampling Method** | **CMPDI/RI-II/LPM 13,(IS 3025:Part -1)** |
| **Sampling Stations** | **MW11** | **Date of Sampling** | **23.06.2025** | **Sample Collected in 5 Ltr Jerricane , Color as observed is transparent** | |

**Period of Analysis** 23.06.2025 **TO** 20.08.2025

| Sl. No. | Parameter | Method of Analysis | MW11 M1597 | Range Of Testing | LDL | MOEF -SCH-VI STANDARDS Class 'A' |
|---|---|---|---|---|---|---|
| 1 | B.O.D (3 days 27°C), mg/l, Max | IS 3025 /44:1993,R:20033 day incubation at 27°C | <2.0 | 2-10000.0 | 2 | 30 |
| 2 | Colour | APHA,24th edition ,2120-B-:2023 | 2 | 1.0-500.0 | 1 | - |
| 3 | COD, mg/l, Max | APHA 24th edition 5220 C Titrimetric Method | 32 | 4.0-800.0 | 4 | 250 |
| 4 | Copper (as Cu), mg/l, *Max* | IS 3025(Part42): 1992 R : 2019, AAS-Flame | <0.2 | 0.2-10.0 | 0.2 | 3 |
| 5 | Dissolved Phosphate (as P), mg/l, Max | IS 3025/ 31, 1988 R 2019 | 0.10 | 0.1-5.0 | 0.1 | 5 |
| 6 | Fluoride (as F) mg/l, *Max* | APHA, 24th Edition, Page 4-90 to , 4500 – F- D (SPADNS Method) | 0.73 | 0.2-2.0 | 0.2 | 2 |
| 7 | Hexavalent Chromium, mg/l, Max | IS 3025 (Part 52) : 2003,Reaffirmed 2019 | <0.01 | 0.01-1.40 | 0.01 | 0.1 |
| 8 | Iron (as Fe), mg/l, *Max* | IS 3025 (Part 53) : 2003, R : 2019 , AAS-Flame | <0.2 | 0.2-10 | 0.2 | 3 |
| 9 | Manganese(as Mn), mg/l, Max | APHA, 24th edition, AAS-Flame | <0.1 | 0.1-10 | 0.1 | 0.1 |
| 10 | Nickel (as Ni), mg/l, *Max* | IS-3025(Part 54):2003, R:2019 AAS-Flame | <0.1 | 0.1-10.0 | 0.1 | 3 |
| 11 | Nitrate Nitrogen, mg/l, *Max* | APHA, 24th Edition,UV-Spectrphotometric | 2.70 | 0.5-45 | 0.5 | 10 |
| 12 | Oil & Grease, mg/l, Max | IS 3025/39:1991, R : 2019, Partition Gravimetric | <4.0 | 2.0-1000 | 2 | 10 |
| 13 | pH value | IS-3025/11:1983, R-2023, Electrometric | 7.78 | 1 -14 | 0.1 | 5.5 to 9.0 |
| 14 | Temperature (°C ) | IS-3025/09:1984, Thermometeric | 29.1 | 1-100 | . | Shall not exceed 5° C above the receiving temp. |
| 15 | Total Chromium (as Cr), mg/l, *Max* | IS-3025(Part 52):2003, R:2019 AAS-Flame | <0.1 | 0.1-10.0 | 0.1 | 2 |
| 16 | Total Suspended Solids, mg/l, Max | IS 3025/17:1984, R :2023, Gravimetric | 42 | 10-5000 | 10 | 100 |
| 17 | Zinc (as Zn), mg/l, *Max* | IS 3025 /49 : 1994, R : 2019, AAS-Flame | <0.1 | 0.1-10.0 | 0.1 | 5 |
| 18 | Odour | APHA, 24th Edition, , 2150-C | Agreeable | Qualitative | Qualitative | Qualitative |

****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,*

***ANALYSED BY***

(Gaurav Kant)
***REVIEWED BY***

(Kumar Vaibhav)
***Authorised Signatory***

**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

## MINE EFFLUENT ANALYSIS TEST REPORT

| | | | | | |
|---|---|---|---|---|---|
| **Month & Year** | **QUARTER ENDING JUNE 2025** | **Name of Cluster** | **CLUSTER XI** | **Report No.** | |
| **Customer** | **Environment Department, Bharat Coking Coal Limited (BCCL), Koyla Bhawan, Dhanbad (E-mail: gmenv.bccl@coalindia.in)** | | | **Date of Issue** | **16.09.2025** |
| **Project** | **Bhagaband UGP** | **Sample Ref. No.** | **REM/BCCL/25-26/MW/** | **Sampling Method** | **CMPDI/RI-II/LPM 13,(IS 3025:Part -1)** |
| **Sampling Stations** | **MW11** | **Date of Sampling** | **23.06.2025** | **Sample Collected in 5 Ltr Jerricane , Color as observed is transparent** | |

**Period of Analysis** **23.06.2025** **TO** **20.08.2025**

| Sl. No. | Parameter | Method of Analysis | MW11 | Range Of Testing | LDL | MOEF -SCH-VI STANDARDS Class 'A' |
|---|---|---|---|---|---|---|
| 1 | Ammonical Nitrogen, mg/l, Max | IS 3025/34:1988,R : 2009, Nessler's | <0.02 | 0.02-100 | 0.02 | 50 |
| 2 | Arsenic (as As), mg/l, Max | IS-3025,part 37:1988, R-2019/ APHA 24th edition AAS-VGA | <0.006 | 0.006-5 | 0.006 | 0.2 |
| 3 | Free Ammonia, mg/l, Max | IS:3025/34:1988, Nesseler's | <0.01 | 0.01-10 | 0.01 | 5 |
| 4 | Lead (as Pb), mg/l, *Max* | IS-3025(Part 59):2006, R 2023 AAS-GTA/APHA, 24th Edition, 3111B, AAS-GTA | <0.005 | 0.005-10 | 0.005 | 2 |
| 5 | Phenolic compounds | APHA, 24th edition4-Amino Antipyrine | <0.002 | 0.002-5 | 0.002 | 1 |
| 6 | Selenium, mg/l, Max | IS-3025,part 56:2003, R-2019/ APHA 24th edition, AAS-VGA | <0.007 | 0.007-5 | 0.007 | 0.05 |
| 7 | Sulphide (as $S^{2-}$) mg/l Max. | APHA 24th edition Methylene Blue Method | <0.005 | 0.005-5 | 0.005 | 2 |
| 8 | Total Kjeldahl Nitrogen, mg/l, Max | IS:3025/34:1988, Nesseler's | <1 | 1-200 | 1 | 100 |
| 9 | Total Residual Chlorine, mg/l, Max | APHA, 24th Edition, , 4500-Cl B. (Iodometric Method-I) | <0.04 | 0.04-5.00 | 0.04 | 1 |

****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,*

***ANALYSED BY***

(Gaurav Kant)
***REVIEWED BY***

(Kumar Vaibhav)
***Authorised Signatory***

**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**
**MINE EFFLUENT ANALYSIS TEST REPORT**

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

| | | | | | |
|---|---|---|---|---|---|
| **Month & Year** | **QUARTER ENDING JUNE 2025** | **Name of Cluster** | **CLUSTER XI** | **ULR No.** | **TC143212500000211 9P** |
| **Customer** | **Environment Department, Bharat Coking Coal Limited (BCCL), Koyla Bhawan, Dhanbad (E-mail: gmenv.bccl@coalindia.in)** | | | **Date of Issue** | **16.09.2025** |
| **Project** | **Moonidih UGP** | **Sample Ref. No.** | **REM/BCCL/25-26/MW/** | **Sampling Method** | **CMPDI/RI-II/LPM 13,(IS 3025:Part -1)** |
| **Sampling Stations** | **MW11** | **Date of Sampling** | **16.06.2025** | **Sample Collected in 5 Ltr Jerricane , Color as observed is transparent** | |

**Period of Analysis** **16.06.2025** **TO** **20.08.2025**

| Sl. No. | Parameter | Method of Analysis | MW11 M1590 | Range Of Testing | LDL | MOEF -SCH-VI STANDARDS Class 'A' |
|---|---|---|---|---|---|---|
| 1 | B.O.D (3 days 27°C), mg/l, Max | IS 3025 /44:1993,R:20033 day incubation at 27°C | <2.0 | 2-10000.0 | 2 | 30 |
| 2 | Colour | APHA,24th edition ,2120-B-:2023 | 1 | 1.0-500.0 | 1 | - |
| 3 | COD, mg/l, Max | APHA 24th edition 5220 C Titrimetric Method | 44 | 4.0-800.0 | 4 | 250 |
| 4 | Copper (as Cu), mg/l, *Max* | IS 3025(Part42): 1992 R : 2019, AAS-Flame | <0.2 | 0.2-10.0 | 0.2 | 3 |
| 5 | Dissolved Phosphate (as P), mg/l, Max | IS 3025/ 31, 1988 R 2019 | 0.092 | 0.1-5.0 | 0.1 | 5 |
| 6 | Fluoride (as F) mg/l, *Max* | APHA, 24th Edition, Page 4-90 to , 4500 – F- D (SPADNS Method) | 0.84 | 0.2-2.0 | 0.2 | 2 |
| 7 | Hexavalent Chromium, mg/l, Max | IS 3025 (Part 52) : 2003,Reaffirmed 2019 | <0.01 | 0.01-1.40 | 0.01 | 0.1 |
| 8 | Iron (as Fe), mg/l, *Max* | IS 3025 (Part 53) : 2003, R : 2019 , AAS-Flame | <0.2 | 0.2-10 | 0.2 | 3 |
| 9 | Manganese(as Mn), mg/l, Max | APHA, 24th edition, AAS-Flame | <0.1 | 0.1-10 | 0.1 | 0.1 |
| 10 | Nickel (as Ni), mg/l, *Max* | IS-3025(Part 54):2003, R:2019 AAS-Flame | <0.1 | 0.1-10.0 | 0.1 | 3 |
| 11 | Nitrate Nitrogen, mg/l, *Max* | APHA, 24th Edition,UV-Spectrphotometric | 1.51 | 0.5-45 | 0.5 | 10 |
| 12 | Oil & Grease, mg/l, Max | IS 3025/39:1991, R : 2019, Partition Gravimetric | <4.0 | 2.0-1000 | 2 | 10 |
| 13 | pH value | IS-3025/11:1983, R-2023, Electrometric | 8.00 | 1 -14 | 0.1 | 5.5 to 9.0 |
| 14 | Temperature (°C ) | IS-3025/09:1984, Thermometeric | 31.3 | 1-100 | . | Shall not exceed 5° C above the receiving temp. |
| 15 | Total Chromium (as Cr), mg/l, *Max* | IS-3025(Part 52):2003, R:2019 AAS-Flame | <0.1 | 0.1-10.0 | 0.1 | 2 |
| 16 | Total Suspended Solids, mg/l, Max | IS 3025/17:1984, R :2023, Gravimetric | 45 | 10-5000 | 10 | 100 |
| 17 | Zinc (as Zn), mg/l, *Max* | IS 3025 /49 : 1994, R : 2019, AAS-Flame | <0.1 | 0.1-10.0 | 0.1 | 5 |
| 18 | Odour | APHA, 24th Edition, , 2150-C | Agreeable | Qualitative | Qualitative | Qualitative |

****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,*

***ANALYSED BY***

(Gaurav Kant)
***REVIEWED BY***

(Kumar Vaibhav)
***Authorised Signatory***

**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 ----*

CMPDIL, RI-II
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CENTRAL MINE PLANNING AND DESIGN INSTITUTE LIMITED

## Environment Laboratory, Regional Institute-II

## MINE EFFLUENT ANALYSIS TEST REPORT

| | | | | | |
|---|---|---|---|---|---|
| **Month & Year** | **QUARTER ENDING JUNE 2025** | **Name of Cluster** | **CLUSTER XI** | **Report No.** | |
| **Customer** | **Environment Department, Bharat Coking Coal Limited (BCCL), Koyla Bhawan, Dhanbad (E-mail: gmenv.bccl@coalindia.in)** | | | **Date of Issue** | **16.09.2025** |
| **Project** | **Bhagaband UGP** | **Sample Ref. No.** | **REM/BCCL/25-26/MW/** | **Sampling Method** | **CMPDI/RI-II/LPM 13,(IS 3025:Part -1)** |
| **Sampling Stations** | **MW11** | **Date of Sampling** | **16.06.2025** | **Sample Collected in 5 Ltr Jerricane , Color as observed is transparent** | |

**Period of Analysis** **16.06.2025** **TO** **20.08.2025**

| **Sl. No.** | **Parameter** | **Method of Analysis** | **MW11** | **Range Of Testing** | **LDL** | **MOEF -SCH-VI STANDARDS Class 'A'** |
|---|---|---|---|---|---|---|
| 1 | Ammonical Nitrogen, mg/l, Max | IS 3025/34:1988,R : 2009, Nessler's | <0.02 | 0.02-100 | 0.02 | 50 |
| 2 | Arsenic (as As), mg/l, Max | IS-3025,part 37:1988, R-2019/ APHA 24th edition AAS-VGA | <0.006 | 0.006-5 | 0.006 | 0.2 |
| 3 | Free Ammonia, mg/l, Max | IS:3025/34:1988, Nesseler's | <0.01 | 0.01-10 | 0.01 | 5 |
| 4 | Lead (as Pb), mg/l, *Max* | IS-3025(Part 59):2006, R 2023 AAS-GTA/APHA, 24th Edition, 3111B, AAS-GTA | <0.005 | 0.005-10 | 0.005 | 2 |
| 5 | Phenolic compounds | APHA, 24th edition4-Amino Antipyrine | <0.002 | 0.002-5 | 0.002 | 1 |
| 6 | Selenium, mg/l, Max | IS-3025,part 56:2003, R-2019/ APHA 24th edition, AAS-VGA | <0.007 | 0.007-5 | 0.007 | 0.05 |
| 7 | Sulphide (as $S^{2-}$) mg/l Max. | APHA 24th edition Methylene Blue Method | <0.005 | 0.005-5 | 0.005 | 2 |
| 8 | Total Kjeldahl Nitrogen, mg/l, Max | IS:3025/34:1988, Nesseler's | <1 | 1-200 | 1 | 100 |
| 9 | Total Residual Chlorine, mg/l, Max | APHA, 24th Edition, , 4500-Cl B. (Iodometric Method-I) | <0.04 | 0.04-5.00 | 0.04 | 1 |

****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,*

***ANALYSED BY***

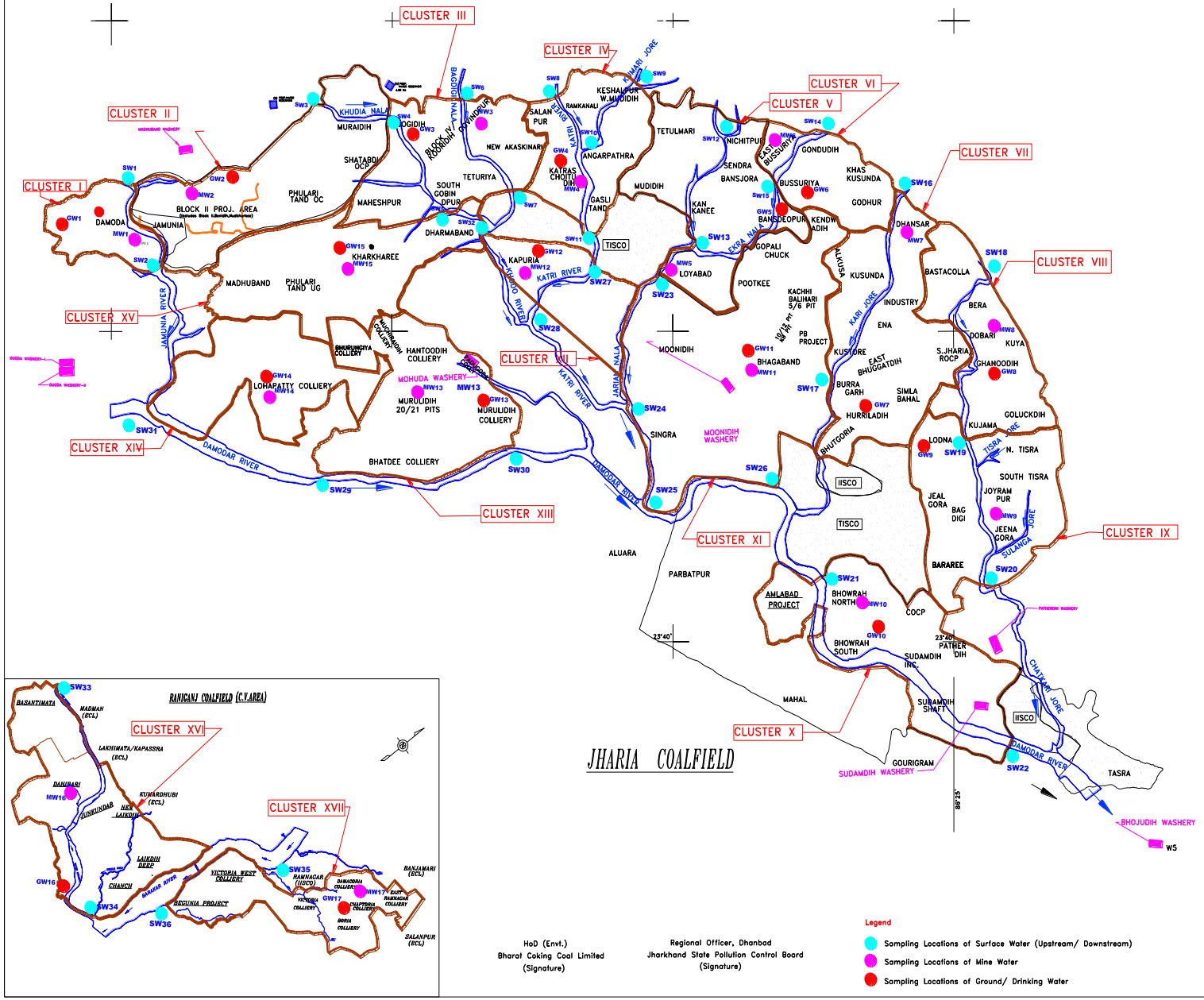
(Gaurav Kant)
***REVIEWED BY***

(Kumar Vaibhav)
***Authorised Signatory***

**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 ----*

# Water Sampling Locations in BCCL




## INDEX

| Cluster | Suface Water (U/S, D/S) | Name of River/ Nala / Jore | Mine/ Effluent Water | Sampling Location | Ground Water | Sampling Location |
|---|---|---|---|---|---|---|
| I | SW1, SW2 | Jamunia River | MW1 | Damoda Area | GW1 | Ghutway Village |
| II | SW3, SW4 | Khudia Nala | MW2 | Block II OCP | GW2 | Joyrampur Village |
| III | SW4, SW5, SW6, SW7 | Khudia Nala, Bagdigi Nala | MW3 | Govindpur Colliery | GW3 | Jogidih Village |
| IV | SW8, SW11, SW9, SW10 | Katri River, Kumari Jore | MW4 | Chotudih | GW4 | Kankanee Village |
| V | SW12, SW13, SW15 | Jarian Nala, Ekra Nala | MW5 | Mudidih | GW5 | Nichitpur |
| VI | SW14, SW15 | Ekra Nala | MW6 | East Bassuria UGP | GW6 | Bansjora Borewell |
| VII | SW16, SW17 | Kari Jore | MW7 | Dhansar UGP | GW7 | Hurriladih |
| VIII | SW18, SW19 | Kashi Jore | MW8 | Dobari UGP | GW8 | Ghanudih |
| IX | SW19, SW20 | Kashi Jore | MW9 | Jeenagora | GW9 | Lodna |
| X | SW21, SW22 | Damodar River | MW10 | Bhowrah North | GW10 | Bhowrah South |
| XI | SW23, SW24, SW25, SW26 | Jarian Nala, Damodar River | MW11 | Bhagaband h UGP | GW11 | Bhagabandh |
| XII | SW27, SW28 | Katri River | MW12 | Kapuria | GW12 | Kapuria |
| XIII | SW29, SW30 | Damodar River | MW13 | Murulidih (20/21) | GW13 | Murilidih |
| XIV | SW31, SW29 | Damodar River | MW14 | Lohapatti | GW14 | Lohapatti |
| XV | SW5, SW32 | Khudia Nala | MW15 | Kharkharee UGP | GW15 | Kharkharee |
| XVI | SW33, SW34 | Khudia River | MW16 | Dahibari OCP | GW16 | Patlabari Village |
| XVII | SW35, SW36 | Barakar River | MW17 | Damagoria Colliery | GW17 | Chaptoria |

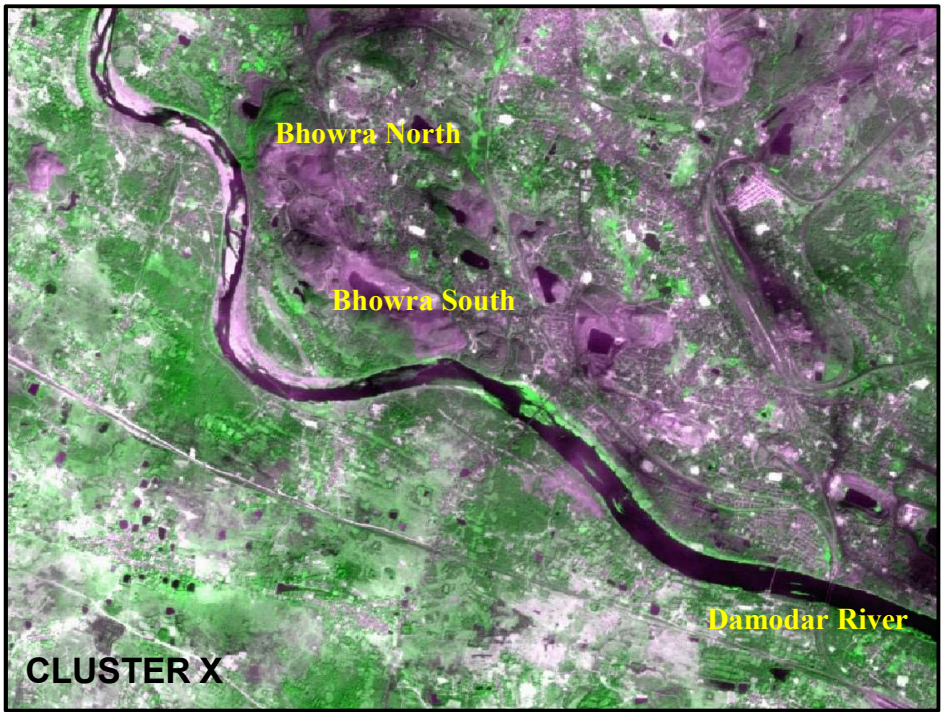
HoD (Envt.)
Bharat Coking Coal Limited
(Signature)

Regional Officer, Dhanbad
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

| | |
|---|---|
| Customer | BHARAT COKING COAL LIMITED |
| Title | WATER SAMPLING LOCATIONS |
| Subject | MONITORING STATIONS |
| CMPDI (ISO 9001 Company) | Scale: Not to Scale |

# 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 | | | | | | | | | | | |
| | | | | Area under Backfilling | | Plantation on Excavated / Backfilled Area | | Plantation on External OB Dumps | | Social Forestry, Avanue 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 | 2018 | 2021 |
| 1 | Cluster I | 575.00 | 575.00 | 10.11 | 11.10 | 7.29 | 7.29 | 47.99 | 45.21 | 25.53 | 25.53 | 28.39 | 27.61 | 45.79 | 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% | 38.00% | 39.98% |
| 2 | Cluster IV | 1123.79 | 1123.79 | 147.22 | 176.03 | 0.00 | 0.00 | 27.11 | 27.11 | 165.09 | 165.09 | 166.67 | 152.29 | 313.89 | 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 | 15.52 | 11.43 | 238.67 | 238.67 | 122.23 | 183.42 | 511.24 | 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 | 59.41 | 45.71 | 204.85 | 218.51 | 236.00 | 236.00 | 145.44 | 172.80 |
| | | | | 56.76% | 65.74% | 14.23% | 13.34% | | | | | 29.00% | 20.92% | | | 11.47% | 11.47% | 71.00% | 79.08% |
| 5 | Cluster XI | - | 3527.58 | - | 30.45 | - | 0.00 | - | 0.00 | - | 187.14 | - | 34.33 | - | 64.78 | - | 187.14 | - | 30.45 |
| | | | | | 47.01% | | 0.00% | | | | | | 52.99% | | | | 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** | **376.70** | **443.36** | **1075.77** | **1218.18** | **800.67** | **968.94** | **699.07** | **774.82** |
| | | | | **58.11%** | **58.52%** | **6.87%** | **5.08%** | | | | | **35.02%** | **36.40%** | | | **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 Area 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".*

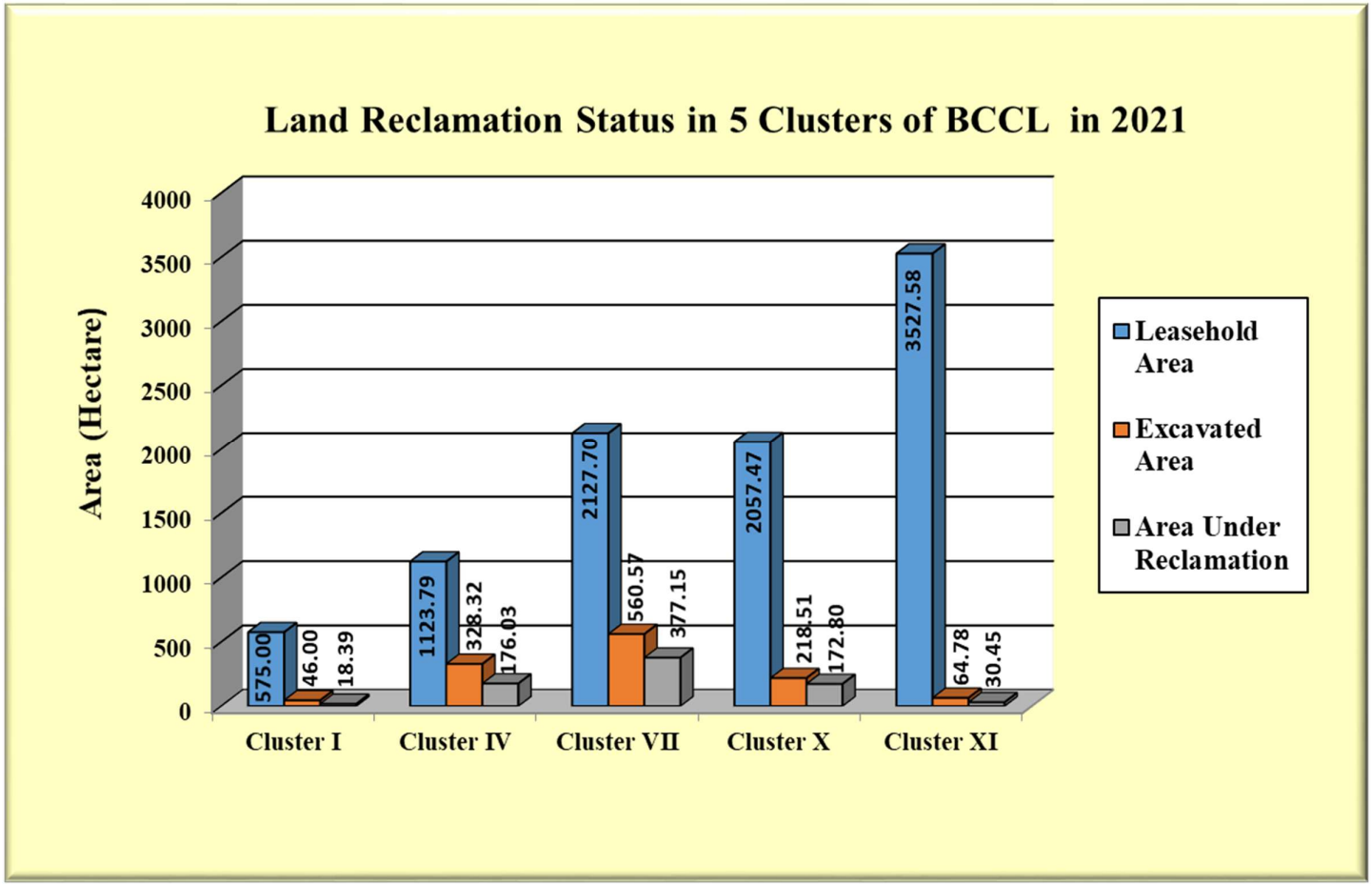



**Fig. 1: Cluster wise Land Reclamation Status in five Clusters - 2021 (BCCL)**

# 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 $m^3$ 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:

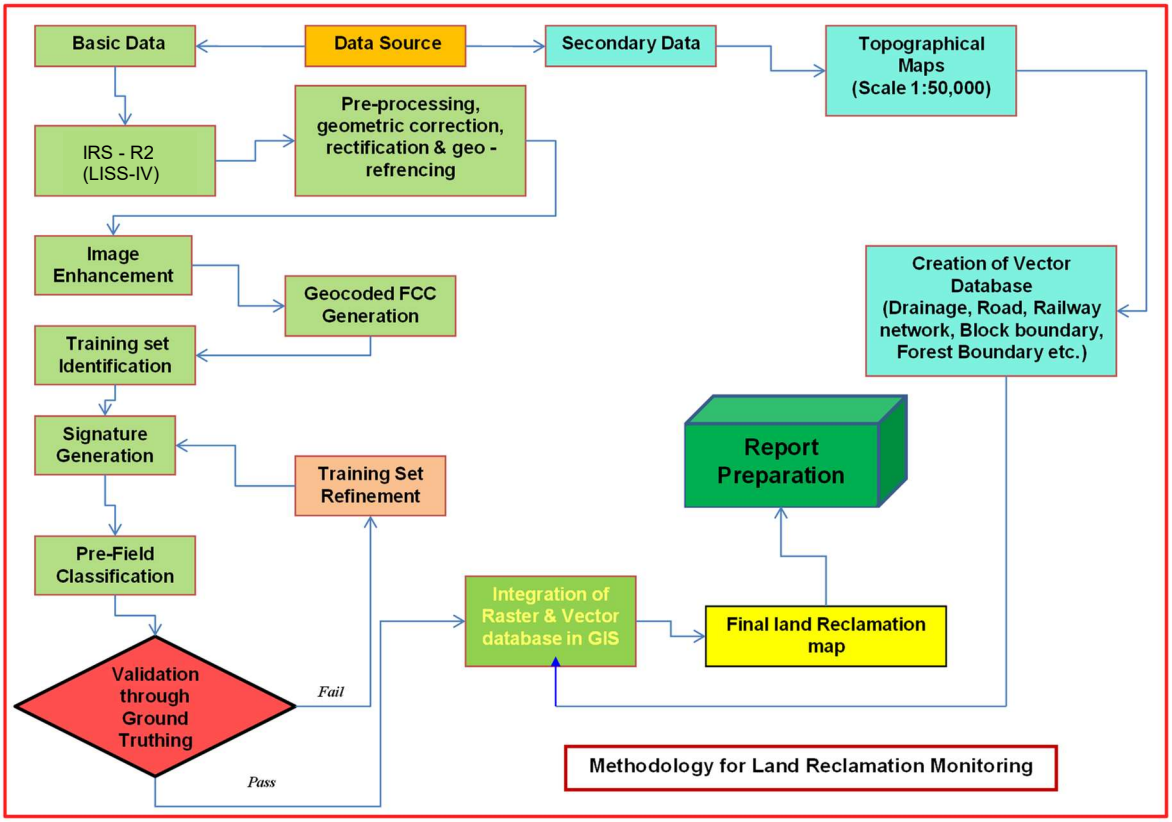



**Fig. 2: Methodology of Land Reclamation Monitoring**

**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 SoI 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.

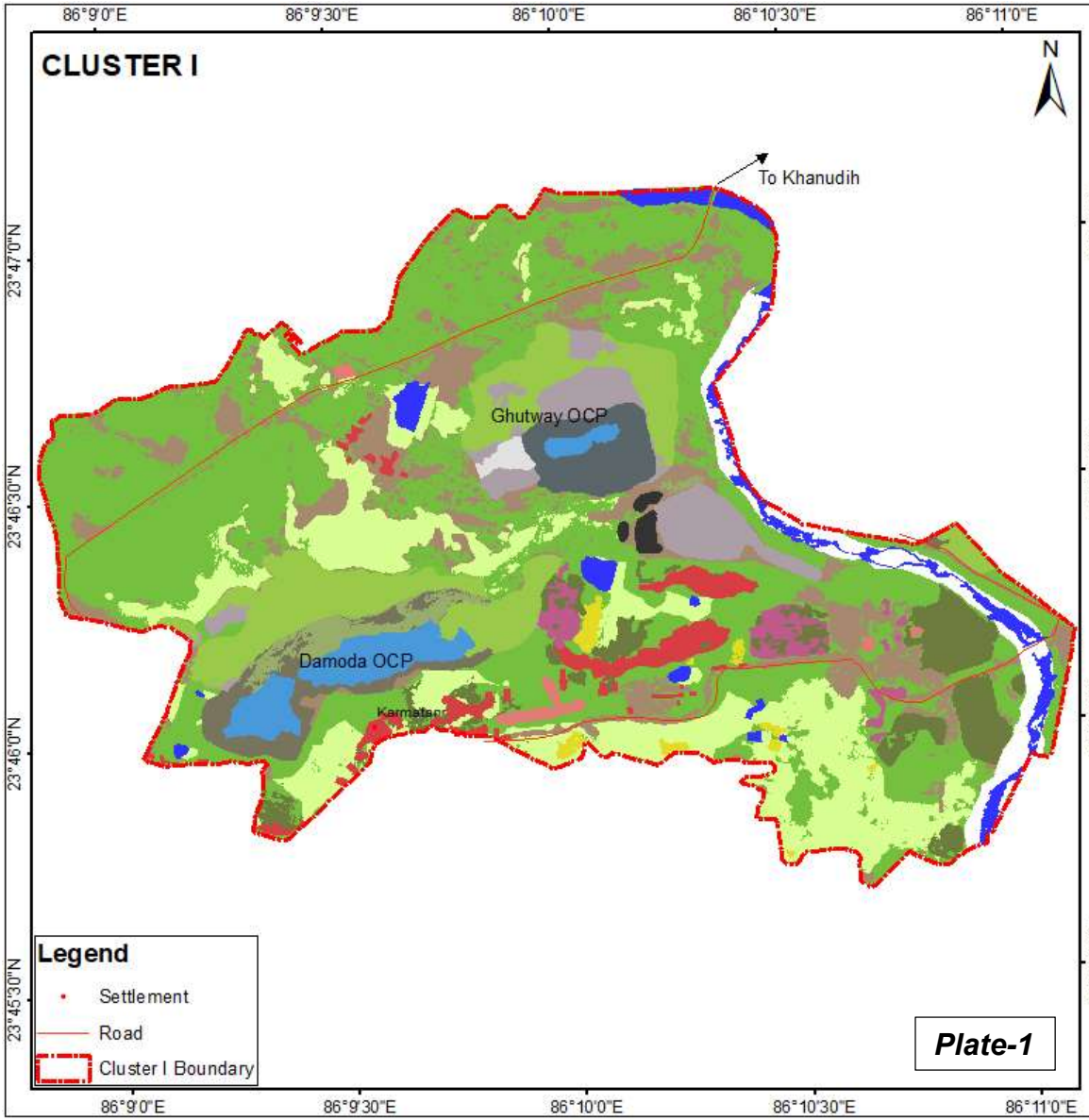
## Table 2

## 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** |
| | 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 |
| ACTIVE MINING | 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** |

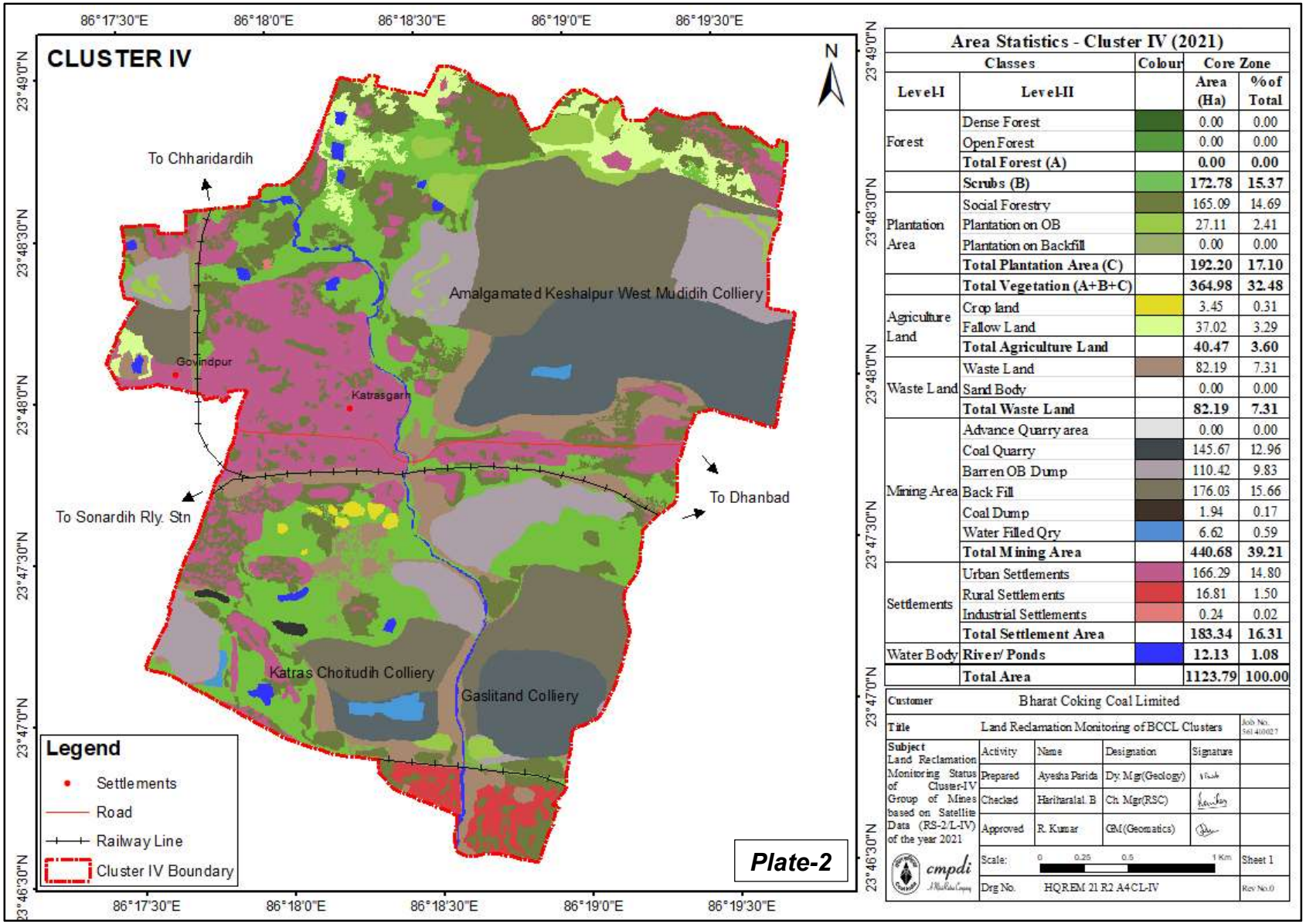



**Area Statistics - Cluster I (2021)**

| 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** |
| | **Scrubs (B)** | | **230.09** | **40.02** |
| Plantation Area | Social Forestry | | 25.53 | 4.44 |
| | Plantation on OB | | 45.21 | 7.86 |
| | Plantation on Backfill | | 7.29 | 1.27 |
| | **Total Plantation Area (C)** | | **78.03** | **13.57** |
| | **Total Vegetation (A+B+C)** | | **308.12** | **53.59** |
| Agriculture Land | Crop land | | 3.42 | 0.59 |
| | Fallow Land | | 80.92 | 14.07 |
| | **Total Agriculture Land** | | **84.34** | **14.67** |
| Waste Land | Waste Land | | 65.94 | 11.47 |
| | Sand Body | | 15.55 | 2.70 |
| | **Total Waste Land** | | **81.49** | **14.17** |
| Mining Area | Advance Quarry area | | 1.73 | 0.30 |
| | Coal Quarry | | 11.14 | 1.94 |
| | Barren OB Dump | | 21.18 | 3.68 |
| | Back Fill | | 11.10 | 1.93 |
| | Coal Dump | | 1.99 | 0.35 |
| | Water Filled Qry | | 14.74 | 2.56 |
| | **Total Mining Area** | | **61.88** | **10.76** |
| Settlements | Urban Settlements | | 7.17 | 1.25 |
| | Rural Settlements | | 14.04 | 2.44 |
| | Industrial Settlements | | 2.58 | 0.45 |
| | **Total Settlement Area** | | **23.79** | **4.14** |
| Water Body | **River/ Ponds** | | **15.38** | **2.67** |
| | **Total Area** | | **575.00** | **100.00** |

| | | | | | |
|---|---|---|---|---|---|
| Customer | Bharat Coking Coal Limited | | | | |
| Title | Land Reclamation Monitoring of BCCL Clusters | | | | Job No.: 561410027 |
| Subject: Land Reclamation Monitoring Status of Cluster-I Group of Mines based on Satellite Data (RS-2/L-IV) of the year 2021 | Activity | Name | Designation | Signature | |
| | Prepared | Ayesha Parida | Dy. Mgr(Geology) | | |
| | Checked | Hariharalal B | Ch. Mgr(RSC) | | |
| | Approved | R. Kumar | GM(Geomatics) | | |
| cmpdi | Scale: 0 0.2 0.4 0.8 Km | | | | Sheet 1 |
| | Drg No. HQ REM 21 R2 A4 CL-I | | | | Rev No. 0 |

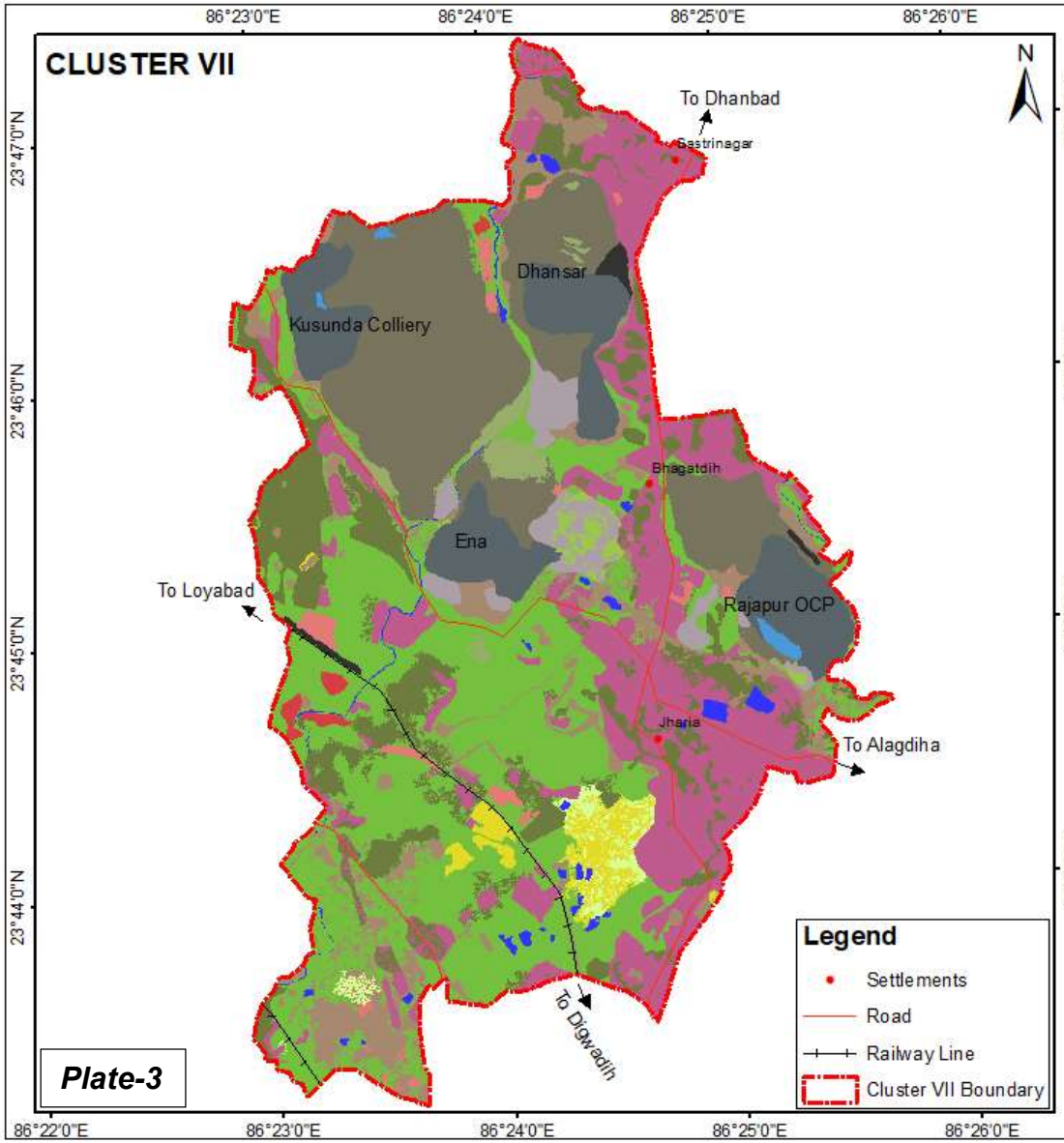
**Plate-1**




**Area Statistics - Cluster IV (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** |
| | **Scrubs (B)** | | **172.78** | **15.37** |
| Plantation Area | Social Forestry | | 165.09 | 14.69 |
| | Plantation on OB | | 27.11 | 2.41 |
| | Plantation on Backfill | | 0.00 | 0.00 |
| | **Total Plantation Area (C)** | | **192.20** | **17.10** |
| | **Total Vegetation (A+B+C)** | | **364.98** | **32.48** |
| Agriculture Land | Crop land | | 3.45 | 0.31 |
| | Fallow Land | | 37.02 | 3.29 |
| | **Total Agriculture Land** | | **40.47** | **3.60** |
| Waste Land | Waste Land | | 82.19 | 7.31 |
| | Sand Body | | 0.00 | 0.00 |
| | **Total Waste Land** | | **82.19** | **7.31** |
| Mining Area | Advance Quarry area | | 0.00 | 0.00 |
| | Coal Quarry | | 145.67 | 12.96 |
| | Barren OB Dump | | 110.42 | 9.83 |
| | Back Fill | | 176.03 | 15.66 |
| | Coal Dump | | 1.94 | 0.17 |
| | Water Filled Qry | | 6.62 | 0.59 |
| | **Total Mining Area** | | **440.68** | **39.21** |
| Settlements | Urban Settlements | | 166.29 | 14.80 |
| | Rural Settlements | | 16.81 | 1.50 |
| | Industrial Settlements | | 0.24 | 0.02 |
| | **Total Settlement Area** | | **183.34** | **16.31** |
| Water Body | **River/ Ponds** | | **12.13** | **1.08** |
| | **Total Area** | | **1123.79** | **100.00** |

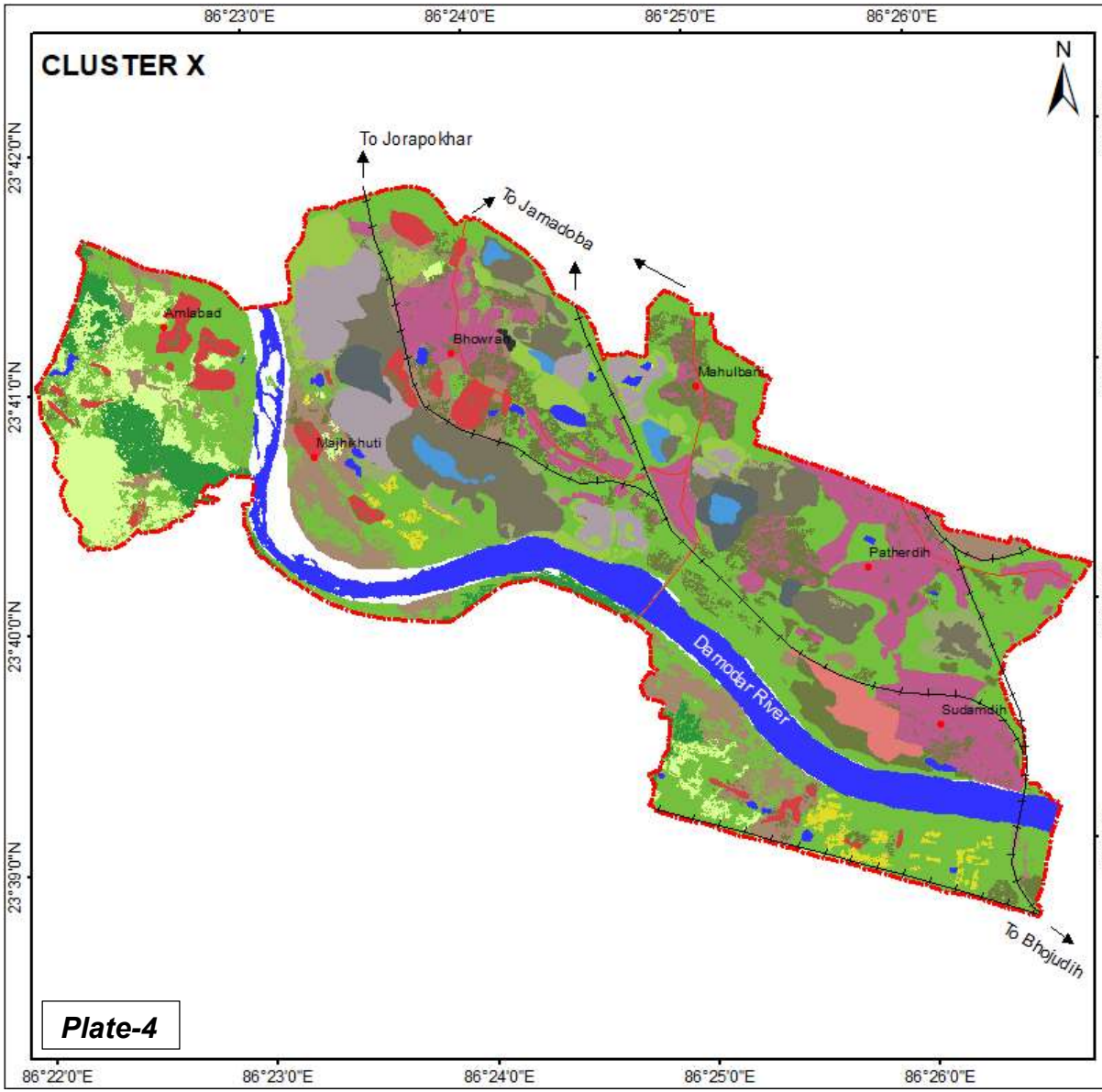
| | | | | | |
|---|---|---|---|---|---|
| Customer | Bharat Coking Coal Limited | | | | |
| Title | Land Reclamation Monitoring of BCCL Clusters | | | | Job No. 561410027 |
| Subject: Land Reclamation Monitoring Status of Cluster-IV Group of Mines based on Satellite Data (RS-2/L-IV) of the year 2021 | Activity | Name | Designation | Signature | |
| | Prepared | Ayesha Parida | Dy. Mgr(Geology) | | |
| | Checked | Hariharalal. B | Ch. Mgr(RSC) | | |
| | Approved | R. Kumar | GM(Geomatics) | | |
| cmpdi | Scale: | 0 0.25 0.5 1 Km | | | Sheet 1 |
| | Drg No. | HQ/REM/21/R2/A4/CL-IV | | | Rev No.0 |




**Area Statistics - Cluster VII (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** |
| | **Scrubs (B)** | | **572.72** | **26.92** |
| Plantation Area | Social Forestry | | 238.67 | 11.22 |
| | Plantation on OB | | 11.43 | 0.54 |
| | Plantation on Backfill | | 25.47 | 1.20 |
| | **Total Plantation Area (C)** | | **275.57** | **12.95** |
| | **Total Vegetation (A+B+C)** | | **848.29** | **39.87** |
| Agriculture Land | Crop land | | 38.23 | 1.80 |
| | Fallow Land | | 20.12 | 0.95 |
| | **Total Agriculture Land** | | **58.35** | **2.74** |
| Waste Land | Waste Land | | 182.23 | 8.56 |
| | Sand Body | | 0.00 | 0.00 |
| | **Total Waste Land** | | **182.23** | **8.56** |
| Mining Area | Advance Quarry area | | 0.00 | 0.00 |
| | Coal Quarry | | 177.97 | 8.36 |
| | Barren OB Dump | | 53.57 | 2.52 |
| | Back Fill | | 351.68 | 16.53 |
| | Coal Dump | | 8.92 | 0.42 |
| | Water Filled Qry | | 5.45 | 0.26 |
| | **Total Mining Area** | | **597.59** | **28.09** |
| Settlements | Urban Settlements | | 390.66 | 18.36 |
| | Rural Settlements | | 9.41 | 0.44 |
| | Industrial Settlements | | 20.57 | 0.97 |
| | **Total Settlement Area** | | **420.64** | **19.77** |
| Water Body | **River/ Ponds** | | **20.60** | **0.97** |
| | **Total Area** | | **2127.70** | **100.00** |

| | | | | | |
|---|---|---|---|---|---|
| Customer | Bharat Coking Coal Limited | | | | |
| Title | Land Reclamation Monitoring of BCCL Clusters | | | | Job No. 561410027 |
| Subject: Land Reclamation Monitoring Status of Cluster-VII Group of Mines based on Satellite Data (RS-2/L-IV) of the year 2021 | Activity | Name | Designation | Signature | |
| | Prepared | Ayesha Parida | Dy. Mgr(Geology) | | |
| | Checked | Hariharalal. B | Ch. Mgr(RSC) | | |
| | Approved | R. Kumar | GM(Geomatics) | | |
| cmpdi | Scale: 0 0.25 0.5 1 Km | | | | Sheet 1 |
| | Drg No. HQ REM 21 R2 A4 CL-VII | | | | Rev No 0 |




**Area Statistics - Cluster X (2021)**

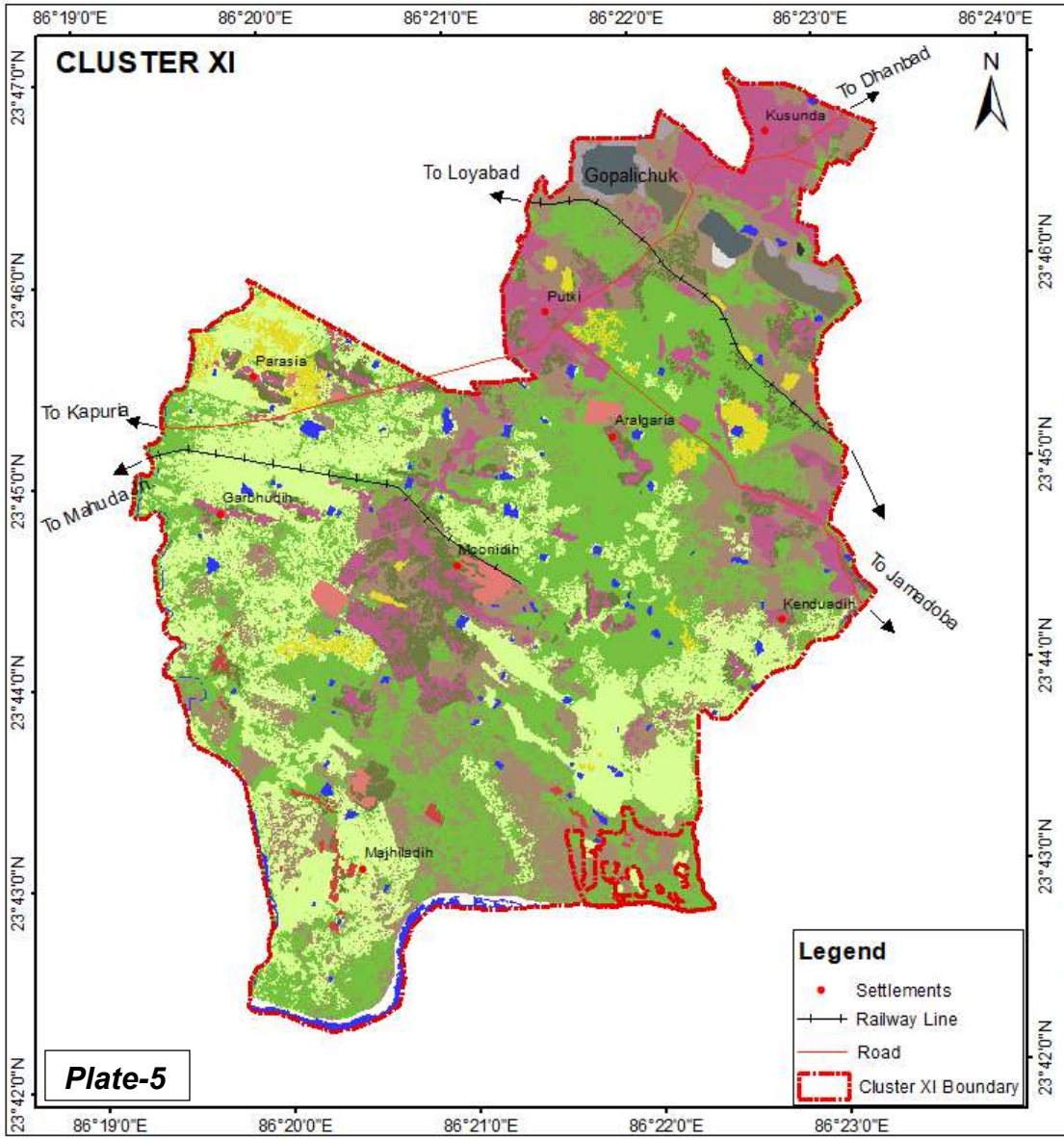
| Classes | | Colour | Core Zone | |
|---|---|---|---|---|
| Level-I | Level-II | | Area (Ha) | % of Total |
| Forest | Dense Forest | | 0.00 | 0.00 |
| | Open Forest | | 64.34 | 3.13 |
| | **Total Forest (A)** | | **64.34** | **3.13** |
| | **Scrubs (B)** | | **645.77** | **31.39** |
| Plantation Area | Social Forestry | | 140.75 | 6.84 |
| | Plantation on OB | | 66.09 | 3.21 |
| | Plantation on Backfill | | 29.16 | 1.42 |
| | **Total Plantation Area (C)** | | **236.00** | **11.47** |
| | **Total Vegetation (A+B+C)** | | **946.11** | **45.98** |
| Agriculture Land | Crop land | | 18.08 | 0.88 |
| | Fallow Land | | 109.95 | 5.34 |
| | **Total Agriculture Land** | | **128.03** | **6.22** |
| Waste Land | Waste Land | | 152.75 | 7.42 |
| | Sand Body | | 53.37 | 2.59 |
| | **Total Waste Land** | | **206.12** | **10.02** |
| Mining Area | Advance Quarry area | | 0.00 | 0.00 |
| | Coal Quarry | | 26.66 | 1.30 |
| | Barren OB Dump | | 90.49 | 4.40 |
| | Back Fill | | 143.64 | 6.98 |
| | Coal Dump | | 1.12 | 0.05 |
| | Water Filled Qry | | 19.05 | 0.93 |
| | **Total Mining Area** | | **280.96** | **13.66** |
| Settlements | Urban Settlements | | 228.39 | 11.10 |
| | Rural Settlements | | 57.90 | 2.81 |
| | Industrial Settlements | | 24.49 | 1.19 |
| | **Total Settlement Area** | | **310.78** | **15.10** |
| Water Body | **River/ Ponds** | | **185.47** | **9.01** |
| | **Total Area** | | **2057.47** | **100.00** |

**Legend**

- Settlements
- Railway Line
- Cluster X Boundary
- Road

| | | | | | |
|---|---|---|---|---|---|
| Customer | Bharat Coking Coal Limited | | | | |
| Title | Land Reclamation Monitoring of BCCL Clusters | | | | Job No. 561410027 |
| Subject: Land Reclamation Monitoring Status of Cluster-X Group of Mines based on Satellite Data (RS-2/L-IV) of the year 2021 | Activity | Name | Designation | Signature | |
| | Prepared | Ayesha Parida | Dy. Mgr(Geology) | | |
| | Checked | Hariharalal. B | Ch. Mgr(RSC) | | |
| | Approved | R. Kumar | GM(Geomatics) | | |
| cmpdi | Scale: 0 0.25 0.5 1 Km | | | | Sheet 1 |
| | Drg No. HQ REM 21 R2 A4 CL-X | | | | Rev No. 0 |

***Plate-4***




**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** |
| | **Scrubs (B)** | | **1177.06** | **33.37** |
| Plantation Area | 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 |
| | Back Fill | | 30.45 | 0.86 |
| | Coal Dump | | 0.73 | 0.02 |
| | Water Filled Qry | | 0.00 | 0.00 |
| | **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 | | | | Job No. 561410027 |
| Subject: Land Reclamation Monitoring Status of Cluster-XI Group of Mines based on Satellite Data (RS-2/L-IV) of the year 2021 | Activity | Name | Designation | Signature | |
| | Prepared | Ayesha Parida | Dy. Mgr(Geology) | | |
| | Checked | Hariharalal. B | Ch. Mgr(RSC) | | |
| | Approved | R. Kumar | GM(Geomatics) | | |
| cmpdi | Scale: 0 0.5 1 2 Km | | | | Sheet 1 |
| | Drg No. HQ REM 21 R2 A4 CL-XI | | | | RevNo 0 |

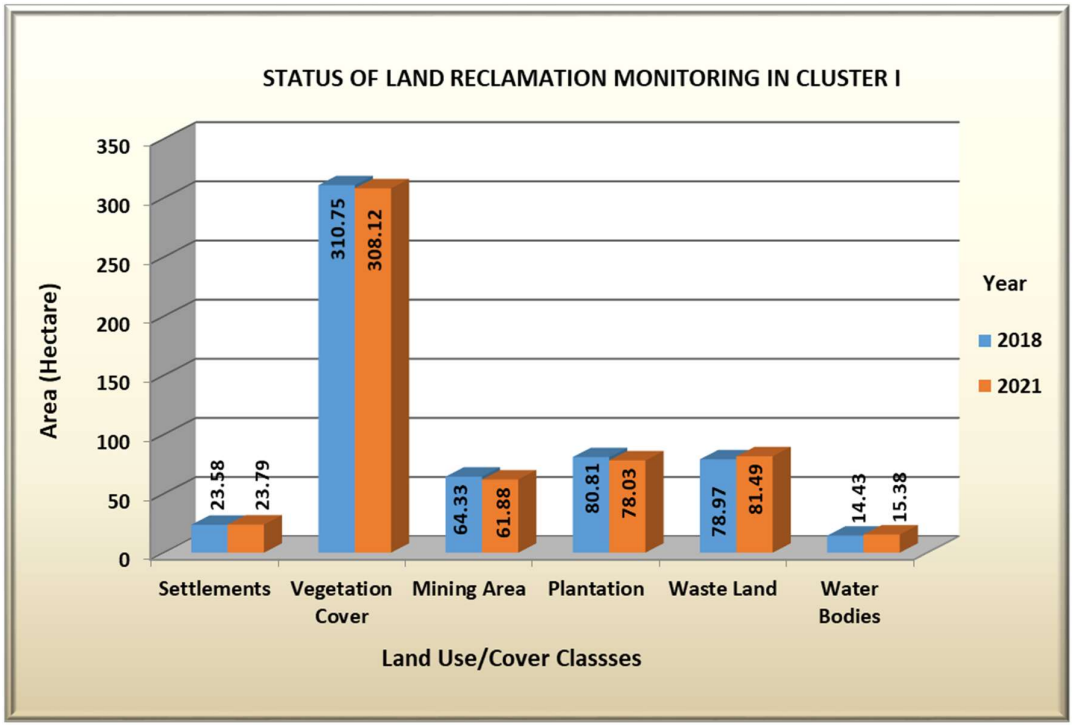



**Fig. 3: Land Reclamation Status of Cluster I**

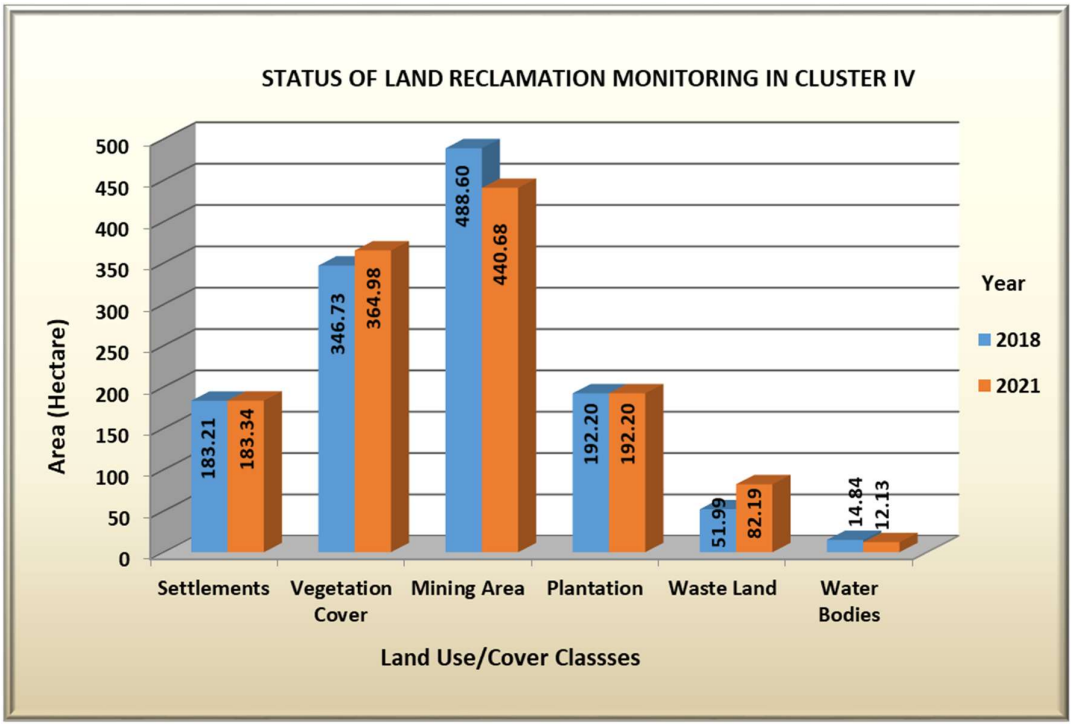



**Fig. 4: Land Reclamation Status of Cluster IV**

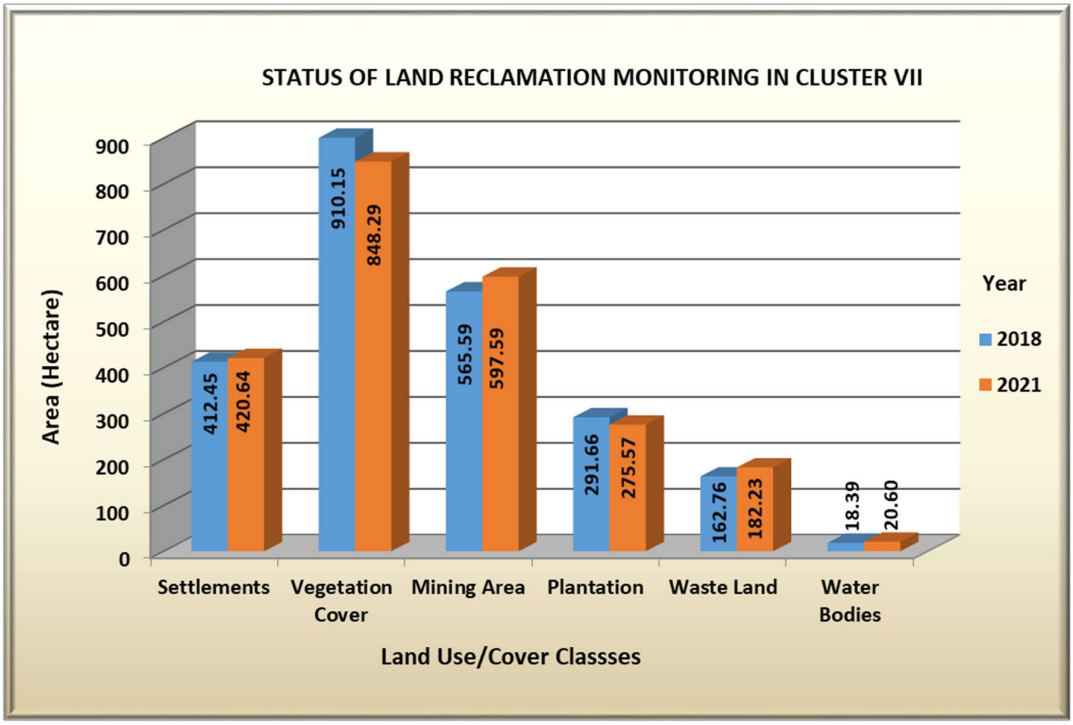



**Fig. 5: Land Reclamation Status of Cluster VII**

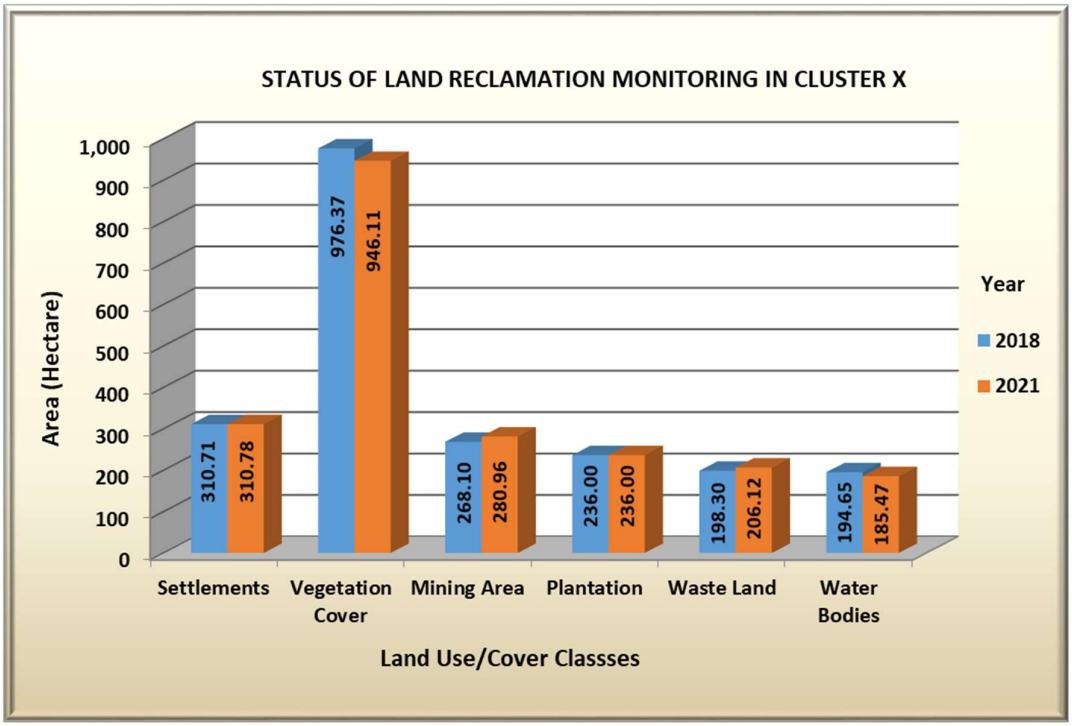



**Fig. 6: Land Reclamation Status of Cluster X**

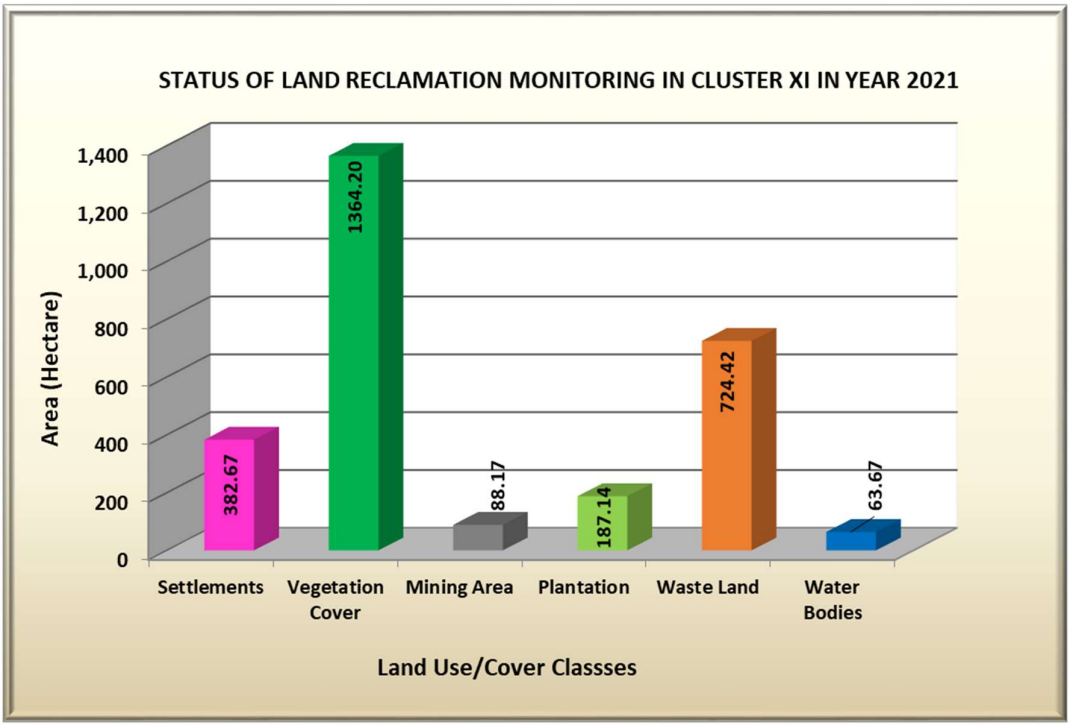



**Fig. 7: Land Reclamation Status of Cluster XI**

**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**

Central Mine Planning & Design Institute Ltd.
(A Subsidiary of Coal India Ltd.)
Gondwana Place, Kanke Road, Ranchi 834031, Jharkhand
Phone : (+91) 651 2230001, 2230002, 2230483, FAX (+91) 651 2231447, 2231851
Website : www.cmpdi.co.in, Email : cmpdihq@cmpdi.co.in

ANNNEXURE XXV

# Bharat Coking Coal Limited

(A Subsidiary of Coal India Limited)
भारत कोकिंग कोल लिमिटेड
(कोल इण्डिया लिमिटेड का एक अंग)
A Miniratna Company
एक मिनीरत्न कम्पनी

**OFFICE OF THE GENERAL MANAGER, P.B. Area, POST KUSUNDA, DHANBAD, JH-828116**

Ref No. BCCL/PBA/GM/22-23/ 331(A) 16.03.2023

OFFICE ORDER

In fulfilment of General condition number XI of Environmental Clearance of Cluster XI, which reads as **"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".**

The Environmental Management Cell shall comprise of following executives at Area level

| | |
|---|---|
| 1. General Manager, P.B. Area- | Chairman |
| 2. Add. General Manager, P.B. Area- | Advisor |
| 3. Nodal Officer (Env.)- | Functional head (under the guidance of chairman and advisor) |
| 4. Area Manager (Safety)/his Representative- | Member |
| 5. Area Manager (planning)/his Representative- | Member |
| 6. Area Manager (Civil)/his Representative- | Member |
| 7. Area Manager (Finance)/his Representative- | Member |
| 8. Area Manager (Survey)/his Representative- | Member |
| 9. Area Manager (Estate)- | Member |
| 10. Area Manager (CSR)- | Member |

At the Unit level Environment Management Cell shall comprise of following executives {Assisted by Nodal Officer (Env.)}

| | |
|---|---|
| 1. Project Officer | Functional Head |
| 2. Manager | Member |
| 3. Safety Officer | Member |

16/03/23
General Manager
P.B. Area

Copy to:

1. HOD (Env.), BCCL Koylabhawan
2. Concerned executives
3. Office file

ANNNEXURE XXX

भारत कोकिंग कोल लिमिटेड
एक मिनी रत्न कम्पनी
(महारत्न कम्पनी कोल इंडिया का एक उपक्रम)
पंजीकृत कार्यालय : कोयला भवन, कोयला नगर,
धनबाद–826005
सीआइएन : U10101JH1972GOI000918
महाप्रबंधक का कार्यालय
पश्चिमी झरिया क्षेत्र
पो. मुनीडीह, जिला: धनबाद (झारखण्ड)-828129
फोन नं. 0326 2273483; फेक्स: 0326 2273445, ई-मेल: gmwj.bccl@coalindia.in

Bharat Coking Coal Limited
A Mini Ratna Company
(A Subsidiary of Coal India Limited: A Maharatna Company)
Regd. Off. : Koyla Bhawan, Koyla Nagar
Dhanbad - 826005
CIN : U10101JH1972GOI000918
OFFICE OF THE GENERAL MANAGER
WESTERN JHARIA AREA
PO: MOONIDIH, DISTT: DHANBAD (JHARKHAND) - 828129
PHONE NO: 0326 2273483, FAX NO: 0326 2273445, e-mail : gmwj.bccl@coalindia.in

Ref No: WJA/ENV/2023/39 **Date:-** 29/03/2023

## OFFICE ORDER

In fulfilment of General condition number XI of the Environmental Clearance of Cluster XI, which reads as **"A separate environmental management cell with suitable qualified personnel shall be setup under the control of a Senior Executive, who will report directly to the Head of the company".**

The Environmental Management Cell shall comprise of the following executives at Area level

| | | |
|---|---|---|
| 1. | General Manager, W.J. Area- | Chairman |
| 2. | Add. General Manager, W.J. Area- | Advisor |
| 3. | Area Manager (Env.)- | Functional head (under the guidance of chairman and advisor) |
| 4. | Area Manager (Safety)/his Representative- | Member |
| 5. | Area Manager (Planning)/his Representative- | Member |
| 6. | Area Manager (Civil)/his Representative- | Member |
| 7. | Area Manager (Finance)/his Representative- | Member |
| 8. | Area Manager (Survey)/ his Representative- | Member |
| 9. | Area manager (Estate)- | Member |
| 10. | Area manager (CSR)- | Member |

At the Unit level Environment Management Cell shall comprise of following executives (Assisted by Nodal Officer (Env.))

| | | |
|---|---|---|
| 1. | Project Officer | Functional Head |
| 2. | Manager | Member |
| 3. | Safety Officer | Member |
| 4. | Environment Officer | Member |

29-3-2023
General Manager
W.J Area

Copy to:

1. HOD (Env.), BCCL Koyla bhawan
2. Concerned executives
3. Project Officer, Moonidih Colliery
4. Office file

Form 59 AXXEXURE-XXXVI

[See rules 115 (2)]

## Pollution Under Control Certificate

**Date** : **14/08/2025**
**Time** : **14:26:51 PM**
**Validity upto** : **13/02/2026**

JH10AH1685

| | | |
|---|---|---|
| Certificate SL. No. | : | HR04600970039955 |
| Registration No. | : | JH10AH1685 |
| Date of Registration | : | 22/Dec/2012 |
| Month & Year of Manufacturing | : | February-2012 |
| Valid Mobile Number | : | ******5654 |
| Emission Norms | : | BHARAT STAGE III |
| Fuel | : | DIESEL |
| PUC Code | : | HR0460097 |
| GSTIN | : | |
| Fees | : | Rs.300.00 |
| MIL observation | : | No |

Vehicle Photo with Registration plate
60 mm x 3O mm

| Sr. No. | Pollutant (as applicable) | Units (as applicable) | Emission limits | Measured Value (upto 2 decimal places) |
|---|---|---|---|---|
| 1 | 2 | 3 | 4 | **5** |
| Idling Emissions | Carbon Monoxide (CO) | percentage (%) | | |
| | Hydrocarbon, (THC/HC) | ppm | | |
| High idling emissions | CO | percentage (%) | | |
| | RPM | RPM | 2500 ± 200 | |
| | Lambda | - | 1 ± 0.03 | |
| Smoke Density | Light absorption coefficient | 1/metre | 2.45 | 2.03 |

This PUC certificate is system generated through the national register of motor vehicles and does not require any signature.

Note : 1. Vehicle owners to link their mobile numbers to registered vehicle by logging to https://puc.parivahan.gov.in

Authorised Signature with stamp of PUC 0perator
60mm x 20 mm

Form 59

[See rules 115 (2)]

## Pollution Under Control Certificate

**Date** : **14/08/2025**
**Time** : **14:25:21 PM**
**Validity upto** : **13/02/2026**

| | | |
|---|---|---|
| Certificate SL. No. | : | HR04600970039953 |
| Registration No. | : | JH10AH1691 |
| Date of Registration | : | 22/Dec/2012 |
| Month & Year of Manufacturing | : | February-2012 |
| Valid Mobile Number | : | ******5645 |
| Emission Norms | : | BHARAT STAGE III |
| Fuel | : | DIESEL |
| PUC Code | : | HR0460097 |
| GSTIN | : | |
| Fees | : | Rs.300.00 |
| MIL observation | : | No |

Vehicle Photo with Registration plate
60 mm x 3O mm

| Sr. No. | Pollutant (as applicable) | Units (as applicable) | Emission limits | Measured Value (upto 2 decimal places) |
|---|---|---|---|---|
| 1 | 2 | 3 | 4 | **5** |
| Idling Emissions | Carbon Monoxide (CO) | percentage (%) | | |
| | Hydrocarbon, (THC/HC) | ppm | | |
| High idling emissions | CO | percentage (%) | | |
| | RPM | RPM | 2500 ± 200 | |
| | Lambda | - | 1 ± 0.03 | |
| Smoke Density | Light absorption coefficient | 1/metre | 2.45 | 2.11 |

This PUC certificate is system generated through the national register of motor vehicles and does not require any signature.

Note : 1. Vehicle owners to link their mobile numbers to registered vehicle by logging to https://puc.parivahan.gov.in

Authorised Signature with stamp of PUC 0perator
60mm x 20 mm

Form 59

[See rules 115 (2)]

## Pollution Under Control Certificate

**Date** : **14/08/2025**
**Time** : **14:25:59 PM**
**Validity upto** : **13/02/2026**

| | | |
|---|---|---|
| Certificate SL. No. | : | HR04600970039954 |
| Registration No. | : | JH10AH1692 |
| Date of Registration | : | 22/Dec/2012 |
| Month & Year of Manufacturing | : | February-2012 |
| Valid Mobile Number | : | ******5645 |
| Emission Norms | : | BHARAT STAGE III |
| Fuel | : | DIESEL |
| PUC Code | : | HR0460097 |
| GSTIN | : | |
| Fees | : | Rs.300.00 |
| MIL observation | : | No |

Vehicle Photo with Registration plate
60 mm x 3O mm

| Sr. No. | Pollutant (as applicable) | Units (as applicable) | Emission limits | Measured Value (upto 2 decimal places) |
|---|---|---|---|---|
| 1 | 2 | 3 | 4 | **5** |
| Idling Emissions | Carbon Monoxide (CO) | percentage (%) | | |
| | Hydrocarbon, (THC/HC) | ppm | | |
| High idling emissions | CO | percentage (%) | | |
| | RPM | RPM | 2500 ± 200 | |
| | Lambda | - | 1 ± 0.03 | |
| Smoke Density | Light absorption coefficient | 1/metre | 2.45 | 2.26 |

This PUC certificate is system generated through the national register of motor vehicles and does not require any signature.

Note : 1. Vehicle owners to link their mobile numbers to registered vehicle by logging to https://puc.parivahan.gov.in

Authorised Signature with stamp of PUC 0perator
60mm x 20 mm

Form 59

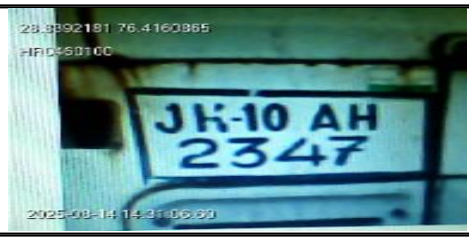
[See rules 115 (2)]

## Pollution Under Control Certificate

**Date** : **14/08/2025**
**Time** : **14:30:03 PM**
**Validity upto** : **13/02/2026**

| | | |
|---|---|---|
| Certificate SL. No. | : | HR04601000052221 |
| Registration No. | : | JH10AH2347 |
| Date of Registration | : | 28/Dec/2012 |
| Month & Year of Manufacturing | : | February-2012 |
| Valid Mobile Number | : | ******9989 |
| Emission Norms | : | BHARAT STAGE III |
| Fuel | : | DIESEL |
| PUC Code | : | HR0460100 |
| GSTIN | : | |
| Fees | : | Rs.300.00 |
| MIL observation | : | No |

Vehicle Photo with Registration plate
60 mm x 3O mm




| Sr. No. | Pollutant (as applicable) | Units (as applicable) | Emission limits | Measured Value (upto 2 decimal places) |
|---|---|---|---|---|
| 1 | 2 | 3 | 4 | **5** |
| Idling Emissions | Carbon Monoxide (CO) | percentage (%) | | |
| | Hydrocarbon, (THC/HC) | ppm | | |
| High idling emissions | CO | percentage (%) | | |
| | RPM | RPM | 2500 ± 200 | |
| | Lambda | - | 1 ± 0.03 | |
| Smoke Density | Light absorption coefficient | 1/metre | 2.45 | 2.3 |

This PUC certificate is system generated through the national register of motor vehicles and does not require any signature.

Note : 1. Vehicle owners to link their mobile numbers to registered vehicle by logging to https://puc.parivahan.gov.in

Authorised Signature with stamp of PUC 0perator
60mm x 20 mm

Form 59

[See rules 115 (2)]

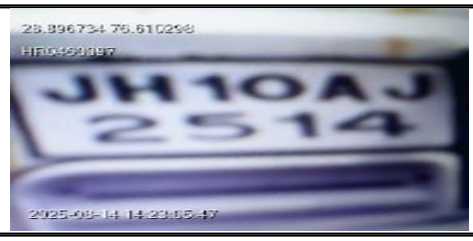
## Pollution Under Control Certificate

**Date** : **14/08/2025**
**Time** : **14:23:27 PM**
**Validity upto** : **13/02/2026**

JH10AJ2514

| | | |
|---|---|---|
| Certificate SL. No. | : | HR04600970039950 |
| Registration No. | : | JH10AJ2514 |
| Date of Registration | : | 23/Mar/2013 |
| Month & Year of Manufacturing | : | February-2012 |
| Valid Mobile Number | : | ******5645 |
| Emission Norms | : | BHARAT STAGE III |
| Fuel | : | DIESEL |
| PUC Code | : | HR0460097 |
| GSTIN | : | |
| Fees | : | Rs.300.00 |
| MIL observation | : | No |

Vehicle Photo with Registration plate
60 mm x 3O mm




| Sr. No. | Pollutant (as applicable) | Units (as applicable) | Emission limits | Measured Value (upto 2 decimal places) |
|---|---|---|---|---|
| 1 | 2 | 3 | 4 | **5** |
| Idling Emissions | Carbon Monoxide (CO) | percentage (%) | | |
| | Hydrocarbon, (THC/HC) | ppm | | |
| High idling emissions | CO | percentage (%) | | |
| | RPM | RPM | 2500 ± 200 | |
| | Lambda | - | 1 ± 0.03 | |
| Smoke Density | Light absorption coefficient | 1/metre | 2.45 | 1.92 |

This PUC certificate is system generated through the national register of motor vehicles and does not require any signature.

Note : 1. Vehicle owners to link their mobile numbers to registered vehicle by logging to https://puc.parivahan.gov.in

Authorised Signature with stamp of PUC 0perator
60mm x 20 mm

Form 59

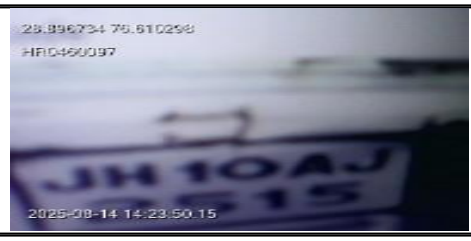
[See rules 115 (2)]

## Pollution Under Control Certificate

**Date** : **14/08/2025**
**Time** : **14:24:02 PM**
**Validity upto** : **13/02/2026**

| | | |
|---|---|---|
| Certificate SL. No. | : | HR04600970039951 |
| Registration No. | : | JH10AJ2515 |
| Date of Registration | : | 23/Mar/2013 |
| Month & Year of Manufacturing | : | February-2012 |
| Valid Mobile Number | : | ******5654 |
| Emission Norms | : | BHARAT STAGE III |
| Fuel | : | DIESEL |
| PUC Code | : | HR0460097 |
| GSTIN | : | |
| Fees | : | Rs.300.00 |
| MIL observation | : | No |

Vehicle Photo with Registration plate
60 mm x 3O mm




| Sr. No. | Pollutant (as applicable) | Units (as applicable) | Emission limits | Measured Value (upto 2 decimal places) |
|---|---|---|---|---|
| 1 | 2 | 3 | 4 | **5** |
| Idling Emissions | Carbon Monoxide (CO) | percentage (%) | | |
| | Hydrocarbon, (THC/HC) | ppm | | |
| High idling emissions | CO | percentage (%) | | |
| | RPM | RPM | 2500 ± 200 | |
| | Lambda | - | 1 ± 0.03 | |
| Smoke Density | Light absorption coefficient | 1/metre | 2.45 | 2.06 |

This PUC certificate is system generated through the national register of motor vehicles and does not require any signature.

Note : 1. Vehicle owners to link their mobile numbers to registered vehicle by logging to https://puc.parivahan.gov.in

Authorised Signature with stamp of PUC 0perator
60mm x 20 mm

Form 59

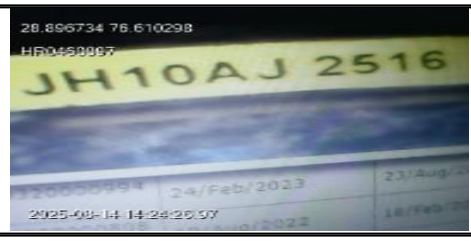
[See rules 115 (2)]

## Pollution Under Control Certificate

**Date** : **14/08/2025**
**Time** : **14:24:40 PM**
**Validity upto** : **13/02/2026**

| | | |
|---|---|---|
| Certificate SL. No. | : | HR04600970039952 |
| Registration No. | : | JH10AJ2516 |
| Date of Registration | : | 23/Mar/2013 |
| Month & Year of Manufacturing | : | February-2012 |
| Valid Mobile Number | : | ******5656 |
| Emission Norms | : | BHARAT STAGE III |
| Fuel | : | DIESEL |
| PUC Code | : | HR0460097 |
| GSTIN | : | |
| Fees | : | Rs.300.00 |
| MIL observation | : | No |

Vehicle Photo with Registration plate
60 mm x 3O mm




| Sr. No. | Pollutant (as applicable) | Units (as applicable) | Emission limits | Measured Value (upto 2 decimal places) |
|---|---|---|---|---|
| 1 | 2 | 3 | 4 | **5** |
| Idling Emissions | Carbon Monoxide (CO) | percentage (%) | | |
| | Hydrocarbon, (THC/HC) | ppm | | |
| High idling emissions | CO | percentage (%) | | |
| | RPM | RPM | 2500 ± 200 | |
| | Lambda | - | 1 ± 0.03 | |
| Smoke Density | Light absorption coefficient | 1/metre | 2.45 | 2.11 |

This PUC certificate is system generated through the national register of motor vehicles and does not require any signature.

Note : 1. Vehicle owners to link their mobile numbers to registered vehicle by logging to https://puc.parivahan.gov.in

Authorised Signature with stamp of PUC 0perator
60mm x 20 mm

Form 59

[See rules 115 (2)]

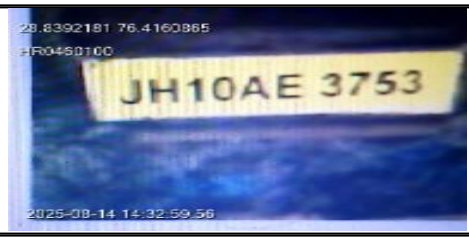
## Pollution Under Control Certificate

**Date** : **14/08/2025**
**Time** : **14:31:57 PM**
**Validity upto** : **13/02/2026**

JH10AE3753

| | | |
|---|---|---|
| Certificate SL. No. | : | HR04601000052223 |
| Registration No. | : | JH10AE3753 |
| Date of Registration | : | 09/Apr/2012 |
| Month & Year of Manufacturing | : | April-2012 |
| Valid Mobile Number | : | ******8899 |
| Emission Norms | : | BHARAT STAGE III |
| Fuel | : | DIESEL |
| PUC Code | : | HR0460100 |
| GSTIN | : | |
| Fees | : | Rs.300.00 |
| MIL observation | : | No |

Vehicle Photo with Registration plate
60 mm x 3O mm




| Sr. No. | Pollutant (as applicable) | Units (as applicable) | Emission limits | Measured Value (upto 2 decimal places) |
|---|---|---|---|---|
| 1 | 2 | 3 | 4 | **5** |
| Idling Emissions | Carbon Monoxide (CO) | percentage (%) | | |
| | Hydrocarbon, (THC/HC) | ppm | | |
| High idling emissions | CO | percentage (%) | | |
| | RPM | RPM | 2500 ± 200 | |
| | Lambda | - | 1 ± 0.03 | |
| Smoke Density | Light absorption coefficient | 1/metre | 2.45 | 1.98 |

This PUC certificate is system generated through the national register of motor vehicles and does not require any signature.

Note : 1. Vehicle owners to link their mobile numbers to registered vehicle by logging to https://puc.parivahan.gov.in

Authorised Signature with stamp of PUC 0perator
60mm x 20 mm

Form 59

[See rules 115 (2)]

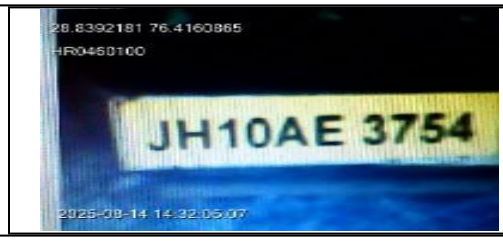
## Pollution Under Control Certificate

**Date** : **14/08/2025**
**Time** : **14:31:03 PM**
**Validity upto** : **13/02/2026**

JH10AE3754

| | | |
|---|---|---|
| Certificate SL. No. | : | HR04601000052222 |
| Registration No. | : | JH10AE3754 |
| Date of Registration | : | 09/Apr/2012 |
| Month & Year of Manufacturing | : | December-2011 |
| Valid Mobile Number | : | ******9898 |
| Emission Norms | : | BHARAT STAGE III |
| Fuel | : | DIESEL |
| PUC Code | : | HR0460100 |
| GSTIN | : | |
| Fees | : | Rs.300.00 |
| MIL observation | : | No |

Vehicle Photo with Registration plate
60 mm x 3O mm




| Sr. No. | Pollutant (as applicable) | Units (as applicable) | Emission limits | Measured Value (upto 2 decimal places) |
|---|---|---|---|---|
| 1 | 2 | 3 | 4 | **5** |
| Idling Emissions | Carbon Monoxide (CO) | percentage (%) | | |
| | Hydrocarbon, (THC/HC) | ppm | | |
| High idling emissions | CO | percentage (%) | | |
| | RPM | RPM | 2500 ± 200 | |
| | Lambda | - | 1 ± 0.03 | |
| Smoke Density | Light absorption coefficient | 1/metre | 2.45 | 2.18 |

This PUC certificate is system generated through the national register of motor vehicles and does not require any signature.

Note : 1. Vehicle owners to link their mobile numbers to registered vehicle by logging to https://puc.parivahan.gov.in

Authorised Signature with stamp of PUC 0perator
60mm x 20 mm

Form 59

[See rules 115 (2)]

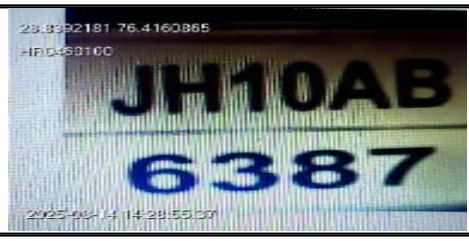
## Pollution Under Control Certificate

**Date** : **14/08/2025**
**Time** : **14:27:53 PM**
**Validity upto** : **13/02/2026**

JH10AB6387

| | | |
|---|---|---|
| Certificate SL. No. | : | HR04601000052219 |
| Registration No. | : | JH10AB6387 |
| Date of Registration | : | 01/Aug/2011 |
| Month & Year of Manufacturing | : | August-2011 |
| Valid Mobile Number | : | ******9819 |
| Emission Norms | : | BHARAT STAGE III |
| Fuel | : | DIESEL |
| PUC Code | : | HR0460100 |
| GSTIN | : | |
| Fees | : | Rs.300.00 |
| MIL observation | : | No |

Vehicle Photo with Registration plate
60 mm x 3O mm




| Sr. No. | Pollutant (as applicable) | Units (as applicable) | Emission limits | Measured Value (upto 2 decimal places) |
|---|---|---|---|---|
| 1 | 2 | 3 | 4 | **5** |
| Idling Emissions | Carbon Monoxide (CO) | percentage (%) | | |
| | Hydrocarbon, (THC/HC) | ppm | | |
| High idling emissions | CO | percentage (%) | | |
| | RPM | RPM | 2500 ± 200 | |
| | Lambda | - | 1 ± 0.03 | |
| Smoke Density | Light absorption coefficient | 1/metre | 2.45 | 2.19 |

This PUC certificate is system generated through the national register of motor vehicles and does not require any signature.

Note : 1. Vehicle owners to link their mobile numbers to registered vehicle by logging to https://puc.parivahan.gov.in

Authorised Signature with stamp of PUC 0perator
60mm x 20 mm

Form 59

[See rules 115 (2)]

## Pollution Under Control Certificate

**Date** : **14/08/2025**
**Time** : **14:35:13 PM**
**Validity upto** : **13/02/2026**

JH10CB8190

| | | |
|---|---|---|
| Certificate SL. No. | : | HR04601000052224 |
| Registration No. | : | JH10CB8190 |
| Date of Registration | : | 10/Sep/2020 |
| Month & Year of Manufacturing | : | November-2019 |
| Valid Mobile Number | : | ******8998 |
| Emission Norms | : | Bharat Stage III (CEV) |
| Fuel | : | DIESEL |
| PUC Code | : | HR0460100 |
| GSTIN | : | |
| Fees | : | Rs.300.00 |
| MIL observation | : | No |

Vehicle Photo with Registration plate
60 mm x 3O mm

| Sr. No. | Pollutant (as applicable) | Units (as applicable) | Emission limits | Measured Value (upto 2 decimal places) |
|---|---|---|---|---|
| 1 | 2 | 3 | 4 | **5** |
| Idling Emissions | Carbon Monoxide (CO) | percentage (%) | | |
| | Hydrocarbon, (THC/HC) | ppm | | |
| High idling emissions | CO | percentage (%) | | |
| | RPM | RPM | 2500 ± 200 | |
| | Lambda | - | 1 ± 0.03 | |
| Smoke Density | Light absorption coefficient | 1/metre | 2.45 | 1.79 |

This PUC certificate is system generated through the national register of motor vehicles and does not require any signature.

Note : 1. Vehicle owners to link their mobile numbers to registered vehicle by logging to https://puc.parivahan.gov.in

Authorised Signature with stamp of PUC 0perator
60mm x 20 mm

# Form 59

[See rules 115 (2)]

**Pollution Under Control Certificate**

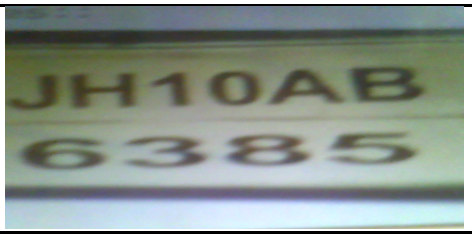
Authorised By :
Government of Jharkhand

| | | |
|---|---|---|
| **Date** | : | **14/08/2025** |
| **Time** | : | **14:41:48 PM** |
| **Validity upto** | : | **13/02/2026** |

JH10AB6385

| | | |
|---|---|---|
| Certificate SL. No. | : | JH01003810009004 |
| Registration No. | : | JH10AB6385 |
| Date of Registration | : | 01/Aug/2011 |
| Month & Year of Manufacturing | : | April-2011 |
| Valid Mobile Number | : | ******6597 |
| Emission Norms | : | BHARAT STAGE III |
| Fuel | : | DIESEL |
| PUC Code | : | JH0100381 |
| GSTIN | : | |
| Fees | : | Rs.120.00 |
| MIL observation | : | No |

Vehicle Photo with Registration plate
60 mm x 3O mm




| Sr. No. | Pollutant (as applicable) | Units (as applicable) | Emission limits | Measured Value (upto 2 decimal places) |
|---|---|---|---|---|
| 1 | 2 | 3 | 4 | **5** |
| Idling Emissions | Carbon Monoxide (CO) | percentage (%) | | |
| | Hydrocarbon, (THC/HC) | ppm | | |
| High idling emissions | CO | percentage (%) | | |
| | RPM | RPM | 2500 ± 200 | |
| | Lambda | - | 1 ± 0.03 | |
| Smoke Density | Light absorption coefficient | 1/metre | 2.45 | 2.17 |

This PUC certificate is system generated through the national register of motor vehicles and does not require any signature.

Note : 1. Vehicle owners to link their mobile numbers to registered vehicle by logging to https://puc.parivahan.gov.in

Authorised Signature with stamp of PUC 0perator
60mm x 20 mm

# Form 59

[See rules 115 (2)]

**Pollution Under Control Certificate**

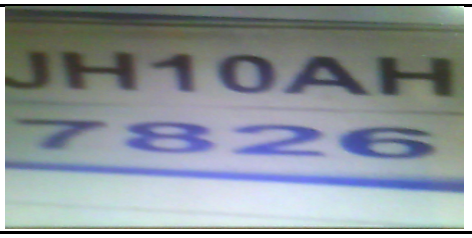
Authorised By :
Government of Jharkhand

| | | |
|---|---|---|
| **Date** | : | **14/08/2025** |
| **Time** | : | **14:45:58 PM** |
| **Validity upto** | : | **13/02/2026** |

JH10AH7826

| | | |
|---|---|---|
| Certificate SL. No. | : | JH01003810009006 |
| Registration No. | : | JH10AH7826 |
| Date of Registration | : | 12/Feb/2013 |
| Month & Year of Manufacturing | : | January-2012 |
| Valid Mobile Number | : | ******5497 |
| Emission Norms | : | Bharat Stage III (CEV) |
| Fuel | : | DIESEL |
| PUC Code | : | JH0100381 |
| GSTIN | : | |
| Fees | : | Rs.120.00 |
| MIL observation | : | No |

Vehicle Photo with Registration plate
60 mm x 3O mm




| Sr. No. | Pollutant (as applicable) | Units (as applicable) | Emission limits | Measured Value (upto 2 decimal places) |
|---|---|---|---|---|
| 1 | 2 | 3 | 4 | **5** |
| Idling Emissions | Carbon Monoxide (CO) | percentage (%) | | |
| | Hydrocarbon, (THC/HC) | ppm | | |
| High idling emissions | CO | percentage (%) | | |
| | RPM | RPM | 2500 ± 200 | |
| | Lambda | - | 1 ± 0.03 | |
| Smoke Density | Light absorption coefficient | 1/metre | 2.45 | 2.38 |

This PUC certificate is system generated through the national register of motor vehicles and does not require any signature.

Note : 1. Vehicle owners to link their mobile numbers to registered vehicle by logging to https://puc.parivahan.gov.in

Authorised Signature with stamp of PUC 0perator
60mm x 20 mm

# Form 59

[See rules 115 (2)]

**Pollution Under Control Certificate**

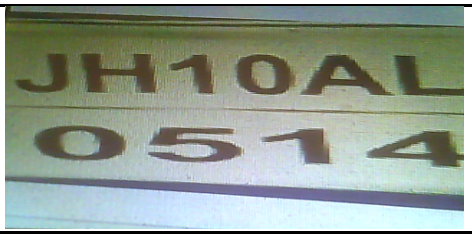
Authorised By :
Government of Jharkhand

| | | |
|---|---|---|
| **Date** | : | **14/08/2025** |
| **Time** | : | **14:44:02 PM** |
| **Validity upto** | : | **13/02/2026** |

JH10AL0514

| | | |
|---|---|---|
| Certificate SL. No. | : | JH01003810009005 |
| Registration No. | : | JH10AL0514 |
| Date of Registration | : | 06/Nov/2013 |
| Month & Year of Manufacturing | : | February-2012 |
| Valid Mobile Number | : | ******5497 |
| Emission Norms | : | Bharat Stage III (CEV) |
| Fuel | : | DIESEL |
| PUC Code | : | JH0100381 |
| GSTIN | : | |
| Fees | : | Rs.120.00 |
| MIL observation | : | No |

Vehicle Photo with Registration plate
60 mm x 3O mm




| Sr. No. | Pollutant (as applicable) | Units (as applicable) | Emission limits | Measured Value (upto 2 decimal places) |
|---|---|---|---|---|
| 1 | 2 | 3 | 4 | **5** |
| Idling Emissions | Carbon Monoxide (CO) | percentage (%) | | |
| | Hydrocarbon, (THC/HC) | ppm | | |
| High idling emissions | CO | percentage (%) | | |
| | RPM | RPM | 2500 ± 200 | |
| | Lambda | - | 1 ± 0.03 | |
| Smoke Density | Light absorption coefficient | 1/metre | 2.45 | 2.04 |

This PUC certificate is system generated through the national register of motor vehicles and does not require any signature.

Note : 1. Vehicle owners to link their mobile numbers to registered vehicle by logging to https://puc.parivahan.gov.in

Authorised Signature with stamp of PUC 0perator
60mm x 20 mm

# Form 59

[See rules 115 (2)]

**Pollution Under Control Certificate**

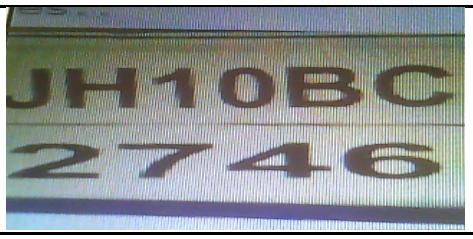
Authorised By :
Government of Jharkhand

| | | |
|---|---|---|
| **Date** | : | **14/08/2025** |
| **Time** | : | **14:39:53 PM** |
| **Validity upto** | : | **13/02/2026** |

JH10BC2746

| | | |
|---|---|---|
| Certificate SL. No. | : | JH01003810009003 |
| Registration No. | : | JH10BC2746 |
| Date of Registration | : | 07/Jan/2017 |
| Month & Year of Manufacturing | : | April-2016 |
| Valid Mobile Number | : | ******5497 |
| Emission Norms | : | BHARAT STAGE III |
| Fuel | : | DIESEL |
| PUC Code | : | JH0100381 |
| GSTIN | : | |
| Fees | : | Rs.120.00 |
| MIL observation | : | No |

Vehicle Photo with Registration plate
60 mm x 3O mm




| Sr. No. | Pollutant (as applicable) | Units (as applicable) | Emission limits | Measured Value (upto 2 decimal places) |
|---|---|---|---|---|
| 1 | 2 | 3 | 4 | **5** |
| Idling Emissions | Carbon Monoxide (CO) | percentage (%) | | |
| | Hydrocarbon, (THC/HC) | ppm | | |
| High idling emissions | CO | percentage (%) | | |
| | RPM | RPM | 2500 ± 200 | |
| | Lambda | - | 1 ± 0.03 | |
| Smoke Density | Light absorption coefficient | 1/metre | 2.45 | 2.09 |

This PUC certificate is system generated through the national register of motor vehicles and does not require any signature.

Note : 1. Vehicle owners to link their mobile numbers to registered vehicle by logging to https://puc.parivahan.gov.in

Authorised Signature with stamp of PUC 0perator
60mm x 20 mm

ANNEXURE-XXVII

# GEOCOAL ENGINEERING PVT. LTD.

*(NABL & NABCB Accredited & ISO 9001, 14001 &45001 Certified Laboratory)*

*(LABORATORY DIVISION)*

TC-11973

**Issue Date: 03/05/2025**

**Test Report No** : **GCEPL/DHN/LAB/O/0019/2025-26**
**ULR No.** : **TC119732500000957F**

## Test Report

| | |
|---|---|
| **Sample Describe by Customer as** | : **WASH COAL** |
| **Customer Name** | : **MOONIDIH COAL WASHERY BCCL –DHN** |
| **Customer Address** | : **MOONIDIH,** DHANBAD |
| **Rake No.** | : **02 (Apr.-25)** |
| **Source/ Siding** | : **BOKARO** |
| **Sampling Date** | : 29/04/2025 |
| **Sampling by** | : **GCEPL – DHN** |
| **Preparation Date** | : **30/04/2025** |
| **Sampling Method Uses** | : **IS: 436 (Part I) 1964, RA 2013** |

## ANALYSIS

| Sl No | Test Parameter | Method Used | Result (with units) |
|---|---|---|---|
| 1 | TOTAL MOISTURE | IS:1350 (PART-1)-1984,RA 2019 | 7.81 % |
| 2 | ASH | IS:1350 (PART-1)-1984,RA 2019 | 20.53 % |
| 3 | MOISTURE (IM) | IS:1350 (PART-1)-1984,RA 2019 | 1.10 % |
| 4 | VOLATILE MATTER (VM) | IS:1350 (PART-1)-1984,RA 2019 | 20.15 % |
| 5 | FIXED CARBON (FC) | IS:1350 (PART-1)-1984,RA 2019 | 58.22 % |
| 6 | GCV | IS:1350 (PART-II)-RA 2017 | 6491 kcal/kg |

- This Sampling and processing done by Geocoal Engineering (P) Ltd (GCEPL). Moisture and Ash determination has been done in accordance to BIS specification, IS 1350 (Part-I): 1984 Reaffirmed 2019
- Analysis reported on air-dried basis
- Sample drawn by Geocoal Engineering private Ltd
- Remaining portion of sample after testing (if any) will be retained for max 15 days only.
- Result relates only to the item tested

Prepared by

Reviewed by

GEOCOAL ENGINEERING PVT. LTD. DHANBAD

Sandeep Soren

Sandeep Soren
Deputy Technical Manager
Authorized Signatory

**End of Report**



Registered Office:
Janki Complex, Bara Jamua, Barwadda, Dhanbad-826004, JHARKHAND (INDIA)
Contact No. 7979834082/9955187135/0326 400 5168
Email - geocoalindia@gmail.com or geocoalengineering@gmail.com
Website - www.geocoal.in

Special Services
SURVEY INSPECTION
TESTING CERTIFICATION

BCCL

Bharat Coking Coal Limited
(A Subsidiary of Coal India Limited)
A Miniratna Company
A Government of India Undertaking

Ref No BCCL/MND/MCW/Lab/WC/2025/E-

Date: 17.6.2025

## MOONIDIH COAL WASHERY ANALYTICAL LAB.

# TEST REPORT

## Analysis report

| | | | |
|---|---|---|---|
| Washery Name | Moonidih Coal Washery | Despatch to: | NMAG |
| Nature of coal | WASHED COAL | Date of preparation | 17.6.2025 |
| Rake no: | 02 | Reporting Date | 17.6.2025 |
| Date of collection | 16.6.2025 | No of Wagon: | 59 |
| R.R. QTY | 3916.15 | D/Note No: | 000248 |
| R.R. No & Date | 18200021 | Date: | 17.6.2025 |

| Date of Loading | No of Wagons sample | Sub Lot no | Ash% | Total Moist | IM% |
|---|---|---|---|---|---|
| 16.6.25 | 10 Box-s | 01 | 18.60 | 8.29 | 1.15 |
| 16.6.25 | 10 " | 02 | 18.49 | 8.32 | 1.20 |
| 16.6.25 | 10 " | 03 | 18.43 | 8.36 | 1.14 |
| 16.6.25 | 10 " | 04 | 18.52 | 8.40 | 1.16 |
| 16.6.25 | 09 " | 05 | 18.56 | 8.35 | 1.11 |
| | | 06 | 18.70 | 8.34 | 1.08 |
| | | Avg.= | 18.55 | 8.34 | 1.14 |

**Wagons Details (Sub Lot Wise)**

| Lot No 1 | Lot No.2 | Lot No.3 | Lot No 4 | Lot No 5 | Lot No 6 |
|---|---|---|---|---|---|
| SCR 61052 | WR 12917 | NC 67866 | SC 17731 | SC 12160 | SC 12965 |
| 10 Box-s | 10 Box-s | 10 Box-s | 10 Box-s | 10 Box-s | 09 Box-s |
| ECR 39754 | ECR 61321 | SE 61461 | SC 62478 | SC 13166 | SC 53051 |

PROJECT OFFICER
Moonidih Coal Washery

MANAGER(C.P.)
Moonidih Coal Washery

CHEMIST 16
Moonidih Coal Washery

CC to:-

1. GM (Ws) BCCL, CCWO, Saraidhela, Dhanbad-By email
2. PO(W) ,By email
3. AFM.WD, BCCL by email
4. ASO,WD,BCCL by email
5. Manager (CP), Statics, WD
6. Finance Manager, MCW
7. Lab Copy
8. Master File

# GEOCOAL ENGINEERING PVT. LTD.

*(LABORATORY DIVISION)*

TC-11973

Test Report No : GCEPL/DHN/LAB/O/0028/2025-26
LR No. : TC1197325000010181F

Issue Date: 29/08/2025

## Test Report

| | |
|---|---|
| Sample Describe by Customer as | : WASH COAL |
| Customer Name | : MOONIDIH COAL WASHERY BCCL –DHN |
| Customer Address | : MOONIDIH, DHANBAD |
| Rake No. | : 01 (Aug.-25) |
| Source/ Siding | : Durgapur |
| Sampling Date | : 21/08/2025 |
| Sampling by | : GCEPL – DHN |
| Preparation Date | : 23/08/2025 |
| Sampling Method Uses | : IS: 436 (Part I) 1964, RA 2013 |

## ANALYSIS

| Sl No | Test Parameter | Method Used | Result (with units) |
|---|---|---|---|
| 1 | TOTAL MOISTURE | IS:1350 (PART-1)-1984,RA 2019 | 7.78 % |
| 2 | ASH | IS:1350 (PART-1)-1984,RA 2019 | 20.10 % |
| 3 | MOISTURE (IM) | IS:1350 (PART-1)-1984,RA 2019 | 1.26 % |
| 4 | VOLATILE MATTER (VM) | IS:1350 (PART-1)-1984,RA 2019 | 20.84 % |
| 5 | FIXED CARBON (FC) | IS:1350 (PART-1)-1984,RA 2019 | 57.80 % |
| 6 | GCV | IS:1350 (PART-1I)-RA 2017 | 6486 kcal/kg |

- This Sampling and processing done by Geocoal Engineering (P) Ltd. (GCEPL). Moisture and Ash determination has been done in accordance to BIS specification IS 1350 (Part-I), 1984 Reaffirmed 2019
- Analysis reported on air-dried basis
- Sample drawn by Geocoal Engineering private Ltd
- Remaining portion of sample after testing (if any) will be returned for max 15 days only
- Result relates only to the item tested

Prepared by

Vandana Kumari

Reviewed by

Sandeep Soren

Sandeep Soren
Quality Manager
Authorized Signatory

**End of Report**



Registered Office:
Janki Complex, Bara Jamua, Barwadda, Dhanbad-826004, JHARKHAND (INDIA)
Contact No. 7979834082/9955187135/0326 400 5168
E-mail : geocoalindia@gmail.com or geocoalengineering@gmail.com
Website : www.geocoal.in

Special Services
SURVEY INSPECTION
TESTING CERTIFICATION

# GEOCOAL ENGINEERING PVT. LTD.

*(LABORATORY DIVISION)*

TC-11973

**Test Report No** : GCEPL/DHN/LAB/O/0034/2025-26
**ULR No.** : TC1197325000010704F

**Issue Date: 06/11/2025**

## Test Report

| | |
|---|---|
| **Sample Describe by Customer as** | **: WASH COAL** |
| **Customer Name** | **: MOONIDIH COAL WASHERY BCCL –DHN** |
| **Customer Address** | **: MOONIDIH,** DHANBAD |
| **Rake No.** | **: 03 (Oct.-25)** |
| **Source/ Siding** | **: BHILAI** |
| **RR No. & RR Date** | **: 162000651 & 01.11.2025** |
| **Quantity (M.T.)** | **: 2415.95** |
| **Sampling Date** | : 31/10/2025 |
| **Sampling by** | **: GCEPL – DHN** |
| **Preparation Date** | **: 02/11/2025** |
| **Sampling Method Uses** | **: IS: 436 (Part I) 1964, RA 2013** |

## ANALYSIS

| Sl No | Test Parameter | Method Used | Result (with units) |
|---|---|---|---|
| 1 | TOTAL MOISTURE | IS:1350 (PART-1)-1984,RA 2019 | 7.75 % |
| 2 | ASH | IS:1350 (PART-1)-1984,RA 2019 | 20.02 % |
| 3 | MOISTURE (IM) | IS:1350 (PART-1)-1984,RA 2019 | 1.27 % |
| 4 | VOLATILE MATTER (VM) | IS:1350 (PART-1)-1984,RA 2019 | 21.28 % |
| 5 | FIXED CARBON (FC) | IS:1350 (PART-1)-1984,RA 2019 | 57.43 % |
| 6 | GCV | IS:1350 (PART-II)-RA 2017 | 6540 kcal/kg |

- This Sampling and processing done by Geocoal Engineering (P) Ltd. (GCEPL). Moisture and Ash determination has been done in accordance to BIS specification IS 1350 (Part-1), 1984 Reaffirmed. 2019.
- Analysis reported on air-dried basis.
- Sample drawn by Geocoal Engineering private Ltd.
- Remaining portion of sample after testing (if any) will be retained for max 15 days only.
- Result relates only to the item tested.

GEOCOAL ENGINEERING PVT. LTD. DHANBAD

Sandeep Soren

Prepared by

Reviewed by

Sandeep Soren
Quality Manager
Authorized Signatory

**End of Report**



**Registered Office:**
Janki Complex, Bara Jamua, Barwadda, Dhanbad-826004, JHARKHAND (INDIA)
Contact No. 7979834082/9955187135/0326 400 5168
Email . geocoalindia@gmail.com or geocoalengineering@gmail.com
Website:- www.geocoal.in

*Special Services*
*SURVEY INSPECTION*
*TESTING CERTIFICATION*

ANNEXURE-XXVIII

# Moonidih Coal Washery

| Months | Production | | | | Dispatch | | |
|---|---|---|---|---|---|---|---|
| | RCF | WC | WPC | Slurry | WC | WPC | Slurry |
| Apr-25 | 29500 | 10569 | 17886 | 1045 | 10327.34 | 13989.78 | 5982.84 |
| May-25 | 51800 | 18130 | 29850 | 3820 | 18077.58 | 32409.56 | 2838.32 |
| Jun-25 | 42300 | 13592 | 26597 | 2111 | 15468.67 | 21581.61 | 1229.8 |
| Jul-25 | 17100 | 5474 | 10747 | 879 | 7728.42 | 15714.62 | 644.18 |
| Aug-25 | 29220 | 9498.6 | 17676 | 2045.4 | 9925.43 | 16686.07 | 0 |
| Sep-25 | 40400 | 15776.5 | 20706.5 | 3917 | 19433.62 | 19961.28 | 0 |
| Oct-25 | 48200 | 22707 | 20454 | 5039 | 22332.63 | 21358.2 | 0 |
| Total | 258520.00 | 95747.10 | 143916.50 | 18856.40 | 103293.69 | 141701.12 | 10695.14 |

22/11/25

Prepared By Statistician
Moonidih Coal Washery

22/11/25

Dy. Manager(CP)
Moonidih Coal Washery

बीसीसीएल
BCCL
Serving coking coal to the nation

भारत कोकिंग कोल लिमिटेड
(कोल इण्डिया लिमिटेड की एक अनुषंगी कंपनी)
Bharat Coking Coal Limited
(A Subsidiary of Coal India Limited)
(एक मिनीरत्न कंपनी / A Miniratna Company)
(भारत सरकार का उपक्रम / A Government of India Undertaking)

Ref. No : BCCL : MND : MCW : PO : E-201

Date : 19-05-23

# UNDERTAKING

This is to certify that all the water requirements of Moonidih Coal Washery are met with the mine water discharge of nearby BCCL mines and no additional ground water is being used for the plant operations.

19/05/2023

Project Officer
Moonidih Washery

PROJECT OFFICER
MOONIDIH COAL WASHERY

**BHARAT COKING COAL LIMITED**
(A Subsidiary of Coal India Ltd.)
भारत कोकिंग कोल लिमिटेड
**Bharat Coking Coal Ltd**
Washery Division,,
PO: Saraidhela,Dist- Dhanbad,Jharkhand,India-828127

**Coal India Limited**
A Maharatna Company
www.coalindia.in

Phone :
Fax :
Website :
Email :
CIN : U10101JH1972GOI000918
GSTN : 20AAACB7934MFZB

SERVICE PURCHASE ORDER

PO No. : 5700471454

Date : 28/11/2025

MSE Status: MSE- GENERAL

To,
INDIAN INSTITUTE OF TECHNOLOGY

DHANBAD
HIRAPUR, SARDAR PATEL NAGAR
DHANBAD
DHANBAD
826004
Jharkhand
India

Vendor Code: 10002451
PAN: AAAAI0686D
GSTIN: 20AAAAI0686D1ZA
Delivery Date: 31/03/2026
Department: Washery

**Header Text:**

Heavy Metal Analysis of 3 NO OF Coal Sample for EC compliance.

| Item | Material/Service | | Qty | Unit | Unit Price | Value | Net Value |
|---|---|---|---|---|---|---|---|
| 10 | Heavy Metal Analysis of Coal Sample | | | | | | |
| | 10 | Heavy Metal Analysis of 3 NO Coal Sample | 1 | AU | 55000.00 per 1 unit | 55000.00 | |
| | | | | Gross Price | | 55,000 | 64900.00 |
| | | | | Goods & Services Tax | | 9,900 | |
| | | | | Value exclusive of Tax | | 55,000 | |

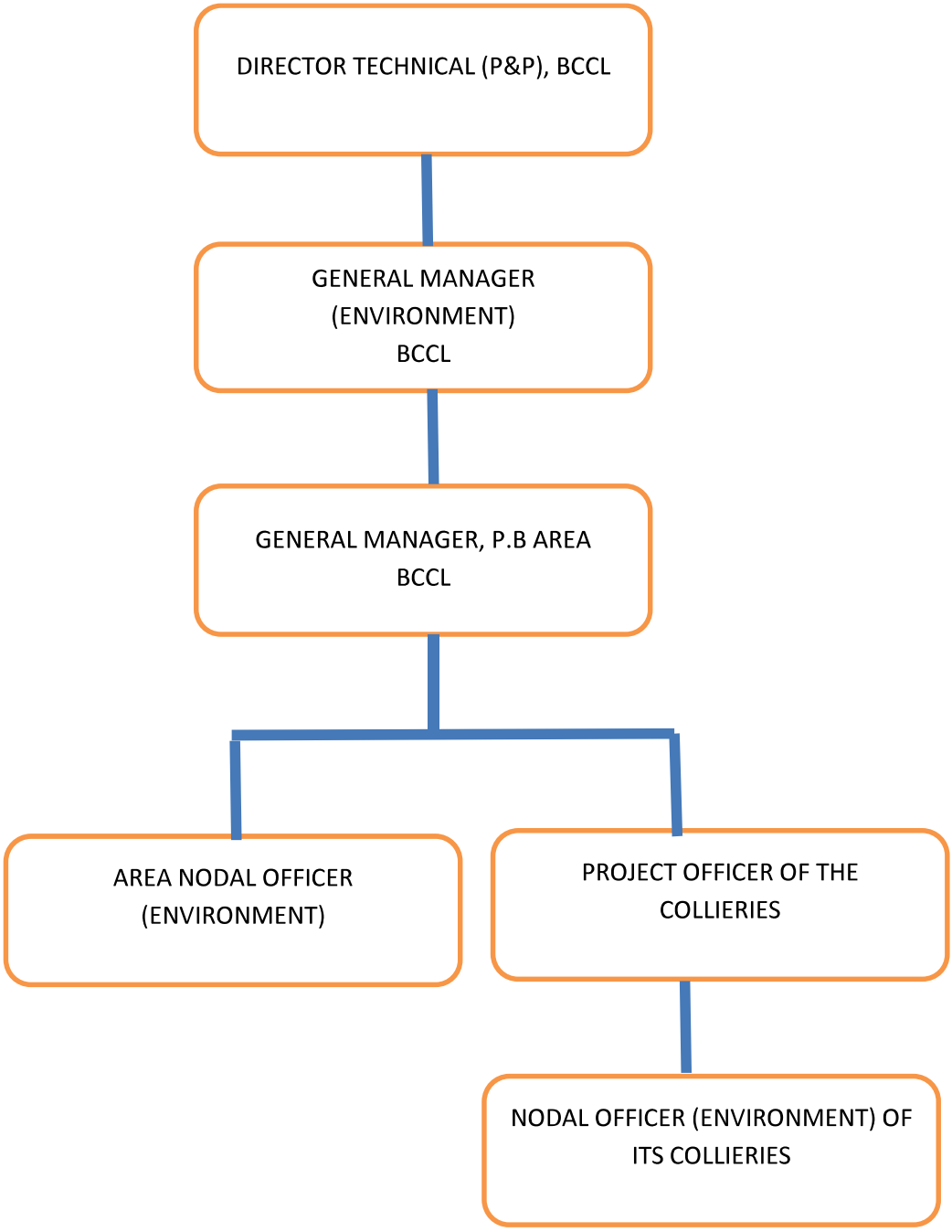
| | | | | |
|---|---|---|---|---|
| | | Inp-Eligible- CGST-9%, SGST-9%, No TCS | 9,900 | |

| | | |
|---|---|---|
| **Net value** | **64900.00** | INR |

Amount in words :SIXTY FOUR THOUSAND NINE HUNDRED RUPEES

Released By :

# ORGANISATION CHART



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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.

# TRACE METAL CONCENTRATION OF AMBIENT AIR QUALITY REPORT OF BHARAT COKING COAL LIMITED,

**(FOR THE HALF YEAR ENDING, JUNE, 2025)**

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

**(FOR THE Q.E. JUNE, 2025)**

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| 1. | CHAPTER - I | EXECUTIVE SUMMARY<br>INTRODUCTION |
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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 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 $23^0$37' N to $23^0$52' N latitudes and $86^0$09' E to $86^0$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.

## 3.0 Methodology of sampling and analysis

### 3.1 Heavy Metal in Ambient Air

Parameters chosen for assessment of Heavy metal in Ambient Air Quality were Cadmium (Cd), Mercury (Hg), Arsenic (As), Chromium (Cr), Nickel (Ni), and Lead (Pb). Respirable Dust Samplers (RDS) were used for sampling these heavy metals on EPM filter paper. These heavy metals are analyzed regularly on half yearly basis. The samples were analyzed in Environment Laboratory of CMPDI, RI-II, Dhanbad.

## 4.0 Results and interpretations

### 4.1 Heavy Metal in Ambient Air

The results of Heavy metal in Ambient Air Quality are presented in tabular form for each monitoring station. The concentration of heavy metals in ambient air is well within the permissible limit.

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

# CHAPTER – II

### AMBIENT AIR QUALITY MONITORING

## 2.1 Results and interpretations

The results of Heavy metal in Ambient Air Quality are presented in tabular form for each monitoring station. The concentration of heavy metals in ambient air is well within the permissible limit.

## TRACE METAL CONCENTRATION IN AMBIENT AIR QUALITY

Name of the Company: **Bharat Coking Coal Limited** Year : **2025-26.**

PERIOD: **HALF YEAR ENDING JUNE, 2025**

**HEAVY METAL ANALYSIS REPORT OF AMBIENT AIR QUALITY**

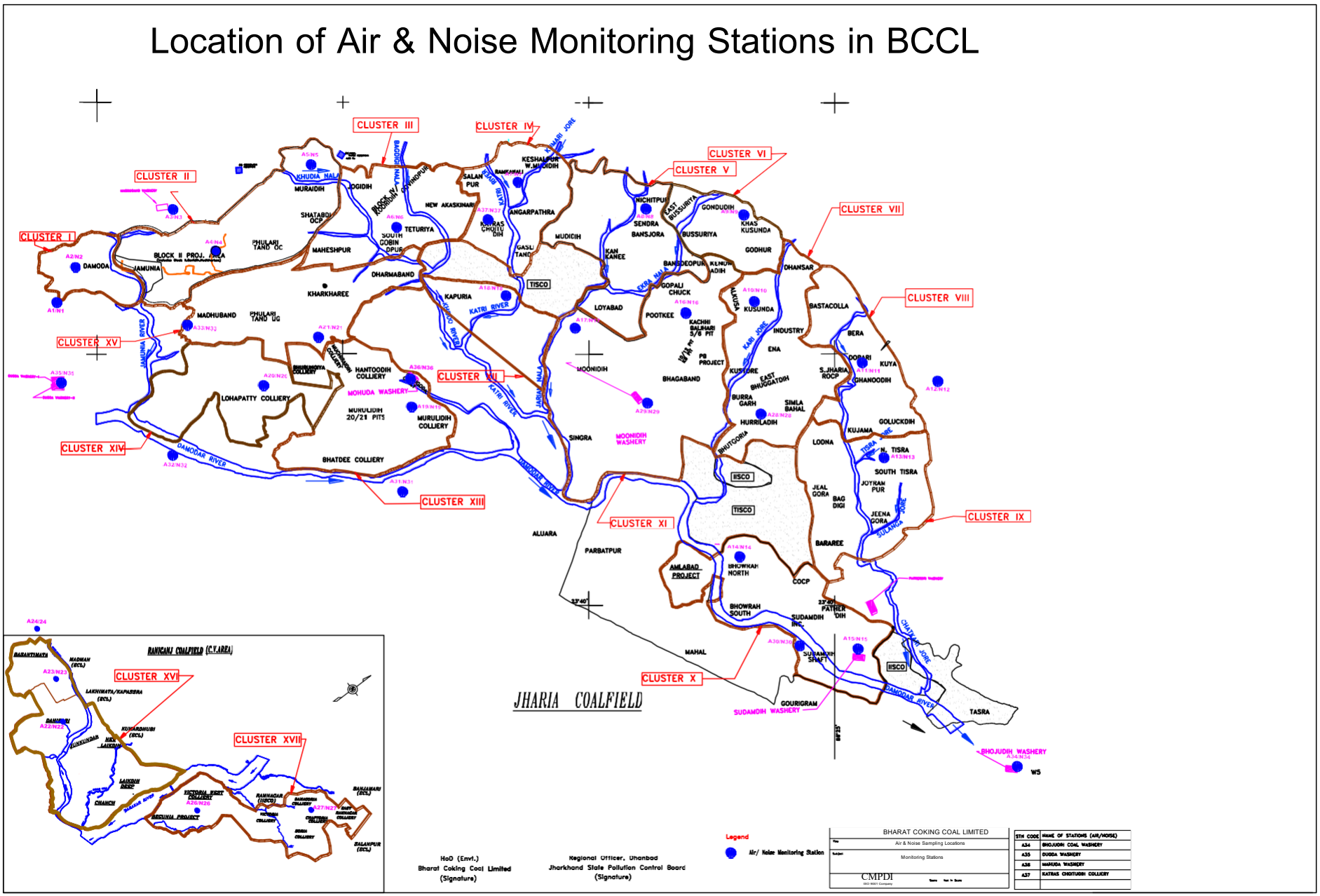
| Results of 6 Heavy Metal for the month of May-2025 | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| **SAMPLE CODE** | **DATE** | **Station Name** | **Cd** CONC. IN µg/m3 | **Hg** CONC. IN µg/m3 | **As** CONC. IN ng/m3 | **Cr** CONC. IN µg/m3 | **Ni** CONC. IN ng/m3 | **Pb** CONC. IN µg/m3 |
| A1 | 20.05.25 | Karmatand Village | BDL | BDL | BDL | BDL | 2.03 | 0.005 |
| A2 | 19.05.25 | Damoda | BDL | BDL | BDL | BDL | 2.14 | BDL |
| A3 | 20.05.25 | Madhuband Washery | BDL | BDL | BDL | BDL | BDL | BDL |
| A4 | 19.05.25 | Block-II | BDL | BDL | BDL | BDL | BDL | 0.006 |
| A5 | 16.05.25 | Muraidih | BDL | BDL | BDL | BDL | 2.25 | BDL |
| A6 | 29.05.25 | Block-IV | BDL | BDL | BDL | BDL | BDL | BDL |
| A7 | 30.05.25 | Govindpur/Ramkanali | BDL | BDL | BDL | BDL | BDL | 0.032 |
| A8 | 26.05.25 | Nichitpur | BDL | BDL | BDL | BDL | BDL | BDL |
| A9 | 27.05.25 | East Basseriya | BDL | BDL | BDL | BDL | BDL | BDL |
| A10 | 16.05.25 | Dhansar/Kusunda | BDL | BDL | BDL | BDL | BDL | BDL |
| A11 | 16.05.25 | Dobari | BDL | BDL | BDL | BDL | BDL | 0.006 |
| A12 | 30.05.25 | Kusmatand Village | BDL | BDL | BDL | BDL | BDL | BDL |
| A13 | 30.05.25 | Jeenagora | BDL | BDL | BDL | BDL | BDL | BDL |
| A14 | 22.05.25 | Bhowrah North | BDL | BDL | BDL | BDL | BDL | BDL |
| A15 | 20.05.25 | Sudamdih Washery | BDL | 0.001 | BDL | BDL | BDL | 0.030 |
| A16 | 21.05.25 | Pootki | BDL | BDL | BDL | BDL | BDL | 0.015 |
| A17 | 21.05.25 | Moonidih UGP | BDL | BDL | BDL | BDL | BDL | BDL |
| A18 | 22.05.25 | Rudih Basti | BDL | BDL | BDL | BDL | BDL | 0.007 |
| A19 | 28.05.25 | Murlidih 20/21 | BDL | BDL | BDL | BDL | BDL | BDL |
| A20 | 21.05.25 | Lohapatti | BDL | BDL | BDL | BDL | BDL | BDL |
| A21 | 26.05.25 | Kharkharee | BDL | BDL | BDL | BDL | BDL | BDL |

| Results of 6 Heavy Metal for the month of May-2025 | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| **SAMPLE CODE** | **DATE** | **Station Name** | **Cd** CONC. IN µg/m3 | **Hg** CONC. IN µg/m3 | **As** CONC. IN ng/m3 | **Cr** CONC. IN µg/m3 | **Ni** CONC. IN ng/m3 | **Pb** CONC. IN µg/m3 |
| A22 | 29.05.25 | Dahibari | BDL | BDL | BDL | BDL | BDL | 0.010 |
| A23 | 29.05.25 | Basantimata | BDL | BDL | BDL | BDL | BDL | BDL |
| A24 | 30.05.25 | Gopinathpur | BDL | BDL | BDL | BDL | BDL | BDL |
| A25 | 28.05.25 | Guliardih | BDL | BDL | BDL | BDL | BDL | 0.005 |
| A26 | 27.05.25 | Begunia | BDL | BDL | BDL | BDL | 2.32 | 0.021 |
| A27 | 26.05.25 | Damagoria | BDL | BDL | BDL | BDL | BDL | 0.030 |
| A28 | 16.05.25 | Hurriladih | BDL | BDL | BDL | BDL | BDL | 0.010 |
| A29 | 21.05.25 | Moonidih Washery | BDL | 0.005 | BDL | BDL | BDL | BDL |
| A30 | 19.05.25 | Sitanala | BDL | BDL | BDL | BDL | BDL | 0.025 |
| A31 | 30.05.25 | Dumarda | BDL | BDL | BDL | BDL | BDL | BDL |
| A32 | 21.05.25 | Telmacho Bridge | BDL | BDL | BDL | BDL | BDL | BDL |
| A33 | 27.05.25 | Madhuband UGP | BDL | 0.002 | BDL | BDL | BDL | BDL |
| A34 | 19.05.25 | Bhojudih Washery | BDL | 0.01 | BDL | BDL | BDL | 0.033 |
| A35 | 21.05.25 | Dugda Washery | BDL | 0.001 | BDL | BDL | BDL | 0.026 |
| A36 | 22.05.25 | Mahuda | BDL | 0.002 | BDL | BDL | BDL | BDL |
| A37 | 30.05.25 | Katras Choitudih | BDL | BDL | BDL | BDL | BDL | BDL |
| A38 | 29.05.25 | Sinidih Workshop | BDL | BDL | BDL | BDL | BDL | 0.010 |
| A39 | 20.05.25 | Patherdih | BDL | BDL | BDL | BDL | BDL | BDL |
| A40 | 22.05.25 | Koyla Nagar | BDL | BDL | BDL | BDL | BDL | BDL |
| A41 | 20.05.25 | Sudamdih Shaft | BDL | BDL | BDL | BDL | BDL | 0.020 |
| A42 | 16.05.25 | RHB | BDL | BDL | BDL | BDL | 2.05 | 0.010 |
| A43 | 16.05.25 | Pandwabhita | BDL | BDL | BDL | BDL | BDL | BDL |
| A44 | 16.05.25 | Sadariadih | BDL | BDL | BDL | BDL | BDL | 0.005 |
| A45 | 19.05.25 | Bhojudih Buffer | BDL | BDL | BDL | BDL | BDL | BDL |
| A46 | 22.05.25 | C.H. D | BDL | BDL | BDL | BDL | BDL | BDL |

**#BDL-Below detection limit**

| Metal | BDL | Standard as per NAAQS |
|---|---|---|
| Hg (µg/m$^3$) | 0.001 | *Standard Not defined |
| Cr(µg/m$^3$) | 0.01 | *Standard Not defined |
| As (ng/m$^3$) | 1 | 6 |
| Pb (µg/m$^3$) | 0.005 | 0.5 |
| Ni (ng/m$^3$) | 2 | 20 |
| Cd (µg/m$^3$) | 0.001 | *Standard Not defined |

# Location of Air & Noise Monitoring Stations in BCCL



ANNEXURE-XXXIII

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# ENVIRONMENTAL MONITORING REPORT OF BHARAT COKING COAL LIMITED, CLUSTER – XI

**(FOR THE MONTH APRIL, 2025)**

**E. C. no. J-11015/77/2011-IA.II (M) dated 26.07.2019.**

# 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 $23^0$37' N to $23^0$52' N latitudes and $86^0$09' E to $86^0$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 ($PM_{10}$), Fine Particulate Matter ($PM_{2.5}$), Sulphur Di-oxide ($SO_2$) and Nitrogen Oxides ($NO_X$). Respirable Dust Samplers (RDS) and Fine Dust

Sampler ($PM_{2.5}$ sampler) were used for sampling of $PM_{10,}$ $SO_2$, & $NO_x$ 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 $PM_{10,}$ $PM_{2.5}$, $SO_2$ 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 $PM_{10}$& $PM_{2.5}$ 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 Standards for Coal Mines were within permissible limits.

### 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-XI is in the Western & Southern part of the Jharia coalfield. It includes a group of 8 Mines (viz. Gopalichak UG&OC Mine**,** Kachhi Balihari 10/12 Pit UG Mine**,** PB UG Project,Bhagabandh UG Mine, Kenwadih UG, Pootkee UG, Kachi Balihari 5/6Pit UG, Moonidih UG mine). The Cluster – XI is situated about 25 - 30 kms from Dhanbad Railway Station. The mines of this Cluster – XI 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 Jarian nala & Damodar River.

1.2 The Project has Environmental Clearance from Ministry of Environment, Forests and Climate Change (MoEF&CC) for a rated capacity 5.08 MTPA (normative) and 6.604 MTPA (peak) capacity of coal production vide letter no. J-11015/77/2011-IA.II (M) dated 26$^{th}$ July, 2019.

.

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 $PM_{10}$, $PM_{2.5}$, $SO_2$, NOx 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) Pootkee Balihari Office (A16): Industrial Area**

The location of the sampling station is 23°45'17.23"N 86°21'46.27"E. The sampler was placed at an elevated platform approx. 1.5m above ground level at Project 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 sampler was placed at an elevated platform approx. 1.5m above ground level at project office.

**iii) Moonidih Washery (A29): Industrial Area**

The location of the sampling station is 23°44'26.00"N 86°21'16.00"E. The sampler was placed at a height of approx. 1.5m above ground level at Project office.

**II.BUFFER ZONE Monitoring Location**

**I) Kusunda OCP (A10)**

The location of the sampling station is 23°46'49.07"N 86°24'15.71"E. The sampler was placed at a height of approx. 1.5m above ground level at Safety 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** | **04/2025** | **Cluster** | **Cluster XI** | **ULR No.** | **TC1432125000001794F** |
| **Customer** | **Environment Department, Bharat Coking Coal Limited (BCCL), Koyla Bhawan, Dhanbad (E-mail: gmenv.bccl@coalindia.in)** | | | **Date of Issue** | **30.05.2025** |
| **Project** | **Pootkee Balihari Office** | **Sample Ref. No.** | **REM/BCCL/2025/04** | **Sampling Method** | **CMPDI/RI-II/LPM 13 , ( IS 5182)** |
| **Date of Sampling** | 03.04.25 | 18.04.25 | **Period of Analysis** | 03.04.25 to 25.05.25 | **Zone of Station:** **Core Zone** |

| **Sl. No.** | **Parameter** | **Method of Analysis** | **Observed Values ( in µg/m³)** | | **Range Of Testing** | **LDL** | **MoEF Standards Notification dated 25th September,2000 (GSR 742 E )** | **NAAQS, 2009** |
|---|---|---|---|---|---|---|---|---|
| | | | **1st FN A3710** | **2nd FN A3790** | | | | |
| 1 | $PM_{10}$ | IS -5182(Part 23):2006, R-2017 | 105 | 103 | 10 µg/m³ - 1000 µg/m³ | 10 µg/m³ | 300 | 100 |
| 2 | $PM_{2.5}$ | IS -5182(Part 24):2019 | 59 | 60 | 10 µg/m³ - 400 µg/m³ | 10 µg/m³ | Not Specified | 60 |
| 3 | $SO_2$ | IS-5182(Part-2): 2001 , R-2017 | 11 | 10 | 10 µg/m³ - 1050 µg/m³ | 10 µg/m³ | 120 | 80 |
| 4 | $NO_2$ | IS-5182 (Part-6): 2006 , R-2017 | 33 | 31 | 06 µg/m³ - 420 µg/m³ | 06 µg/m³ | 120 | 80 |

** LDL indicates Lower Detection Limit,*

***All units are in µg/m3, 24 hourly Average,*

***ANALYSED BY*** (Gaurav Kant) ***CHECKED BY*** (Amit Raj Mishra) ***Authorised Signatory***

***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 Air Quality Test Report

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

TC-14321

**Test Report for Ambient Air Samples**

| | | | | | |
|---|---|---|---|---|---|
| **Month & Year** | **04/2025** | **Cluster** | **Cluster XI** | **ULR No.** | **TC1432125000001794F** |
| **Customer** | **Environment Department, Bharat Coking Coal Limited (BCCL), Koyla Bhawan, Dhanbad (E-mail: gmenv.bccl@coalindia.in)** | | | **Date of Issue** | **30.05.2025** |
| **Project** | **Moonidih UGP** | **Sample Ref. No.** | **REM/BCCL/2025/04** | **Sampling Method** | **CMPDI/RI-II/LPM 13 , ( IS 5182)** |
| **Date of Sampling** | 04.04.25 | 28.04.25 | **Period of Analysis** | 04.04.25 to 25.05.25 | **Zone of Station:** **Core Zone** |

| **Sl. No.** | **Parameter** | **Method of Analysis** | **Observed Values ( in µg/m³)** | | **Range Of Testing** | **LDL** | **MoEF Standards Notification dated 25th September,2000 (GSR 742 E )** | **NAAQS, 2009** |
|---|---|---|---|---|---|---|---|---|
| | | | **1st FN A3715** | **2nd FN A3837** | | | | |
| 1 | $PM_{10}$ | IS -5182(Part 23):2006, R-2017 | 99 | 105 | 10 µg/m³ - 1000 µg/m³ | 10 µg/m³ | 300 | 100 |
| 2 | $PM_{2.5}$ | IS -5182(Part 24):2019 | 56 | 60 | 10 µg/m³ - 400 µg/m³ | 10 µg/m³ | Not Specified | 60 |
| 3 | $SO_2$ | IS-5182(Part-2): 2001 , R-2017 | <10 | <10 | 10 µg/m³ - 1050 µg/m³ | 10 µg/m³ | 120 | 80 |
| 4 | $NO_2$ | IS-5182 (Part-6): 2006 , R-2017 | 32 | 30 | 06 µg/m³ - 420 µg/m³ | 06 µg/m³ | 120 | 80 |

** LDL indicates Lower Detection Limit,*

***All units are in µg/m3, 24 hourly Average,*

***ANALYSED BY***

(Gaurav Kant)
***CHECKED BY***

(Amit Raj Mishra)
***Authorised Signatory***

***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** | **04/2025** | **Cluster** | **Cluster XI** | **ULR No.** | **TC1432125000001794F** |
| **Customer** | **Environment Department, Bharat Coking Coal Limited (BCCL), Koyla Bhawan, Dhanbad (E-mail: gmenv.bccl@coalindia.in)** | | | **Date of Issue** | **30.05.2025** |
| **Project** | **Moonidih Washery** | **Sample Ref. No.** | **REM/BCCL/2025/04** | **Sampling Method** | **CMPDI/RI-II/LPM 13 , ( IS 5182)** |
| **Date of Sampling** | 04.04.25 | 28.04.25 | **Period of Analysis** | 04.04.25 to 25.05.25 | **Zone of Station:** **Core Zone** |

| **Sl. No.** | **Parameter** | **Method of Analysis** | **Observed Values ( in µg/m³)** 1st FN A3714 | 2nd FN A3836 | **Range Of Testing** | **LDL** | **MoEF Standards Notification dated 25th September,2000 (GSR 742 E )** | **NAAQS, 2009** |
|---|---|---|---|---|---|---|---|---|
| 1 | $PM_{10}$ | IS -5182(Part 23):2006, R-2017 | 122 | 112 | 10 µg/m³ - 1000 µg/m³ | 10 µg/m³ | 300 | 100 |
| 2 | $PM_{2.5}$ | IS -5182(Part 24):2019 | 61 | 53 | 10 µg/m³ - 400 µg/m³ | 10 µg/m³ | Not Specified | 60 |
| 3 | $SO_2$ | IS-5182(Part-2): 2001 , R-2017 | <10 | <10 | 10 µg/m³ - 1050 µg/m³ | 10 µg/m³ | 120 | 80 |
| 4 | $NO_2$ | IS-5182 (Part-6): 2006 , R-2017 | 30 | 28 | 06 µg/m³ - 420 µg/m³ | 06 µg/m³ | 120 | 80 |

** LDL indicates Lower Detection Limit,*

***All units are in µg/m3, 24 hourly Average,*

***ANALYSED BY*** (Gaurav Kant) ***CHECKED BY*** (Amit Raj Mishra) ***Authorised Signatory***

***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

TC-14321

**Test Report for Ambient Air Samples**

| | | | | | |
|---|---|---|---|---|---|
| **Month & Year** | **04/2025** | **Cluster** | **Cluster XI** | **Report No.** | TC1432125000001794F |
| **Customer** | **Environment Department, Bharat Coking Coal Limited (BCCL), Koyla Bhawan, Dhanbad (E-mail: gmenv.bccl@coalindia.in)** | | | **Date of Issue** | **30.05.2025** |
| **Project** | **Kusunda** | **Sample Ref. No.** | **REM/BCCL/2025/04** | **Sampling Method** | **CMPDI/RI-II/LPM 13 , ( IS 5182)** |
| **Date of Sampling** | 15.04.25 | 26.04.25 | **Period of Analysis** | 15.04.25 to 25.05.25 | **Zone of Station:** **Buffer Zone** |

| **Sl. No.** | **Parameter** | **Method of Analysis** | **Observed Values ( in µg/m³)** | | **Range Of Testing** | **LDL** | **MoEF Standards Notification dated 25th September,2000 (GSR 742 E )** | **NAAQS, 2009** |
|---|---|---|---|---|---|---|---|---|
| | | | **1st FN A3769** | **2nd FN A3830** | | | | |
| 1 | $PM_{10}$ | IS -5182(Part 23):2006, R-2017 | 102 | 118 | 10 µg/m³ - 1000 µg/m³ | 10 µg/m³ | 300 | 100 |
| 2 | $PM_{2.5}$ | IS -5182(Part 24):2019 | 58 | 67 | 10 µg/m³ - 400 µg/m³ | 10 µg/m³ | Not Specified | 60 |
| 3 | $SO_2$ | IS-5182(Part-2): 2001 , R-2017 | 12 | 11 | 10 µg/m³ - 1050 µg/m³ | 10 µg/m³ | 120 | 80 |
| 4 | $NO_2$ | IS-5182 (Part-6): 2006 , R-2017 | 33 | 27 | 06 µg/m³ - 420 µg/m³ | 06 µg/m³ | 120 | 80 |

** LDL indicates Lower Detection Limit,*
***All units are in µg/m3, 24 hourly Average,*

***ANALYSED BY*** (Gaurav Kant) ***CHECKED BY*** (Amit Raj Mishra) ***Authorised Signatory***

***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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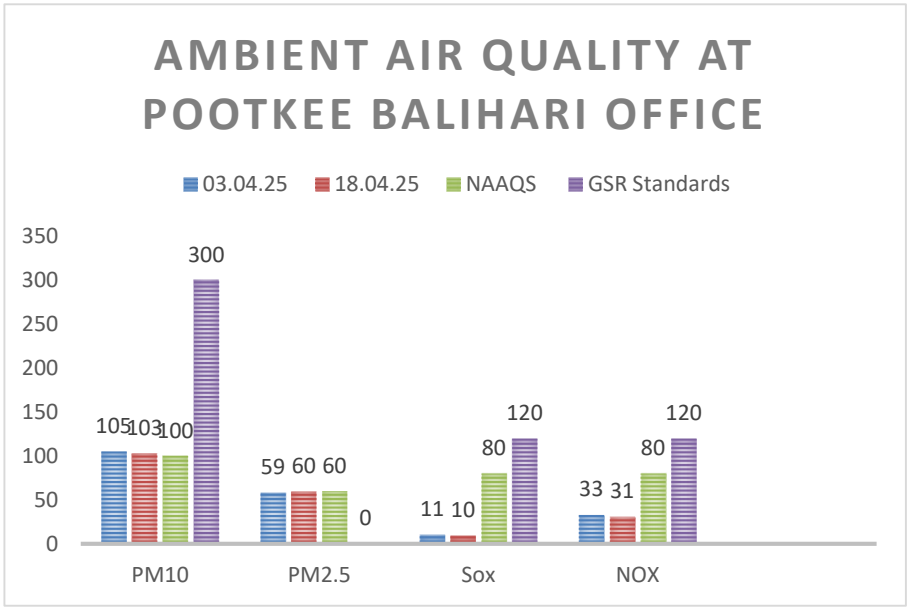
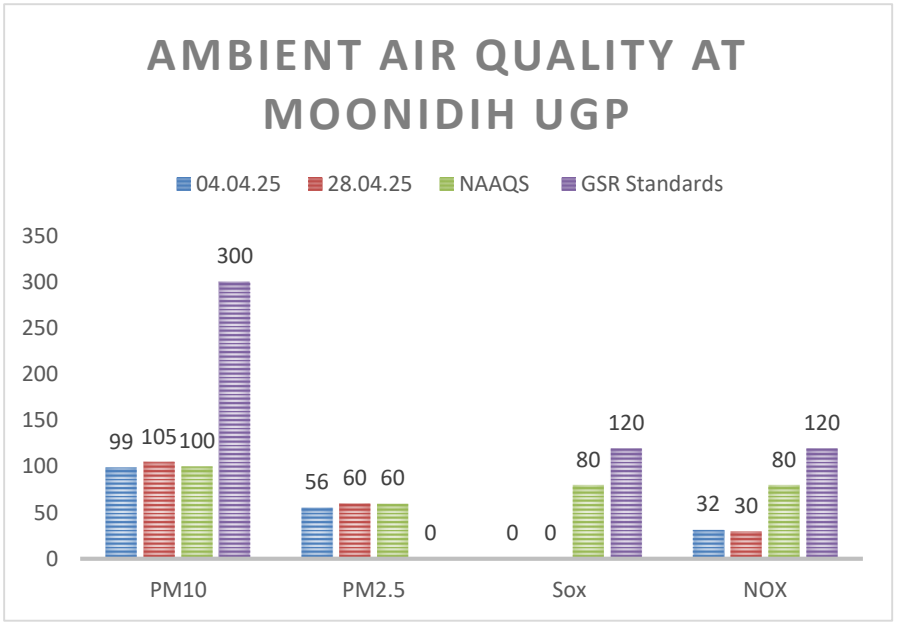
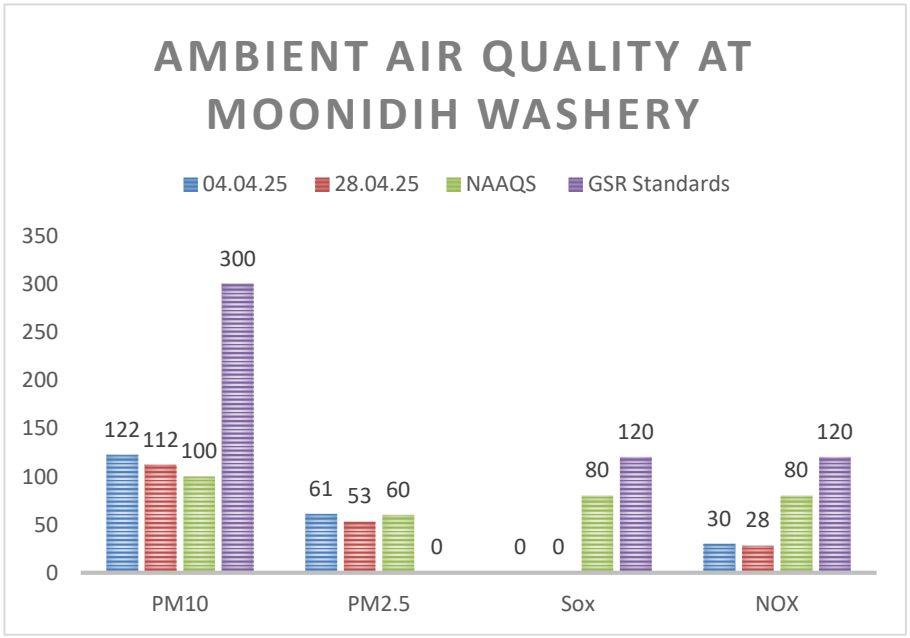
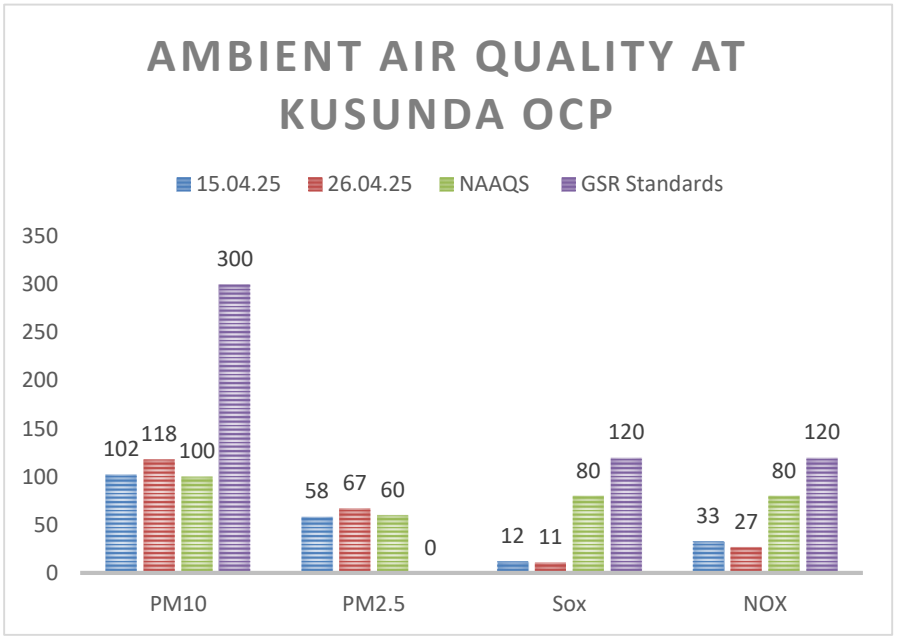
*Page -1 of 1*


AMBIENT AIR QUALITY AT POOTKEE BALIHARI OFFICE
03.04.25
18.04.25
NAAQS
GSR Standards
350
300
250
200
150
100
50
0
105 103 100 300
59 60 60 0
11 10 80 120
33 31 80 120
PM10
PM2.5
Sox
NOX


AMBIENT AIR QUALITY AT MOONIDIH UGP
04.04.25
28.04.25
NAAQS
GSR Standards
350
300
250
200
150
100
50
0
99 105 100 300
56 60 60 0
0 0 80 120
32 30 80 120
PM10
PM2.5
Sox
NOX


AMBIENT AIR QUALITY AT MOONIDIH WASHERY
04.04.25
28.04.25
NAAQS
GSR Standards
350
300
250
200
150
100
50
0
122 112 100 300
61 53 60 0
0 0 80 120
30 28 80 120
PM10
PM2.5
Sox
NOX


AMBIENT AIR QUALITY AT KUSUNDA OCP
15.04.25
26.04.25
NAAQS
GSR Standards
350
300
250
200
150
100
50
0
102 118 100 300
58 67 60 0
12 11 80 120
33 27 80 120
PM10
PM2.5
Sox
NOX

# WATER QUALITY MONITORING

## 3.1 Location of sampling sites

(Refer **Plate No. – II**)

### i) Mine Discharge of Bhagabandh (MW11)

A sampling point is fixed to assess the effluent quality of Mine discharge. This location is selected to monitor effluent discharge in to Kari jore.

## 3.2 Methodology of sampling and analysis

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

## 3.3 Results & Interpretations

The results are given in tabular form along with the applicable standards. Results are compared with Schedule - VI, effluent prescribed by MoEF&CC. Results show that most of the parameters are within the permissible limits.

TC-14321

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

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

**Test Report for Mine Effluent samples**

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| **Month & Year** | **04/2025** | **Cluster** | **Cluster XI** | **ULR No.** | | TC1432125000001812F | |
| **Customer** | **Environment Department, Bharat Coking Coal Limited (BCCL), Koyla Bhawan, Dhanbad (E-mail: gmenv.bccl@coalindia.in)** | | | | | **Date of Issue** | **30.05.2025** |
| **Project** | | **Sampling Ref. No.** | **REM/BCCL/2025/ 04** | **Sampling Method** | **IS 3025 (Part-1)** | | **CMPDI/RI-II/LPM 13** |
| **Sampling Stations** | **(i)** | **Bhagabandh** | **Sample Collected in 2.5 Ltr Jerricane , Color as observed is transparent** | | | **Period of Analysis** | **01.04.25 TO 30.04.25** |
| | | | **Date of Sampling** | 01.04.25 | 28.04.2025 | | |

| **Sl. No.** | **Parameter** | **Method of Analysis** | **Observed Values** | | **STANDARDS FOR COAL MINES (Stipulated by Ministry of Environment and Forests (MoEF), Vide Notification No. GSR 742(E), Dt: 25.09.2000)** | **LDL** |
|---|---|---|---|---|---|---|
| | | | **M1447** | **M1484** | | |
| 1 | Total Suspended Solids | IS 3025/17:1984, R :2017, Gravimetric | 34 | 32 | *100 (Max)* | 10 |
| 2 | pH | IS-3025/11:1983, R-2017, Electrometric | 7.64 | 7.62 | *5.5 - 9.0* | 0.2 |
| 3 | Oil & Grease | IS 3025/39:1991, R : 2019, Partition Gravimetric | <4.0 | <4.0 | *10 (Max)* | 2 |
| 4 | COD | APHA 23rd Edition 5220 C Titrimetric Method | 32 | 36 | *250 (Max)* | 4 |

***Grab sampling carried out for water samples **All units in mg/L unless specified otherwise *LDL indicates Lower Detection Limit & BDL indicates Below Detection Limit,*

***ANALYSED BY***

(Kumar Vaibhav)
***CHECKED BY***

(Amit Raj Mishra)
***Authorised Signatory***

*Note: The results above relate to the samples tested as received. This report cannot 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

## 4.1Location of sampling sites

1. **Pootkee Balihari Office (N16)**
2. **Moonidih UGP (N17)**
3. **Moonidih Washery (N29)**
4. **Kusunda OCP (N10)**

**4.2**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

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

TC-14321

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| **Month & Year** | **04/2025** | **Cluster** | **Cluster XI** | | | **ULR No.** | **TC1432125000001828F** |
| **Customer** | **Environment Department, Bharat Coking Coal Limited (BCCL), Koyla Bhawan, Dhanbad (E-mail: gmenv.bccl@coalindia.in)** | | | | | **Date of Issue** | **30.05.2025** |
| **Project** | | **Sample Ref. No.** | **REM/BCCL/2025/ 04** | | **Sampling Method** | **CMPDI/RI-II/LPM 22** | |
| **Sampling Stations** | **i** | **Pootki Balihari Office** | **Date of Sampling** | 03.04.25 | 18.04.25 | **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 | 49.7 | 50.8 | CPCB, Protocol for Ambient Level Noise Monitoring -2015 | 35 dB-135 dB | 35 Db (A) | Industrial<br>Commercial<br>Residential<br>Silence | 75<br>65<br>55<br>50 |
| 2 | | 07:00 - 08:00 | 52.9 | 53.5 | | | | | |
| 3 | | 08:00 - 09:00 | 55.4 | 56.1 | | | | | |
| 4 | | 09:00 – 10:00 | 61.6 | 62.2 | | | | | |
| 5 | | 10:00 - 11:00 | 63.1 | 63.9 | | | | | |
| 6 | | 11:00 - 12:00 | 58.4 | 59.1 | | | | | |
| 7 | | 12:00 - 13:00 | 56.9 | 56.2 | | | | | |
| 8 | | 13:00 - 14:00 | 54.3 | 54 | | | | | |
| 9 | | 14:00 - 15:00 | 53.2 | 51 | | | | | |
| 10 | | 15:00 - 16:00 | 50.4 | 50.7 | | | | | |
| 11 | | 16:00 - 17:00 | 49.7 | 49.2 | | | | | |
| 12 | | 17:00 - 18:00 | 49.3 | 50 | | | | | |
| 13 | | 18:00 - 19:00 | 49.3 | 49.8 | | | | | |
| 14 | | 19:00 - 20:00 | 47.6 | 48.9 | | | | | |
| 15 | | 20:00 - 21:00 | 47.5 | 47.7 | | | | | |
| 16 | | 21:00 - 22:00 | 47.4 | 47 | | | | | |
| | | Leq Day | 56.0 | 56.4 | | | | | |
| 1 | Noise Level dB(A)Leq -Night | 22:00-23:00 | 49.7 | 49.9 | CPCB, Protocol for Ambient Level Noise Monitoring -2015 | 35 dB-135 dB | 35 dB (A) | Industrial<br>Commercial<br>Residential<br>Silence | 70<br>55<br>45<br>50 |
| 2 | | 23:00- 00:00 | 48.9 | 49.2 | | | | | |
| 3 | | 00:00- 01:00 | 47.8 | 48.8 | | | | | |
| 4 | | 01.00-02.00 | 47.7 | 48.5 | | | | | |
| 5 | | 02.00-03.00 | 47.1 | 47.3 | | | | | |
| 6 | | 03.00-04.00 | 46.9 | 46.8 | | | | | |
| 7 | | 04.00-05.00 | 47.8 | 47.9 | | | | | |
| 8 | | 05:00-06:00 | 48.3 | 48.1 | | | | | |
| | | Leq Night | 48.1 | 48.4 | | | | | |

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

| | | | |
|---|---|---|---|
| Sampling Assistants | (Gaurav Kant) | | (Amit Raj Mishra) |
| ANALYSED BY | CHECKED BY | | Authorised Signatory |

Note: The results above relate to the samples tested as received. This report cannot 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
CMPDIL, RI-II
KOYLA BHAWAN OMPLEX
DHANBAD. -826005
Phone:0326-223-850
email:i2cmpdi@coalindia.in

# Ambient Noise Level Test Report

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| **Month & Year** | **04/2025** | **Cluster** | **Cluster XI** | | | **ULR No.** | **TC1432125000001828F** |
| **Customer** | **Environment Department, Bharat Coking Coal Limited (BCCL), Koyla Bhawan, Dhanbad (E-mail: gmenv.bccl@coalindia.in)** | | | | | **Date of Issue** | **30.05.2025** |
| **Project** | | **Sample Ref. No.** | **REM/BCCL/2025/04** | **Sampling Method** | | **CMPDI/RI-II/LPM 22** | |
| **Sampling Stations** | **i** | **Moonidih UGP** | **Date of Sampling** | 04.04.25 | 28.04.25 | **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 | 49.5 | 50.2 | CPCB, Protocol for Ambient Level Noise Monitoring -2015 | 35 dB-135 dB | 35 dB(A) | Industrial<br>Commercial<br>Residential<br>Silence | 75<br>65<br>55<br>50 |
| 2 | | 07:00 - 08:00 | 45.1 | 46.1 | | | | | |
| 3 | | 08:00 - 09:00 | 52.6 | 54.2 | | | | | |
| 4 | | 09:00 – 10:00 | 50.7 | 48.3 | | | | | |
| 5 | | 10:00 - 11:00 | 53.7 | 52.7 | | | | | |
| 6 | | 11:00 - 12:00 | 56 | 57.8 | | | | | |
| 7 | | 12:00 - 13:00 | 55.2 | 54.9 | | | | | |
| 8 | | 13:00 - 14:00 | 56.9 | 55.8 | | | | | |
| 9 | | 14:00 - 15:00 | 53.1 | 52.7 | | | | | |
| 10 | | 15:00 - 16:00 | 51.4 | 50.7 | | | | | |
| 11 | | 16:00 - 17:00 | 50.9 | 51.1 | | | | | |
| 12 | | 17:00 - 18:00 | 50.6 | 51.1 | | | | | |
| 13 | | 18:00 - 19:00 | 49.8 | 50.2 | | | | | |
| 14 | | 19:00 - 20:00 | 50.4 | 50 | | | | | |
| 15 | | 20:00 - 21:00 | 48.9 | 48.8 | | | | | |
| 16 | | 21:00 - 22:00 | 48.4 | 48.7 | | | | | |
| | | **Leq Day** | 52.4 | 52.5 | | | | | |
| 1 | Noise Level dB(A)Leq -Night | 22:00-23:00 | 48.2 | 48.2 | CPCB, Protocol for Ambient Level Noise Monitoring -2015 | 35 dB-135 dB | 35 dB(A) | Industrial<br>Commercial<br>Residential<br>Silence | 70<br>55<br>45<br>50 |
| 2 | | 23:00- 00:00 | 47.6 | 47.8 | | | | | |
| 3 | | 00:00- 01:00 | 46.8 | 47.8 | | | | | |
| 4 | | 01.00-02.00 | 45.8 | 46.5 | | | | | |
| 5 | | 02.00-03.00 | 45.6 | 45.7 | | | | | |
| 6 | | 03.00-04.00 | 45.6 | 45.8 | | | | | |
| 7 | | 04.00-05.00 | 47.2 | 47.3 | | | | | |
| 8 | | 05:00-06:00 | 47.6 | 47.8 | | | | | |
| | | **Leq Night** | 46.9 | 47.2 | | | | | |

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

| | | | |
|---|---|---|---|
| Sampling Assistants | (Gaurav Kant) | | (Amit Raj Mishra) |
| ***ANALYSED BY*** | ***CHECKED BY*** | | ***Authorised Signatory*** |

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email: rdri2cmpdi@coalindia.in

TC-14321

cmpdi A Mini Ratna Company

# CENTRAL MINE PLANNING AND DESIGN INSTITUTE LIMITED

## Environment Laboratory, Regional Institute-II

## Ambient Noise Level Test Report

| | | | | | |
|---|---|---|---|---|---|
| **Month & Year** | **04/2025** | **Cluster** | **Cluster XI** | **ULR No.** | **TC1432125000001828F** |
| **Customer** | **Environment Department, Bharat Coking Coal Limited (BCCL), Koyla Bhawan, Dhanbad (E-mail: gmenv.bccl@coalindia.in)** | | | **Date of Issue** | **30.05.2025** |
| **Project** | | **Sample Ref. No.** | **REM/BCCL/2025/04** | **Sampling Method** | **CMPDI/RI-II/LPM 22** |
| **Sampling Stations** | **i** | **Moonidih Washery** | **Date of Sampling** | 04.04.25 – 28.04.25 | **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 | 48.4 | 48.7 | CPCB, Protocol for Ambient Level Noise Monitoring -2015 | 35 dB-135 dB | 35 dB(A) | Industrial<br>Commercial<br>Residential<br>Silence | 75<br>65<br>55<br>50 |
| 2 | | 07:00 - 08:00 | 50.7 | 51.1 | | | | | |
| 3 | | 08:00 - 09:00 | 54.5 | 53.9 | | | | | |
| 4 | | 09:00 – 10:00 | 57.9 | 58 | | | | | |
| 5 | | 10:00 - 11:00 | 60.1 | 60.1 | | | | | |
| 6 | | 11:00 - 12:00 | 61.1 | 58.8 | | | | | |
| 7 | | 12:00 - 13:00 | 62.8 | 64.5 | | | | | |
| 8 | | 13:00 - 14:00 | 62.2 | 62.2 | | | | | |
| 9 | | 14:00 - 15:00 | 57.3 | 58 | | | | | |
| 10 | | 15:00 - 16:00 | 58 | 57 | | | | | |
| 11 | | 16:00 - 17:00 | 56.3 | 55.4 | | | | | |
| 12 | | 17:00 - 18:00 | 55.2 | 54.5 | | | | | |
| 13 | | 18:00 - 19:00 | 53.7 | 53.6 | | | | | |
| 14 | | 19:00 - 20:00 | 52.6 | 53.2 | | | | | |
| 15 | | 20:00 - 21:00 | 51.7 | 50 | | | | | |
| 16 | | 21:00 - 22:00 | 49.5 | 50.2 | | | | | |
| | | | 57.8 | 57.8 | | | | | |
| 1 | Noise Level dB(A)Leq -Night | 22:00-23:00 | 51.9 | 52.6 | CPCB, Protocol for Ambient Level Noise Monitoring -2015 | 35 dB-135 dB | 35 dB(A) | Industrial<br>Commercial<br>Residential<br>Silence | 70<br>55<br>45<br>50 |
| 2 | | 23:00- 00:00 | 50.6 | 49.9 | | | | | |
| 3 | | 00:00- 01:00 | 46.1 | 46 | | | | | |
| 4 | | 01.00-02.00 | 45.8 | 45.8 | | | | | |
| 5 | | 02.00-03.00 | 45.5 | 44.5 | | | | | |
| 6 | | 03.00-04.00 | 45 | 45.7 | | | | | |
| 7 | | 04.00-05.00 | 47.2 | 47.6 | | | | | |
| 8 | | 05:00-06:00 | 47.6 | 47.8 | | | | | |
| | | **Leq Night** | 48.2 | 48.3 | | | | | |

***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) | | | (Amit Raj Mishra) |
| | ***ANALYSED BY*** | | ***CHECKED BY*** | | ***Authorised Signatory*** |

*Note: The results above relate to the samples tested as received. This report cannot 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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TC-14321

# CENTRAL MINE PLANNING AND DESIGN INSTITUTE LIMITED

## Environment Laboratory, Regional Institute-II

## Ambient Noise Level Test Report

| | | | | | |
|---|---|---|---|---|---|
| **Month & Year** | **04/2025** | **Cluster** | **Cluster XI** | **ULR No.** | **TC1432125000001828F** |
| **Customer** | **Environment Department, Bharat Coking Coal Limited (BCCL), Koyla Bhawan, Dhanbad (E-mail: gmenv.bccl@coalindia.in)** | | | **Date of Issue** | **30.05.2025** |
| **Project** | | **Sample Ref. No.** | **REM/BCCL/2025/ 04** | **Sampling Method** | **CMPDI/RI-II/LPM 22** |
| **Sampling Stations** | **i** | **Kusunda OCP** | **Date of Sampling** | 15.04.25 – 26.04.25 | **Zone Category of Station: Bufferr 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 | 48.4 | 48.8 | CPCB, Protocol for Ambient Level Noise Monitoring -2015 | 35 dB-135 dB | 35 dB(A) | Industrial<br>Commercial<br>Residential<br>Silence | 75<br>65<br>55<br>50 |
| 2 | | 07:00 - 08:00 | 51.7 | 51.1 | | | | | |
| 3 | | 08:00 - 09:00 | 54.9 | 51 | | | | | |
| 4 | | 09:00 – 10:00 | 60.1 | 58.3 | | | | | |
| 5 | | 10:00 - 11:00 | 62.2 | 61 | | | | | |
| 6 | | 11:00 - 12:00 | 60.9 | 59.5 | | | | | |
| 7 | | 12:00 - 13:00 | 63.8 | 62.3 | | | | | |
| 8 | | 13:00 - 14:00 | 65.3 | 63 | | | | | |
| 9 | | 14:00 - 15:00 | 65.3 | 58.2 | | | | | |
| 10 | | 15:00 - 16:00 | 57.8 | 56 | | | | | |
| 11 | | 16:00 - 17:00 | 58 | 64.8 | | | | | |
| 12 | | 17:00 - 18:00 | 57.5 | 56.2 | | | | | |
| 13 | | 18:00 - 19:00 | 55.9 | 55.4 | | | | | |
| 14 | | 19:00 - 20:00 | 56.1 | 54.5 | | | | | |
| 15 | | 20:00 - 21:00 | 54.7 | 53.7 | | | | | |
| 16 | | 21:00 - 22:00 | 55.1 | 53.8 | | | | | |
| | | **Leq Day** | 60.2 | 58.9 | | | | | |
| 1 | Noise Level dB(A)Leq -Night | 22:00-23:00 | 57 | 41.9 | CPCB, Protocol for Ambient Level Noise Monitoring -2015 | 35 dB-135 dB | 35 dB(A) | Industrial<br>Commercial<br>Residential<br>Silence | 70<br>55<br>45<br>50 |
| 2 | | 23:00- 00:00 | 56.1 | 41.9 | | | | | |
| 3 | | 00:00- 01:00 | 54.9 | 41.4 | | | | | |
| 4 | | 01.00-02.00 | 50.7 | 41.3 | | | | | |
| 5 | | 02.00-03.00 | 48.9 | 40.8 | | | | | |
| 6 | | 03.00-04.00 | 47.9 | 40.3 | | | | | |
| 7 | | 04.00-05.00 | 46.6 | 40 | | | | | |
| 8 | | 05:00-06:00 | 48.4 | 39.8 | | | | | |
| | | Leq Night | 53.0 | 41.0 | | | | | |

***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) | | | (Amit Raj Mishra) |
| | ***ANALYSED BY*** | | ***CHECKED BY*** | | ***Authorised Signatory*** |

*Note: The results above relate to the samples tested as received. This report cannot 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**<br><br>Coal mines located in the coal fields of<br>• Jharia<br>• Raniganj<br>• Bokaro | Suspended Particulate Matter (SPM) | Annual Average *<br>24 hours ** | 500 µg/$m^3$<br><br>700 µg/$m^3$ | - High Volume Sampling (Average flow rate not less than 1.1 |
| | Respirable Particulate Matter (size less than 10 µm) (RPM) | Annual Average *<br>24 hours ** | 250 µg/$m^3$<br><br>300 µg/$m^3$ | Respirable Particulate Matter sampling and analysis |
| | Sulphur Dioxide ($SO_2$) | Annual Average *<br>24 hours ** | 80 µg/$m^3$<br><br>120 µg/$m^3$ | 1.Improvedwest and Gaeke method<br>2.Ultraviolet fluorescene |
| | Oxide of Nitrogen as $NO_2$ | Annual Average *<br>24 hours ** | 80 µg/$m^3$<br><br>120 µg/$m^3$ | 1. Jacob & Hochheiser Modified (Na-Arsenic) Method<br>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.

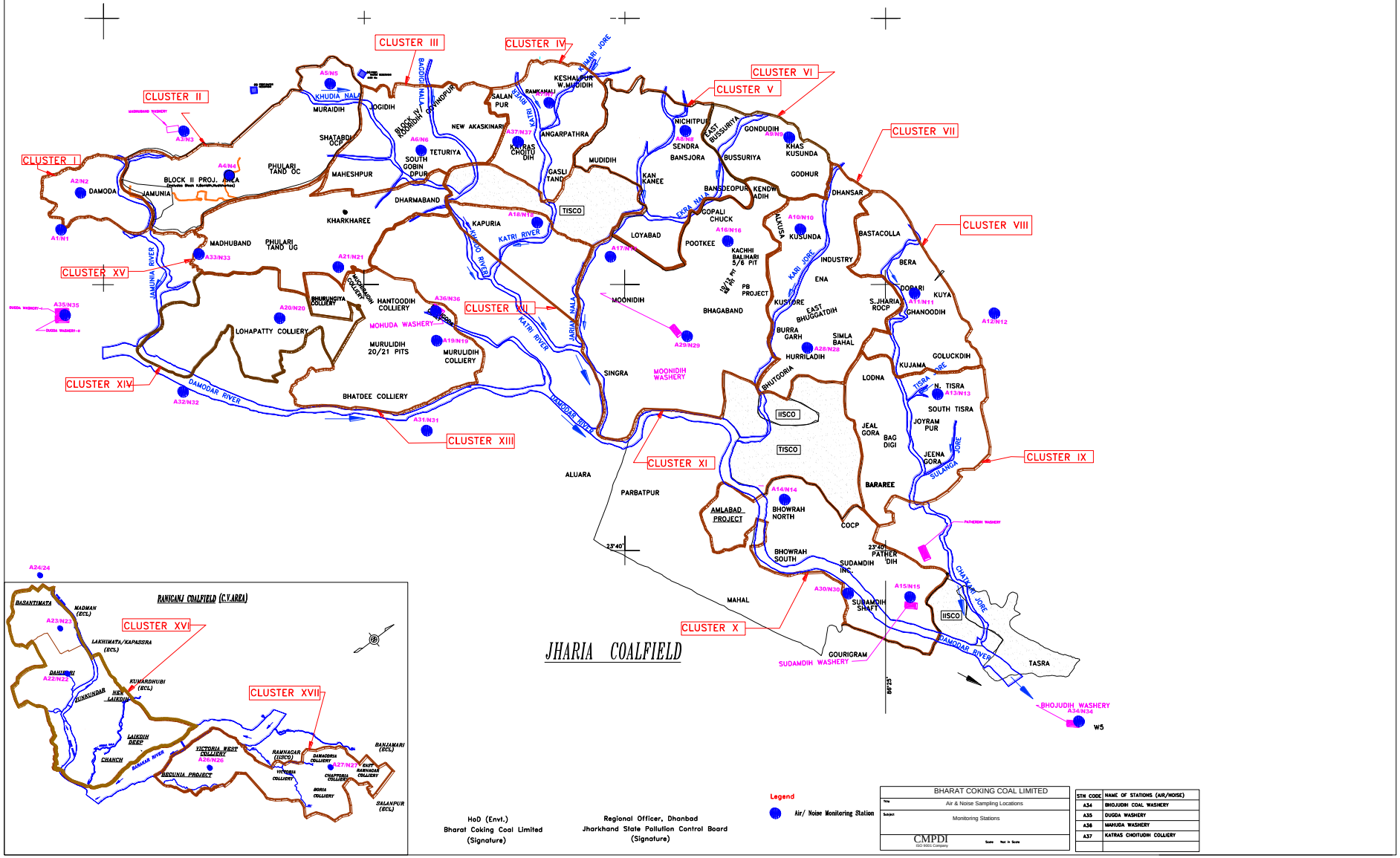
| Pollutant | Time Weighted Average | Concentration in Ambient Air | | Methods of Measurement |
|---|---|---|---|---|
| | | Industrial, Residential, Rural and other Areas | Ecologically Sensitive Area (Notified by Central Government) | |
| **Sulphur Dioxide ($SO_2$), µg/m³** | Annual *<br>24 Hours ** | 50<br>80 | 20<br>80 | -Improved West and Gaeke Method<br>-Ultraviolet Fluorescence |
| **Nitrogendioxide ($NO_2$), µg/m³** | Annual *<br>24 Hours ** | 40<br>80 | 30<br>80 | -Jacob &Hochheiser modified ($NaOH$-$NaAsO_2$) Method<br>-Gas Phase Chemiluminescence |
| **Particulate Matter (Size less than 10µm) or $PM_{10}$, µg/m³** | Annual *<br>24 Hours ** | 60<br>100 | 60<br>100 | -Gravimetric<br>-TEOM<br>-Beta attenuation |
| **Particulate Matter (Size less than 2.5µm) or $PM_{2.5}$, µg/m³** | Annual *<br>24 Hours ** | 40<br>60 | 40<br>60 | -Gravimetric<br>-TEOM<br>-Beta attenuation |
| **Ozone ($O_3$) , µg/m³** | 8 Hours *<br>1 Hour ** | 100<br>180 | 100<br>180 | -UV Photometric<br>-Chemiluminescence<br>-Chemical Method |
| **Lead (Pb) , µg/m³** | Annual *<br>24 Hours ** | 0.50<br>1.0 | 0.50<br>1.0 | -AAS/ICP Method after sampling on EPM 2000 or equivalent filter paper<br>-ED-XRF using Teflon filter |
| **Carbon Monoxide (CO), mg/m³** | 8 Hours **<br>1 Hour ** | 02<br>04 | 02<br>04 | -Non dispersive Infrared (NDIR) Spectroscopy |
| **Ammonia ($NH_3$), µg/m³** | Annual *<br>24 Hours ** | 100<br>400 | 100<br>400 | -Chemiluminescence<br>-Indophenol blue method |
| **Benzene ($C_6H_6$), µg/m³** | Annual * | 05 | 05 | -Gas Chromatography (GC) based continuous analyzer<br>-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.

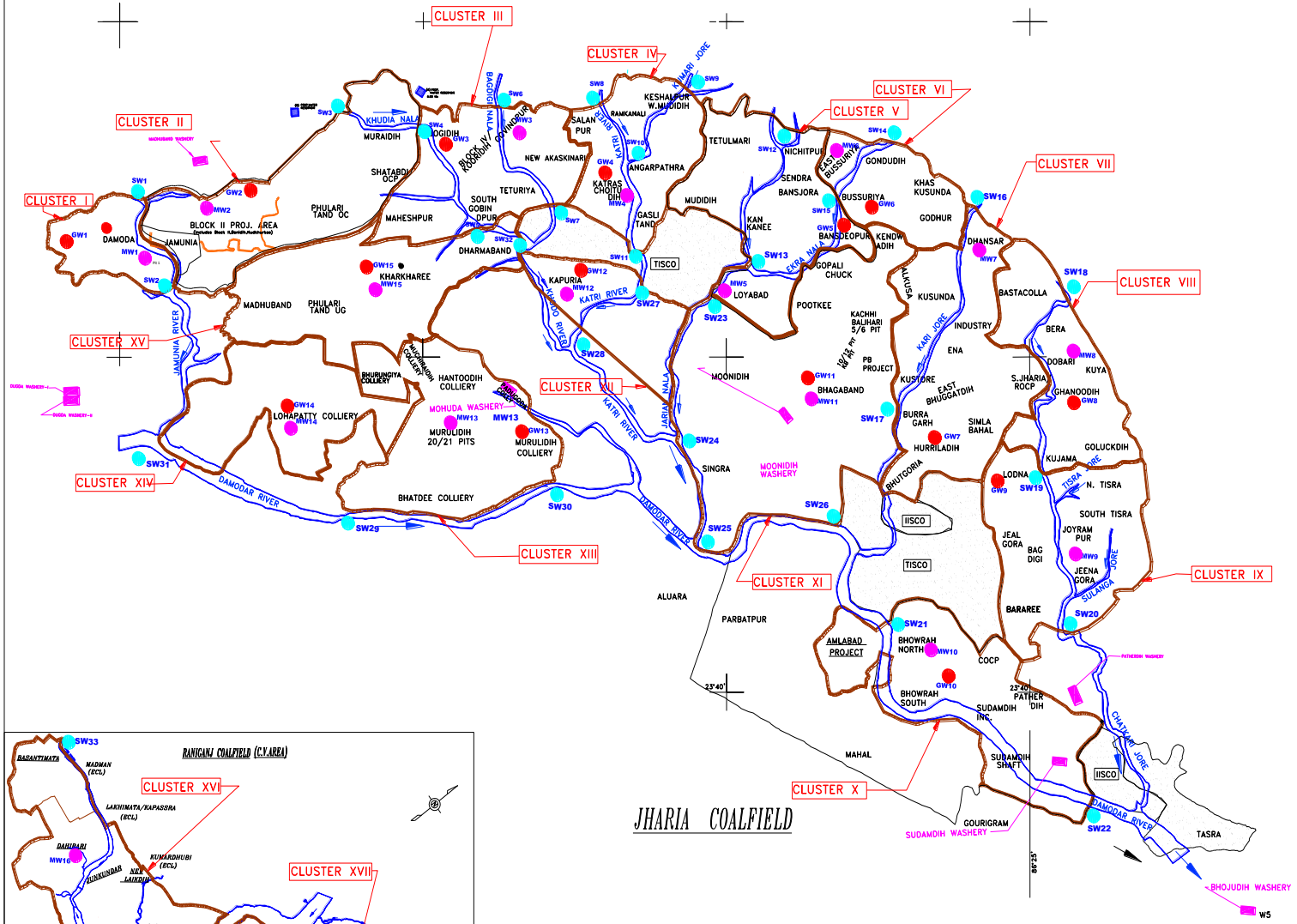
** 24 hourly or 8 hourly or 1 hourly monitored values, as applicable, shall be complied with 98% of the time in a year. 2% of the time, they JUNE exceed the limits but not on two consecutive days of monitoring.

**NOTE:**Whenever and wherever monitoring results on two consecutive days of monitoring exceed the limits specified above for the respective catego

# Location of Air & Noise Monitoring Stations in BCCL



# Water Sampling Locations in BCCL




## INDEX

| Cluster | Suface Water (U/S, D/S) | Name of River/ Nala / Jore | Mine/ Effluent Water | Sampling Location | Ground Water | Sampling Location |
|---|---|---|---|---|---|---|
| I | SW1, SW2 | Jamunia River | MW1 | Damoda Area | GW1 | Ghutway Village |
| II | SW3, SW4 | Khudia Nala | MW2 | Block II OCP | GW2 | Joyrampur Village |
| III | SW4, SW5, SW6, SW7 | Khudia Nala, Bagdigi Nala | MW3 | Govindpur Colliery | GW3 | Jogidih Village |
| IV | SW8, SW11, SW9, SW10 | Katri River, Kumari Jore | MW4 | Chotudih | GW4 | Kankanee Village |
| V | SW12, SW13, SW15 | Jarian Nala, Ekra Nala | MW5 | Mudidih | GW5 | Nichitpur |
| VI | SW14, SW15 | Ekra Nala | MW6 | East Bassuria UGP | GW6 | Bansjora Borewell |
| VII | SW16, SW17 | Kari Jore | MW7 | Dhansar UGP | GW7 | Hurriladih |
| VIII | SW18, SW19 | Kashi Jore | MW8 | Dobari UGP | GW8 | Ghanudih |
| IX | SW19, SW20 | Kashi Jore | MW9 | Jeenagora | GW9 | Lodna |
| X | SW21, SW22 | Damodar River | MW10 | Bhowrah North | GW10 | Bhowrah South |
| XI | SW23, SW24, SW25, SW26 | Jarian Nala, Damodar River | MW11 | Bhagaband h UGP | GW11 | Bhagabandh |
| XII | SW27, SW28 | Katri River | MW12 | Kapuria | GW12 | Kapuria |
| XIII | SW29, SW30 | Damodar River | MW13 | Murulidih (20/21) | GW13 | Murilidih |
| XIV | SW31, SW29 | Damodar River | MW14 | Lohapatti | GW14 | Lohapatti |
| XV | SW5, SW32 | Khudia Nala | MW15 | Kharkharee UGP | GW15 | Kharkharee |
| XVI | SW33, SW34 | Khudia River | MW16 | Dahibari OCP | GW16 | Patlabari Village |
| XVII | SW35, SW36 | Barakar River | MW17 | Damagoria Colliery | GW17 | Chaptoria |

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# ENVIRONMENTAL MONITORING REPORT OF BHARAT COKING COAL LIMITED, CLUSTER – XI

**(FOR THE MONTH MAY, 2025)**

**E. C. no. J-11015/77/2011-IA.II (M) dated 26.07.2019.**

# 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 $23^0$37' N to $23^0$52' N latitudes and $86^0$09' E to $86^0$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 ($PM_{10}$), Fine Particulate Matter ($PM_{2.5}$), Sulphur Di-oxide ($SO_2$) and Nitrogen Oxides ($NO_X$). Respirable Dust Samplers (RDS) and Fine Dust

Sampler ($PM_{2.5}$ sampler) were used for sampling of $PM_{10,}$ $SO_2$, & $NO_x$ 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 $PM_{10,}$ $PM_{2.5}$, $SO_2$ 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 $PM_{10}$& $PM_{2.5}$ 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 Standards for Coal Mines were within permissible limits.

### 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-XI is in the Western & Southern part of the Jharia coalfield. It includes a group of 8 Mines (viz. Gopalichak UG&OC Mine**,** Kachhi Balihari 10/12 Pit UG Mine**,** PB UG Project,Bhagabandh UG Mine, Kenwadih UG, Pootkee UG, Kachi Balihari 5/6Pit UG, Moonidih UG mine). The Cluster – XI is situated about 25 - 30 kms from Dhanbad Railway Station. The mines of this Cluster – XI 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 Jarian nala & Damodar River.

1.2 The Project has Environmental Clearance from Ministry of Environment, Forests and Climate Change (MoEF&CC) for a rated capacity 5.08 MTPA (normative) and 6.604 MTPA (peak) capacity of coal production vide letter no. J-11015/77/2011-IA.II (M) dated 26$^{th}$ July, 2019.

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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 $PM_{10}$, $PM_{2.5}$, $SO_2$, NOx 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) Pootkee Balihari Office (A16): Industrial Area**

The location of the sampling station is 23°45'17.23"N 86°21'46.27"E. The sampler was placed at an elevated platform approx. 1.5m above ground level at Project 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 sampler was placed at an elevated platform approx. 1.5m above ground level at project office.

**iii) Moonidih Washery (A29): Industrial Area**

The location of the sampling station is 23°44'26.00"N 86°21'16.00"E. The sampler was placed at a height of approx. 1.5m above ground level at Project office.

**II.BUFFER ZONE Monitoring Location**

**I) Kusunda OCP (A10)**

The location of the sampling station is 23°46'49.07"N 86°24'15.71"E. The sampler was placed at a height of approx. 1.5m above ground level at Safety 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
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DHANBAD. -826005
Phone:0326-223-850
email: rdri2cmpdi@coalindia.in

## Test Report for Ambient Air Samples

| | | | | | |
|---|---|---|---|---|---|
| **Month & Year** | **05/2025** | **Cluster** | **Cluster XI** | **ULR No.** | **TC1432125000001846F** |
| **Customer** | **Environment Department, Bharat Coking Coal Limited (BCCL), Koyla Bhawan, Dhanbad (E-mail: gmenv.bccl@coalindia.in)** | | | **Date of Issue** | **24.06.2025** |
| **Project** | **Pootkee Balihari Office** | **Sample Ref. No.** | **REM/BCCL/2025/05** | **Sampling Method** | **CMPDI/RI-II/LPM 13 , ( IS 5182)** |
| **Date of Sampling** | 06.05.25 | 21.05.25 | **Period of Analysis** | 06.05.25 to 20.06.25 | **Zone of Station:** **Core Zone** |

| **Sl. No.** | **Parameter** | **Method of Analysis** | **Observed Values ( in µg/m³)** | | **Range Of Testing** | **LDL** | **MoEF Standards Notification dated 25th September,2000 (GSR 742 E )** | **NAAQS, 2009** |
|---|---|---|---|---|---|---|---|---|
| | | | **1st FN A3872** | **2nd FN A3952** | | | | |
| 1 | $PM_{10}$ | IS -5182(Part 23):2006, R-2017 | 97 | 95 | 10 µg/m³ - 1000 µg/m³ | 10 µg/m³ | 300 | 100 |
| 2 | $PM_{2.5}$ | IS -5182(Part 24):2019 | 53 | 51 | 10 µg/m³ - 400 µg/m³ | 10 µg/m³ | Not Specified | 60 |
| 3 | $SO_2$ | IS-5182(Part-2): 2001 , R-2017 | 11 | 12 | 10 µg/m³ - 1050 µg/m³ | 10 µg/m³ | 120 | 80 |
| 4 | $NO_2$ | IS-5182 (Part-6): 2006 , R-2017 | **29** | **34** | 06 µg/m³ - 420 µg/m³ | 06 µg/m³ | 120 | 80 |

** LDL indicates Lower Detection Limit,*

***All units are in µg/m3, 24 hourly Average,*

***ANALYSED BY*** (Gaurav Kant) ***CHECKED BY*** (Amit Raj Mishra) ***Authorised Signatory***

***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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Environment Laboratory, Regional Institute-II
Ambient Air Quality Test Report

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**Test Report for Ambient Air Samples**

| | | | | | |
|---|---|---|---|---|---|
| **Month & Year** | **05/2025** | **Cluster** | **Cluster XI** | **ULR No.** | **TC1432125000001846F** |
| **Customer** | **Environment Department, Bharat Coking Coal Limited (BCCL), Koyla Bhawan, Dhanbad (E-mail: gmenv.bccl@coalindia.in)** | | | **Date of Issue** | **24.06.2025** |
| **Project** | **Moonidih UGP** | **Sample Ref. No.** | **REM/BCCL/2025/05** | **Sampling Method** | **CMPDI/RI-II/LPM 13 , ( IS 5182)** |
| **Date of Sampling** | 07.05.25 | 21.05.25 | **Period of Analysis** | 07.05.25 to 20.06.25 | **Zone of Station:** **Core Zone** |

| **Sl. No.** | **Parameter** | **Method of Analysis** | **Observed Values ( in µg/m³)** | | **Range Of Testing** | **LDL** | **MoEF Standards Notification dated 25th September,2000 (GSR 742 E )** | **NAAQS, 2009** |
|---|---|---|---|---|---|---|---|---|
| | | | **1st FN A3878** | **2nd FN A3954** | | | | |
| 1 | $PM_{10}$ | IS -5182(Part 23):2006, R-2017 | 90 | 118 | 10 µg/m³ - 1000 µg/m³ | 10 µg/m³ | 300 | 100 |
| 2 | $PM_{2.5}$ | IS -5182(Part 24):2019 | 54 | 62 | 10 µg/m³ - 400 µg/m³ | 10 µg/m³ | Not Specified | 60 |
| 3 | $SO_2$ | IS-5182(Part-2): 2001 , R-2017 | <10 | 10 | 10 µg/m³ - 1050 µg/m³ | 10 µg/m³ | 120 | 80 |
| 4 | $NO_2$ | IS-5182 (Part-6): 2006 , R-2017 | **32** | **34** | 06 µg/m³ - 420 µg/m³ | 06 µg/m³ | 120 | 80 |

** LDL indicates Lower Detection Limit,*

***All units are in µg/m3, 24 hourly Average,*

***ANALYSED BY***

(Gaurav Kant)
***CHECKED BY***

(Amit Raj Mishra)
***Authorised Signatory***

***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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Environment Laboratory, Regional Institute-II
Ambient Air Quality Test Report

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email: rdri2cmpdi@coalindia.in

**Test Report for Ambient Air Samples**

| | | | | | |
|---|---|---|---|---|---|
| **Month & Year** | **05/2025** | **Cluster** | **Cluster XI** | **ULR No.** | **TC1432125000001846F** |
| **Customer** | **Environment Department, Bharat Coking Coal Limited (BCCL), Koyla Bhawan, Dhanbad (E-mail: gmenv.bccl@coalindia.in)** | | | **Date of Issue** | **24.06.2025** |
| **Project** | **Moonidih Washery** | **Sample Ref. No.** | **REM/BCCL/2025/05** | **Sampling Method** | **CMPDI/RI-II/LPM 13 , ( IS 5182)** |
| **Date of Sampling** | 07.05.25 | 21.05.25 | **Period of Analysis** | 07.05.25 to 20.06.25 | **Zone of Station:** **Core Zone** |

| **Sl. No.** | **Parameter** | **Method of Analysis** | **Observed Values ( in µg/m³)** 1st FN **A3877** | 2nd FN **A3953** | **Range Of Testing** | **LDL** | **MoEF Standards Notification dated 25th September,2000 (GSR 742 E )** | **NAAQS, 2009** |
|---|---|---|---|---|---|---|---|---|
| 1 | $PM_{10}$ | IS -5182(Part 23):2006, R-2017 | 97 | 93 | 10 µg/m³ - 1000 µg/m³ | 10 µg/m³ | 300 | 100 |
| 2 | $PM_{2.5}$ | IS -5182(Part 24):2019 | 52 | 51 | 10 µg/m³ - 400 µg/m³ | 10 µg/m³ | Not Specified | 60 |
| 3 | $SO_2$ | IS-5182(Part-2): 2001 , R-2017 | 10 | <10 | 10 µg/m³ - 1050 µg/m³ | 10 µg/m³ | 120 | 80 |
| 4 | $NO_2$ | IS-5182 (Part-6): 2006 , R-2017 | **29** | **33** | 06 µg/m³ - 420 µg/m³ | 06 µg/m³ | 120 | 80 |

** LDL indicates Lower Detection Limit,*

***All units are in µg/m3, 24 hourly Average,*

***ANALYSED BY***

(Gaurav Kant)
***CHECKED BY***

(Amit Raj Mishra)
***Authorised Signatory***

***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** | **05/2025** | **Cluster** | **Cluster XI** | **Report No.** | TC1432125000001846F |
| **Customer** | **Environment Department, Bharat Coking Coal Limited (BCCL), Koyla Bhawan, Dhanbad (E-mail: gmenv.bccl@coalindia.in)** | | | **Date of Issue** | **24.06.2025** |
| **Project** | **Kusunda** | **Sample Ref. No.** | **REM/BCCL/2025/05** | **Sampling Method** | **CMPDI/RI-II/LPM 13 , ( IS 5182)** |
| **Date of Sampling** | 09.05.25 | 16.05.25 | **Period of Analysis** | 09.05.25 to 20.06.25 | **Zone of Station:** **Buffer Zone** |

| **Sl. No.** | **Parameter** | **Method of Analysis** | **Observed Values ( in µg/m³)** | | **Range Of Testing** | **LDL** | **MoEF Standards Notification dated 25th September,2000 (GSR 742 E )** | **NAAQS, 2009** |
|---|---|---|---|---|---|---|---|---|
| | | | **1st FN A3892** | **2nd FN A3931** | | | | |
| 1 | $PM_{10}$ | IS -5182(Part 23):2006, R-2017 | 102 | 118 | 10 µg/m³ - 1000 µg/m³ | 10 µg/m³ | 300 | 100 |
| 2 | $PM_{2.5}$ | IS -5182(Part 24):2019 | 58 | 67 | 10 µg/m³ - 400 µg/m³ | 10 µg/m³ | Not Specified | 60 |
| 3 | $SO_2$ | IS-5182(Part-2): 2001 , R-2017 | 12 | 11 | 10 µg/m³ - 1050 µg/m³ | 10 µg/m³ | 120 | 80 |
| 4 | $NO_2$ | IS-5182 (Part-6): 2006 , R-2017 | 33 | 27 | 06 µg/m³ - 420 µg/m³ | 06 µg/m³ | 120 | 80 |

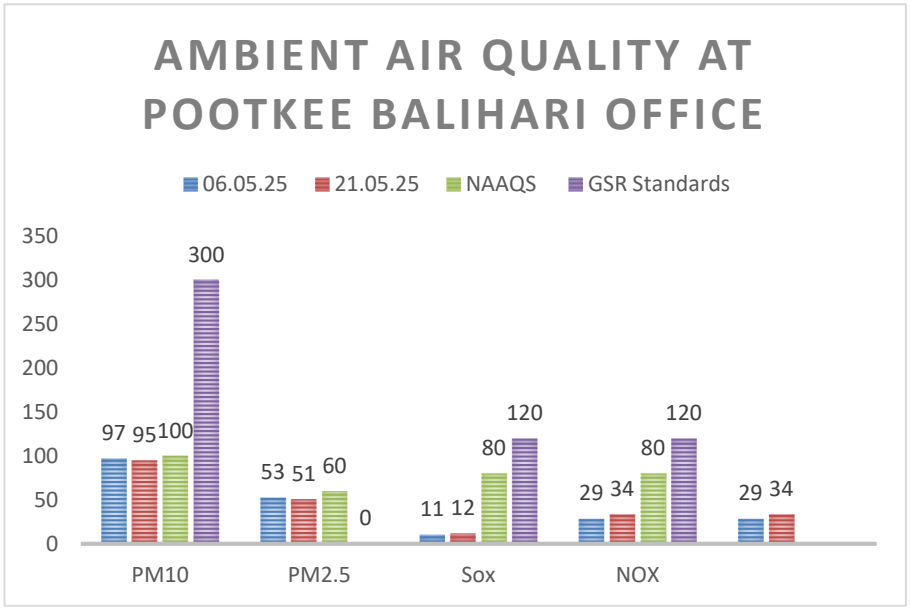
** LDL indicates Lower Detection Limit,*
***All units are in µg/m3, 24 hourly Average,*

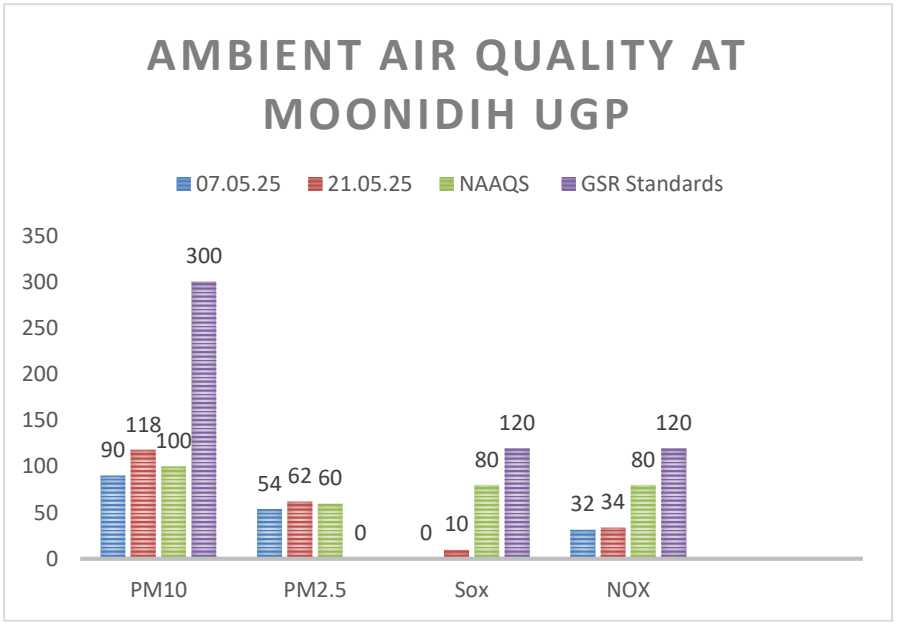
***ANALYSED BY*** (Gaurav Kant) ***CHECKED BY*** (Amit Raj Mishra) ***Authorised Signatory***

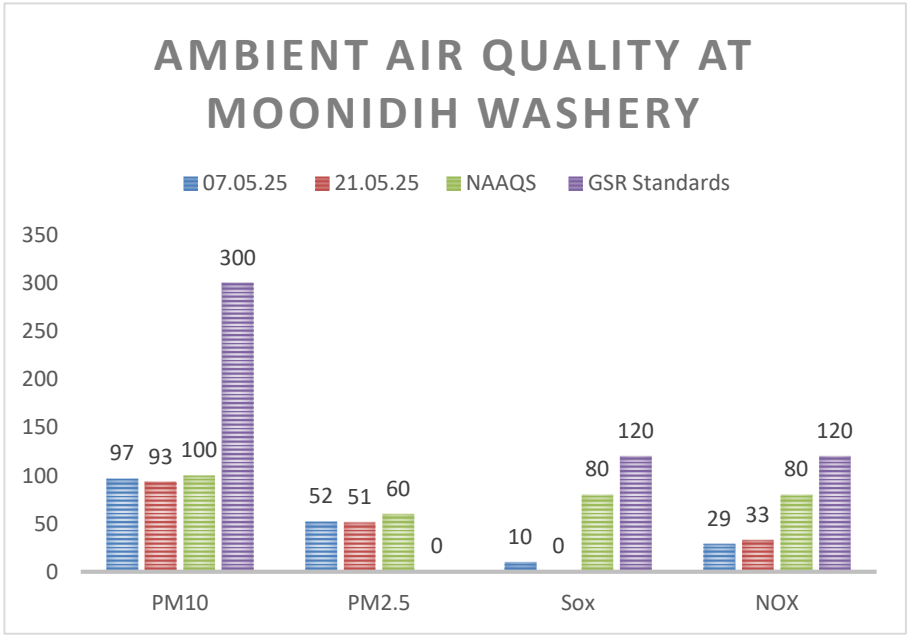
***Note**: The results above relate to the samples tested as received. This report can not be reproduced in part or full without the written permission of the HOD(Env) , CMPDI, RI-II.*

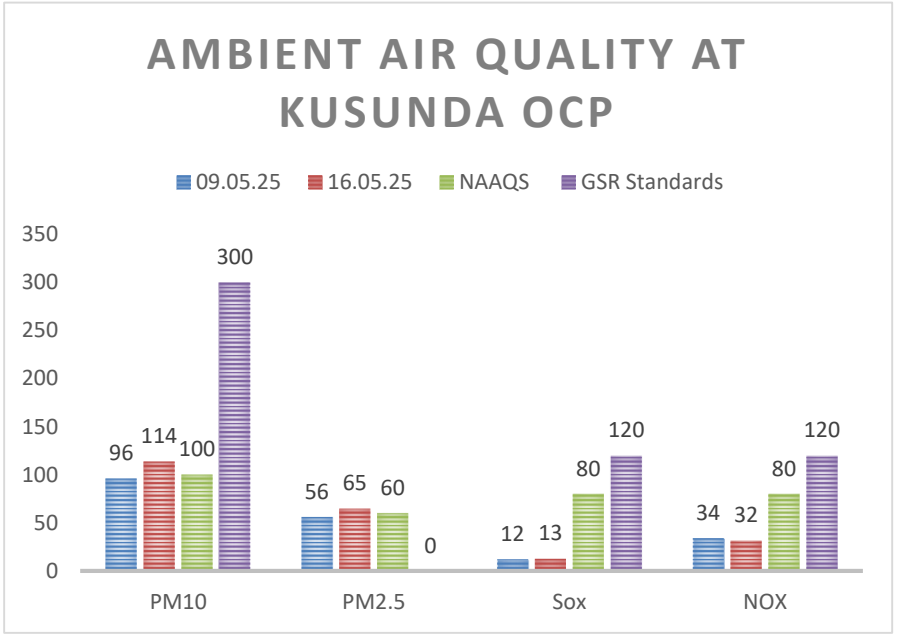
*---- End of Report ----*

*Page -1 of 1*


AMBIENT AIR QUALITY AT POOTKEE BALIHARI OFFICE
06.05.25
21.05.25
NAAQS
GSR Standards
350
300
250
200
150
100
50
0
97 95 100 300
53 51 60 0
11 12 80 120
29 34 80 120
29 34
PM10
PM2.5
Sox
NOX


AMBIENT AIR QUALITY AT MOONIDIH UGP
07.05.25
21.05.25
NAAQS
GSR Standards
350
300
250
200
150
100
50
0
90 118 100 300
54 62 60 0
0 10 80 120
32 34 80 120
PM10
PM2.5
Sox
NOX


AMBIENT AIR QUALITY AT MOONIDIH WASHERY
07.05.25
21.05.25
NAAQS
GSR Standards
350
300
250
200
150
100
50
0
97 93 100 300
52 51 60 0
10 0 80 120
29 33 80 120
PM10
PM2.5
Sox
NOX


AMBIENT AIR QUALITY AT KUSUNDA OCP
09.05.25
16.05.25
NAAQS
GSR Standards
350
300
250
200
150
100
50
0
96 114 100 300
56 65 60 0
12 13 80 120
34 32 80 120
PM10
PM2.5
Sox
NOX

# WATER QUALITY MONITORING

## 3.1 Location of sampling sites

(Refer **Plate No. – II**)

### i) Mine Discharge of Bhagabandh (MW11)

A sampling point is fixed to assess the effluent quality of Mine discharge. This location is selected to monitor effluent discharge in to Kari jore.

## 3.2 Methodology of sampling and analysis

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

## 3.3 Results & Interpretations

The results are given in tabular form along with the applicable standards. Results are compared with Schedule - VI, effluent prescribed by MoEF&CC. Results show that most of the parameters are within the permissible limits.

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

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

**Test Report for Mine Effluent samples**

| | | | | | | |
|---|---|---|---|---|---|---|
| **Month & Year** | **05/2025** | **Cluster** | **Cluster XI** | **ULR No.** | TC1432125000001864F | |
| **Customer** | **Environment Department, Bharat Coking Coal Limited (BCCL), Koyla Bhawan, Dhanbad (E-mail: gmenv.bccl@coalindia.in)** | | | | **Date of Issue** | **24.06.2025** |
| **Project** | | **Sampling Ref. No.** | **REM/BCCL/2025/ 05** | **Sampling Method** **IS 3025 (Part-1)** | | **CMPDI/RI-II/LPM 13** |
| **Sampling Stations** | **(i)** | **Bhagabandh** | **Sample Collected in 2.5 Ltr Jerricane , Color as observed is transparent** | | **Period of Analysis** | **13.05.25 TO 31.05.25** |
| | | | **Date of Sampling** | **13.05.25** **26.05.25** | | |

| **Sl. No.** | **Parameter** | **Method of Analysis** | **Observed Values** | | **STANDARDS FOR COAL MINES (Stipulated by Ministry of Environment and Forests (MoEF), Vide Notification No. GSR 742(E), Dt: 25.09.2000)** | **LDL** |
|---|---|---|---|---|---|---|
| | | | **M1515** | **M1542** | | |
| 1 | Total Suspended Solids | IS 3025/17:1984, R :2017, Gravimetric | 40 | 42 | *100 (Max)* | 10 |
| 2 | pH | IS-3025/11:1983, R-2017, Electrometric | 7.59 | 7.54 | *5.5 - 9.0* | 0.2 |
| 3 | Oil & Grease | IS 3025/39:1991, R : 2019, Partition Gravimetric | <4.0 | <4.0 | *10 (Max)* | 2 |
| 4 | COD | APHA 23rd Edition 5220 C Titrimetric Method | 32 | 36 | *250 (Max)* | 4 |

***Grab sampling carried out for water samples **All units in mg/L unless specified otherwise *LDL indicates Lower Detection Limit & BDL indicates Below Detection Limit,*

***ANALYSED BY***

(Kumar Vaibhav)
***CHECKED BY***

(Amit Raj Mishra)
***Authorised Signatory***

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

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

# NOISE LEVEL QUALITY MONITORING

## 4.1Location of sampling sites

1. **Pootkee Balihari Office (N16)**
2. **Moonidih UGP (N17)**
3. **Moonidih Washery (N29)**
4. **Kusunda OCP (N10)**

**4.2**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

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

TC-14321

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| **Month & Year** | **05/2025** | **Cluster** | **Cluster XI** | | | **ULR No.** | **TC1432125000001880F** |
| **Customer** | **Environment Department, Bharat Coking Coal Limited (BCCL), Koyla Bhawan, Dhanbad (E-mail: gmenv.bccl@coalindia.in)** | | | | | **Date of Issue** | **24.06.2025** |
| **Project** | | **Sample Ref. No.** | **REM/BCCL/2025/ 05** | | **Sampling Method** | **CMPDI/RI-II/LPM 22** | |
| **Sampling Stations** | **i** | **Pootki Balihari Office** | **Date of Sampling** | 06.05.25 | 21.05.25 | **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 | 51.5 | 52.8 | CPCB, Protocol for Ambient Level Noise Monitoring -2015 | 35 dB-135 dB | 35 Db (A) | Industrial<br>Commercial<br>Residential<br>Silence | 75<br>65<br>55<br>50 |
| 2 | | 07:00 - 08:00 | 54.9 | 55.5 | | | | | |
| 3 | | 08:00 - 09:00 | 57.5 | 58.2 | | | | | |
| 4 | | 09:00 – 10:00 | 63.9 | 64.6 | | | | | |
| 5 | | 10:00 - 11:00 | 65.5 | 66.4 | | | | | |
| 6 | | 11:00 - 12:00 | 60.6 | 61.4 | | | | | |
| 7 | | 12:00 - 13:00 | 59 | 58.3 | | | | | |
| 8 | | 13:00 - 14:00 | 56.3 | 56.1 | | | | | |
| 9 | | 14:00 - 15:00 | 55.2 | 53 | | | | | |
| 10 | | 15:00 - 16:00 | 52.3 | 52.7 | | | | | |
| 11 | | 16:00 - 17:00 | 51.5 | 51.1 | | | | | |
| 12 | | 17:00 - 18:00 | 51.2 | 51.9 | | | | | |
| 13 | | 18:00 - 19:00 | 51.2 | 51.6 | | | | | |
| 14 | | 19:00 - 20:00 | 49.4 | 50.7 | | | | | |
| 15 | | 20:00 - 21:00 | 49.3 | 49.5 | | | | | |
| 16 | | 21:00 - 22:00 | 49.2 | 48.8 | | | | | |
| | | Leq Day | 58.2 | 58.8 | | | | | |
| 1 | Noise Level dB(A)Leq -Night | 22:00-23:00 | 45.8 | 46 | CPCB, Protocol for Ambient Level Noise Monitoring -2015 | 35 dB-135 dB | 35 dB (A) | Industrial<br>Commercial<br>Residential<br>Silence | 70<br>55<br>45<br>50 |
| 2 | | 23:00- 00:00 | 45.1 | 45.4 | | | | | |
| 3 | | 00:00- 01:00 | 44.1 | 45 | | | | | |
| 4 | | 01.00-02.00 | 44 | 44.7 | | | | | |
| 5 | | 02.00-03.00 | 43.4 | 43.6 | | | | | |
| 6 | | 03.00-04.00 | 43.2 | 43.1 | | | | | |
| 7 | | 04.00-05.00 | 44.1 | 44.2 | | | | | |
| 8 | | 05:00-06:00 | 44.5 | 44.4 | | | | | |
| | | Leq Night | 44.4 | 44.6 | | | | | |

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

| | | | | | |
|---|---|---|---|---|---|
| Sampling Assistants | | (Gaurav Kant) | | | (Amit Raj Mishra) |
| ANALYSED BY | | CHECKED BY | | | Authorised Signatory |

Note: The results above relate to the samples tested as received. This report cannot 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
CMPDIL, RI-II
KOYLA BHAWAN OMPLEX
DHANBAD. -826005
Phone:0326-223-850
email:i2cmpdi@coalindia.in

# Ambient Noise Level Test Report

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| **Month & Year** | **05/2025** | **Cluster** | **Cluster XI** | | | **ULR No.** | **TC1432125000001880F** |
| **Customer** | **Environment Department, Bharat Coking Coal Limited (BCCL), Koyla Bhawan, Dhanbad (E-mail: gmenv.bccl@coalindia.in)** | | | | | **Date of Issue** | **24.06.2025** |
| **Project** | | **Sample Ref. No.** | **REM/BCCL/2025/05** | **Sampling Method** | | **CMPDI/RI-II/LPM 22** | |
| **Sampling Stations** | **i** | **Moonidih UGP** | **Date of Sampling** | 07.05.25 | 21.05.25 | **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 | 51.3 | 52.1 | CPCB, Protocol for Ambient Level Noise Monitoring -2015 | 35 dB-135 dB | 35 dB(A) | Industrial<br>Commercial<br>Residential<br>Silence | 75<br>65<br>55<br>50 |
| 2 | | 07:00 - 08:00 | 46.9 | 47.8 | | | | | |
| 3 | | 08:00 - 09:00 | 54.6 | 56.2 | | | | | |
| 4 | | 09:00 – 10:00 | 52.7 | 50.2 | | | | | |
| 5 | | 10:00 - 11:00 | 55.8 | 54.7 | | | | | |
| 6 | | 11:00 - 12:00 | 59.2 | 60 | | | | | |
| 7 | | 12:00 - 13:00 | 57.3 | 57 | | | | | |
| 8 | | 13:00 - 14:00 | 59 | 57.9 | | | | | |
| 9 | | 14:00 - 15:00 | 55.1 | 54.7 | | | | | |
| 10 | | 15:00 - 16:00 | 53.3 | 52.7 | | | | | |
| 11 | | 16:00 - 17:00 | 52.9 | 53.1 | | | | | |
| 12 | | 17:00 - 18:00 | 52.5 | 53.1 | | | | | |
| 13 | | 18:00 - 19:00 | 51.6 | 52.1 | | | | | |
| 14 | | 19:00 - 20:00 | 52.3 | 51.9 | | | | | |
| 15 | | 20:00 - 21:00 | 50.8 | 50.6 | | | | | |
| 16 | | 21:00 - 22:00 | 50.3 | 50.5 | | | | | |
| | | **Leq Day** | 54.6 | 54.6 | | | | | |
| 1 | Noise Level dB(A)Leq -Night | 22:00-23:00 | 44.4 | 44.4 | CPCB, Protocol for Ambient Level Noise Monitoring -2015 | 35 dB-135 dB | 35 dB(A) | Industrial<br>Commercial<br>Residential<br>Silence | 70<br>55<br>45<br>50 |
| 2 | | 23:00- 00:00 | 43.9 | 44.1 | | | | | |
| 3 | | 00:00- 01:00 | 43.1 | 44.1 | | | | | |
| 4 | | 01.00-02.00 | 42.3 | 42.9 | | | | | |
| 5 | | 02.00-03.00 | 42.1 | 42.2 | | | | | |
| 6 | | 03.00-04.00 | 42.1 | 42.3 | | | | | |
| 7 | | 04.00-05.00 | 43.5 | 43.6 | | | | | |
| 8 | | 05:00-06:00 | 43.9 | 44.1 | | | | | |
| | | **Leq Night** | 43.2 | 43.5 | | | | | |

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

| | | | |
|---|---|---|---|
| Sampling Assistants | (Gaurav Kant) | | (Amit Raj Mishra) |
| ***ANALYSED BY*** | ***CHECKED BY*** | | ***Authorised Signatory*** |

*Note: The results above relate to the samples tested as received. This report cannot 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*

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

TC-14321

cmpdi A Mini Ratna Company

# CENTRAL MINE PLANNING AND DESIGN INSTITUTE LIMITED

## Environment Laboratory, Regional Institute-II

## Ambient Noise Level Test Report

| | | | | | |
|---|---|---|---|---|---|
| **Month & Year** | **05/2025** | **Cluster** | **Cluster XI** | **ULR No.** | **TC1432125000001880F** |
| **Customer** | **Environment Department, Bharat Coking Coal Limited (BCCL), Koyla Bhawan, Dhanbad (E-mail: gmenv.bccl@coalindia.in)** | | | **Date of Issue** | **24.06.2025** |
| **Project** | | **Sample Ref. No.** | **REM/BCCL/2025/05** | **Sampling Method** | **CMPDI/RI-II/LPM 22** |
| **Sampling Stations** | **i** | **Moonidih Washery** | **Date of Sampling** 07.05.25 – 21.05.25 | **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 | 50.3 | 50.5 | CPCB, Protocol for Ambient Level Noise Monitoring -2015 | 35 dB-135 dB | 35 dB(A) | Industrial<br>Commercial<br>Residential<br>Silence | 75<br>65<br>55<br>50 |
| 2 | | 07:00 - 08:00 | 52.7 | 53.1 | | | | | |
| 3 | | 08:00 - 09:00 | 56.5 | 56 | | | | | |
| 4 | | 09:00 – 10:00 | 60.1 | 60.2 | | | | | |
| 5 | | 10:00 - 11:00 | 62.4 | 62.4 | | | | | |
| 6 | | 11:00 - 12:00 | 63.5 | 61 | | | | | |
| 7 | | 12:00 - 13:00 | 65.2 | 66.9 | | | | | |
| 8 | | 13:00 - 14:00 | 64.6 | 64.6 | | | | | |
| 9 | | 14:00 - 15:00 | 59.4 | 60.2 | | | | | |
| 10 | | 15:00 - 16:00 | 60.2 | 59.1 | | | | | |
| 11 | | 16:00 - 17:00 | 58.5 | 57.5 | | | | | |
| 12 | | 17:00 - 18:00 | 57.3 | 56.5 | | | | | |
| 13 | | 18:00 - 19:00 | 55.8 | 55.7 | | | | | |
| 14 | | 19:00 - 20:00 | 54.6 | 55.2 | | | | | |
| 15 | | 20:00 - 21:00 | 53.7 | 51.9 | | | | | |
| 16 | | 21:00 - 22:00 | 51.3 | 52.1 | | | | | |
| | | | 60.0 | 60.1 | | | | | |
| 1 | Noise Level dB(A)Leq -Night | 22:00-23:00 | 48 | 48.6 | CPCB, Protocol for Ambient Level Noise Monitoring -2015 | 35 dB-135 dB | 35 dB(A) | Industrial<br>Commercial<br>Residential<br>Silence | 70<br>55<br>45<br>50 |
| 2 | | 23:00- 00:00 | 46.6 | 46 | | | | | |
| 3 | | 00:00- 01:00 | 42.5 | 42.4 | | | | | |
| 4 | | 01.00-02.00 | 42.3 | 42.3 | | | | | |
| 5 | | 02.00-03.00 | 42 | 41 | | | | | |
| 6 | | 03.00-04.00 | 41.5 | 42.2 | | | | | |
| 7 | | 04.00-05.00 | 43.5 | 43.9 | | | | | |
| 8 | | 05:00-06:00 | 43.9 | 44.1 | | | | | |
| | | **Leq Night** | 44.4 | 44.5 | | | | | |

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

| | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| Sampling Assistants | | | (Gaurav Kant) | | | | | | (Amit Raj Mishra) |
| | ***ANALYSED BY*** | | ***CHECKED BY*** | | | | | | ***Authorised Signatory*** |

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

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

*Page -1 of 1*

TC-14321

# 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** | **05/2025** | **Cluster** | **Cluster XI** | **ULR No.** | **TC1432125000001880F** |
| **Customer** | **Environment Department, Bharat Coking Coal Limited (BCCL), Koyla Bhawan, Dhanbad (E-mail: gmenv.bccl@coalindia.in)** | | | **Date of Issue** | **24.06.2025** |
| **Project** | | **Sample Ref. No.** | **REM/BCCL/2025/ 05** | **Sampling Method** | **CMPDI/RI-II/LPM 22** |
| **Sampling Stations** | **i** | **Kusunda OCP** | **Date of Sampling** | 09.05.25 – 16.05.25 | **Zone Category of Station:** **Bufferr 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 | 50.3 | 50.6 | CPCB, Protocol for Ambient Level Noise Monitoring -2015 | 35 dB-135 dB | 35 dB(A) | Industrial<br>Commercial<br>Residential<br>Silence | 75<br>65<br>55<br>50 |
| 2 | | 07:00 - 08:00 | 53.7 | 53.1 | | | | | |
| 3 | | 08:00 - 09:00 | 57 | 53 | | | | | |
| 4 | | 09:00 – 10:00 | 62.4 | 60.5 | | | | | |
| 5 | | 10:00 - 11:00 | 64.6 | 63.4 | | | | | |
| 6 | | 11:00 - 12:00 | 63.2 | 61.8 | | | | | |
| 7 | | 12:00 - 13:00 | 66.3 | 64.7 | | | | | |
| 8 | | 13:00 - 14:00 | 67.7 | 65.4 | | | | | |
| 9 | | 14:00 - 15:00 | 67.7 | 60.4 | | | | | |
| 10 | | 15:00 - 16:00 | 60 | 59.4 | | | | | |
| 11 | | 16:00 - 17:00 | 60.2 | 67.3 | | | | | |
| 12 | | 17:00 - 18:00 | 59.7 | 58.3 | | | | | |
| 13 | | 18:00 - 19:00 | 58 | 57.4 | | | | | |
| 14 | | 19:00 - 20:00 | 58.2 | 56.5 | | | | | |
| 15 | | 20:00 - 21:00 | 56.8 | 55.8 | | | | | |
| 16 | | 21:00 - 22:00 | 57.2 | 55.9 | | | | | |
| | | **Leq Day** | 62.6 | 61.3 | | | | | |
| 1 | Noise Level dB(A)Leq -Night | 22:00-23:00 | 52.7 | 38.6 | CPCB, Protocol for Ambient Level Noise Monitoring -2015 | 35 dB-135 dB | 35 dB(A) | Industrial<br>Commercial<br>Residential<br>Silence | 70<br>55<br>45<br>50 |
| 2 | | 23:00- 00:00 | 51.8 | 38.6 | | | | | |
| 3 | | 00:00- 01:00 | 50.7 | 38.2 | | | | | |
| 4 | | 01.00-02.00 | 46.7 | 38.1 | | | | | |
| 5 | | 02.00-03.00 | 45.1 | 37.7 | | | | | |
| 6 | | 03.00-04.00 | 44.2 | 37.2 | | | | | |
| 7 | | 04.00-05.00 | 43 | 36.9 | | | | | |
| 8 | | 05:00-06:00 | 44.6 | 36.7 | | | | | |
| | | Leq Night | 48.8 | 37.8 | | | | | |

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

| | | | | |
|---|---|---|---|---|
| Sampling Assistants | (Gaurav Kant) | | | (Amit Raj Mishra) |
| ***ANALYSED BY*** | ***CHECKED BY*** | | | ***Authorised Signatory*** |

*Note: The results above relate to the samples tested as received. This report cannot 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**<br><br>Coal mines located in the coal fields of<br>• Jharia<br>• Raniganj<br>• Bokaro | Suspended Particulate Matter (SPM) | Annual Average *<br>24 hours ** | 500 µg/$m^3$<br><br>700 µg/$m^3$ | - High Volume Sampling (Average flow rate not less than 1.1 |
| | Respirable Particulate Matter (size less than 10 µm) (RPM) | Annual Average *<br>24 hours ** | 250 µg/$m^3$<br><br>300 µg/$m^3$ | Respirable Particulate Matter sampling and analysis |
| | Sulphur Dioxide ($SO_2$) | Annual Average *<br>24 hours ** | 80 µg/$m^3$<br><br>120 µg/$m^3$ | 1.Improvedwest and Gaeke method<br>2.Ultraviolet fluorescene |
| | Oxide of Nitrogen as $NO_2$ | Annual Average *<br>24 hours ** | 80 µg/$m^3$<br><br>120 µg/$m^3$ | 1. Jacob & Hochheiser Modified (Na-Arsenic) Method<br>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.

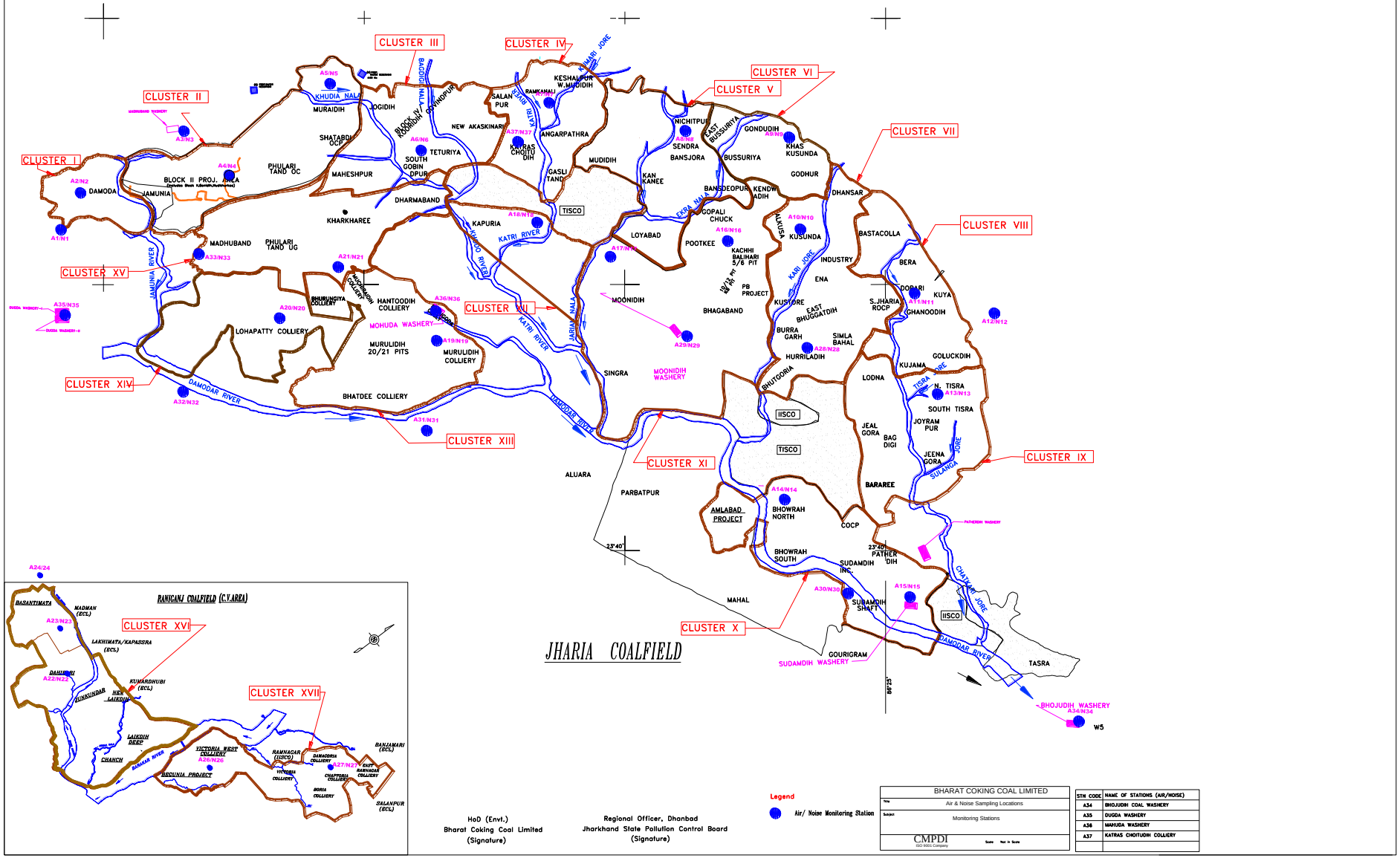
| Pollutant | Time Weighted Average | Concentration in Ambient Air | | Methods of Measurement |
|---|---|---|---|---|
| | | Industrial, Residential, Rural and other Areas | Ecologically Sensitive Area (Notified by Central Government) | |
| **Sulphur Dioxide ($SO_2$), µg/m³** | Annual *<br>24 Hours ** | 50<br>80 | 20<br>80 | -Improved West and Gaeke Method<br>-Ultraviolet Fluorescence |
| **Nitrogendioxide ($NO_2$), µg/m³** | Annual *<br>24 Hours ** | 40<br>80 | 30<br>80 | -Jacob &Hochheiser modified ($NaOH$-$NaAsO_2$) Method<br>-Gas Phase Chemiluminescence |
| **Particulate Matter (Size less than 10µm) or $PM_{10}$, µg/m³** | Annual *<br>24 Hours ** | 60<br>100 | 60<br>100 | -Gravimetric<br>-TEOM<br>-Beta attenuation |
| **Particulate Matter (Size less than 2.5µm) or $PM_{2.5}$, µg/m³** | Annual *<br>24 Hours ** | 40<br>60 | 40<br>60 | -Gravimetric<br>-TEOM<br>-Beta attenuation |
| **Ozone ($O_3$) , µg/m³** | 8 Hours *<br>1 Hour ** | 100<br>180 | 100<br>180 | -UV Photometric<br>-Chemiluminescence<br>-Chemical Method |
| **Lead (Pb) , µg/m³** | Annual *<br>24 Hours ** | 0.50<br>1.0 | 0.50<br>1.0 | -AAS/ICP Method after sampling on EPM 2000 or equivalent filter paper<br>-ED-XRF using Teflon filter |
| **Carbon Monoxide (CO), mg/m³** | 8 Hours **<br>1 Hour ** | 02<br>04 | 02<br>04 | -Non dispersive Infrared (NDIR) Spectroscopy |
| **Ammonia ($NH_3$), µg/m³** | Annual *<br>24 Hours ** | 100<br>400 | 100<br>400 | -Chemiluminescence<br>-Indophenol blue method |
| **Benzene ($C_6H_6$), µg/m³** | Annual * | 05 | 05 | -Gas Chromatography (GC) based continuous analyzer<br>-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.

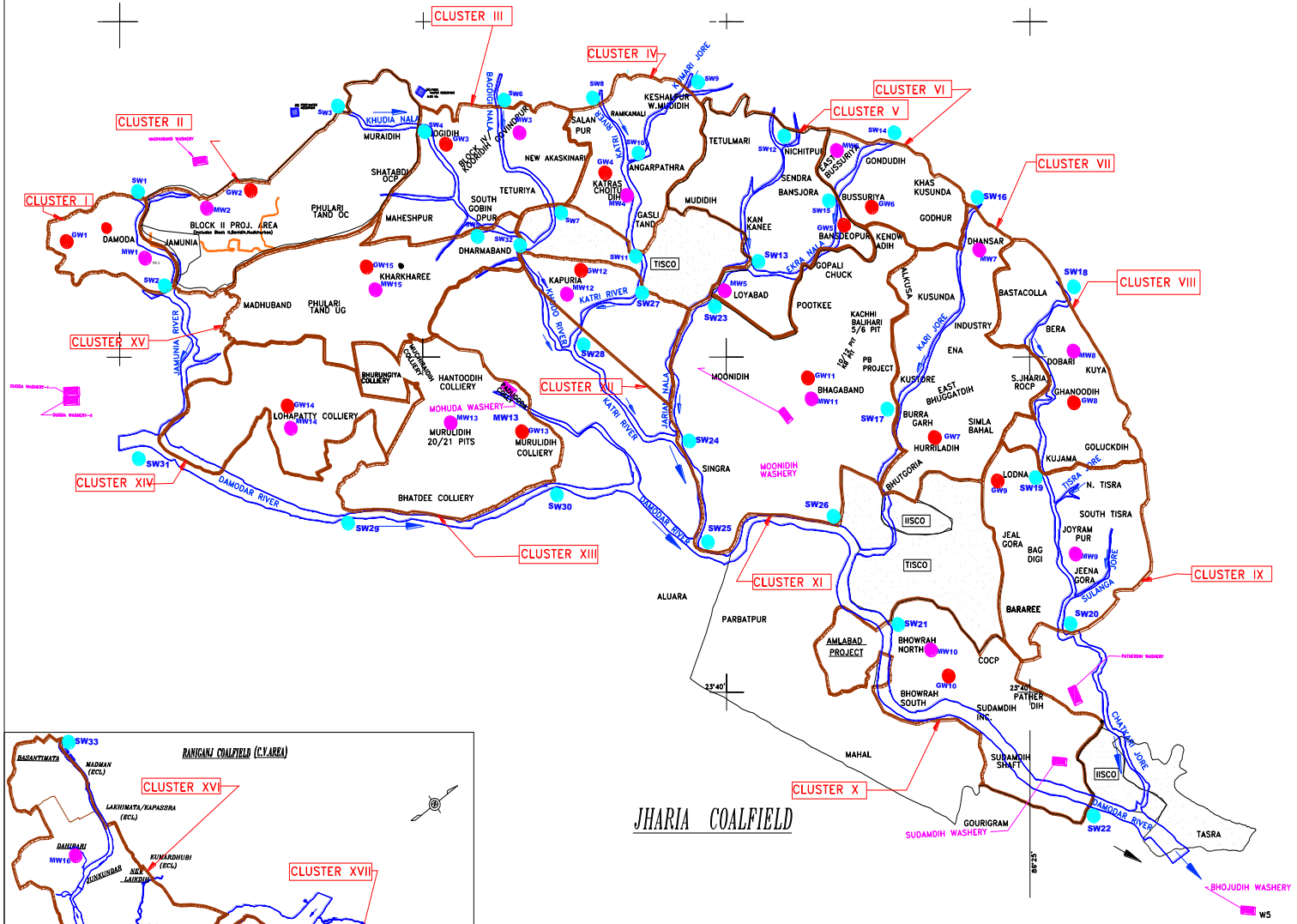
** 24 hourly or 8 hourly or 1 hourly monitored values, as applicable, shall be complied with 98% of the time in a year. 2% of the time, they JUNE exceed the limits but not on two consecutive days of monitoring.

**NOTE:**Whenever and wherever monitoring results on two consecutive days of monitoring exceed the limits specified above for the respective catego

# Location of Air & Noise Monitoring Stations in BCCL



# Water Sampling Locations in BCCL




## INDEX

| Cluster | Suface Water (U/S, D/S) | Name of River/ Nala / Jore | Mine/ Effluent Water | Sampling Location | Ground Water | Sampling Location |
|---|---|---|---|---|---|---|
| I | SW1, SW2 | Jamunia River | MW1 | Damoda Area | GW1 | Ghutway Village |
| II | SW3, SW4 | Khudia Nala | MW2 | Block II OCP | GW2 | Joyrampur Village |
| III | SW4, SW5, SW6, SW7 | Khudia Nala, Bagdigi Nala | MW3 | Govindpur Colliery | GW3 | Jogidih Village |
| IV | SW8, SW11, SW9, SW10 | Katri River, Kumari Jore | MW4 | Chotudih | GW4 | Kankanee Village |
| V | SW12, SW13, SW15 | Jarian Nala, Ekra Nala | MW5 | Mudidih | GW5 | Nichitpur |
| VI | SW14, SW15 | Ekra Nala | MW6 | East Bassuria UGP | GW6 | Bansjora Borewell |
| VII | SW16, SW17 | Kari Jore | MW7 | Dhansar UGP | GW7 | Hurriladih |
| VIII | SW18, SW19 | Kashi Jore | MW8 | Dobari UGP | GW8 | Ghanudih |
| IX | SW19, SW20 | Kashi Jore | MW9 | Jeenagora | GW9 | Lodna |
| X | SW21, SW22 | Damodar River | MW10 | Bhowrah North | GW10 | Bhowrah South |
| XI | SW23, SW24, SW25, SW26 | Jarian Nala, Damodar River | MW11 | Bhagaband h UGP | GW11 | Bhagabandh |
| XII | SW27, SW28 | Katri River | MW12 | Kapuria | GW12 | Kapuria |
| XIII | SW29, SW30 | Damodar River | MW13 | Murulidih (20/21) | GW13 | Murilidih |
| XIV | SW31, SW29 | Damodar River | MW14 | Lohapatti | GW14 | Lohapatti |
| XV | SW5, SW32 | Khudia Nala | MW15 | Kharkharee UGP | GW15 | Kharkharee |
| XVI | SW33, SW34 | Khudia River | MW16 | Dahibari OCP | GW16 | Patlabari Village |
| XVII | SW35, SW36 | Barakar River | MW17 | Damagoria Colliery | GW17 | Chaptoria |

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# ENVIRONMENTAL MONITORING REPORT OF BHARAT COKING COAL LIMITED, CLUSTER – XI

**(FOR THE MONTH JUNE, 2025)**

**E. C. no. J-11015/77/2011-IA.II (M) dated 26.07.2019.**

# CMPDI

ISO 9001 Company

**Regional Institute-II**

**Dhanbad, Jharkhand**

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| 4. | CHAPTER-IV | STANDARDS AND PLANS | 20-21 |

# 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 $23^0$37' N to $23^0$52' N latitudes and $86^0$09' E to $86^0$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 ($PM_{10}$), Fine Particulate Matter ($PM_{2.5}$), Sulphur Di-oxide ($SO_2$) and Nitrogen Oxides ($NO_X$). Respirable Dust Samplers (RDS) and Fine Dust

Sampler ($PM_{2.5}$ sampler) were used for sampling of $PM_{10,}$ $SO_2$, & $NO_x$ 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 $PM_{10,}$ $PM_{2.5}$, $SO_2$ 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 $PM_{10}$& $PM_{2.5}$ 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 Standards for Coal Mines were within permissible limits.

### 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-XI is in the Western & Southern part of the Jharia coalfield. It includes a group of 8 Mines (viz. Gopalichak UG&OC Mine**,** Kachhi Balihari 10/12 Pit UG Mine**,** PB UG Project,Bhagabandh UG Mine, Kenwadih UG, Pootkee UG, Kachi Balihari 5/6Pit UG, Moonidih UG mine). The Cluster – XI is situated about 25 - 30 kms from Dhanbad Railway Station. The mines of this Cluster – XI 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 Jarian nala & Damodar River.

1.2 The Project has Environmental Clearance from Ministry of Environment, Forests and Climate Change (MoEF&CC) for a rated capacity 5.08 MTPA (normative) and 6.604 MTPA (peak) capacity of coal production vide letter no. J-11015/77/2011-IA.II (M) dated 26$^{th}$ July, 2019.

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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 $PM_{10}$, $PM_{2.5}$, $SO_2$, NOx 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) Pootkee Balihari Office (A16): Industrial Area**

The location of the sampling station is 23°45'17.23"N 86°21'46.27"E. The sampler was placed at an elevated platform approx. 1.5m above ground level at Project 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 sampler was placed at an elevated platform approx. 1.5m above ground level at project office.

**iii) Moonidih Washery (A29): Industrial Area**

The location of the sampling station is 23°44'26.00"N 86°21'16.00"E. The sampler was placed at a height of approx. 1.5m above ground level at Project office.

**II.BUFFER ZONE Monitoring Location**

**I) Kusunda OCP (A10)**

The location of the sampling station is 23°46'49.07"N 86°24'15.71"E. The sampler was placed at a height of approx. 1.5m above ground level at Safety Office.

# AMBIENT AIR QUALITY DATA

TC-14321

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** | **06/2025** | **Cluster** | **Cluster XI** | **ULR No.** | **TC1432125000001900F** |
| **Customer** | **Environment Department, Bharat Coking Coal Limited (BCCL), Koyla Bhawan, Dhanbad (E-mail: gmenv.bccl@coalindia.in)** | | | **Date of Issue** | **11.08.2025** |
| **Project** | **Pootkee Balihari Office** | **Sample Ref. No.** | **REM/BCCL/2025/06** | **Sampling Method** | **CMPDI/RI-II/LPM 13 , ( IS 5182)** |
| **Date of Sampling** | | | **Period of Analysis** | **Zone of Station:** | **Core Zone** |

| **Sl. No.** | **Parameter** | **Method of Analysis** | **Observed Values ( in µg/m³)** | | **Range Of Testing** | **LDL** | **MoEF Standards Notification dated 25th September,2000 (GSR 742 E )** | **NAAQS, 2009** |
|---|---|---|---|---|---|---|---|---|
| | | | **A4064** | **A4142** | | | | |
| 1 | $PM_{10}$ | IS -5182(Part 23):2006, R-2017 | 89 | 94 | 10 µg/m³ - 1000 µg/m³ | 10 µg/m³ | 300 | 100 |
| 2 | $PM_{2.5}$ | IS -5182(Part 24):2019 | 48 | 52 | 10 µg/m³ - 400 µg/m³ | 10 µg/m³ | Not Specified | 60 |
| 3 | $SO_2$ | IS-5182(Part-2): 2001 , R-2017 | <10 | <10 | 10 µg/m³ - 1050 µg/m³ | 10 µg/m³ | 120 | 80 |
| 4 | $NO_2$ | IS-5182 (Part-6): 2006 , R-2017 | 24 | 33 | 06 µg/m³ - 420 µg/m³ | 06 µg/m³ | 120 | 80 |

*Environmental Condition : Sunny*
** LDL indicates Lower Detection Limit,*
***All units are in µg/m3, 24 hourly Average,*

***ANALYSED BY*** (Gaurav Kant) ***CHECKED BY*** (Amit Raj Mishra) ***Authorised Signatory***

***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 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** | **06/2025** | **Cluster** | **Cluster XI** | **ULR No.** | **TC1432125000001900F** |
| **Customer** | **Environment Department, Bharat Coking Coal Limited (BCCL), Koyla Bhawan, Dhanbad (E-mail: gmenv.bccl@coalindia.in)** | | | **Date of Issue** | **11.08.2025** |
| **Project** | **Moonidih UGP** | **Sample Ref. No.** | **REM/BCCL/2025/06** | **Sampling Method** | **CMPDI/RI-II/LPM 13 , ( IS 5182)** |
| **Date of Sampling** | 12.06.25 | 26.06.25 | **Period of Analysis** | 12.06.2025 TO 25.07.2025 | **Zone of Station:** **Core Zone** |

| **Sl. No.** | **Parameter** | **Method of Analysis** | **Observed Values ( in µg/m³)** | | **Range Of Testing** | **LDL** | **MoEF Standards Notification dated 25th September,2000 (GSR 742 E )** | **NAAQS, 2009** |
|---|---|---|---|---|---|---|---|---|
| | | | **1st FN A4072** | **2nd FN A4150** | | | | |
| 1 | $PM_{10}$ | IS -5182(Part 23):2006, R-2017 | 99 | 96 | 10 µg/m³ - 1000 µg/m³ | 10 µg/m³ | 300 | 100 |
| 2 | $PM_{2.5}$ | IS -5182(Part 24):2019 | 58 | 53 | 10 µg/m³ - 400 µg/m³ | 10 µg/m³ | Not Specified | 60 |
| 3 | $SO_2$ | IS-5182(Part-2): 2001 , R-2017 | 10 | <10 | 10 µg/m³ - 1050 µg/m³ | 10 µg/m³ | 120 | 80 |
| 4 | $NO_2$ | IS-5182 (Part-6): 2006 , R-2017 | 34 | 25 | 06 µg/m³ - 420 µg/m³ | 06 µg/m³ | 120 | 80 |

*Environmental Condition : Sunny*

** LDL indicates Lower Detection Limit,*

***All units are in µg/m3, 24 hourly Average,*

***ANALYSED BY*** (Gaurav Kant) ***CHECKED BY*** (Amit Raj Mishra) ***Authorised Signatory***

***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** | **06/2025** | **Cluster** | **Cluster XI** | **ULR No.** | **TC1432125000001900F** |
| **Customer** | **Environment Department, Bharat Coking Coal Limited (BCCL), Koyla Bhawan, Dhanbad (E-mail: gmenv.bccl@coalindia.in)** | | | **Date of Issue** | **11.08.2025** |
| **Project** | **Moonidih Washery** | **Sample Ref. No.** | **REM/BCCL/2025/06** | **Sampling Method** | **CMPDI/RI-II/LPM 13 , ( IS 5182)** |
| **Date of Sampling** | 12.06.25 | 26.06.25 | **Period of Analysis** | 12.06.2025 TO 25.07.2025 | **Zone of Station:** **Core Zone** |

| **Sl. No.** | **Parameter** | **Method of Analysis** | **Observed Values ( in µg/m³)** 1st FN **A4071** | 2nd FN **A4149** | **Range Of Testing** | **LDL** | **MoEF Standards Notification dated 25th September,2000 (GSR 742 E )** | **NAAQS, 2009** |
|---|---|---|---|---|---|---|---|---|
| 1 | $PM_{10}$ | IS -5182(Part 23):2006, R-2017 | 115 | 91 | 10 µg/m³ - 1000 µg/m³ | 10 µg/m³ | 300 | 100 |
| 2 | $PM_{2.5}$ | IS -5182(Part 24):2019 | 60 | 45 | 10 µg/m³ - 400 µg/m³ | 10 µg/m³ | Not Specified | 60 |
| 3 | $SO_2$ | IS-5182(Part-2): 2001 , R-2017 | 10 | 10 | 10 µg/m³ - 1050 µg/m³ | 10 µg/m³ | 120 | 80 |
| 4 | $NO_2$ | IS-5182 (Part-6): 2006 , R-2017 | 23 | 33 | 06 µg/m³ - 420 µg/m³ | 06 µg/m³ | 120 | 80 |

*Environmental Condition : Sunny*

** LDL indicates Lower Detection Limit,*

***All units are in µg/m3, 24 hourly Average,*

***ANALYSED BY*** (Gaurav Kant) ***CHECKED BY*** (Amit Raj Mishra) ***Authorised Signatory***

***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** | **06/2025** | **Cluster** | **Cluster XI** | **Report No.** | TC1432125000001900F |
| **Customer** | **Environment Department, Bharat Coking Coal Limited (BCCL), Koyla Bhawan, Dhanbad (E-mail: gmenv.bccl@coalindia.in)** | | | **Date of Issue** | **11.08.2025** |
| **Project** | **Kusunda** | **Sample Ref. No.** | **REM/BCCL/2025/06** | **Sampling Method** | **CMPDI/RI-II/LPM 13 , ( IS 5182)** |
| **Date of Sampling** | 09.06.25 | 23.06.25 | **Period of Analysis** | 09.06.2025 TO 25.07.2025 | **Zone of Station:** **Buffer Zone** |

| **Sl. No.** | **Parameter** | **Method of Analysis** | **Observed Values ( in µg/m³)** | | **Range Of Testing** | **LDL** | **MoEF Standards Notification dated 25th September,2000 (GSR 742 E )** | **NAAQS, 2009** |
|---|---|---|---|---|---|---|---|---|
| | | | **1st FN A4047** | **2nd FN A4125** | | | | |
| 1 | $PM_{10}$ | IS -5182(Part 23):2006, R-2017 | 96 | 112 | 10 µg/m³ - 1000 µg/m³ | 10 µg/m³ | 300 | 100 |
| 2 | $PM_{2.5}$ | IS -5182(Part 24):2019 | 52 | 58 | 10 µg/m³ - 400 µg/m³ | 10 µg/m³ | Not Specified | 60 |
| 3 | $SO_2$ | IS-5182(Part-2): 2001 , R-2017 | 14 | 10 | 10 µg/m³ - 1050 µg/m³ | 10 µg/m³ | 120 | 80 |
| 4 | $NO_2$ | IS-5182 (Part-6): 2006 , R-2017 | 35 | 29 | 06 µg/m³ - 420 µg/m³ | 06 µg/m³ | 120 | 80 |

*Environmental Condition : Sunny*

** LDL indicates Lower Detection Limit,*

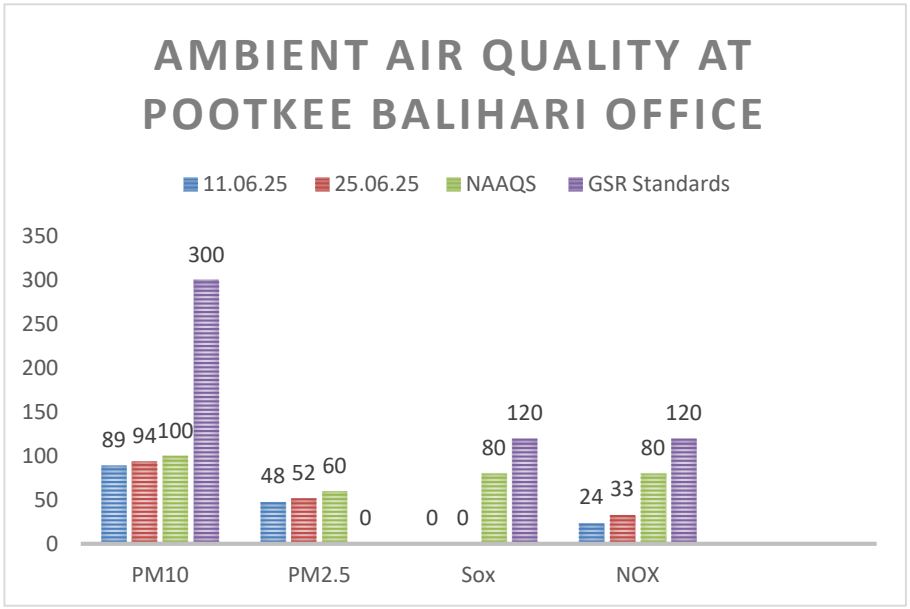
***All units are in µg/m3, 24 hourly Average,*

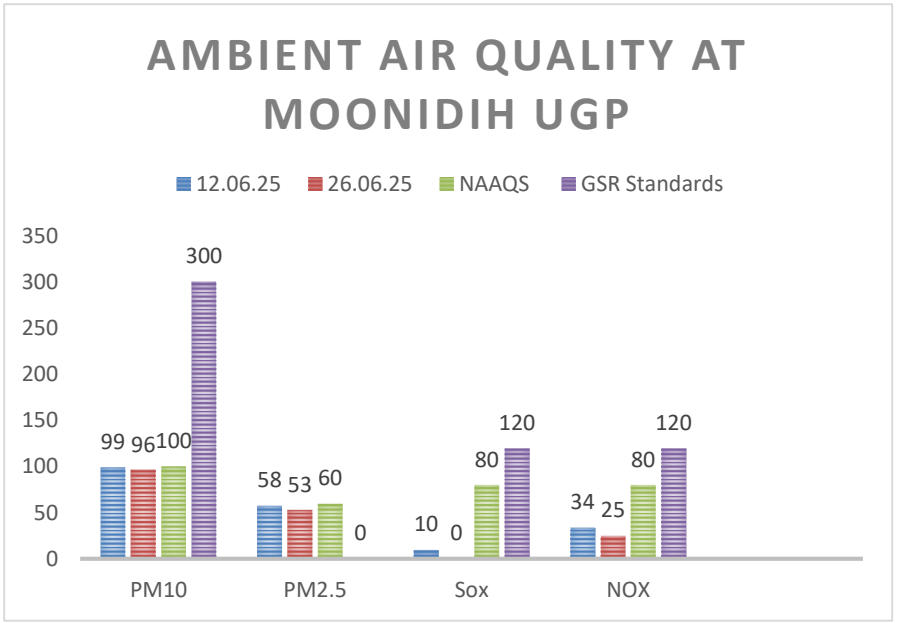
***ANALYSED BY*** (Gaurav Kant) ***CHECKED BY*** (Amit Raj Mishra) ***Authorised Signatory***

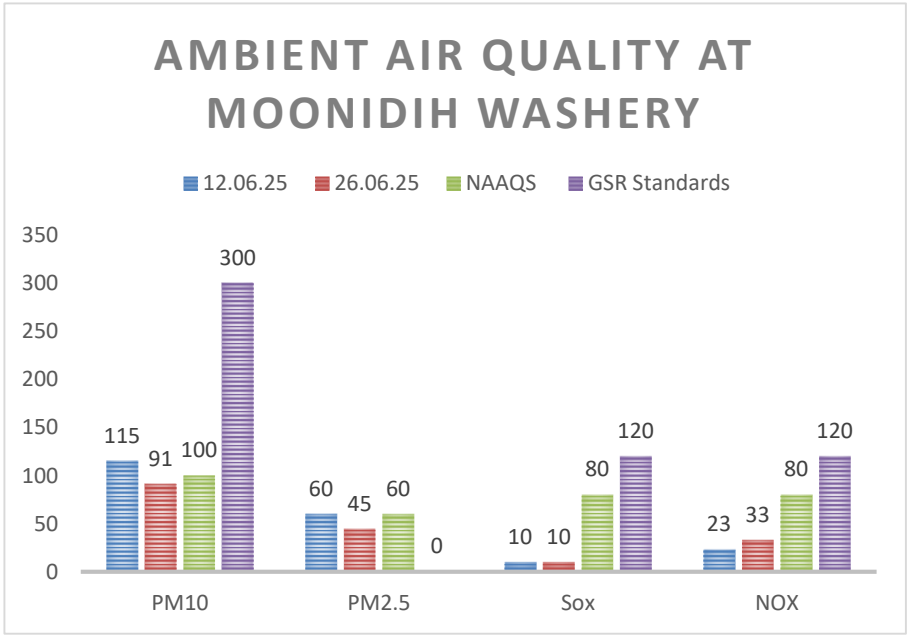
***Note**: The results above relate to the samples tested as received. This report can not be reproduced in part or full without the written permission of the HOD(Env) , CMPDI, RI-II.*

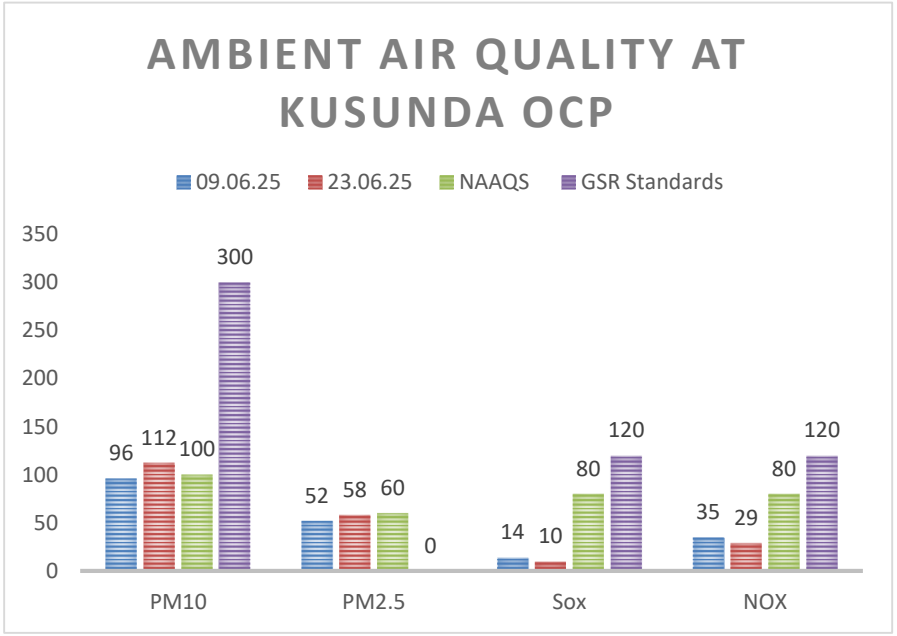
*---- End of Report ----*

*Page -1 of 1*


AMBIENT AIR QUALITY AT POOTKEE BALIHARI OFFICE
11.06.25
25.06.25
NAAQS
GSR Standards
350
300
250
200
150
100
50
0
89 94 100 300
48 52 60 0
0 0 80 120
24 33 80 120
PM10
PM2.5
Sox
NOX


AMBIENT AIR QUALITY AT MOONIDIH UGP
12.06.25
26.06.25
NAAQS
GSR Standards
350
300
250
200
150
100
50
0
99 96 100 300
58 53 60 0
10 0 80 120
34 25 80 120
PM10
PM2.5
Sox
NOX


AMBIENT AIR QUALITY AT MOONIDIH WASHERY
12.06.25
26.06.25
NAAQS
GSR Standards
350
300
250
200
150
100
50
0
115 91 100 300
60 45 60 0
10 10 80 120
23 33 80 120
PM10
PM2.5
Sox
NOX


AMBIENT AIR QUALITY AT KUSUNDA OCP
09.06.25
23.06.25
NAAQS
GSR Standards
350
300
250
200
150
100
50
0
96 112 100 300
52 58 60 0
14 10 80 120
35 29 80 120
PM10
PM2.5
Sox
NOX

# WATER QUALITY MONITORING

## 3.1 Location of sampling sites

(Refer **Plate No. – II**)

### i) Mine Discharge of Bhagabandh (MW11)

A sampling point is fixed to assess the effluent quality of Mine discharge. This location is selected to monitor effluent discharge in to Kari jore.

## 3.2 Methodology of sampling and analysis

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

## 3.3 Results & Interpretations

The results are given in tabular form along with the applicable standards. Results are compared with Schedule - VI, effluent prescribed by MoEF&CC. Results show that most of the parameters are within the permissible limits.

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

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

**Test Report for Mine Effluent samples**

| | | | | | | |
|---|---|---|---|---|---|---|
| **Month & Year** | **06/2025** | **Cluster** | **Cluster XI** | **ULR No.** | TC1432125000001918F | |
| **Customer** | **Environment Department, Bharat Coking Coal Limited (BCCL), Koyla Bhawan, Dhanbad (E-mail: gmenv.bccl@coalindia.in)** | | | | **Date of Issue** | **11.08.2025** |
| **Project** | | **Sampling Ref. No.** | **REM/BCCL/2025/ 06** | **Sampling Method** **IS 3025 (Part-1)** | | **CMPDI/RI-II/LPM 13** |
| **Sampling Stations** | **(i)** | **Bhagabandh** | **Sample Collected in 2.5 Ltr Jerricane , Color as observed is transparent** | | **Period of Analysis** | **09.06.25 to 30.06.2025** |
| | | | **Date of Sampling** | 09.06.25 23.06.25 | | |

| **Sl. No.** | **Parameter** | **Method of Analysis** | **Observed Values** | | **STANDARDS FOR COAL MINES (Stipulated by Ministry of Environment and Forests (MoEF), Vide Notification No. GSR 742(E), Dt: 25.09.2000)** | **LDL** |
|---|---|---|---|---|---|---|
| | | | M1570 | M1597 | | |
| 1 | Total Suspended Solids | IS 3025/17:1984, R :2017, Gravimetric | 41 | 42 | *100 (Max)* | 10 |
| 2 | pH | IS-3025/11:1983, R-2017, Electrometric | 7.79 | 7.78 | *5.5 - 9.0* | 0.2 |
| 3 | Oil & Grease | IS 3025/39:1991, R : 2019, Partition Gravimetric | <4.0 | <4.0 | *10 (Max)* | 2 |
| 4 | COD | APHA 23rd Edition 5220 C Titrimetric Method | 44 | 32 | *250 (Max)* | 4 |

***Grab sampling carried out for water samples **All units in mg/L unless specified otherwise *LDL indicates Lower Detection Limit & BDL indicates Below Detection Limit,*

***ANALYSED BY***

(Kumar Vaibhav)
***CHECKED BY***

(Amit Raj Mishra)
***Authorised Signatory***

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

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

# NOISE LEVEL QUALITY MONITORING

## 4.1Location of sampling sites

1. **Pootkee Balihari Office (N16)**
2. **Moonidih UGP (N17)**
3. **Moonidih Washery (N29)**
4. **Kusunda OCP (N10)**

**4.2**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

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

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| **Month & Year** | **06/2025** | **Cluster** | **Cluster XI** | | | **ULR No.** | **TC1432125000001934F** |
| **Customer** | **Environment Department, Bharat Coking Coal Limited (BCCL), Koyla Bhawan, Dhanbad (E-mail: gmenv.bccl@coalindia.in)** | | | | | **Date of Issue** | **11.08.2025** |
| **Project** | | **Sample Ref. No.** | **REM/BCCL/2025/ 06** | | **Sampling Method** | **CMPDI/RI-II/LPM 22** | |
| **Sampling Stations** | **i** | **Pootki Balihari Office** | **Date of Sampling** | 11.06.25 | 25.06.25 | **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 | 53.2 | 54.5 | CPCB, Protocol for Ambient Level Noise Monitoring -2015 | 35 dB-135 dB | 35 Db (A) | Industrial<br>Commercial<br>Residential<br>Silence | 75<br>65<br>55<br>50 |
| 2 | | 07:00 - 08:00 | 56.7 | 57.3 | | | | | |
| 3 | | 08:00 - 09:00 | 59.4 | 60.2 | | | | | |
| 4 | | 09:00 – 10:00 | 66 | 66.7 | | | | | |
| 5 | | 10:00 - 11:00 | 67.6 | 68.5 | | | | | |
| 6 | | 11:00 - 12:00 | 62.6 | 63.4 | | | | | |
| 7 | | 12:00 - 13:00 | 60.9 | 60.3 | | | | | |
| 8 | | 13:00 - 14:00 | 58.1 | 57.9 | | | | | |
| 9 | | 14:00 - 15:00 | 57 | 54.7 | | | | | |
| 10 | | 15:00 - 16:00 | 53.9 | 54.3 | | | | | |
| 11 | | 16:00 - 17:00 | 53.2 | 52.7 | | | | | |
| 12 | | 17:00 - 18:00 | 52.8 | 53.6 | | | | | |
| 13 | | 18:00 - 19:00 | 52.8 | 53.3 | | | | | |
| 14 | | 19:00 - 20:00 | 51.1 | 52.3 | | | | | |
| 15 | | 20:00 - 21:00 | 50.9 | 51.2 | | | | | |
| 16 | | 21:00 - 22:00 | 50.8 | 50.4 | | | | | |
| | | Leq Day | 60.2 | 60.8 | | | | | |
| 1 | Noise Level dB(A)Leq -Night | 22:00-23:00 | 49.3 | 49.5 | CPCB, Protocol for Ambient Level Noise Monitoring -2015 | 35 dB-135 dB | 35 dB (A) | Industrial<br>Commercial<br>Residential<br>Silence | 70<br>55<br>45<br>50 |
| 2 | | 23:00- 00:00 | 48.6 | 48.9 | | | | | |
| 3 | | 00:00- 01:00 | 47.6 | 48.5 | | | | | |
| 4 | | 01.00-02.00 | 47.5 | 48.2 | | | | | |
| 5 | | 02.00-03.00 | 46.9 | 47.1 | | | | | |
| 6 | | 03.00-04.00 | 46.6 | 46.5 | | | | | |
| 7 | | 04.00-05.00 | 47.6 | 47.6 | | | | | |
| 8 | | 05:00-06:00 | 48 | 47.8 | | | | | |
| | | Leq Night | 47.8 | 48.1 | | | | | |

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

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| Sampling Assistants | | | (Gaurav Kant) | | | | (Amit Raj Mishra) |
| | ANALYSED BY | | CHECKED BY | | | | Authorised Signatory |

Note: The results above relate to the samples tested as received. This report cannot 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
CMPDIL, RI-II
KOYLA BHAWAN OMPLEX
DHANBAD. -826005
Phone:0326-223-850
email:i2cmpdi@coalindia.in

# Ambient Noise Level Test Report

| | | | | | |
|---|---|---|---|---|---|
| **Month & Year** | **06/2025** | **Cluster** | **Cluster XI** | **ULR No.** | **TC1432125000001934F** |
| **Customer** | **Environment Department, Bharat Coking Coal Limited (BCCL), Koyla Bhawan, Dhanbad (E-mail: gmenv.bccl@coalindia.in)** | | | **Date of Issue** | **11.08.2025** |
| **Project** | | **Sample Ref. No.** | **REM/BCCL/2025/06** | **Sampling Method** | **CMPDI/RI-II/LPM 22** |
| **Sampling Stations** | **i** | **Moonidih UGP** | **Date of Sampling** | 12.06.25 – 26.06.25 | **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 | 53 | 53.7 | CPCB, Protocol for Ambient Level Noise Monitoring -2015 | 35 dB-135 dB | 35 dB(A) | Industrial<br>Commercial<br>Residential<br>Silence | 75<br>65<br>55<br>50 |
| 2 | | 07:00 - 08:00 | 48.4 | 49.2 | | | | | |
| 3 | | 08:00 - 09:00 | 56.4 | 58 | | | | | |
| 4 | | 09:00 – 10:00 | 54.3 | 51.8 | | | | | |
| 5 | | 10:00 - 11:00 | 57.6 | 56.5 | | | | | |
| 6 | | 11:00 - 12:00 | 61.1 | 61.9 | | | | | |
| 7 | | 12:00 - 13:00 | 59.1 | 58.7 | | | | | |
| 8 | | 13:00 - 14:00 | 60.9 | 59.8 | | | | | |
| 9 | | 14:00 - 15:00 | 56.9 | 56.5 | | | | | |
| 10 | | 15:00 - 16:00 | 55 | 54.3 | | | | | |
| 11 | | 16:00 - 17:00 | 54.6 | 54.8 | | | | | |
| 12 | | 17:00 - 18:00 | 54.1 | 54.8 | | | | | |
| 13 | | 18:00 - 19:00 | 53.3 | 53.7 | | | | | |
| 14 | | 19:00 - 20:00 | 53.9 | 53.6 | | | | | |
| 15 | | 20:00 - 21:00 | 52.4 | 52.2 | | | | | |
| 16 | | 21:00 - 22:00 | 51.9 | 52.1 | | | | | |
| | | **Leq Day** | 56.4 | 56.3 | | | | | |
| 1 | Noise Level dB(A)Leq -Night | 22:00-23:00 | 47.9 | 47.9 | CPCB, Protocol for Ambient Level Noise Monitoring -2015 | 35 dB-135 dB | 35 dB(A) | Industrial<br>Commercial<br>Residential<br>Silence | 70<br>55<br>45<br>50 |
| 2 | | 23:00- 00:00 | 47.4 | 47.6 | | | | | |
| 3 | | 00:00- 01:00 | 46.5 | 47.6 | | | | | |
| 4 | | 01.00-02.00 | 45.5 | 46.3 | | | | | |
| 5 | | 02.00-03.00 | 45.3 | 45.4 | | | | | |
| 6 | | 03.00-04.00 | 45.3 | 45.5 | | | | | |
| 7 | | 04.00-05.00 | 47 | 47.1 | | | | | |
| 8 | | 05:00-06:00 | 47.4 | 47.6 | | | | | |
| | | **Leq Night** | 46.6 | 47.0 | | | | | |

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

Sampling Assistants — (Gaurav Kant) — (Amit Raj Mishra)

***ANALYSED BY*** — ***CHECKED BY*** — ***Authorised Signatory***

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

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

*Page -1 of 1*

TC-14321

cmpdi A Mini Ratna Company

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** | **06/2025** | **Cluster** | **Cluster XI** | **ULR No.** | **TC1432125000001934F** |
| **Customer** | **Environment Department, Bharat Coking Coal Limited (BCCL), Koyla Bhawan, Dhanbad (E-mail: gmenv.bccl@coalindia.in)** | | | **Date of Issue** | **11.08.2025** |
| **Project** | | **Sample Ref. No.** | **REM/BCCL/2025/06** | **Sampling Method** | **CMPDI/RI-II/LPM 22** |
| **Sampling Stations** | **i** | **Moonidih Washery** | **Date of Sampling** 12.06.25 – 26.06.25 | **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 | 51.9 | 52.1 | CPCB, Protocol for Ambient Level Noise Monitoring -2015 | 35 dB-135 dB | 35 dB(A) | Industrial<br>Commercial<br>Residential<br>Silence | 75<br>65<br>55<br>50 |
| 2 | | 07:00 - 08:00 | 54.3 | 54.8 | | | | | |
| 3 | | 08:00 - 09:00 | 58.2 | 57.8 | | | | | |
| 4 | | 09:00 – 10:00 | 62 | 62.1 | | | | | |
| 5 | | 10:00 - 11:00 | 64.5 | 64.5 | | | | | |
| 6 | | 11:00 - 12:00 | 65.5 | 62.9 | | | | | |
| 7 | | 12:00 - 13:00 | 67.3 | 69.2 | | | | | |
| 8 | | 13:00 - 14:00 | 66.7 | 66.7 | | | | | |
| 9 | | 14:00 - 15:00 | 61.3 | 62.1 | | | | | |
| 10 | | 15:00 - 16:00 | 62.1 | 61 | | | | | |
| 11 | | 16:00 - 17:00 | 60.5 | 59.4 | | | | | |
| 12 | | 17:00 - 18:00 | 59.1 | 58.2 | | | | | |
| 13 | | 18:00 - 19:00 | 57.6 | 57.5 | | | | | |
| 14 | | 19:00 - 20:00 | 56.4 | 57 | | | | | |
| 15 | | 20:00 - 21:00 | 55.5 | 53.6 | | | | | |
| 16 | | 21:00 - 22:00 | 53 | 53.7 | | | | | |
| | | | 62.0 | 62.2 | | | | | |
| 1 | Noise Level dB(A)Leq -Night | 22:00-23:00 | 51.7 | 52.3 | CPCB, Protocol for Ambient Level Noise Monitoring -2015 | 35 dB-135 dB | 35 dB(A) | Industrial<br>Commercial<br>Residential<br>Silence | 70<br>55<br>45<br>50 |
| 2 | | 23:00- 00:00 | 50.3 | 49.5 | | | | | |
| 3 | | 00:00- 01:00 | 45.9 | 45.8 | | | | | |
| 4 | | 01.00-02.00 | 45.5 | 45.5 | | | | | |
| 5 | | 02.00-03.00 | 45.2 | 44.3 | | | | | |
| 6 | | 03.00-04.00 | 44.7 | 45.4 | | | | | |
| 7 | | 04.00-05.00 | 47 | 47.4 | | | | | |
| 8 | | 05:00-06:00 | 47.4 | 47.6 | | | | | |
| | | **Leq Night** | 47.9 | 48.0 | | | | | |

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

| | | | | |
|---|---|---|---|---|
| Sampling Assistants | (Gaurav Kant) | | | (Amit Raj Mishra) |
| ***ANALYSED BY*** | ***CHECKED BY*** | | | ***Authorised Signatory*** |

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

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

*Page -1 of 1*

TC-14321

# 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** | **06/2025** | **Cluster** | **Cluster XI** | **ULR No.** | **TC1432125000001934F** |
| **Customer** | **Environment Department, Bharat Coking Coal Limited (BCCL), Koyla Bhawan, Dhanbad (E-mail: gmenv.bccl@coalindia.in)** | | | **Date of Issue** | 11.08.2025 |
| **Project** | | **Sample Ref. No.** | **REM/BCCL/2025/ 06** | **Sampling Method** | **CMPDI/RI-II/LPM 22** |
| **Sampling Stations** | **i** | **Kusunda OCP** | **Date of Sampling** | 09.06.25 – 23.06.25 | **Zone Category of Station:** **Bufferr 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 | 51.9 | 52.2 | CPCB, Protocol for Ambient Level Noise Monitoring -2015 | 35 dB-135 dB | 35 dB(A) | Industrial | 75 |
| 2 | | 07:00 - 08:00 | 55.5 | 54.8 | | | | Commercial | 65 |
| 3 | | 08:00 - 09:00 | 58.7 | 54.7 | | | | Residential | 55 |
| 4 | | 09:00 – 10:00 | 64.5 | 62.5 | | | | Silence | 50 |
| 5 | | 10:00 - 11:00 | 66.7 | 65.4 | | | | | |
| 6 | | 11:00 - 12:00 | 65.2 | 63.8 | | | | | |
| 7 | | 12:00 - 13:00 | 68.4 | 66.8 | | | | | |
| 8 | | 13:00 - 14:00 | 69.9 | 67.4 | | | | | |
| 9 | | 14:00 - 15:00 | 69.9 | 62.3 | | | | | |
| 10 | | 15:00 - 16:00 | 61.9 | 61.3 | | | | | |
| 11 | | 16:00 - 17:00 | 62.1 | 69.6 | | | | | |
| 12 | | 17:00 - 18:00 | 61.6 | 60.3 | | | | | |
| 13 | | 18:00 - 19:00 | 60 | 59.3 | | | | | |
| 14 | | 19:00 - 20:00 | 60.2 | 58.2 | | | | | |
| 15 | | 20:00 - 21:00 | 58.5 | 57.6 | | | | | |
| 16 | | 21:00 - 22:00 | 59 | 57.7 | | | | | |
| | | **Leq Day** | 64.7 | 63.4 | | | | | |
| 1 | Noise Level dB(A)Leq -Night | 22:00-23:00 | 50.7 | 48.6 | CPCB, Protocol for Ambient Level Noise Monitoring -2015 | 35 dB-135 dB | 35 dB(A) | Industrial | 70 |
| 2 | | 23:00- 00:00 | 47.6 | 47.6 | | | | Commercial | 55 |
| 3 | | 00:00- 01:00 | 46.2 | 44.3 | | | | Residential | 45 |
| 4 | | 01.00-02.00 | 44.3 | 44 | | | | Silence | 50 |
| 5 | | 02.00-03.00 | 43.5 | 43.1 | | | | | |
| 6 | | 03.00-04.00 | 37.3 | 43 | | | | | |
| 7 | | 04.00-05.00 | 38.9 | 44.6 | | | | | |
| 8 | | 05:00-06:00 | 41 | 45.9 | | | | | |
| | | Leq Night | 45.6 | 45.6 | | | | | |

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

| | | | | |
|---|---|---|---|---|
| Sampling Assistants | | (Gaurav Kant) | | (Amit Raj Mishra) |
| ***ANALYSED BY*** | | ***CHECKED BY*** | | ***Authorised Signatory*** |

*Note: The results above relate to the samples tested as received. This report cannot 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**<br><br>Coal mines located in the coal fields of<br>• Jharia<br>• Raniganj<br>• Bokaro | Suspended Particulate Matter (SPM) | Annual Average *<br>24 hours **| 500 µg/$m^3$<br><br>700 µg/$m^3$ | - High Volume Sampling (Average flow rate not less than 1.1 $m^3$ |
| | Respirable Particulate Matter (size less than 10 µm) (RPM) | Annual Average *<br>24 hours **| 250 µg/$m^3$<br><br>300 µg/$m^3$ | Respirable Particulate Matter sampling and analysis |
| | Sulphur Dioxide ($SO_2$) | Annual Average *<br>24 hours **| 80 µg/$m^3$<br><br>120 µg/$m^3$ | 1.Improvedwest and Gaeke method<br>2.Ultraviolet fluorescene |
| | Oxide of Nitrogen as $NO_2$ | Annual Average *<br>24 hours **| 80 µg/$m^3$<br><br>120 µg/$m^3$ | 1. Jacob & Hochheiser Modified (Na-Arsenic) Method<br>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.

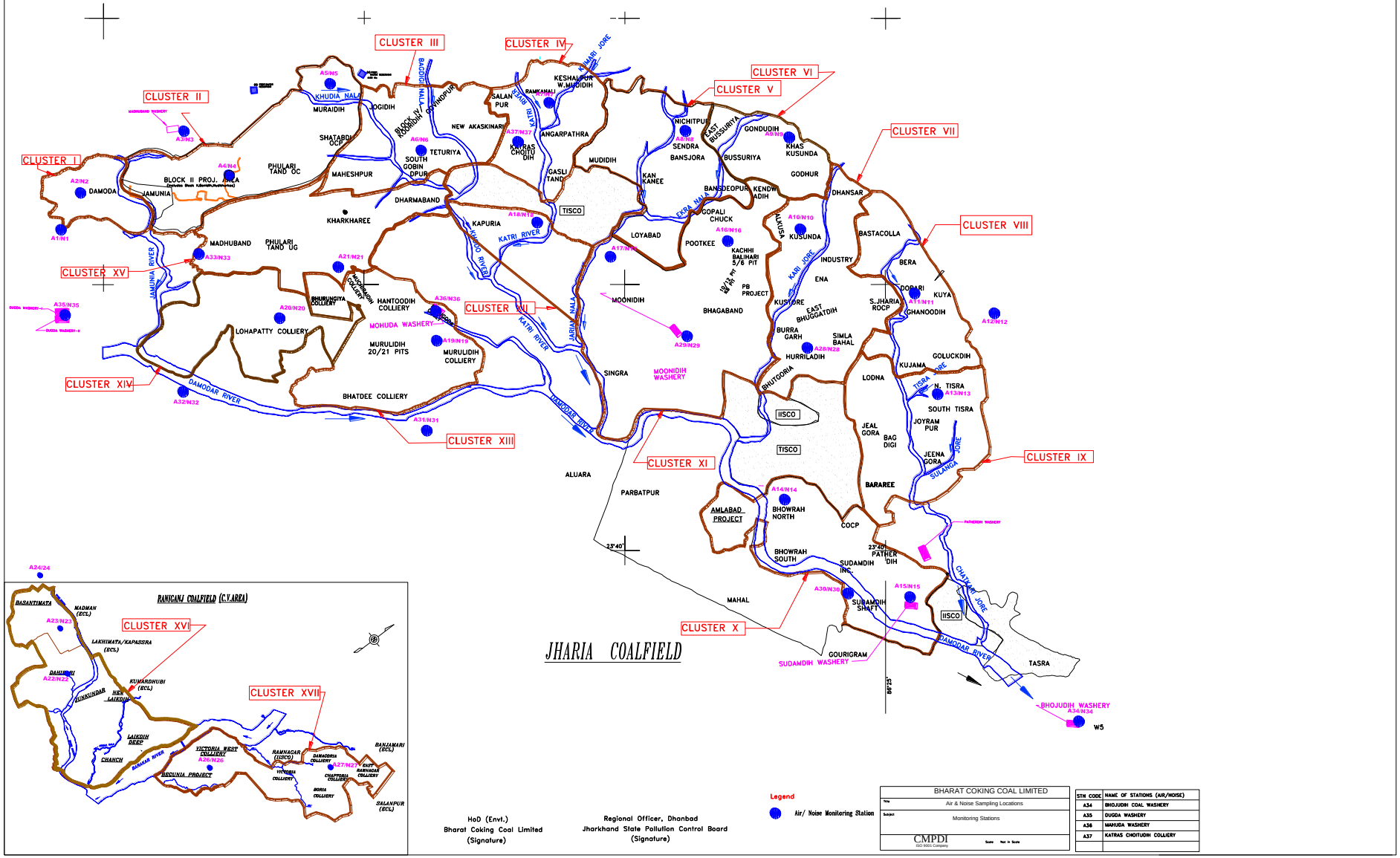
| Pollutant | Time Weighted Average | Concentration in Ambient Air | | Methods of Measurement |
|---|---|---|---|---|
| | | Industrial, Residential, Rural and other Areas | Ecologically Sensitive Area (Notified by Central Government) | |
| **Sulphur Dioxide ($SO_2$), µg/m³** | Annual *<br>24 Hours ** | 50<br>80 | 20<br>80 | -Improved West and Gaeke Method<br>-Ultraviolet Fluorescence |
| **Nitrogendioxide ($NO_2$), µg/m³** | Annual *<br>24 Hours ** | 40<br>80 | 30<br>80 | -Jacob &Hochheiser modified ($NaOH$-$NaAsO_2$) Method<br>-Gas Phase Chemiluminescence |
| **Particulate Matter (Size less than 10µm) or $PM_{10}$, µg/m³** | Annual *<br>24 Hours ** | 60<br>100 | 60<br>100 | -Gravimetric<br>-TEOM<br>-Beta attenuation |
| **Particulate Matter (Size less than 2.5µm) or $PM_{2.5}$, µg/m³** | Annual *<br>24 Hours ** | 40<br>60 | 40<br>60 | -Gravimetric<br>-TEOM<br>-Beta attenuation |
| **Ozone ($O_3$) , µg/m³** | 8 Hours *<br>1 Hour ** | 100<br>180 | 100<br>180 | -UV Photometric<br>-Chemiluminescence<br>-Chemical Method |
| **Lead (Pb) , µg/m³** | Annual *<br>24 Hours ** | 0.50<br>1.0 | 0.50<br>1.0 | -AAS/ICP Method after sampling on EPM 2000 or equivalent filter paper<br>-ED-XRF using Teflon filter |
| **Carbon Monoxide (CO), mg/m³** | 8 Hours **<br>1 Hour ** | 02<br>04 | 02<br>04 | -Non dispersive Infrared (NDIR) Spectroscopy |
| **Ammonia ($NH_3$), µg/m³** | Annual *<br>24 Hours ** | 100<br>400 | 100<br>400 | -Chemiluminescence<br>-Indophenol blue method |
| **Benzene ($C_6H_6$), µg/m³** | Annual * | 05 | 05 | -Gas Chromatography (GC) based continuous analyzer<br>-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.

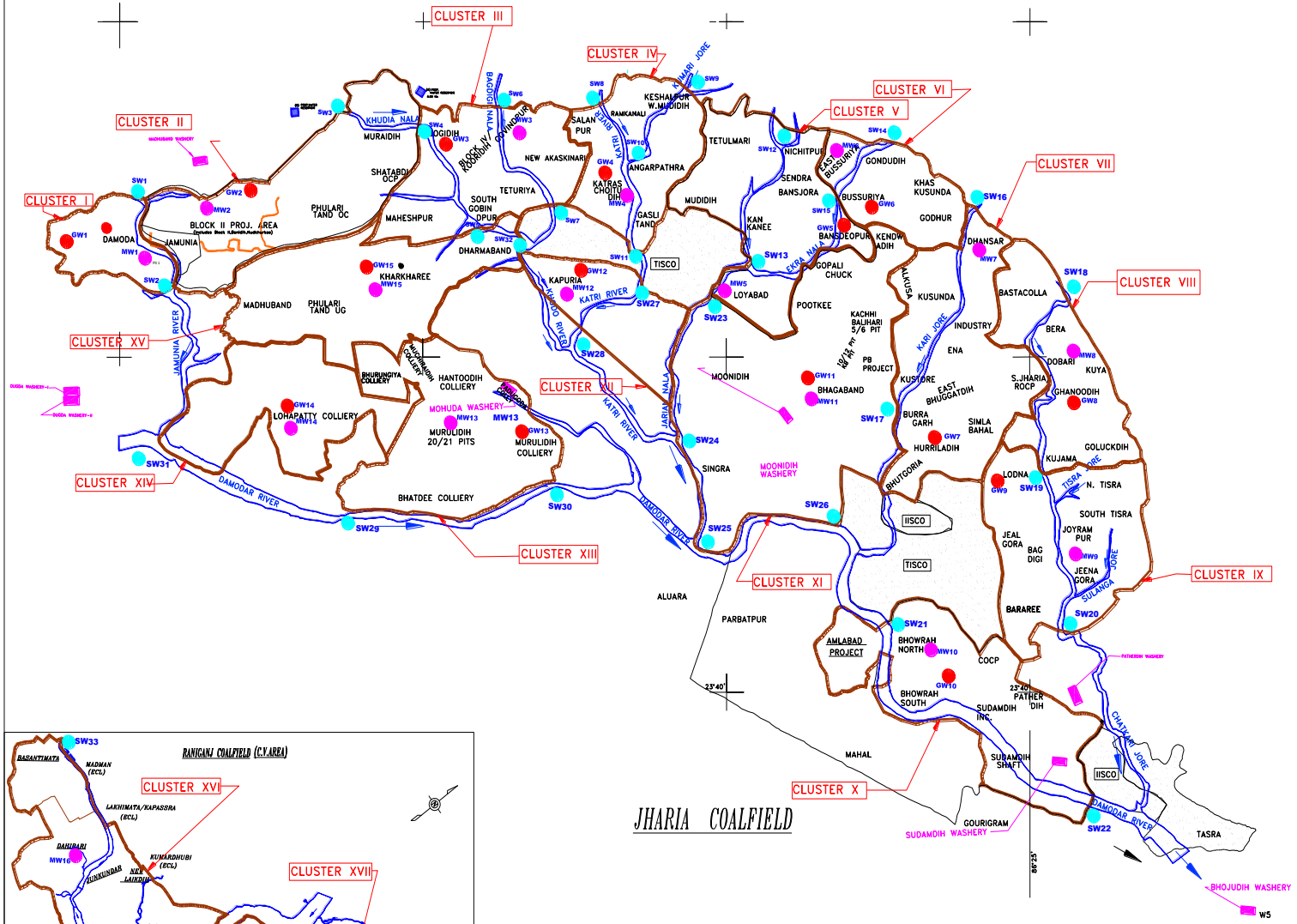
** 24 hourly or 8 hourly or 1 hourly monitored values, as applicable, shall be complied with 98% of the time in a year. 2% of the time, they JUNE exceed the limits but not on two consecutive days of monitoring.

**NOTE:**Whenever and wherever monitoring results on two consecutive days of monitoring exceed the limits specified above for the respective catego

# Location of Air & Noise Monitoring Stations in BCCL



# Water Sampling Locations in BCCL




## INDEX

| Cluster | Suface Water (U/S, D/S) | Name of River/ Nala / Jore | Mine/ Effluent Water | Sampling Location | Ground Water | Sampling Location |
|---|---|---|---|---|---|---|
| I | SW1, SW2 | Jamunia River | MW1 | Damoda Area | GW1 | Ghutway Village |
| II | SW3, SW4 | Khudia Nala | MW2 | Block II OCP | GW2 | Joyrampur Village |
| III | SW4, SW5, SW6, SW7 | Khudia Nala, Bagdigi Nala | MW3 | Govindpur Colliery | GW3 | Jogidih Village |
| IV | SW8, SW11, SW9, SW10 | Katri River, Kumari Jore | MW4 | Chotudih | GW4 | Kankanee Village |
| V | SW12, SW13, SW15 | Jarian Nala, Ekra Nala | MW5 | Mudidih | GW5 | Nichitpur |
| VI | SW14, SW15 | Ekra Nala | MW6 | East Bassuria UGP | GW6 | Bansjora Borewell |
| VII | SW16, SW17 | Kari Jore | MW7 | Dhansar UGP | GW7 | Hurriladih |
| VIII | SW18, SW19 | Kashi Jore | MW8 | Dobari UGP | GW8 | Ghanudih |
| IX | SW19, SW20 | Kashi Jore | MW9 | Jeenagora | GW9 | Lodna |
| X | SW21, SW22 | Damodar River | MW10 | Bhowrah North | GW10 | Bhowrah South |
| XI | SW23, SW24, SW25, SW26 | Jarian Nala, Damodar River | MW11 | Bhagaband h UGP | GW11 | Bhagabandh |
| XII | SW27, SW28 | Katri River | MW12 | Kapuria | GW12 | Kapuria |
| XIII | SW29, SW30 | Damodar River | MW13 | Murulidih (20/21) | GW13 | Murilidih |
| XIV | SW31, SW29 | Damodar River | MW14 | Lohapatti | GW14 | Lohapatti |
| XV | SW5, SW32 | Khudia Nala | MW15 | Kharkharee UGP | GW15 | Kharkharee |
| XVI | SW33, SW34 | Khudia River | MW16 | Dahibari OCP | GW16 | Patlabari Village |
| XVII | SW35, SW36 | Barakar River | MW17 | Damagoria Colliery | GW17 | Chaptoria |

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# ENVIRONMENTAL MONITORING REPORT OF BHARAT COKING COAL LIMITED, CLUSTER – XI

**(FOR THE MONTH JULY, 2025)**

**E. C. no. J-11015/77/2011-IA.II (M) dated 26.07.2019.**

# CMPDI

ISO 9001 Company

**Regional Institute-II**

**Dhanbad, Jharkhand**

# CONTENTS


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| 4. | CHAPTER-IV | STANDARDS AND PLANS | 20-21 |

# 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 $23^0$37' N to $23^0$52' N latitudes and $86^0$09' E to $86^0$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 ($PM_{10}$), Fine Particulate Matter ($PM_{2.5}$), Sulphur Di-oxide ($SO_2$) and

Nitrogen Oxides ($NO_X$). Respirable Dust Samplers (RDS) and Fine Dust Sampler ($PM_{2.5}$ sampler) were used for sampling of $PM_{10,}$ $SO_2$, & $NO_X$ 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 $PM_{10,}$ $PM_{2.5}$, $SO_2$ 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 $PM_{10}$& $PM_{2.5}$ 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 Standards for Coal Mines were within permissible limits.

### 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-XI is in the Western & Southern part of the Jharia coalfield. It includes a group of 8 Mines (viz. Gopalichak UG&OC Mine**,** Kachhi Balihari 10/12 Pit UG Mine**,** PB UG Project,Bhagabandh UG Mine, Kenwadih UG, Pootkee UG, Kachi Balihari 5/6Pit UG, Moonidih UG mine). The Cluster – XI is situated about 25 - 30 kms from Dhanbad Railway Station. The mines of this Cluster – XI 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 Jarian nala & Damodar River.

1.2 The Project has Environmental Clearance from Ministry of Environment, Forests and Climate Change (MoEF&CC) for a rated capacity 5.08 MTPA (normative) and 6.604 MTPA (peak) capacity of coal production vide letter no. J-11015/77/2011-IA.II (M) dated 26$^{th}$ July, 2019.

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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 $PM_{10}$, $PM_{2.5}$, $SO_2$, NOx 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) Pootkee Balihari Office (A16): Industrial Area**

The location of the sampling station is 23°45'17.23"N 86°21'46.27"E. The sampler was placed at an elevated platform approx. 1.5m above ground level at Project 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 sampler was placed at an elevated platform approx. 1.5m above ground level at project office.

**iii) Moonidih Washery (A29): Industrial Area**

The location of the sampling station is 23°44'26.00"N 86°21'16.00"E. The sampler was placed at a height of approx. 1.5m above ground level at Project office.

**II.BUFFER ZONE Monitoring Location**

**I) Kusunda OCP (A10)**

The location of the sampling station is 23°46'49.07"N 86°24'15.71"E. The sampler was placed at a height of approx. 1.5m above ground level at Safety Office.

# AMBIENT AIR QUALITY DATA

TC-14321

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** | **07/2025** | **Cluster** | **Cluster XI** | **ULR No.** | TC1432125000001954F |
| **Customer** | **Environment Department, Bharat Coking Coal Limited (BCCL), Koyla Bhawan, Dhanbad (E-mail: gmenv.bccl@coalindia.in)** | | | **Date of Issue** | **21.08.2025** |
| **Project** | **Pootkee Balihari Office** | **Sample Ref. No.** | **REM/BCCL/2025/07** | **Sampling Method** | **CMPDI/RI-II/LPM 13 , ( IS 5182)** |
| **Date of Sampling** | 10.07.25 | 25.07.25 | **Period of Analysis** | 10.07025 to 20.08.2025 | **Zone of Station:** **Core Zone** |

| **Sl. No.** | **Parameter** | **Method of Analysis** | **Observed Values ( in µg/m³)** | | **Range Of Testing** | **LDL** | **MoEF Standards Notification dated 25th September,2000 (GSR 742 E )** | **NAAQS, 2009** |
|---|---|---|---|---|---|---|---|---|
| | | | **A4212** | **A4296** | | | | |
| 1 | $PM_{10}$ | IS -5182(Part 23):2006, R-2017 | 72 | 68 | 10 µg/m³ - 1000 µg/m³ | 10 µg/m³ | 300 | 100 |
| 2 | $PM_{2.5}$ | IS -5182(Part 24):2019 | 32 | 29 | 10 µg/m³ - 400 µg/m³ | 10 µg/m³ | Not Specified | 60 |
| 3 | $SO_2$ | IS-5182(Part-2): 2001 , R-2017 | 10 | 10 | 10 µg/m³ - 1050 µg/m³ | 10 µg/m³ | 120 | 80 |
| 4 | $NO_2$ | IS-5182 (Part-6): 2006 , R-2017 | 34 | 36 | 06 µg/m³ - 420 µg/m³ | 06 µg/m³ | 120 | 80 |

*Environmental Condition : Sunny*

** LDL indicates Lower Detection Limit,*

***All units are in µg/m3, 24 hourly Average,*

***ANALYSED BY***

(Gaurav Kant)
***CHECKED BY***

(Amit Raj Mishra)
***Authorised Signatory***

***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 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** | **07/2025** | **Cluster** | **Cluster XI** | **ULR No.** | TC1432125000001954F |
| **Customer** | **Environment Department, Bharat Coking Coal Limited (BCCL), Koyla Bhawan, Dhanbad (E-mail: gmenv.bccl@coalindia.in)** | | | **Date of Issue** | **21.08.2025** |
| **Project** | **Moonidih UGP** | **Sample Ref. No.** | **REM/BCCL/2025/07** | **Sampling Method** | **CMPDI/RI-II/LPM 13 , ( IS 5182)** |
| **Date of Sampling** | 10.07.25 | 28.07.25 | **Period of Analysis** | 10.07.25 to 20.08.25 | **Zone of Station:** **Core Zone** |

| **Sl. No.** | **Parameter** | **Method of Analysis** | **Observed Values ( in µg/m³)** | | **Range Of Testing** | **LDL** | **MoEF Standards Notification dated 25th September,2000 (GSR 742 E )** | **NAAQS, 2009** |
|---|---|---|---|---|---|---|---|---|
| | | | **A4217** | **A4305** | | | | |
| 1 | $PM_{10}$ | IS -5182(Part 23):2006, R-2017 | 83 | 81 | 10 µg/m³ - 1000 µg/m³ | 10 µg/m³ | 300 | 100 |
| 2 | $PM_{2.5}$ | IS -5182(Part 24):2019 | 37 | 33 | 10 µg/m³ - 400 µg/m³ | 10 µg/m³ | Not Specified | 60 |
| 3 | $SO_2$ | IS-5182(Part-2): 2001 , R-2017 | <10 | 10 | 10 µg/m³ - 1050 µg/m³ | 10 µg/m³ | 120 | 80 |
| 4 | $NO_2$ | IS-5182 (Part-6): 2006 , R-2017 | 33 | 29 | 06 µg/m³ - 420 µg/m³ | 06 µg/m³ | 120 | 80 |

*Environmental Condition : Sunny*

** LDL indicates Lower Detection Limit,*

***All units are in µg/m3, 24 hourly Average,*

***ANALYSED BY***

(Gaurav Kant)
***CHECKED BY***

(Amit Raj Mishra)
***Authorised Signatory***

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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

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**Test Report for Ambient Air Samples**

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| **Month & Year** | **07/2025** | **Cluster** | **Cluster XI** | | | **ULR No.** | TC1432125000001954F |
| **Customer** | **Environment Department, Bharat Coking Coal Limited (BCCL), Koyla Bhawan, Dhanbad (E-mail: gmenv.bccl@coalindia.in)** | | | | | **Date of Issue** | **21.08.2025** |
| **Project** | **Moonidih Washery** | | **Sample Ref. No.** | **REM/BCCL/2025/07** | **Sampling Method** | **CMPDI/RI-II/LPM 13 , ( IS 5182)** | |
| **Date of Sampling** | 10.07.25 | | 28.07.25 | **Period of Analysis** | 10.07.25 to 20.08.25 | **Zone of Station:** | **Core Zone** |

| **Sl. No.** | **Parameter** | **Method of Analysis** | **Observed Values ( in µg/m³)** | | **Range Of Testing** | **LDL** | **MoEF Standards Notification dated 25th September,2000 (GSR 742 E )** | **NAAQS, 2009** |
|---|---|---|---|---|---|---|---|---|
| | | | **A4218** | **A4306** | | | | |
| 1 | $PM_{10}$ | IS -5182(Part 23):2006, R-2017 | 70 | 65 | 10 µg/m³ - 1000 µg/m³ | 10 µg/m³ | 300 | 100 |
| 2 | $PM_{2.5}$ | IS -5182(Part 24):2019 | 32 | 31 | 10 µg/m³ - 400 µg/m³ | 10 µg/m³ | Not Specified | 60 |
| 3 | $SO_2$ | IS-5182(Part-2): 2001 , R-2017 | <10 | <10 | 10 µg/m³ - 1050 µg/m³ | 10 µg/m³ | 120 | 80 |
| 4 | $NO_2$ | IS-5182 (Part-6): 2006 , R-2017 | 37 | 34 | 06 µg/m³ - 420 µg/m³ | 06 µg/m³ | 120 | 80 |

*Environmental Condition : Sunny*

** LDL indicates Lower Detection Limit,*

***All units are in µg/m3, 24 hourly Average,*

***ANALYSED BY***

(Gaurav Kant)
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*Page -1 of 1*

TC-14321

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

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DHANBAD. -826005
Phone:0326-223-850
email: rdri2cmpdi@coalindia.in

**Test Report for Ambient Air Samples**

| | | | | | |
|---|---|---|---|---|---|
| **Month & Year** | **07/2025** | **Cluster** | **Cluster XI** | **ULR No.** | TC1432125000001954F |
| **Customer** | **Environment Department, Bharat Coking Coal Limited (BCCL), Koyla Bhawan, Dhanbad (E-mail: gmenv.bccl@coalindia.in)** | | | **Date of Issue** | **21.08.2025** |
| **Project** | **Kusunda** | **Sample Ref. No.** | **REM/BCCL/2025/07** | **Sampling Method** | **CMPDI/RI-II/LPM 13 , ( IS 5182)** |
| **Date of Sampling** | 11.07.25 | 29.07.25 | **Period of Analysis** | 11.07.25 to 20.08.25 | **Zone of Station:** **Buffer Zone** |

| **Sl. No.** | **Parameter** | **Method of Analysis** | **Observed Values ( in µg/m³)** | | **Range Of Testing** | **LDL** | **MoEF Standards Notification dated 25th September,2000 (GSR 742 E )** | **NAAQS, 2009** |
|---|---|---|---|---|---|---|---|---|
| | | | **A4227** | **A4312** | | | | |
| 1 | $PM_{10}$ | IS -5182(Part 23):2006, R-2017 | 63 | 65 | 10 µg/m³ - 1000 µg/m³ | 10 µg/m³ | 300 | 100 |
| 2 | $PM_{2.5}$ | IS -5182(Part 24):2019 | 26 | 27 | 10 µg/m³ - 400 µg/m³ | 10 µg/m³ | Not Specified | 60 |
| 3 | $SO_2$ | IS-5182(Part-2): 2001 , R-2017 | 13 | <10 | 10 µg/m³ - 1050 µg/m³ | 10 µg/m³ | 120 | 80 |
| 4 | $NO_2$ | IS-5182 (Part-6): 2006 , R-2017 | 38 | 35 | 06 µg/m³ - 420 µg/m³ | 06 µg/m³ | 120 | 80 |

*Environmental Condition : Sunny*

** LDL indicates Lower Detection Limit,*

***All units are in µg/m3, 24 hourly Average,*

***ANALYSED BY***

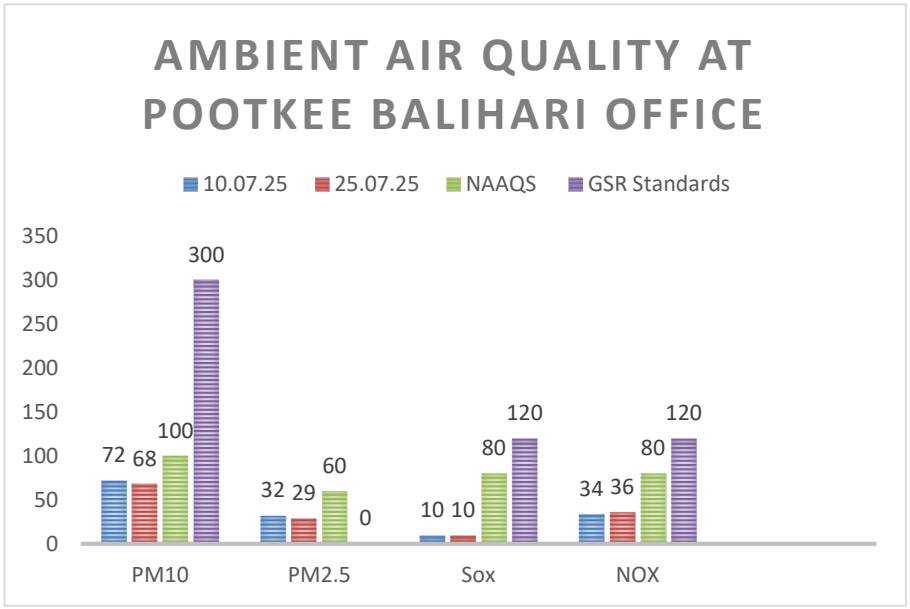
(Gaurav Kant)
***CHECKED BY***

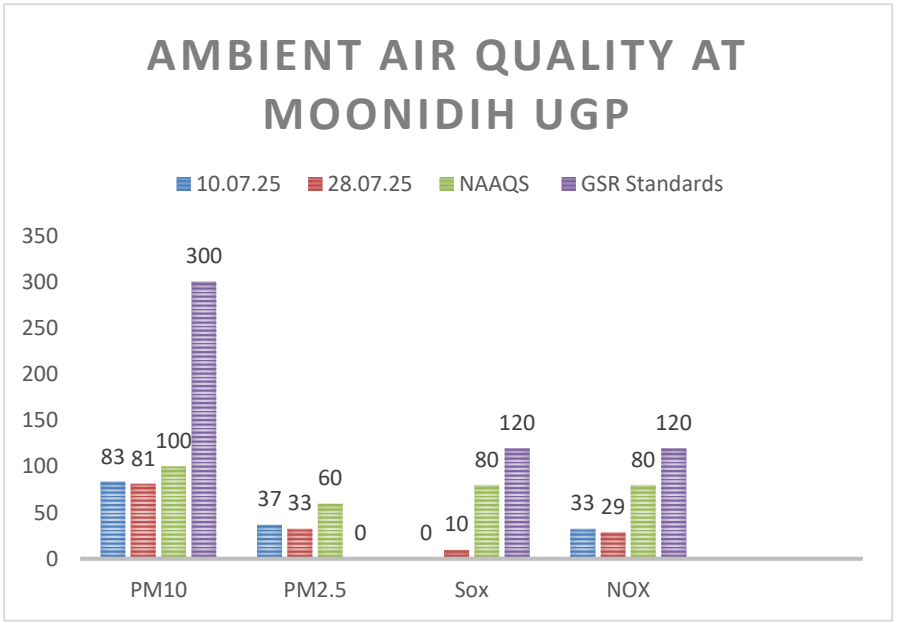
(Amit Raj Mishra)
***Authorised Signatory***

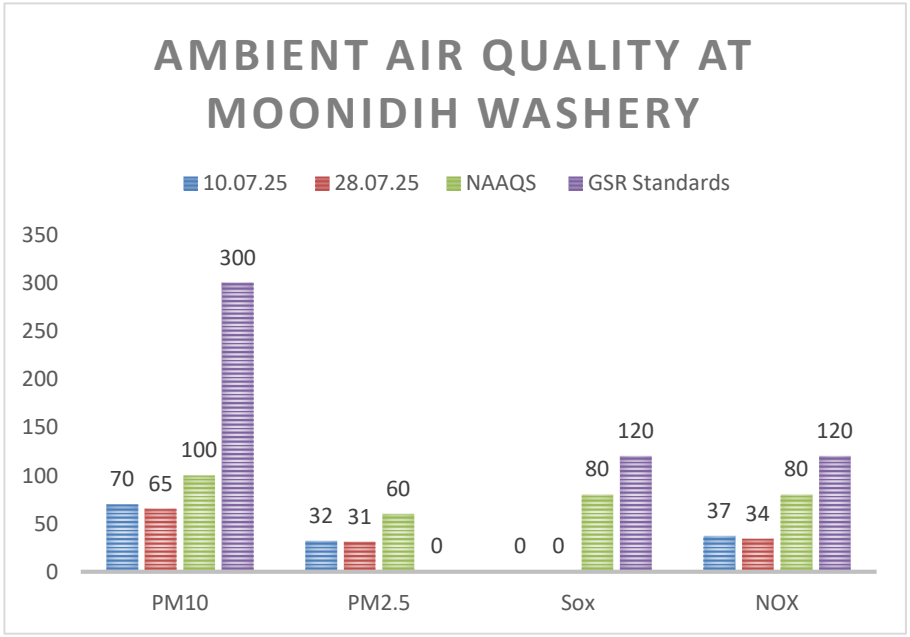
***Note**: The results above relate to the samples tested as received. This report can not be reproduced in part or full without the written permission of the HOD(Env) , CMPDI, RI-II.*

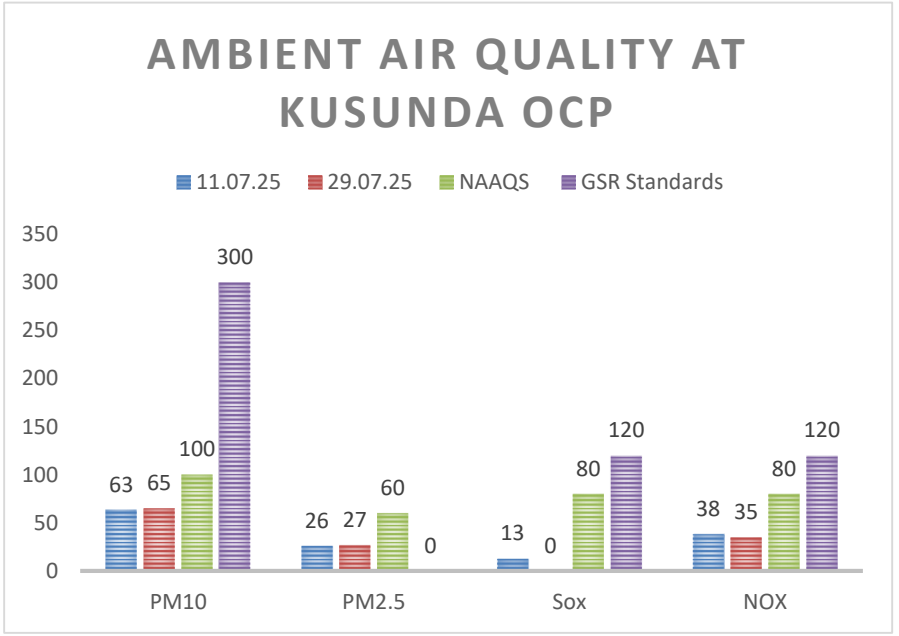
*---- End of Report ----*

*Page -1 of 1*


AMBIENT AIR QUALITY AT POOTKEE BALIHARI OFFICE
10.07.25
25.07.25
NAAQS
GSR Standards
350
300
250
200
150
100
50
0
72 68 100 300
32 29 60 0
10 10 80 120
34 36 80 120
PM10
PM2.5
Sox
NOX


AMBIENT AIR QUALITY AT MOONIDIH UGP
10.07.25
28.07.25
NAAQS
GSR Standards
350
300
250
200
150
100
50
0
83 81 100 300
37 33 60 0
0 10 80 120
33 29 80 120
PM10
PM2.5
Sox
NOX


AMBIENT AIR QUALITY AT MOONIDIH WASHERY
10.07.25
28.07.25
NAAQS
GSR Standards
350
300
250
200
150
100
50
0
70 65 100 300
32 31 60 0
0 0 80 120
37 34 80 120
PM10
PM2.5
Sox
NOX


AMBIENT AIR QUALITY AT KUSUNDA OCP
11.07.25
29.07.25
NAAQS
GSR Standards
350
300
250
200
150
100
50
0
63 65 100 300
26 27 60 0
13 0 80 120
38 35 80 120
PM10
PM2.5
Sox
NOX

# WATER QUALITY MONITORING

## 3.1 Location of sampling sites

(Refer **Plate No. – II**)

i) **Mine Discharge of Bhagabandh (MW11)**

A sampling point is fixed to assess the effluent quality of Mine discharge. This location is selected to monitor effluent discharge in to Kari jore.

## 3.2 Methodology of sampling and analysis

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

## 3.3 Results & Interpretations

The results are given in tabular form along with the applicable standards. Results are compared with Schedule - VI, effluent prescribed by MoEF&CC. Results show that most of the parameters are within the permissible limits.

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

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

**Test Report for Mine Effluent samples**

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| **Month & Year** | **07/2025** | **Cluster** | **Cluster XI** | **ULR No.** | | TC1432125000001972F | |
| **Customer** | **Environment Department, Bharat Coking Coal Limited (BCCL), Koyla Bhawan, Dhanbad (E-mail: gmenv.bccl@coalindia.in)** | | | | | **Date of Issue** | **21.08.25** |
| **Project** | | **Sampling Ref. No.** | **REM/BCCL/2025/ 07** | **Sampling Method** | **IS 3025 (Part-1)** | | **CMPDI/RI-II/LPM 13** |
| **Sampling Stations** | **(i)** | **Bhagabandh** | **Sample Collected in 2.5 Ltr Jerricane , Color as observed is transparent** | | | **Period of Analysis** | 01.07.25 to 20.08.25 |
| | | | **Date of Sampling** | 01.07.25 | 16.07.2025 | | |

| **Sl. No.** | **Parameter** | **Method of Analysis** | **Observed Values** | | **STANDARDS FOR COAL MINES (Stipulated by Ministry of Environment and Forests (MoEF), Vide Notification No. GSR 742(E), Dt: 25.09.2000)** | **LDL** |
|---|---|---|---|---|---|---|
| | | | **M1611** | **M1638** | | |
| 1 | Total Suspended Solids | IS 3025/17:1984, R :2017, Gravimetric | 42 | 40 | *100 (Max)* | 10 |
| 2 | pH | IS-3025/11:1983, R-2017, Electrometric | 7.85 | 7.8 | *5.5 - 9.0* | 0.2 |
| 3 | Oil & Grease | IS 3025/39:1991, R : 2019, Partition Gravimetric | <4.0 | <4.0 | *10 (Max)* | 2 |
| 4 | COD | APHA 23rd Edition 5220 C Titrimetric Method | 40 | 32 | *250 (Max)* | 4 |

***Grab sampling carried out for water samples **All units in mg/L unless specified otherwise *LDL indicates Lower Detection Limit & BDL indicates Below Detection Limit,*

***ANALYSED BY***

(Kumar Vaibhav)
***CHECKED BY***

(Amit Raj Mishra)
***Authorised Signatory***

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

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

# NOISE LEVEL QUALITY MONITORING

## 4.1Location of sampling sites

1. **Pootkee Balihari Office (N16)**
2. **Moonidih UGP (N17)**
3. **Moonidih Washery (N29)**
4. **Kusunda OCP (N10)**

**4.2**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

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

TC-14321

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| **Month & Year** | **07/2025** | **Cluster** | **Cluster XI** | | | **ULR No.** | TC14321250000019 88F |
| **Customer** | **Environment Department, Bharat Coking Coal Limited (BCCL), Koyla Bhawan, Dhanbad (E-mail: gmenv.bccl@coalindia.in)** | | | | | **Date of Issue** | **21.08.2025** |
| **Project** | | **Sample Ref. No.** | **REM/BCCL/2025/ 07** | | **Sampling Method** | **CMPDI/RI-II/LPM 22** | |
| **Sampling Stations** | **i** | **Pootki Balihari Office** | **Date of Sampling** | 10.07.25 | 25.07.25 | **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** | **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 | 46.2 | 47.1 | CPCB, Protocol for Ambient Level Noise Monitoring -2015 | 35 dB-135 dB | 35 Db (A) | Industrial<br>Commercial<br>Residential<br>Silence | 75<br>65<br>55<br>50 |
| 2 | | 07:00 - 08:00 | 46.9 | 47.2 | | | | | |
| 3 | | 08:00 - 09:00 | 48.6 | 49.5 | | | | | |
| 4 | | 09:00 – 10:00 | 51.8 | 50.9 | | | | | |
| 5 | | 10:00 - 11:00 | 53.8 | 57.5 | | | | | |
| 6 | | 11:00 - 12:00 | 54.3 | 55.7 | | | | | |
| 7 | | 12:00 - 13:00 | 62.8 | 63.5 | | | | | |
| 8 | | 13:00 - 14:00 | 63.2 | 58.1 | | | | | |
| 9 | | 14:00 - 15:00 | 62.2 | 62.9 | | | | | |
| 10 | | 15:00 - 16:00 | 55.3 | 55.7 | | | | | |
| 11 | | 16:00 - 17:00 | 71.4 | 70.5 | | | | | |
| 12 | | 17:00 - 18:00 | 51.1 | 49.9 | | | | | |
| 13 | | 18:00 - 19:00 | 48.7 | 48.7 | | | | | |
| 14 | | 19:00 - 20:00 | 47.4 | 47.2 | | | | | |
| 15 | | 20:00 - 21:00 | 46.2 | 45.2 | | | | | |
| 16 | | 21:00 - 22:00 | 46.5 | 46.6 | | | | | |
| | | Leq Day | 61.2 | 60.5 | | | | | |
| 1 | Noise Level dB(A)Leq -Night | 22:00-23:00 | 41.9 | 42.3 | CPCB, Protocol for Ambient Level Noise Monitoring -2015 | 35 dB-135 dB | 35 dB (A) | Industrial<br>Commercial<br>Residential<br>Silence | 70<br>55<br>45<br>50 |
| 2 | | 23:00- 00:00 | 41.3 | 42 | | | | | |
| 3 | | 00:00- 01:00 | 43.3 | 44.1 | | | | | |
| 4 | | 01.00-02.00 | 43.2 | 44 | | | | | |
| 5 | | 02.00-03.00 | 42.6 | 42.8 | | | | | |
| 6 | | 03.00-04.00 | 42.4 | 42.3 | | | | | |
| 7 | | 04.00-05.00 | 43.3 | 43.4 | | | | | |
| 8 | | 05:00-06:00 | 43.8 | 43.6 | | | | | |
| | | Leq Night | 42.8 | 43.1 | | | | | |

**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) | | (Amit Raj Mishra) |
| ANALYSED BY | CHECKED BY | | Authorised Signatory |

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

---- End of Report ----

CMPDIL, RI-II
KOYLA BHAWAN OMPLEX
DHANBAD. -826005
Phone:0326-223-850
email:i2cmpdi@coalindia.in

# CENTRAL MINE PLANNING AND DESIGN INSTITUTE LIMITED

## Environment Laboratory, Regional Institute-II

## Ambient Noise Level Test Report

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| **Month & Year** | **07/2025** | **Cluster** | **Cluster XI** | | | **ULR No.** | TC1432125000001988F |
| **Customer** | **Environment Department, Bharat Coking Coal Limited (BCCL), Koyla Bhawan, Dhanbad (E-mail: gmenv.bccl@coalindia.in)** | | | | | **Date of Issue** | **21.08.2025** |
| **Project** | | **Sample Ref. No.** | **REM/BCCL/2025/07** | **Sampling Method** | | **CMPDI/RI-II/LPM 22** | |
| **Sampling Stations** | **i** | **Moonidih UGP** | **Date of Sampling** | 10.07.25 | 28.07.25 | **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 | 46.9 | 47.1 | CPCB, Protocol for Ambient Level Noise Monitoring -2015 | 35 dB-135 dB | 35 dB(A) | Industrial<br>Commercial<br>Residential<br>Silence | 75<br>65<br>55<br>50 |
| 2 | | 07:00 - 08:00 | 46.8 | 46.3 | | | | | |
| 3 | | 08:00 - 09:00 | 47.4 | 48.9 | | | | | |
| 4 | | 09:00 – 10:00 | 52.8 | 52.1 | | | | | |
| 5 | | 10:00 - 11:00 | 54.3 | 52.8 | | | | | |
| 6 | | 11:00 - 12:00 | 57.5 | 55.7 | | | | | |
| 7 | | 12:00 - 13:00 | 63.7 | 61.5 | | | | | |
| 8 | | 13:00 - 14:00 | 58.2 | 59.4 | | | | | |
| 9 | | 14:00 - 15:00 | 62.3 | 62.9 | | | | | |
| 10 | | 15:00 - 16:00 | 56.3 | 55.7 | | | | | |
| 11 | | 16:00 - 17:00 | 71 | 72.9 | | | | | |
| 12 | | 17:00 - 18:00 | 48.9 | 47.5 | | | | | |
| 13 | | 18:00 - 19:00 | 48.1 | 46.6 | | | | | |
| 14 | | 19:00 - 20:00 | 48.6 | 47.1 | | | | | |
| 15 | | 20:00 - 21:00 | 46 | 47.1 | | | | | |
| 16 | | 21:00 - 22:00 | 47.1 | 48.6 | | | | | |
| | | **Leq Day** | 60.8 | 62.0 | | | | | |
| 1 | Noise Level dB(A)Leq -Night | 22:00-23:00 | 42.2 | 42 | CPCB, Protocol for Ambient Level Noise Monitoring -2015 | 35 dB-135 dB | 35 dB(A) | Industrial<br>Commercial<br>Residential<br>Silence | 70<br>55<br>45<br>50 |
| 2 | | 23:00- 00:00 | 42 | 41.7 | | | | | |
| 3 | | 00:00- 01:00 | 42.3 | 43.3 | | | | | |
| 4 | | 01.00-02.00 | 41.5 | 42.1 | | | | | |
| 5 | | 02.00-03.00 | 41.3 | 41.4 | | | | | |
| 6 | | 03.00-04.00 | 41.3 | 41.5 | | | | | |
| 7 | | 04.00-05.00 | 42.7 | 42.8 | | | | | |
| 8 | | 05:00-06:00 | 43.1 | 43.3 | | | | | |
| | | **Leq Night** | 42.1 | 42.3 | | | | | |

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

| | | | | | |
|---|---|---|---|---|---|
| Sampling Assistants | | (Gaurav Kant) | | | (Amit Raj Mishra) |
| ***ANALYSED BY*** | | ***CHECKED BY*** | | | ***Authorised Signatory*** |

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

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

*Page -1 of 1*

TC-14321

cmpdi A Mini Ratna Company

# 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** | **07/2025** | **Cluster** | **Cluster XI** | **ULR No.** | TC1432125000001988F |
| **Customer** | **Environment Department, Bharat Coking Coal Limited (BCCL), Koyla Bhawan, Dhanbad (E-mail: gmenv.bccl@coalindia.in)** | | | **Date of Issue** | **21.08.2025** |
| **Project** | | **Sample Ref. No.** | **REM/BCCL/2025/07** | **Sampling Method** | **CMPDI/RI-II/LPM 22** |
| **Sampling Stations** | **i** | **Moonidih Washery** | **Date of Sampling** | 10.07.25 – 28.07.25 | **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 | 46.8 | 48.4 | CPCB, Protocol for Ambient Level Noise Monitoring -2015 | 35 dB-135 dB | 35 dB(A) | Industrial<br>Commercial<br>Residential<br>Silence | 75<br>65<br>55<br>50 |
| 2 | | 07:00 - 08:00 | 46.8 | 48.4 | | | | | |
| 3 | | 08:00 - 09:00 | 50 | 49 | | | | | |
| 4 | | 09:00 – 10:00 | 63 | 61.8 | | | | | |
| 5 | | 10:00 - 11:00 | 61.8 | 62.9 | | | | | |
| 6 | | 11:00 - 12:00 | 62.9 | 61.8 | | | | | |
| 7 | | 12:00 - 13:00 | 65 | 65.6 | | | | | |
| 8 | | 13:00 - 14:00 | 65.6 | 65.7 | | | | | |
| 9 | | 14:00 - 15:00 | 67.1 | 68.6 | | | | | |
| 10 | | 15:00 - 16:00 | 66.7 | 66 | | | | | |
| 11 | | 16:00 - 17:00 | 57 | 58.9 | | | | | |
| 12 | | 17:00 - 18:00 | 55.6 | 58.3 | | | | | |
| 13 | | 18:00 - 19:00 | 53.3 | 56.9 | | | | | |
| 14 | | 19:00 - 20:00 | 52.5 | 54.7 | | | | | |
| 15 | | 20:00 - 21:00 | 52.1 | 53.3 | | | | | |
| 16 | | 21:00 - 22:00 | 51.3 | 50.7 | | | | | |
| | | | 61.7 | 62.2 | | | | | |
| 1 | Noise Level dB(A)Leq -Night | 22:00-23:00 | 47.1 | 46.4 | CPCB, Protocol for Ambient Level Noise Monitoring -2015 | 35 dB-135 dB | 35 dB(A) | Industrial<br>Commercial<br>Residential<br>Silence | 70<br>55<br>45<br>50 |
| 2 | | 23:00- 00:00 | 45.8 | 45.1 | | | | | |
| 3 | | 00:00- 01:00 | 41.8 | 41.7 | | | | | |
| 4 | | 01.00-02.00 | 41.5 | 41.5 | | | | | |
| 5 | | 02.00-03.00 | 41.2 | 40.2 | | | | | |
| 6 | | 03.00-04.00 | 40.7 | 41.4 | | | | | |
| 7 | | 04.00-05.00 | 42.7 | 43.1 | | | | | |
| 8 | | 05:00-06:00 | 43.1 | 43.3 | | | | | |
| | | **Leq Night** | 43.6 | 43.3 | | | | | |

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

| | | | |
|---|---|---|---|
| Sampling Assistants | (Gaurav Kant) | | (Amit Raj Mishra) |
| ***ANALYSED BY*** | ***CHECKED BY*** | | ***Authorised Signatory*** |

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

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

*Page -1 of 1*

TC-14321

# 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** | 07/2025 | **Cluster** | Cluster XI | **ULR No.** | TC1432125000001988F |
| **Customer** | Environment Department, Bharat Coking Coal Limited (BCCL), Koyla Bhawan, Dhanbad (E-mail: gmenv.bccl@coalindia.in) | | | **Date of Issue** | 21.08.2025 |
| **Project** | | **Sample Ref. No.** | REM/BCCL/2025/ 07 | **Sampling Method** | CMPDI/RI-II/LPM 22 |
| **Sampling Stations** | i | **Kusunda OCP** | **Date of Sampling** | 11.07.25 – 29.07.25 | **Zone Category of Station:** Bufferr 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 | 46.8 | 47.1 | CPCB, Protocol for Ambient Level Noise Monitoring -2015 | 35 dB-135 dB | 35 dB(A) | Industrial<br>Commercial<br>Residential<br>Silence | 75<br>65<br>55<br>50 |
| 2 | | 07:00 - 08:00 | 48.6 | 47.4 | | | | | |
| 3 | | 08:00 - 09:00 | 48.9 | 49.4 | | | | | |
| 4 | | 09:00 – 10:00 | 51.3 | 50.9 | | | | | |
| 5 | | 10:00 - 11:00 | 54.6 | 52.8 | | | | | |
| 6 | | 11:00 - 12:00 | 54.8 | 55.8 | | | | | |
| 7 | | 12:00 - 13:00 | 63.7 | 62.2 | | | | | |
| 8 | | 13:00 - 14:00 | 62.3 | 61.2 | | | | | |
| 9 | | 14:00 - 15:00 | 62.3 | 62.9 | | | | | |
| 10 | | 15:00 - 16:00 | 63.3 | 62.8 | | | | | |
| 11 | | 16:00 - 17:00 | 62.1 | 63.5 | | | | | |
| 12 | | 17:00 - 18:00 | 50.9 | 51.2 | | | | | |
| 13 | | 18:00 - 19:00 | 50.9 | 50 | | | | | |
| 14 | | 19:00 - 20:00 | 48.1 | 47.5 | | | | | |
| 15 | | 20:00 - 21:00 | 46.3 | 44.8 | | | | | |
| 16 | | 21:00 - 22:00 | 46.6 | 48.1 | | | | | |
| | | **Leq Day** | 58.3 | 58.1 | | | | | |
| 1 | Noise Level dB(A)Leq -Night | 22:00-23:00 | 42.5 | 43.8 | CPCB, Protocol for Ambient Level Noise Monitoring -2015 | 35 dB-135 dB | 35 dB(A) | Industrial<br>Commercial<br>Residential<br>Silence | 70<br>55<br>45<br>50 |
| 2 | | 23:00- 00:00 | 42 | 40.8 | | | | | |
| 3 | | 00:00- 01:00 | 41.4 | 39.5 | | | | | |
| 4 | | 01.00-02.00 | 41.3 | 39.4 | | | | | |
| 5 | | 02.00-03.00 | 39.9 | 40.8 | | | | | |
| 6 | | 03.00-04.00 | 39.5 | 40.2 | | | | | |
| 7 | | 04.00-05.00 | 40.7 | 39.5 | | | | | |
| 8 | | 05:00-06:00 | 41.3 | 41.7 | | | | | |
| | | Leq Night | 41.2 | 41.0 | | | | | |

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

| | | |
|---|---|---|
| Sampling Assistants | (Gaurav Kant) | (Amit Raj Mishra) |
| ***ANALYSED BY*** | ***CHECKED BY*** | ***Authorised Signatory*** |

*Note: The results above relate to the samples tested as received. This report cannot 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**<br><br>Coal mines located in the coal fields of<br>• Jharia<br>• Raniganj<br>• Bokaro | Suspended Particulate Matter (SPM) | Annual Average *<br>24 hours **| 500 µg/$m^3$<br><br>700 µg/$m^3$ | - High Volume Sampling (Average flow rate not less than 1.1 $m^3$ |
| | Respirable Particulate Matter (size less than 10 µm) (RPM) | Annual Average *<br>24 hours **| 250 µg/$m^3$<br><br>300 µg/$m^3$ | Respirable Particulate Matter sampling and analysis |
| | Sulphur Dioxide ($SO_2$) | Annual Average *<br>24 hours **| 80 µg/$m^3$<br><br>120 µg/$m^3$ | 1.Improvedwest and Gaeke method<br>2.Ultraviolet fluorescene |
| | Oxide of Nitrogen as $NO_2$ | Annual Average *<br>24 hours **| 80 µg/$m^3$<br><br>120 µg/$m^3$ | 1. Jacob & Hochheiser Modified (Na-Arsenic) Method<br>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.

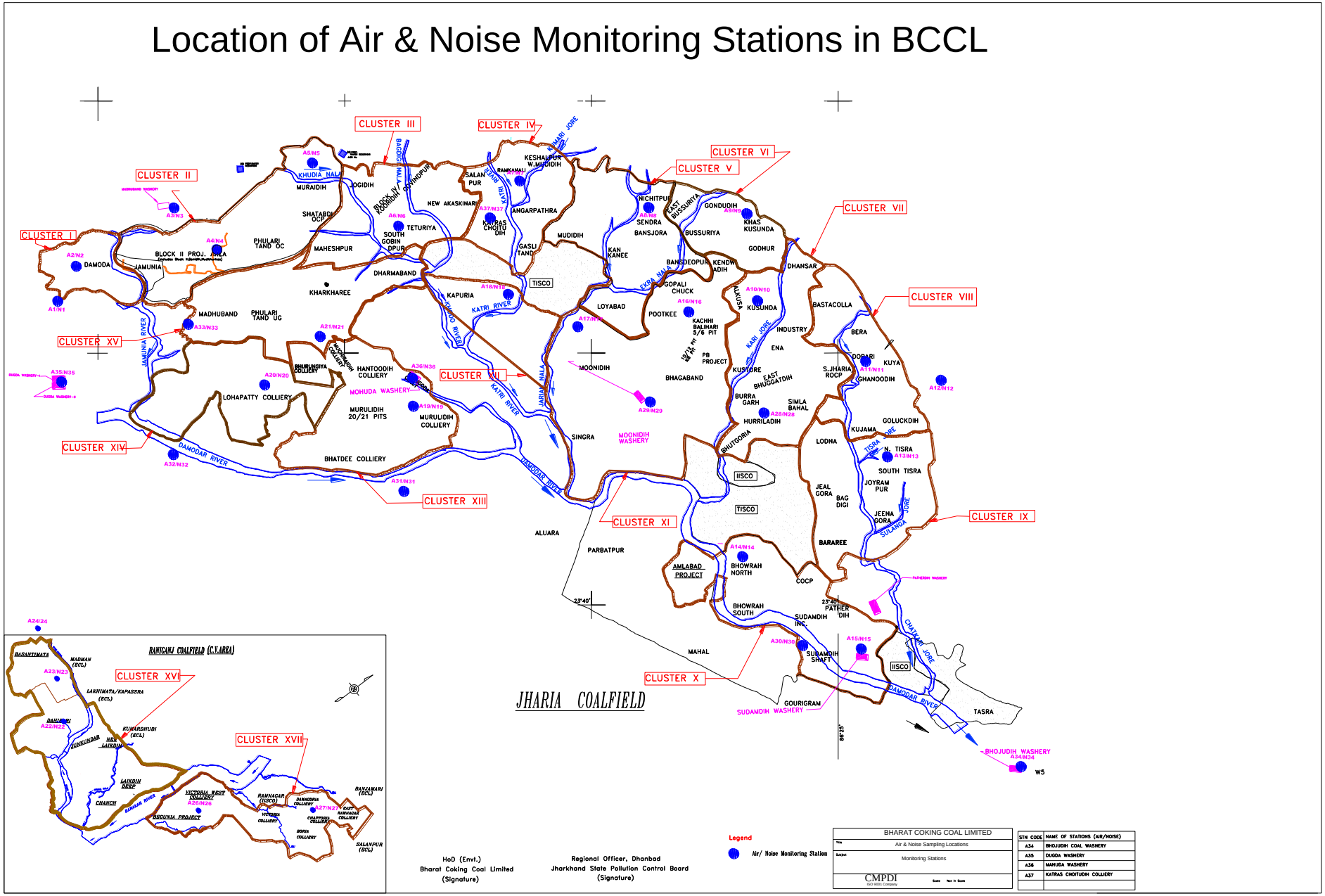
| Pollutant | Time Weighted Average | Concentration in Ambient Air | | Methods of Measurement |
|---|---|---|---|---|
| | | Industrial, Residential, Rural and other Areas | Ecologically Sensitive Area (Notified by Central Government) | |
| **Sulphur Dioxide ($SO_2$), µg/m³** | Annual *<br>24 Hours ** | 50<br>80 | 20<br>80 | -Improved West and Gaeke Method<br>-Ultraviolet Fluorescence |
| **Nitrogendioxide ($NO_2$), µg/m³** | Annual *<br>24 Hours ** | 40<br>80 | 30<br>80 | -Jacob &Hochheiser modified ($NaOH$-$NaAsO_2$) Method<br>-Gas Phase Chemiluminescence |
| **Particulate Matter (Size less than 10µm) or $PM_{10}$, µg/m³** | Annual *<br>24 Hours ** | 60<br>100 | 60<br>100 | -Gravimetric<br>-TEOM<br>-Beta attenuation |
| **Particulate Matter (Size less than 2.5µm) or $PM_{2.5}$, µg/m³** | Annual *<br>24 Hours ** | 40<br>60 | 40<br>60 | -Gravimetric<br>-TEOM<br>-Beta attenuation |
| **Ozone ($O_3$) , µg/m³** | 8 Hours *<br>1 Hour ** | 100<br>180 | 100<br>180 | -UV Photometric<br>-Chemiluminescence<br>-Chemical Method |
| **Lead (Pb) , µg/m³** | Annual *<br>24 Hours ** | 0.50<br>1.0 | 0.50<br>1.0 | -AAS/ICP Method after sampling on EPM 2000 or equivalent filter paper<br>-ED-XRF using Teflon filter |
| **Carbon Monoxide (CO), mg/m³** | 8 Hours **<br>1 Hour ** | 02<br>04 | 02<br>04 | -Non dispersive Infrared (NDIR) Spectroscopy |
| **Ammonia ($NH_3$), µg/m³** | Annual *<br>24 Hours ** | 100<br>400 | 100<br>400 | -Chemiluminescence<br>-Indophenol blue method |
| **Benzene ($C_6H_6$), µg/m³** | Annual * | 05 | 05 | -Gas Chromatography (GC) based continuous analyzer<br>-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.

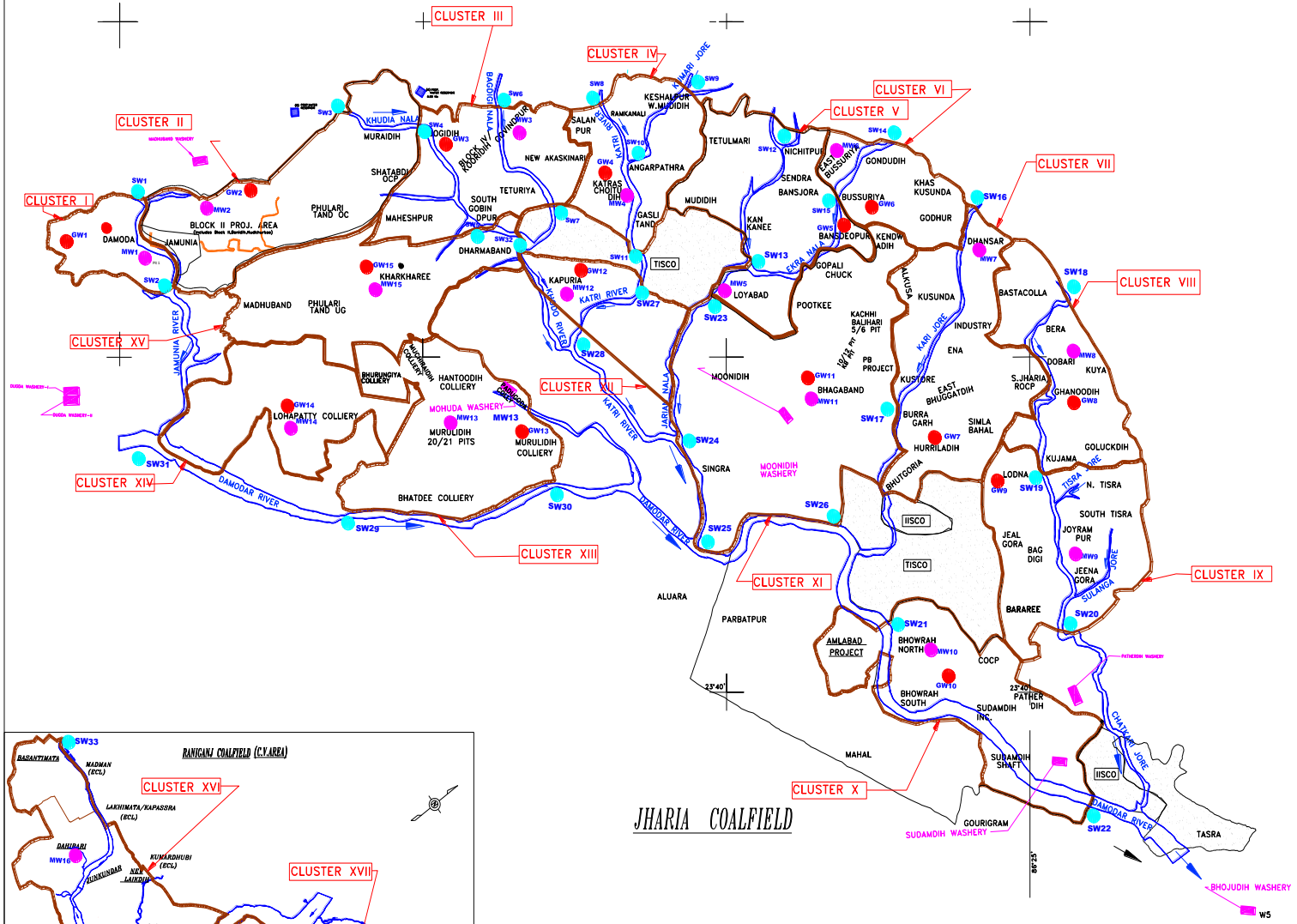
** 24 hourly or 8 hourly or 1 hourly monitored values, as applicable, shall be complied with 98% of the time in a year. 2% of the time, they JUNE exceed the limits but not on two consecutive days of monitoring.

**NOTE:**Whenever and wherever monitoring results on two consecutive days of monitoring exceed the limits specified above for the respective catego

# Location of Air & Noise Monitoring Stations in BCCL



# Water Sampling Locations in BCCL




## INDEX

| Cluster | Suface Water (U/S, D/S) | Name of River/ Nala / Jore | Mine/ Effluent Water | Sampling Location | Ground Water | Sampling Location |
|---|---|---|---|---|---|---|
| I | SW1, SW2 | Jamunia River | MW1 | Damoda Area | GW1 | Ghutway Village |
| II | SW3, SW4 | Khudia Nala | MW2 | Block II OCP | GW2 | Joyrampur Village |
| III | SW4, SW5, SW6, SW7 | Khudia Nala, Bagdigi Nala | MW3 | Govindpur Colliery | GW3 | Jogidih Village |
| IV | SW8, SW11, SW9, SW10 | Katri River, Kumari Jore | MW4 | Chotudih | GW4 | Kankanee Village |
| V | SW12, SW13, SW15 | Jarian Nala, Ekra Nala | MW5 | Mudidih | GW5 | Nichitpur |
| VI | SW14, SW15 | Ekra Nala | MW6 | East Bassuria UGP | GW6 | Bansjora Borewell |
| VII | SW16, SW17 | Kari Jore | MW7 | Dhansar UGP | GW7 | Hurriladih |
| VIII | SW18, SW19 | Kashi Jore | MW8 | Dobari UGP | GW8 | Ghanudih |
| IX | SW19, SW20 | Kashi Jore | MW9 | Jeenagora | GW9 | Lodna |
| X | SW21, SW22 | Damodar River | MW10 | Bhowrah North | GW10 | Bhowrah South |
| XI | SW23, SW24, SW25, SW26 | Jarian Nala, Damodar River | MW11 | Bhagaband h UGP | GW11 | Bhagabandh |
| XII | SW27, SW28 | Katri River | MW12 | Kapuria | GW12 | Kapuria |
| XIII | SW29, SW30 | Damodar River | MW13 | Murulidih (20/21) | GW13 | Murilidih |
| XIV | SW31, SW29 | Damodar River | MW14 | Lohapatti | GW14 | Lohapatti |
| XV | SW5, SW32 | Khudia Nala | MW15 | Kharkharee UGP | GW15 | Kharkharee |
| XVI | SW33, SW34 | Khudia River | MW16 | Dahibari OCP | GW16 | Patlabari Village |
| XVII | SW35, SW36 | Barakar River | MW17 | Damagoria Colliery | GW17 | Chaptoria |

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# ENVIRONMENTAL MONITORING REPORT OF BHARAT COKING COAL LIMITED, CLUSTER – XI

**(FOR THE MONTH JULY, 2025)**

**E. C. no. J-11015/77/2011-IA.II (M) dated 26.07.2019.**

# CMPDI

ISO 9001 Company

**Regional Institute-II**

**Dhanbad, Jharkhand**

# CONTENTS


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| 4. | CHAPTER-IV | STANDARDS AND PLANS | 20-21 |

# 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 $23^0$37' N to $23^0$52' N latitudes and $86^0$09' E to $86^0$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 ($PM_{10}$), Fine Particulate Matter ($PM_{2.5}$), Sulphur Di-oxide ($SO_2$) and Nitrogen Oxides ($NO_X$). Respirable Dust Samplers (RDS) and Fine Dust Sampler ($PM_{2.5}$ sampler) were used for sampling of $PM_{10}$, $SO_2$, & $NO_X$ 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 $PM_{10}$, $PM_{2.5}$, $SO_2$ 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 $PM_{10}$& $PM_{2.5}$ 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 Standards for Coal Mines were within permissible limits.

### 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-XI is in the Western & Southern part of the Jharia coalfield. It includes a group of 8 Mines (viz. Gopalichak UG&OC Mine**,** Kachhi Balihari 10/12 Pit UG Mine**,** PB UG Project,Bhagabandh UG Mine, Kenwadih UG, Pootkee UG, Kachi Balihari 5/6Pit UG, Moonidih UG mine). The Cluster – XI is situated about 25 - 30 kms from Dhanbad Railway Station. The mines of this Cluster – XI 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 Jarian nala & Damodar River.

1.2 The Project has Environmental Clearance from Ministry of Environment, Forests and Climate Change (MoEF&CC) for a rated capacity 5.08 MTPA (normative) and 6.604 MTPA (peak) capacity of coal production vide letter no. J-11015/77/2011-IA.II (M) dated 26$^{th}$ July, 2019.

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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 $PM_{10}$, $PM_{2.5}$, $SO_2$, NOx 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) Pootkee Balihari Office (A16): Industrial Area**

The location of the sampling station is 23°45'17.23"N 86°21'46.27"E. The sampler was placed at an elevated platform approx. 1.5m above ground level at Project 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 sampler was placed at an elevated platform approx. 1.5m above ground level at project office.

**iii) Moonidih Washery (A29): Industrial Area**

The location of the sampling station is 23°44'26.00"N 86°21'16.00"E. The sampler was placed at a height of approx. 1.5m above ground level at Project office.

**II.BUFFER ZONE Monitoring Location**

**I) Kusunda OCP (A10)**

The location of the sampling station is 23°46'49.07"N 86°24'15.71"E. The sampler was placed at a height of approx. 1.5m above ground level at Safety 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** | **07/2025** | **Cluster** | **Cluster XI** | | | **ULR No.** | TC1432125000002006F |
| **Customer** | **Environment Department, Bharat Coking Coal Limited (BCCL), Koyla Bhawan, Dhanbad (E-mail: gmenv.bccl@coalindia.in)** | | | | | **Date of Issue** | 05.09.2025 |
| **Project** | **Pootkee Balihari Office** | **Sample Ref. No.** | **REM/BCCL/2025/07** | | **Sampling Method** | **CMPDI/RI-II/LPM 13 , ( IS 5182)** | |
| **Date of Sampling** | 12.08.25 | 21.08.25 | **Period of Analysis** | 12.08.25 | 02.09.25 | **Zone of Station:** | **Core Zone** |

| **Sl. No.** | **Parameter** | **Method of Analysis** | **Observed Values ( in µg/m³)** | | **Range Of Testing** | **LDL** | **MoEF Standards Notification dated 25th September,2000 (GSR 742 E )** | **NAAQS, 2009** |
|---|---|---|---|---|---|---|---|---|
| | | | **A4379** | **A4416** | | | | |
| 1 | $PM_{10}$ | IS -5182(Part 23):2006, R-2017 | 81 | 76 | 10 µg/m³ - 1000 µg/m³ | 10 µg/m³ | 300 | 100 |
| 2 | $PM_{2.5}$ | IS -5182(Part 24):2019 | 35 | 35 | 10 µg/m³ - 400 µg/m³ | 10 µg/m³ | Not Specified | 60 |
| 3 | $SO_2$ | IS-5182(Part-2): 2001 , R-2017 | 10 | 10 | 10 µg/m³ - 1050 µg/m³ | 10 µg/m³ | 120 | 80 |
| 4 | $NO_2$ | IS-5182 (Part-6): 2006 , R-2017 | 31 | 36 | 06 µg/m³ - 420 µg/m³ | 06 µg/m³ | 120 | 80 |

*Environmental Condition : Sunny*

** LDL indicates Lower Detection Limit,*

***All units are in µg/m3, 24 hourly Average,*

***ANALYSED BY*** (Gaurav Kant) ***CHECKED BY*** (Kumar Vaibhav) ***Authorised Signatory***

***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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Environment Laboratory, Regional Institute-II
Ambient Air Quality Test Report

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

**Test Report for Ambient Air Samples**

| | | | | | |
|---|---|---|---|---|---|
| **Month & Year** | **07/2025** | **Cluster** | **Cluster XI** | **ULR No.** | TC1432125000002006F |
| **Customer** | **Environment Department, Bharat Coking Coal Limited (BCCL), Koyla Bhawan, Dhanbad (E-mail: gmenv.bccl@coalindia.in)** | | | **Date of Issue** | 05.09.2025 |
| **Project** | **Moonidih UGP** | **Sample Ref. No.** | **REM/BCCL/2025/07** | **Sampling Method** | **CMPDI/RI-II/LPM 13 , ( IS 5182)** |
| **Date of Sampling** | 12.08.25 | 22.08.25 | **Period of Analysis** | 12.08.25 – 02.09.25 | **Zone of Station:** **Core Zone** |

| **Sl. No.** | **Parameter** | **Method of Analysis** | **Observed Values ( in µg/m³)** | | **Range Of Testing** | **LDL** | **MoEF Standards Notification dated 25th September,2000 (GSR 742 E )** | **NAAQS, 2009** |
|---|---|---|---|---|---|---|---|---|
| | | | **A4381** | **A4423** | | | | |
| 1 | $PM_{10}$ | IS -5182(Part 23):2006, R-2017 | 86 | 84 | 10 µg/m³ - 1000 µg/m³ | 10 µg/m³ | 300 | 100 |
| 2 | $PM_{2.5}$ | IS -5182(Part 24):2019 | 39 | 36 | 10 µg/m³ - 400 µg/m³ | 10 µg/m³ | Not Specified | 60 |
| 3 | $SO_2$ | IS-5182(Part-2): 2001 , R-2017 | <10 | <10 | 10 µg/m³ - 1050 µg/m³ | 10 µg/m³ | 120 | 80 |
| 4 | $NO_2$ | IS-5182 (Part-6): 2006 , R-2017 | 28 | 32 | 06 µg/m³ - 420 µg/m³ | 06 µg/m³ | 120 | 80 |

*Environmental Condition : Sunny*

** LDL indicates Lower Detection Limit,*

***All units are in µg/m3, 24 hourly Average,*

***ANALYSED BY*** | (Gaurav Kant) ***CHECKED BY*** | (Kumar Vaibhav) ***Authorised Signatory***

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*Page -1 of 1*

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Ambient Air Quality Test Report

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**Test Report for Ambient Air Samples**

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| **Month & Year** | **07/2025** | **Cluster** | **Cluster XI** | | | **ULR No.** | TC1432125000002006F |
| **Customer** | **Environment Department, Bharat Coking Coal Limited (BCCL), Koyla Bhawan, Dhanbad (E-mail: gmenv.bccl@coalindia.in)** | | | | | **Date of Issue** | 05.09.2025 |
| **Project** | **Moonidih Washery** | | **Sample Ref. No.** | **REM/BCCL/2025/07** | **Sampling Method** | **CMPDI/RI-II/LPM 13 , ( IS 5182)** | |
| **Date of Sampling** | 12.08.25 | | 22.08.25 | **Period of Analysis** | 12.08.25 02.09.25 | **Zone of Station:** | **Core Zone** |

| **Sl. No.** | **Parameter** | **Method of Analysis** | **Observed Values ( in µg/m³)** | | **Range Of Testing** | **LDL** | **MoEF Standards Notification dated 25th September,2000 (GSR 742 E )** | **NAAQS, 2009** |
|---|---|---|---|---|---|---|---|---|
| | | | **A4380** | **A4422** | | | | |
| 1 | $PM_{10}$ | IS -5182(Part 23):2006, R-2017 | 74 | 75 | 10 µg/m³ - 1000 µg/m³ | 10 µg/m³ | 300 | 100 |
| 2 | $PM_{2.5}$ | IS -5182(Part 24):2019 | 32 | 33 | 10 µg/m³ - 400 µg/m³ | 10 µg/m³ | Not Specified | 60 |
| 3 | $SO_2$ | IS-5182(Part-2): 2001 , R-2017 | <10 | <10 | 10 µg/m³ - 1050 µg/m³ | 10 µg/m³ | 120 | 80 |
| 4 | $NO_2$ | IS-5182 (Part-6): 2006 , R-2017 | 36 | 33 | 06 µg/m³ - 420 µg/m³ | 06 µg/m³ | 120 | 80 |

*Environmental Condition : Sunny*

** LDL indicates Lower Detection Limit,*

***All units are in µg/m3, 24 hourly Average,*

***ANALYSED BY*** (Gaurav Kant) ***CHECKED BY*** (Kumar Vaibhav) ***Authorised Signatory***

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*Page -1 of 1*

TC-14321

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

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**Test Report for Ambient Air Samples**

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| **Month & Year** | **07/2025** | **Cluster** | **Cluster XI** | | | **ULR No.** | TC1432125000002006F |
| **Customer** | **Environment Department, Bharat Coking Coal Limited (BCCL), Koyla Bhawan, Dhanbad (E-mail: gmenv.bccl@coalindia.in)** | | | | | **Date of Issue** | 05.09.2025 |
| **Project** | **Kusunda** | | **Sample Ref. No.** | **REM/BCCL/2025/07** | **Sampling Method** | **CMPDI/RI-II/LPM 13 , ( IS 5182)** | |
| **Date of Sampling** | 08.08.25 | | 20.08.25 | **Period of Analysis** | 08.08.25 02.09.25 | **Zone of Station:** | **Buffer Zone** |

| **Sl. No.** | **Parameter** | **Method of Analysis** | **Observed Values ( in µg/m³)** | | **Range Of Testing** | **LDL** | **MoEF Standards Notification dated 25th September,2000 (GSR 742 E )** | **NAAQS, 2009** |
|---|---|---|---|---|---|---|---|---|
| | | | **A4335** | **A4404** | | | | |
| 1 | $PM_{10}$ | IS -5182(Part 23):2006, R-2017 | 75 | 73 | 10 µg/m³ - 1000 µg/m³ | 10 µg/m³ | 300 | 100 |
| 2 | $PM_{2.5}$ | IS -5182(Part 24):2019 | 31 | 31 | 10 µg/m³ - 400 µg/m³ | 10 µg/m³ | Not Specified | 60 |
| 3 | $SO_2$ | IS-5182(Part-2): 2001 , R-2017 | 11 | <10 | 10 µg/m³ - 1050 µg/m³ | 10 µg/m³ | 120 | 80 |
| 4 | $NO_2$ | IS-5182 (Part-6): 2006 , R-2017 | 36 | 34 | 06 µg/m³ - 420 µg/m³ | 06 µg/m³ | 120 | 80 |

*Environmental Condition : Sunny*

** LDL indicates Lower Detection Limit,*

***All units are in µg/m3, 24 hourly Average,*

***ANALYSED BY***

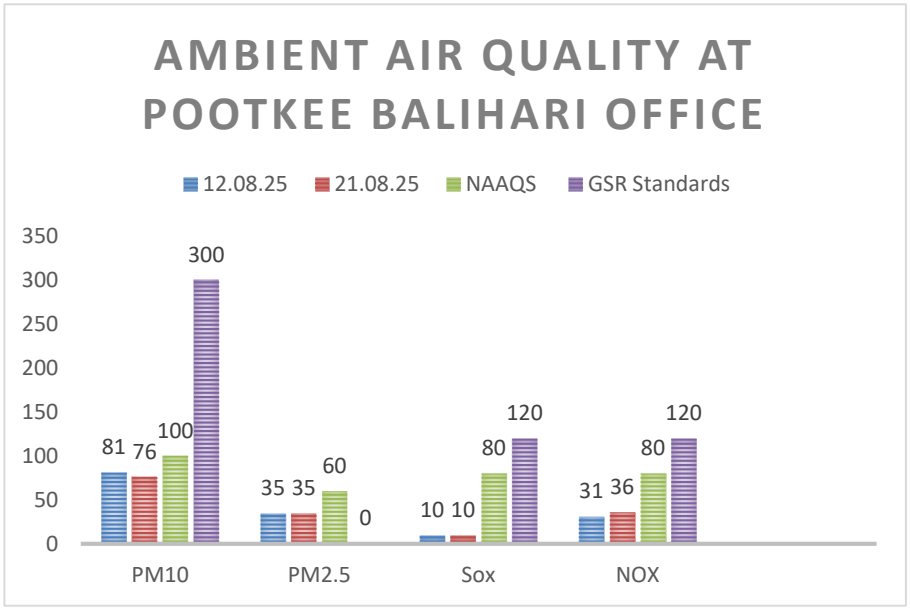
(Gaurav Kant)
***CHECKED BY***

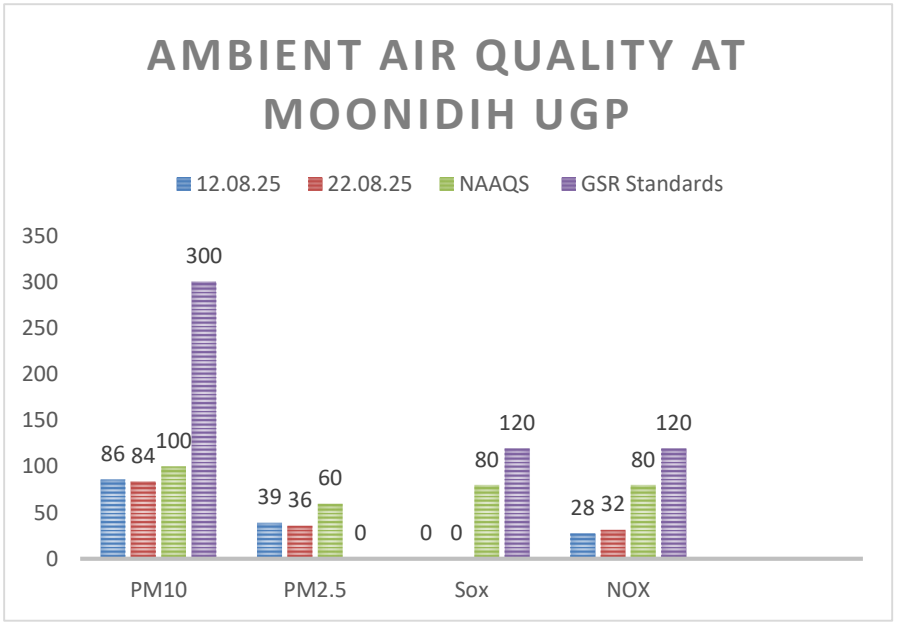
(Kumar Vaibhav)
***Authorised Signatory***

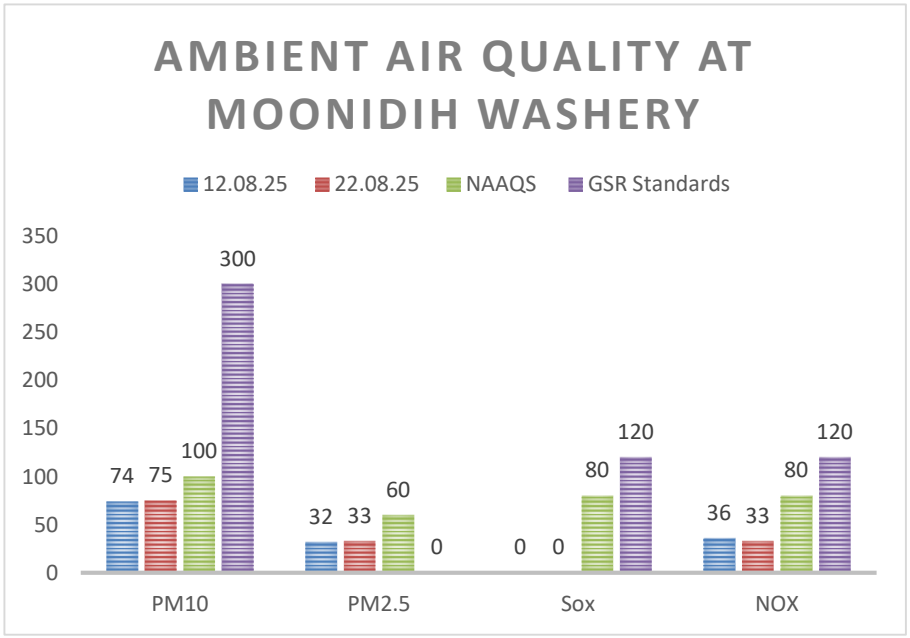
***Note**: The results above relate to the samples tested as received. This report can not be reproduced in part or full without the written permission of the HOD(Env) , CMPDI, RI-II.*

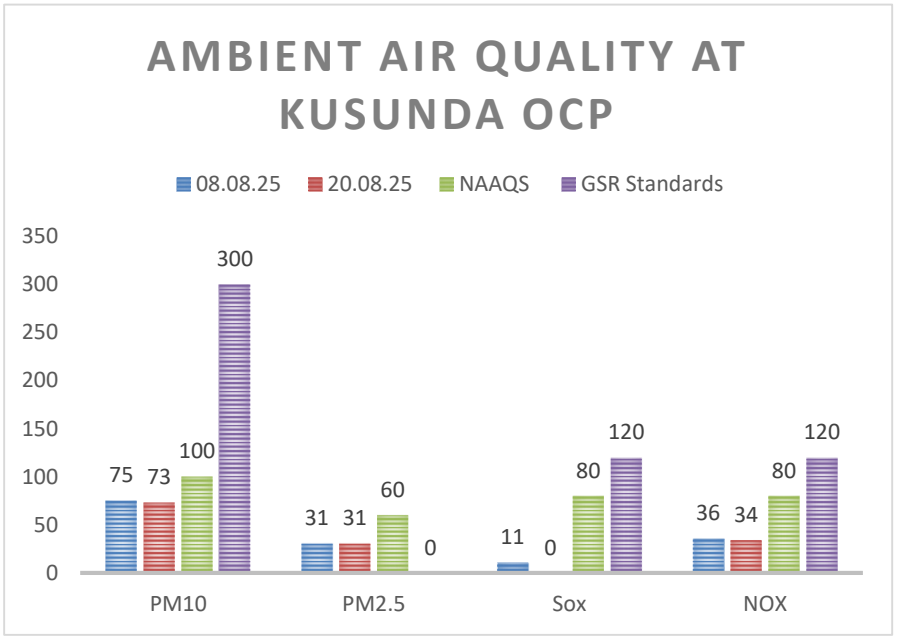
*---- End of Report ----*

*Page -1 of 1*


AMBIENT AIR QUALITY AT POOTKEE BALIHARI OFFICE
12.08.25
21.08.25
NAAQS
GSR Standards
350
300
250
200
150
100
50
0
81 76 100 300
35 35 60 0
10 10 80 120
31 36 80 120
PM10
PM2.5
Sox
NOX


AMBIENT AIR QUALITY AT MOONIDIH UGP
12.08.25
22.08.25
NAAQS
GSR Standards
350
300
250
200
150
100
50
0
86 84 100 300
39 36 60 0
0 0 80 120
28 32 80 120
PM10
PM2.5
Sox
NOX


AMBIENT AIR QUALITY AT MOONIDIH WASHERY
12.08.25
22.08.25
NAAQS
GSR Standards
350
300
250
200
150
100
50
0
74 75 100 300
32 33 60 0
0 0 80 120
36 33 80 120
PM10
PM2.5
Sox
NOX


AMBIENT AIR QUALITY AT KUSUNDA OCP
08.08.25
20.08.25
NAAQS
GSR Standards
350
300
250
200
150
100
50
0
75 73 100 300
31 31 60 0
11 0 80 120
36 34 80 120
PM10
PM2.5
Sox
NOX

# WATER QUALITY MONITORING

## 3.1 Location of sampling sites

(Refer **Plate No. – II**)

### i) Mine Discharge of Bhagabandh (MW11)

A sampling point is fixed to assess the effluent quality of Mine discharge. This location is selected to monitor effluent discharge in to Kari jore.

## 3.2 Methodology of sampling and analysis

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

## 3.3 Results & Interpretations

The results are given in tabular form along with the applicable standards. Results are compared with Schedule - VI, effluent prescribed by MoEF&CC. Results show that most of the parameters are within the permissible limits.

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

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

**Test Report for Mine Effluent samples**

| | | | | | | |
|---|---|---|---|---|---|---|
| **Month & Year** | **07/2025** | **Cluster** | **Cluster XI** | **ULR No.** | | TC1432125000002024F |
| **Customer** | **Environment Department, Bharat Coking Coal Limited (BCCL), Koyla Bhawan, Dhanbad (E-mail: gmenv.bccl@coalindia.in)** | | | | **Date of Issue** | 05.09.2025 |
| **Project** | | **Sampling Ref. No.** | **REM/BCCL/2025/ 07** | **Sampling Method** | **IS 3025 (Part-1)** | **CMPDI/RI-II/LPM 13** |
| **Sampling Stations** | **(i)** | **Bhagabandh** | **Sample Collected in 2.5 Ltr Jerricane , Color as observed is transparent** | | **Period of Analysis** | 11.08.2025 to 05.09.25 |
| | | | **Date of Sampling** | 11.08.2025 | 25.08.2025 | |

| **Sl. No.** | **Parameter** | **Method of Analysis** | **Observed Values** | | **STANDARDS FOR COAL MINES (Stipulated by Ministry of Environment and Forests (MoEF), Vide Notification No. GSR 742(E), Dt: 25.09.2000)** | **LDL** |
|---|---|---|---|---|---|---|
| | | | M1676 | M1703 | | |
| 1 | Total Suspended Solids | IS 3025/17:1984, R :2017, Gravimetric | 38 | 41 | *100 (Max)* | 10 |
| 2 | pH | IS-3025/11:1983, R-2017, Electrometric | 7.91 | 7.99 | *5.5 - 9.0* | 0.2 |
| 3 | Oil & Grease | IS 3025/39:1991, R : 2019, Partition Gravimetric | <4.0 | <4.0 | *10 (Max)* | 2 |
| 4 | COD | APHA 23rd Edition 5220 C Titrimetric Method | 40 | 36 | *250 (Max)* | 4 |

***Grab sampling carried out for water samples **All units in mg/L unless specified otherwise *LDL indicates Lower Detection Limit & BDL indicates Below Detection Limit,*

***ANALYSED BY***

(Gaurav Kant)
***CHECKED BY***

(Kumar Vaibhav)
***Authorised Signatory***

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

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

# NOISE LEVEL QUALITY MONITORING

## 4.1Location of sampling sites

1. **Pootkee Balihari Office (N16)**
2. **Moonidih UGP (N17)**
3. **Moonidih Washery (N29)**
4. **Kusunda OCP (N10)**

**4.2**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

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

TC-14321

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| **Month & Year** | **07/2025** | **Cluster** | **Cluster XI** | | | **ULR No.** | TC14321250000002040F |
| **Customer** | **Environment Department, Bharat Coking Coal Limited (BCCL), Koyla Bhawan, Dhanbad (E-mail: gmenv.bccl@coalindia.in)** | | | | | **Date of Issue** | 05.09.2025 |
| **Project** | | **Sample Ref. No.** | **REM/BCCL/2025/ 07** | | **Sampling Method** | **CMPDI/RI-II/LPM 22** | |
| **Sampling Stations** | **i** | **Pootki Balihari Office** | **Date of Sampling** | 12.08.25 | 21.08.25 | **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 | 44.7 | 45.7 | CPCB, Protocol for Ambient Level Noise Monitoring -2015 | 35 dB-135 dB | 35 Db (A) | Industrial<br>Commercial<br>Residential<br>Silence | 75<br>65<br>55<br>50 |
| 2 | | 07:00 - 08:00 | 47.6 | 48.1 | | | | | |
| 3 | | 08:00 - 09:00 | 49.8 | 50.4 | | | | | |
| 4 | | 09:00 – 10:00 | 55.4 | 55.9 | | | | | |
| 5 | | 10:00 - 11:00 | 56.7 | 57.5 | | | | | |
| 6 | | 11:00 - 12:00 | 52.5 | 53.1 | | | | | |
| 7 | | 12:00 - 13:00 | 51.1 | 50.5 | | | | | |
| 8 | | 13:00 - 14:00 | 48.8 | 48.6 | | | | | |
| 9 | | 14:00 - 15:00 | 49 | 45.9 | | | | | |
| 10 | | 15:00 - 16:00 | 45.3 | 45.6 | | | | | |
| 11 | | 16:00 - 17:00 | 44.7 | 44.2 | | | | | |
| 12 | | 17:00 - 18:00 | 44.3 | 44.9 | | | | | |
| 13 | | 18:00 - 19:00 | 44.3 | 44.8 | | | | | |
| 14 | | 19:00 - 20:00 | 42.8 | 44 | | | | | |
| 15 | | 20:00 - 21:00 | 42.7 | 42.9 | | | | | |
| 16 | | 21:00 - 22:00 | 42.6 | 42.2 | | | | | |
| | | Leq Day | 50.1 | 50.5 | | | | | |
| 1 | Noise Level dB(A)Leq -Night | 22:00-23:00 | 43.7 | 43.9 | CPCB, Protocol for Ambient Level Noise Monitoring -2015 | 35 dB-135 dB | 35 dB (A) | Industrial<br>Commercial<br>Residential<br>Silence | 70<br>55<br>45<br>50 |
| 2 | | 23:00- 00:00 | 43.1 | 43.3 | | | | | |
| 3 | | 00:00- 01:00 | 42.1 | 43 | | | | | |
| 4 | | 01.00-02.00 | 42 | 42.8 | | | | | |
| 5 | | 02.00-03.00 | 41.4 | 41.6 | | | | | |
| 6 | | 03.00-04.00 | 43 | 41.2 | | | | | |
| 7 | | 04.00-05.00 | 42.1 | 42.2 | | | | | |
| 8 | | 05:00-06:00 | 42.6 | 42.4 | | | | | |
| | | Leq Night | 42.6 | 42.6 | | | | | |

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

| | | | |
|---|---|---|---|
| Sampling Assistants | (Gaurav Kant) | | (Kumar Vaibhav) |
| ANALYSED BY | CHECKED BY | | Authorised Signatory |

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

---- End of Report ----

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Environment Laboratory, Regional Institute-II
CMPDIL, RI-II
KOYLA BHAWAN OMPLEX
DHANBAD. -826005
Phone:0326-223-850
email:i2cmpdi@coalindia.in

# Ambient Noise Level Test Report

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| **Month & Year** | **07/2025** | **Cluster** | **Cluster XI** | | | **ULR No.** | TC1432125000002040F |
| **Customer** | **Environment Department, Bharat Coking Coal Limited (BCCL), Koyla Bhawan, Dhanbad (E-mail: gmenv.bccl@coalindia.in)** | | | | | **Date of Issue** | 05.09.2025 |
| **Project** | | **Sample Ref. No.** | **REM/BCCL/2025/07** | **Sampling Method** | | **CMPDI/RI-II/LPM 22** | |
| **Sampling Stations** | **i** | **Moonidih UGP** | **Date of Sampling** | 12.08.25 | 22.08.25 | **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 | 44.5 | 45.1 | CPCB, Protocol for Ambient Level Noise Monitoring -2015 | 35 dB-135 dB | 35 dB(A) | Industrial<br>Commercial<br>Residential<br>Silence | 75<br>65<br>55<br>50 |
| 2 | | 07:00 - 08:00 | 40.6 | 41.4 | | | | | |
| 3 | | 08:00 - 09:00 | 47.3 | 48.7 | | | | | |
| 4 | | 09:00 – 10:00 | 45.6 | 43.5 | | | | | |
| 5 | | 10:00 - 11:00 | 48.3 | 47.4 | | | | | |
| 6 | | 11:00 - 12:00 | 51.3 | 52 | | | | | |
| 7 | | 12:00 - 13:00 | 49.7 | 49.4 | | | | | |
| 8 | | 13:00 - 14:00 | 51.1 | 50.2 | | | | | |
| 9 | | 14:00 - 15:00 | 47.7 | 47.4 | | | | | |
| 10 | | 15:00 - 16:00 | 46.2 | 45.6 | | | | | |
| 11 | | 16:00 - 17:00 | 45.8 | 49 | | | | | |
| 12 | | 17:00 - 18:00 | 45.5 | 46 | | | | | |
| 13 | | 18:00 - 19:00 | 44.8 | 45.1 | | | | | |
| 14 | | 19:00 - 20:00 | 45.3 | 44.9 | | | | | |
| 15 | | 20:00 - 21:00 | 44 | 43.9 | | | | | |
| 16 | | 21:00 - 22:00 | 43.6 | 43.8 | | | | | |
| | | **Leq Day** | 47.2 | 47.4 | | | | | |
| 1 | Noise Level dB(A)Leq -Night | 22:00-23:00 | 42.5 | 42.5 | CPCB, Protocol for Ambient Level Noise Monitoring -2015 | 35 dB-135 dB | 35 dB(A) | Industrial<br>Commercial<br>Residential<br>Silence | 70<br>55<br>45<br>50 |
| 2 | | 23:00- 00:00 | 41.9 | 42.1 | | | | | |
| 3 | | 00:00- 01:00 | 41.2 | 42.1 | | | | | |
| 4 | | 01.00-02.00 | 40.4 | 41 | | | | | |
| 5 | | 02.00-03.00 | 40.2 | 40.3 | | | | | |
| 6 | | 03.00-04.00 | 40.2 | 40.4 | | | | | |
| 7 | | 04.00-05.00 | 41.5 | 41.6 | | | | | |
| 8 | | 05:00-06:00 | 41.9 | 42.1 | | | | | |
| | | **Leq Night** | 41.3 | 41.6 | | | | | |

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

| Sampling Assistants | (Gaurav Kant) | (Kumar Vaibhav) |
|---|---|---|
| ***ANALYSED BY*** | ***CHECKED BY*** | ***Authorised Signatory*** |

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

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

*Page -1 of 1*

TC-14321

cmpdi A Mini Ratna Company

# 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** | 07/2025 | **Cluster** | Cluster XI | **ULR No.** | TC1432125000002040F |
| **Customer** | Environment Department, Bharat Coking Coal Limited (BCCL), Koyla Bhawan, Dhanbad (E-mail: gmenv.bccl@coalindia.in) | | | **Date of Issue** | 05.09.2025 |
| **Project** | | **Sample Ref. No.** | REM/BCCL/2025/07 | **Sampling Method** | CMPDI/RI-II/LPM 22 |
| **Sampling Stations** | i | **Moonidih Washery** | **Date of Sampling** | 12.08.25 – 22.08.25 | **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 | 43.6 | 43.8 | CPCB, Protocol for Ambient Level Noise Monitoring -2015 | 35 dB-135 dB | 35 dB(A) | Industrial | 75 |
| 2 | | 07:00 - 08:00 | 45.6 | 46 | | | | Commercial | 65 |
| 3 | | 08:00 - 09:00 | 49 | 48.5 | | | | Residential | 55 |
| 4 | | 09:00 – 10:00 | 52.1 | 52.2 | | | | Silence | 50 |
| 5 | | 10:00 - 11:00 | 54 | 54 | | | | | |
| 6 | | 11:00 - 12:00 | 55 | 52.9 | | | | | |
| 7 | | 12:00 - 13:00 | 56.4 | 58.1 | | | | | |
| 8 | | 13:00 - 14:00 | 55.9 | 55.9 | | | | | |
| 9 | | 14:00 - 15:00 | 51.5 | 52.2 | | | | | |
| 10 | | 15:00 - 16:00 | 52.2 | 51.2 | | | | | |
| 11 | | 16:00 - 17:00 | 50.6 | 49.8 | | | | | |
| 12 | | 17:00 - 18:00 | 49.7 | 49 | | | | | |
| 13 | | 18:00 - 19:00 | 48.3 | 48.2 | | | | | |
| 14 | | 19:00 - 20:00 | 47.3 | 47.8 | | | | | |
| 15 | | 20:00 - 21:00 | 46.5 | 44.9 | | | | | |
| 16 | | 21:00 - 22:00 | 44.5 | 45.1 | | | | | |
| | | **Leq Day** | 51.8 | 51.8 | | | | | |
| 1 | Noise Level dB(A)Leq -Night | 22:00-23:00 | 45.7 | 46.3 | CPCB, Protocol for Ambient Level Noise Monitoring -2015 | 35 dB-135 dB | 35 dB(A) | Industrial | 70 |
| 2 | | 23:00- 00:00 | 44.6 | 43.9 | | | | Commercial | 55 |
| 3 | | 00:00- 01:00 | 40.7 | 40.6 | | | | Residential | 45 |
| 4 | | 01.00-02.00 | 40.4 | 40.4 | | | | Silence | 50 |
| 5 | | 02.00-03.00 | 40.1 | 39.1 | | | | | |
| 6 | | 03.00-04.00 | 40.7 | 41.4 | | | | | |
| 7 | | 04.00-05.00 | 42.7 | 43.1 | | | | | |
| 8 | | 05:00-06:00 | 43.1 | 43.3 | | | | | |
| | | **Leq Night** | 43.6 | 43.3 | | | | | |

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

| | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| Sampling Assistants | | | (Gaurav Kant) | | | | | | (Kumar Vaibhav) |
| | ***ANALYSED BY*** | | ***CHECKED BY*** | | | | | | ***Authorised Signatory*** |

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

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

*Page -1 of 1*

CMPDIL, RI-II
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TC-14321

# CENTRAL MINE PLANNING AND DESIGN INSTITUTE LIMITED

## Environment Laboratory, Regional Institute-II

## Ambient Noise Level Test Report

| | | | | | |
|---|---|---|---|---|---|
| **Month & Year** | 07/2025 | **Cluster** | Cluster XI | **ULR No.** | TC1432125000002040F |
| **Customer** | Environment Department, Bharat Coking Coal Limited (BCCL), Koyla Bhawan, Dhanbad (E-mail: gmenv.bccl@coalindia.in) | | | **Date of Issue** | 05.09.2025 |
| **Project** | | **Sample Ref. No.** | REM/BCCL/2025/ 07 | **Sampling Method** | CMPDI/RI-II/LPM 22 |
| **Sampling Stations** | i | **Kusunda OCP** | **Date of Sampling** | 08.08.25 – 20.08.25 | **Zone Category of Station:** Bufferr 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 | 43.6 | 43.9 | CPCB, Protocol for Ambient Level Noise Monitoring -2015 | 35 dB-135 dB | 35 dB(A) | Industrial<br>Commercial<br>Residential<br>Silence | 75<br>65<br>55<br>50 |
| 2 | | 07:00 - 08:00 | 46.5 | 46 | | | | | |
| 3 | | 08:00 - 09:00 | 49.4 | 45.9 | | | | | |
| 4 | | 09:00 – 10:00 | 54 | 52.5 | | | | | |
| 5 | | 10:00 - 11:00 | 55.9 | 54.9 | | | | | |
| 6 | | 11:00 - 12:00 | 54.8 | 53.5 | | | | | |
| 7 | | 12:00 - 13:00 | 57.4 | 56 | | | | | |
| 8 | | 13:00 - 14:00 | 58.6 | 56.6 | | | | | |
| 9 | | 14:00 - 15:00 | 58.6 | 52.4 | | | | | |
| 10 | | 15:00 - 16:00 | 52 | 51.5 | | | | | |
| 11 | | 16:00 - 17:00 | 52.2 | 58.3 | | | | | |
| 12 | | 17:00 - 18:00 | 51.7 | 50.5 | | | | | |
| 13 | | 18:00 - 19:00 | 50.3 | 49.8 | | | | | |
| 14 | | 19:00 - 20:00 | 50.4 | 49 | | | | | |
| 15 | | 20:00 - 21:00 | 49.2 | 48.3 | | | | | |
| 16 | | 21:00 - 22:00 | 49.6 | 48.4 | | | | | |
| | | **Leq Day** | 53.9 | 52.9 | | | | | |
| 1 | Noise Level dB(A)Leq -Night | 22:00-23:00 | 50.2 | 36.9 | CPCB, Protocol for Ambient Level Noise Monitoring -2015 | 35 dB-135 dB | 35 dB(A) | Industrial<br>Commercial<br>Residential<br>Silence | 70<br>55<br>45<br>50 |
| 2 | | 23:00- 00:00 | 49.4 | 36.9 | | | | | |
| 3 | | 00:00- 01:00 | 48.4 | 36.5 | | | | | |
| 4 | | 01.00-02.00 | 44.7 | 36.4 | | | | | |
| 5 | | 02.00-03.00 | 43.1 | 36 | | | | | |
| 6 | | 03.00-04.00 | 42.2 | 35.5 | | | | | |
| 7 | | 04.00-05.00 | 41.1 | 35.2 | | | | | |
| 8 | | 05:00-06:00 | 42.7 | 35 | | | | | |
| | | Leq Night | 46.5 | 36.1 | | | | | |

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

| | | | |
|---|---|---|---|
| Sampling Assistants | (Gaurav Kant) | | (Kumar Vaibhav) |
| ***ANALYSED BY*** | ***CHECKED BY*** | | ***Authorised Signatory*** |

*Note: The results above relate to the samples tested as received. This report cannot 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**<br><br>Coal mines located in the coal fields of<br>• Jharia<br>• Raniganj<br>• Bokaro | Suspended Particulate Matter (SPM) | Annual Average *<br>24 hours **| 500 µg/$m^3$<br><br>700 µg/$m^3$ | - High Volume Sampling (Average flow rate not less than 1.1 $m^3$ |
| | Respirable Particulate Matter (size less than 10 µm) (RPM) | Annual Average *<br>24 hours **| 250 µg/$m^3$<br><br>300 µg/$m^3$ | Respirable Particulate Matter sampling and analysis |
| | Sulphur Dioxide ($SO_2$) | Annual Average *<br>24 hours **| 80 µg/$m^3$<br><br>120 µg/$m^3$ | 1.Improvedwest and Gaeke method<br>2.Ultraviolet fluorescene |
| | Oxide of Nitrogen as $NO_2$ | Annual Average *<br>24 hours **| 80 µg/$m^3$<br><br>120 µg/$m^3$ | 1. Jacob & Hochheiser Modified (Na-Arsenic) Method<br>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.

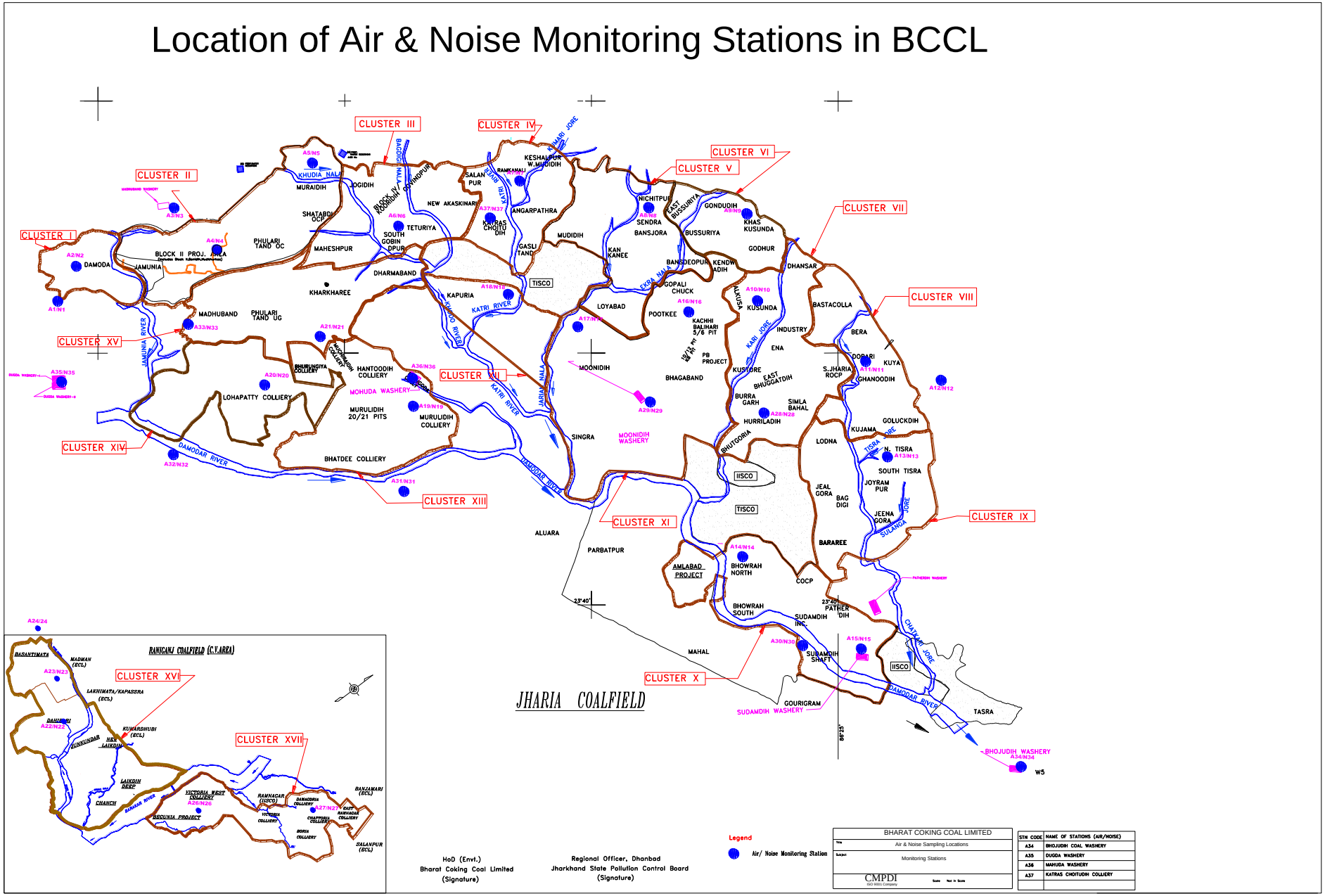
| Pollutant | Time Weighted Average | Concentration in Ambient Air | | Methods of Measurement |
|---|---|---|---|---|
| | | Industrial, Residential, Rural and other Areas | Ecologically Sensitive Area (Notified by Central Government) | |
| **Sulphur Dioxide ($SO_2$), µg/m³** | Annual *<br>24 Hours ** | 50<br>80 | 20<br>80 | -Improved West and Gaeke Method<br>-Ultraviolet Fluorescence |
| **Nitrogendioxide ($NO_2$), µg/m³** | Annual *<br>24 Hours ** | 40<br>80 | 30<br>80 | -Jacob &Hochheiser modified ($NaOH$-$NaAsO_2$) Method<br>-Gas Phase Chemiluminescence |
| **Particulate Matter (Size less than 10µm) or $PM_{10}$, µg/m³** | Annual *<br>24 Hours ** | 60<br>100 | 60<br>100 | -Gravimetric<br>-TEOM<br>-Beta attenuation |
| **Particulate Matter (Size less than 2.5µm) or $PM_{2.5}$, µg/m³** | Annual *<br>24 Hours ** | 40<br>60 | 40<br>60 | -Gravimetric<br>-TEOM<br>-Beta attenuation |
| **Ozone ($O_3$) , µg/m³** | 8 Hours *<br>1 Hour ** | 100<br>180 | 100<br>180 | -UV Photometric<br>-Chemiluminescence<br>-Chemical Method |
| **Lead (Pb) , µg/m³** | Annual *<br>24 Hours ** | 0.50<br>1.0 | 0.50<br>1.0 | -AAS/ICP Method after sampling on EPM 2000 or equivalent filter paper<br>-ED-XRF using Teflon filter |
| **Carbon Monoxide (CO), mg/m³** | 8 Hours **<br>1 Hour ** | 02<br>04 | 02<br>04 | -Non dispersive Infrared (NDIR) Spectroscopy |
| **Ammonia ($NH_3$), µg/m³** | Annual *<br>24 Hours ** | 100<br>400 | 100<br>400 | -Chemiluminescence<br>-Indophenol blue method |
| **Benzene ($C_6H_6$), µg/m³** | Annual * | 05 | 05 | -Gas Chromatography (GC) based continuous analyzer<br>-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.

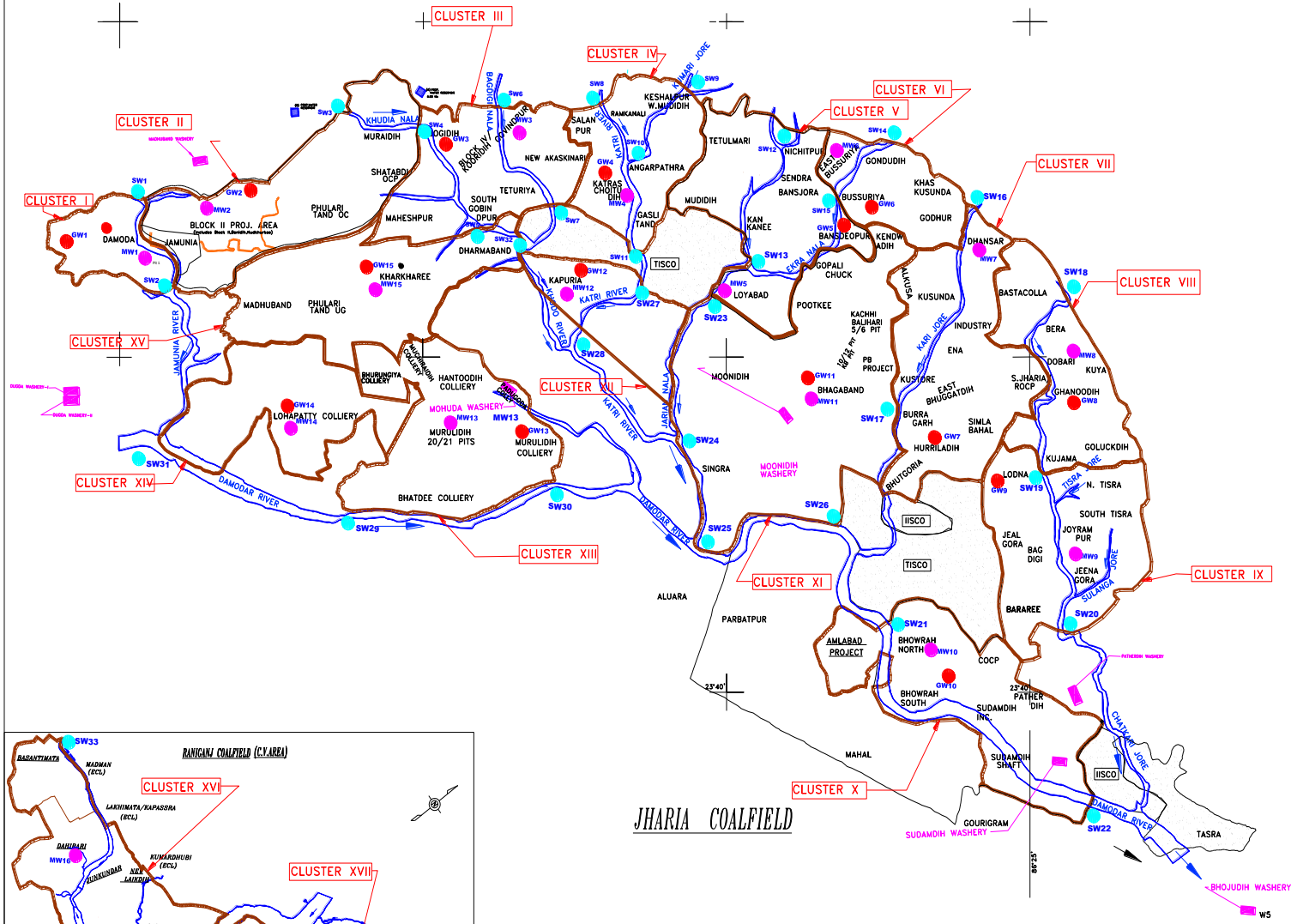
** 24 hourly or 8 hourly or 1 hourly monitored values, as applicable, shall be complied with 98% of the time in a year. 2% of the time, they JUNE exceed the limits but not on two consecutive days of monitoring.

**NOTE:**Whenever and wherever monitoring results on two consecutive days of monitoring exceed the limits specified above for the respective catego

# Location of Air & Noise Monitoring Stations in BCCL



# Water Sampling Locations in BCCL




## INDEX

| Cluster | Suface Water (U/S, D/S) | Name of River/ Nala / Jore | Mine/ Effluent Water | Sampling Location | Ground Water | Sampling Location |
|---|---|---|---|---|---|---|
| I | SW1, SW2 | Jamunia River | MW1 | Damoda Area | GW1 | Ghutway Village |
| II | SW3, SW4 | Khudia Nala | MW2 | Block II OCP | GW2 | Joyrampur Village |
| III | SW4, SW5, SW6, SW7 | Khudia Nala, Bagdigi Nala | MW3 | Govindpur Colliery | GW3 | Jogidih Village |
| IV | SW8, SW11, SW9, SW10 | Katri River, Kumari Jore | MW4 | Chotudih | GW4 | Kankanee Village |
| V | SW12, SW13, SW15 | Jarian Nala, Ekra Nala | MW5 | Mudidih | GW5 | Nichitpur |
| VI | SW14, SW15 | Ekra Nala | MW6 | East Bassuria UGP | GW6 | Bansjora Borewell |
| VII | SW16, SW17 | Kari Jore | MW7 | Dhansar UGP | GW7 | Hurriladih |
| VIII | SW18, SW19 | Kashi Jore | MW8 | Dobari UGP | GW8 | Ghanudih |
| IX | SW19, SW20 | Kashi Jore | MW9 | Jeenagora | GW9 | Lodna |
| X | SW21, SW22 | Damodar River | MW10 | Bhowrah North | GW10 | Bhowrah South |
| XI | SW23, SW24, SW25, SW26 | Jarian Nala, Damodar River | MW11 | Bhagaband h UGP | GW11 | Bhagabandh |
| XII | SW27, SW28 | Katri River | MW12 | Kapuria | GW12 | Kapuria |
| XIII | SW29, SW30 | Damodar River | MW13 | Murulidih (20/21) | GW13 | Murilidih |
| XIV | SW31, SW29 | Damodar River | MW14 | Lohapatti | GW14 | Lohapatti |
| XV | SW5, SW32 | Khudia Nala | MW15 | Kharkharee UGP | GW15 | Kharkharee |
| XVI | SW33, SW34 | Khudia River | MW16 | Dahibari OCP | GW16 | Patlabari Village |
| XVII | SW35, SW36 | Barakar River | MW17 | Damagoria Colliery | GW17 | Chaptoria |

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# ENVIRONMENTAL MONITORING REPORT OF BHARAT COKING COAL LIMITED, CLUSTER – XI

**(FOR THE MONTH SEPTEMBER, 2025)**

**E. C. no. J-11015/77/2011-IA.II (M) dated 26.07.2019.**

# CMPDI

ISO 9001 Company

**Regional Institute-II**

**Dhanbad, Jharkhand**

# CONTENTS


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| 4. | CHAPTER-IV | STANDARDS AND PLANS | 20-21 |

# 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 $23^0$37' N to $23^0$52' N latitudes and $86^0$09' E to $86^0$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 ($PM_{10}$), Fine Particulate Matter ($PM_{2.5}$), Sulphur Di-oxide ($SO_2$) and Nitrogen Oxides ($NO_X$). Respirable Dust Samplers (RDS) and Fine Dust Sampler ($PM_{2.5}$ sampler) were used for sampling of $PM_{10}$, $SO_2$, & $NO_X$ 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 $PM_{10}$, $PM_{2.5}$, $SO_2$ 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 $PM_{10}$& $PM_{2.5}$ 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 Standards for Coal Mines were within permissible limits.

### 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-XI is in the Western & Southern part of the Jharia coalfield. It includes a group of 8 Mines (viz. Gopalichak UG&OC Mine**,** Kachhi Balihari 10/12 Pit UG Mine**,** PB UG Project,Bhagabandh UG Mine, Kenwadih UG, Pootkee UG, Kachi Balihari 5/6Pit UG, Moonidih UG mine). The Cluster – XI is situated about 25 - 30 kms from Dhanbad Railway Station. The mines of this Cluster – XI 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 Jarian nala & Damodar River.

1.2 The Project has Environmental Clearance from Ministry of Environment, Forests and Climate Change (MoEF&CC) for a rated capacity 5.08 MTPA (normative) and 6.604 MTPA (peak) capacity of coal production vide letter no. J-11015/77/2011-IA.II (M) dated 26$^{th}$ July, 2019.

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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 $PM_{10}$, $PM_{2.5}$, $SO_2$, NOx 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) Pootkee Balihari Office (A16): Industrial Area**

The location of the sampling station is 23°45'17.23"N 86°21'46.27"E. The sampler was placed at an elevated platform approx. 1.5m above ground level at Project 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 sampler was placed at an elevated platform approx. 1.5m above ground level at project office.

**iii) Moonidih Washery (A29): Industrial Area**

The location of the sampling station is 23°44'26.00"N 86°21'16.00"E. The sampler was placed at a height of approx. 1.5m above ground level at Project office.

**II.BUFFER ZONE Monitoring Location**

**I) Kusunda OCP (A10)**

The location of the sampling station is 23°46'49.07"N 86°24'15.71"E. The sampler was placed at a height of approx. 1.5m above ground level at Safety 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** | **09/2025** | **Cluster** | **Cluster XI** | | | **ULR No.** | TC1432125000002142F |
| **Customer** | **Environment Department, Bharat Coking Coal Limited (BCCL), Koyla Bhawan, Dhanbad (E-mail: gmenv.bccl@coalindia.in)** | | | | | **Date of Issue** | 31.10.2025 |
| **Project** | **Pootkee Balihari Office** | **Sample Ref. No.** | **REM/BCCL/2025/09** | | **Sampling Method** | **CMPDI/RI-II/LPM 13 , ( IS 5182)** | |
| **Date of Sampling** | 03.09.25 | 16.09.25 | **Period of Analysis** | 03.09.25 | 25.10.2025 | **Zone of Station:** | **Core Zone** |

| **Sl. No.** | **Parameter** | **Method of Analysis** | **Observed Values ( in µg/m³)** | | **Range Of Testing** | **LDL** | **MoEF Standards Notification dated 25th September,2000 (GSR 742 E )** | **NAAQS, 2009** |
|---|---|---|---|---|---|---|---|---|
| | | | **A4487** | **A4553** | | | | |
| 1 | $PM_{10}$ | IS -5182(Part 23):2006, R-2017 | 81 | 76 | 10 µg/m³ - 1000 µg/m³ | 10 µg/m³ | 300 | 100 |
| 2 | $PM_{2.5}$ | IS -5182(Part 24):2019 | 35 | 35 | 10 µg/m³ - 400 µg/m³ | 10 µg/m³ | Not Specified | 60 |
| 3 | $SO_2$ | IS-5182(Part-2): 2001 , R-2017 | 10 | 10 | 10 µg/m³ - 1050 µg/m³ | 10 µg/m³ | 120 | 80 |
| 4 | $NO_2$ | IS-5182 (Part-6): 2006 , R-2017 | 31 | 36 | 06 µg/m³ - 420 µg/m³ | 06 µg/m³ | 120 | 80 |

*Environmental Condition : Sunny*

** LDL indicates Lower Detection Limit,*

***All units are in µg/m3, 24 hourly Average,*

***ANALYSED BY***

(Gaurav Kant)
***CHECKED BY***

(Kumar Vaibhav)
***Authorised Signatory***

***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 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** | **09/2025** | **Cluster** | **Cluster XI** | | | **ULR No.** | TC1432125000002142F |
| **Customer** | **Environment Department, Bharat Coking Coal Limited (BCCL), Koyla Bhawan, Dhanbad (E-mail: gmenv.bccl@coalindia.in)** | | | | | **Date of Issue** | 31.10.2025 |
| **Project** | **Moonidih UGP** | **Sample Ref. No.** | **REM/BCCL/2025/09** | | **Sampling Method** | **CMPDI/RI-II/LPM 13 , ( IS 5182)** | |
| **Date of Sampling** | 03.09.25 | 16.09.25 | **Period of Analysis** | 03.09.25 | 25.10.2025 | **Zone of Station:** | **Core Zone** |

| **Sl. No.** | **Parameter** | **Method of Analysis** | **Observed Values ( in µg/m³)** | | **Range Of Testing** | **LDL** | **MoEF Standards Notification dated 25th September,2000 (GSR 742 E )** | **NAAQS, 2009** |
|---|---|---|---|---|---|---|---|---|
| | | | **A4489** | **A4551** | | | | |
| 1 | $PM_{10}$ | IS -5182(Part 23):2006, R-2017 | 86 | 84 | 10 µg/m³ - 1000 µg/m³ | 10 µg/m³ | 300 | 100 |
| 2 | $PM_{2.5}$ | IS -5182(Part 24):2019 | 39 | 36 | 10 µg/m³ - 400 µg/m³ | 10 µg/m³ | Not Specified | 60 |
| 3 | $SO_2$ | IS-5182(Part-2): 2001 , R-2017 | <10 | <10 | 10 µg/m³ - 1050 µg/m³ | 10 µg/m³ | 120 | 80 |
| 4 | $NO_2$ | IS-5182 (Part-6): 2006 , R-2017 | 28 | 32 | 06 µg/m³ - 420 µg/m³ | 06 µg/m³ | 120 | 80 |

*Environmental Condition : Sunny*

** LDL indicates Lower Detection Limit,*

***All units are in µg/m3, 24 hourly Average,*

***ANALYSED BY*** (Gaurav Kant) ***CHECKED BY*** (Kumar Vaibhav) ***Authorised Signatory***

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

**Test Report for Ambient Air Samples**

| | | | | | |
|---|---|---|---|---|---|
| **Month & Year** | **09/2025** | **Cluster** | **Cluster XI** | **ULR No.** | TC1432125000002142F |
| **Customer** | **Environment Department, Bharat Coking Coal Limited (BCCL), Koyla Bhawan, Dhanbad (E-mail: gmenv.bccl@coalindia.in)** | | | **Date of Issue** | 31.10.2025 |
| **Project** | **Moonidih Washery** | **Sample Ref. No.** | **REM/BCCL/2025/09** | **Sampling Method** | **CMPDI/RI-II/LPM 13 , ( IS 5182)** |
| **Date of Sampling** | 03.09.25 | 16.09.25 | **Period of Analysis** | 03.09.2025 – 25.10.2025 | **Zone of Station:** **Core Zone** |

| **Sl. No.** | **Parameter** | **Method of Analysis** | **Observed Values ( in µg/m³)** | | **Range Of Testing** | **LDL** | **MoEF Standards Notification dated 25th September,2000 (GSR 742 E )** | **NAAQS, 2009** |
|---|---|---|---|---|---|---|---|---|
| | | | **A4488** | **A4552** | | | | |
| 1 | $PM_{10}$ | IS -5182(Part 23):2006, R-2017 | 74 | 75 | 10 µg/m³ - 1000 µg/m³ | 10 µg/m³ | 300 | 100 |
| 2 | $PM_{2.5}$ | IS -5182(Part 24):2019 | 32 | 33 | 10 µg/m³ - 400 µg/m³ | 10 µg/m³ | Not Specified | 60 |
| 3 | $SO_2$ | IS-5182(Part-2): 2001 , R-2017 | <10 | <10 | 10 µg/m³ - 1050 µg/m³ | 10 µg/m³ | 120 | 80 |
| 4 | $NO_2$ | IS-5182 (Part-6): 2006 , R-2017 | 36 | 33 | 06 µg/m³ - 420 µg/m³ | 06 µg/m³ | 120 | 80 |

*Environmental Condition : Sunny*

** LDL indicates Lower Detection Limit,*

***All units are in µg/m3, 24 hourly Average,*

***ANALYSED BY*** | (Gaurav Kant) ***CHECKED BY*** | (Kumar Vaibhav) ***Authorised Signatory***

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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

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email: rdri2cmpdi@coalindia.in

**Test Report for Ambient Air Samples**

| | | | | | |
|---|---|---|---|---|---|
| **Month & Year** | **09/2025** | **Cluster** | **Cluster XI** | **ULR No.** | TC1432125000002142F |
| **Customer** | **Environment Department, Bharat Coking Coal Limited (BCCL), Koyla Bhawan, Dhanbad (E-mail: gmenv.bccl@coalindia.in)** | | | **Date of Issue** | 31.10.2025 |
| **Project** | **Kusunda** | **Sample Ref. No.** | **REM/BCCL/2025/09** | **Sampling Method** | **CMPDI/RI-II/LPM 13 , ( IS 5182)** |
| **Date of Sampling** | 15.09.25 | 19.09.25 | **Period of Analysis** | 15.09.2025 – 31.10.2025 | **Zone of Station:** **Buffer Zone** |

| **Sl. No.** | **Parameter** | **Method of Analysis** | **Observed Values ( in µg/m³)** | | **Range Of Testing** | **LDL** | **MoEF Standards Notification dated 25th September,2000 (GSR 742 E )** | **NAAQS, 2009** |
|---|---|---|---|---|---|---|---|---|
| | | | **A4545** | **A4574** | | | | |
| 1 | $PM_{10}$ | IS -5182(Part 23):2006, R-2017 | 75 | 73 | 10 µg/m³ - 1000 µg/m³ | 10 µg/m³ | 300 | 100 |
| 2 | $PM_{2.5}$ | IS -5182(Part 24):2019 | 31 | 31 | 10 µg/m³ - 400 µg/m³ | 10 µg/m³ | Not Specified | 60 |
| 3 | $SO_2$ | IS-5182(Part-2): 2001 , R-2017 | 11 | <10 | 10 µg/m³ - 1050 µg/m³ | 10 µg/m³ | 120 | 80 |
| 4 | $NO_2$ | IS-5182 (Part-6): 2006 , R-2017 | 36 | 34 | 06 µg/m³ - 420 µg/m³ | 06 µg/m³ | 120 | 80 |

*Environmental Condition : Sunny*

** LDL indicates Lower Detection Limit,*

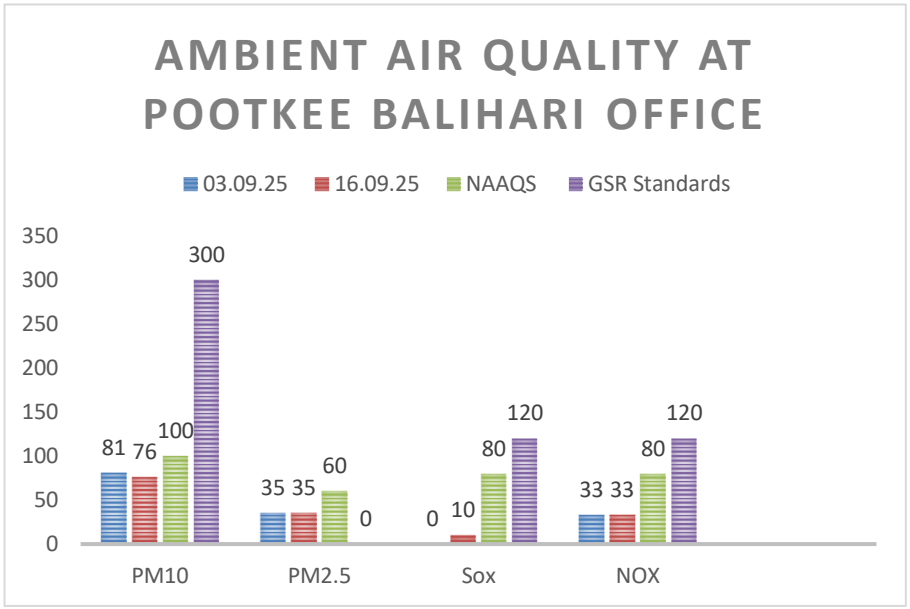
***All units are in µg/m3, 24 hourly Average,*

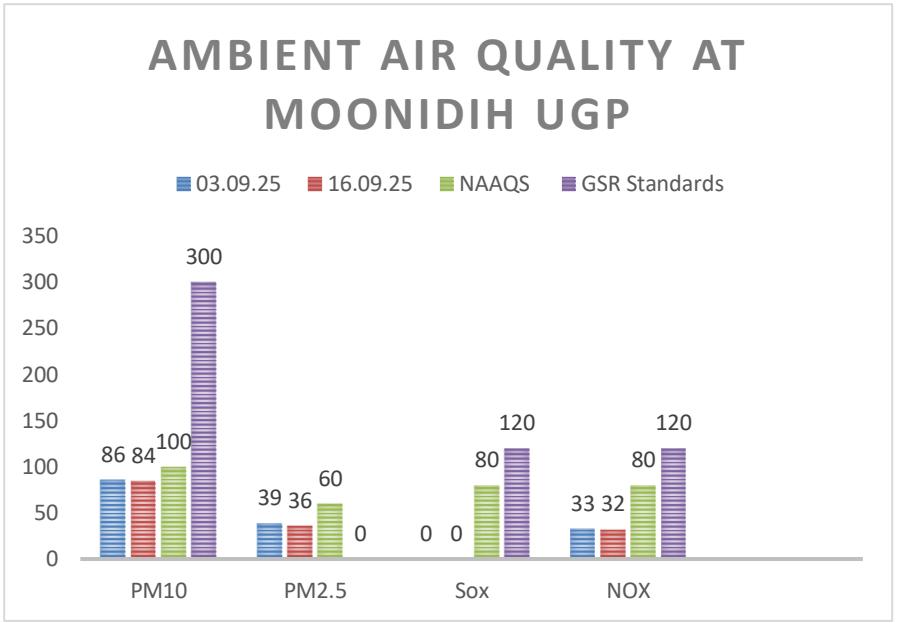
***ANALYSED BY*** (Gaurav Kant) ***CHECKED BY*** (Kumar Vaibhav) ***Authorised Signatory***

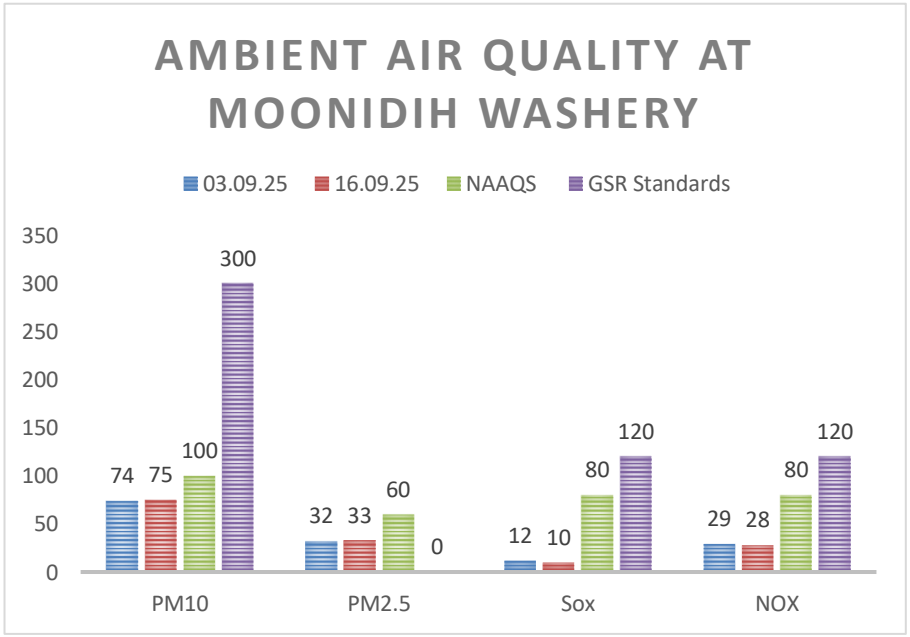
***Note**: The results above relate to the samples tested as received. This report can not be reproduced in part or full without the written permission of the HOD(Env) , CMPDI, RI-II.*

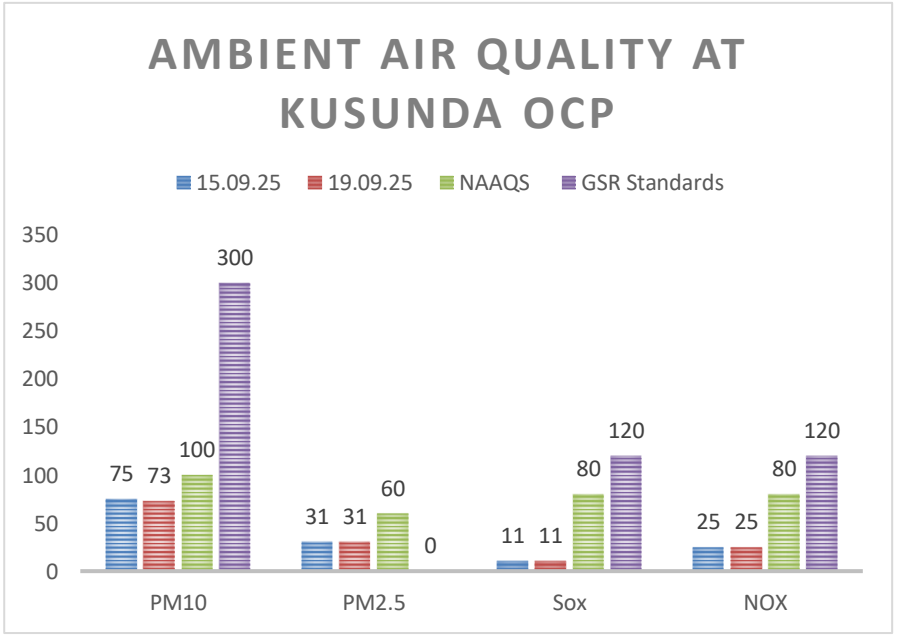
*---- End of Report ----*

*Page -1 of 1*


AMBIENT AIR QUALITY AT POOTKEE BALIHARI OFFICE
03.09.25
16.09.25
NAAQS
GSR Standards
350
300
250
200
150
100
50
0
81 76 100 300
35 35 60 0
0 10 80 120
33 33 80 120
PM10
PM2.5
Sox
NOX


AMBIENT AIR QUALITY AT MOONIDIH UGP
03.09.25
16.09.25
NAAQS
GSR Standards
350
300
250
200
150
100
50
0
86 84 100 300
39 36 60 0
0 0 80 120
33 32 80 120
PM10
PM2.5
Sox
NOX


AMBIENT AIR QUALITY AT MOONIDIH WASHERY
03.09.25
16.09.25
NAAQS
GSR Standards
350
300
250
200
150
100
50
0
74 75 100 300
32 33 60 0
12 10 80 120
29 28 80 120
PM10
PM2.5
Sox
NOX


AMBIENT AIR QUALITY AT KUSUNDA OCP
15.09.25
19.09.25
NAAQS
GSR Standards
350
300
250
200
150
100
50
0
75 73 100 300
31 31 60 0
11 11 80 120
25 25 80 120
PM10
PM2.5
Sox
NOX

# WATER QUALITY MONITORING

## 3.1 Location of sampling sites

(Refer **Plate No. – II**)

### i) Mine Discharge of Bhagabandh (MW11)

A sampling point is fixed to assess the effluent quality of Mine discharge. This location is selected to monitor effluent discharge in to Kari jore.

## 3.2 Methodology of sampling and analysis

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

## 3.3 Results & Interpretations

The results are given in tabular form along with the applicable standards. Results are compared with Schedule - VI, effluent prescribed by MoEF&CC. Results show that most of the parameters are within the permissible limits.

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

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

**Test Report for Mine Effluent samples**

| | | | | | | |
|---|---|---|---|---|---|---|
| **Month & Year** | **09/2025** | **Cluster** | **Cluster XI** | **ULR No.** | TC1432125000002160F | |
| **Customer** | **Environment Department, Bharat Coking Coal Limited (BCCL), Koyla Bhawan, Dhanbad (E-mail: gmenv.bccl@coalindia.in)** | | | | **Date of Issue** | 31.10.2025 |
| **Project** | | **Sampling Ref. No.** | **REM/BCCL/2025/ 09** | **Sampling Method** **IS 3025 (Part-1)** | | **CMPDI/RI-II/LPM 13** |
| **Sampling Stations** | **(i)** | **Bhagabandh** | **Sample Collected in 2.5 Ltr Jerricane , Color as observed is transparent** | | **Period of Analysis** | **15.09.25 to 30.09.2025** |
| | | | **Date of Sampling** | 15.09.25 29.09.25 | | |

| Sl. No. | Parameter | Method of Analysis | Observed Values | | STANDARDS FOR COAL MINES (Stipulated by Ministry of Environment and Forests (MoEF), Vide Notification No. GSR 742(E), Dt: 25.09.2000) | LDL |
|---|---|---|---|---|---|---|
| | | | **M1727** | **M1754** | | |
| 1 | Total Suspended Solids | IS 3025/17:1984, R :2017, Gravimetric | 48 | 49 | *100 (Max)* | 10 |
| 2 | pH | IS-3025/11:1983, R-2017, Electrometric | 8.01 | 8.02 | *5.5 - 9.0* | 0.2 |
| 3 | Oil & Grease | IS 3025/39:1991, R : 2019, Partition Gravimetric | <4.0 | <4.0 | *10 (Max)* | 2 |
| 4 | COD | APHA 23rd Edition 5220 C Titrimetric Method | 36 | 40 | *250 (Max)* | 4 |

***Grab sampling carried out for water samples **All units in mg/L unless specified otherwise *LDL indicates Lower Detection Limit & BDL indicates Below Detection Limit,*

***ANALYSED BY*** (Gaurav Kant) ***CHECKED BY*** (Kumar Vaibhav) ***Authorised Signatory***

*Note: The results above relate to the samples tested as received. This report cannot 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
MINE EFFLUENT TEST REPORT

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

**Test Report for Mine Effluent samples**

| | | | | | | |
|---|---|---|---|---|---|---|
| **Month & Year** | **09/2025** | **Cluster** | **Cluster XI** | **ULR No.** | TC1432125000002160F | |
| **Customer** | **Environment Department, Bharat Coking Coal Limited (BCCL), Koyla Bhawan, Dhanbad (E-mail: gmenv.bccl@coalindia.in)** | | | | **Date of Issue** | 31.10.2025 |
| **Project** | | **Sampling Ref. No.** | **REM/BCCL/2025/ 09** | **Sampling Method** **IS 3025 (Part-1)** | | **CMPDI/RI-II/LPM 13** |
| **Sampling Stations** | **(i)** | **Moonidih UGP** | **Sample Collected in 2.5 Ltr Jerricane , Color as observed is transparent** | | **Period of Analysis** | **15.09.25 to 30.09.2025** |
| | | | **Date of Sampling** | 15.09.25 29.09.25 | | |

| **Sl. No.** | **Parameter** | **Method of Analysis** | **Observed Values** | | **STANDARDS FOR COAL MINES (Stipulated by Ministry of Environment and Forests (MoEF), Vide Notification No. GSR 742(E), Dt: 25.09.2000)** | **LDL** |
|---|---|---|---|---|---|---|
| | | | **M1739** | **M1766** | | |
| 1 | Total Suspended Solids | IS 3025/17:1984, R :2017, Gravimetric | 38 | 33 | *100 (Max)* | 10 |
| 2 | pH | IS-3025/11:1983, R-2017, Electrometric | 8.02 | 8 | *5.5 - 9.0* | 0.2 |
| 3 | Oil & Grease | IS 3025/39:1991, R : 2019, Partition Gravimetric | <4.0 | <4.0 | *10 (Max)* | 2 |
| 4 | COD | APHA 23rd Edition 5220 C Titrimetric Method | 32 | 36 | *250 (Max)* | 4 |

***Grab sampling carried out for water samples **All units in mg/L unless specified otherwise *LDL indicates Lower Detection Limit & BDL indicates Below Detection Limit,*

***ANALYSED BY*** (Gaurav Kant) ***CHECKED BY*** (Kumar Vaibhav) ***Authorised Signatory***

*Note: The results above relate to the samples tested as received. This report cannot 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

## 4.1Location of sampling sites

1. **Pootkee Balihari Office (N16)**
2. **Moonidih UGP (N17)**
3. **Moonidih Washery (N29)**
4. **Kusunda OCP (N10)**

**4.2**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

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

TC-14321

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| **Month & Year** | **09/2025** | **Cluster** | **Cluster XI** | | | **ULR No.** | TC1432125000002176F |
| **Customer** | **Environment Department, Bharat Coking Coal Limited (BCCL), Koyla Bhawan, Dhanbad (E-mail: gmenv.bccl@coalindia.in)** | | | | | **Date of Issue** | 31.10.2025 |
| **Project** | | **Sample Ref. No.** | **REM/BCCL/2025/ 09** | | **Sampling Method** | **CMPDI/RI-II/LPM 22** | |
| **Sampling Stations** | **i** | **Pootki Balihari Office** | **Date of Sampling** | 03.09.25 | 16.09.25 | **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 | 46.2 | 47.1 | CPCB, Protocol for Ambient Level Noise Monitoring -2015 | 35 dB-135 dB | 35 Db (A) | Industrial<br>Commercial<br>Residential<br>Silence | 75<br>65<br>55<br>50 |
| 2 | | 07:00 - 08:00 | 46.9 | 47.2 | | | | | |
| 3 | | 08:00 - 09:00 | 48.6 | 49.5 | | | | | |
| 4 | | 09:00 – 10:00 | 51.8 | 50.9 | | | | | |
| 5 | | 10:00 - 11:00 | 53.8 | 57.5 | | | | | |
| 6 | | 11:00 - 12:00 | 54.3 | 55.7 | | | | | |
| 7 | | 12:00 - 13:00 | 62.8 | 63.5 | | | | | |
| 8 | | 13:00 - 14:00 | 63.2 | 58.1 | | | | | |
| 9 | | 14:00 - 15:00 | 62.2 | 62.9 | | | | | |
| 10 | | 15:00 - 16:00 | 55.3 | 55.7 | | | | | |
| 11 | | 16:00 - 17:00 | 71.4 | 70.5 | | | | | |
| 12 | | 17:00 - 18:00 | 51.1 | 49.9 | | | | | |
| 13 | | 18:00 - 19:00 | 48.7 | 48.7 | | | | | |
| 14 | | 19:00 - 20:00 | 47.4 | 47.2 | | | | | |
| 15 | | 20:00 - 21:00 | 46.2 | 45.2 | | | | | |
| 16 | | 21:00 - 22:00 | 46.5 | 46.6 | | | | | |
| | | Leq Day | 61.2 | 60.5 | | | | | |
| 1 | Noise Level dB(A)Leq -Night | 22:00-23:00 | 47.2 | 47.4 | CPCB, Protocol for Ambient Level Noise Monitoring -2015 | 35 dB-135 dB | 35 dB (A) | Industrial<br>Commercial<br>Residential<br>Silence | 70<br>55<br>45<br>50 |
| 2 | | 23:00- 00:00 | 46.5 | 46.8 | | | | | |
| 3 | | 00:00- 01:00 | 45.5 | 46.4 | | | | | |
| 4 | | 01.00-02.00 | 45.5 | 46.1 | | | | | |
| 5 | | 02.00-03.00 | 44.9 | 45.1 | | | | | |
| 6 | | 03.00-04.00 | 44.6 | 44.5 | | | | | |
| 7 | | 04.00-05.00 | 45.5 | 45.5 | | | | | |
| 8 | | 05:00-06:00 | 45.9 | 45.7 | | | | | |
| | | Leq Night | 45.8 | 46.0 | | | | | |

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

| | | | |
|---|---|---|---|
| Sampling Assistants | (Gaurav Kant) | | (Kumar Vaibhav) |
| ANALYSED BY | CHECKED BY | | Authorised Signatory |

Note: The results above relate to the samples tested as received. This report cannot 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 OMPLEX
DHANBAD. -826005
Phone:0326-223-850
email:i2cmpdi@coalindia.in

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| **Month & Year** | **09/2025** | **Cluster** | **Cluster XI** | | | **ULR No.** | TC1432125000002176F |
| **Customer** | **Environment Department, Bharat Coking Coal Limited (BCCL), Koyla Bhawan, Dhanbad (E-mail: gmenv.bccl@coalindia.in)** | | | | | **Date of Issue** | 31.10.2025 |
| **Project** | | **Sample Ref. No.** | **REM/BCCL/2025/09** | | **Sampling Method** | **CMPDI/RI-II/LPM 22** | |
| **Sampling Stations** | **i** | **Moonidih UGP** | **Date of Sampling** | 03.09.25 – 16.09.25 | **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 | 46.9 | 47.1 | CPCB, Protocol for Ambient Level Noise Monitoring -2015 | 35 dB-135 dB | 35 dB(A) | Industrial | 75 |
| 2 | | 07:00 - 08:00 | 46.8 | 46.3 | | | | Commercial | 65 |
| 3 | | 08:00 - 09:00 | 47.4 | 48.9 | | | | Residential | 55 |
| 4 | | 09:00 – 10:00 | 52.8 | 52.1 | | | | Silence | 50 |
| 5 | | 10:00 - 11:00 | 54.3 | 52.8 | | | | | |
| 6 | | 11:00 - 12:00 | 57.5 | 55.7 | | | | | |
| 7 | | 12:00 - 13:00 | 63.7 | 61.5 | | | | | |
| 8 | | 13:00 - 14:00 | 58.2 | 59.4 | | | | | |
| 9 | | 14:00 - 15:00 | 62.3 | 62.9 | | | | | |
| 10 | | 15:00 - 16:00 | 56.3 | 55.7 | | | | | |
| 11 | | 16:00 - 17:00 | 71 | 72.9 | | | | | |
| 12 | | 17:00 - 18:00 | 48.9 | 47.5 | | | | | |
| 13 | | 18:00 - 19:00 | 48.1 | 46.6 | | | | | |
| 14 | | 19:00 - 20:00 | 48.6 | 47.1 | | | | | |
| 15 | | 20:00 - 21:00 | 46 | 47.1 | | | | | |
| 16 | | 21:00 - 22:00 | 47.1 | 48.6 | | | | | |
| | | **Leq Day** | 60.8 | 62.0 | | | | | |
| 1 | Noise Level dB(A)Leq -Night | 22:00-23:00 | 45.8 | 45.8 | CPCB, Protocol for Ambient Level Noise Monitoring -2015 | 35 dB-135 dB | 35 dB(A) | Industrial | 70 |
| 2 | | 23:00- 00:00 | 45.4 | 45.5 | | | | Commercial | 55 |
| 3 | | 00:00- 01:00 | 44.5 | 45.5 | | | | Residential | 45 |
| 4 | | 01.00-02.00 | 43.5 | 44.3 | | | | Silence | 50 |
| 5 | | 02.00-03.00 | 43.3 | 43.4 | | | | | |
| 6 | | 03.00-04.00 | 43.3 | 43.5 | | | | | |
| 7 | | 04.00-05.00 | 45 | 45.1 | | | | | |
| 8 | | 05:00-06:00 | 45.4 | 45.5 | | | | | |
| | | **Leq Night** | 44.6 | 44.9 | | | | | |

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

| | | |
|---|---|---|
| Sampling Assistants | (Gaurav Kant) | (Kumar Vaibhav) |
| ***ANALYSED BY*** | ***CHECKED BY*** | ***Authorised Signatory*** |

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

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

*Page -1 of 1*

TC-14321

cmpdi A Mini Ratna Company

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** | **09/2025** | **Cluster** | **Cluster XI** | **ULR No.** | TC1432125000002176F |
| **Customer** | **Environment Department, Bharat Coking Coal Limited (BCCL), Koyla Bhawan, Dhanbad (E-mail: gmenv.bccl@coalindia.in)** | | | **Date of Issue** | 31.10.2025 |
| **Project** | | **Sample Ref. No.** | **REM/BCCL/2025/09** | **Sampling Method** | **CMPDI/RI-II/LPM 22** |
| **Sampling Stations** | **i** | **Moonidih Washery** | **Date of Sampling** 03.09.25 – 16.09.25 | **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 | 46.8 | 48.4 | CPCB, Protocol for Ambient Level Noise Monitoring -2015 | 35 dB-135 dB | 35 dB(A) | Industrial<br>Commercial<br>Residential<br>Silence | 75<br>65<br>55<br>50 |
| 2 | | 07:00 - 08:00 | 46.8 | 48.4 | | | | | |
| 3 | | 08:00 - 09:00 | 50 | 49 | | | | | |
| 4 | | 09:00 – 10:00 | 63 | 61.8 | | | | | |
| 5 | | 10:00 - 11:00 | 61.8 | 62.9 | | | | | |
| 6 | | 11:00 - 12:00 | 62.9 | 61.8 | | | | | |
| 7 | | 12:00 - 13:00 | 65 | 65.6 | | | | | |
| 8 | | 13:00 - 14:00 | 65.6 | 65.7 | | | | | |
| 9 | | 14:00 - 15:00 | 67.1 | 68.6 | | | | | |
| 10 | | 15:00 - 16:00 | 66.7 | 66 | | | | | |
| 11 | | 16:00 - 17:00 | 57 | 58.9 | | | | | |
| 12 | | 17:00 - 18:00 | 55.6 | 58.3 | | | | | |
| 13 | | 18:00 - 19:00 | 53.3 | 56.9 | | | | | |
| 14 | | 19:00 - 20:00 | 52.5 | 54.7 | | | | | |
| 15 | | 20:00 - 21:00 | 52.1 | 53.3 | | | | | |
| 16 | | 21:00 - 22:00 | 51.3 | 50.7 | | | | | |
| | | **Leq Day** | 61.7 | 62.2 | | | | | |
| 1 | Noise Level dB(A)Leq -Night | 22:00-23:00 | 49.5 | 50 | CPCB, Protocol for Ambient Level Noise Monitoring -2015 | 35 dB-135 dB | 35 dB(A) | Industrial<br>Commercial<br>Residential<br>Silence | 70<br>55<br>45<br>50 |
| 2 | | 23:00- 00:00 | 48.1 | 47.4 | | | | | |
| 3 | | 00:00- 01:00 | 43.9 | 43.8 | | | | | |
| 4 | | 01.00-02.00 | 43.5 | 43.5 | | | | | |
| 5 | | 02.00-03.00 | 43.2 | 42.4 | | | | | |
| 6 | | 03.00-04.00 | 42.8 | 43.4 | | | | | |
| 7 | | 04.00-05.00 | 45 | 45.4 | | | | | |
| 8 | | 05:00-06:00 | 45.4 | 45.5 | | | | | |
| | | **Leq Night** | 45.8 | 45.9 | | | | | |

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

| | | | | |
|---|---|---|---|---|
| Sampling Assistants | | (Gaurav Kant) | | (Kumar Vaibhav) |
| ***ANALYSED BY*** | | ***CHECKED BY*** | | ***Authorised Signatory*** |

*Note: The results above relate to the samples tested as received. This report cannot 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 Noise Level Test Report

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

| | | | | | |
|---|---|---|---|---|---|
| **Month & Year** | **09/2025** | **Cluster** | **Cluster XI** | **ULR No.** | TC1432125000002176F |
| **Customer** | **Environment Department, Bharat Coking Coal Limited (BCCL), Koyla Bhawan, Dhanbad (E-mail: gmenv.bccl@coalindia.in)** | | | **Date of Issue** | 31.10.2025 |
| **Project** | | **Sample Ref. No.** | **REM/BCCL/2025/ 09** | **Sampling Method** | **CMPDI/RI-II/LPM 22** |
| **Sampling Stations** | **i** | **Kusunda OCP** | **Date of Sampling** | 15.09.25 – 19.09.25 | **Zone Category of Station:** **Bufferr 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 | 46.8 | 47.1 | CPCB, Protocol for Ambient Level Noise Monitoring -2015 | 35 dB-135 dB | 35 dB(A) | Industrial<br>Commercial<br>Residential<br>Silence | 75<br>65<br>55<br>50 |
| 2 | | 07:00 - 08:00 | 48.6 | 47.4 | | | | | |
| 3 | | 08:00 - 09:00 | 48.9 | 49.4 | | | | | |
| 4 | | 09:00 – 10:00 | 51.3 | 50.9 | | | | | |
| 5 | | 10:00 - 11:00 | 54.6 | 52.8 | | | | | |
| 6 | | 11:00 - 12:00 | 54.8 | 55.8 | | | | | |
| 7 | | 12:00 - 13:00 | 63.7 | 62.2 | | | | | |
| 8 | | 13:00 - 14:00 | 62.3 | 61.2 | | | | | |
| 9 | | 14:00 - 15:00 | 62.3 | 62.9 | | | | | |
| 10 | | 15:00 - 16:00 | 63.3 | 62.8 | | | | | |
| 11 | | 16:00 - 17:00 | 62.1 | 63.5 | | | | | |
| 12 | | 17:00 - 18:00 | 50.9 | 51.2 | | | | | |
| 13 | | 18:00 - 19:00 | 50.9 | 50 | | | | | |
| 14 | | 19:00 - 20:00 | 48.1 | 47.5 | | | | | |
| 15 | | 20:00 - 21:00 | 46.3 | 44.8 | | | | | |
| 16 | | 21:00 - 22:00 | 46.6 | 48.1 | | | | | |
| | | **Leq Day** | 58.3 | 58.1 | | | | | |
| 1 | Noise Level dB(A)Leq -Night | 22:00-23:00 | 48.5 | 46.5 | CPCB, Protocol for Ambient Level Noise Monitoring -2015 | 35 dB-135 dB | 35 dB(A) | Industrial<br>Commercial<br>Residential<br>Silence | 70<br>55<br>45<br>50 |
| 2 | | 23:00- 00:00 | 45.5 | 45.5 | | | | | |
| 3 | | 00:00- 01:00 | 44.2 | 42.4 | | | | | |
| 4 | | 01.00-02.00 | 42.4 | 42.1 | | | | | |
| 5 | | 02.00-03.00 | 41.6 | 41.2 | | | | | |
| 6 | | 03.00-04.00 | 35.7 | 41.1 | | | | | |
| 7 | | 04.00-05.00 | 37.2 | 42.7 | | | | | |
| 8 | | 05:00-06:00 | 39.2 | 43.9 | | | | | |
| | | Leq Night | 43.6 | 43.6 | | | | | |

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

| | | |
|---|---|---|
| Sampling Assistants | (Gaurav Kant) | (Kumar Vaibhav) |
| ***ANALYSED BY*** | ***CHECKED BY*** | ***Authorised Signatory*** |

*Note: The results above relate to the samples tested as received. This report cannot 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**<br><br>Coal mines located in the coal fields of<br>• Jharia<br>• Raniganj<br>• Bokaro | Suspended Particulate Matter (SPM) | Annual Average *<br>24 hours **| 500 µg/$m^3$<br><br>700 µg/$m^3$ | - High Volume Sampling (Average flow rate not less than 1.1 |
| | Respirable Particulate Matter (size less than 10 µm) (RPM) | Annual Average *<br>24 hours ** | 250 µg/$m^3$<br><br>300 µg/$m^3$ | Respirable Particulate Matter sampling and analysis |
| | Sulphur Dioxide ($SO_2$) | Annual Average *<br>24 hours ** | 80 µg/$m^3$<br><br>120 µg/$m^3$ | 1.Improvedwest and Gaeke method<br>2.Ultraviolet fluorescene |
| | Oxide of Nitrogen as $NO_2$ | Annual Average *<br>24 hours ** | 80 µg/$m^3$<br><br>120 µg/$m^3$ | 1. Jacob & Hochheiser Modified (Na-Arsenic) Method<br>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.

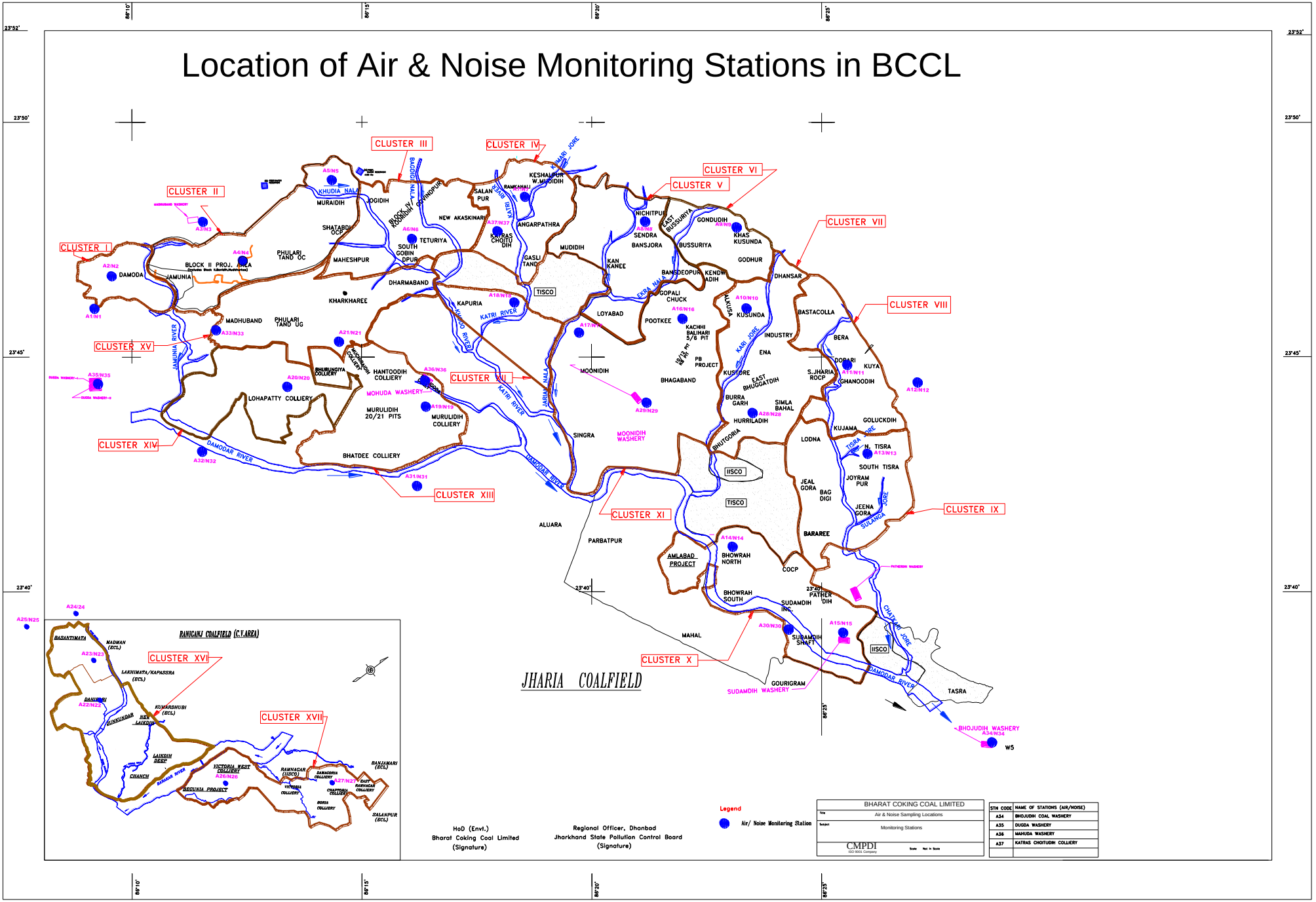
| Pollutant | Time Weighted Average | Concentration in Ambient Air | | Methods of Measurement |
|---|---|---|---|---|
| | | Industrial, Residential, Rural and other Areas | Ecologically Sensitive Area (Notified by Central Government) | |
| **Sulphur Dioxide ($SO_2$), µg/m³** | Annual *<br>24 Hours ** | 50<br>80 | 20<br>80 | -Improved West and Gaeke Method<br>-Ultraviolet Fluorescence |
| **Nitrogendioxide ($NO_2$), µg/m³** | Annual *<br>24 Hours ** | 40<br>80 | 30<br>80 | -Jacob &Hochheiser modified ($NaOH$-$NaAsO_2$) Method<br>-Gas Phase Chemiluminescence |
| **Particulate Matter (Size less than 10µm) or $PM_{10}$, µg/m³** | Annual *<br>24 Hours ** | 60<br>100 | 60<br>100 | -Gravimetric<br>-TEOM<br>-Beta attenuation |
| **Particulate Matter (Size less than 2.5µm) or $PM_{2.5}$, µg/m³** | Annual *<br>24 Hours ** | 40<br>60 | 40<br>60 | -Gravimetric<br>-TEOM<br>-Beta attenuation |
| **Ozone ($O_3$) , µg/m³** | 8 Hours *<br>1 Hour ** | 100<br>180 | 100<br>180 | -UV Photometric<br>-Chemiluminescence<br>-Chemical Method |
| **Lead (Pb) , µg/m³** | Annual *<br>24 Hours ** | 0.50<br>1.0 | 0.50<br>1.0 | -AAS/ICP Method after sampling on EPM 2000 or equivalent filter paper<br>-ED-XRF using Teflon filter |
| **Carbon Monoxide (CO), mg/m³** | 8 Hours **<br>1 Hour ** | 02<br>04 | 02<br>04 | -Non dispersive Infrared (NDIR) Spectroscopy |
| **Ammonia ($NH_3$), µg/m³** | Annual *<br>24 Hours ** | 100<br>400 | 100<br>400 | -Chemiluminescence<br>-Indophenol blue method |
| **Benzene ($C_6H_6$), µg/m³** | Annual * | 05 | 05 | -Gas Chromatography (GC) based continuous analyzer<br>-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.

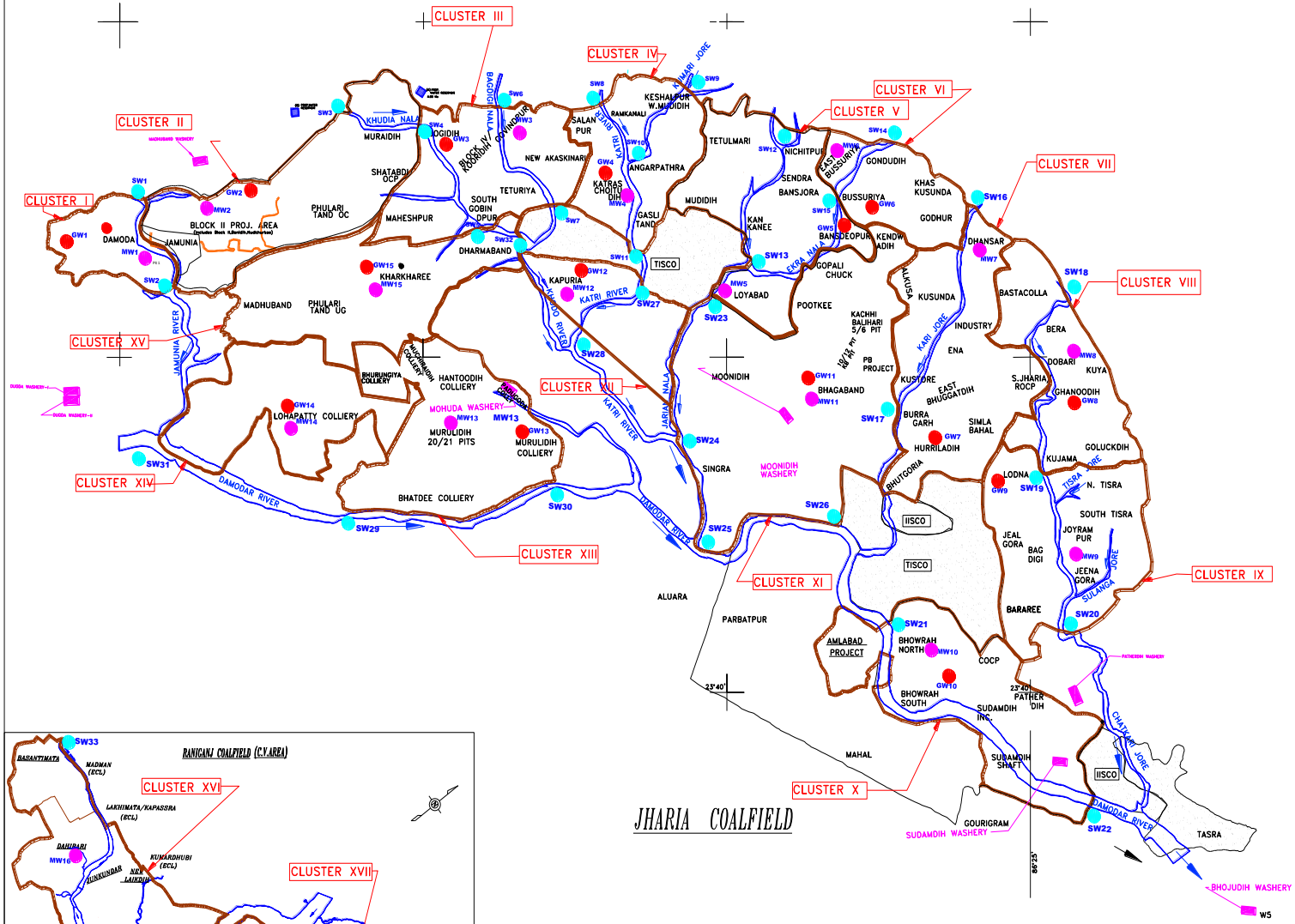
** 24 hourly or 8 hourly or 1 hourly monitored values, as applicable, shall be complied with 98% of the time in a year. 2% of the time, they JUNE exceed the limits but not on two consecutive days of monitoring.

**NOTE:**Whenever and wherever monitoring results on two consecutive days of monitoring exceed the limits specified above for the respective catego

# Location of Air & Noise Monitoring Stations in BCCL



# Water Sampling Locations in BCCL




## INDEX

| Cluster | Suface Water (U/S, D/S) | Name of River/ Nala / Jore | Mine/ Effluent Water | Sampling Location | Ground Water | Sampling Location |
|---|---|---|---|---|---|---|
| I | SW1, SW2 | Jamunia River | MW1 | Damoda Area | GW1 | Ghutway Village |
| II | SW3, SW4 | Khudia Nala | MW2 | Block II OCP | GW2 | Joyrampur Village |
| III | SW4, SW5, SW6, SW7 | Khudia Nala, Bagdigi Nala | MW3 | Govindpur Colliery | GW3 | Jogidih Village |
| IV | SW8, SW11, SW9, SW10 | Katri River, Kumari Jore | MW4 | Chotudih | GW4 | Kankanee Village |
| V | SW12, SW13, SW15 | Jarian Nala, Ekra Nala | MW5 | Mudidih | GW5 | Nichitpur |
| VI | SW14, SW15 | Ekra Nala | MW6 | East Bassuria UGP | GW6 | Bansjora Borewell |
| VII | SW16, SW17 | Kari Jore | MW7 | Dhansar UGP | GW7 | Hurriladih |
| VIII | SW18, SW19 | Kashi Jore | MW8 | Dobari UGP | GW8 | Ghanudih |
| IX | SW19, SW20 | Kashi Jore | MW9 | Jeenagora | GW9 | Lodna |
| X | SW21, SW22 | Damodar River | MW10 | Bhowrah North | GW10 | Bhowrah South |
| XI | SW23, SW24, SW25, SW26 | Jarian Nala, Damodar River | MW11 | Bhagaband h UGP | GW11 | Bhagabandh |
| XII | SW27, SW28 | Katri River | MW12 | Kapuria | GW12 | Kapuria |
| XIII | SW29, SW30 | Damodar River | MW13 | Murulidih (20/21) | GW13 | Murulidih |
| XIV | SW31, SW29 | Damodar River | MW14 | Lohapatti | GW14 | Lohapatti |
| XV | SW5, SW32 | Khudia Nala | MW15 | Kharkharee UGP | GW15 | Kharkharee |
| XVI | SW33, SW34 | Khudia River | MW16 | Dahibari OCP | GW16 | Patlabari Village |
| XVII | SW35, SW36 | Barakar River | MW17 | Damagoria Colliery | GW17 | Chaptoria |

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

Regional Officer, Dhanbad
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

Customer: BHARAT COKING COAL LIMITED
Title: WATER SAMPLING LOCATIONS
Subject: MONITORING STATIONS
CMPDI (ISO 9001 Company)
Scale: Not to Scale

**Annexure-XXXIV**

## Cluster XI

## Safety Material Distribution between April 2025 and September 2025

| S.NO | Items | PB Area |
|---|---|---|
| 1. | Mining Shoes | 545 |
| 2. | GUMBOOT | 212 |
| 3. | Helmet | 60 |
| 4. | Dust Mask | - |
| 5. | Goggles | - |
| 6. | Earmuffs | - |
| 7. | Florescent Jackets | 50 |
| 8. | Leather Gloves | 03 |
| 39. | Electrical Gloves | - |
| 10. | Safety Belt | - |

## Moonidih UG colliery

**SAFETY MATERIAL & PPE DISTRIBUTION DATA W.E.F-JAN-25**

| SL. NO. | MONTH/YEAR NAME | HELMATE | GUMBOOT | MINING-SHOE | FLURECENT JACKET | GOGGLES | EAR PLUG | DUST MASK | LEATHER GLOVES | ELECTRICAL GLOVES |
|---|---|---|---|---|---|---|---|---|---|---|
| 1 | 2025-JAN | 84 | 107 | 8 | 76 | NIL | 40 | NIL | 7 | NIL |
| 2 | 2025-FEB | 19 | 56 | 4 | 14 | NIL | 15 | NIL | NIL | NIL |
| 3 | 2025-MAR | 21 | 109 | 11 | 1 | NIL | 30 | NIL | NIL | NIL |
| 4 | 2025-APR | 32 | 94 | 1 | 4 | 18 | 2 | 18 | NIL | 24 |
| 5 | 2025-MAY | 19 | 52 | 6 | 17 | NIL | NIL | NIL | NIL | NIL |
| 6 | 2025-JUNE | 11 | 84 | 4 | 12 | NIL | NIL | NIL | NIL | NIL |
| 7 | 2025-JULY | 26 | 104 | NIL | 28 | NIL | NIL | NIL | NIL | NIL |
| 8 | 2025-AUG | 34 | 134 | 5 | 32 | NIL | NIL | NIL | NIL | NIL |
| 9 | 2025-SEP | 6 | 49 | NIL | 29 | NIL | NIL | NIL | NIL | NIL |
| 10 | 2025-OCT | 39 | 117 | 32 | 27 | NIL | NIL | NIL | NIL | NIL |
| 11 | 2025-NOV | 5 | 70+ | 27+ | 11 | NIL | NIL | NIL | NIL | NIL |
| 12 | 2025-DEC | | | | | | | | | |
| | TOTAL | 296 | 976 | 98 | 251 | 18 | 87 | 18 | 7 | 24 |

**Annexure-XXXV**

# VTC data of Cluster XI

| Month | Departmental | Contractual |
|---|---|---|
| 2025-26<br>(April-2025 to September-2025)<br>(PB Area) | Initial Training- 1<br>Refresher training -125 | Initial Training-39<br>Refresher training -0 |
| 2025-26<br>(April-2025 to September-2025)<br>(Moonidih Colliery) | Initial Training-10<br>Refresher training -131 | basic Training-190<br>Refresher training -81 |

**SPECIAL TRAINING:** (April-2025 to September-2025)

**PB Area**

| Sl. No. | Name of training | Total Achievement |
|---|---|---|
| 1. | Basic Training Dept. | 40 |
| 2. | Special Training | 319 |
| 3. | Contractor Worker | - |

**WJ Area**

| Sl. No. | Name of training | Total Achievement |
|---|---|---|
| 1. | Basic Training Dept. | - |
| 2. | Special Training | 02 |
| 3. | Contractor Worker | - |

**Annexure-XXXVI**

# PME/IME data of Cluster XI

| Year **2025-26** April 2025 to September 2025 | PME | | IME | |
|---|---|---|---|---|
| | Departmental | Contractual | (Contractual) | Departmental |
| PB Area | 202 | 50 | | -- |

## Departmental IME/PME Moonidih Colliery

| SL. NO. | MONTH/YEAR NAME | IME DATA | PME DATA |
|---|---|---|---|
| 1 | 2025-JAN | N.A | 2 |
| 2 | 2025-FEB | N.A | NIL |
| 3 | 2025-MAR | N.A | 27 |
| 4 | 2025-APR | N.A | 44 |
| 5 | 2025-MAY | N.A | 53 |
| 6 | 2025-JUNE | N.A | 45 |
| 7 | 2025-JULY | N.A | 39 |
| 8 | 2025-AUG | N.A | 33 |
| 9 | 2025-SEP | N.A | 24 |
| 10 | 2025-OCT | N.A | 17 |
| 11 | 2025-NOV | N.A | 41+ |
| 12 | 2025-DEC | N.A | |
| | TOTAL | N.A | 325+ |

## Contractual IME/PME Moonidih Colliery

| SL. NO. | MONTH/YEAR NAME | IME DATA | PME DATA |
|---|---|---|---|
| 1 | 2025-JAN | 99 | 44 |
| 2 | 2025-FEB | 16 | 2 |
| 3 | 2025-MAR | 29 | 34 |
| 4 | 2025-APR | 61 | 17 |
| 5 | 2025-MAY | 42 | 18 |
| 6 | 2025-JUNE | 81 | 13 |
| 7 | 2025-JULY | 138 | 88 |
| 8 | 2025-AUG | 85 | 37 |
| 9 | 2025-SEP | 117 | 15 |
| 10 | 2025-OCT | 70 | 37 |
| 11 | 2025-NOV | 49+ | 39+ |
| 12 | 2025-DEC | | |
| | TOTAL | 787+ | 344+ |

**ANNEXURE XXXVII**

## Environmental Expenditure (Cluster-XI)

| S. No. | Activity | PB Area | | Moonidih UG Colliery | |
|---|---|---|---|---|---|
| | | **FY.2023-24** | **FY. 2024-25** | **FY.2023-24** | **FY. 2024-25** |
| 1 | Plantation | 75,99,268.00 | 2024212.00 | 22,15,845.00 | 9,47,000.00 |
| 2 | OB Dump Reclamation (through DFO) | | - | | |
| | OB Dump Reclamation (Departmental) | | - | | |
| 3 | Dust suppression using mobile tanker (cost of diesel only) | 3,30,179 | 574929.00 | | |
| 3.1 | New Machine for Dust suppression (truck mounted fog cannon system) | | - | 41,95,800.00 | |
| 3.2 | New machine (trolley mounted fog cannon system) | | - | | |
| 4 | CTE/CTO Renewal Fees | 13,75,000.00 | | | |
| 6 | HWM fees | 15,500.00 | | | |
| 7 | New Structure Wheel Washing Arrangement | | - | | |
| 8 | Routine Env. Monitoring (through CMPDI) | 29,34,900.72 | 26,89,165.72 | | |
| 10 | Biomedical Waste collection and treatment | 23,520.00 | 14,112.00 | 50,400.00 | 50,400.00 |
| 11 | Oil and grease trap with washing platform at Auto workshop Kustore | | - | | |
| 12 | Fencing around Gopalichuck weighbridge to restrict/control fugitive emissions | | | | |
| 13 | ETP 5 KLD at Hospitals under Cluster XI. | 3,29,905.17(Kustore Regional Hospital) | | | 3,35,001.00(Moonidih Hospital) |
| 14 | Toe Wall Around OB Dump (Approx. length 1.5 Kms) | 5960509.63 | | | |
| 15 | Drain Around Gopalichuck OC Patch (750 mtrs) | 38,21,476.15 | | | |
| 16 | PM 10 Analyzer (2 pc) | | - | | |
| 17. | Rain Water Harvesting | 314236.29 | | | 1,00,256.5 |
| 18. | Mine water treatment(cost of ferric allum) | -- | -- | 5,29,200.00 | 10,48,772.39 |
| 19. | Procurement of Mechanical sweeper | | 3046000.00 | | |
| | **Total Expenditure (in Rs)** | **2,27,04,494.96** | **8348418.72** | **69,91,245.00** | **2481429.89** |

ANNEXURE XXXVIII

सांसद पीएन सिंह ने कहा कि कर्ल चुनाव के लिए तैयार रहें।

माता समिति के मानदेय में वृद्धि हो। विधायक ने कहा कि आवश्यकता पड़ने

देवी, दिनेश मुर्मू, भीम गोराई, सायरा खातून थे।

विज्ञान एवं प्रावि

विज्ञापन संख्या : 73

**NEET-UG-2013 के**
**द्वितीय साक्षात**

विज्ञापन सं0 63, दिनांक
के उपरान्त राज्य कोटे की
को साक्षात्कार स्थल पर स्व
पात्रता तथा प्रमाण पत्रों /
साक्षात्कार कार्यक्रम, विज्ञा
http://www.jceceboard.
दिनांक 25.09.2013 को पूर्व
साक्षात्कार संबंधी, अन्य
रहेंगी। साक्षात्कार में भाग
साक्षात्कार शुल्क, बैंक चाल
जमा किया जा सकता है।
पर्षद के वेबसाईट http://w

झारखंड : झारखण्डप्रारम्भिक शिक्षा बोर्ड, रां

# भारत कोकिंग कोल लिमिटेड

(कोल इण्डिया लिमिटेड का एक अंग)

पर्यावरण विभाग

कोयला भवन: धनबाद, झारखंड

सभी सम्बंधित व्यक्तियों को सूचित किया जाता है कि भारत कोकिंग कोल लिमिटेड के क्लस्टर-06 एवं क्लस्टर -11 को पर्यावरण एवं वन मंत्रालय के द्वारा पर्यावरणीय स्वीकृति दी गई है जो इस प्रकार है:-

| क्रम संख्या | क्लस्टर (खान समूह) का नाम | स्वीकृती पत्र संख्या एवं दिनांक |
|---|---|---|
| 1. | झरिया कोलफिल्ड में स्थित भारत कोकिंग कोल लिमिटेड का क्लस्टर -6 जिसका कुल खान पट्टा क्षेत्र 876.55 हेक्टर है एवं उत्पादन क्षमता सामान्य 5.87 मिलियन टन प्रति वर्ष एवं अधिकतम क्षमता 7.631 मिलियन टन प्रति वर्ष है और जिसमे ईस्ट बसुरिया कोलियरी, बसुरिया कोलियरी, गोदुडीह - खास कुसुण्डा कोलियरी एवं गोधर कोलियरी शामिल है। | J-11015/183/ 2011- IA.II (M) दिनांक 26 अगस्त 2013 |
| 2. | झरिया कोलफिल्ड में स्थित भारत कोकिंग कोल लिमिटेड का क्लस्टर -11 जिसका कुल खान पट्टा क्षेत्र 3447.14 हेक्टर है एवं उत्पादन क्षमता सामान्य 5.08 मिलियन टन प्रति वर्ष एवं अधिकतम क्षमता 6.604 मिलियन टन प्रति वर्ष है और जिसमें गोपालिचक भूमिगत खान, कच्ची बलिहारी 10/12 पिट भूमिगत खान, पुटकी भूमिगत खान, कच्ची बलिहारी 5/6 पिट भूमिगत खान, मुनीडीह-भूमिगत खान शामिल है। साथ ही 1.6 मिलियन टन प्रति वर्ष क्षमता की मुनीडीह वाशरी भी शामिल है। | J-11015/77/ 2011- IA.II (M) दिनांक 26 अगस्त 2013 |

पर्यावरणीय स्वीकृती की प्रतिलिपि झारखंड राज्य प्रदूषण नियंत्रण बोर्ड के पास उपलब्ध है तथा इसे पर्यावरण एवं वन मंत्रालय की आधिकारीक वेबसाइट http://envfor.nic.in और भारत कोकिंग कोल लिमिटेड के आधिकारिक वेबसाईट http://www.bccl.gov.in पर उपलब्ध है।

19.09.13.

# कार्यालय जिला ग्रामीण विकास अभिकरण, साहेबगंज

(UIDAI CELL)

## आम सूचना

साहेबगंज जिला में प्रज्ञा केन्द्र के माध्यम से स्थायी आधार पंजीकरण केन्द्र की स्थापना की गयी है। इन केन्द्रों में निम्नलिखित सेवायें साहेबगंज जिलावासी के लिए उपलब्ध है।

### उपलब्ध सेवायें

(क) निःशुल्क आधार पंजीकरण सेवा। (ख) शुल्क आधार कार्ड एवं पत्रकी सेवा। (ग) पंजीकरण के 90 दिनों या उसके बाद आधार कार्ड की स्थिती की जानकारी पूर्णतः निःशुल्क प्राप्त कर सकते है। (घ) आधार कार्ड की छपी हुई प्रति ए4 साइज पेपर की प्रिंट आउट A-4 कागज पर जनेक एड वाईट प्राप्त कर सकते है। (ङ) आधार कार्ड में [illegible] के पश्चात कर अपने स्मार्ट आवेदन के माध्यम से सुधार करवाया जा सकता है।

Newspaper: Hindustan
Date: 19/03/2013
Edition: Dhanbad

### साहेबगंज जिला के स्थायी आधार केन्द्रों की सूची

| क्र. | प्रखंड | स्थायी आधार पंजीकरण के केन्द्रों का पता | संपर्क व्यक्ति | मोबाइल नं. |
|---|---|---|---|---|
| 1. | राजमहल | शोभापुर, पोस्ट-सरकण्डा, राजमहल, साहेबगंज | श्रवण कुमार मंडल | 9955833406 |
| 2. | मण्डरो | प्रज्ञा केन्द्र प्रखंड मुख्यालय, मण्डरो, साहेबगंज | संजय मरांण्डी | 8292856228 |
| 3. | उधवा | प्रज्ञा केन्द्र पंचायत सरफराजगंज, पोस्ट फुदकीपुर, राधानगर, साहेबगंज | तपन मंडल | 9709213085 |
| 4. | उधवा | प्रज्ञा केन्द्र पंचायत दक्षिणी फलाशगाछी, उधवा, साहेबगंज | मो. तजरूल हक | 8292918927 |
| 5. | उधवा | प्रज्ञा केन्द्र, गाँव पहाड़ गाँव, राधानगर, उधवा, साहेबगंज | मो. जिआउल हक | 9955900663 |
| 6. | उधवा | प्रज्ञा केन्द्र, प्रखंड कार्यालय के सामने उधवा, साहेबगंज | मो. जसमुद्दीन | 8521886750 |
| 7. | उधवा | प्रज्ञा केन्द्र, गाँव अमानत, पोस्ट पियारपुर, राधानगर साहेबगंज | नजमुल होदा | 8877177682 |
| 8. | उधवा | प्रज्ञा केन्द्र, पंचायत एवं गाँव पश्चिम प्राणपुर, उधवा, साहेबगंज | मो. अजमत हुसैन | 7677779073 |
| 9. | उधवा | प्रज्ञा केन्द्र , पंचायत एवं गाँव पतौड़ा, उधवा, साहेबगंज | हराराम यादव | 9931392143 |
| 10. | उधवा | प्रज्ञा केन्द्र, पंचायत एवं गाँव दक्षिण सरफराजगंज,उधवा साहेबगंज | मो.इरफान अंसारी | 9708574291 |
| 11. | उधवा | प्रज्ञा केन्द्र पंचायत एवं गाँव चाँदशहर, उधवा,साहेबगंज | राकेश कुमार पाण्डे | 9334956358 |
| 12. | बरहरवा | प्रज्ञा केन्द्र पंचायत कोटालपोखर, बरहरवा, साहेबगंज | मदनेश्वर पाण्डे | 8002926343 |
| 13. | बरहरवा | प्रज्ञा केन्द्र, पंचायत एवं मयूरकोला, बरहरवा, साहेबगंज | अविनाश कुमार उपाध्याय | 9835419992 |

ह०/-
उपायुक्त -सह-
उप रजिस्ट्रार यू.आई.डी. परियोजना
साहेबगंज

पत्रांक : 1361/जि.ग्रा.वि.साहेबगंज, दिनांक : 17.09.13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का विश्वास हो गया, स
लगा। बालों के टूटने,
केश किंग तेल के महा



Newspaper: Hindustan
Date: 19/03/2013
Edition: Dhanbad

ANNEXURE XLI



## नहीं : जगरनाथ

# का जाम

...हतो. फोटो : प्रभात खबर

सामुदायिक भवन में हुआ. मुख्य अतिथि विधायक जगरनाथ महतो ने कहा कि सीसीएल प्रबंधन को कारो परियोजना के लिए यहां के ग्रामीणों को नौकरी के साथ वन टाइम सेटेलमेंट पैकेज देना होगा. जब तक मुआवजा, नौकरी व पुनर्वास नहीं मिलेगा, काम शुरू नहीं करने दिया जायेगा. बेनीलाल महतो ने कहा कि कारो परियोजना के विस्थापितों को नियोजन देना होगा. 23 सितंबर को बिनोद बाबू की जयंती को सफल बनाने का निर्णय लिया गया. इस दौरान दूसरे दलों के दर्जनों लोगों ने झामुमो की सदस्यता ली. विधायक ने माला पहना कर उनका स्वागत किया. मौके पर जयनारायण महतो, आभाष चंद्र गांगुली सहित नंदलाल महतो, मुन्नीलाल महतो, चंदन चक्रवर्ती, कृष्णा साव सहित दर्जनों उपस्थित थे. संचालन विश्वनाथ तुरी ने किया.

## ट्रैकमैन को पीटा कार्य बहिष्कार

**चंद्रपुरा.** चंद्रपुरा स्टेशन में गुरुवार को कर्मी शिवलाल साहनी (ट्रैकमैन) साथ पीडब्ल्यूआइ में कार्यरत चंदन र शुक्ला ने मारपीट की. उक्त ा के बाद सभी ट्रैकमैनों ने कार्य का कार कर दिया. बाद में विभागीय कारियों द्वारा दोषी के खिलाफ ाई का आश्वासन देने के बाद न काम पर लौटे. ट्रैकमैनों का है कि ट्रैकमैन होते हुए भी चंदन डब्ल्यूआइ कार्यालय में रखा गया कार्यालय में सबको अपना धौंस है. कुछ यूनियन नेताओं का मिलने के कारण उस पर कोई नहीं होती.

### झुमरा में हाथियों का उत्पात

## कई घरों को रौंदा एक को कुचला

**गोमिया.** रामगढ़ जिले से सटे झुमरा पहाड़ के तलहटी स्थित जितटुंगरी गांव में बुधवार की रात जंगली हाथियों के एक झुंड में जम कर उत्पात मचाया. हाथियों का झुंड रात करीब 10 बजे गांव में घुसा और एक दर्जनों घरों को तोड़ डाला. इस दौरान गांव के एक युवक को कुचल कर मार डाला. इसके बाद झुंड बोकारो जिले के पचमो पंचायत अंतर्गत पुराना पानी जंगल में प्रवेश कर गया. इससे ग्रामीण भयभीत हैं. ग्रामीण हाथियों को इलाके से भगाने के लिए ढोल-ढाक व टीना बजा रहे हैं.

### जरीडीह में फसल को रौंदा

**जैनामोड़.** जरीडीह प्रखंड के भस्की पंचायत के लिपु, कुसुलमुंडु व रोरिया गांव में बुधवार की रात 13 जंगली हाथियों ने उत्पात मचाया. कई किसानों का फसल रौंद दिया. सुलमुंडू निवासी शंभु मुंडा, जगतु मुंडा, मोची राम मुंडा, भासु मुंडा व रोरिया निवासी प्रफुल्ल महतो, बहादुर महतो, नेहरू महतो के खेत में लगे धान को रौंद दिया. लोगों ने किसी तरह हाथियों के झुंड को भगाया.

# सीबीआइ व विजिलेंस की टीम ने खंगाला दस्तावेज

- कथारा वाशरी के रिजेक्ट व स्लरी कोल में गड़बड़ी का मामला
- दो दिन कथारा में रहेगी टीम

**प्रतिनिधि, कथारा**

सीसीएल कथारा प्रक्षेत्र की कथारा वाशरी में गुरुवार को दूसरे दिन सीबीआइ व विजिलेंस की संयुक्त टीम ने रिजेक्ट व स्लरी कोयले में गड़बड़ी से संबंधित कई दस्तावेज को घंटों खंगाला. सेल्स से संबंधित कागजात की जांच-पड़ताल की. टीम में सीबीआइ, धनबाद के तीन अधिकारी व रांची विजिलेंस के दो अधिकारी शामिल थे. हालांकि अधिकारियों ने इस मामले में कुछ भी बताने से इनकार किया. जानकारी के अनुसार सीबीआइ व विजिलेंस के अधिकारियों ने कथारा वाशरी के सेल्स विभाग में फाइलों की जांच-पड़ताल की. इसके बाद फाइलों को सूचीबद्ध कर खाली बॉक्स में सुरक्षित रखा. विजिलेंस द्वारा दिये गये कई फाइलों को सीबीआइ अधिकारियों ने अपने अधीन कर लिया है. चर्चा है कि टीम फिलहाल एक-दो दिन कथारा में ही रहेगी.

**क्या है मामला :** कुछ माह पूर्व कथारा वाशरी के रिजेक्ट व स्लरी कोयले में गड़बड़ी को लेकर सीबीआइ की टीम ने कथारा में कई लोगों के आवास पर छापेमारी की थी. इसके पूर्व आयकर विभाग के अधिकारियों ने कई लोगों के आवास व दफ्तर में छापेमारी कर कई दस्तावेज जब्त किये थे. दो माह पूर्व भी इसी मामले में सीबीआइ ने कथारा वाशरी के पूर्व पीओ जेएस श्रीवास्तव सहित आधा दर्जन कर्मियों के यहां छापेमारी की थी.

## निःशुल्क जांच शिविर 22 को

**बेरमो.** आस्था पुनर्वास केंद्र की ओर से महिला कल्याण मंडल, करगली में 22 सितंबर को निःशुल्क स्वास्थ्य जांच शिविर लगाया जायेगा. शिविर में मुख्य अतिथि बीएंडके जीएम अनुराग कुमार तथा बीडीओ प्रमोद कुमार उपस्थित रहेंगे.


## भारत कोकिंग कोल लिमिटेड

(कोल इंडिया लिमिटेड का एक अंग)

पर्यावरण विभाग, कोयला भवन, धनबाद, झारखंड

सभी संबंधित व्यक्तियों को सूचित किया जाता है कि भारत कोकिंग कोल लिमिटेड के क्लस्टर-06 एवं क्लस्टर-11 को पर्यावरण एवं वन मंत्रालय के द्वारा पर्यावरणीय स्वीकृति दी गई है जो इस प्रकार है :-

| क्रम संख्या | क्लस्टर (खान समूह) का नाम | स्वीकृत पत्र संख्या एवं दिनांक |
|---|---|---|
| 1. | झरिया कोलफिल्ड में स्थित भारत कोकिंग कोल लिमिटेड का क्लस्टर- 6 जिसका कुल खान पट्टा क्षेत्र 876.55 हेक्टेर है एवं उत्पादन क्षमता सामान्य 5.87 मिलियन टन प्रति वर्ष एवं अधिकतम क्षमता 7.631 मिलियन टन प्रति वर्ष है ओर जिसमें ईस्ट बसुरिया कोलियरी, बसुरिया कोलियरी, गोंदुडीह-खास कुसुण्डा कोलियरी एवं गोधर कोलिवरी शामिल है. | J-11015/183/ 2011-IA.II (M) दिनांक 26 अगस्त 2013 |
| 2 | झरिया कोलफिल्ड में स्थित भारत कोकिंग कोल लिमिटेड का क्लस्टर-11 जिसका कुल खान पट्टा क्षेत्र 3447.14 हेक्टेर है एवं उत्पादन क्षमता सामान्य 5.08 मिलियन टन प्रति वर्ष एवं अधिकतम क्षमता 6.604 मिलियन टन प्रति वर्ष है ओर जिसमें गोपालिचक भूमिगत खान, कच्छी बलिहारी 10/12 पिट भूमिगत खान, पी.बी. भूमिगत परियोजना, भागाबांध भूमिगत खान, केंदुआडीह भूमिगत खान, पुटकी भूमिगत खान, कच्छी बलिहारी 5/6 पिट भूमिगत खान, मुनीडीह भूमिगत खान शामिल है. साथ ही 1.6 मिलियन टन प्रति वर्ष क्षमता की मुनीडीह वाशरी भी शामिल है. | J-11015/77/ 2011-IA.II (M) दिनांक 26 अगस्त 2013 |

पर्यावरणीय स्वीकृति की प्रतिलिपि झारखंड राज्य प्रदूषण नियंत्रण बोर्ड के पास उपलब्ध है तथा इसे पर्यावरण एवं वन मंत्रालय की आधिकारिक वेबसाईड http://envfor.nic.in और भारत कोकिंग कोल लिमिटेड के आधिकारिक वेबसाईड http://www.bccl.gov.in पर उपलब्ध है.


**Newspaper: Prabhat Khabar**
**Date: 20 September 2013**
**Edition: Dhanbad**

No.J-11015/77/2011-IA-II(M)
Government of India
Ministry of Environment, Forest & Climate Change
IA-II Division

Indira Paryavaran Bhawan,
Jorbagh Road, N Delhi-3
Dated: 26th July, 2019

To,

The General Manager (E&F)
M/s Bharat Coking Coal Ltd.,
Koyla Bhawan, Koyla Nagar,
District **Dhanbad** (Jharkhand) Email: envbccl@gmail.com

**Sub: Cluster XI group of mines of capacity 6.604 MTPA (peak) of M/s Bharat Coking Coal Limited in an area of 3447.14 ha located in Jharia Coalfields, District Dhanbad (Jharkhand) - Amendment in Environmental Clearance - reg.**

Sir,

This is with reference to your online application vide No. IA/JH/CMIN/9513/2011 dated 13th September, 2017 and additional information provided on 7th February, 2019

**2.** The Ministry of Environment, Forest and Climate Change has granted environmental clearance vide letter dated 26th August, 2013 in favour of M/s Bharat Coking Coal Ltd (BCCL) to Cluster XI group of mines of combined capacity 5.08 MTPA (Normative)/6.604 MTPA (Peak) and Moonidih Washery of 1.6 MTPA in a total area of 3447.14 ha located in Jharia Coalfields, District Dhanbad (Jharkhand).

**3.** Now, amendment in environmental clearance has been sought due to proposed restructuring/re-assessment of capacities of some of the constituent mines namely Gopalichuck, Moonidih and Kendwadih, for implementation of Jharia Master Plan dealing with fire and subsidence, with the details as under:-

| S. No. | Mine | UG/ OC | Reasons for amendment | Capacity (MTPA) | Leasehold Area (ha) | Mine life (Balance years) |
|---|---|---|---|---|---|---|
| 1 | Gopalichuck | UG | | 0.143 | 241.94 | >30 |
| 1(a) | Gopalichuck | OC | Excavation of fiery coal under Jharia Master Plan | 0.65 | | |
| 2 | Kachi Balihari 10/12 Pit | UG | | 0.117 | 60.00 | 19 |
| 3 | PB Project | UG | | 1.04 | 89.00 | >30 |
| 4 | Bhagabandh | UG | | 0.104 | 581.17 | 10 |
| 5 | Kendwadih | OC | -do- | 0.26 | 217.54 | 23 |
| 6 | Pootkee | UG | -do- | Nil | 153.77 | Closed |
| 7 | Kachi Balihari 5/6 Pit | UG | -do- | Nil | 120.71 | Closed |
| 8 | Moonidih | UG | | 4.16 | 1982.90 | 28 |
| | **Total** | | | **6.474** | **3447.03** | |

Received
Nitin Singh
मुखिया
अलकडीहा पंचायत
धनबाद

No.J-11015/77/2011-IA-II(M)
Government of India
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| 3 | PB Project | UG | | 1.04 | 89.00 | >30 |
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| 5 | Kendwadih | OC | -do- | 0.26 | 217.54 | 23 |
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| 7 | Kachi Balihari 5/6 Pit | UG | -do- | Nil | 120.71 | Closed |
| 8 | Moonidih | UG | | 4.16 | 1982.90 | 28 |
| | **Total** | | | **6.474** | **3447.03** | |

2.06121 मति नक

11051/2023
मुखिया
ग्राम पंचायत–गोपीनाथडीह
प्रखण्ड–धनबाद

No.J-11015/77/2011-IA-II(M)
Government of India
Ministry of Environment, Forest & Climate Change
IA-II Division

Indira Paryavaran Bhawan,
Jorbagh Road, N Delhi-3
Dated: 26th July, 2019

To,

The General Manager (E&F)
M/s Bharat Coking Coal Ltd.,
Koyla Bhawan, Koyla Nagar,
District **Dhanbad** (Jharkhand) Email: envbccl@gmail.com

**Sub: Cluster XI group of mines of capacity 6.604 MTPA (peak) of M/s Bharat Coking Coal Limited in an area of 3447.14 ha located in Jharia Coalfields, District Dhanbad (Jharkhand) - Amendment in Environmental Clearance - reg.**

Sir,

This is with reference to your online application vide No. IA/JH/CMIN/9513/2011 dated 13th September, 2017 and additional information provided on 7th February, 2019

**2.** The Ministry of Environment, Forest and Climate Change has granted environmental clearance vide letter dated 26th August, 2013 in favour of M/s Bharat Coking Coal Ltd (BCCL) to Cluster XI group of mines of combined capacity 5.08 MTPA (Normative)/6.604 MTPA (Peak) and Moonidih Washery of 1.6 MTPA in a total area of 3447.14 ha located in Jharia Coalfields, District Dhanbad (Jharkhand).

**3.** Now, amendment in environmental clearance has been sought due to proposed restructuring/re-assessment of capacities of some of the constituent mines namely Gopalichuck, Moonidih and Kendwadih, for implementation of Jharia Master Plan dealing with fire and subsidence, with the details as under:-

| S. No. | Mine | UG/ OC | Reasons for amendment | Capacity (MTPA) | Leasehold Area (ha) | Mine life (Balance years) |
|---|---|---|---|---|---|---|
| 1 | Gopalichuck | UG | | 0.143 | 241.94 | >30 |
| 1(a) | Gopalichuck | OC | Excavation of fiery coal under Jharia Master Plan | 0.65 | | |
| 2 | Kachi Balihari 10/12 Pit | UG | | 0.117 | 60.00 | 19 |
| 3 | PB Project | UG | | 1.04 | 89.00 | >30 |
| 4 | Bhagabandh | UG | | 0.104 | 581.17 | 10 |
| 5 | Kendwadih | OC | -do- | 0.26 | 217.54 | 23 |
| 6 | Pootkee | UG | -do- | Nil | 153.77 | Closed |
| 7 | Kachi Balihari 5/6 Pit | UG | -do- | Nil | 120.71 | Closed |
| 8 | Moonidih | UG | | 4.16 | 1982.90 | 28 |
| | **Total** | | | **6.474** | **3447.03** | |

Received
Dhanbad

AXXEXURE-XLI

भारत कोकिंग कोल लिमिटेड
एक मिनी रत्न कम्पनी
(महारत्न कम्पनी कोल इंडिया का एक उपक्रम)
पंजीकृत कार्यालय : कोयला भवन, कोयला नगर, धनबाद–826005
सीआइएन : U10101JH1972GOI000918
महाप्रबंधक का कार्यालय
पश्चिमी झरिया क्षेत्र
पो. मुनीडीह, जिला: धनबाद (झारखण्ड)-828129
फोन नं. 0326 2273483; फेक्स: 0326 2273445, ई-मेल: cgmwj@bccl.gov.in

Bharat Coking Coal Limited
A Mini Ratna Company
(A Subsidiary of Coal India Limited: A Maharatna Company)
Regd. Off. : Koyla Bhawan, Koyla Nagar
Dhanbad - 826005
CIN : U10101JH1972GO1000918
OFFICE OF THE GENERAL MANAGER
WESTERN JHARIA AREA
PO: MOONIDIH, DISTT: DHANBAD (JHARKHAND) - 828129
PHONE NO: 0326 2273483, FAX NO: 0326 2273445, e-mail : cgmwj@bccl.gov.in

**Ref:** BCCL/WJA/ENV/2025/428 **Date:** 26/09/2025

To,
The Member Secretary
Jharkhand State Pollution Control Board
T.A. Division Building, HEC Dhurwa,
Ranchi-834004

**Sub: - Environmental statement for the year ending 31st March, 2025 in respect of Cluster-XI Group of Mines of BCCL.**

Dear Sir,

Please find enclosed herewith the Environment Statement for the year ending 31st March, 2025 in respect of Cluster-XI Group of Mines of BCCL.

Thanking you

Encl.: As above.

i. Form-V

Yours faithfully

26/9/25

AGM
W.J Area,BCCL

C C to: -

1. Regional Officer, JSPCB, HIG-1 Housing Colony, Bartand, Dhanbad, Pin-826015.
2. G.M., W.J.Area
3. Dy. G.M. (Envn.), BCCL Koyla Bhawan, Dhanbad.
4. Nodal Officer (Env.), WJ Area

[FORM – V]
(See rule 14)

# Environmental Statement of Cluster XI for the financial year ending the 31st March 2025

## PART – A

(i) Name and address of the owner/occupier of the industry operation or process:
Shri Niladri Roy Director (Tech), (P&P)
Koyla Bhawan, Koyla Nagar, BCCL, Dhanbad

(ii) Industry category Primary ---- (STC code) Secondary. -----(SIC Code): RED

(iii) Production capacity. ----Units----: 6.474 (Prod. Capacity As per EC of cluster XI)

(iv) Year of establishment: 1971-72

Date of the last environmental statement submitted: Earlier Environment Statement was submitted mine wise in the month of September 2024.

This Environmental Statement is based on cluster basis as CTO was granted on cluster basis vide Ref No. JSPCB/HO/RNC/CTO-16941577/2023/2065 dated 14.12.2023.

## PART – B

### Water and River Material Consumption

Water consumption ($m^3/d$) (Mine discharge is from Gopalichuck UG colliery, this pumped out water is used in Gopalichuck OC project) other mines like Bhagabandh, KB 10-12, P.B. Project, Kendwadih and Pootkee colliery are flooded with water and hence non-operative. Only Gopalichuck OCP is operative at the moment.Moonidih washery is working on zero liquid discharge facility ,the process water recycled and re- used through settling ponds.Moonidih mine is a UG mine where water pumping is done for smooth operation of coal mining.

**Process:** Sprinkling or any other industrial use (Treated mine water)

**Other:** Nil

| Unit/Colliery | Name of Products | Process water consumption per unit of product output. | |
|---|---|---|---|
| | | During the previous financial Year (April 23 to March 24) | During the Current financial Year (April 24 to March 25) |
| | | (1) | (2) |
| Gopalichuck OCP | Coal | 0.79 m3/ton | 0.5611 m3/ton |
| Moonidih Colliery | Coal | 0.0311 m3/ton | 0.0441m3/ton |
| Moonidih Coal Washery | Washed coal | 4.49 m3/ton | 4.68m3/ton |

*The amount of water consumed is the weighted average of amount of water required for production of each product (washed coal, washed powder coal, and slurry). The water quantity includes fresh water and recycled water.

1. Substituted by Rule 2 (b) of the Environment (Protection) Amendment Rules, 1993 notified vide G.S.R 3'6 (E) dated 22.04.1993.

**Raw Material Consumption**

| Unit/Colliery | *Name of raw materials | Name of products | Consumption of raw material per Unit of output | |
|---|---|---|---|---|
| | | | During the previous financial Year (April 23 to March 24) | During the current Financial Year (April 24 to March 25) |
| Gopalichuck OCP | Explosives | Coal | 5.493 kg/ton | 5.36 kg/ton |
| | Detonator | Coal | 0.2371 Num/ton | 0.145 Num/ton |
| | Diesel | Coal | 0.278 ltr/ton | 0.212ltr/ton |
| | Grease | Coal | 0.00069 kg/ton | 0.00067 kg/ton |
| | Lubricant | Coal | 0.0007 ltr/ton | 0.0006 ltr/ton |
| Moonidih Colliery | Explosives | Coal | 0.00367 kg/ton | 0.00947kg/ton |
| | Detonator | Coal | 0.01077 Num/ ton | 0.0219Nos./ton |
| | Diesel | Coal | 0.05419 ltr/ton | 0.0420ltr/ton |
| | Grease | Coal | 0.00563 kg/ton | 0.00228 kg/ton |
| | Lubricant | Coal | 0.04081 ltr/ton | 0.01500ltr/ton |
| MOONIDIH COAL WASHERY | Raw Coal feed | Washed Coal | 1.906 ton | 2.51 ton |
| | Magnetite | Washed Coal | 5.200 kg/ton | 5.46kg/ton |
| | Lubricant | Washed Coal | 0.069 ltr/ton | 0.051ltr/ton |
| | Diesel | Washed Coal | 0.542 ltr/ton | 0.751ltr/ton |

*Industry may use codes if disclosing details of raw material would violate contractual obligations, otherwise all industries have to name the raw materials used.

## PART - C

Pollution discharged to environment/unit of output (Parameter as specified in the consent issued)

| 1) Pollutants | Quantity of pollutants discharged (mass/day) | Concentrations of pollutants in discharges (mass/ volume) | Percentage of variation from prescribed standards with reasons |
|---|---|---|---|
| a. Water | Water analysis done by CMPDI | Within the Prescribed limit | NA |
| b. Air | Air analysis done by CMPDI | The emissions are mainly from fugitive sources (non-point sources). | NA |

Environment monitoring report for cluster XI is enclosed.

## PART – D

### Hazardous Wastes

(As specified under Hazardous Waste Management and Handling Rules, 1989)

| Hazardous waste | Total Quantity | |
|---|---|---|
| | During the previous financial Year (April 23 to March 24) | During the current Financial Year (April 24 to March 25) |

| | | |
|---|---|---|
| Burnt oil | 2.76 KL/ Annum | 4.2 KL/ Annum |
| Waste cotton | 687 KG/ Annum | 585 KG/ Annum |

## PART – E

**Solid Wastes**

**Solid Waste is not produced from Mining activity**

(a) From process: Nil

(b) From pollution control facility: Nil

## PART – F

Please specify the characterizations (in terms of composition of quantum) of hazardous as well as solid wastes and indicate disposal practice adopted for both these categories of wastes.

N.A

## PART – G

Impact of the pollution abatement measures taken on conservation of natural resources and on the cost of production.

Various pollution abatement measures are practiced by which the impacts on the environment become Positive. Due care is taken to conserve the natural resources and protect the environment and all its Components. Rich biodiversity with dozens of species of birds, mammals, insects, etc. can be seen (Pictures enclosed).

## PART – H

Additional measures/investment proposal for environmental protection including abatement of pollution, prevention of pollution.

**a) Measures taken to prevent water pollution:**

i. Treated mine water discharge is used for industrial purpose like dust suppression and for domestic non- drinking purpose.

ii. Although, no integrated DETP exist, practice of septic tanks and soak pits are provided for quarters.

iii. Proper Drain is available in mine premises to prevent mixing of different types of water discharge, if any.

**b) Measures taken to prevent air pollution:**

i. Truck is covered with tarpaulin cover during transportation of coal

ii. Truck Mounted Fog Cannon is used for dust suppression.

iii. Tree plantation is done regularly in and around mine areas

**PART – I**

Any other particulars for improving the quality of the environment.

i. Oil and grease trap along with washing platform is constructed in Workshop

ii. Top soil is spread over old overburden site and different species of plants are planted

iii. High rise Fencing is constructed around weighbridge

iv. Regular water sprinkling takes place using mobile water sprinkler tankers to prevent fugitive dust emissions.

v. PM 10 Analyzers are installed to keep a check on air quality.

vi. Wheel washing system installed at washery.

25.9.25
Project Officer
Moonidih Colliery
W.J. Area

PROJECT OFFICER/AGENT
MOONIDIH COLLIERY
B.C.C.L. LTD.

26/09/25
Project Officer
Moonidih Washery
W.J. Area

PROJECT OFFICER
MOONIDIH COAL WASHERY

26/09/25
Project Officer
Gopalichuck, PB Area

Project Officer
Gopalichuck Colliery

Annexure XLII

GMPD
526/L
23-11-17


**भारत कोकिंग कोल लिमिटेड**
Bharat Coking Coal Limited
*(A Mini Ratna Company)*
(A Subsidiary of Coal India Ltd.)
(www.bcclweb.in)

पं.काकोयला भवन -:., कोयला नगर, धनबाद –826005,
Regd. Off: Koyla Bhawan, Koyla Nagar,Dhanbad – 826005.
CIN: U10101JH1972GOI000918
दूरभाष: 0326-2230190/ फेक्स -0326-2230050,
ईमेल: cos.bccl@coalindia.in


बोर्ड सचिवालय /Board Secretariat

24 पत्रांक:बीसीसील:सीएस:-एफ-1ए: 506

दिनांक:23.11.2017

To,
GM(P&P),
BCCL, Koyla Bhawan.

**Sub: Extracts of Minutes of 335th Board Meeting held on 04.11.2017.**

Dear Sir,

We send herewith extracts of Minutes of Item No. **335. 4O, 335.5S, 335.5V, 335.5W, 335.5X & 335.5Y** of 335th Meeting of the Board of Directors of Bharat Coking Coal Limited held on 04.11.2017 at Registered Office, Koyla Bhawan, Dhanbad for taking necessary action at your end.

भवदीय

बी.के.पारुई
(कंपनी सचिव)

संलग्न : यथोपरी

Board Resolution Sheet

23/11

**Item No. 335.4O**

**Agenda note for reappropriation & inclusion of new activities done during 1st and 2nd quarter of FY 2017-18 in capital budget 2017-18(BE) of BCCL for information to BCCL Board.**

Board noted the information furnished in the agenda note.

**Item No. 335.5S**

**Allocation of additional coal blocks to BCCL.**

**Background**:

As per the approved production plan of BCCL the Company is expected to produce 53 million tonne of coal in 2019-20. However, it has been given an ambitious target by Ministry of Coal to further augment its production capacity to achieve annual production level of 100 million tonne. BCCL has examined its strength and it is found that the mining condition of the existing property within BCCL leasehold Area is not suitable for further augmentation of production from the earlier approved production plan. BCCL is operating its mines spread over Jharia Coalfield and part of Raniganj Coalfield. Both the coalfields are having problems associated with fire, unstable areas and other surface constraints like township, roads, railways and infrastructure coupled with land and R & R issues. Hence the current proposal was placed before the Board earlier through circulation which was not agreed to by majority of the Board members. Hence it has been placed again with the modifications suggested by D(T), CIL.

**Decision**:

Board after deliberation approved the proposal seeking allocation of additional coal blocks to BCCL and to request CIL to take further action on this matter in respect of following coal blocks:

1. East of Damagoria(Kalyaneshwari).
2. Sitarampur Block "

**Item No. 335.5V**

**Approval of Mining Plan of Gopalichak OC.**

**Background**:

The Empowered Sub-committee of BCCL Board deliberated the Mining Plan of Gopalichak Colliery for opencast working as detailed in the agenda note and recommended to BCCL Board for further deliberation and approval.

**Decision**:

As recommended by the Empowered Sub Committee of BCCL Board, the Board deliberated the Agenda Note on Mining Plan of Gopalichak Colliery for opencast working and approved the same.

Certified to be True Copy

B. K. Paul
Company Secretary
Bharat Coking Coal Limited
Koyla Bhawan
Dhanbad - 826005

**Item No. 335.5W**

**Approval of Mining Plan of Kankanee Colliery.**

**Background**:

The Empowered Sub-committee of BCCL Board deliberated the Mining Plan of Kankanee Colliery for opencast working as detailed in the agenda note and recommended to BCCL Board for further deliberation and approval.

**Decision**:

As recommended by the Empowered Sub Committee of BCCL Board, the Board deliberated the Agenda Note on Mining Plan of Kankanee Colliery for opencast working and approved the same.

**Item No. 335.5X**

**Approval of Mine closure Plan of Kankanee Colliery, BCCL.**

**Background**:

The subject proposal was placed before Audit Committee of BCCL and Audit Committee recommended to place the proposal before Board for approval.

**Decision**:

Board after deliberation approved the proposal of Mine closure Plan of Kankanee Colliery with the total closure cost of ₹1541.586 lakhs (Rupees fifteen crores forty one lakhs fifty eight thousand six hundred only) to be deposited in Escrow Account under Revenue head.

**Item No. 335.5Y**

**Approval of Mine closure Plan of Gopalichak Colliery, P.B. Area.**

**Background**:

The subject proposal was placed before Audit Committee of BCCL and Audit Committee recommended to place the proposal before Board for approval.

**Decision**:

Board deliberated the proposal of Mine Closure Plan of Gopalichak Colliery of PB area and approved the same for the total closure cost of ₹3848.995 lakhs (Rupees thirty-eight crores forty-eight lakhs ninety-nine thousand and five hundred only) based on OC norms at WPI of January, 2017. A new Escrow Account will be opened named as Gopalichak Mine.

Certified to be True Copy

B. K. Paul
Company Secretary
Bharat Coking Coal Limited
Koyla Bhawan
Dhanbad - 826005

F-20A

भारत कोकिंग कोल लिमिटेड
(कोल इंडिया लिमिटेड का एक अंग)
कोयला भवन/ कोयला नगर,
धनबाद –826005
**दूरभाष :**0326-2230190/ **फ़ैक्स**-0326-2230050
**ईमेल**: cos@bccl.gov.in

Bharat Coking Coal Limited
*(A Subsidiary of Coal India Limited)*
Koyla Bhawan/ Koyla Nagar
Dhanbad-826005
Phone No. 0326-2230190/Fax-0326-2230050
email ID: cos@bccl.gov.in

बोई सचिवालय /Board Secretariat

GMPP 5&4 15/10/13

Ref. No. BCCL:CS:F-1(A): 742

Dated:15.10.2013

To
GM(P&P)
BCCL, Koyla Bhawan
Dhanbad

**Sub: Extracts of Minutes of 300th Meeting of the Board of Directors of BCCL held on 21.09.2013 at Dhanbad.**

Dear Sir,

We send herewith extracts of Minutes of the Item No. 300.4N of the 300th Meeting of the Board of Directors of Bharat Coking Coal Limited held on 21.09.2013 at Dhanbad for taking necessary action at your end.

Action Taken Report (ATR) on the decision of the Board may please be submitted for appraisal of the Board.

Yours faithfully

15/10/13

(B.K. Parui)
(Company Secretary)

Encl: As above

Board file 16/10

Extracts of Minutes of 300th Board Meeting held on 21.09.2013

300.4N **Approval of Mine Closure Plan.**

Board after deliberation passed the following resolution:

Resolved that the proposal of Mine Closure Plan of the 20(Twenty) mines (as per the enclosed mine closure list vide enclosure 'A') including the total closure cost of ₹ 27980.77 Lakh (Rupees two hundred seventy nine crore eighty lakh and seventy seven thousand only) to be deposited in "Escrow Account" under Revenue head be and is hereby approved.

Further resolved that the said 'Escrow Account' will be opened in accordance with the guidelines issued by D(F),CIL vide letter No.168/96 dated 26.06.2013 and 168/98 dated 28.06.2013 (copy attached vide enclosure-'B') be and is hereby approved.

Certified to be True Copy

B. K. Parul
Company Secretary
Bharat Coking Coal Limited
Koyla Bhawan
Dhanbad - 826005

TOTAL MINE CLOSURE COST (RS. LAKH) TO BE DEPOSITED BY BCCL FOR THE FOLLOWING TWENTY MINES DURING COMING 30 YEARS(2013-14 TO 2042-43, YEARWISE)

| Sl. No. | Name of Mine | Project Area (Ha) | Remaining life of Mine (Years) | Total Mine Closure Cost (Rs. In lakh) | 1st | 2nd | 3rd | 4th | 5th | 6th | 7th | 8th | 9th | 10th |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | 2013-14 | 2014-15 | 2015-16 | 2016-17 | 2017-18 | 2018-19 | 2019-20 | 2020-21 | 2021-22 | 2022-23 |
| 1 | Muraidih-Shatabdi Group of Mines | 584.70 | 13 | 4796.56 | 270.79 | 284.33 | 298.55 | 313.48 | 329.15 | 345.61 | 362.89 | 381.03 | 400.09 | 420.09 |
| 2 | Bhutgoria UG | 131.67 | 24 | 330.43 | 7.43 | 7.80 | 8.19 | 8.60 | 9.03 | 9.48 | 9.95 | 10.45 | 10.97 | 11.52 |
| 3 | Gopalichak UG | 241.44 | 30 | 764.64 | 75.49 | 11.06 | 11.61 | 12.19 | 12.80 | 13.44 | 14.11 | 14.82 | 15.56 | 16.34 |
| 4 | Hurriladih UG | 127.17 | 25 | 329.67 | 8.49 | 7.22 | 7.58 | 7.96 | 8.35 | 8.77 | 9.21 | 9.67 | 10.16 | 10.66 |
| 5 | Burragarh UG | 147.83 | 30 | 443.09 | 6.67 | 7.00 | 7.35 | 7.72 | 8.11 | 8.51 | 8.94 | 9.38 | 9.85 | 10.35 |
| 6 | Simlabahal UG | 178.13 | 30 | 535.95 | 11.27 | 8.42 | 8.84 | 9.28 | 9.75 | 10.23 | 10.74 | 11.28 | 11.85 | 12.44 |
| 7 | Jogidih Colliery | 167.00 | 27 | 478.62 | 39.85 | 8.58 | 9.01 | 9.46 | 9.94 | 10.43 | 10.96 | 11.50 | 12.08 | 12.68 |
| 8 | Kharkharee Colliery | 355.00 | 30 | 1064.03 | 16.02 | 16.82 | 17.66 | 18.54 | 19.47 | 20.44 | 21.46 | 22.53 | 23.66 | 24.84 |
| 9 | Nichitpur Colliery | 122.73 | 10 | 1253.53 | 99.66 | 104.64 | 109.88 | 115.37 | 121.14 | 127.20 | 133.56 | 140.23 | 147.25 | 154.61 |
| 10 | Loyabad Colliery | 424.56 | 30 | 1313.50 | 83.75 | 19.73 | 20.72 | 21.75 | 22.84 | 23.98 | 25.18 | 26.44 | 27.76 | 29.15 |
| 11 | Basantimata Colliery | 235.30 | 11 | 485.34 | 121.88 | 28.90 | 30.34 | 31.86 | 33.45 | 35.12 | 36.88 | 38.72 | 40.66 | 42.69 |
| 12 | Dahibari Basantimata OCP | 190.00 | 12 | 2046.51 | 128.57 | 135.00 | 141.75 | 148.84 | 156.28 | 164.09 | 172.30 | 180.91 | 189.96 | 199.46 |
| 13 | Mudidih Colliery | 356.23 | 17 | 2218.11 | 118.24 | 124.15 | 130.36 | 136.87 | 143.72 | 150.90 | 158.45 | 166.37 | 174.69 | 183.42 |
| 14 | Bhowrah South Group of Mines | 316.74 | 9 | 1227.61 | 563.49 | 211.98 | 87.57 | 91.95 | 96.55 | 40.85 | 42.89 | 45.04 | 47.29 | |
| 15 | New Akashkinaree Mine | 367.58 | 30 | 3013.24 | 60.59 | 63.62 | 66.80 | 70.14 | 73.65 | 77.34 | 81.19 | 85.26 | 89.52 | 94.00 |
| 16 | Sendra Bansjora Colliery | 150.00 | 23 | 2194.11 | 52.96 | 55.61 | 58.39 | 61.31 | 64.37 | 67.59 | 70.97 | 74.52 | 78.24 | 82.16 |
| 17 | Tetulmari Colliery | 273.00 | 30 | 2256.41 | 129.16 | 135.62 | 142.40 | 149.52 | 156.99 | 164.84 | 173.09 | 181.74 | 190.83 | 200.37 |
| 18 | Block-IV/Kooridih Mine | 149.00 | 12 | 1604.89 | 100.83 | 105.87 | 111.16 | 116.72 | 122.56 | 128.68 | 135.12 | 141.88 | 148.97 | 156.42 |
| 19 | Govindpur Colliery | 159.55 | 30 | 830.13 | 20.58 | 21.61 | 22.68 | 23.82 | 25.01 | 26.26 | 27.58 | 28.96 | 30.40 | 31.93 |
| 20 | Maheshpur Colliery | 292.68 | 26 | 794.40 | 38.40 | 15.84 | 16.63 | 17.45 | 18.34 | 19.25 | 20.22 | 21.23 | 22.29 | 23.40 |
| | | | | | | | | | | | | | | |
| | | | | 27980.77 | 1954.12 | 1373.80 | 1307.47 | 1372.86 | 1441.50 | 1453.04 | 1525.67 | 1601.94 | 1682.07 | 1716.54 |

TOTAL MINE CLOSURE COST (RS. LAKH) TO BE DEPOSITED BY BCCL FOR THE FOLLOWING TWENTY MINES DURING COMING 30 YEARS(2013-14 TO 2042-43, YEARWISE)

| Sl. No. | Name of Mine | Project Area (Ha) | Remaining life of Mine (Years) | Total Mine Closure Cost (Rs. In lakh) | 11th | 12th | 13th | 14th | 15th | 16th | 17th | 18th | 19th | 20th | 21st |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | 2023-24 | 2024-25 | 2025-26 | 2026-27 | 2027-28 | 2028-29 | 2029-30 | 2030-31 | 2031-32 | 2032-33 | 2033-34 |
| 1 | Muraidih-Shatabdi Group of Mines | 584.70 | 13 | 4796.56 | 441.09 | 463.15 | 486.31 | | | | | | | | |
| 2 | Bhutgoria UG | 131.67 | 24 | 330.43 | 12.09 | 12.70 | 13.33 | 14.00 | 14.70 | 15.44 | 16.21 | 17.02 | 17.87 | 18.76 | 19.70 |
| 3 | Gopalichak UG | 241.44 | 30 | 764.64 | 17.15 | 18.01 | 18.91 | 19.86 | 20.85 | 21.89 | 22.99 | 24.14 | 25.34 | 26.61 | 27.94 |
| 4 | Hurriladih UG | 127.17 | 25 | 329.67 | 11.20 | 11.76 | 12.34 | 12.96 | 13.61 | 14.29 | 15.00 | 15.75 | 16.54 | 17.37 | 18.24 |
| 5 | Burragarh UG | 147.83 | 30 | 443.09 | 10.86 | 11.41 | 11.98 | 12.58 | 13.20 | 13.86 | 14.56 | 15.29 | 16.05 | 16.85 | 17.70 |
| 6 | Simlabahal UG | 178.13 | 30 | 535.95 | 13.06 | 13.71 | 14.40 | 15.12 | 15.88 | 16.67 | 17.50 | 18.38 | 19.30 | 20.26 | 21.27 |
| 7 | Jogidih Colliery | 167.00 | 27 | 478.62 | 13.32 | 13.98 | 14.68 | 15.42 | 16.19 | 17.00 | 17.85 | 18.74 | 19.68 | 20.66 | 21.69 |
| 8 | Kharkharee Colliery | 355.00 | 30 | 1064.03 | 26.09 | 27.39 | 28.76 | 30.20 | 31.71 | 33.29 | 34.96 | 36.71 | 38.54 | 40.47 | 42.49 |
| 9 | Nichitpur Colliery | 122.73 | 10 | 1253.53 | | | | | | | | | | | |
| 10 | Loyabad Colliery | 424.56 | 30 | 1313.50 | 30.61 | 32.14 | 33.75 | 35.44 | 37.21 | 39.07 | 41.02 | 43.07 | 45.23 | 47.49 | 49.86 |
| 11 | Basantimata Colliery | 235.30 | 11 | 485.34 | 44.83 | | | | | | | | | | |
| 12 | Dahibari Basantimata OCP | 190.00 | 12 | 2046.51 | 209.43 | 219.90 | | | | | | | | | |
| 13 | Mudidih Colliery | 356.23 | 17 | 2218.11 | 192.59 | 202.22 | 212.33 | 28.72 | 30.16 | 31.67 | 33.25 | | | | |
| 14 | Bhowrah South Group of Mines | 316.74 | 9 | 1227.61 | | | | | | | | | | | |
| 15 | New Akashkinaree Mine | 367.58 | 30 | 3013.24 | 98.70 | 103.64 | 108.82 | 114.26 | 77.17 | 81.03 | 85.08 | 89.34 | 93.80 | 98.49 | 103.42 |
| 16 | Sendra Bansjora Colliery | 150.00 | 23 | 2194.11 | 86.26 | 90.58 | 95.11 | 99.86 | 104.86 | 110.10 | 115.60 | 121.38 | 127.45 | 133.82 | 140.52 |
| 17 | Tetulmari Colliery | 273.00 | 30 | 2256.41 | 210.39 | 220.91 | 7.13 | 7.49 | 7.86 | 8.25 | 8.67 | 9.10 | 9.55 | 10.03 | 10.53 |
| 18 | Block-IV/Kooridih Mine | 149.00 | 12 | 1504.89 | 164.24 | 172.45 | | | | | | | | | |
| 19 | Govindpur Colliery | 159.55 | 30 | 830.13 | 33.52 | 35.19 | 36.95 | 38.81 | 40.74 | 42.78 | 44.92 | 47.17 | 49.52 | 14.20 | 14.91 |
| 20 | Maheshpur Colliery | 292.68 | 26 | 794.40 | 24.57 | 25.80 | 27.09 | 28.45 | 29.87 | 31.36 | 32.93 | 34.58 | 36.31 | 38.12 | 40.03 |
| | | | | | | | | | | | | | | | |
| | | | | 27980.77 | 1640.01 | 1674.94 | 1121.89 | 473.16 | 454.01 | 476.70 | 500.54 | 490.66 | 515.18 | 503.14 | 528.31 |

TOTAL MINE CLOSURE COST (RS. LAKH) TO BE
DEPOSITED BY BCCL FOR THE FOLLOWING TWENTY
MINES DURING COMING 30 YEARS(2013-14 TO 2042-43, YEARWISE)

| Sl. No. | Name of Mine | Project Area (Ha) | Remaining life of Mine (Years) | Total Mine Closure Cost (Rs. In lakh) | 22nd | 23rd | 24th | 25th | 26th | 27th | 28th | 29th | 30th |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | 2034-35 | 2035-36 | 2036-37 | 2037-38 | 2038-39 | 2039-40 | 2040-41 | 2041-42 | 2042-43 |
| 1 | Muraidih-Shatabdi Group of Mines | 584.70 | 13 | 4796.56 | | | | | | | | | |
| 2 | Bhutgoria UG | 131.67 | 24 | 330.43 | 20.69 | 21.72 | 22.81 | | | | | | |
| 3 | Gopalichak UG | 241.44 | 30 | 764.64 | 29.34 | 30.81 | 32.35 | 33.96 | 35.66 | 37.45 | 39.32 | 41.28 | 43.35 |
| 4 | Hurriladih UG | 127.17 | 25 | 329.67 | 19.15 | 20.11 | 21.11 | 22.17 | | | | | |
| 5 | Burragarh UG | 147.83 | 30 | 443.09 | 18.58 | 19.51 | 20.48 | 21.51 | 22.58 | 23.71 | 24.90 | 26.14 | 27.45 |
| 6 | Simlabahal UG | 178.13 | 30 | 535.95 | 22.34 | 23.45 | 24.63 | 25.86 | 27.15 | 28.51 | 29.93 | 31.43 | 33.00 |
| 7 | Jogidih Colliery | 167.00 | 27 | 478.62 | 22.78 | 23.92 | 25.11 | 26.37 | 27.69 | 29.07 | | | |
| 8 | Kharkharee Colliery | 355.00 | 30 | 1064.03 | 44.62 | 46.85 | 49.19 | 51.65 | 54.23 | 56.94 | 59.79 | 62.78 | 65.92 |
| 9 | Nichitpur Colliery | 122.73 | 10 | 1253.53 | | | | | | | | | |
| 10 | Loyabad Colliery | 424.56 | 30 | 1313.50 | 52.35 | 54.97 | 57.72 | 60.61 | 63.64 | 66.82 | 70.16 | 73.67 | 77.35 |
| 11 | Basantimata Colliery | 235.30 | 11 | 485.34 | | | | | | | | | |
| 12 | Dahibari Basantimata OCP | 190.00 | 12 | 2046.51 | | | | | | | | | |
| 13 | Mudidih Colliery | 356.23 | 17 | 2218.11 | | | | | | | | | |
| 14 | Bhowrah South Group of Mines | 316.74 | 9 | 1227.61 | | | | | | | | | |
| 15 | New Akashkinaree Mine | 367.58 | 30 | 3013.24 | 108.59 | 114.02 | 119.72 | 125.71 | 131.99 | 138.59 | 145.52 | 152.80 | 160.44 |
| 16 | Sendra Bansjora Colliery | 150.00 | 23 | 2194.11 | 147.54 | 154.92 | | | | | | | |
| 17 | Tetulmari Colliery | 273.00 | 30 | 2256.41 | 11.06 | 11.61 | 12.19 | 12.80 | 13.44 | 14.12 | 14.82 | 15.56 | 16.34 |
| 18 | Block-IV/Kooridih Mine | 149.00 | 12 | 1604.89 | | | | | | | | | |
| 19 | Govindpur Colliery | 159.55 | 30 | 830.13 | 15.65 | 16.44 | 17.26 | 18.12 | 19.03 | 19.98 | 20.98 | 22.03 | 23.13 |
| 20 | Maheshpur Colliery | 292.68 | 26 | 794.40 | 42.03 | 44.13 | 46.34 | 48.65 | 51.09 | | | | |
| | | | | | | | | | | | | | |
| | | | | 27980.77 | 554.71 | 582.45 | 448.91 | 447.42 | 446.51 | 415.19 | 405.42 | 425.70 | 446.98 |

F-20A


भारत कोकिंग कोल लिमिटेड

*(कोल इंडिया लिमिटेड का एक अंग)*

कोयला भवन/ कोयला नगर,

धनबाद –826005

**दूरभाष :**0326-2230190/ **फ़ेक्स**-0326-2230050

**ईमेल**: cos@bccl.gov.in

Bharat Coking Coal Limited

*(A Subsidiary of Coal India Limited)*

Koyla Bhawan/ Koyla Nagar

Dhanbad-826005

Phone No. 0326-2230190/Fax-0326-2230050

email ID: cos@bccl.gov.in


बोर्ड सचिवालय /Board Secretariat

Ref. No. BCCL:CS:F-1(A): 154

Dated:21.02.2014

To
GM(P&P)
BCCL, Koyla Bhawan

**Sub: Extracts of Minutes of 304th Meeting of the Board of Directors of BCCL held on 03.02.2014 at Dhanbad.**

Dear Sir,

We send herewith extracts of Minutes of the **Item No. 304.5D** of the 304th Meeting of the Board of Directors of Bharat Coking Coal Limited held on 03.02.2014 at Dhanbad for taking necessary action at your end.

Action Taken Report (ATR) on the decision of the Board may please be submitted for appraisal of the Board.

Encl: As above

Yours faithfully

(B.K. Parui)
Company Secretary

cc to 1. Addl. GM (F) I/C
2. HOD (Budget)
3. Ratnagiri Sahu R&P Deptt
4. Board file

304.5D **Approval of Mine Closure Plan.**

Board after deliberation passed the following resolution

**Resolved that** the proposal of Mine Closure Plan of the following 7(Seven) mines (as per the mine closure list given below) including the total closure cost of ₹61285.713 Lakhs (Rupees Six hundred twelve crores eighty five lakhs seventy one thousand and three hundred only) to be deposited in "Escrow Account" under Revenue head be and is hereby approved.

**Further resolved that** the said "Escrow Account' will be opened in accordance with the guidelines issued by D (F), CIL vide letter No.168/96 dated 26.06.2013 and 168/98 dated 28.06.2013 be and is hereby approved.

| Sl. No | Name of Mine/Project | Project Area | Balance Life of Mine | Amount to be deposited to Escrow Account(₹Lakh) | | | |
|---|---|---|---|---|---|---|---|
| | | | | 1st Year | 2nd Year | $n^{th}$ Year | Total Mine Closure Cost |
| | | (Ha) | (Years) | | | (End Year) | |
| 1 | Kalyaneswari Group of Mines | 851.33 | 33 | 209.610 | 220.090 | 998.740 | **16781.990** |
| 2 | Lohapatti Colliery | 1535.31 | 16 | 267.695 | 281.080 | 264.047 | **3293.157** |
| 3 | Block-II OCP Mines | 707.00 | 26 | 207.396 | 217.766 | 702.315 | **10600.717** |
| 4 | Pootkee Balihari Group of Mines | 730.17 | 30 | 84.913 | 34.302 | 134.469 | **2222.722** |
| 5 | NT-ST-Jeenagora Group of Mines | 1431.00 | 30 | 387.563 | 406.941 | 1595.260 | **25749.206** |
| 6 | Murulidih 20/21 Pits Colliery | 394.32 | 17 | 31.410 | 32.981 | 68.567 | **881.654** |
| 7 | Godhur Group of Mines | 153.72 | 20 | 55.232 | 57.993 | 139.566 | **1826.267** |
| **TOTAL** | | | | **1243.819** | **1251.153** | | **61285.713** |

Certified to be True Copy

21/4/14

B.K. Paul
Company Secretary
Bharat Coking Coal Limited
Koyla Bhawan
Dhanbad - 826005

GMPD
526/L
23-11-17

24


**भारत कोकिंग कोल लिमिटेड**

Bharat Coking Coal Limited

*(A Mini Ratna Company)*

(A Subsidiary of Coal India Ltd.)

(www.bcclweb.in)

पं.काकोयला भवन -:., कोयला नगर, धनबाद –826005,

Regd. Off: Koyla Bhawan, Koyla Nagar,Dhanbad – 826005.

CIN: U10101JH1972GOI000918

दूरभाष: 0326-2230190/ फ़ेक्स -0326-2230050,

ईमेल: cos.bccl@coalindia.in


बोर्ड सचिवालय /Board Secretariat

पत्रांक:बीसीसील:सीएस:-एफ-1ए: 506

दिनांक:23.11.2017

To,
GM(P&P),
BCCL, Koyla Bhawan.

**Sub: Extracts of Minutes of 335th Board Meeting held on 04.11.2017.**

Dear Sir,

We send herewith extracts of Minutes of Item No. **335. 4O, 335.5S, 335.5V, 335.5W, 335.5X & 335.5Y** of 335th Meeting of the Board of Directors of Bharat Coking Coal Limited held on 04.11.2017 at Registered Office, Koyla Bhawan, Dhanbad for taking necessary action at your end.

भवदीय

बी.के.पारुई
(कंपनी सचिव)

संलग्न : यथोपरी

Board Resolution Sheet

23/11

**Item No. 335.4O**

**Agenda note for reappropriation & inclusion of new activities done during 1st and 2nd quarter of FY 2017-18 in capital budget 2017-18(BE) of BCCL for information to BCCL Board.**

Board noted the information furnished in the agenda note.

**Item No. 335.5S**

**Allocation of additional coal blocks to BCCL.**

**Background**:

As per the approved production plan of BCCL the Company is expected to produce 53 million tonne of coal in 2019-20. However, it has been given an ambitious target by Ministry of Coal to further augment its production capacity to achieve annual production level of 100 million tonne. BCCL has examined its strength and it is found that the mining condition of the existing property within BCCL leasehold Area is not suitable for further augmentation of production from the earlier approved production plan. BCCL is operating its mines spread over Jharia Coalfield and part of Raniganj Coalfield. Both the coalfields are having problems associated with fire, unstable areas and other surface constraints like township, roads, railways and infrastructure coupled with land and R & R issues. Hence the current proposal was placed before the Board earlier through circulation which was not agreed to by majority of the Board members. Hence it has been placed again with the modifications suggested by D(T), CIL.

**Decision**:

Board after deliberation approved the proposal seeking allocation of additional coal blocks to BCCL and to request CIL to take further action on this matter in respect of following coal blocks:

1. East of Damagoria(Kalyaneshwari).
2. Sitarampur Block "

**Item No. 335.5V**

**Approval of Mining Plan of Gopalichak OC.**

**Background**:

The Empowered Sub-committee of BCCL Board deliberated the Mining Plan of Gopalichak Colliery for opencast working as detailed in the agenda note and recommended to BCCL Board for further deliberation and approval.

**Decision**:

As recommended by the Empowered Sub Committee of BCCL Board, the Board deliberated the Agenda Note on Mining Plan of Gopalichak Colliery for opencast working and approved the same.

Certified to be True Copy

B. K. Paul
Company Secretary
Bharat Coking Coal Limited
Koyla Bhawan
Dhanbad - 826005

**Item No. 335.5W**

**Approval of Mining Plan of Kankanee Colliery.**

**Background**:

The Empowered Sub-committee of BCCL Board deliberated the Mining Plan of Kankanee Colliery for opencast working as detailed in the agenda note and recommended to BCCL Board for further deliberation and approval.

**Decision**:

As recommended by the Empowered Sub Committee of BCCL Board, the Board deliberated the Agenda Note on Mining Plan of Kankanee Colliery for opencast working and approved the same.

**Item No. 335.5X**

**Approval of Mine closure Plan of Kankanee Colliery, BCCL.**

**Background**:

The subject proposal was placed before Audit Committee of BCCL and Audit Committee recommended to place the proposal before Board for approval.

**Decision**:

Board after deliberation approved the proposal of Mine closure Plan of Kankanee Colliery with the total closure cost of ₹1541.586 lakhs (Rupees fifteen crores forty one lakhs fifty eight thousand six hundred only) to be deposited in Escrow Account under Revenue head.

**Item No. 335.5Y**

**Approval of Mine closure Plan of Gopalichak Colliery, P.B. Area.**

**Background**:

The subject proposal was placed before Audit Committee of BCCL and Audit Committee recommended to place the proposal before Board for approval.

**Decision**:

Board deliberated the proposal of Mine Closure Plan of Gopalichak Colliery of PB area and approved the same for the total closure cost of ₹3848.995 lakhs (Rupees thirty-eight crores forty-eight lakhs ninety-nine thousand and five hundred only) based on OC norms at WPI of January, 2017. A new Escrow Account will be opened named as Gopalichak Mine.

Certified to be True Copy

B. K. Paul
Company Secretary
Bharat Coking Coal Limited
Koyla Bhawan
Dhanbad - 826005

GMPD
391/L
16-5-18

भारत कोकिंग कोल लिमिटेड
**Bharat Coking Coal Limited**
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(A Subsidiary of Coal India Ltd.)
(www.bcclweb.in)

पं.का -:.कोयला भवन, कोयला नगर, धनबाद –826005,
Regd. Off: Koyla Bhawan, Koyla Nagar,
Dhanbad - 826005.
CIN: U10101JH1972GOI000918
दूरभाष: 0326-2230190/ फ़ेक्स -0326-2230050,
ईमेल: cos.bccl@coalindia.in

बोर्ड सचिवालय /Board Secretariat

Ref. No. BCCL:CS:F-1A: 316

Dated: 15.05.2018

To,
GM(P&P),
BCCL, Koyla Bhawan.

**Sub: Certified copy of Minutes of 342nd Board Meeting held on 04.05.2018.**

Dear Sir,

We send herewith certified copy of Minutes of Item No. **342.5L, 342.5M & 342.5R** of 342nd Meeting of the Board of Directors of Bharat Coking Coal Limited held at Registered Office, Koyla Bhawan, Dhanbad on 04.05.2018 for taking necessary action at your end.

Encl: As above

Yours faithfully

(B.K. Parui)
Company Secretary

**Item No. 342.5L**

**Mining Plan along with Mine Closure Plan of Kalyaneshwari OC.**

**Background:**

BCCL Board in its 326th meeting held on 27.08.2016 has directed that the Mining Plan is to be examined by the Empowered Sub Committee (ESC) before the same is placed for Board's consideration. Accordingly, the subject proposal was placed before Empowered Sub-Committee Meeting of BCCL held on 04.05.2018 and ESC recommended to place the proposal before Board.

**Decision:**

After detailed deliberation the proposal for Mining Plan along with Mine Closure Plan of Kalyaneshwari OC Mine having normative capacity of 4.0 MTPA and the total Mine Closure cost being ₹**26730.534** Lakhs (Rupees Twenty-Six Thousand Seven Hundred Thirty Lakh and Fifty-Three Thousand four hundred only) to be deposited in the Escrow Account (existing) as recommended by the Empowered Sub-Committee was approved by the Board.

**Item No. 342.5M**

**Mining Plan alongwith Mine Closure Plan Kendwadih OC Mine.**

**Background :**

The proposal was placed before Empowered Sub-Committee of BCCL in its meeting held on 04.05.2018 and ESC recommended to place the proposal before Board for decision.

**Decision**:

After detailed deliberation the proposal for Mining Plan along with Mine Closure Plan of Kendwadih OC Mine having normative capacity of 0.20 MTPA and the total Mine Closure cost being ₹**2351.394** Lakhs (Rupees two thousand three hundred fifty-one Lakh and thirty-nine Thousand four hundred only), to be deposited in the Escrow Account (to be opened) as recommended by the Empowered Sub-Committee was approved by the Board.

**Item No. 342.5R**

**Annual Capital Budget (new commitment) for the Financial Year 2018-19 for existing mines / completed projects and ongoing projects.**

Deferred.

Certified to be True Copy

B. K. Parui
Company Secretary
Bharat Coking Coal Limited
Koyla Bhawan
Dhanbad - 826005

भारत कोकिंग कोल लिमिटेड
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पं का - कोयला भवन, कोयला नगर, धनबाद -826005
Regd. Off: Koyla Bhawan, Koyla Nagar
Dhanbad - 826005
CIN: U10101JH1972GOI000918
दूरभाष: 0326-2230190
ईमेल: cos.bccl@coalindia.in

## बोर्ड सचिवालय/Board Secretariat

पत्रांक : बीसीसीएल / सीएस / एफ-1(A) / 67 (H)

दिनांक: 01.03.2025

सेवा में,
महाप्रबंधक(भुमिगत / साइडिंग),
बीसीसीएल, कोयला भवन, धनबाद।

विषय: **Certified copy of Minutes of 418th Board Meeting held on 21.02.2025.**

Dear Sir,

We send herewith certified copy of Minutes of Item No. 418.PoT-1 of 418th Meeting of the Board of Directors of Bharat Coking Coal Limited held at Regd. Office, Koyla Bhawan, Dhanbad on 21.02.2025 for taking necessary action at your end.

**You are requested to send the Action Taken Report (ATR) on the above, duly approved by the concerned Director, for placing before the next Board Meeting as per the format given below. Soft copy of the same in MS word format to the mail id cos.bccl@coalindia.in .**

Format of ATR:

| **Department:** | | | |
|---|---|---|---|
| **Item No.** | **Subject** | **Decision of the Board** | **Action Taken** |

भवदीय,

बी.के.पारूई
कंपनी सचिव

Encl: As above

U.G & Siding
4536(H)
01-03-25

Shri Ashutosh

**Item No. 418.POT-1**

**Approval of Mining Plan and Mine Closure Plan of PB Project Colliery under PB Area, awarded on MDO mode under Revenue Sharing Basis.**

**Background:-**

The proposal was placed before ESC (Tech.) meeting and recommended to Board for its approval.

The PB Project Colliery, along with the Kachhi Balihari 10/12 Pit Colliery, Bhagabandh Colliery and ECC Kenduadih Colliery, were neighbouring mines under administrative control of PB area. These mines have been inactive due to significant underground water inflow, resulting in waterlogging. Consequently, a considerable amount of coal remains locked in inter-mine barriers, developed pillars, and virgin seams.

To address this issue, it was proposed for the extraction of this locked coal by consolidating these mines into a single entity, the PB Project Colliery Coal Mine. Bids were invited for re-opening, development and operation of the PB Project Colliery on 17.10.2022. After evaluation of the bids received, Letter of Award (LOA) has been issued to M/s Eagle Infra India Ltd. on 21.03.2023 requiring execution of contract agreement through the Special Purpose Vehicle (SPV) in accordance of clause/terms of NIT. M/s Eagle Infra India Ltd has promoted and incorporated the Mine operator, M/s Eagledeep PB Dhanbad Coal Private Limited as a SPV to enter the contract agreement and undertake all the obligations for re-opening, development, operation and safety of the mine. The contract agreement was signed between BCCL and M/s Eagledeep PB Dhanbad Coal Private Limited on 15.09.2023 for its quoted coal production of 52 MT for a period of 25 years, commencing from the Appointed Date and with the percentage of revenue share of BCCL as 6 %. Environment Clearance (EC) has been accorded under Cluster XI - 1.261 MTPA for UG (KB 10/12 UG - 0.117, PB UG 1.04, Bhagaband UG - 0.104). The leasehold area of PB Project Colliery is 730.17 Ha. The Peak Rated Capacity of the mine as per this Mining plan is 2.7 MTY.

Ministry of Coal vide letter F. No. CPAM-34011/28/2019-CPAM-Part (2) [359539] dated 29th May, 2024 issued by Under Secretary to Govt. of India has stated that Mining plans of MDOs and Revenue sharing projects of CIL prepared by Mining Plan Preparing Agencies [MPPAs] may be approved by CIL/its Subsidiaries after due scrutiny, vetting and recommendation by CMPDIL. The Mining plan and Mine Closure Plan of PB Project Colliery has been prepared by DMT Consulting Private Limited accredited by QCI-NABET (Quality Council of India-National Accreditation Board for Education & Training) having certificate no. NABET/APA-MPPA/IA/009. Vetting of Mining plan has been done jointly by CMPDI HQ (UG Part) and RI-II (OC Part).

**Decision:-**

The proposal was deliberated in ESC (Tech.) committee meeting held on 21.02.2025 and the committee recommended that proposal for approval of Board.

During deliberation of the proposal it was noticed that the email dated 07.02.2025 with a comment that 'Mine closure plan was vetted and found to be okay' but certificate on the same from CMPDIL was not found available. Hence it was asked to be submitted and communicated to all the members of the Board. Subsequently certificate from CMPDIL was obtained and communicated to all the members of the Board.

After detailed deliberation, as recommended by ESC (Tech.) Mining Plan and Mine Closure Plan of PB Project Colliery under PB Area (having PRC-2.7 MTY, Leasehold-730.17 Ha, Mine life of 35 years with Total Mine Closure Cost being ₹58.98 Crores (including already deposited amount of ₹5.7224 Crores) was approved by the Board.

The above discontinued mine was awarded to M/s Eagle Infra India Limited on MDO mode under Revenue sharing contract vide LOA dated 21.03.2023 and was approved

Certified to be True Copy

बी. के. पारुलई
कंपनी सचिव
भारत कोकिंग कोल लिमिटेड
कोयला भवन
धनबाद– 826005

by the BCCL Board on 17.03.2023. M/s Eagle Infra India Ltd. formed an SPV in the name M/s Eagledeep PB Dhanbad Coal Private Limited with whom revenue contract was signed act as Mine operator with all obligations related to land acquisition and R&R, under the scope of mine operator. The escrow account of PB Group of Mines already exists with A/c no: 00150100009045.

The proposal as recommended by the ESC (Tech.) that the escrow account of PB Group of Mines shall be continued with the new account name as **PB Project Colliery Coal Mine** was also agreed by the Board.

**Action: GM (UG & Siding)**

Certified to be True Copy

बी. के. पारुई
कंपनी सचिव
भारत कोकिंग कोल लिमिटेड
कोयला भवन
धनबाद– 826005

GMPD
391/L
16-5-18

ANNEXURE XLIII

भारत कोकिंग कोल लिमिटेड
**Bharat Coking Coal Limited**
*(A Mini Ratna Company)*
(A Subsidiary of Coal India Ltd.)
(www.bcclweb.in)

पं.का -:.कोयला भवन, कोयला नगर, धनबाद –826005,
Regd. Off: Koyla Bhawan, Koyla Nagar,
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CIN: U10101JH1972GOI000918
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ईमेल: cos.bccl@coalindia.in

बोर्ड सचिवालय /Board Secretariat

Ref. No. BCCL:CS:F-1A: 316

Dated: 15.05.2018

To,
GM(P&P),
BCCL, Koyla Bhawan.

**Sub: Certified copy of Minutes of 342nd Board Meeting held on 04.05.2018.**

Dear Sir,

We send herewith certified copy of Minutes of Item No. **342.5L, 342.5M & 342.5R** of 342nd Meeting of the Board of Directors of Bharat Coking Coal Limited held at Registered Office, Koyla Bhawan, Dhanbad on 04.05.2018 for taking necessary action at your end.

Encl: As above

Yours faithfully

(B.K. Parui)
Company Secretary

**Item No. 342.5L**

**Mining Plan along with Mine Closure Plan of Kalyaneshwari OC.**

**Background:**

BCCL Board in its 326th meeting held on 27.08.2016 has directed that the Mining Plan is to be examined by the Empowered Sub Committee (ESC) before the same is placed for Board's consideration. Accordingly, the subject proposal was placed before Empowered Sub-Committee Meeting of BCCL held on 04.05.2018 and ESC recommended to place the proposal before Board.

**Decision:**

After detailed deliberation the proposal for Mining Plan along with Mine Closure Plan of Kalyaneshwari OC Mine having normative capacity of 4.0 MTPA and the total Mine Closure cost being ₹**26730.534** Lakhs (Rupees Twenty-Six Thousand Seven Hundred Thirty Lakh and Fifty-Three Thousand four hundred only) to be deposited in the Escrow Account (existing) as recommended by the Empowered Sub-Committee was approved by the Board.

**Item No. 342.5M**

**Mining Plan alongwith Mine Closure Plan Kendwadih OC Mine.**

**Background :**

The proposal was placed before Empowered Sub-Committee of BCCL in its meeting held on 04.05.2018 and ESC recommended to place the proposal before Board for decision.

**Decision**:

After detailed deliberation the proposal for Mining Plan along with Mine Closure Plan of Kendwadih OC Mine having normative capacity of 0.20 MTPA and the total Mine Closure cost being ₹**2351.394** Lakhs (Rupees two thousand three hundred fifty-one Lakh and thirty-nine Thousand four hundred only), to be deposited in the Escrow Account (to be opened) as recommended by the Empowered Sub-Committee was approved by the Board.

**Item No. 342.5R**

**Annual Capital Budget (new commitment) for the Financial Year 2018-19 for existing mines / completed projects and ongoing projects.**

Deferred.

Certified to be True Copy

B. K. Parui
Company Secretary
Bharat Coking Coal Limited
Koyla Bhawan
Dhanbad - 826005

ANNEXURE XLIV

# Impact Assessment of CSR projects undertaken by Bharat Coking Coal Limited, Dhanbad FY(2015-16)


**By**

**National CSR Hub**

**Tata Institute of Social Sciences, Mumbai**

## RESEARCH TEAM AT NATIONAL CSR HUB

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Ms. Sushma Kir

## ACKNOWLEDGEMENT

This Impact Assessment Study of CSR project of Bharat Coking Coal Limited, Dhanbad for the FY 2015-16 has been undertaken by National CSR Hub, Tata Institute of Social Sciences (TISS) as a part of the MoU with CIL and TISS.

At the outset, we would like to thank BCCL for granting this project to National CSR Hub, TISS. We express heartfelt gratitude to Director (Personnel), BCCL for giving us the opportunity to carry out the Impact Assessment study of CSR projects for the FY 2015-16. We express our gratitude to the General Manager, CSR and the entire CSR department of BCCL for their continuous support and guidance to the research team of NCSR Hub.

We also extend our gratefulness to respective area General Managers, Medical Officers (Health Department) and concerned project in-charge appointed by BCCL (CSR officials) for making all the arrangements for the study and making us comfortable with their warm hospitality.

Prof. B. Venkatesh Kumar
Director
National Corporate Social Responsibility Hub
TISS, Mumbai

## EXECUTIVE SUMMARY

Bharat Coking Coal Limited is a subsidiary of Coal India Limited, a Maharatna Company. The company is currently operating in 12 administrative areas in Jharia Coalfields encompassing around 226 peripheral villages mainly in the District of Dhanbad, Jharkhand and in some part of West Bengal. The Strategic CSR of BCCL states that the company's main objective is to improve the quality of life of people living in and around its command areas. The key areas of CSR invention are rural development, livelihood generation and skill development. It has a long history of philanthropic activities which were converged to align with the Corporate Social Responsibility mandate of the Companies Act 2013. Rural development, livelihood generation and skill development are thrust areas of the BCCL's CSR interventions. As per the CSR guideline, BCCL has partnered with Tata Institute of Social Sciences to conduct evaluation studies for the completed CSR projects.

For the purpose of this report, impact assessment studies were carried out for four projects, namely, Scheme for Multi-Purpose Utilisation of Mine Water, Mobile Medical Van, Village Adoption and Construction of PCC/Bituminous Road.

The primary data collection for the impact assessment studies was completed in September 2017 by a six member team from TISS. Mixed research methodology was used while In-Depth Interviews, Household Surveys and focused group discussions were the main methods implemented to collect data. 1000 samples were collected from 13 operational areas of BCCL for the impact assessment study.

The objectives of the impact assessment were:

(i) To assess if the objectives of individual projects have been met;

(ii) To understand the continued relevance of the individual projects in their respective contexts; and

(iii) To identify issues in programmatic implementation and provide recommendation to fulfill the objectives efficiently.

Mobile Medical Van has aimed to provide quality health services to the rural poor residing in the operational areas of BCCL. The impact of the project on the community has been remarkable as it provides doorstep medical services to the poor, reduces the medical expenditures, reached the most remote villages and awareness generation. Limited health services, awareness campaigns and limited regularity are the major drawbacks of the project.

In the project Scheme for Multi-Purpose Utilisation of Mine Water, 352 samples were collected, 13 FGDs and 4 Key Informant Interviews (KII) were conducted. There is strong demand for the supply of mine water in the renovated ponds especially during water scarcity periods, which have been stopped for the last couple of months. The mine water is used for household and cattle consumption. Livelihood generation activities have not commenced as yet.

BCCL also adopted Lahbera village, situated in Jharia block of Dhanbad district and committed to the holistic development of the village. Various infrastructural and economic projects were implemented in the village. Although the project has been a huge success, a lapse in monitoring, incomplete projects and limited resources for employment generation have inhibited the successful completion of the project.

BCCL also constructed roads at 7 locations across Dhanbad districts. The roads had led to improved connectivity and enhanced hygienic living conditions, but lack of monitoring, limited connectivity and lack of participatory approach have been some of the shortcomings of the project.

TISS has also provided recommendation such as regular monitoring, creation of employment generation activities, the formation of SHGs etc. for efficient execution of future projects.

## LIST OF ABBREVIATIONS

| | | |
|---|---|---|
| **ADC** | - | Adult Education Center |
| **BCCL** | - | Bharat Coking Coal Limited |
| **CHC** | - | Community Healthcare Center |
| **CSR** | - | Social Corporate Responsibility |
| **CTP** | - | Computer Training Program |
| **FGD** | - | Focused Group Discussion |
| **GM** | - | General Manager |
| **HHI** | - | Household Interviews |
| **IDI** | - | In – depth Interviews |
| **IT** | - | Information and Technology |
| **KII** | - | Key Informant Interviews |
| **LVA** | - | Lahbera – Village Adoption |
| **MMV** | - | Mobile Medical Van |
| **MUMW** | - | Scheme for multipurpose utilization of abandoned mine water |
| **PCC** | - | Plain Cement Concrete |
| **PHC** | - | Primary Health Care Center |
| **SHG** | - | Self Help Group |
| **ST** | - | Schedule Tribes |
| **STC** | - | Sewing Training Centre |
| **STP** | - | Sewing Training Program |
| **EJ** | – | Eastern Jharia |
| **WJ** | – | Western Jahria |
| **WWD** | _ | Western Washery Division |
| **CV** | – | Chanch Victora |

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# CHAPTER 1 - INTRODUCTION

Businesses are the most powerful constituents of the society, and they do not operate in isolation; there is an increased realization that not only can companies affect society at large, but they are also in a unique position to influence society and a make positive impact.

> "The Organization for Economic Co-operation and Development[1] (OECD) established a set of guidelines for multinational enterprises in 1976 and was thus a pioneer in developing the concept of CSR. The purpose of these guidelines was to improve the 'investment' climate and encourage the positive contribution multinational enterprises can make to economic and social progress".

An evaluation is 'the systematic and objective assessment of an on-going or completed project, programme or policy, its design, implementation and results. The aim is to determine the relevance and fulfilment of objectives, development efficiency, effectiveness, impact and sustainability. An evaluation should provide information that is credible and useful, enabling the incorporation of lessons learned into the decision-making process of both recipient and donors.' (OECD Publications, 2010)

### 1.1. About Bharat Coking Coal Limited

Bharat Coking Coal Limited (BCCL) is a subsidiary of Coal India Limited, a Maharatna Company. The company is operating in 12 administrative areas in Jharia Coalfields encompassing around 226 peripheral villages mainly in the District of Dhanbad, Jharkhand and in some part of West Bengal. The Strategic CSR of BCCL states that the company's main objective is to improve the quality of life of people living in and around its command areas. Towards achieving this objective and understand the interest levels of the local community, BCCL has undertaken a departmental baseline survey cum Skill Gap Analysis study at some locations. The recommendations from the study would form the basis for the design and deployment of the various skill development initiatives to be planned.

[1] http://www.oecd.org/about/

### 1.2 About National Corporate Social Responsibility Hub, TISS

National Corporate Social Responsibility Hub, (NCSR Hub) was established in 2011 by the Department of Public Enterprises to enable the Public Sector Enterprises to design and implement holistic and rights-based CSR initiatives. Tata Institute of Social Sciences (TISS), Mumbai and Department of Public Enterprises (DPE), Government of India had come to realize that there is a need to have a centralized system where core functions of CSR including learning and knowledge dissemination take place. The core activities of the Hub are:

- Vision and strategic direction setting for Policy and Programme
- Advisory role for PSEs on Policy and Programme implementation
- Research and development and 'evidence-based' policy advocacy
- Capacity building of PSEs, partners and civil society institution
- Impact assessment, monitoring and evaluation
- Empanelment and partner management

### 1.3 Project Backgrounds

Bharat Coking Coal Limited (BCCL) sanctioned impact evaluation studies for four projects in different stages of completion which were carried out by National CSR Hub in August-September 2017. The following report details the evaluation of projects undertaken by Bharat Coking Coal Limited in accordance with their CSR policy laid out in 2014. A cogent CSR policy is a requirement laid out in the Companies (CSR Policy) Rules, 2014 conferred under the Companies Act, 2013.

As stated above, for this report four projects were evaluated namely: *Mobile Medical Van, Scheme for multipurpose utilisation of abandoned mine water, Village adoption program and construction of PCC/Bituminous road.*

a) **Mobile Medical Van (*Swastha Ratha*) -** The service of Mobile Medical Van for villagers under command areas of BCCL started in 2009 with the help of 2 Mobile Medical Vans. Now BCCL has fourteen Medical Mobile Vans (MMVs) equipped with doctors, paramedical staff serving different 203 villages situated in and around the mining areas on working days. The villagers are examined by the experienced clinicians

and medicines are dispensed free of cost to them. This provision has been made by BCCL exclusively under CSR activities for the benefit of villagers by providing them free medical assistance.

**Objective:** To provide health services in peripheral villages in and around BCCL command area to provide medical facilities with a focused service on identification, screening, diagnosis and treatment to provide free medical; assistance.

**Location of implementation:** 203 villages in the peripheral areas of BCCL

b) **Scheme for multipurpose utilisation of abandoned mine water -** BCCL since inception has felt the importance of water and endeavoured for effective and gainful utilisation of mine water from abandoned mines which has to be taken out compulsorily in the course of the mining process. For harnessing such water, BCCL has taken upon the task of holding the mine water into the water bodies by restricting them to flow into the natural drainage course like village reservoirs which gets dried during summers by laying out a pipeline network of approximately 45 km.

**Objective of the project:** Harnessing mine water for its gainful multipurpose utilisation in the peripheral villages of BCCL command area.

**Location:** Two reservoirs are situated in Khonathi and Behrakudar villages of Baghmara block of Dhanbad district.

c) **Lahbera Village Adoption Program** - In order to develop peripheral villages of BCCL in an integrated manner, including their economic development, infrastructure upliftment, providing opportunities for social empowerment and other aspects of overall human development. i.e. education, health, drinking water supply, providing training and tools for self-employment etc. This would include economic development, infrastructure development and other aspects of human development, i.e. education, health, drinking water supply and credit linkage.

**Objective of the project:** The objective of Village Adoption Programme is to develop the selected village in an integrated manner ensuring the holistic and integrated development of village through capacity building and participation of local people and institutions.

**Location:** Lahbera Village in Jharia block of Dhanbad district

**d) Construction of PCC/Bituminous road -** Understanding the importance of Road BCCL had Constructed PCC Roads in and around eight villages of the BCCL command area. Roads are of vital importance to make a nation grow and develop. In addition, providing access to employment, social, health and education services makes a road network crucial in fighting against poverty. They open up areas of economic and social development.

**Objective of the project**: Enabling and increasing the connectivity from semi-rural to urban areas by constructing PCC Road.

**Location:**

| SN | Name of Village/Area | Construction in Km/Meters |
|---|---|---|
| 1 | Kacharra Arah Tola , Hatudih Panchayat | 400 meters |
| 2 | Lahbera Village | 1.5 Km |
| 3 | Aamtal Village, Aamtal Panchayat (Kusunda) | 1.5 km |
| 4 | Satitand Village, Bauakala Panchayat (Kusunda) | 500 meters |
| 5 | Padugora Village, Padugora Panchayat (WJ area) | 400 meters |
| 6 | Kandra Village, Kandrta Panchayat | 500 meters |
| 7 | Bakaspura Village, Luti Pahari Panchayat | 400 meters |

# CHAPTER 2 – RESEARCH METHODOLOGY

Research methodology is a way to systematically solve the research problem. It may be understood as a science of studying how research is done scientifically. In it, one studies the various steps that are adopted by a researcher in studying his research problem along with the logic behind them (Kothari, 2004). This chapter outlines the research methodology and also examines the objectives of the study and the research question. The chapter also includes the research design, methods, and level of engagement for data collection, on and off the field. The stage of data collection has also been explained in the chapter with a subsequently the steps utilized to analyze the data that is already collected from the field.

### 2.1 Objective of Study

The very purpose of the research is to discover answers to the question through the application of the scientific procedures (Kothari, 2004). The aim of the study was to understand the extent of the impact of projects on the socio-economic conditions of the targeted beneficiaries.

The Impact Assessment was conducted on four major projects namely:

1. Mobile Medical Van (MMV),
2. Scheme for multipurpose utilization of abandoned mine water (MUMW),
3. Road Construction, and
4. Labhera village adoption project (LVA)

Therefore the objective of each project has some variation from the other even though having that the main objectives were as follows:

i. To Analyzed the key impact areas of the project
ii. To Analyzed the extent of impact on the beneficiaries
iii. To suggest recommendation for improvement for the project.

## 2.2 Research Design

The research design refers to the overall strategy that one choose to integrate the different components of the study in a coherent and logical way, thereby, ensuring one will effectively address the research problem; it constitutes the blueprint for the collection, measurement, and analysis of data (De Vaus, 2001)

This study is an **Evaluation** research study as it is designed to assess the outcomes of an intervention so that the findings will provide insights useful for the organizations that have funded and implemented the project. The study is an end line evaluation study, which implies that the findings would be useful if the Company intent to reintroduce the project.

The project undertaken for impact assessment studies were those which are implemented by the BCCL CSR and which covers a mixed chunk of populate spread across the BCCL Command area. As there were four projects that required studying, the research team had developed two research designs based on the project objectives and population covered. This study employs a mixture of Quantitative and Qualitative research methods to evaluate the key aspects of the two projects namely; MMV and MUMV. If one has to define mixed method research it can be 'In general, mixed methods research represents research that involves collecting, analyzing, and interpreting quantitative and qualitative data in a single study or in a series of studies that investigate the same underlying phenomenon.' (Leech N, Onwuegbuzie A, 2008). The study has attempted not just to generate summary statistics that reveal the overall performance of the projects but has also attempted to delve into the individual stories, histories, life experiences and psyche of the beneficiaries through intensive beneficiary-specific case studies (of selected beneficiaries. While conducting the study of MMV and MUMW the research team used two major tools for data collection mainly: Focused Group Discussion (FGD) and Household Survey (HH). These methods were felt appropriate by the research team as it helped in fulfilling the appropriate size and appropriate response.

Simultaneously a different research design was formed for studying the impact of LVA and Road Construction. The qualitative research design enabled the research team to understand the impact of project in their daily life. Along with it, the project had limited beneficiaries that provided the research team with the opportunity to study and to understand the lived narratives of the beneficiaries and also the impact of LVA and road in their day to day life.

### 2.3 Tools for Data Collection

The tool is one of the essential components of a research study. It is an instrument that helps the researcher to meet the objectives of the research. There are various kinds of tools that are utilized based on the needs and objectives of the research. In the current study the research team undertook certain sets of tool they are listed below;

Major tools involved in the study were:

i. **i. House Hold Interview (Survey) (HHI)**: As a few projects had greater coverage in terms of area and population the household survey was used to get details from the identified villages and areas/panchayats

ii. **ii. Focused Group Discussion (FGD):** FGDs where conducted in all the four project, and the interviewers for the FGD was the village members, Ward/Gram Panchayat Representative, ASHA, Women Representative, SHGs Group Women's, Youth group member etc.

iii. **iii. In-depth Interviews (IDI):** Similarly IDI was conducted with village members who were directly affected by the project

iv. **iv. Case studies:** Case studies were used to get life narratives of the beneficiaries and to understand the impact of the project on their socio-economic and cultural lives

v.

### 2.4 Data collection methods

The sampling type used for data collection was stratified random sampling method. **The primary data** was collected using the following methods, selected as per the above-explained research design:

a. Survey of beneficiaries through questionnaire
b. Semi-structured interview (using interview schedule) and In-depth interviews. The in-depth interviews were open-ended with complete scope for probing and getting detailed information from the participants.
c. Participatory research methods such as transect walk
d. Document analysis (review of project reports)
e. Direct observation (home visit, village/town visit and institution visit)

### 2.5 Participants of Data Collection

This study emphasizes the obtaining of perspectives from multiple stakeholders. Accordingly, the following participants and stakeholders were covered through the data collection done in this study:

i. Beneficiaries, i.e. people impacted by the project

i. ii. Higher authorities of BCCL, Area GM, Medical Officers

ii. iii. Village level stakeholders (Community Leaders):, Sarpanch, ward members and former Sarpanch

iii. iv. Project In-charge appointed by BCCL (CSR officials) – the monitoring authority involved in the project

### 2.6 Sampling with Location for Data Collection

Table 1 – Showing sampling of Multipurpose Utilization of Mine Water (MUMW) through Household Survey

| Sr No | Village Name | Block | District | Sample Achieved |
|---|---|---|---|---|
| 1 | Darda | Baghmara | Dhanbad | 82 |
| 2 | Sidhwatand | Baghmara | Dhanbad | 65 |
| 3 | Behrakhurd | Baghmara | Dhanbad | 34 |
| 4 | Nisithpur | Baghmara | Dhanbad | 82 |
| 5 | Konati | Baghmara | Dhanbad | 93 |
| | | | **Total** | **356** |

Table 2 – Showing sampling of Mobile Medical Van (MMV) through Household Survey

| Sr No | Village Name | Block | District | Sample Achieved |
|---|---|---|---|---|
| 1 | Karma Tand | Chandrapura | Bokaro | 13 |
| 2 | Patra Kuli | Chandrapura | Bokaro | 8 |
| 3 | Uper Devghara | Baghmara | Dhanbad | 15 |
| 4 | Chhatawad Kailudih | Baghmara | Dhanbad | 10 |

| | | | | |
|---|---|---|---|---|
| 5 | Power House | Dhanbad | Dhanbad | 26 |
| 6 | Madhuban | Baghmara | Dhanbad | 13 |
| 7 | Rathtand | Baghmara | Dhanbad | 10 |
| 8 | Chanchpotri | Agra Khurd | Dhanbad | 12 |
| 9 | Barora | Kulti | Bangal | 25 |
| 10 | Mohlidih | Katras | Dhanbad | 20 |
| 11 | Khanodih | Baghmara | Dhanbad | 6 |
| 12 | Bhim Kanali | Baghmara | Dhanbad | 3 |
| 13 | Bakaspura | Baghmara | Dhanbad | 10 |
| 14 | Bhagabandh | Dhanbad | Dhanbad | 19 |
| 15 | Manjhla Dih | Dhanbad | Dhanbad | 19 |
| 16 | Bhatdih | Jhariya | Dhanbad | 19 |
| 17 | Manpur | Chandan Kyari | Bokaro | 19 |
| 18 | Amlabad | Chandan Kyari | Bokaro | 19 |
| 19 | Sona Nagar | Baghmara | Dhanbad | 14 |
| 20 | Mandal Kedwari | Baghmara | Dhanbad | 9 |
| 21 | Gudri Bera | Baghmara | Dhanbad | 18 |
| 22 | Southari | Dhanbad | Dhanbad | 19 |
| 23 | Betenga bandh | Dhanbad | Dhanbad | 12 |
| 24 | Kari Tand | Dhanbad | Dhanbad | 7 |
| 25 | Basjoda | Dhanbad | Dhanbad | 24 |
| 26 | Lavera Manjhi Tola | Jhariya | Dhanbad | 20 |
| 27 | Ranguni | Baghmara | Dhanbad | 18 |
| 28 | Bangali Kothi | Baliyapur | Dhanbad | 20 |
| 29 | Aamtalbauritola | Baliyapur | Dhanbad | 18 |
| 30 | Nunudih | Jhariya | Dhanbad | 20 |

| | | | | |
|---|---|---|---|---|
| 31 | Idgah Pathar tola | Jhariya | Dhanbad | 20 |
| 32 | Pathaldih(Pandiya Tola) | Jhariya | Dhanbad | 18 |
| | | | **Total** | **503** |

The Data collection for Lebhara and Road construction were through FGD where the research team intend to capture the live narrative of the beneficiaries impacted by the project, therefore in FDG the interviews mostly consisted of Sarpanch, Village members, Women Representative, Senior citizen, Children, youths and BCCL higher authorities

### 2.7 Data Analysis

As previously mentioned, this study employs a mixture of qualitative and quantitative methods. Accordingly, SPSS was used for the quantitative data analysis of the study (such as the analysis of the responses of closed-ended questions in the questionnaires). The responses from the in-depth interviews and the other qualitative data were subjected to coding for detecting patterns. The data from interviews and discussions were analyzed **thematically,** and the data from all the sources was integrated as per the responses to understand, assess and evaluate the entire process of implementation. Being a qualitative study, there was an emphasis on understanding and analyzing the perceptions, views and experiences of the beneficiaries and other key stakeholders with respect to the scholarship project.

### 2.8 Challenges of the study

**1. Language Barrier:** The major hurdle in data collection was the language barriers, few of the villagers were speaking Bengali, and few were oddia.

**2. Limited documentation:** The Limited documentation of CSR project was another hurdle faced by the research team as it had to completely rely on primary data. Most of the employees working on the projects were mostly retrained and even in a few projects, documentation was not available.

# CHAPTER 3 –MOBILE MEDICAL VAN (SWASTHA RATH)

### 3.1 Introduction

Health is an important aspect of human life; it plays a very vital role in our social, economic and other spheres of our life. The better the health, the better the other factors. Mobile Medical Van or Swastha Rath was one of the popular projects that aimed at treating the general illness in the command area population of BCCL. The project was initiated with only 2 Mobile Medical Van in 2009, had now covered more than 203 villages with 14 Mobile Medical Vans. The staffs in the van consist of the doctor, paramedical staff and a driver to provide free consultancy and medicine for general illness.

### 3.2 Objectives of the Project

The objective of the project was to provide medical health facilities with a focus on identification, screening, diagnosis and treatment of general illness by providing free consultancy and medicine.

### 3.3 Locations of project

The project location covers the command area of BCCL. This includes rural, semi-rural and urban areas. Following is the list of villages and town where the Swastha rath facility is being provided.

Table 3 – Showing list of villages covered under Mobile Medical Van services (Swastha Rath)

| SN | Name of Area | Name of Village |
|---|---|---|
| 1 | BARORA | 1. PatraKulh 2. Karmatand 3. Manpur 4. Amlabad |
| 2 | BLOCK-II | 1. Rath Tand Basti 2 Bakaspur Basti 3. Mahato Tola Bhim Canali Basti 4. Khanudih Basti |
| 3 | GOVINDPUR | 1. Chhatawad Kailudih, 2. Uper Devghara |
| 4 | EJ | 1. Lavera Manjhi Tola 2. Idgah Pathar tola |
| 5 | WJ | 1. Moonidih Basti 2. Bhawardaha Basti |
| 6 | WWD | 1. Southari 2. Betenga bandh 3. Kari Tand |
| 7 | KATRAS | 1. Alakdiha 2. Mohlidih |
| 8 | SIJUA | 1. Pandeydih Basti |
| 9 | KUSUNDA | 1. Lahbera Basti 2. Rawani Basti |
| 10 | BASTACOLLA | 1. Sonar Basti. 2. Amtal Basti 3. Bangali Kothi |
| 11 | PB | 1. Surguja Basti 2. Kaligarh Basti |
| 12 | LODNA | 1. Nunudih Basti 2. Bhatdih |
| 13 | CV | 1. Bhatnidih 2. Dispur Basti |

### 3.4 Impact of the project on community

#### i. Door to door accessibility of health service

Due to the lack and poor health services most of the people in the command face difficulties in accessing the health services as services in government CHC, PHC are not up to the mark. The people used to do self-diagnosis and just randomly take medicine from the pharmacist without any proper consent from the doctor and which

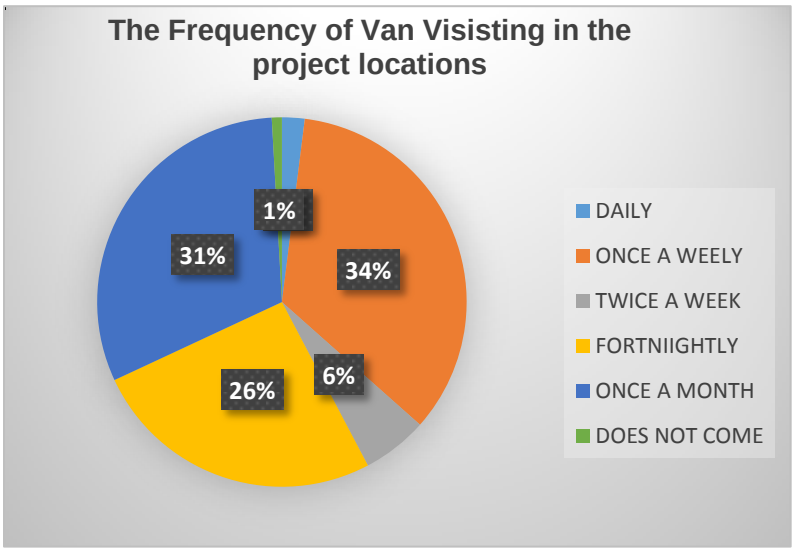


Figure 1 – Frequency of Van Visiting in the project locations

eventually seems to be one of the major cause for the adverse impact on their health. To avoid this and provide basic health care service to the people in the command area of BCCL, Swastha Rath was introduced. The Swastha Rath used to visit at least twice in each village. The respond gathered from the respondent through FGD and HH shows positive impacts of the project on the people in terms of the door to door accessibility of the project.

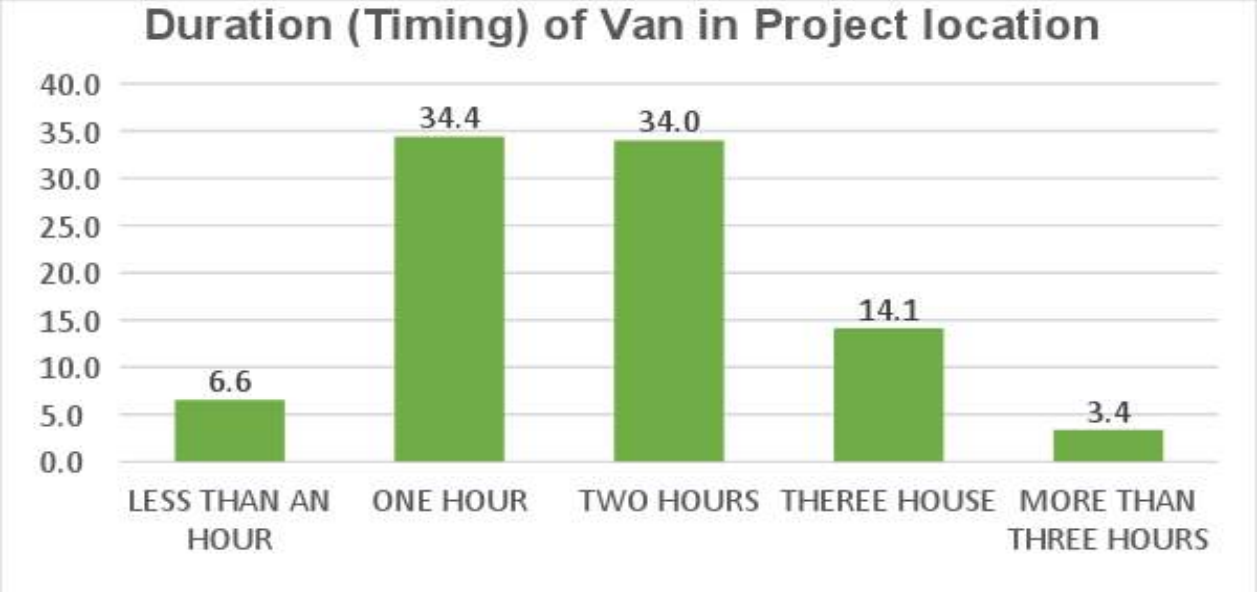


**Figure 2 – Duration (Timing) of Van in project location**

When interviewed, out of 503 respondents, 93.4 per cent responded that the medical van used to halt on fixed locations. Around 54.9 per cent people reported that the Medical Van had fixed timing and date of visits, which was informed by the Mobile Medical Team prior to its arrival. The locations were selected by keeping in mind the centre point of the villages or near the vital resource area of the villages such as Samaj Mandir, panchayat office etc. 70 % of respondent reported that the Swastha Rath used to wait at least 1 to 2 hours in each village making sure that all the people approaching them are checked and medicines were provided.

When interviewed people regarding the satisfaction of the duration of stay of van in their villages, 47.9 per cent people reported that they are satisfied by the duration (Time) of the van in their villages. Whereas, around 44.1 per cent people responded that they are not satisfied by the timing of the van. Similarly, around 92.8 per cent respondent reported that the location of Swastha rath was easily accessible by them as well as by their family members.

ii. **Filling the gap in health service**

Health is a primary and essential need of human being. It plays an important role in human life. The government hospital lacks in quality health care, infrastructure and accessibility because of which people mostly avoid going to the government-run hospital. To avoid this and provide basic health services, BCCL started Swastha Rath which aims in providing basic health service at the doorstep. Also, the service has enabled people to get access to basic health services at free of cost. Thus the service was a boon to the villagers.

**Availability of health services**

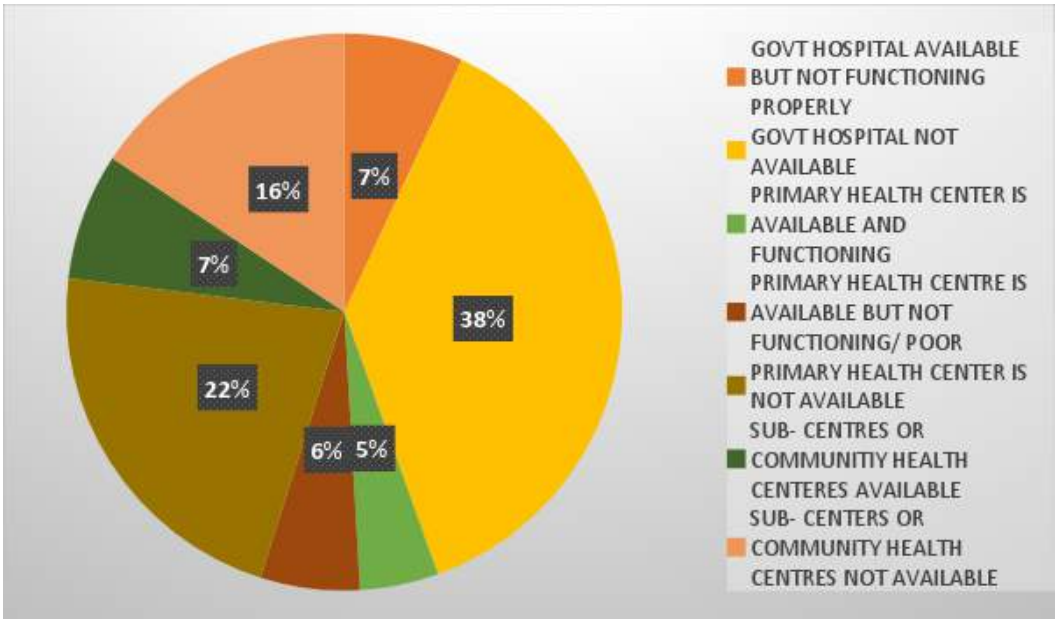


Figure 3 – Availability of health services

The above figure was derived by interviewing 505 households, out of which 38 per cent beneficiaries reported that government hospitals are not available, 22 per cent reported non-availability of primary health center and 16 per cent reported government hospital available but not functioning. Around 90 per cent respondent responded saying the nearest government heath care center is around 6 to 8 km away from their villages. Besides that, one of the major hurdles in reaching the health centre is the non-availability of adequate road infrastructure.

Around 95 per cent of people reported that the roads leading to the PHCs, CHC and Government hospital are mainly kaccha and thus is inaccessible. Therefore by understanding and analyzing the needs of the people regarding health services, BCCL felt the need of starting the Mobile

Medical Van called *Swastha Rathi* that would aim at providing primary health care service to these needy and disadvantaged group on their door step at free of cost.

### iii. Awareness about health and hygiene :

Awareness generation was one of the core aspects of Swastha Rath. The MMV team used to provide information regarding healthy surrounding, general cleanness, tuberculosis, maternal and child health care, hygienic water consumption and hygienic sanitation. Many respondent also reported that the team used to practice healthy habits so that people can easily understand. Besides that around 95 per cent people knew that the swastha rath was run by BCCL. And in that around 29 per cent people reported that they came to know about this by seeing the BCCL name on the van.

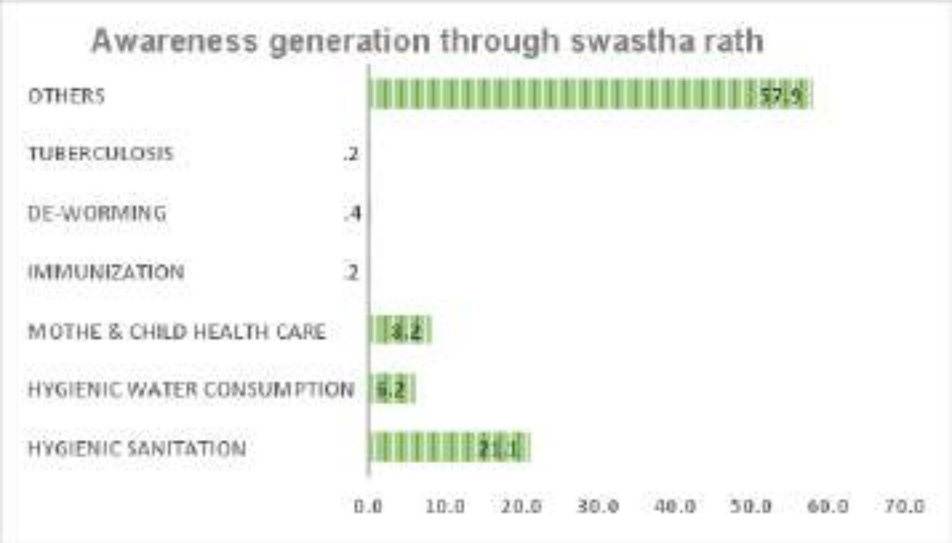


Figure 4 – Awareness generation through swastha Rath

### iv. Reduce Economic Burden

Most common disease reported in the region is fever, cough, cold, anaemia, diarrhoea, and skin infection. Since there is no availability of medical services in the entire region, the villagers have to suffer a lot. The average income of the household were not good as the villagers are mainly engaged in agricultural work or work as a labourer. So, their

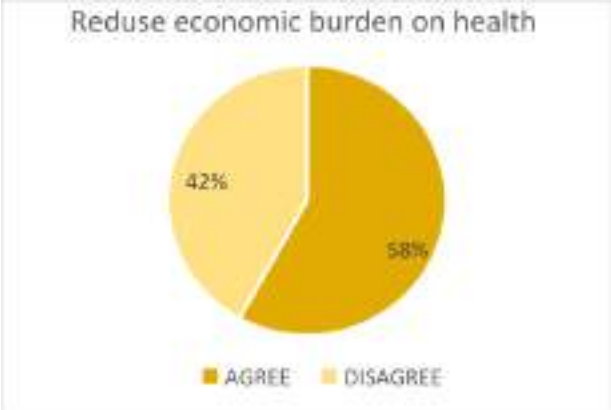


Figure 5 – Reduction in economic burden on health

earning is not sufficient and somehow people manage to survive and fulfil their basic needs. And if someone from family falls ill, then it's a significant economic burden on them to buy medicines because they have to go private hospitals or privately run clinics to purchase medicines even for normal fever or a cough and cold. Therefore, they are thankful to Swastha Rath for providing them medicines and eventually reducing their economic burden.

### v. Addressing the health needs of people

Health care services in the entire region are dismal in terms of accessibility, infrastructure and quality. There are only a few Sub Health Centres in the entire area which is functional, but due to lack of such basic medical facilities, people were forced to travel at least 5 to 10 km to avail such medical facilities. Besides that, the transportation system is also very expensive and so accessing the existing health care facilities, which is at a quite long distance, becomes a crucial issue for the villagers. So, Swastha Rath was great hope for them as they are getting services at their doorstep without paying a single penny; in fact, it's saving their money and time as they are getting free services and medicines and also saving their travelling time and transportation cost.

**Major ailments in the families**

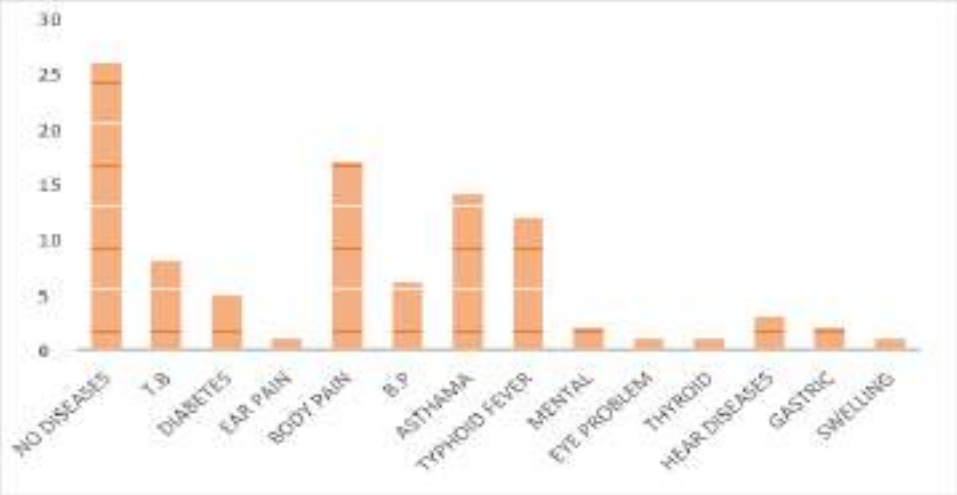


Figure 6 – Major ailments in the families

The major ailments that were reported by the respondent were Body pain, Asthma and Typhoid. When asked further, the respondents replied saying that the working environment and the pollution caused by the open cast mining illness such as respiratory tract infections have had an adverse impact on their health.

### vi. Reduction in sickness

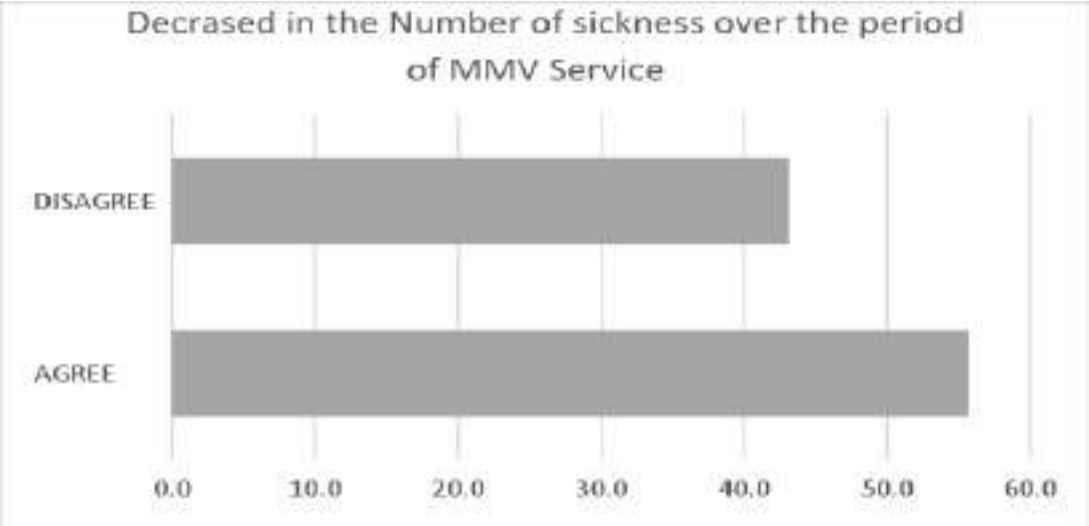


Figure 7 – Decrease in number of sicknesses over the period of MMV service

The above graph shows that 56% of the beneficiaries agreed about the fact that there was decrease in occurrence of sickness over the period of MMV services. While 44% beneficiaries disagreed about this fact.

## 3.5 Gap identified in the project

### a. Limited Regularity of Swastha Rath

Even though the intention of the project was noble, but the regularity was the big hurdle in proper implementation of the project. The Swastha Rath had the target to visit the villages at least twice a month, but during the study it was identified that a few of the places were kept untouched by the project and these areas were mostly near to the colliery areas. As mentioned above around 34 per cent people reported that the Swastha Rath visits once in a week and 31 per cent people reported that it used to report once in a month. The reason for the same reported by medical team of BCCL was availability of limited number of vans. Each BCCL area had only 1 to 2 Swastha Rath. It becomes difficult for the doctors and also to the staffs to reach all the

villages, as each area only gets a van for only 15 days and thus this also limits their accessibility in terms of reaching all the villages.

### b. Limited Awareness campaign

In spite of having awareness campaign as the core idea of swastha rath around 93 per cent of people reported that no such awareness campaign has been done by the Swastha Rath. Whereas only 7 per cent of people reported that awareness campaign has been conducted by the Swastha Rath

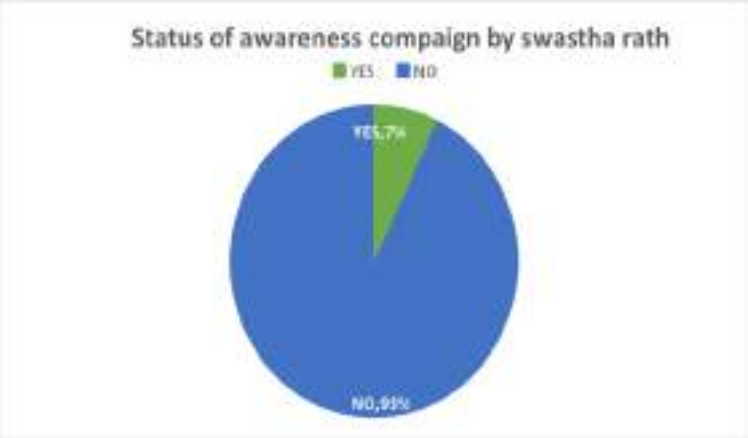


Figure 8 – Status of awareness campaign by Swastha Rath

### c. Limited Health Services

The Basic/Primary health services is very limited that is only free health checkup and medicine supply. In some villages, it was also found that the doctor used to visit sometimes and only the pharmacist and the driver use to go and distribute the medicine without any proper diagnosis process being followed. In addition to that blood pressure check and weight checkup were not conducted. At the village level, there was no appointed person who could look after the health services in absences of Swastha Rath. Around 99 per cent people raised the concerns stating that there is scope for improvement and enhancement of the Swastha Rath. 3.6

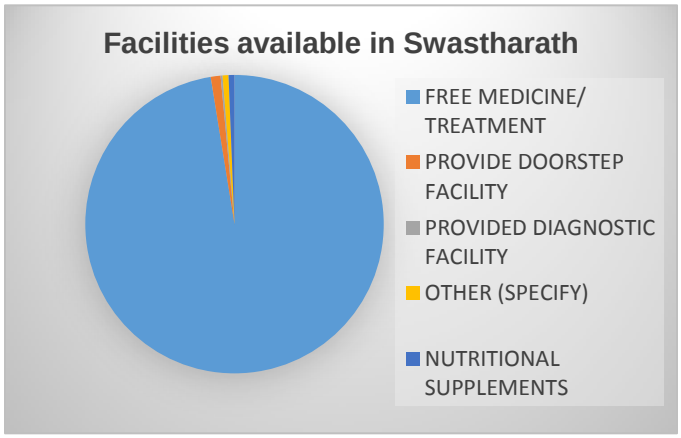


Figure 9 – Facilities available in Swastha Rath

**Multi-stakeholder Perspective on Swastha Rath**

a. **BCCL Officials:** BCCL being a responsible corporate in Dhanbad region had always been active in providing basic health services to the people of the company's command area since a long time. Therefore BCCL started Swastha Rath with the intention of providing basic health care service in the remote areas for those who are unable to access them or afford them. Besides that, the company aims at creating general awareness about health and hygiene. The Project was run in 206 villages and has targeted more than 2 lakhs people.

b. **Village People:** The Swastha Rath was very useful. It has helped the villagers in many ways. The accessibility of health care has increased as medicines and treatments are being provided free of cost at their doorstep. The economic burden has been reduced. Now people neither travel nor go to the private hospitals and clinics. At the same time, the cost of the travelling is also being saved. Along with this various awareness campaign are conducted wherein the people are being provided with the informations regarding health and hygiene.

### 3.6 Beneficiaries' point of view on Swastha Rath

*3.6.1 Vinay Bhal, 49 year old: a resident of fulwar basti is a laborer in coal mine says "Since the time Swastha Rath had started coming we are very happy because we are staying here for a very long time and health is the major problem that we are facing. The nearest Sub-centre is around 8 km away and that too is not in good condition. It was difficult for us to travel so long, with no other option left, we used to go to local pharmacy and tell them our sickness, and accordingly they use to give us the medicine, and we use to have it. Swastha Rath comes in the village twice a month and provides us medicines free of cost. They treat us all. The doctor behaviour is good. He checks us and also make us aware of the health and hygienic conditions in we should dwell. Since Swastha Rath started coming to our village, our money is being saved and also the medicines are effective".*

*3.6.2 Meena Rahman 25 year old, resident of Amlabad village says: "Coming from a poor background we are unable to afford to go to private clinics or hospitals. The nearest government Sub-centre is around 7 km away. From where do we bring the money? We work as a wage earner. There is no guarantee of the job. We would get tomorrow or not, we don't know. Thanks to BCCL Swastha Rath! Since the time it has started coming to the village, the economic burden of health has been reduced. We get free treatment and medicines. The van comes twice a month and check all of us. Now we don't get worried so much as the van comes and check us and treat us for free."*

### 3.7 Recommendation of the project

1. **Frequency of the Swasth Rath Should be Increased**

One of the most important demands that came from the public was that the frequency of the Rath should be increased. As it was supposed to visit the targeted villages twice a month, but as mentioned previously that the Rath was unable to visit a few villages. Similarly in many villages, the Rath only visited once in two to three months. Therefore the frequency of the Rath should be increased and should be available in the areas/ villages where it is needed the most and also the availability should be increased.

**Frequency of Swastha Rath in Village**

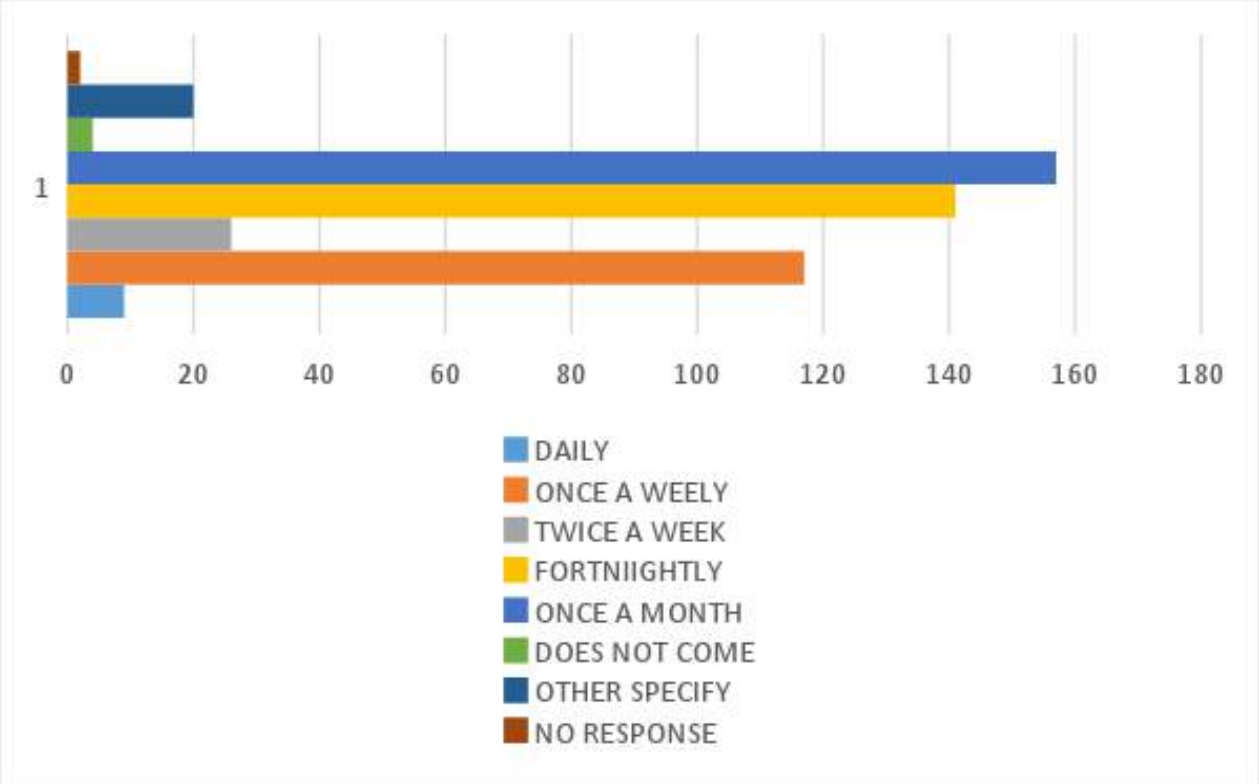


Figure 10 – Frequency of Swastha Rath

The above graph highlights that the frequency of Swastha Rath in the targeted village. Around 157 people responded that the Swastha Rath came once in a month, whereas 141 respondents reported that the Swastha Rath used to come once in fortnight. Again, around 117 people reported that every once a week the Swastha Rath used to come.

**2. Need for female doctor and nurse**

It was highlighted by the statistical data that out of 500 samples 99.8 per cent reported that there is a need for female doctors and nurses in the Swastha Rath as the women feel uncomfortable to open up their sicknesses in front of male doctors.

**3. Need of a health worker at the village level**

It is recommended that there should be a health worker appointed at the village level that would look after the health services and status of the village and subsequently could report to the nearest BCCL regional or area hospital. At the same time, medical stock should be provided to this appointed health worker, who in times of emergency could provide necessary medicines as per the need of the villagers.

**ii. 4. Necessary Provision for Emergency**

Around 98.5 per cent of people responded the need of emergency services in Swastha Rath, and this could be done by printing the emergency helpline number on the van so that during the emergency the people can avail the services.

**iii. 5. Need of Additional Services**

Additional services such as blood pressure check, BMI, Weight test and malnutrition test should be conducted and if significant issues found in the test results, then further treatment should also be provided to the beneficiaries by referring them to the nearby BCCL area hospitals.

# CHAPTER 4 – MULTIPURPOSE UTILIZATION OF MINE WATER

## 4.1 Background of the project

Since its inception, BCCL has felt the importance of water and endeavoured for effective and gainful utilisation of mine water from abandoned mines which has to be taken out of course of mining process necessarily. For harnessing such water, BCCL has taken upon the task of holding the mine water into the water bodies by restricting them to flow into the natural drainage course like village reservoirs which gets dried during summers, by laying out a pipeline network of approximately 45 km.

With the help of this scheme, approximately 47 million gallon surplus mine water is presently being discharged into natural water courses from the mines of Barora, Block-II & Govindpur areas of BCCL. This water is being stored in two reservoirs situated in Khonathi and Behrakudar villages with storage capacities 16 million gallon & 31 million gallon and with area of about 4.0 ha & 4.5 ha respectively.

Under this scheme of BCCL, the farmers residing nearby and having their cultivation fields in reasonable proximity will benefit in carrying out their agricultural works, in all seasons, which at present is totally dependent on rainwater in monsoon.

This provision will certainly enhance the Socio-Economic status of the area and will also result in more opportunities in secondary & tertiary fields of employment. This water could also be used for drinking purposes after required treatment. In these reservoirs, Pisciculture could also be adopted with the help of self-help groups for their livelihood.

### 4.2 Objective of the project

To harness mine water for its gainful multipurpose utilisation in the peripheral villages of BCCL command area.

### 4.3 Location of Implementation

Two reservoirs situated in Khonathi and Behrakudar villages of Baghmara block of Dhanbad district.

### 4.4 Study sample details

Out of the 352 samples collected by the research team in the villages near the two ponds in Baghmara block, 72 per cent respondents belong to the OBC category while SC makes up 10.5 per cent of the sample studied. Again, 8.2 per cent are Scheduled Tribe and 7.4 per cent belong to the General category. Apart from these categories, a few samples from Nomadic Tribe and Denotified Tribe (around 0.9% each) were also taken into consideration for the study.

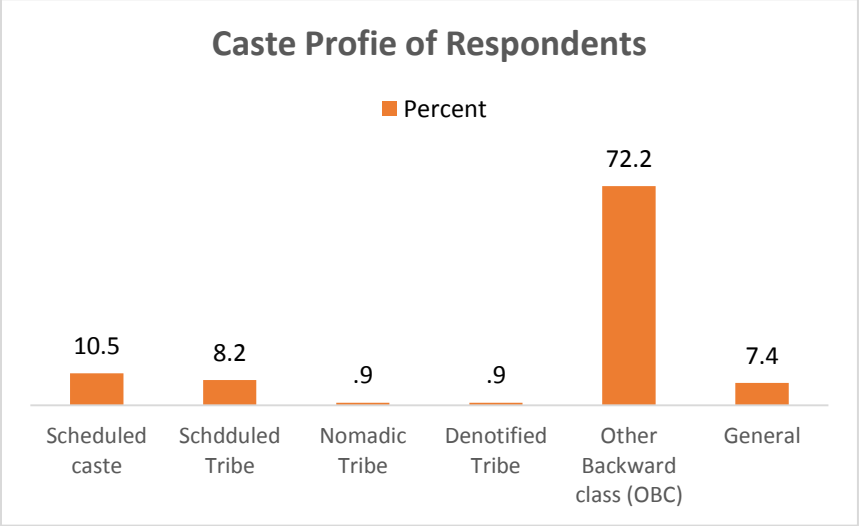


Figure 11 – Caste profile of respondents

42.3 per cent respondents reside in 'pucca' houses while 34.1 per cent resides in semi-pucca houses. 15.3 per cent respondents owned kutcha houses, and 8.2 per cent of the respondents reside in huts. Focused Group Discussions revealed that houses in the villages were not accurate depictions of income and wealth of respondents as the most of the houses were inherited which housed two to three families dwelling together, i.e. 10-15 people in a two bedroom house. Therefore, the respondents staying in houses made of brick and mortar do not necessarily have high-income sources. Electrification of the villages has been a success as 92.9 per cent of the respondents' houses were electrified although the electricity is supplied for 3-4 hours daily. Open defecation is an overarching phenomenon in the villages with 51.7 per cent of respondents opt for this option while 41.5 per cent use their pit toilets.

Private sources of water are scarce as 45.2 per cent of respondents rely on community hand-pump for their potable water needs. While the quality of water could not be ascertained, 38.6 per cent respondents boil the water as a method of water purification, 16.5 per cent respondents sieve the water, and 6.3 per cent do not do anything for water purification.

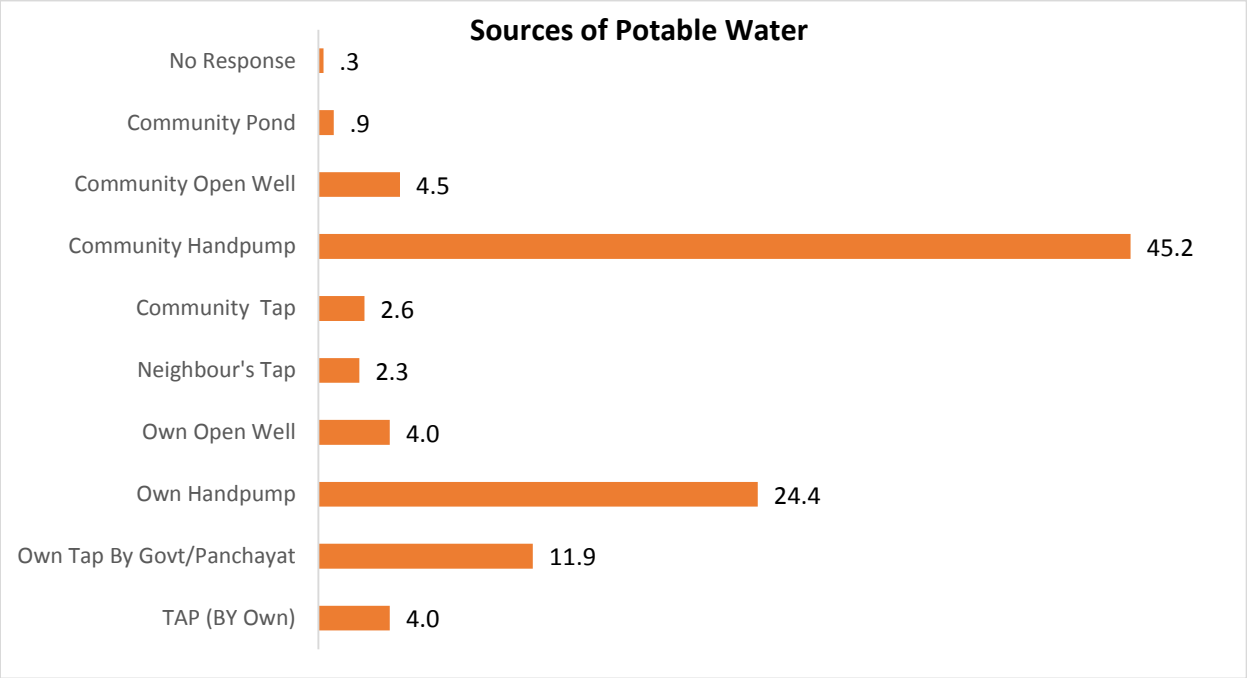


Figure 12 – Sources of potable water

## 4.5 Impact on the community

### i. Use of Mine water supply for filling ponds

The respondents are compelled to use whatever water is available to them for their daily needs. To wash clothes, 49.4 per cent respondents use the mine water ponds while only 0.3 per cent respondents use the ponds for agricultural activities.

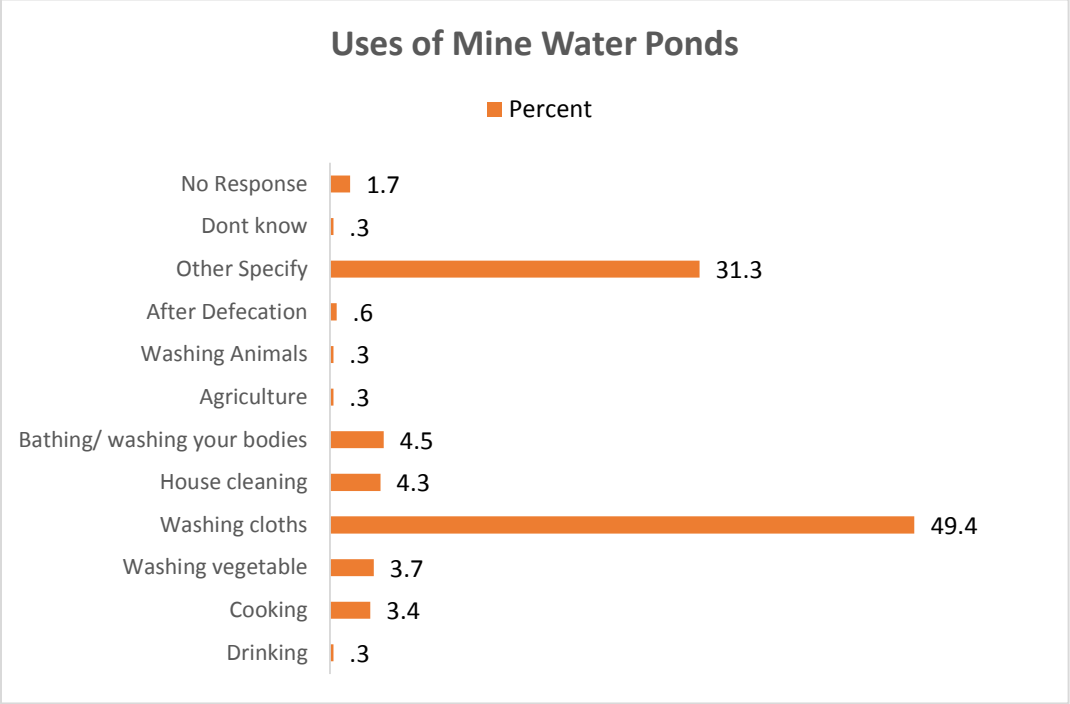


Figure 13 – Uses of mine water ponds

### ii. Land holdings and irrigation sources

64.5 per cent respondents claimed they owned agricultural land while 35.5 per cent were found landless. According to the landed respondents, 35.5 per cent of them use the mine water pond for irrigation while 4 per cent have no sources of irrigation. Borewells near the farmland are another source of irrigation which is depicted in the 'other' category in figure no 14. The major crops grown by the respondents are paddy (65.3 per cent), vegetables (21 per cent) and maize (11.3 per cent).

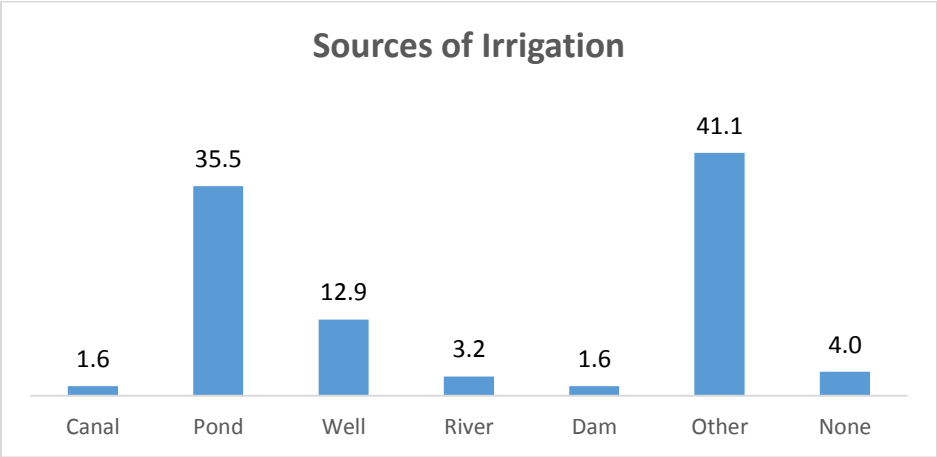


Figure 14 – Sources of irrigation

### iii. Renovation activities of the ponds:

For the impact assessment study, it is primarily important to gauge the opinions and perceptions of the beneficiaries about the mine water ponds. BCCL has been operational in the Baghmara block for several years and has created a rapport with the residents of the villages. Therefore 59.1 per cent respondents knew that the mine water was drained into ponds. The respondents were enquired about the activities done by BCCL for the pond. 54.3 per cent of them knew that embankment or stone pitching was done around the bank, while 17 per cent knew that the *ghats*/stairs were constructed. 16.8 per cent respondents did not knew any of these activities, mainly due to the farther distance from the pond or not being present at the time, etc.

Table 4 – Beneficiaries awareness about activities done by BCCL for the pond

| Activity | Percentage of respondent responses |
|---|---|
| **Embankment or stone pitching around the bank** | 54.3 |
| **Inlet and Outlets** | 2.6 |
| **Ghats/Stairs** | 17.0 |
| **Repair** | 8.5 |
| **Don't know any of the above** | 16.2 |
| **Don't know** | .6 |
| **No Response** | .9 |
| **Total** | 100.0 |

Approximately 70 per cent of beneficiaries came to know about the renovation of the pond by physically observing the activities while 9.1 per cent came to know through the display boards put up by BCCL. Only 2.3 per cent were informed in the *gram sabha*.

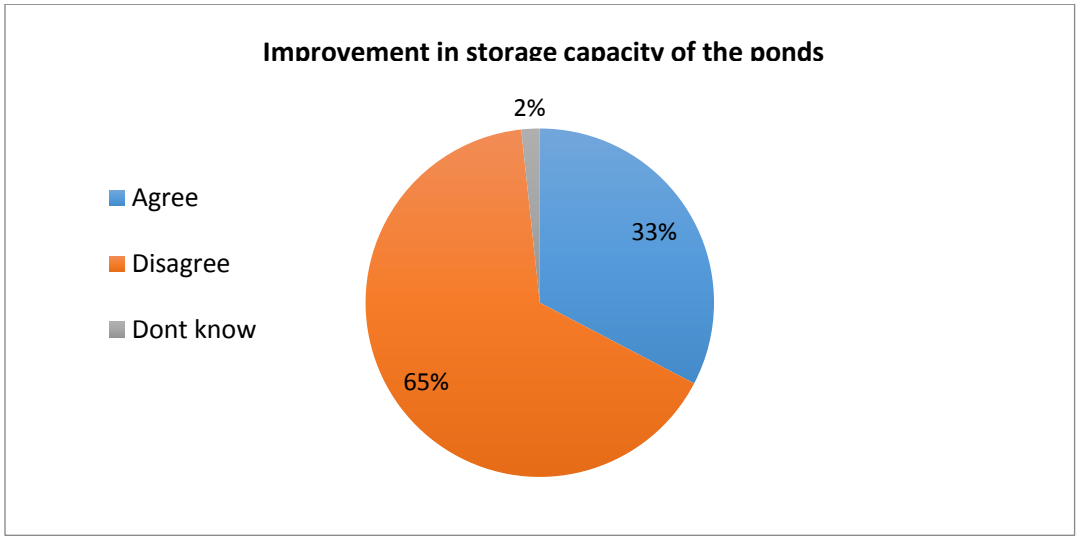


**Figure 15 – Improvement in storage capacity of the ponds**

It is of great importance that the beneficiaries are being involved in the planning process of a project so that their needs and problems are accounted during the intervention.

During FGDs it was found that heavy machinery such as excavators, loaders and trucks were used to finish the work in less than ten days as manual labour would have extended the time of completion of work to 30-35 days. It was also mentioned that the work in one of the ponds was proposed to be carried out in monsoon. But due to monsoon, the pond was full of water and therefore many areas in the pond was left unexcavated.

## 4.6 Gaps Identified

### i. Minimal improvement in storage capacity

During the discussions, it was discovered that the ponds lie in the natural catchment area of rainwater, therefore, the water in the ponds did not dried up during the summer season before the renovation.

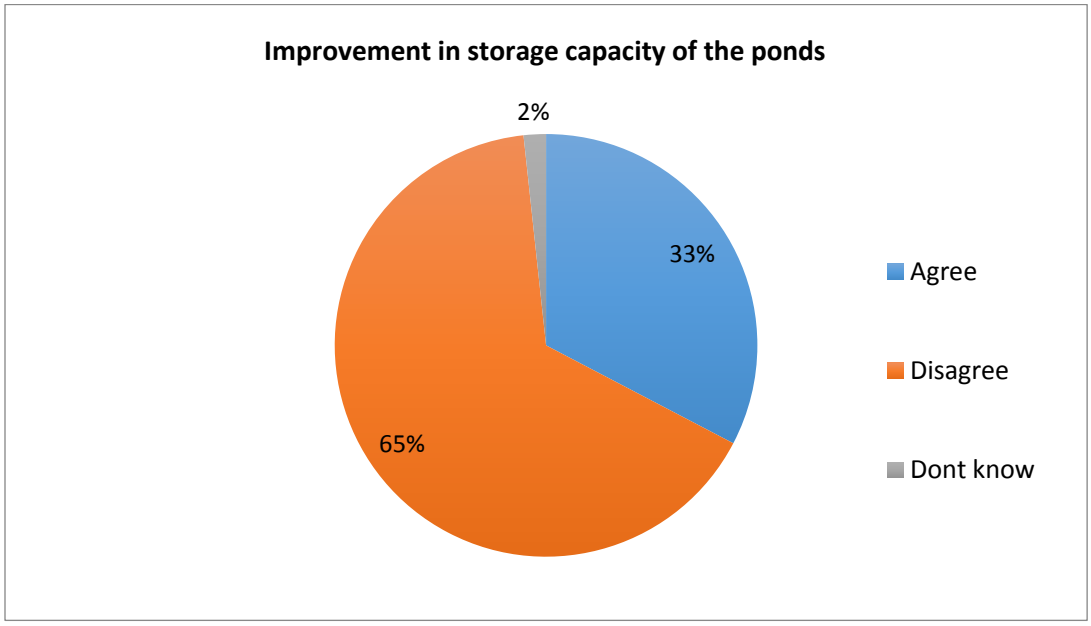


Figure 16 - Improvement in storage capacity of the ponds

Even though the ponds do not dry up, the water is scarce and the population depending on it for routine activities is increasing every year. Respondents also shared that they have to skip bathing for many days so as to preserve water for cooking and drinking. Therefore, 65.6 per cent of the respondents disagreed when asked about the improvement in storage capacity after the renovation of ponds. Also, as evident in Figure 17, 69.3 per cent respondents states that the scarcity of water has not reduced.

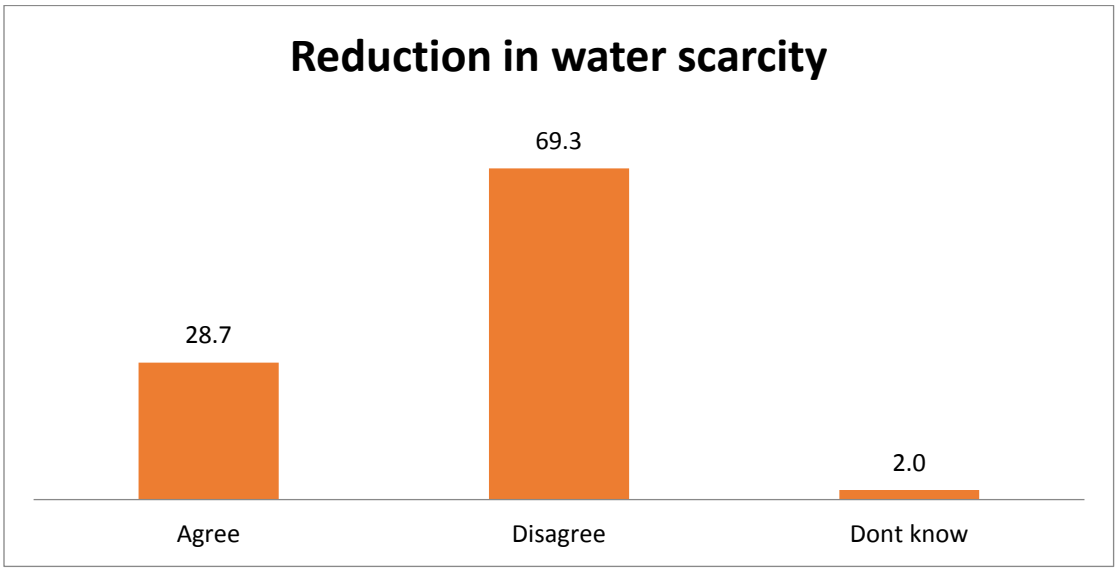


Figure 17 – Reduction in water scarcity

### ii. Lack of employment generation activities

Employment generation would have been an important gainful use from the ponds as duckery and fishery activities were proposed in the project. But 92.3 per cent respondents feel that no new job opportunities have been created with the renovation of the ponds.

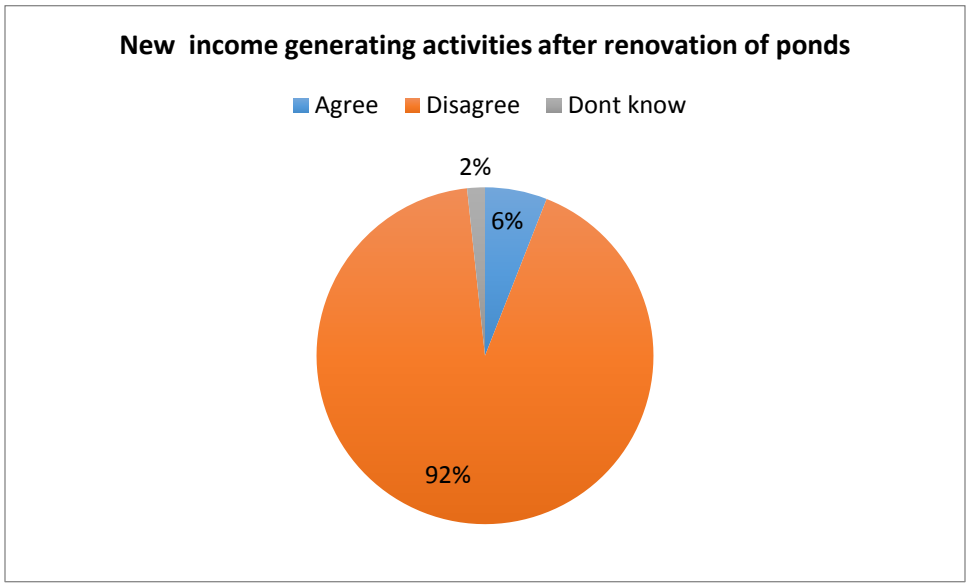


Figure 18 - New income generating activities after renovation of ponds

The respondents also stated their concern to the research team that these gainful activities are being carried out by contractors for their profits, and therefore, the villagers are unofficially banned from carrying out these activities.

### iii. Minimal increase in agricultural production

Further, 86.6 per cent respondents believe that the pond has not aided in critical irrigation requirements as there are farmlands of hardly four to five farmers near the pond. Most of th e farmlands are significantly at greater distances. In such cases, the cost of machinery to lift the water to these far away farms is high that residents avoid taking water for irrigation from these ponds. Therefore, the number of crops grown per year by most of the respondents has also remained unchanged after the renovation of ponds.

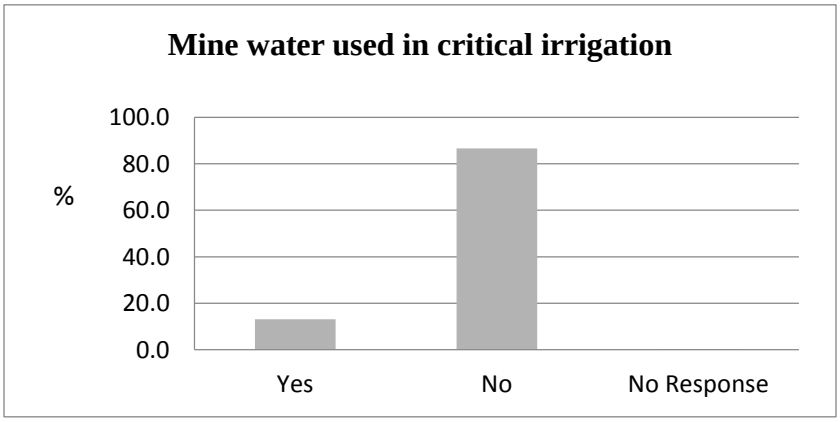


Figure 19 – Mine water used in critical irrigation

As per 90.3 respondents, agricultural production does not happen beyond personal consumption. As a result, the small and marginal farmers go to cities in search of work at least 15 days a month in order to feed their families.

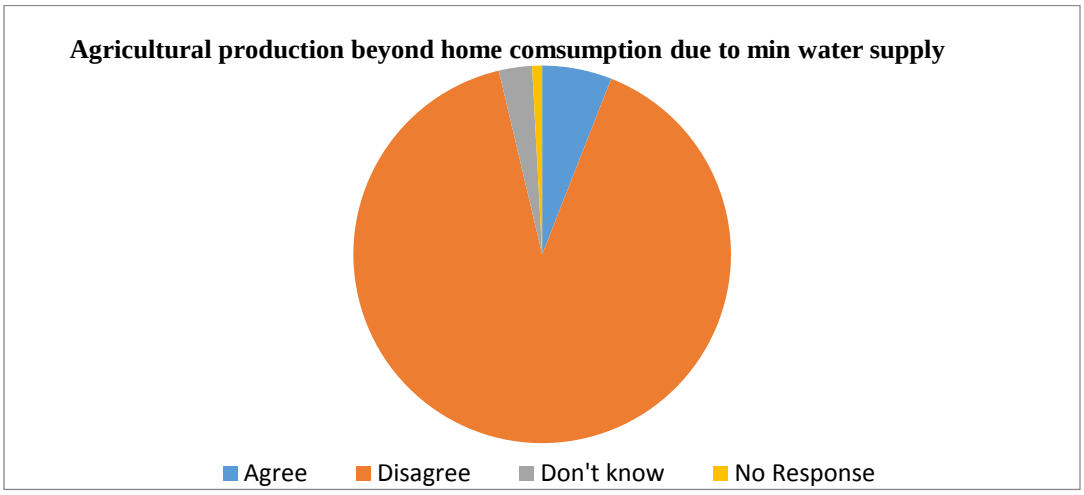


Figure 20 - Agricultural production beyond home consumption due to min water supply

Therefore, when asked if there has been a cumulative increase in the income of the household post- renovation of ponds, 94.9 per cent of the respondents replied negatively.

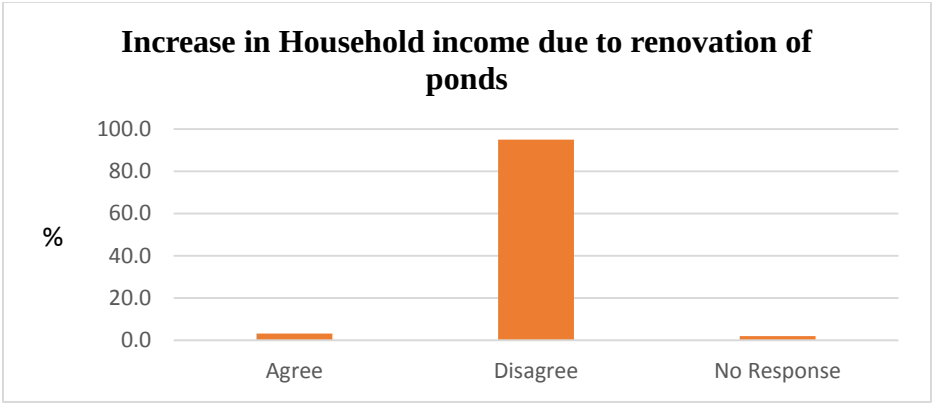


Figure 21 - Increase in Household income due to renovation of ponds

### iv. Irregular supply of mine water

Another motive of conducting the impact assessment of this project was to find out from the beneficiaries whether there is any need of improvement in the projects and in which areas. In FGDs, respondents overwhelming suggested that there is an urgent need for improvement in the project in terms of mine water supply. Officially, 70 per cent respondents did not know how often the mine water is being supplied, but 83.2 per cent respondents agreed that there should be a timely supply of mine water.

### v. Lack of participatory planning

94.3 per cent respondents claim that no village meeting was conducted before the supply of mine water in the ponds. This highlights the lack of participatory nature of the activity. It can further be showcased when the respondents were asked regarding their participation through *shramdaan* (voluntary labour) and 84.9 per cent responded negatively. Apart from these concerns, 51.1 per cent of the respondents did not know who carries out repair and maintenance of ponds, while 8.8 per cent claimed that BCCL is responsible for the same.

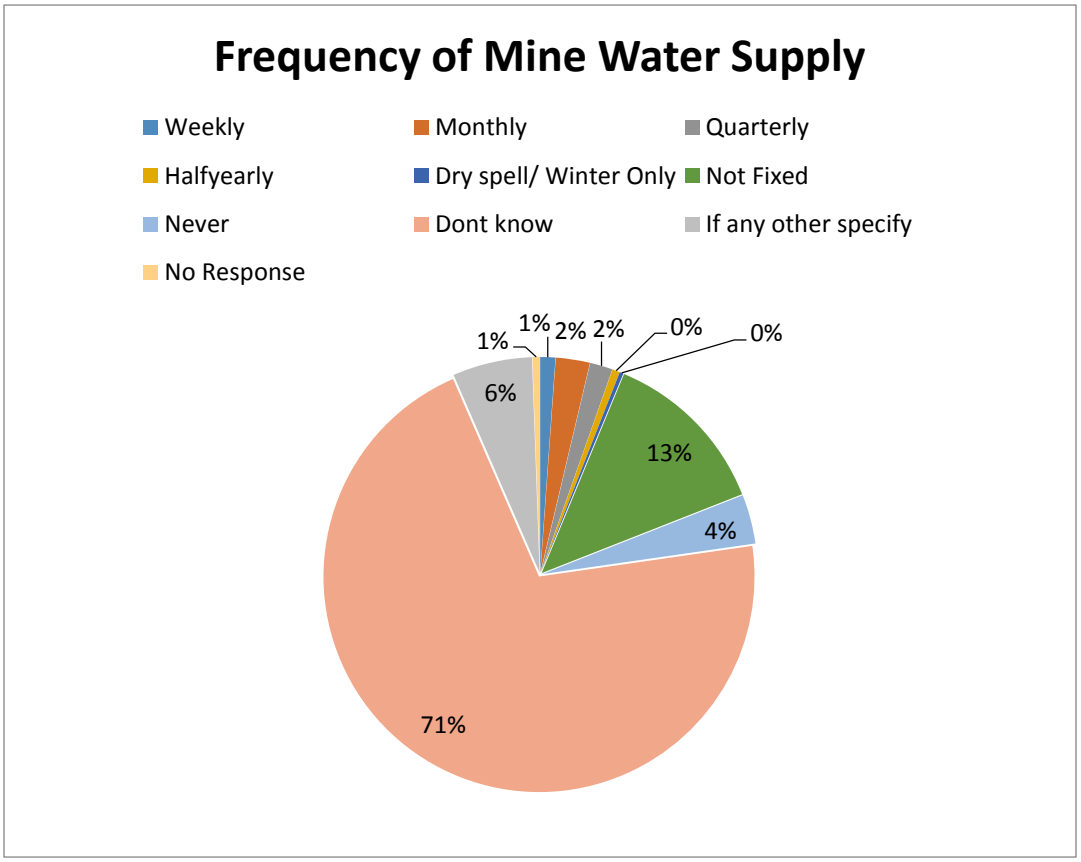


Figure 22 – Frequency of mine water supply

The respondents stated that since the renovation of the pond had taken place, only two or three times the mine water had been supplied. And eventually it was not sufficient for consumption by all the beneficiaries of the ponds.

Table 5 – Beneficiaries response on last supply of mine water.

| Last supply of mine water | Percentage |
|---|---|
| Last three months | .6 |
| Last six months | 1.7 |
| Last one year | 9.1 |
| More than a Year | 47.2 |
| Don't know | 40.1 |
| No Response | 1.4 |
| Total | 100.0 |

It is of utmost importance to note that 94.3 per cent of the respondents want BCCL to resume supplying mine water to the ponds as they believe that even though there may be no short-term benefits of the project, long-term benefits will help the future generations in leading a better quality of life.

### 4.7 Recommendations

Due to various reasons, mine water supply to both the ponds has been halted for the past one year. According to the beneficiaries, they have not been able to reap any benefits from the projects. In the project proposal, 25000+ beneficiaries were identified who would be able to avail the benefits of the mine water supply project. However, it was found that only around 1000 families were able to use the ponds. Also, the project proposal had stated further highlighting that the beneficiaries would see a marked improvement in the household income after the pond renovation as they will be able to carry out multiple income generating activities. But as of now, the beneficiaries uses the ponds for only household consumption which was the case prior to the pond renovation as well. Overall, they insist that the mine water project was a fruitful venture but the supply of mine water is insufficient to bring about a change in their income or general quality of life.

**Following are the main recommendations for the improvement of the Mine Water supply project:**

- Participatory approach: Participatory project development is necessary to gauge the perception and needs of the beneficiarie,s and hence the project needs to be modelled around that.
- Pond upkeep: Repairs and maintenance of the ponds need to be carried out regularly with an immediate attention to Khonati pond as one of the pipes laid near this pond has been damaged.
- Sharing of information: For proper dissemination of the information regarding project cost, project details and maps, boards need to be put up at various locations so that damage to the pipelines could be avoided.
- Focus on employment generation: A plan needs to be developed to ensure effective utilisation of the mine water supplied to the ponds which would subsequently lead to augmentation of household incomes of the beneficiaries.
- BCCL should conduct a cost-benefit analysis as well as Social Return on Investments (SROI) analysis in such large-scale projects.

# CHAPTER 5 - VILLAGE ADOPTION PROJECT (LAHBERA)

### 5.1 Introduction

Lahbera, a village situated in Jharia block of Dhanbad district, Jharkhand is one of the centers attraction of BCCL CSR activities. The village mainly consists of the tribal population of 392 people with 63 households. The charm of this project lies in many facts, one of which is the integrated module of development experimented by the BCCL. The BCCL adopted the village in the year 2009 with an intention of integrated development of tribal for their economic and social development through various schemes and program run by them. As the part of the CSR activities, various infrastructural and economic projects were set up that could help the villagers in their economic development.

### 5.2 Objectives of the Study

The main objectives of the project is to develop the selected village in an integrated manner ensuring its holistic and integrated development through capacity building and participation of local people and institutions, and this is done through establishing and creating various infrastructures such as:

a. *Construction of Primary School*
b. *Masala Chakki,*
c. *Health Centre*
d. *Sewing Training Centre*
e. *Multipurpose Hall*
f. *Adult Education Centre*
g. *Pipeline for water supplies*
h. *PCC Road and Drainage lines*
i. *Solar lights*
j. *Playground*

*5.3* **Projects and their Impacts**

**I. Multipurpose Hall**

The hall as its name suggest was used for multiple reasons. It was constructed in the year 2009. It is located in the premises of playground and having the area of approx 800 – 1000 sq ft. The amount invested in this infrastructure was Rs.650851/-. The hall is used for various programs such as conducting health camps, adult education centre, village meetings, social gatherings, marriages, family functions and various other programs. The hall was equipped with tube lights, fans and toilet facilities that have impressed the people, utilizing it for various purposes.

**Beneficiaries' viewpoint**

*Meera Marandi, a residence of labhera village says: 'this hall has helped us a lot, especially during our adult education centre; we use to come here daily at 4 pm and study till 6 pm. Not only this, we also used hall for various occasions such as marriages, meetings and other family functions. She also added further admitting that her brother marriage was also fixed here. When we were small, our family used to have functions in our aangana. But after the hall was constructed we are utilizing it for many purposes, and it does not cost us anything as it is free for us. When asked for maintenance, Meera said that usually BCCL looks into it. But she feels it's also her's responsibility to take care of the hall as it is very beneficial for them.*

## II. Adult Education Centre

The Center started in the year 2009 and was run by the two mentors which were appointed to teach by the BCCL. The aim of the Centre was to provide basic and primary education skill sets to those who were unable to get benefit from the regular education system but were dedicated to learn. The classes were held in the hall where 150 students including young girls and married women were taught in one batch, from 4 pm to 6 pm, for five days a week. The course design was from simple to complex or from known to unknown. The classes include subjects that were related to the daily life of people such as basic mathematics and hindi. Besides that, subject such as English was also encouraged. The session on gender sensitization and human biology were also being taught. Teaching and writing skills to the women was one of the important aspects of the AEC. Girls and women used to like the classes and the mentor's way of teaching.

**Beneficiaries' viewpoint**

*Rani, a construal laborer in a mine and also the residences of lahbera village says: 'from the time the classes had started, I used to come here for studying. Coming from a poor family, I was unable to get school education as I had to assist my parents in coal mines. I wanted to study, but my family condition didn't allow me. Then through BCCL, we got this education centre, where the master used to teach us - how to speak, read and write. In the beginning, I was very shy but then the master always used to motivate me and call me in front and asked me to talk about myself. I used to be very shy and reluctant. But gradually I started speaking and slowly writing and reading too. Now, I also understand basic maths that helps me to calculate the numbers of days my friends and I work and the salary we deserve for it.Earlier we used to be paid less. Because of these classes, I feel empowered and confident now. I can directly speak to my malik*

*(Boss) and other people.' Rani now feels she is empowered and also has the courage. She also motivates other girls like her to come and join the classes. But it is unfortunate that the classes are not running now as the salary of a few of the mentors has not been paid yet by the BCCL. Hence, the mentors have stopped coming to teach.*

### III. Health Centre

The Health Centre was also established in the year 2009 and was operation till 2015. The aim of this project was to provide primary health care services to the people of lahbera village. The total cost of construction of health centre was Rs.373096/-. The Health Centre was used to run with the help of the Kusuda Area Medical team. The team consisting of doctors and nurses used to visit the hospital on a regular basis. The health team used to provide services such as consultations and medicine free of cost to all the villagers. Besides that, services such as blood pressure checking and weight measurement were also been provided. In addition to these services, awareness generation on health and hygiene was also provided periodically. The timing of the hospital was mostly 11 am to 2 pm. In case of emergency, the case was transferred to

Kusuma area hospital for further treatment. Health camps were also organized in the village whereby services such as eye checkup and other primary health care treatment were provided. When the research team asked the people about the medical services, a common replay come from all of them was that, 'the health centre must start again'. The impact of this health services was not only limited to the lahbera village, but it was also beneficial for the people from the nearby villages. From the response that the team got from the people states that medicines were mostly provided on general and seasonal illness. And for terminal sickness, the patients were recommended to visit the regional hospitals or the central hospital in Dhanbad.

**Beneficiaries' viewpoint**

*Ravi Mhatto, a residence of lahbera says: 'the health centre was very helpful for us. In the older days we have walk a few kilometres to get access to the health services. Most of the people use to just go to the medical shop and ask for the medicines, and the shopkeeper just used to give them medicines without any knowledge about the sickness. But, when the health centre started, people started coming here. They used to get free treatment and medicines. The doctor's behaviour was also good and kind. But from past few years, the health centre is closed. Since then, it's the same condition as before.' He added: 'we are adopted village and health is the most basic things that we need. We request BCCL that they should start the health centre once again'.*

## IV. Masala Chakki

Masala Chakki was one of the economic empowerment projects of BCCL. BCCL had provided the Masala Chakki to the villages. The total cost spend on the masala chakki project was Rs.394918/-, and it was run by the group formed by the villagers itself, consisting both male and female members of villages. The aim of Masala Chakki project was to provide self-employment and develop entrepreneurship at the village level. The Masala Chakki was operational only for a few weeks after which the group stopped it. The reasons highlighted for the same was that there was no market linkages, no proper monitoring and no guidance to run the Chakki and even no proper financial management. Hence, it was nonfunctional project as said by the people.

## V. Sewing Training Centre

The Sewing Training Centre was another economic empowerment activity of BCCL which intended to provide sewing skills sets to young girls and women through practical teaching. The course was started in the year 2009. The investment made by the BCCL CSR was Rs.378459/-.

The centre was run in collaboration with BCCL CSR and Nari Shakti Samiti, a branch of women development of BCCL. The training was provided to girls and women from the lahbera village which was free of cost but for other participants from nearby villagers was Rs.50/- for admission and Rs.25/- as monthly fees. The training was taught by the two mentors appointed by the BCCL and Nari Shakti Samiti. The training consisted of sewing training of various types such as dress, fall biding, bed sheets and a few others. The total batches run till now were two with the targeted beneficiaries of 156. After the completion of course, a certificate was also issued to the participants. The duration of the first batch was for nine months and for the second batch was six months. The training program also had the practical exam whereby the participants were told to demonstrate the skills that they had learned during the sewing classes.

**Beneficiaries' viewpoint**

*'I did not know what is called sewing', says Nelam Marandi, a girl of 18 years coming from a poor family. She only got a chance to educate herself till STD 4 after which she was told to assist her family by working with them in coal mines. Nelam was very much fond of clothes, especially designing and sewing. But due to no proper skill sets she used to get disappointed. Since the sewing course had started, she joined in. She was the student of the first batch. Over a period of months she started enjoying the training program as it was something that she liked. She learned about different type of fabric cloth, stitching, dress designs and much more. Over the period, she was empowered. Her skills in sewing was improved considerably, along with that her confidence too! After completing the course, she got a job of the assistant tailor in a tailor shop where she experimented her skills and also gathered enough money to buy a new sewing machine for her'. She says, 'I was working hard, saved the money which I got from my job and bought a machine for me. Now, I work from home and I earn around Rs.2000/- a month from this'. She was very thankful to the training centre and also motivated many others like her.*

## VI. Solar Lights

As on paper, 20 stands of solar lights were to be installed in and around village. But on field, it was observed that only 6 solar lights were present and that too around the corner of the park. Also, the batteries of these 6 solar lights stands were stolen and thus it was not functioning.

## VII. Primary School Building

One of the major infrastructural developments in Lahbera was the primary school building. As per the information obtained from the residents, the school was constructed in 2014 but not yet inaugurated. The school intended in providing primary education to the children of lahbera village and other nearby villages. Since the construction had been completed, the school building is not being inaugurated and thus left abandoned.

## VIII. Computer Training Center

The centre was started in collaboration with Nari Shakti Samiti and BCCL CSR. Around eight computers were provided to Lehbera CTP. The purpose of the project was to develope IT skills among the youths of Lahbera. The project was functional only for a few months, without any expected outcome.

## IX. Drainage line and PCC Road

The Construction of Drainage line and PCC Road in Lahbera covered only a particular region of the whole village. The drainage line physically observed was less than 400 metres, and half the work of the drainage system had been left incomplete. Same was the case with the PCC road construction. A few areas of the village had incomplete road construction as well as unrepaired kaccha roads. The amount of money spent on drainage line and PCC road was Rs.7, 27,949/-.

## X. Water supply

Before the village had been adopted, it was facing water scarcity issues. The villagers had to walk a few kilometres to fetch water. The situation didn't change even after the adoption. BCCL installed only three water pipelines that were observed on the field against the population of 392 peoples. As observed on the field, the water flow was very slow and also the water supply was only for 3 hours a day. In place of taps, BCCL had just provided a pipe with no proper measures to control the flow of water and to avoid the wastage of water. The total cost spent on the project seems to be more considering the negligible impact caused by it.

### 5.4 Multi-stakeholder Perspectives on village Adoption project

Table 6 – Multi – stakeholder perspectives on village adoption project

| Projects | Villagers | BCCL |
|---|---|---|
| **Multipurpose Hall** | The Hall was very useful for them as it is easily accessible and can be used for both, personal and community functions purposes. | The BCCL was aware of the need of community hall as it was used for important purpose, both at personal and community level. |
| **Health Center** | The Health centre was useful as it was providing medical treatment free of cost. But now disappointed as the centre is closed from past two years and even the MMV project has been stopped. So people now depend upon the privately run clinics. | As a part of adoption project, health was seen as an important aspect. Thus the Health Centre was constructed. |
| **School Building** | The school building is constructed. However, it has not yet started and thus need to start. | BCCL was aware of the educational problem of villagers and so they constructed the school. But the school has not started yet as the procurement is under process. |
| **Masala Chakki** | The people were upset as it had provided employment only for a few weeks. | Intention was to generate employment opportunity by providing the required infrastructure. |
| **AEC** | The centre was very useful as it had helped many girls and women to learn basic reading and writing skills and hence villagers demanded to start it once again. | Intention was to provide basic skills of writing and learning. |
| **STC** | The Training was useful, but at times there was discrimination among the girls as the girls from Lahbera were | The intention was to provide entrepreneur skills to the girls and women by providing them sewing |

| | | |
|---|---|---|
| | given preferences, and girls from other villages were not allowed to use the machine in spite of paying the fees. | training skillsets. |
| **Drainage line and PCC Road** | The project was good as it had reduced the mosquito breeding spots and has made the communication with main road easy. But the construction is left incomplete and only a few lanes have PCC road and drainage system. | The intention was to increase the communication and reduce the unhygienic condition in Lahbera |
| **Water Connection** | The scarcity of water prevailed before, and even now the villagers bring water from outskirts. Only three pipelines are being installed for the whole village which is not sufficient. | Intended to provide water for the entire village by providing pipeline supply system. |
| **CTP** | It was useful but was shut down after some time. reason was not to know | Intended to develop IT skills among the student of Lahbera village. |
| **Solar Lights** | It was not useful for people, as it is only limited to a few spots. The villagers get electricity connection through state supply electricity connection. | The intention was to provide electrification to the village. |

## 5.5 Gaps and Scope for Improvement

i. **Lack Monitoring:** The proposed project intented towards the integrated development of Lahbera village. But since past few years, no monitoring has been done by the BCCL and that had led to the ineffectiveness of the projects. Some of the projects have been unsuccessful, namely Health Center, STP, CTP, and AEC, due to lack of monitoring.

ii. **Unfinished projects: A** Few of the projects/infrastructures such as school building, road and drainage lines, solar light stands and water connection is partially done and that had created a negative image of the company in the eyes of villagers.

iii. **Lack of Execution:** Among nine projects that were aimed at developing the village four projects have been unsuccessful, namely Water pipeline connection, Solar Stand Lights, School and Masala chakki**.**

iv. **Limited Resources in training centre:** The resource supply in training centre especially STP was very limited. The number of students in a batch was more than 50 but the sewing machines available were only 4. A few batchmates even complaint for not allowing them to use the machines.

v. **No Scope for employment generation:** One of the common gaps found among the STP and the Computer centre was that there was no scope for the students, neither for future training nor employment generation, as this centre only provided basic training. In case of masala chakki, no market linkages were made for the production and sale of masala.

vi. **Limited growth through training program:** The training programs such as STP, AEC, and CTP had very limited growth outcome as teachers/mentors teaching the courses were not upgraded, and also the salaries of the mentors were not paid. Thus, it was reflected in their teaching. In case of STP and CTP, no linkages were created.

## 5.6 Recommendations

i. **Creating a local sustainable mechanism to look over the monitoring of the projects:** It is essential that a village development committee consisting of BCCL officials, village members and the panchayat representative should be formed. This committee must be autonomous and should monitor and recommend projects that are essential for the developing Lehbera as an ideal village. At the same time, periodic training should be provided to the villagers for increasing their skills sets and capability.

ii. **Formation of SHGs:** Self Help Groups have played an important role in development of individual and as well as the community. Therefore, SHGs especially of women and youth should be formed, and they should be provided training on capacity building and entrepreneur skills rather than just providing infrastructure.

iii. **Need Base Assessment should be done:** The demand for a particular project or infrastructure should come from the voices of people rather than from the BCCL. Therefore, proper need base assessment should be done.

iv. **Creating Jobs and Market linkages:** Linkages should be created for jobs so that after the training the students can get jobs. At the same time, market linkages such as textile and spice market should be created, might be within BCCL, where the product produced by the villagers could be sold.

v. **Rejuvenating the existing project:** The projects such as CTP, ADC, STP, and Health Centre should be rejuvenated, as these projects had created good impacts on the villagers. At the same time, it is essential that required resources and periodic upgradation should be done. Emergency medical vans should be made available. A female doctor should be available in the health centre.

vi. **Linking the villages with existing government schemes:** It was evident during the field visit that most of the villagers belong to the ST community. Hence, they could be linked with various government schemes and services that are available for them by creating awareness generation for the same.

# CHAPTER 6 - CONSTRUCTION OF PCC ROAD

## 6.1 Introduction

Roads are primary mean of transportation. These provide human access to different places. Roads make a crucial contribution to economic development and growth and bring important social benefits. They are of vital importance in order to make a nation grow and develop. In addition, providing access to employment, social, health and education services makes a road network crucial in fighting against poverty. Roads open up more areas and stimulate economic and social development. Hence understanding the importance of Road BCCL had Constructed PCC Roads in and around eight villages of the BCCL command area.

## 6.2 Objective of the project

Enabling and increasing the connectivity from semi-rural to urban areas by constructing PCC Road.

## 6.3 Location of implementation

Table 7 – Location of implementation of road projects in various areas

| SN | Name of Village/Area | Construction in Km/Meters |
|---|---|---|
| 1 | Kacharra Arah Tola , Hatudih Panchayat | 400 meters |
| 2 | Lahbera Village | 1.5 Km |
| 3 | Aamtal Village, Aamtal Panchayat (Kusunda) | 1.5 km |
| 4 | Satitand Village, Bauakala Panchayat (Kusunda) | 500 meters |
| 5 | Padugora Village, Padugora Panchayat (WJ area) | 400 meters |
| 6 | Kandra Village, Kandrta Panchayat | 500 meters |
| 7 | Bakaspura Village, Luti Pahari Panchayat | 400 meters |

## 6.4 Impact of Road on Community

### 1. Improved Connectivity

The most important aspect of this project is improved connectivity of people from both rural and urban area to the main town or urban world. The road has helped these communities by increasing their accessibility and communication to various vital resources centres such as health, market, schools and employment places. Hence people have now been easily accessing this place without any difficulty.

**Beneficiaries' viewpoint**

*Sunil Mahato Resident of Kahcharra arah Tola, Hadudih Panchayat says: 'the road has helped us. The connectivity has increased. Health centre, schools and marketplaces are now easily accessible. Besides that, there is increase in the rate of vehicles after completion of the road.'*

## 2. Enhanced Hygienic Living Condition

The Construction of Road has enhanced hygienic living condition. PCC road had reduced the risk of getting malaria and other vector-borne diseases. Besides that, there is also improvement in communication from one part to another part of village and also to the other vital resources centres

**Beneficiaries' viewpoint**

*'The road has improved our living condition. We had Kaccha road in rainy season. There was always water logging and slushy pathways that made all of us difficult to walk, Children use to fall on the road. Besides that, due to the slushy pathways we also faced health issues such as malaria. Mosquitos were all around, especially in rainy season. But, since the PCC road has been constructed, it has prevented water logging and slushy pathways and even had reduced the mosquito breeding spots. Thus our health issues are also being reduced'; says Krishna Singh, Resident of Amtal Village.*

### 6.5 Gaps identified in the project

**i. Inferior Quality of Road Construction**

Almost all the road constructed under the CSR project was of inferior quality. The quality of the road had started diminishing after a few months from its construction. In many places, potholes and cracks were found by the research team. It was reported by the community that the construction of the road involved several unscrupulous means.

**ii. Limited Connectivity**

Most of the road constructed had limited connectivity. The road which was constructed was the internal road, which at some places was not even connecting to the main road. For example, the road constructed in lahbera was mostly internal and no connection was made with the main road. Thus, the people highlighted regarding its limited social value. A few of the road constructions were left incomplete. Besides that, lack of maintenance was also reported by the people.

**iii. Participatory Approach**

It was reported by the people that the participatory approach was neither utilized before nor during the construction of the road. Opinion and views of the people should be taken into consideration. The people reported that consent during infrastructure development such as in road was mostly avoided.

**iv. Lack of monitoring from the BCCL**

All the villages and areas where the road had been constructed, people reported that no monitoring or follow-up was done after the construction of the road. It was also told to the research team that after the construction of the road that is after two to three years, it is only now that the BCCL officials have come to inspect the road, along with the research team. People reported that they were highly unsatisfied for the negligence of BCCL officials in terms of monitoring and inspection.

### 6.6 Multi-stakeholder Perspective

**i. BCCL officials -** The aim of the project was to provide connectivity, connecting the small villages to the main town or main road that would subsequently enhance the productivity of the people and also the standard of living.

ii. **Villagers -** The road is useful to villagers in many ways. For example, it has increased the accessibility of vital resource centres such as schools, market, hospitals, etc. It has also increased the communication from one village to another and also from the village to the main town.

### 6.7 Recommendations

i. **Periodic monitoring** should be conducted by the BCCL. This would enable the company to identify the gaps in implementation of project, and at the same time while doing this; the creditability of the organization will also increase among the people/community.

ii. **Considering People's opinion and view** will enable the BCCL to implement the project in more effectively. Besides that good rapport will develope between both the parties.

iii. **Regular Maintenances** should be done by the BCCL. Similarly expansion should be done based on the needs and demands of the people/community.

iv. **Improvisation of road quality** by tendering the project to a contractor with better credibility and good quality work record in the past.

**v. Participation of community** should be encouraged before as well as during the construction of road as it would provide an opportunity to the villagers to monitor and supervise the construction process in terms of higher transparency, accountability and sustainability.

# ANNEXURE

Confidential (for research purpose only- property of TISS)

## HOUSEHOLD QUESTIONNAIRE

**Project - Mobile Medical Van (*Swasth Rath*)**

(As this questionnaire requires input from male and female members of household, it should be administered to head of household in the presence of other responsible adult male and female members.)

**IDENTIFICATION PARTICULARS**

**Before Starting Interview**

Name of District _____Code:_____
Name of Taluka _____Code:_____
Name of Block _____Code:_____
Gram Panchayat _____Code:_____
Name of the village_____Code:_____

Name of the Mining Area _____

Date of Interview (DD/MM/YY): _____/_____/_____
Time of starting Interview (HH.MM): _____. _____ AM/PM

**After Ending Interview**

Time of ending interview (HH.MM): _____. _____ AM/PM
Names of Respondents 1: _____ MID: _____
2: _____ MID: _____
3: _____ MID: _____
Name of Interviewer: _____ Code: _____

**After Checking/Editing Questionnaire**

Name of Supervisor: _____Code: _____
Name of Editor: _____Code:
_____

**A: HOUSEHOLD PROFILE AND HEALTH SEEKING BEHAVIOR**

| Qn. | QUESTIONS AND FILTERS | CODING CATEGORIES | SKIP |
|---|---|---|---|
| A01 | What is your religion? | HINDU….....1<br>MUSLIM….....2<br>CHRISTIAN….....3<br>SIKH….....4<br>BUDHHIST….....5<br>JAIN….....6<br>OTHER _____7<br>NO RELIGION….....8 | |
| A02 | Do you come under scheduled caste, scheduled tribe, nomadic tribe, or other backward class? Which one? | SCHEDULED CASTE….....1<br>SCHEDULED TRIBE….....2<br>NOMADIC TRIBE….....3<br>DENOTIFIED TRIBE….....4<br>OTHER BACKWARD CLASS (OBC)……..5<br>GENERAL….....6<br>DON'T KNOW….....7 | |
| A03 | From where do you fetch water for your household?<br>(ask for all sources) | TAP (BY OWN).....1<br>OWN TAP BY GOVT/PANCHAYAT .....2<br>OWN HANDPUMP.....3<br>OWN OPEN WELL.....4<br>NEIGHBOUR'S TAP.....5<br>COMMUNITY TAP.....6<br>COMMUNITY HANDPUMP.....7<br>COMMUNITY OPEN WELL.....8<br>OTHER(SPECIFY)_____9 | |
| A04 | If household members fall sick, where do you go or whom do you consult first? | TRADITIONAL HEALER/DAI.....1<br>LOCAL DOCTOR/RMP.....2<br>CHEMIST SHOP.....3<br>MOBILE CLINIC OF JHARKHAND GOVERNMENT.....4<br>SHC/ASHA/ANGANWADI.....5<br>PHC/CHC.....6<br>GOVT HOSPITAL.....7<br>PRIVATE CLINIC.....8<br>PRIVATE HOSPITAL.....9<br>COMPANY/AIDED HOSPITAL.....10<br>SEEK NO TREATMENT.....11<br>DEPENDS ON AILMENT.....12<br>MOBILE MEDICAL VAN OF BCCL....13 | |

| | | | |
|---|---|---|---|
| | | OTHER_____14 | |
| A05 | During the last 12 months, which are the agencies did you/your household members visit for consultation and/or treatment?<br><br>(ASK FOR ALL SOURCES) | TRADITIONAL HEALER/DAI.....1<br>LOCAL DOCTOR/RMP.....2<br>CHEMIST SHOP.....3<br>MOBILE CLINIC.....4<br>SHC/ASHA/ANGANWADI.....5<br>PHC/CHC.....6<br>GOVT HOSPITAL.....7<br>PRIVATE CLINIC.....8<br>PRIVATE HOSPITAL.....9<br>COMPANY/AIDED HOSPITAL.....10<br>MOBILE MEDICAL VAN OF BCCL.....11<br>MOBILE CLINIC OF JHARKHAND GOVERNMENT.....12<br>OTHER_____13<br>NO TREATMENT.....14<br>NOBODY FELL SICK.....15 | |
| A06 | How the purification techniques followed at household level? | BOIL THE WATER.....1<br>ADD BLEACH/CHLORINE.....2<br>SIEVE IT THROUGH CLOTH.....3<br>WATER FILTER (CERAMIC, SAND, COMPOSITE, ETC.).....4<br>LET IT STAND AND SETTLE.....5<br>OTHER _____6<br>DON'T KNOW.....7 | |
| A07 | What type of toilet facility do you have? | FLUSH TOILET (OWN).....1<br>PIT TOILET(OWN).....2<br>FLUSH TOILET(COMMUNITY).....3<br>PIT TOILET(COMMUNITY).....4<br>OTHER _____5<br>GO FOR OPEN DEFECATION.....6 | |
| A08 | Do you wash hand properly after defecation? | YES.....1<br>NO.....2 | |
| A09 | What is the status of health infrastructures availability in the villages or nearest location in terms of government services? | GOVT HOSPITAL AVAILABLE BUT NOT FUNCTIONING PROPERLY.....1<br>GOVT HOSPITAL NOT AVAILABLE…..2<br>PRIMARY HEALTH CENTER IS AVAILABLE AND FUNCTIONING.....3<br>PRIMARY HEALTH CENTER IS AVAILABLE BUT NOT | |

| | | | |
|---|---|---|---|
| | | FUNCTIONING/POOR.....4<br>PRIMARY HEALTH CENTER IS NOT AVAILABLE.....5<br>SUB-CENTRES OR COMMUNITY HEALTH CENTRES AVAILABLE .....6<br>SUB-CENTRES OR COMMUNITY HEALTH CENTRES NOT AVAILABLE.....7 | |
| A10 | How is the access to health facilities in terms of connectivity to/from villages, type of approach road? | KUCCHA ROAD.....1<br>PACCA ROAD IN GOOD CONDITION....2<br>PACCA ROAD IN BAD CONDITION.....3<br>ROAD INSIE THE VILLAGE IS GOOD..4<br>ROAD INSIDE THE VILLAGE IS NOT GOOD.....5 | |
| A11 | What are the major Ailments in your family? | COUGH & COLD.....1<br>SKIN DISEASES (ITCHING ETC.)....2<br>WATER BORNE DISEASE .....3<br>MALARIA/ DENGUE.....4<br>OTHER (SPECIFY)_____5 | |
| A12 | What is the mode of transport used for referral cases? | AMBULANCE.....1<br>HIRED VAN/TRAKER/TAXI/AUTO RICKSHAW.....2<br>JUTE COT (KHATIA).....3<br>MAN DRIVEN RIKSHAW.....4<br>OTHER(SPECIFY) _____5 | |

**B. SERVICES OF MOBILE MEDICAL VAN (*Swastha Rath*)**

| Qn. | QUESTIONS AND FILTERS | CODING CATEGORIES | SKIP |
|---|---|---|---|
| B01 | Are you aware that Mobile Medical Van (Swastha Rath) is sponsored by BCCL? | YES.....1<br>NO.....2 | |
| B02 | How long back the van been coming? | MORE THAN FIVE YEARS.....1<br>FIVE YEARS.....2<br>FOUR YEARS.....3<br>THREE YEARS.....4<br>TWO YEARS.....5<br>ONE YEARS.....6<br>DON'T KNOW/REMEMBER.....7 | |
| B03 | How does the BCCL plan to publicize and make the communities in the village aware of their visits as they have a set a time for their visits | ANNOUNCEMENT BY MUKHIYA IN GRAM SABHA.....1<br>ANNOUNCEMENT THOUGH LOUDSPEAKER BY BCCL.....2<br>BY ASHA WORKER/VILLAGE VOLUNTEERS.....3<br>BCCL REPRESENTATIVES CALL FOR VILLAGE MEETING.....4 | |

| | | | |
|---|---|---|---|
| | | OTHER MEANS(SPECIFY)_____5 | |
| B04 | Do you think the van comes frequently enough? | DAILY.....1<br>ONCE A WEEKLY.....2<br>TWICE A WEEK.....3<br>FORTNIIGHTLY.....4<br>ONCE A MONTH.....5<br>DOES NOT COME.....6<br>OTHER SPECIFY.....7 | |
| B05 | Is there a fixed point where the van comes and waits? | YES.....1<br>NO.....2<br>DON'T KNOW.....3 | |
| B06 | If yes, specify: | | |
| B07 | Does fixed date and time of visit is maintained by the Mobile Medical Van? | YES.....1<br>NO.....2<br>DON'T KNOW.....3 | |
| B08 | How long does the van wait in the village? | LESS THAN AN HOUR.....1<br>ONE HOUR.....2<br>TWO HOURS.....3<br>THREE HOURS.....4<br>MORE THAN THREE HOURS.....5<br>DON'T KNOW.....6 | |
| B09 | Do you think this time is enough? | YES.....1<br>NO.....2<br>CAN'T SAY.....3 | |
| B10 | If no, how much longer should it wait?<br>(Write as it is) | | |
| B11 | How is the priority in beneficiary selection governed? | FIRST COME FIRST SERVE.....1<br>AGED PERSONS.....2<br>INFANTS/CHILDREN.....3<br>DIFFERENTLY ABLED.....4<br>PREGNANT WOMEN.....5<br>RANDOM, NO PRIORITY AS SUCH....6<br>VISIBLY VERY UNWELL PERSON.....7 | |

| | | | |
|---|---|---|---|
| B12 | Facilities available in the van | FREE MEDICINE/ TREATMENT.....1<br>PROVIDE DOORSTEP FACILITIES....2<br>PROVIDE DIAGNOSTIC FACILITY....3<br>PROVIDE ALL THE FACILITIES THAT ARE PROVIDED IN A HOSPITAL.....4<br>OTHER(SPECIFY)_____5 | |
| B13 | Does the medical team give awareness about the followings? | HYGIENIC SANITATION.....1<br>HYGIENIC WATER CONSUMPTION.....2<br>MOTHER & CHILD HEALTH CARE.....3<br>IMMUNIZATION.....4<br>ANAEMIA.....5<br>DE-WORMING.....6<br>VECTOR BORNE DISEASES.....7<br>HEPATITIS.....8<br>TYPHOID.....9<br>COMMON CARDIAC PROBLEMS.....10<br>HIV.....11<br>DIABETES.....12<br>SNAKE BITE.....13<br>TUBERCULOSIS.....14<br>OTHERS_____15 | |
| B14 | Does the medical team diagnose the following? | BLOOD PRESSURE.....1<br>HEMOGLOBIN LEVELS.....2<br>OXYGEN SATURATION.....3<br>MALARIA.....4<br>HEPATITIS.....5<br>DENGUE.....6<br>TYPHOID.....7<br>DIABETES.....8<br>OTHERS_____9 | |
| B15 | What kind of services do you get from the van as far as cure is concern? | MEDICINES.....1<br>NUTRITIONAL SUPPLEMENTS.....2<br>DE-WORMING.....3<br>TONICS.....4<br>OTHERS_____5 | |
| B16 | Is it convenient for your family to reach the MMV point? (Ask specific to women, children, senior citizen, and differently abled if any in the family). | WOMEN.....YES(1)<br>NO(2)<br>CHILDREN.....YES(1)<br>NO(2)<br>SENIOR CITIZEN.....YES(1)<br>NO(2) | |

| | | | |
|---|---|---|---|
| | | PWD.....YES(1)<br>NO(2) | |
| B17 | If no, then what is the difficulty? | LONG DISTANCE.....1<br>NO INTERNAL ROAD.....2<br>NO APPROACH ROAD.....3<br>NO CONNECTING BRIDGE.....4<br>KUTTCHA ROAD.....5<br>NO MODE OF TRANSPORTATION.....6<br>INCONVINIENT TIMING OF THE MMV.7<br>OTHERS SPECIFY_____8 | |
| B18 | Who are present in the Mobile Medical Van of BCCL? | DOCTOR.....1<br>COMPOUNDER/PHARMACIST.....2<br>NURSE/ANM.....3<br>DRIVER.....4<br>ALL THE ABOVE.....5<br>OTHER(SPECIFY)_____6 | |
| B19 | What is the availability of doctor in the Van? | ALWAYS PRESENT .....1<br>SOMETIMES PRESENT.....2<br>NEVER PRESENT.....3 | |
| B20 | If no, then who facilitate the service? (Write as it is) | | |
| B21 | Do you able to convey your problems to the Doctor/pharmacist?<br>(probe behavior of the medical team) | YES.....1<br>NO.....2 | |
| B22 | What if a person falls ill in the period when Van is not visiting? (Write as it is) | VISIT PRIVATE PRACTIONER.....1<br>VISIT RMP.....2<br>NEAREST HEALTH GOVERNMENT HEALTH CENTER.....3<br>NEAREST PRIVATE CLINIC/HOSPITAL..4<br>WAIT FOR MMV FOR NEXT VISIT.....5<br>OTHERS(SPECIFY)_____6 | |
| B23 | Does the medical team provide awareness campaign? | YES.....1<br>NO.....2<br>CAN'T SAY.....3 | |
| B24 | If yes, what are they? | HIV/AIDS/SMOKING/ALCHOLISM.....1<br>PUBLICITY AND SENSITIZATION CAMPAIGN.....2<br>CLEANINESS AND HYGIEN.....3 | |

| | | | |
|---|---|---|---|
| | | MATERNITY CARE.....4<br>OTHER(SPECIFY)_____5 | |

**C. BENEFICIARIES' FEEDBACK ON MMV SERVICE**

| Qn. | QUESTIONS AND FILTERS | CODING CATEGORIES | SKIP |
|---|---|---|---|
| C01 | Do you think the frequency of doctor's visit to private clinic/hospital or government health center has been reduced due to service of MMV provided by BCCL? | AGREE.....1<br>DISAGREE.....2<br>CAN'T SAY.....3 | |
| C02 | Do you think monthly expenditure on health checkups /medicine has been reduced due to the service of MMV provided by BCCL? | AGREE.....1<br>DISAGREE.....2<br>CAN'T SAY.....3 | |
| C03 | Do you think that your time has been saved due to the service of MMV provided by BCCL? | AGREE.....1<br>DISAGREE.....2<br>CAN'T SAY.....3 | |
| C04 | Do you think travelling cost has been saved due to service provided by MMV of BCCL? | AGREE.....1<br>DISAGREE.....2<br>CAN'T SAY.....3 | |
| C05 | Do you think you get free advice by a qualified trained/ qualified doctors at your door step? | AGREE.....1<br>DISAGREE.....2<br>CAN'T SAY.....3 | |
| C06 | Do you think major ailments in your family have been reduced due to awareness given by the medical team of BCCL through MMV? OR your family is healthier than before? | AGREE.....1<br>DISAGREE.....2<br>CAN'T SAY.....3 | |
| C07 | Is there any scope of improvement in MMV? If yes, answer the question from **C08 to C12** | YES.....1<br>NO.....2<br>CAN'T SAY.....3 | |
| C08 | MMV should reach on time/ time should be fixed | YES.....1<br>NO.....2<br>CAN'T SAY.....3 | |
| C09 | There should be fixed/ convenient time of reaching the MMV (any) | YES.....1<br>NO.....2<br>CAN'T SAY.....3 | |
| C10 | Quantity/ variety of medicines should be increased (any) | YES.....1<br>NO.....2<br>CAN'T SAY.....3 | |

| | | | |
|---|---|---|---|
| C11 | Frequency/coverage of MMV should be increased (any) | YES.....1<br>NO.....2<br>CAN'T SAY.....3 | |
| C12 | Requirement of a lady doctor/nurse | YES.....1<br>NO.....2<br>CAN'T SAY.....3 | |
| C13 | How would you rate (out of 5) the service of Mobile Medical Van provide by BCCL. | POOR(1/5).....1<br>BELOW AVERAGE(2/5).....2<br>AVERAGE(3/5).....3<br>GOOD(4/5).....4<br>EXCELLENT(5/5).....5 | |
| C14 | Do you think this service by BCCL should be continued? | AGREE.....1<br>DISAGREE.....2<br>CAN'T SAY.....3 | |

# HOUSEHOLD QUESTIONNAIRE

**Project - Scheme for multipurpose utilization of abandoned mine water**

(As this questionnaire requires input from male and female members of household, it should be administered to head of household in the presence of other responsible adult male and female members.)

## IDENTIFICATION PARTICULARS

### Before Starting Interview

Name of District

_____Code:_____

Name of Taluka

_____Code:_____

Name of Block

_____Code:_____

Gram Panchayat

_____Code:_____

Name of the

village_____Code:_____

Pond Name_____

Date of Interview (DD/MM/YY): _____/_____/_____

Time of starting Interview (HH.MM): _____. _____

AM/PM

### After Ending Interview

Time of ending interview (HH.MM): _____. _____

AM/PM

**A: HOUSEHOLD PROFILE AND AGRICULTURE AND WATER AVAILABILITY**

| Qn. | QUESTIONS AND FILTERS | CODING CATEGORIES | SKIP |
|---|---|---|---|
| A01 | What is your religion? | HINDU….....1<br>MUSLIM….....2<br>CHRISTIAN….....3<br>SIKH….....4<br>BUDHHIST….....5<br>JAIN….....6<br>OTHER _____7<br>NO RELIGION….....8 | |
| A02 | Do you come under scheduled caste, scheduled tribe, nomadic tribe, or other backward class? Which one? | SCHEDULED CASTE….....1<br>SCHEDULED TRIBE….....2<br>NOMADIC TRIBE….....3<br>DENOTIFIED TRIBE….....4<br>OTHER BACKWARD CLASS (OBC)……..5<br>GENERAL….....6<br>DON'T KNOW….....7 | |
| A03 | Type of house<br>(record as per guidelines based on type of wall,<br>roof and floor) | RCC .....1<br>PUCCA .....2<br>SEMI-PUCCA .....3<br>KUCHCHA .....4<br>HUT .....5<br>TENT (MAKESHIFT).....6 | |
| A04 | House electrified? | YES.....1<br>NO.....2 | |
| A05 | From where do you fetch potable water for your household?<br>(ask for all sources) | TAP (BY OWN).....1<br>OWN TAP BY GOVT/PANCHAYAT .....2<br>OWN HANDPUMP.....3<br>OWN OPEN WELL.....4<br>NEIGHBOUR'S TAP.....5<br>COMMUNITY TAP.....6<br>COMMUNITY HANDPUMP.....7<br>COMMUNITY OPEN WELL.....8<br>COMMUNITY POND.....9<br>OTHER(SPECIFY)_____10 | |
| A06 | How far is the water source from your household? | JUST OUTSIDE.....1<br>WITHIN 1/2 KM.....2<br>WITHIN 1 KM.....3<br>MORE THAN 1 KM.....4 | |

| | | | |
|---|---|---|---|
| A07 | If it is used for drinking, what is purification techniques followed at household level? | BOIL THE WATER.....1<br>ADD BLEACH/CHLORINE.....2<br>SIEVE IT THROUGH CLOTH.....3<br>WATER FILTER (CERAMIC, SAND, COMPOSITE, ETC).....4<br>LET IT STAND AND SETTLE .....5<br>OTHER (SPECIFY).....6<br>DON'T KNOW.....7 | |
| A08 | What is the purpose of mine water utilization through pond? | DRINKING.....1<br>COOKING.....2<br>WASHING VEGETABLES .....3<br>WASHING CLOTHES.....4<br>HOUSE CLEANING.....5<br>BATHING/WASHING YOUR BODIES....6<br>AGRICULTURE.....7<br>WASHING ANIAMLS.....8<br>AFTER DEFECATION.....9<br>OTHER(SPECIFY) .....10 | |
| A09 | What type of toilet facility do you have? | FLUSH TOILET (OWN).....1<br>PIT TOILET(OWN).....2<br>FLUSH TOILET(COMMUNITY).....3<br>PIT TOILET(COMMUNITY).....4<br>OTHER _____5<br>GO FOR OPEN DEFECATION.....6 | |
| A10 | Do you use pond water after open defecation? | YES.....1<br>NO.....2 | |
| A11 | Does your household own any agricultural land including any plantation land? | YES.....1<br>NO.....2 | |
| A12 | How much agriculture land do you own? | _____ACRS<br>_____(LOCALE MEASUREMENT SCALE) | |
| A13 | How much of the land cultivated by you is irrigated? | NIL..... 0<br>_____ACRS<br>_____(LOCALE MEASUREMENT SCALE) | |
| A14 | What are the sources of irrigation?<br>Do not record rain as a method of irrigation<br>(ASK FOR ALL SOURCES) | CANAL.....1<br>POND.....2<br>WELL.....3<br>RIVER.....4<br>MOTOR PUMP.....5<br>TUBE WELL.....6 | |

| | | | |
|---|---|---|---|
| | | BORE WELL.....7<br>DAM.....8<br>OTHER_____9<br>NONE.....10 | |
| C15 | What is the lift irrigation equipment used by you to draw water from pond to agriculture field? | DIESEL ENGINE/PUMP.....1<br>ELECRIC MOTOR..... .....2<br>SUBMERGIBLE PUMP.....3<br>OTHER (SPECILFY)_____4 | |
| A16 | Major crops grown | 1) _____<br>2) _____<br>3) _____<br>4) _____<br>5) _____ | |

**B. AWARENESS ABOUT MINE WATER SUPPY, REPAIRS, RENOVATION & RESTORATION OF THE PONDS AT KHONATHI AND BEHRAKUDAR BY BCCL**

| Qn. | QUESTIONS AND FILTERS | CODING CATEGORIES | SKIP |
|---|---|---|---|
| B01 | Do you know that BCCL is supplying mine water to the pond? | YES.....1<br>NO.....2 | |
| B02 | Do you know about the activities done by BCCL for the pond? | EMBANKMENT OR STONE PITCHNG AROUND THE BANK .....1<br>INLET AND OUTLETS.....2<br>GHATS/STAIRS .....3<br>REPAIRE.....4<br>INCREASED THE CATCHMENT/RESTORATION.....5<br>DON'T KNOW ANY OF THE ABOVE.....6 | |
| B03 | How you come to know that BCCL has renovated the pond? | DISPLAY BOARD BY BCCL.....1<br>GRAM SABHA.....2<br>OBSERVED RENOVATION WAS GOING.....3<br>OTHER SOURCE (PLEASE MENTION)..4<br>_____ | |
| B04 | Whether BCCL conducted any village meeting along with Mukhiya before supplying mine water to the pond? | YES.....1<br>NO.....2<br>DON'T KNOW.....3 | |

| | | | |
|---|---|---|---|
| B05 | When and how many meetings were held?<br>(Specify the number with month and year) | | |
| B06 | Does the pond dry up initially during summer? | YES.....1<br>NO.....2<br>DON'T KNOW.....3 | |
| B07 | How often the mine water is supplied to the village pond by BCCL? | WEEKLY.....1<br>MONTHLY.....2<br>QUARTERLY.....3<br>HALFYEARLY.....4<br>DRY SPELL/WINTER ONLY.....5<br>NOT FIXED.....6<br>NEVER..... .....7<br>DON'T KNOW.....8<br>IF ANY OTHER, SPECIFY.....9 | |
| B08 | How many hours/day is water supplied? | 30 MINUTES.....1<br>45 MINUTES.....2<br>ONE HOUR.....3<br>TWO HOURS.....4<br>MORE THAN TWO HOURS.....5 | |
| B09 | Is the quantity of water supplied sufficient for your village? | YES.....1<br>NO.....2<br>DON'T KNOW.....3 | |
| B10 | Has there been any case of illness die to poor water quality? If yes, please specify | NO<br>YES (SPECIFY)<br>_____<br>_____ | |
| B11 | What is alternative source of water in case the existing facility is damaged? (Specify) | | |
| B12 | When was the last mine water supplied by BCCL? | LAST MONTH….....1<br>LAST THREE MONTHS….....2<br>LAST SIX MONTHS….....3<br>LAST ONE YEAR.....4<br>MORE THAN A YEAR(HOW LONG,SPECIFY)<br>_____5 | |

| | | | |
|---|---|---|---|
| B13 | When was the last monitoring done by BCCL regarding utilization of mine water? | LAST MONTH….....1<br>LAST THREE MONTHS….....2<br>LAST SIX MONTHS….....3<br>LAST ONE YEAR….....4<br>MORE THAN A YEAR(HOW LONG,SPECIFY)<br>_____5<br>NEVER.....6<br>DON'T KNOW.....7 | |

**C. IMPACT AFTER THE INTERVENTION ON UTILIZATION OF MINE WATER FOR DOMENSTIC AND AGRICULTURAL USE**

| Qn. | QUESTIONS AND FILTERS | CODING CATEGORIES | SKIP |
|---|---|---|---|
| C01 | Is water available throughout the year? | YES.....1<br>NO.....2 | |
| C02 | What you think, the availability of water in the pond throughout the year is due to? | MINE WATER SUPPLIED BY BCCL...1<br>NATURALLY DUE TO RAIN WATER...2<br>GROUND WATER REGENERATION.....3<br>DON'T KNOW.....4<br>OTHER REASONS(SPECIFY)_____<br>_____5 | |
| C03 | Is there any improvement in water storage capacity or catchment areas of tank seen after the renovation of pond by BCCL? | AGREE.....1<br>DISAGREE.....2<br>DON'T KNOW.....4 | |
| C04 | Do you think that water scarcity has reduced during dry spell/winter due to mine water supply provided by BCCL? | AGREE.....1<br>DISAGREE.....2<br>DON'T KNOW.....4 | |
| C05 | Do you find adequate quantity of water during summer/winter due to mine water supply provided by BCCL? | AGREE.....1<br>DISAGREE.....2<br>DON'T KNOW.....4 | |
| C06 | Do you think the impact of flood has been reduced during monsoon due to renovation of pond by BCCL? | AGREE.....1<br>DISAGREE.....2<br>DON'T KNOW.....4 | |
| C07 | Do you think the distance of water availability has been reduced for animals especially for those who can't go long distance to drink water due to mine water supply of BCCL? | AGREE.....1<br>DISAGREE.....2<br>DON'T KNOW.....4 | |

| | | | |
|---|---|---|---|
| C08 | Do you think you get water for household easily and timely due to mine water supply of BCCL? | AGREE.....1<br>DISAGREE.....2<br>DON'T KNOW.....4 | |
| C09 | Do you think that villages has developed new job opportunity like duckery and fishery in dry season and use their time better than before? | AGREE.....1<br>DISAGREE.....2<br>DON'T KNOW.....4 | |
| C10 | Do you utilize pond water for critical irrigation? | YES.....1<br>NO.....2 | |
| C11 | Do you think you are able to produce two crops (Winter crops) in a year due to mine water supply of BCCL | AGREE.....1<br>DISAGREE.....2<br>DON'T KNOW.....4 | |
| C12 | Do you think you produce beyond your home consumption and get money to be used for different purposes due to mine water supply of BCCL? | AGREE.....1<br>DISAGREE.....2<br>DON'T KNOW.....4 | |
| C13 | Are any new crops grown due to this intervention, which were not sown before due to unavailability of water during winter/dry spell? | YES.....1<br>NO.....2 | |
| C14 | The new crops grown are | 1)_____<br>2)_____<br>3)_____<br>4)_____<br>5)_____ | |
| C15 | Was any increase in land under irrigation seen? | YES.....1<br>NO.....2 | |
| C16 | How much land under irrigation increased? | _____ACRS<br>_____(LOCALE MEASUREMENT SCALE) | |
| C17 | Do you think your income has been increased due to pond renovation and mine water supply? | AGREE.....1<br>DISAGREE.....2<br>DON'T KNOW.....4 | |
| C18 | Do you think your agricultural production has been increased due to pond renovation and mine water supply? | AGREE.....1<br>DISAGREE.....2<br>DON'T KNOW.....4 | |
| C19 | Have you used pond for fishery or duckery | YES.....1<br>NO.....2 | |
| C20 | How much income have you gained? | RS._____/MONTH | |

| | | | |
|---|---|---|---|
| C21 | Do you think there is scope for improvement with regards to mine water supply?<br>If yes, answer **C22 to C24** | YES.....1<br>NO.....2 | |
| C22 | Mine water should be reached on time/ time should be fixed | YES.....1<br>NO.....2<br>CAN'T SAY.....3 | |
| C23 | Frequency of mine water supply should be increased | YES.....1<br>NO.....2<br>CAN'T SAY.....3 | |
| C24 | Quantity and quantity of water should be improved | YES.....1<br>NO.....2<br>CAN'T SAY.....3 | |
| C25 | How would you rate (out of 5) the quantity of water service provide by BCCL. | POOR(1/5).....1<br>BELOW AVERAGE(2/5).....2<br>AVERAGE(3/5).....3<br>GOOD(4/5).....4<br>EXCELLENT(5/5).....5 | |
| C26 | How would you rate (out of 5) the quality of water service provide by BCCL. | POOR(1/5).....1<br>BELOW AVERAGE(2/5).....2<br>AVERAGE(3/5).....3<br>GOOD(4/5).....4<br>EXCELLENT(5/5).....5 | |
| C27 | Do you think BCCL should continue supplying Mine water? | YES.....1<br>NO.....2 | |

**D. MANAGEMENT OF POND**

| Qn. | QUESTIONS AND FILTERS | CODING CATEGORIES | SKIP |
|---|---|---|---|
| D01 | Have community participated during pond renovation through*"shramdaan"*? | YES.....1<br>NO.....2<br>DON'T KNOW.....3 | |
| D02 | Is there any evidence that the pond has been recently undergone maintenance/ de-silting? | YES.....1<br>NO.....2<br>DON'T KNOW.....3 | |
| D03 | Does community also participate in maintenance/ de-silting? | YES.....1<br>NO.....2<br>DON'T KNOW.....3 | |

| | | | |
|---|---|---|---|
| D04 | If the BCCL water supply facility gets damaged, who repair it? (write as it is) | | |
| D05 | Maintenance is carried out? | FUND RAISED BY COMMUNITY(*CHANDA*) .....1<br>MUKHIYA DEVELOPMENT FUND.....2<br>BCCL CSR FUND.....3<br>MP/MLA FUND.....4<br>OTHER(SPECIFY)_____5 | |
| D06 | Constraint in O & M | **INEFFECTIVE COORDINATION AMONG USERS**.....1<br>**LACK OF FUND REHABILITAION**....2<br>NEGELGENCE OF LOCAL AUTHORITY.3<br>OTHER(SPECIFY)_____4 | |

**QUESTIONNAIRE**
**VILLAGE ADOPTION PROGRAMME (Lahbera, Dhanbad)**

1. Date Time

2. Village:
   Panchayat:
   Block:
   District:
   State:

3. Mukhiya/Sarpanch/Ward member/Participant:
   Name:
   Contact No.:

4. Population:

***Multipurpose hall***

**Questions**

| | |
|---|---|
| 1. | When was the hall built? How much time did the construction take? |
| 2. | Who built it? (Mention implementing agency). Who provided the land for the same. |
| 3. | Why was the need felt to build this hall? |
| 4. | Were the villagers consulted before constructing the hall? |
| 5. | What is the cost of the building? (How many respondents know?) |
| 6. | Was there any board displayed during/after the construction of the hall providing information related to it? |
| 7. | Is the hall useful? |
| 8. | What is the hall used for?<br>• SHG Meetings<br>• Wage Payments<br>• Bank related details<br>• Gram Sabha<br>• Awareness Campaigns<br>• Meetings with BCCL<br>• Trainings<br>• Functions (community)<br>• Functions (individuals)<br>• Livelihood activities<br>• Fairs<br>• Lodging<br>• Others (Please specify) |
| 9. | Is the access to multi-purpose hall affected by any factor?<br>• Caste<br>• Religion<br>• PRI Members<br>• Gender<br>• Gram Sachiv<br>• Other govt. employee<br>• Others (Please specify) |
| 10. | Who has the control over or authority related to the multi-purpose hall?<br>• Gram Sabha<br>• Sarpanch<br>• Specific committee/group<br>• Individual (Please specify)<br>• BCCL<br>• Others |
| 11. | What is the procedure to use the hall for any purpose? Is there a system devised? If yes, please specify. |
| 12. | How can this hall be better utilized? |

***Masala Chakki:***

**Questions for Beneficiaries**

| | |
|---|---|
| 1. | When was the Masala Chakki made operational? How much time did the process of operationalization take? |
| 2. | Who installed it? (Mention implementing agency). Who provided the land/building for the same? |
| 3. | Why was the need felt to start this initiative? |

4. Were the villagers consulted before starting this initiative?
5. What is the cost of the initiative? (How many respondents know?)
6. Was there any board displayed during/after the installation and operationalization of the Masala Chakki providing information related to it?
7. Is the Masala Chakki useful?
   - Enhancing livelihood
   - Making grinding easier
   - Others (Mention)
8. What is the impact of this initiative for participants?
- Tangible (income)
   - Earnings of individual workers
   - Collective income of the community
   - Profit by owners
   - Others

- Intangible
   - Services/sales/production increase or decrease
   - Empowerment
   - Drudgery Reduction
   - Negative impacts if any (pollution/disputes/others)
   - Are they now able to make Investment in areas like:
      - Health
      - Education
      - Malnutrition
      - Transportation
      - Other (Specify)
   - Others (Mention)
9. What is the mechanism of selling the products? Where are the masalas sold? How is the demand in market?
10. What is the technical support provided for production as well as marketing? What more is expected?
11. How can we make this initiative better?
- To enhance positive impacts
- To reduce negative impact
12. Are impacts overall positive or negative? For whom?
13. What are the most important impacts? According to whom?
14. How significant are they? In what way?
15. Do changes alter livelihood strategies and security, or do they just add one element (a coping strategy) within existing approaches? Can impacts be summarised in terms of changes in livelihood security or robustness?

***Health Centre*:**

**Questions**

1. What was the scenario before the Health Centre was started?
   - Doctors
   - Health workers
   - Nearest Health Centre
   - Access to medicines
   - Access to screening tests
   - Others (Mention)
2. Why was the health centre set up in the village?
3. Were people of the village involved in the decision making?
- Need Assessment
- Location of Health Centre
- Others (Specify)
4. What is the basic infrastructure available?
   - Electricity
   - Water
   - Drinking water
   - Ambulance
   - Others (Mention)
5. What is the human resource deployed at the health Centre?
   - Doctor (qualification)
   - Nurse/ANM
   - Pharmacist
   - Lab-technician
   - Others (Specify)
6. How is the behaviour of the staff?

| |
|---|
| 7. Population Coverage by the Health Centre |
| 8. How is the utilization of the medical services at the Health centre? |
| 9. Institutional Deliveries<br>• Vaccination<br>• First Aid<br>• General Check ups<br>• Ante natal services<br>• Others |
| 10. What diseases do people generally suffer from? |
| 11. Name the diseases/symptoms. Also mention if they receive treatment for the mentioned diseases at the health centre |
| 12. Are referral services provided? |
| 13. What are the timings of the Health Centre? |
| 14. How are emergencies handled? |
| 15. Are people satisfied with the health Centre? If yes provide reasons. |
| 16. What are people dissatisfied about?<br>• Staff unavailable<br>• Non-examination by staff<br>• Improper attention<br>• Centre not clean<br>• Medicines not available<br>• Others (Mention) |
| 17. Are the services provided for free? If not, how much do they pay for treatment/medicines? |
| 18. Is education/awareness provided at the health centre? |
| 19. Complaints/Improvement suggestion for health centre. |

**Sewing Training Centre**

**Question**

| |
|---|
| 1. Why was the Sewing Machine initiative started? |
| 2. Who use the Sewing Machine Initiative? Name the stakeholders.<br>• Direct Participants<br>o Owners<br>o Workers<br>o Customers<br>• Non-participants (local residents)<br>• Others<br>o Government<br>o NGO<br>o CBO<br>o PRI<br>o Co-operatives |
| 3. What is the criterion to be a part of this initiative? |
| 4. Who is not a part of it or stays out of it? |
| 5. Specify who and the reason. Following maybe the reasons:<br>• Gender<br>• Power Dynamics<br>• Education<br>• Poverty<br>• Disability<br>• Other |
| 6. How can participation be encouraged? |
| 7. How is it beneficial? |
| 8. What is the impact of livelihoods for participants?<br>• Tangible (income)<br>o Earnings of individual workers<br>o Collective income of the community<br>o Profit by owners<br>• Intangible (empowerment)<br>• Direct (services/sales/production)<br>• Positive<br>• Negative<br>• Intended<br>• Unintended |

| |
|---|
| 9. What impact does it have on the quality of life? |
| 10. How has the investment pattern changed?<br>• Health<br>• Education<br>• Malnutrition<br>• Transportation<br>• Other (Specify) |
| 11. What is sown or stitched? Where are the clothes sold? How is the demand in market? |
| 12. What is the technical support provided for production as well as marketing? What more is expected? |
| 13. How can we make this initiative better?<br>• To enhance positive impacts<br>• To reduce negative impact |
| 14. What are the most important impacts? According to whom? |
| 15. How significant are they? In what way? |
| 16. Why did only 6 women start earning? How can that be improved? |

***Adult Education Centre:***

**Questions:**

| |
|---|
| 1. What is the literacy percentage of the village? Male and female both. |
| 2. Why did the need to have arisen to have the adult education centre? |
| 3. How long has it been functional? |
| 4. What subjects are taught? |
| 5. How many students are enrolled? How many attend |
| 6. How is the attendance of the students? Do they enjoy coming? |
| 7. Anyone who has dropped out from the Adult Education centre? If yes, Why? |
| 8. Why are only women studying? What is the selection criterion? |
| 9. What is the impact of the initiative on the following?<br>• Employment<br>• Basic Reading Skills<br>• Health<br>• Personal Goals<br>• Further Education<br>• Skill Development<br>• Other outcomes |
| 10. How can we encourage participation of enrolling illiterate people irrespective of barriers? What are the barriers? How can we overcome them? |
| 11. Who is the teacher? How does he/she evaluate the progress? |
| 12. Any complaints |
| 13. Any success story |

***Primary School building:***

***Questions***

| |
|---|
| 1. When was the school constructed? Since when is it functional? |
| 2. How many students study in school? Male/Female |
| 3. What is the human resource and the respective strength in the school? |
| 4. What is the average number of students in a class? |
| 5. What is the infrastructure at the primary school?<br>• Classrooms<br>• Benches<br>• Electricity<br>• Lights<br>• Fans<br>• Toilets and water supply<br>• Drinking Water<br>• Other (mention) |
| 6. Are teachers good? What is the learning level of children?<br>• Good 4-5<br>• Average 2-3<br>• Bad-0-1 |
| 7. Do children enjoy going to school? |
| 8. Are children benefitting from the school? In what ways (Mention)? |
| 9. Any complaints? |

***Water supply***

**Questions**

| |
|---|
| 1. What difficulties were faced by the villagers before the intervention? |
| 2. How far are the other water sources from the village? |
| 3. Why did the need of laying down pipelines arise? |
| 4. Who all were involved in the decision making process? |
| 5. Where is the water supplied (individual households/common storage)? If it is a common storage how do people take it home for use? |
| 6. How many people benefit from this? |
| 7. What do the people use the water for? |
| 8. How does it affect their life?<br>• Education<br>• Livelihood<br>• Sanitation<br>• Commercial<br>• Domestic affairs<br>• Others |
| 9. What are the areas with water deficit? How does this initiative benefit those areas? |
| 10. Any complaints? |
| 11. How can this be improved? |

***Drainage:***

| **Questions** |
|---|
| 1. How was the drainage managed before the initiative? |
| 2. What is the drainage for? |
| 3. What are benefits that are reaped by the people after the initiative? |
| 4. Where is the waste water directed to? |
| 5. Does it have an impact on health?<br>• Positives<br>• Negatives |
| 6. Were people of the village provided information before implementing the project? |

***Solar Lights:***

**Questions**

| |
|---|
| 1. How is the supply of electricity in the village? |
| 2. What were the issues faced by the villagers before the solar light intervention? |
| 3. What is the use of the installed solar lights? |
| 4. Why are the provided for public usage and not for individual usage? |
| 5. Success stories |
| 6. Complaints |

**QUESTIONNAIRE**

***CONSTRUCTION OF PCC/ BITUMINOUS ROAD FOR THE COMMUNITY***

5. Date Time

6. Village:
   Panchayat:
   Block:
   District:
   State:

7. Mukhiya/Sarpanch/Ward member/Participant:
   Name:
   Contact No.:

8. Population:

| | |
|---|---|
| **1.** | When was this road constructed? |
| **2.** | Do you know the agency who created this road?<br>a. BCCL<br>b. State Government<br>c. Local MLA<br>d. MP<br>e. Others - |
| **3.** | If BCCL, How you know about this fact?<br>a. Display board by BCCL<br>b. Gram Sabha/Village Meeting<br>c. Witnessed/passing while construction was going<br>d. Villages<br>e. Others |
| **4.** | What is the length of the road? (In kms.) |
| **5.** | What was the condition before the construction of the road?<br>a. Pucca<br>b. PCC but damaged |
| **6.** | What is the condition after the construction of the road? |
| **7.** | How far is the road from your place? (in kms) |
| **8.** | How many villages or towns does this road connect? (The geographical scale, names of the villages) |
| **9.** | Has this road been benefitted or affected your situation? Please elaborate. |
| **10.** | Please state <u>your</u> uses of this road. |
| **11.** | Did the community contribute in any way during the construction? If yes, how? |
| **12.** | Do you know anyone who was directly involved in the construction of road?<br>a. Yes, who?<br>b. No |
| **13.** | How has this road improved the quality of the life in this particular area?<br>the following questions mark YES or NO. If yes, kindly elaborate. |
| | a. Has there been an increase in amount (volume/proportion) of the commercial profit agricultural production in the area? |

| | |
|---|---|
| | b. Has it become easier to reach the markets with the produce of the area? |
| | c. Have you noticed an increase employment of people in this area? |
| | d. Are more people engaging in the non-agricultural employment like businesses,eg. groceries, artisans, labourers,etc.? |
| **14.** | Has this road improved the connectivity of this area to other places, causing decrease in transportation cost and time to reach places? If yes, how? |
| | For the following questions mark YES or NO. If yes, kindly elaborate. |
| | Education: |
| | a. Has it helped to access the educational institutes more easily? Does it take less time to reach them?<br>b. Has there been an increase in attendance in primary and high schools of the area after the construction? |
| | c. How far are the high schools from here? |
| | d. Has it become more convenient to reach them now? |
| | e. Are more children from this area going to school now? |
| | f. Can you use transports like cycles or rickshaws to reach these places now? |
| | Health: |
| | a. Is there any health care facility in your area?<br>i. Primary Health Centre<br>ii. Community Health Centre<br>iii. Referral Hospital<br>iv. Private Nursing home/Dispensary<br>v. Others |
| | b. How far is the closest healthcarefacility or hospital?<br>i. Less than half Km<br>ii. Less than 1 Km<br>iii. More than 1 Km<br>iv. More than 5 Kms.<br>v. Others |
| | c. Has road made it more convenient to access these centres now? |
| | d. Are you provided with MMV services here? |
| | e. How often?<br>i. Weekly:<br>ii. Monthly: |
| | f. Have you seen an overall improvement of health because of this? |
| | g. Has there been an increase in the utilization of hospitals or healthcare centres after the construction of road? |
| | h. Has the maternal health improved since the construction of the road? |
| | i. Do you see any improvement in rates institutional delivery of infants in this area? |
| **15.** | Has there been any repairs or upkeep after the construction of the road? If yes, who is responsible for the upkeep?<br>a. Fund raising in the villages<br>b. Mukhiya Fund<br>c. Others: |
| **16.** | How does this road serve you during rains? |

| | |
|---|---|
| **17.** | Have you faced any problems after the construction? If yes, what? Please elaborate. |
| **18.** | How the village does contributes to the upkeeping of the road? |
| **19.** | How would rate the quality and viability of this road on a scale<br>a. Very poor<br>b. Poor<br>c. Average<br>d. Good<br>e. Excellent |
| **20.** | Kindly provide any additional comments, concerns and/or observations/suggestions to improve this project? |

# Mid- term Evaluation of Project *Swablamban* - Reeling and Spinning Training Projecr under CSR (Sustainable Development Department), Bharat Coking Coal Limited, Dhanbad FY(2015-16)


**By**

**National CSR Hub**

**Tata Institute of Social Sciences, Mumbai**

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We also extend our gratefulness to respective area General Managers, Medical Officers (Health Department) and concerned project in-charge appointed by BCCL (CSR officials) for making all the arrangements for the study and making us comfortable with their warm hospitality.

Prof. B. Venkatesh Kumar
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## EXECUTIVE SUMMARY

The purpose of this report, mid-term evaluation study was conducted for Reeling and Spinning training as a skill development project. The locations of the study were Alakdiha and Mukunda training centres, in Dhanbad. The primary data collection for the mid-term evaluation was completed in September 2017 by a 6 member team from TISS. Qualitative research methodology was used while in-depth interviews and focused group discussions were the main methods employed.

The Reeling and Spinning training project was conducted in association with Jharkhand Silk Textile and Handicraft Development Corporation (JHARCRAFT), a Government of Jharkhand undertaking under Industry Department, registered under section 26 Companies Act. 1956.

While BCCL provided monetary support and infrastructure, JHARCRAFT provided skilled trainers, handlooms and raw material for the training. The Primary beneficiaries of the project were 150 underprivileged women across locations. Five training centres were proposed in the project proposal out of which two centres were selected as pilot initiatives of the project.

After successful completion of two month long training course at both the centres, beneficiaries were given access to handloom machinery to hone their skills and earn an income in the process. Currently, only one centre is functional with 20-25 beneficiaries regularly coming to the training centre. The project in the mid-implementation phase faces certain challenges such as minimal increase in household income and lack of orders from JHARCRAFT, these if overcome, can result in effective and efficient implementation of the reeling and spinning training project.

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# CHAPTER 1- INTRODUCTION

Businesses are the most powerful constituents of the society and they do not operate in isolation; there is an increased realization that not only can companies affect society at large, but they are also in a unique position to influence society and make positive impact.

> "The Organization for Economic Co-operation and Development[1] (OECD) established a set of guidelines for multinational enterprises in 1976, and was thus a pioneer in developing the concept of CSR. The purpose of these guidelines was to improve the 'investment' climate and encourage the positive contribution multinational enterprises can make to economic and social progress".

An evaluation is 'the systematic and objective assessment of an on-going or completed project, programme or policy, its design, implementation and results. The aim is to determine the relevance and fulfillment of objectives, development efficiency, effectiveness, impact and sustainability. An evaluation should provide information that is credible and useful, enabling the incorporation of lessons learned into the decision-making process of both recipient and donors.' (OECD Publications, 2010)

### 1.1. About Bharat Coking Coal Limited

Bharat Coking Coal Limited (BCCL) is a subsidiary of Coal India Limited, a Maharatna Company. The company is operating in 12 administrative areas in Jharia Coalfields encompassing around 226 peripheral villages mainly in the District of Dhanbad, Jharkhand and in some part of West Bengal. The CSR strategy of BCCL states that the company's main objective is to improve the quality of life of people living in and around its command areas. Towards achieving this objective and to understand the interest levels of the local community, BCCL undertook a departmental baseline survey cum Skill Gap Analysis study at some locations. The recommendations from the study formed the basis for the design and deployment of the skill development initiatives.

[1] http://www.oecd.org/about/

### 1.2. About National Corporate Social Responsibility Hub, TISS

National Corporate Social Responsibility Hub, (NCSR Hub) was established in 2011 by the Department of Public Enterprises to enable the Public Sector Enterprises to design and implement holistic and rights-based CSR initiatives. Tata Institute of Social Sciences (TISS), Mumbai and Department of Public Enterprises (DPE), Government of India had come to realize that there is a need to have centralized system where core functions of CSR including learning and knowledge dissemination take place. The core activities of the Hub are:

- Vision and strategic direction setting for Policy and Programme
- Advisory role for PSEs on Policy and Programme implementation
- Research and development and 'evidence-based' policy advocacy
- Capacity building of PSEs, partners and civil society institution
- Impact assessment, monitoring and evaluation
- Empanelment and partner management

### 1.3. Project Background

REELING AND SPINNING TRAINING PROJECT: This is a skill Development cum employment generation project under "*Swaavlambee* Project" of BCCL targeting groups of unemployed and willing to work women from *Mukunda, Alakdiha, Gareia , Panchmohali* and *Nootangram* villages belonging to Dhanbad District. These villages were chosen because they are located in the command area of BCCL, a project was estimated to generate employment for a group of thirty women from a village. For this purpose, BCCL and JHARCRAFT entered into an agreement for implementation of the project.

### 1.4. Objectives of the project

1. Skill enhancement through Training and shortening the learning curve of skilled and semi-skilled women.
2. Self-Employment generation and enhancing employability of women groups in the villages.

3. To help improve overall quality of life by providing employment to women especially the weaker section of the society.

### 1.5. Mid Term Evaluation study for Reeling And Spinning project of BCCL

Bharat Coking Coal Limited (BCCL) sanctioned mid-term evaluation of the reeling and spinning skill development project to National CSR Hub in August-September 2017. The following report details the evaluation of projects undertaken by Bharat Coking Coal Limited in accordance to their CSR policy laid out in 2014.

As per the agreement with CIL, TISS was entrusted the responsibility to undertake the work of generating data through a baseline survey in the peripheral villages of BCCL. Accordingly TISS conducted a sample survey in 42 villages in and around BCCL in the year 2013 to assess community needs that could be addressed through CSR initiatives. .

Based on the results of the baseline survey, a skilled development and employment generation project was envisioned for unemployed women of these villages. In order to facilitate the identified groups of women of these villages with employment opportunities, initiatives have been taken to take the help of JHARCRAFT, a Government of Jharkhand undertaking. Five groups of women each group comprising of thirty (30) women were identified at Mukunda, Alakdiha, Gareria, Panchmohali and Nootangram village.

# CHAPTER 2– RESEARCH METHODOLOGY

Research methodology is a way to systematically solve the research problem. It may be understood as a science of studying how research is done scientifically. In it, one studies the various steps that are generally adopted by a researcher in studying his research problem along with the logic behind them (Kothari, 2004). This chapter outlines the research methodology and also examines the objectives of the study and the research question. The chapter also includes the research design, methods, and level of engagement for data collection, on and off the field as well as the ethics of research and the limitations that the researcher has kept in consideration.

## 2.1 Objective of Study

The very purpose of the research is to discover answers to the question through the application of the scientific procedures (Kothari, 2004). These objectives help in exploring answers and understanding the behaviour, condition or phenomenon prevalent in the population under study. The aim of the study was to understand the extent of the impact of the project on the socio-economic conditions of the targeted beneficiaries. Further, following are the main objectives of the study:

i. To assess if the objectives of individual projects are being met/have been met;
ii. To understand the continued relevance of the individual projects in their respective contexts;
iii. To identify issues in programmatic implementation and provide recommendation to fulfil the objectives efficiently.

## 2.2 Key issues addressed

- Implementation mechanisms used by the Implementation Agencies;
- Monitoring mechanisms undertaken by the IAs;
- Scope of improvement as articulated by various stakeholders;
- Efforts towards ensuring sustainability of the project
- Documentation of the project design, outcomes and achievements.

## 2.3 Research Design

The research design refers to the overall strategy that one chooses to integrate the different components of the study in a coherent and logical way, thereby, ensuring one will effectively address the research problem; it constitutes the blueprint for the collection, measurement, and analysis of data (De Vaus, 2001)

This study is an **Evaluation** research study as it is designed to assess the outcomes of an intervention, so that the findings will provide insights useful for the organizations that have funded and implemented the project. For the purpose of the mid-term evaluation of reeling and spinning training project, qualitative research design was developed.

## 2.4 Research Methods

### Tools for Data Collection

The tool is one of the essential components of a research study. It is an instrument that helps the researcher to meet the objectives of the research. There are various kinds of tools that are utilized based on the needs and objectives of the research. In the current study the research team made use of certain sets of tools which are as follows:

- **Focused Group Discussion (FGD):** FGDs where conducted in all the 4 project, and those interviewed for the FGD were the village members, Ward/Gram Panchayat Representative, ASHA workers, Women Representatives, SHGs Youth group members etc.
- **In-depth Interviews (IDI):** Similarly IDI was conducted with village members who were directly affected by the project
- **Case studies:** Case studies were used to get life narratives of the beneficiaries and to understand the impact of the project on their socio-economic and cultural lives

## 2.5 Data collection methods

The sampling type used for Data collection was Random Stratified sampling. **Primary data** was collected using the following methods, selected as per the above-explained research design:

a. Survey of beneficiaries through questionnaire

b. Semi-structured interview (using interview schedule) and In-depth interviews. The in-depth interviews were open-ended with complete scope for probing and getting detailed information from the participants.
c. Participatory research methods such as transect walk
d. Document analysis (review of project reports)
e. Direct observation (home visit, village/town visit and institution visit)

**Secondary data:** Secondary data, wherever made available by the implementing agencies, consisted of Annual reports, Project Proposals, Baseline studies and project blue prints

### 2.6 Participants of Data Collection

This study aims to capture perspectives from multiple stakeholders. Accordingly the following participants and stakeholders were covered through the data collection done in this study:

- Beneficiaries i.e. people (here SHG/Women's group) impacted by the project
- Officials of BCCL (Sustainable Development Department)
- Village level stakeholders (Community Leaders):, Sarpanch, ward members and former Sarpanch

### 2.7 Data Analysis

As previously mentioned, this study employs qualitative methods. The responses from the in-depth interviews and the other qualitative data were subjected to coding for detecting patterns. The data from interviews and discussions was analyzed **thematically** and the data from all the sources was integrated as per the responses to understand, assess and evaluate the entire process of implementation. This being a qualitative study, there is an emphasis on understanding and analyzing the perceptions, views and experiences of the beneficiaries and other key stakeholders with respect to the skilled development project.

### 2.8 Challenges of the study

1. **Language Barrier:** The major hurdle in data collection was the language barriers, few of the villagers were speaking Bengali and few were Oriya/Odia.

2. **Limited documentation:** The Limited documentation of the CSR project was another hurdle faced by the research team. It rendered primary data as the only source of information

# CHAPTER 3–FINDINGS FROM THE FIELD

## 3.1 Introduction

"Swaavlambi Project" is a Skill Development initiative of BCCL and JHARCRAFT, an undertaking of Government of Jharkhand. They have mutually agreed to develop skills in weaving and reeling to assure sustainable livelihoods to underprivileged and unemployed women of Dhanbad District of Jharkhand. Mukunda, Alakdiha, Gareia, Panchmohali and Nootangram are the chosen villages to implement this employment generation program. The purpose of the intervention is to develop an infrastructure to train women, employ them in the centres and assure a market linkage for sustainability. The aim is to ensure maximum possible monetary benefits to these women.

## 3.2 Background

"Swaavlambi Project" is a Skill Development initiative of BCCL and JHARCRAFT, an undertaking of Government of Jharkhand. They have mutually agreed to develop skills in weaving and reeling to assure sustainable livelihoods to underprivileged and unemployed women of Dhanbad District of Jharkhand. Mukunda, Alakdiha, Gareia, Panchmohali and Nootangram are the chosen villages to implement this employment generation program. The purpose of the intervention is to develop an infrastructure to train women, employ them in the centres and assure a market linkage for sustainability. The aim is to ensure minimum monetary benefits to these women, BCCL and JHARCRAFT have entered into an agreement to share the responsibilities of the Weaving and Reeling Training Program. JHARCRAFT imparted skill development training to a group of thirty women on Reeling and Spinning of cotton and silk thread in two locations for a period of one month. After having received training, the women were found to be skilled enough, to produce the cotton and silk handlooms. The training centre was the production centre and guidance was provided by the trainers and officials of JHARCRAFT. Apart from training, JHARCRAFT was responsible for generating a market for the produce. The Emporiums across the country were the platforms to exhibit and sale the finished products. The money earned from the sale was to be transferred to the bank accounts of women.

Reeling and spinning training project is a CSR initiative which is a skill development and employment generation project under "*Swaavlambee* Project" of BCCL. Itis focussed on willing unemployed groups of women of the villages *Mukunda, Alakdiha, Gareia, Panchmohali* and *Nootangram* belonging to Dhanbad District. To generate employment opportunities for the women, BCCL and Jharkhand Silk Textile and Handicraft Development Corporation Ltd. (JHARCRAFT) have entered into an agreement for implementation of the project. JHARCRAFT is a Government of Jharkhand undertaking under Industry Department and is registered under section 26 under Companies Act. 1956. It is operating such projects successfully at Khraswan in Jameshdpur, Nagri in Ranchi and Bhagahiya in Sahebganj. Besides this, their projects are also being implemented as CSR activities of Gua Ore Mines, Megahatburu, Kirkburn, Durgapur plant of SAIL and NTPC Hazaribagh, THIESS Minaces, JINDAL Power Patratuas organisations.

In the first phase, for one month, JHARCRAFT imparted skill development training to a group of thirty women on Reeling and Spinning of cotton and silk thread in two locations, Mukunda and Alakdiha. Once trained, these women started production of cotton and silk fabrics under the guidance of JHARCRAFT trainers and officials for the remaining project period. According to the agreement, JHARCRAFT also managed production of the silk products produced by the trained women and promoted marketing of the products through their emporiums spread over various locations of the country. Money earned from the sale of the silk products is being transferred to bank accounts of the women.

This project, therefore, intended to provide a sustainable employment generation for the women of the target communities

### 3.3 Objectives of the reeling and spinning training project

a) Skill enhancement through Training and shortening the learning curve of skilled and semi-skilled women.
b) Self-Employment generation and enhancing employability of women groups in the villages.
c) To help improve overall quality of life by providing employment to women especially the weaker section of the society.

### 3.4 Implementation of the Project

BCCL is the donor partner and JHARCRAFT the Implementing Agency for the Reeling and Spinning Training Program. JHARCRAFT is responsible to train the women and guide the production of cotton and silk handloom for the period of two years. The Agency is also liable for promoting and marketing the produce with sales. Both parties are accountable to each other for the period of mutual agreement as per the MoU. In the documents presented and official's accounts collected, it was found that there was no clear exit strategy after the completion of the project. The officials reported that bimonthly monitoring visits were made to ensure the efficient implementation of the project.

The primary beneficiaries of the project were thirty women pre centre. The beneficiaries were selected on the basis of their vulnerable background and willingness to acquire skills and participate in production post training. These women belonged to socio-economically vulnerability groups. The indirect beneficiaries were, thus, the families of these women.

Out of five proposed locations, centres have been started at Mukunda and Alakdiha. The other centres will be gradually started after analyzing the results of the pilot
Proposed Location of Implementation:

Table No. 1 – Proposed Location of implementation

| Sl.No. | Name of Village | Name of *panchayat* | Name of police Station | District | State |
|---|---|---|---|---|---|
| **1** | Mukunda | Mukunda | Tisra | Dhanbad | Jharkhand |
| **2** | Alakdiha | Alakdiha | Tisra | Dhanbad | Jharkhand |
| **3** | Gareria | Gareria | Kenduadih | Dhanbad | Jharkhand |
| **4** | Panchmohali | Panchmohali | Chirkunda | Dhanbad | Jharkhand |
| **5** | Nootangram | Nootangram | Chirkunda | Dhanbad | Jharkhand |

### 3.5 Observations of the Mid Term Evaluation

Focused Group Discussions with the beneficiaries and Key Informant Interviews with the officials of BCCL were conducted to gain insights on the ongoing projects. BCCL provided financial support to JHARCRAFT so as to develop an infrastructural facility to conduct trainings and manufacture the handlooms. Whereas, JHARCRAFT provided training and guidance for the duration of two years. They also arranged for required resources like raw materials, reeling and spinning equipment, technical support and a network for promotion of sale of the produce from these centres.

During the study, it was observed that out of two, only one centre at Mukunda is functional with only twenty to twenty-five women working for five days a week. The other centre at Alakdiha is non-operational. However, thirty women were provided training at the location. A negotiation is on-going between BCCL, JHARCRAFT and group of women to re-initiate the centre and start the production.

### 3.6 Mukunda Training Centre

The centre was inaugurated in the month of January, 2016 and training started from the month of March, 2016. The facility was provided in the adjoining centre of Mukunda Hospital operated by BCCL. The centre is spacious to facilitate trainings and store needful logistics like raw material, equipment & finished products.

Twenty-five women have been trained and are participating in the process of manufacturing at the Mukunda Centre. They reside in the radius of five kilometers from the centre and are between twenty-five to thirty-five years old. Most are either illiterate or barely educated, only one was reported to be a graduate. The women largely belong to Other Backward Classes, Scheduled Caste and Scheduled Tribe and monthly average income ranges from Rs. 15000 to Rs. 30000 per month. According to the beneficiaries, they are currently not employed anywhere else other than the training centre. None of them have started a self-employment venture as a result of the reeling and spinning training because according to the beneficiaries, the handlooms are unaffordable for them.

Beneficiaries with a finished handloom product and reeling *charkha*

The beneficiaries explained that they were uninitiated to the workings of the handloom craft and thus were hesitant to join the training and commit two years for the same. Since the beneficiaries had not contributed to the household income prior to this initiative, their family members were uncertain about the viability of the project as well. It was only after the detailed information dissemination by the '*mukhiya*' and the BCCL personnel that the women decided to join the training. The beneficiaries were also assured an increase in income as a consequence of the training program. The beneficiaries noted that their main motivation for engaging with this program was to gain a unique skill which could be used for income generation at any time in the future.

The training was conducted in a facility adjoining the Mukunda hospital operated by BCCL. The centre was found to be spacious enough to facilitate trainings and store resources. The facility houses 20 large handlooms along with a storage room for raw materials such as thread, needles, parts of the handlooms and also the finished materials. The women spent approximately five to six hours a day at the facility weaving fabrics. Even though the agreement between BCCL and

Government of Jharkhand states that JHARCRAFT will be solely responsible for the purchase of the finished products and will also bring business for the beneficiaries evidence from secondary research conducted and perspectives from KIIs on the field, indicate that JHARCRAFT has been unable to uphold this aspect of the agreement in its totality. Nevertheless, JHARCRAFT has been instrumental in providing training to the beneficiaries and the trainer is still involved with the production of fabric so that he can provide assistance to the beneficiaries when required.

According to secondary research, JHARCRAFT is, however, not able to provide the optimum market for the produce of the centre. Handloom is learnt over many years whereas these women had spent only two years practicing the craft. Consequently the quality of the product was not at par with market standards On the other hand, the women expected get gainful employment after the completion of the project. Resulting in uncertainty due to the lack of it. This is also breach of contract as they agreed to sale the output of the centre.

The beneficiaries unanimously noted that the trainer was a highly skilled professional trainer who had been integral in the growth of their artisan skills. They were well aware of the procedures of the agreement and the roles of JHARCRAFT and BCCL officials. In addition, they were found to have successfully grasped intricate concepts from their syllabus. They also mentioned that post the initial training period, they practiced the nuances of handloom reeling and spinning and are still in the process of honing their craft. They express their gratitude to the involved parties to help them work on the handloom machines post the training.

Apart from facilitation in acquiring a new skill, the reeling and spinning training project has also helped in self-esteem boost, development of entrepreneurship and enhancement in quality of life. The beneficiaries shared that they had never gone out of their house without a male companion but now are able to access the banking services without any assistance post the training program. They also shared instances of realizing the importance of quality education after exposure to myriad of delegates and officials from the well renowned organisations such as BCCL and their partners. The beneficiaries have now tried to chart out a plan to provide quality education to their children and hope this training program will aid them in contributing to the increase in their household income.

As regards to achievement of stated milestones, disappointment was expressed by beneficiaries, as there have been no financial gains to the women in spite of working for more than five hours a day for twenty days in the month. They earn a bare minimum income of INR 350- INR 600 per month which is less than minimum wages and far less than the benefit promised to them. Conclusively, there is a marginal increase in the household incomes as reported by the beneficiaries. Corrective measures for the same are yet to be taken from the all the stakeholders.

**3.7 Alakdiha Training Centre**

The Research Investigators were unable to interact with any of the respondents from this centre as it was not functional at the time of the study.

The training centre at Alakdiha is non-operational due to many unfortunate constraints accumulated over a period of time. Thirty women were successfully trained and were about to initiate the process of production but everything halted at the demand of mechanized reeling machines. These machines reduce the human labour and time required to weave the handlooms.

At present, all stakeholders are discussing and negotiating in order to reach a mutual consent to re-initiate the centre and avoid further delays loses losses to any of the shareholders.

The BCCL officials explained that the beneficiaries belong to the highly marginalised communities and their villages are located amidst the mining activities of BCCL. Public and private transport rarely plies to these villages making them cut-off from the nearest towns and cities. In these situations, the beneficiaries expected an avenue of income generation located in their vicinity but they feel that this training program has been unsuccessful in providing the same.

Further, there is a strong demand of a mechanised machine for reeling the threads which will reduce their manual labour on reeling on a manual charkha and focus the remaining time on weaving the thread. This matter has been escalated at the level of BCCL and JHARCRAFT and both the organisations are amidst negotiations with the beneficiaries and among themselves to come to a fruitful conclusion.

Table no. 2 – Summary of concerns in Alakdiha Centre

| Sr.No | Stakeholder | Concerns in regard to mechanised reeling machine | Recommendation |
|---|---|---|---|
| **1** | Beneficiaries | Decreases the reeling time by at least 60%. | Demand for mechanised reeling machine. |
| **2** | BCCL | No budgetary allowances for the same in the MoU | Negotiation meeting to be scheduled with JHARCRAFT |
| **3** | JHARCRAFT | No budgetary allowances for the same in the MoU | |

Secondly, the travelling is another major area of concern of these women. There are no public or private transport services bridging the distances between the centre and habitat of the women. These women hail from highly marginalized communities and reside at the sites amidst of the mining activities of BCCL. They remain disconnected with the main cities as there is no consistent and assured mode of transport which is 15-20 kms away. The beneficiaries have also demanded for the production near their vicinity. They expressed that their expectations were not fulfilled and the project was not considerate enough to support these women from the far places.
In spite of extreme difficulties, the recipients of training acknowledged the quality of training, the skills of the trainer, infrastructural facilities, tools & techniques and other necessary resources of the training program.

BCCL and JHARCRAFT are interacting with the women to find best possible solution to terminate the conflicts and re-start the process of manufacturing at the centre.

### 3.8 Concerns regarding the project

When asked about the challenges being faced by the beneficiaries from both training facilities in the past two years of the reeling and spinning training program, following are the main responses:

- Minimal increase in household income: even though the beneficiaries received Rs. 3000 per month for the period of the training, the beneficiaries' state that the income posts that has dwindled. In Mukunda, the women have persevered in the hope of learning new skill as they hail from economically stable families while in Alakdiha, lack of income is of primary concern as they are situated in geographically and economically remote areas. Therefore, lack of income coupled with spending a full working day at the loom is not feasible for the beneficiaries of Alakdiha centre.

- Lack of mechanised tools: the beneficiaries expressed concern about the time manual reeling machines take as compared to ones that have a motor attached. According to the beneficiaries, the mechanised reeling machine can save up to 60% of their time spent in the reeling activities in preparation of fabric production. They note that the time spent on the production of fabric can be increased if the time on reeling the thread is reduced. Currently, they spend at least 10 days on reeling the threads on a manual *charkha* which is then used in the handlooms. They claim that on a mechanised *charkha*, the same reeling process will take 4 days instead of 10 days.

- Lack of orders from JHARCRAFT: the beneficiaries have expressed that there has been a decrease in orders from the aforementioned organisation and they are not provided a variety of threads to work with. They were hoping to be working on bigger orders by now but according to their trainer some of the beneficiaries are still learning and once their skills are further developed they will be able to work with other thread varieties to produce fabric on the handloom.

# CHAPTER 4 - RECOMMENDATIONS

Table no. 3 – Summary of recommendations

| Sr.No | Recommendation | Purpose |
|---|---|---|
| **1** | The internal conflicts can be mutually resolved by discussions and provisions of viable demands. | To revive the existing centres (operational & non-operational) with increased productivity and enhanced quality. |
| **2** | Market Linkages can be multiplied by creating avenues like online sale, participation in exhibitions, display in retail chains and B2B contracts | To assure consistent sale for sustainability. |
| **3** | Branding, product innovation, design development, technical training and technological support can be imparted for better quality product and higher goodwill. | To compete with the changing trends of fashion and offer products at affordable prices. |
| **4** | Training in Entrepreneurship can be conducted as part of the training program. | To motivate the trainees to own the responsibility of sustaining the centres of production. |
| **5** | Trainees can be educated on forming SHGs and availing micro-finance from the financial intuitions. | To make the collective self-reliable and self-sufficient. |
| **6** | Introduce and link with State and Government schemes in Handloom Sector, Women Entrepreneurship, Micro-Finance, Market Linkages, Procurement of raw material & other technical support, | To assure support and sustainability of the enterprise. |
| **7** | A website can be launched with Brand Name | To reach to the new |

| | | |
|---|---|---|
| | and portal for online payments to promote the produce and increase the sale. Social Media can be used as a platform for publicity and awareness. | community of online purchasers and increase the sale multi-fold. |
| **8** | Training on data management, financial management, logistics management, etc can be imparted to the beneficiaries. | To educate beneficiaries on aspects of managerial skills for analysing the state of the enterprise to plan the line of action. |
| **9** | Backward and forward linkages can be identified and specialised services can be exchanged. | To withstand the uncertainties of the market and minimise the risks by sharing it with multiple stakeholders. |
| **10** | Exposure to interact with established cluster collectives. | To learn the process of formation of an enterprise from a small no.of beneficiaries,and extending the participation for more benefits. |

# ANNEXURE

.

**QUESTIONNAIRE FOR BENEFICIARIES**

***SKILL DEVELOPMENT ON REELING AND SPINNING TRAINING UNDER CSR OF BCCL***

*Date:*

*Time:*

*Village:*

| | |
|---|---|
| **1.** | Details of the beneficiary: |
| a) | Name: |
| b) | Age: |
| c) | Educational Qualification: |
| d) | Income: |
| **2.** | Are you currently employed? If yes, with whom? |
| **3.** | Are you working as a skill artisan? |
| **4.** | Or are there initiatives taken to make you self-sufficient entrepreneurs? |
| **5.** | What do you know of this training? (Objectives) |
| **6.** | When did this training start? |
| **7.** | How did you know about this training? |
| **8.** | What made you join this training? |
| **9.** | What were you trained for? |
| **10.** | How were you trained? |
| **11.** | What was the duration of the training? |
| **12.** | Were you satisfied with the trainer? |
| **13.** | How has this training benefitted you? |

| | |
|---|---|
| **14.** | Has there been an increase in the household income? |
| **15.** | What personal skills did you develop? |
| **16.** | Has it brought about any perceptional change in your family? |
| **17.** | What did you like about the training? |
| **18.** | What did you not like about the training? |
| **19.** | What were the immediate effects after training?<br>Social:<br>Familial:<br>Economic: |
| **20.** | Did you earn from the products made during the training? How much did you earn? |
| **21.** | Was it more or less according to your expectations? |
| **22.** | Were you given any stipend during the training? |
| **23.** | Can you teach others what you have learnt? |
| **24.** | Who do you sell your products to? |
| **25.** | Do they give you a target to achieve in a month? |
| **26.** | What are the transactions terms by the buyer? |
| **27.** | Were the beneficiaries given the final assessment at the end of the training? If yes, what was it? |
| **28.** | Are the beneficiaries' parts of a Self Help Group? |
| **29.** | What other skills were imparted to them? |
| **30.** | Was the community involved? If yes, in what ways? |
| **31.** | How has this project shown improvement in the quality of the life in the beneficiaries? Please elaborate (medical insurances, bank accounts, etc.) |
| **32.** | What has been the response/feedback from the beneficiaries to Jharcraft on this project? |
| **33.** | Did Jharcraft face any challenges while engaging with the community? |
| **34.** | To your knowledge, are there any other organizations working with a similar programme in this geographical area? If yes, could you provide the names of those organizations? |
| **35.** | Budget of running the particular project: |

| | |
|---|---|
| **36.** | What was the cost decided upon? |
| **37.** | Was there any deviance? |
| **38.** | Please provide details about the team who were assigned the project:<br>*What was their role? What was the input and the output?* |
| **39.** | What are the strengths and weaknesses of this project? |
| **40.** | Has Jharcraft faced any challenges in engaging with BCCL? What were the key challenges faced during this project? |
| **41.** | What are the key achievements of this project? |
| **42.** | According to you should there be additional measures taken to improve this project? |
| **43.** | Kindly provide any additional comments, concerns and/or observations/suggestions to improve this project? |

**INTERVIEW SCHEDULE FOR BHARAT COKING COAL LIMITED**

DATE:

TIME:

| | | |
|---|---|---|
| **44.** | Details of the Company: | |
| e) | Name: | |
| f) | Designation: | |
| g) | Contact No.: | |
| h) | Address: | |
| **45.** | Name of project: | |
| **46.** | Date of Implementation: | |
| **47.** | Objectives of the project: | |
| **48.** | List which of these objectives were achieved and which were not achieved? | |
| **49.** | Please explain the process of collaboration with Jharcraft. The rationale is stated in the proposal, was that idea accomplished? | |
| **50.** | Why and how did BCCL choose Jharcraft to implement this project? | |
| **51.** | As per the MoU, did Jharcraft do any baseline study before commencing the program? | |
| **52.** | State the geographical areas the project is being implemented in. | |
| **53.** | No. of villages: | Names of villages: |
| **54.** | What is the total number of beneficiaries? (please attach scanned copy of total number of beneficiaries mentioning their phone numbers) | |

| | |
|---|---|
| **55.** | Is there a deviance from the numbers decided upon initially? If yes, why? |
| **56.** | How did you decide upon the beneficiaries? |
| **57.** | Since when has BCCL been funding this project? |
| **58.** | What resources did BCCL contribute? E.g.: Infrastructure, monetary contribution, etc. |
| **59.** | Was the community involved? If yes, in what ways? |
| **60.** | Are the beneficiaries aware of the role of BCCL in this project? Has a display board used to make them aware? |
| **61.** | How has this project shown improvement in the quality of the life in the beneficiaries? What has been the response/feedback from the beneficiaries to BCCL on this project? |
| **62.** | Did BCCL face any challenges while engaging with the community? |
| **63.** | Did the community know that BCCL is the funder agency of this project? |
| **64.** | To your knowledge, are there any other organizations working with a similar programme in this geographical area? If yes, could you provide the names of those organizations? |
| **65.** | Budget of running the particular project: |
| | What was the cost decided upon? Was there any deviance? |
| **66.** | Please provide details about the team who were assigned the project:<br>What was their role? What was the input and the output? |
| **67.** | What are the strengths and weakness of this project? |
| | Strengths: |
| | Weakness: |
| **68.** | Has BCCL undertaken monitoring of the said project? How many times? Kindly provide documents if any. |
| **69.** | Has Jharcraft conducted any evaluation of the project? |
| **70.** | Has BCCL received any monthly reports from Jharcraft? If yes, how many? Please provide with the documents. |
| **71.** | Has BCCL faced any challenges in engaging with Jharcraft? What were the key challenges faced during this project? |
| **72.** | What are the key achievements of this project? |
| **73.** | According to you should there be additional measures taken to improve this project? |
| **74.** | Would you replicate this model in future as your CSR project in more villages? Has this model been already replicated? |
| **75.** | What changes would you include in the replication of the project? |
| **76.** | Kindly provide any additional comments, concerns and/or observations/ suggestions to improve this project? |