भारत कोकिंग कोल लिमिटेड
(एक मिनीरत्न कंपनी)
(कोल इण्डिया लिमिटेड की एक अनुषंगी कंपनी)
(भारत सरकार का उपक्रम)

बीसीसीएल
BCCL
भारत कोकिंग कोल लिमिटेड
Bharat Coking Coal Limited

Bharat Coking Coal Limited
(A Miniratna Company)
(A Subsidiary of Coal India Limited)
(A Government of India Undertaking)

Ref no-BCCL/KA/GM/2025/ 139

Date-28.11.2025

To
The Director
Ministry of Environment, Forest & Climate Change
Regional Office (ECZ)
Bungalow Office No. 42, Shyamali Colony
Ranchi – 834002

Sub: Submission of Six-Monthly EC Compliance Report for the Period April 2025 to September 2025.

Respected Sir,

Kindly find enclosed the Six-Monthly Environmental Clearance (EC) Compliance Report on the implementation of environmental protection measures for the period **April 2025 to September 2025**, pertaining to **Cluster IV Group of Mines** under **Katras Area, BCCL**.

Sir, this is for your kind information and necessary action please.
Hope you will find in order.
Enclosure-As above

Yours Faithfully

28/11/25
General Manager
Cluster IV, BCCL

Copy:-
1.The Director,1A Monitoring cell,Paryavaran Bhawan,CGO Complex, New Delhi-110003
2. Central Pollution Control Board, Parivesh Bhawan, CBD-cum-Office Complex East Arjun Nagar, DELHI - 110 032, INDIA
3. The Director,(S) Ministry of Environment & Forest,Govt.of India –Bhuneshwar751023
4.The Member Secretary, Jharkhand state Pollution Control Board,Ranchi-834004
5. The Regional Officer, Jharkhand state Pollution Board,Dhanabad-826001
6.GM(ENV),BCCL,Koyla Bhawan,Dhanbad
6.Office Copy

EC Order no.J-11015/372/2013-Ia-II(M) dated 16th july 2018 &23rd october 2019		
Sr.no	**Condition**	**Complaince**
1	The project proponent shall carryout source apportionment study and establishment of piezometres within 3 years from the date of issue of this letter.	Source apportionment study for cluster iv has been done(copy attached).2 no's of piezometres with DWLR (one with telemetry system and one with nontelemetry) have been installed.
2	All other terms and condition stipulated in the said environmental clearance dated 16th July 2013 shall remain unchanged.	Agreed to comply
3	The proponent shall obtain all necessary clearance/approvals that may be required before the start of the project.The ministry or any other competent authority may stipulate any further condition for environmental protection.The ministry or any other competent authority may stipulate any further condition for environmental protection.	Agreed to comply
4	The coal company project performance shall be liable to pay the compensation against the illegal mining ,if any and as a by the respective state governments at any point of time in terms of order dated 2nd July 2017 of hon'ble supreme court in WP (civil) no. 114/2014 in the term in the matter of common cause vs union of India and others.	Agreed
5	The concern state government shall ensure that no mining operation shall be carried out till the entire compensation for illegal mining, if any is paid by the project proponent through their respective department of mining and geology in strict compliance of the judgement of honorable supreme court.	Agreed
6	The environmental clearance shall not be operation till such time the project proponent complies with the above said judgement of hon'ble supreme court,as applicable and other statutory requirements.	Agreed
7	This environmental clerance superseds the earlier environmental clerance granted vide letter no.J-11015/212/2010-IA-II(M) dated 6th february 2013.	Noted

CamScanner

SL	Mining	Compliance
1	The environmental clearance shall be valid for a period of one year from the issue of this letter. Further extension/continuance of the project shall be based on evaluation of the action taken on each of the observations of this Ministry's Regional Office during their site visit on 22nd August, 2016.	Agreed. Validity extension of Environmental clearance has been made. EC validity has been extended for life of mine or 30 years whichever is earlier vide EC order no J-11015/372/2013-IA-II (M), dated 23.10.2019. **Annexure 1-** EC order
2	The project proponent shall obtain Consent to establish from the State Pollution Control Boards of Jharkhand for the proposed peak capacity of 9.55 MTPA prior to commencement of the increased production.	Agreed.
3	Transportation of coal from face to Coal heap shall be carried out by truck. Further, the coal transportation from Coal heap to Coal Handling Plant shall be carried out through covered trucks.	It is being complied. **Annexure 2- Pictures of Tarpaulin covered coal transportation in Cluster IV of Bharat Coking Coal Limited**
4	Mitigative measures to be undertaken to control dust and other fugitive emissions all along the roads by providing sufficient numbers of water sprinklers.	It is being complied. Two nos of fixed type fog cannon with 100mt. throw has been installed at siding to suppress the dust emission at siding. Mobile water tanker is used for dust suppression. Fixed Water sprinkling system has been installed. 5 no's of Water tanker of capacity 28KL with mist fitting arrangement and apart from that 1 no's of truck mounted fog cannon of capacity 12 KL has been deployed in cluster IV group of mines. **Annexure 3- Pic of Mobile water tanker with mist fitting, truck mounted fog cannon and fixed water sprinkler.**
5	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.	It is Being Complied. Sufficient coal pillars have been left un-extracted around the air shaft.
6	Solid barrier shall be left below the roads falling within the block to avoid any damage to the roads and no depillaring operation shall be carried out below the township/colony.	Solid barrier have been left below the roads falling within the block to avoid any damage to the roads and no depillaring operation have been carried out below the township/colony.
7	Depression due to subsidence resulting in water accumulating within the low lying areas shall be filled up or drained out by cutting drains.	It is being complied.
8	Sufficient number of pumps of adequate capacity shall be deployed to pump out mine water during peak rain fall.	It is being complied.
9	The company shall obtain approval of CGWA for use of groundwater for mining operations at its enhanced capacity of 9.55 MTPA.	No objection certificate for Ground water abstraction has been accorded by ministry of Jal Shakti vide noc ref letter no-CGWA/NOC/MIN/REN/1/2025/11517. **Annexure-3(A)**

10	Continuous monitoring of occupational safety and other health hazards, and the corrective actions need to be ensured.	It is being complied. Safety talk is being given to workers at mine during starting of shift. PPE has been provided to workers. **Annexure 4-safety talk pic and distribution list of PPE.**
11	The fire dealing operations by excavating out fire should be expedited.	It is being complied. **Annexure 5-** Pic of fire dealing operation.
1	Mining shall be carried out under strict adherence to provisions of the Mines Act, 1952 and subordinate legislations made there-under as applicable.	It is being Complied.
2	Mining shall be carried out as per the approved mining plan(including Mine Closure Plan) abiding by mining laws related to coal mining and the relevant circulars issued by Directorate General Mines Safety (DGMS).	It is being Complied. Mining Plans of mines of Cluster-IV has been approved on 03.08.2017 on 333th Board Meeting & revision of Katras choitudih colliery has also been made on 392nd Board Meeting of M/s BCCL whereas Mine life of Katras choitudih colliery has been extended upto 24 years. **Annexure 6-** Copy of approved mining plan
3	No mining shall be carried out in forest land without obtaining Forestry Clearance as per Forest (Conservation) Act, 1980	There is no forest land existing under the leasehold of Cluster IV. **Annexure 7-** No forest land certificate
4	No change in mining method i.e. UG to OC, calendar programme and scope of work shall be made without obtaining prior approval of the Ministry of Environment, Forests and Climate Change (MoEFCC).	It is being Complied. OCP based on shovel-dumper combination and UG based on bord and pillar are in operation at present.
5	Underground work place environmental conditions shall be rendered ergonomic and air breathable with adequate illumination in conformance with DGMS standards.	It is being Complied.
	Land reclamation and water conservation	
1	Digital Survey of entire lease hold area/core zone using Satellite Remote Sensing survey shall be carried out at least once in three years for monitoring land use pattern and report in 1:50,000 scale or as notified by the Ministry of Environment, Forest and Climate Change from time to time shall be submitted to MoEFCC/Regional Office.	The proponent has got a study carried out through NRSC Hyderabad. NRSC has been awarded the work to prepare time series map by isothermal mapping. NRSC has carried out the work of Isothermal Mapping in 2014, 2018 ,2021&2024. **Annexure 8– Last Time-series map of 2024**

2	The surface drainage plan including surface water conservation plan for the area of influence affected by the said mining operations, considering the presence of river/rivulet/pond/lake etc, shall be prepared and implemented by the project proponent. The surface drainage plan and/or any diversion of natural water courses shall be as per the approved Mining Plan/EIAIEMP report and with due approval of the concerned State/Go I Authority. The construction of embankment to prevent any danger against inrush of surface water into the mine should be as per the approved Mining Plan and as per the permission of DGMS or any other authority as prescribed by the law.	The surface drainage plan is attached herewith. No diversion of natural water courses has been done. The construction of embankment to prevent any danger against inrush of surface water into the mine has been constructed. **Annexure- 9-** surface drainage plan
3	The final mine void depth should preferably be as per the approved Mine Closure Plan, and in case it exceeds 40 m, adequate engineering interventions shall be provided for sustenance of aquatic life therein. The remaining area shall be backfilled and covered with thick and alive top soil. Post-mining land be rendered usable for agricultural/forestry purposes and shall be diverted. Further action will be treated as specified in the guidelines for preparation of Mine Closure Plan issued by the Ministry of Coal dated 2th August, 2009.	The final mine void depth will preferably be as per the approved Mine Closure Plan. At the end of mining all the remaining excavated area will be leveled and reclaimed physically as well as Biologically.
4	The entire excavated area, backfilling, external OB dumping (including top soil) and afforestation plan shall be in conformity with the "during mining"/"post mining" land-use pattern, which is an integral part of the approved Mining Plan and the EIA/EMP submitted to this Ministry. Progressive compliance status vis-a-vis the post mining land use pattern shall be submitted to the MOEFCC/RO.	The entire excavated area, backfilling, external OB dumping (including topsoil), and afforestation plan is in conformity with the approved guidelines. The land-use pattern has already been submitted to the Ministry. A total green-belt area of 197.57 Ha(29.75 Ha over OB dumps 160.53 Ha under social forestry & avenue plantation,7.29 Ha over backfilled area)can be observed within cluster IV as per CMPDIL Land Reclamation Monitoring Report-2024. During FY 2024-25, greenery development has been carried out over 2.4 Ha of OB dump area. In addition, 1,200 nos. of avenue plantations have been undertaken. In FY 2025-26, plantation over 2.3 Ha area has developed. Annexure-10: Land Reclamation Monitoring Report

5	Fly ash shall be used for external dump of overburden, backfilling or stowing of mine as per provisions contained in clause (I) and (ii) of subparagraph (8) of fly ash notification issued vide S.0.2804 (E) dated 3rd November, 2009 as amended from time to time. Efforts shall be made to utilize gypsum generated from Flue Gas Desulfurization (FGD), if any, along with fly ash for external dump of overburden, backfilling or stowing of mines. Compliance report shall be submitted to Regional Office of MoEF&CC, CPCB and SPCB.	There is no generation of fly ash in cluster IV.
6	It shall be ensured that as per the time schedule specified in mine closure plan it should remain live till the point of utilization. The top soil shall temporarily be stored at earmarked site(s) only and shall not be kept unutilized. The top soil shall be used for land reclamation and plantation purposes. Active OB dumps shall be stabilised with native grass species to prevent erosion and surface run off. The other overburden dumps shall be vegetated with native flora species. The excavated area shall be backfilled and afforested in line with the approved Mine Closure Plan. Monitoring and management of rehabilitated areas shall continue until the vegetation becomes self-sustaining. Compliance status shall be submitted to the Ministry.	It is being Complied. Top soil is being stored. Top soil is being utilized as plantation site. Grassing after preparing of seed ball has been done over 33 Ha OB area till date. Backfilling of excavated area is being done as per mine closure guidelines. green-belt area of 197.57 Ha(29.75 Ha over OB dumps 160.53 Ha under social forestry & avenue plantation,7.29 Ha over backfilled area)can be observed within cluster IV as per CMPDIL Land Reclamation Monitoring Report-2024. During FY 2024-25, greenery development has been carried out over 2.4 Ha of OB dump area. In addition, 1,200 nos. of avenue plantations have been undertaken. In FY 2025-26, plantation over 2.3 Ha area has developed. **Annexure 10 A- Top soil storage plan** **Annexure 10 B- Plantation details (2014-15 to till date)**
7	Post-mining land shall be rendered usable for agricultural/forestry purposes and handed over to the respective State Government, as specified in the Ministry of Coal Guidelines dated 27th August, 2009 for Preparation of Mine Closure Plan.	It will be complied. **Annexure 11- Approval copy of Mine closer plan.**
8	Regular monitoring of subsidence movement on the surface over and around the working areas and its 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 beyond the limit prescribed, appropriate effective mitigation measures shall be taken to avoid loss of life and materials. Cracks should be effectively plugged in with ballast and clay soil/suitable material.	No depillaring in underground mine is going on hence no mining induced subsidence is taking place. Regular monitoring of subsidence is being done by subsidence monitoring committee of the area.
9	A separate team for subsidence monitoring and surface mitigation measures shall be constituted and continuous monitoring & implementation of mitigation measures be carried out.	It is being complied. A Certificate of Project Officers and General Manager of the Cluster IV, indicating no subsidence due to mining operation is being attached. **Annexure 12- Certificate Regarding no subsidence due to mining operation.**

10	Thorough inspection of the mine lease area for any cracks developed at the surface due to mining activities below ground shall be carried out to prevent inrush of water in the mine.	It is being complied.
11	Native tree species shall be selected and planted over areas affected by subsidence.	Plants like seesam, Gamhar, Aam, Peepal,Bargad, Sagwan, Kathal etc. has been planted over areas likely to be affected by subsidence.
	Emissions, effluents, and waste disposal	
1	Transportation of coal, to the extent permitted by road, shall becarried out by covered trucks/conveyors. Effective control measures such as regular water/mist sprinkling/rain gun etc shall be carried out in critical areas prone to air pollution (with higher values of PM1Q/PM2.s)such as haul road, loading/unloading and transfer points. Fugitive dust emissionsfrom all sourcesshall be controlled regularly. It shall be ensured that the Ambient Air Quality parameters confirm to the norms prescribed by the Central/State Pollution Control Board.	Vehicular emission is kept under control by proper maintenance of vehicles. Vehicular emissions are being monitored in every prescribed period. Only those vehicles are being allowed to run having PUC. In addition to the above coal transportation is done by tarpaulins covered and optimally loaded vehicles. The project authorities are regularly checking all the loaded trucks/dumpers coming inside the plant about their valid PUC.
2	Greenbelt consisting of 3-tier plantation of width not less than 7.5 m shall be developed all along the mine lease area as soon as possible. The green belt comprising a mix of native species (endemic species should be given priority) shall be developed all along the major approach/ coal transportation roads.	During FY 2025–26, greenery development has been carried out over 2.3 Ha of OB dump area. In addition to this, 1,200 nos. of avenue plantations have been completed. To meet the green-belt development target, the work order has been issued to the DFO, Dhanbad. Till date, a total plantation over 24 Ha of OB dump area and 2,285 nos. of avenue plantations have been undertaken by DFO Dhanbad. Plantation activities are being carried out in all available spaces to achieve a dense and effective green belt within the project area. Green belt development is being complied with. A total green-belt area of 197.57 Ha has been developed, including:29.75 Ha over OB dumps 160.53 Ha under social forestry & avenue plantation 7.29 Ha over backfilled area can be observed within cluster IV as per CMPDIL Land Reclamation Monitoring Report-2024. Additionally, two Sneh Smriti Udyan (Fruit Orchard) sites have been developed over around 1.5 Ha area. Grass seeding has also been broadcast over around 36 Ha of OB dump area. **13 - plantation Pics.**

3	The transportation of coal shall be carried out as per the provisions and route envisaged in the approved Mining Plan or environment monitoring plan. Transportation of the coal through the existing road passing through any village shall be avoided. In case, it is proposed to construct a 'bypass' road, it should be so constructed so that the impact of sound, dust and accidents could be appropriately mitigated.	Presently, road transportation is being done by covering vehicle with tarpaulin.
4	Vehicular emissions shall be kept under control and regularly monitored. All the vehicles engaged in mining and allied activities shall operate only after obtaining 'PUC' certificate from the authorized pollution testing centres.	Vehicular emissions are being monitored in every prescribed period. Only those vehicles are being allowed to run having PUC. In addition to the above coal transportation is done by tarpaulins covered and optimally loaded vehicles. The project authorities are regularly checking all the loaded trucks/dumpers coming inside the plant about their valid PUC.
5	Coal stock pile/crusher/feeder and breaker material transfer points shall invariably be provided with dust suppression system. Belt-conveyors shall be fully covered to avoid air borne dust. Side cladding all along the conveyor gantry should be made to avoid air borne dust. Drills shall be wet operated or fitted with dust extractors.	It is being complied. Dust suppression arrangement has been made at crusher. Fixed type water sprinkler have been installed. Installation of Belt conveyor system may leads to fire Hazard as the existence of fiery coal seam in our command area. **Annexure 14- Dust suppression arrangement at coal loading point of CHP.**
6	Coal handling plant shall be operated with effective control measures w.r.t. Various environmental parameters. Environmental friendly sustainable technology should be implemented for mitigating such parameters.	It is being complied. Two nos of fixed type fog cannon with 100mt. throw has been installed at siding to suppress the dust emission at siding. Mobile water tanker is used for dust suppression. Fixed Water sprinkling system has been installed. 5 no's of Water tanker of capacity 28KL with mist fitting arrangement and apart from that 1 no's of truck mounted fog cannon of capacity 12 KL has been deployed in cluster IV group of mines.
7	Ground water, excluding mine water, shall not be used for mining operations. Rainwater harvesting shall be implemented for conservation and augmentation of ground water resources.	It is being complied. Only mine water is used for industrial purpose i.e fire dealing, watering the mine area, roads, green belt development etc. Regular monitoring of ground water level and quality are being monitored by CMPDIL, Ranchi. Rain water Harvesting arrangement has been made. Roof top rain water harvesting system has also been developed at coal dump colony under cluster IV. **Annexure 15- Ground water monitoring report** **Annexure 16- Rain water harvesting arrangement.**

8	Catch and or garland drains and siltation ponds in adequate numbers and appropriate size shall be constructed around the mine working, coal heaps & OB dumps to prevent run off of water and flow of sediments directly into the river and water bodies. Further, dump material shall be properly consolidated/ compacted and accumulation of water over dumps shall be avoided by providing adequate channels for flow of silt into the drains. The drains/ ponds so constructed shall be regularly de-silted particularly before onset of monsoon and maintained properly. Sump capacity should provide adequate retention period to allow proper settling of silt material. The water so collected in the sump shall be utilised for dust suppression and green belt development and other industrial use. Dimension of the retaining wall constructed, if any, at the toe of the OB dumps within the mine to check run-off and siltation should be based on the rainfall data. The plantation of native species to be made between toe of the dump and adjacent field/habitation/water bodies.	It is being complied. A total **400 meters** length of toe wall has been constructed along the OB dump. With this, the cumulative toe wall length constructed till date stands at **1,200 meters.** Additionally, a **spillway** has been constructed to prevent the entry of silt into the main stream. **Annexure 17- Pic of toe wall made along OB dump.** **Annexure 18- Pic of siltation pond.**
9	Adequate groundwater recharge measures shall be taken up for augmentation of ground water. The project authorities shall meet water requirement of nearby village(s) after due treatment conforming to the specific requirement (standards).	Five nos of Rain water Harvesting pond has been created. Water is being supplying to nearby villages after treatment of mine water as per requirement.
10	Solid waste/hazardous waste generated in the mines shall be addressed in accordance to the MSW Rules, 2016.	It is being complied. Solid waste/hazardous waste generated in the mines is being addressed in accordance to the MSW Rules, 2016.
11	The water pumped out from the mine, after siltation, shall be utilized for industrial purpose viz. watering the mine area, roads, green belt development etc. The drains shall be regularly desilted particularly after monsoon and maintained properly.	It is being complied. Pumped out water are being utilized for water sprinkling on haul road, green belt development, fire dealing etc.
12	Major approach roads shall be black topped and properly maintained.	It is being complied.
13	The project proponent shall not alter major water channels around the site. Appropriate embankment shall beprovided along the side of the river/nallah flowing near or adjacent to the mine. The embankment constructed along the river/nallah boundary shall be of suitable dimensions and critical patches shall be strengthened by stone pitching on the river front side, stabilized with plantation so as to withstand the peak water pressure preventing any chance of mine inundation.	The embankment constructed along the river boundary is of suitable dimension and critical patches has been strengthened by concreting and stone pitching as per design made by Central Mine Planning and Design Institute Limited (CMPDIL) on the river front side and stabilized with plantation to withstand the peak water flow and prevent mine inundation. Construction of concrete embankment at critical patch of nallah/Jore has been done. Total length of constructed embankment is 3000 m. **Annexure 19-Pic of embankment constructed.**

14	Garland drains (of suitable size, gradient and length) around the critical areas i.e. mine shaft and low lying areas, shall be designed keeping at least 50% safety margin over and above the peak sudden rainfall and maximum discharge in the area adjoining the mine sites. The sump capacity shall also provide adequate retention period to allow proper settling of silt material of the surface runoff.	It is being complied. Garland drains (of suitable size, gradient and length) around the critical areas i.e. mine shaft and low lying areas, has been designed.
15	Industrial waste water from coal handling plant and mine water shall be properly collected and treated so as to conform to the standards prescribed under the Environment (Protection) Act, 1986 and the Rules made there under, and as amended from time to time. Oil and grease trap shall be installed before discharge of workshop effluent. Sewage treatment plant of adequate capacity shall be installed for treatment of domestic waste water.	Mine water is being reused in mine for industrial purposes (sprinkling, fire control etc.) Oil and grease trap has been installed at the workshops. **Annexure 20- Pic of Oil & Grease trap**
	Illumination, noise & vibration	
1	Adequate illumination shall be ensured in all mine locations (as per DGMS standards) and monitored weekly. The report on the same shall be submitted to this ministry & its RO on six-monthly basis.	It is being complied. Latest report of the same is being attached herewith. **Annexure 21- Illumination monitoring report.**
2	Adequate measures shall be taken for control of noise levels as per noise pollution Rules, 2016 in the work environment. Workers engaged in blasting and drilling operations, operation of HEMM, etc shall be provided with personal protective equipments (PPE) like ear plugs/muffs in conformity with the prescribed norms and guidelines in this regard. Adequate awareness programme for users to be conducted.	Personnel operating near HEMMs, drilling machine comply with safety regulation and are equipped with Personal Protective Equipment. Awareness programmes are being given to all the personnel at Vocational training center and mine site.
3	Controlled blasting techniques shall be practiced in order to mitigate ground vibrations, fly rocks, noise and air blast etc. as per the guidelines prescribed by the DGMS.	It is being complied. Controlled blasting techniques are being practiced in order to mitigate ground vibrations, fly rocks, noise and air blast etc. as per the guidelines prescribed by the DGMS. **Annexure 22- Ground vibration report.**
4	The noise level survey shall be carried out as per the prescribed guidelines to assess noise exposure of the workmen at vulnerable points in the mine premises, and report in this regard shall be submitted to the Ministry/RO on six-monthly basis.	It is being complied. Noise level is being monitored by CMPDIL. **Annexure 23- Noise level Monitoring Report**
	Occupational health & safety	
1	The project proponent shall undertake occupational health survey for initial and periodical medical examination of the personnel engaged in the project and maintain records accordingly as per the provisions of the Mines Rules, 1955 and DGMS circulars. Besides regular periodic health check-up, 20% of the personnel identified from workforce engaged in active mining operations shall be subjected to health check-up for occupational diseases and hearing impairment, if any, as amended time to time.	IME/PME is done periodically for the workers to observe any contractions due to exposure to dust and to take corrective measures, if needed and records maintained thereof. **Annexure 24- IME/PME report**

2	Personnel working in core zone shall wear protective respiratory devices and shall also be provided with adequate training and information on safety and health aspects.	Training and awareness programmes are being given to all the personnel working in dusty areas. PPE kit have been provided to the personnel engaged in mining and working under cluster IV. **Annexure 25- training photograph**
	Ecosystem and biodiversity conservation	
1	The project proponent shall take all precautionary measures during mining operation for conservation and protection of endangered/endemic flora/fauna, if any, spotted/reported in the study area. The Action plan in this regard, if any, shall be prepared and implemented in consultation with the State Forest and Wildlife Department.	For the FY 2025-26 plantation over 2.3 ha area has been developed.Ecological restoration are being done in consultation with FRI, dehradun. Road Map of Ecological restoration has been made. **Annexure 26- Afforestation Programme of cluster-IV**
2	The project proponent shall take all precautionary measures to ensure riverine/riparian ecosystem in and around the coal mine upto a distance of 5 km. A riverine/riparian ecosystem conservation and management plan should be prepared and implemented in consultation with the irrigation/water resource department in the State Government.	Monitoring of river water is being done regularly. Special affords has been made for cleaning of river water, drives like swachhta pakhwada are being organised regularly.
	Public Hearing, R&R and CSR	
1	Implementation of the action plan on the issues raised during the public hearing shall be ensured. The project proponent shall undertake all the tasks/measures as per the action plan submitted with budgetary provisions during the public hearing. Land oustees shall be compensated as per the norms laid down in the R&R policy of the company/State Government/Central Government, as applicable.	It is being complied. Compliance report of public hearing has been sent to ministry. Land oustees are getting their compensation as per norms laid down in R&R policy of the company.
2	The project proponent shall ensure the expenditure towards socio-economic development in and around the mine every financial year in pursuance of the Corporate Social Responsibility Policy as per the provisions under Section 135 of the Companies Act, 2013.	It is being complied. Expenditure towards socio-economic development has been ensured. During the COVID-19 pandemic distribution of food packets, mask, sanitizer and other essentials has been provided to local peoples. **Annexure 27- List of activities undertaken in and around the mine in pursuance of CSR policy.**
3	The project proponent shall follow the mitigation measures provided in this Ministry's OM NO.Z-11013/5712014-IA.11 (M) dated 29th October, 2014, titled 'Impact of mining activities on habitations-issues related to the mining projects wherein habitations and villages are the part of mine lease areas or habitations and villages are surrounded by the mine lease area'.	It is being complied.

4	The project proponent shall make necessary alternative arrangements, if grazing land is involved in core zone, in consultation with the State government to provide alternate areas for livestock grazing, if any. In this context, the project proponent shall implement the directions of Hon'ble Supreme Court with regard to acquiring grazing land.	No grazing land is involved in core zone.
	Corporate environment responsibility	
1	The Company shall have a well laid down environment policy duly approved by Board of Directors. The environment policy should prescribe for standard operating procedures to have proper checks and balances and to bring into focus any infringements/deviation/violation of the environmental or forest norms/conditions. Also, the company shall have a defined system of reporting of non-compliances/violations of environmental norms to the Board of Directors and/or shareholders/stakeholders.	It is being complied. Corporate Environmental policy has been made, approved by CMD of M/s BCCL and it is being implemented. Environment management cell has also been made to ensure implementation of environmental management plan. A parasnath udhyan as an eco-park has been made under corporate environment responsibility. The said park was inaugurated by honorable home minister shri Amit Shah on dated 23-July-2020 in presence of honorable coal minister shri pralhad joshi. **Annexure 28- CER policy**
2	The project proponent shall comply with the provisions contained in this Ministry's OM dated 1st May, 2018, as applicable, regarding Corporate Environment Responsibility.	It is being complied. Corporate Environmental policy has been made, approved by CMD of M/s BCCL and it is being implemented.
3	A separate environmental management cell both at the project and company headquarter level, with suitable qualified personnel shall be set-up under the control of a Senior Executive, who will report directly to the Board level executive/Head of the Organization.	A full-fledged Environment Department, headed by a HoD (Environment) along with a suitable qualified multidisciplinary team of executives has been established at the Headquarters. At the area level, one Executive in each area has been nominated as Nodal Officer (Environment). Management Trainees/Asst. Managers (Environment) have also been deputed at area level. The activities are monitored on regular basis at Area and at Headquarters levels. DGM (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.

4	Action plan for implementing EMP and environmental conditions along with responsibility matrix of the company shall be prepared and shall be duly approved by competent authority. The year wise funds earmarked for environmental protection measures shall be kept in separate account and not to be diverted for any other purpose. Year wise progress of implementation of action plan shall be reported to the Ministry/Regional Office along with the Six Monthly Compliance Report.	It is being complied. Action plan has been made, work is being done accordingly. Year wise funds earmarked for environmental protection measure has been kept separately. **Annexure 29- Environmental protection measure expenditure details**
5	Self environmental audit shall be conducted annually. Every three years third party environmental audit shall be carried out.	It is being complied. CCO has been engaged for the audit of plantation done per year. IIEST, Shibpur is attached for auditing of Mine closure activity done in Katras Area.
6	Skill training as per safety norms specified by DGMS shall be provided to all workmen including the outsourcing employees to ensure high safety standards in mines.	Skill training as per safety norms specified by DGMS are being provided to all workmen including the outsourcing employees to ensure high safety standards in mines.
7	Effective arrangement shall be made to provide and maintain at suitable points conveniently situated, a sufficient supply of drinking water for all the persons employed.	It is being Complied.
	Statutory Obligations	
1	This environmental clearance shall be subject to obtaining Forest Clearance from the concerned regulatory authority, Wildlife clearance from the Standing Committee of National Board for Wildlife, as applicable to the project.	There is no forest land existing under the leasehold of Cluster IV.
2	The project proponent shall obtain the necessary permission from the Central Ground Water Authority (CGWA) if applicable.	NOC have been accorded from ministry of Jal Shakti. **Annexure 30-** NOC for ground water abstraction
3	The Environmental clearance shall be subject to orders of Hon'ble Supreme Court of India, Hon'ble High Courts, NGT and any other Court of Law, from time to time, and as applicable to the project.	It is being complied.
4	The project proponent shall obtain Consent to Establish/Operate under the Air (Prevention &Control of Pollution) Act, 1981 and the Water (Prevention & Control of Pollution) Act, 1974 from concerned SPCB	It is being complied.
	Monitoring of project	

1	Continuous ambient air quality monitoring stations as prescribed in the statue be established in the core zone as well as in the buffer zone for monitoring of pollutants, namely PM1o, PM2.5, S02 and NOx. Location of the stations shall be decided based on the meteorological data, topographical features and environmentally and ecologically sensitive targets in consultation with the State Pollution Control Board. Online ambient air quality monitoring stations may also be installed in addition to the regular monitoring stations as per the requirement and/or in consultation with the SPCB. Monitoring of heavy metals such as Hg, As, Ni, Cd, Cr, etc to be carried out at least once in six months.	Location of Monitoring station in the Jharia Coal Field have been finalized with the Jharkhand State Pollution Control Board. Five ambient air quality monitoring station has been established two at core zone and three at buffer zone. At core zone station established at AARC (Ramkanali) & Katras Chotudih Mine office and at buffer zone station established at Mine office-Block-IV, Nichitpur and RudhiBasti respectively. Presently air quality monitoring is being done as per norms at each location. Monitoring data regularly submitted to the Ministry including its Regional Office at Ranchi. Monitoring of air quality is being done by Central Mining & Planning Design Institute (CMPDIL), Dhanbad. Administrative approval has been accorded for the installation of CoAAQMS and the location has been finalized by Regional Officer, JSPCB Dhanbad. Tendering for installation of Coaaqms has been done several times but no bidder qualified. Retendering done and technical evaluation is in progress, however PM10 analyzer has been installed at two locations one for monitoring of siding and one for mines. **Annexure 31- Monitoring station location details and Coaaqms tender copy**
2	The Ambient Air Quality monitoring in the core zone shall be carried out to ensure the Coal Industry Standards notified vide GSR 742 (E) dated 25.9.2000 and as amended from time to time by the Central Pollution Control Board. Data on ambient air quality and heavy metals such as Hg, As, Ni, Cd, Cr and other monitoring data shall be regularly reported to the Ministry/Regional Office and to the CPCB/SPCB.	It is being complied. CMPDIL has been engaged for Air Quality monitoring as well as heavy metals. **Annexure 32- Ambient Air quality monitoring report**
3	The effluent discharge (mine waste water, workshop effluent) shall be monitored in terms of the parameters notified under the Water Act, 1974 Coal Industry Standards vide GSR 742 (E) dated zs" September, 2000 and as amended from time to time by the Central Pollution Control Board.	Monitoring of River water are being done by CMPDIL regularly in Upstream and Downstream. **Annexure 33- Monitoring Report**
4	The monitoring data shall be uploaded on the company's website and displayed at the project site at a suitable location. The circular No. J-20012/1/2006-IA.11 (M) dated 27th May, 2009 issued by the Ministry shall also be referred in this regard for compliance.	It is being complied.

5	Regular monitoring of ground water level and quality shall be carried out in and around the mine lease area by establishing a network of existing wells and constructing new piezometers during the mining operations. The monitoring of ground water levels shall be carried out four times a year i.e. pre-monsoon, monsoon, post-monsoon and winter and water quality once a year, and the data thus collected shall be sent regularly to MoEFCC/RO.	2 nos of Piezometer have been installed at cluster IV group of mines.
6	Monitoring of water quality upstream and downstream of water bodies shall be carried out once in six months and record of monitoring data shall be maintained and submitted to the Ministry of Environment, Forest and Climate Change/Regional Office.	It is being complied. Monitoring of water quality upstream and downstream of water bodies is being carried out once in six months and record of monitoring data has been maintained and submitted to the Ministry of Environment, Forest and Climate Change/Regional Office. **Annexure 34- Water quality Monitoring Report enclosed as an Annexure 33**
7	The project proponent shall submit six monthly reports on the status of the implementation of the stipulated environmental conditions to the MOEFCC/RO. For half yearly monitoring reports, the data should be monitored for the period of April to September and October to March of the financial years.	It is being Complied. Six monthly reports on the status of the implementation of the stipulated environmental conditions are being submitted to the MOEFCC/RO. **Annexure 35 - Forwarding letter of last six monthly compliance report**
8	The Regional Office of this Ministry shall monitor compliance of the stipulated conditions. The project authorities should extend full cooperation to the officer (s) of the Regional Office by furnishing the requisite data / information/monitoring reports.	It is being complied.
	Miscellaneous	
1	Efforts should be made to reduce energy consumption by conservation, efficiency improvements and use of renewable energy.	LED bulb has been distributed among employees. Training has also been provided regarding the same. Solar panel have been installed at cluster IV. (Pic attached) Installation of Roof top solar system at cluster IV, head office is also in line, tender has been floated for the same.
2	The project authorities shall inform to the Regional Office of the MOEFCC regarding commencement of mining operations.	Complied.
3	A copy of the environmental clearance shall be marked to concerned Panchayat. A copy of the same shall also be sent to the concerned State Pollution Control Board, Regional Office of the MOEFCC, District Industries Centre and Collector's Office/Tehsildar Office for information in public domain within 30 days.	complied.

4	The EC shall be uploaded on the company's website. The compliance status of the stipulated EC 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.	It is being Complied. EC has uploaded on the company's website. Six monthly compliance status are also being uploaded on company's website.
5	The project authorities shall advertise at least in two local newspapers widely circulated, one of which shall be in the vernacular language of the locality concerned, within 7 days of the issue 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 also at web site of this Ministry at www.environmentclearance.nic.in and a copy of the same shall be forwarded to the Regional Office.	Complied. **Annexure 36- Copy of newspaper advertisement.**
6	The environmental statement for each financial year ending 31st March in Form-V is mandated to be submitted by the project proponent for the concerned State Pollution Control Board as prescribed under the Environment (Protection) Rules, 1986, as amended subsequently, shall also be uploaded on the Company's website along with the status of compliance of EC conditions and shall be sent to the respective Regional Offices of the MoEF&CC by email.	Complied regularly on time
7	The project proponent shall abide by all the commitments and recommendations made in the EIA/EMP report and also that during their presentation to the EAC.	It is being Complied. EIA/EMP is being implemented.
8	Concealing factual data or submission of false/fabricated data and failure to comply with any of the conditions mentioned above may result in revocation of this EC and attract action under the provisions of Environment (Protection) Act, 1986.	Agreed.
9	The above conditions will be enforced inter-alia, under the provrsrons of the Water (Prevention & Control of Pollution) Act, 1974, the Air (Prevention & Control of Pollution) Act, 1981, the Environment (Protection) Act, 1986 and the Public Liability Insurance Act, 1991 along with their amendments and Rules and any other orders passed by the Hon'ble Supreme Court of India/High Courts and any other Court of Law relating to the subject matter.	Agreed.
10	Adequate ambient air quallty monitoring stations shall be established in the core zone as well as in the buffer zone for monitoring of pollutants, namely particulates, S02 and NOx. Location of the stations shall be decided based on the meteorological data, topographical features and environmentally and ecologically sensitive receptors in consultation with the State	Location of Monitoring station in the Jharia Coal Field have been finalized with the Jharkhand State Pollution Control Board. Five ambient air quality monitoring station has been established two at core zone and three at buffer zone. At core zone station established at AARC

	Pollution Control Board. Monitoring of heavy metals such as Hg, As, Ni, Cd, Cr, etc. to be carried out at least once in six months. Online ambient air quality monitoring station/stations may also be installed in addition to the regular air monitoring stations as per the requirement and/or in consultation with the SPCB.	(Ramkanali) & Katras Chotudih Mine office and at buffer zone station established at Mine office-Block-IV, Nichitpur and RudhiBasti respectively. Presently air quality monitoring is being done as per norms at each location. Monitoring data regularly submitted to the Ministry including its Regional Office at Ranchi. Monitoring of air quality is being done by Central Mining & Planning Design Institute (CMPDIL), Dhanbad.

28/11/25

General Manager
Cluster IV, BCCL

No.J-11015/372/2013-IA-II (M)
Government of India
Ministry of Environment, Forest and Climate Change
IA Division (Coal Mining)

Indira Paryavaran Bhawan,
Jorbagh Road, N Delhi-3
Dated: 23rd October, 2019

To,

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

Sub: Expansion of Cluster-IV (5 mixed mines) Coal Mining Project from 3.706 MTPA (Peak) to 7.34 MTPA (Normative)/9.55 MTPA (Peak) in ML area of 1123.79 ha of M/s Bharat Coking Coal Ltd, District Dhanbad (Jharkhand) – Continuation of Environmental Clearance - reg.

Sir,

This has reference to your online proposal No. IA/JH/CMIN/109351/2019 dated 28th June, 2019 on the above-mentioned subject.

2. The Ministry of Environment, Forest and Climate Change vide letter dated 20th February, 2018, has granted environmental clearance to the Cluster-IV (Group of 5 mixed mines) Coal Mining Project from 3.706 MTPA to 9.55 MTPA of M/s Bharat Coking Coal Limited in Mine Lease area of 1123.79 ha in District Dhanbad, (Jharkhand), subject to compliance of certain terms and conditions, which *inter-alia* included the following:-

'The environmental clearance shall be valid for a period of one year from the issue of this letter. Further extension/continuance of the project shall be based on evaluation of the action taken on each of the observations of this Ministry's Regional Office during their site vist on 22nd August, 201€.

3. In line with the above condition, site inspection was carried out by Ministry's Regional Office at Ranchi on 17-18 May, 2019 to monitor compliance status of the conditions stipulated in the said environmental clearance. The report in this regard has been forwarded by the Regional Office vide letter dated 22nd June, 2019.

4. The proposal was considered by the sectoral Expert Appraisal Committee (EAC) in its meeting held on 22nd August, 2019 and recommended for continuance of the project beyond 16th July, 2019 and validity of environmental clearance dated 16th July, 2018 for a period of 30 years or life of the mine, whichever is earlier. Based on recommendations of the EAC, the Ministry of Environment, Forest and Climate Change hereby accords approval for continuance of the Cluster-IV (Group of 5 mixed mines) Coal Mining Project from 3.706 MTPA to 9.55 MTPA of M/s Bharat Coking Coal Limited in Mine Lease area of 1123.79 ha in District Dhanbad, (Jharkhand), for a period of 30 years or life of the mine, whichever is earlier, under the provisions of the Environment Impact Assessment Notification, 2006 and subsequent amendments/circulars thereto,

5. The project proponent shall carryout source apportionment study and establishment of piezometers, within 3 years from the date of issue of this letter.

6. All other terms and conditions stipulated in the said environmental clearance dated 16th July, 2018 shall remain unchanged.

(Sharath Kumar Pallerla)
Scientist F

Copy to:

1. The Secretary, Ministry of Coal, Shastri Bhawan, New Delhi
2. The Secretary, Department of Environment & Forests, Government of Jharkhand, Secretariat, Ranchi
3. The Additional Principal Chief Conservator of Forests, Regional office (ECZ), Ministry of Environment Forests and Climate Change, Bungalow No. A-2, Shyamali Colony, Ranchi - 834002
4. The Member Secretary, Jharkhand State Pollution Control Board, TA Building, HEC Complex, PO Dhurwa, Ranchi
5. The Member Secretary, Central Pollution Control Board, CBD-cum-Office Complex, East Arjun Nagar, Delhi - 32
6. The Member Secretary, Central Ground Water Authority, Ministry of Water Resources, Curzon Road Barracks, A-2, W-3 Kasturba Gandhi Marg, New Delhi
7. The District Collector, **Dhanbad**, Government of Jharkhand
8. Monitoring File 10. Guard File 11. Record File. 12. Notice Board

(Sharath Kumar Pallerla)
Scientist F

No J-11015/372/2013 -IA-II (M)
Government of India
Ministry of Environment, Forest and Climate Change
IA-II (Coal Mining) Division

Indira Paryavaran Bhawan,
Jorbagh Road, N Delhi-3
Dated: 16th July, 2018

To,

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

Sub: Expansion of Cluster-IV (Group of 5 mixed mines) Coal Mining Project from 3.706 MTPA to 9.55 MTPA of M/s Bharat Coking Coal Limited in Mine Lease area of 1123.79 ha in District Dhanbad (Jharkhand) - Environmental Clearance - reg.

Sir,

This has reference to your letter No. BCCL/GM (Katras) /F EC/15 4709 dated 2nd December, 2015 along with online proposal No.IA/JH/CMIN/202277/2013 dated 8th December, 2014 and subsequent letters dated 13.1.2015, 15.1.2015, 17.8.2015, 1.12.2015, 1.1.2016, 8.1.2016, 15.2.2016, 3.8.2017, 20.8.2017, 23.8.2017, 31.8.2017, 12.2.2018, 15.2.2018 and 10.3.2018 on the above mentioned subject.

2. The Ministry of Environment, Forest and Climate Change has considered the proposal for environmental clearance to expansion of Cluster-IV (Group of 5 mixed mines) Coal Mining Project from 3.706 MTPA to 7.34 MTPA (Normative)/9.55 MTPA (Peak) of M/s Bharat Coking Coal Ltd in mine lease area of 1123.79 ha located in District Dhanbad (Jharkhand).

3. The proposal was considered by the Expert Appraisal Committee (EAC) in the Ministry for Thermal & Coal Mining Sector in its 29th meeting held on 15 -16 January, 2015 49th meeting on 7-8 January, 2016, 17th meeting on 31st August, 2017, 26th meeting on 15-16 February, 2018 and 30th meeting held on 17-18 May, 2018. The details of the project, as per the documents submitted by the project proponent, and also as informed during the meeting, are as under -

(i) Earlier, Cluster-IV Coal Mining project for capacity of 3.706 MTPA in an area of 1123.79 ha was granted environmental clearance on 6th February, 2013. The present proposal is for expansion of the project to implement Jharia Master Plan to deal with the fire in the coal field.
(ii) The project was accorded ToR vide letter dated 10.02.2014 with exemption from fresh public hearing for preparation of EIA/EMP report
(iii) The latitude and longitude of the project are 23°46'31.71" N to 23°49'1.87" N and 86°17'25.11" E to 86°20'13.13" E respectively.
(iv) Joint Venture: No Joint Venture.
(v) Employment Generated/To be generated 5359 persons deployed.
(vi) Benefits of the project: Providing valuable coking coal to steel plant and coal to power plant; liquidating fire to conserve coal reserve and dovetailing EC condition with Jharia Master Plan; liquidating fire to prevent further spread of fire and safeguard population; Liquidating fire to improve environmental condition of the region

(vii) Coal Linkage: The coal from the cluster is linked to power plants and steel plants via rail and road

Mode	Railway Siding	Linkages	
		Power Plants	Steel Plants
Rail	KDS 2	Panipat, Paricha, Panki, Uchhahar, BGB, HGJ (Harduaganj), Farakka, PMRG, DTPS, DSTP, Roper, Koderma Pit, Kanti, CTPS BTPS, Budge-Budge, DGTP	Panipat, B.T.I., Nangal
Road		MPL, Moonidih, RGNTPR (Raghunathpur), RNPTS, CTPS	

(viii) The land usage of the project will be as follows:

Pre-Mining:

S.N.	LANDUSE	Within ML Area (ha)	Outside ML Area(ha)	TOTAL
1.	Agricultural land	21.22	0	21.22
2.	Forest land	0	0	0
3.	Wasteland	455.27	0	455.27
4.	Grazing land	0	0	0
5.	Surface water bodies	48.42	0	48.42
6.	Settlements	136.87	0	136.87
7.	Infrastructure	134.40	0	134.40
8.	Quarry	294.65	0	294.65
9.	OB Dump	28.89	0	28.89
10.	Plantation	4.07	0	4.07
	Total	1123.79	0	1123.79

Post- Mining & Core Area

S.N.	Land use during Mining	Land Use (ha)				TOTAL
		Plantation	Water Body	Public Use	Undisturbed	
1	External OB Dump	28.89	0	0	0	28.89
2	Top soil Dump	-	-	-	-	0
3	Excavation	608.95	10.76	0	0	619.71
4	Roads& Rail	0	0	106.52	0	106.52
5	Built up area	18.52	0	0	72.5	91.02
6	Green Belt	0	0	0	4.07	4.07
7	Undisturbed Area	9.36	0	0	264.22	273.58
	TOTAL	665.72	10.76	106.52	340.79	1123.79

(ix) Total geological reserve, mineable reserve and extractable reserve are 228.5 MT, 201.67 MT and 99.607 MT respectively. Thus, percent of extraction would be 49.39 %

(x) The coal grade is W-IV to ST-II. The stripping ratio in AKWMC is 1:2.54, in Gaslitand is 1:9, in Katras Choitudih is 1 10.54 and in Salanpur colliery is 1:2.434. The average gradient of the seams is 1 in 5 and thickness of seams is worked to be 1.32 to 8 m

(xi) Total estimated water requirement for the project is 9678 m^3/day. The level of ground water ranges from 0.85-9.65 m. A request in this regard has been made to the CGWB, New Delhi on 26th August, 2017.
(xii) The method of mining would be mixed i.e. with opencast and underground mining technologies.

	Salanpur Colliery	Katras Choitudih Colliery	Amalgamated Keshalpur West Mudidih Colliery	Angarpathra colliery & Ramkanali colliery	Gaslitand colliery
Method of mining	Bord & Pillar (UG) & Shovel- dumper Combination (OC)	Shovel-dumper Combination (OC)	Shovel-dumper in OC and Bord & Pillar in (UG)	Bord & Pillar (UG)	Shovel-dumper (OC)

(xiii) There are 6 external OB dumps with quantity of 9.903 Mcum in an area of 37.84 ha with height of 30 m above the surface level. There are 4 internal dumps with quantity of 174.38 Mcum in an area of 257.67 ha with height up to ground level.
(xiv) The final mine void would be in an area of 10.76 ha with depth of 20-30 m which is proposed to be converted into a water body. Out of the total quarry area of 603.4 ha, backfilled quarry area of 592.64 ha shall be reclaimed with plantation.
(xv) The seasonal data for ambient air quality has been documented and all results at all stations are within prescribed limits.
(xvi) The life of mines are:

	Salanpur Colliery	Katras Choitudih Colliery	Amalgamated Keshalpur West Mudidih Colliery	Angarpathra colliery & Ramkanali colliery	Gaslitand colliery
Life of mine (yrs)	10 years	4 years	20 years	Over 30 years	3 years

(xvii) There are 7012 project affected families. R&R cost for the project is Rs.299.22 Crore.
(xviii) Total capital cost of the project is Rs 346.36 Crores. CSR shall be done on actual production basis. An amount of Rs. 191.0 Lakhs will be used for the CSR works per year for the project at the peak production i.e. 9.55 Mt. The fund for CSR will be allocated on 2% of the average net profit of the Company for the three immediate preceding financial years or Rs 2.00 per tonne of Coal production of previous year whichever is higher. Environmental Management Cost shall be provided as per norm.
(xix) Katri Nallah flows within the cluster whereas Khudia Nallah, Jarian Nallah and Kumari Jore are on the west, east and north side respectively of the Cluster-IV and flow southwardly.
(xx) Almost all the mines of BCCL are taken over from the erstwhile private owners. Therefore, the mine does not have structured mining plans. The mining operations are being continued as amalgamated collieries in Cluster-IV. BCCL Board has approved the mining plans & Mine Closure Plans of Salanpur, AKWMC & AARC in 305th meeting held on 12.03.2014 and of Katras choitudih in its 312th meeting held on 13th December, 2014.
(xxi) There are no national park, wildlife sanctuary and biosphere reserves located in 10 km buffer zone.
(xxii) There is no forest area involved.
(xxiii) Total afforestation plan shall be implemented covering an area of 665.72 ha at the end of mining operations. Green belt shall be developed over an area of 105.55 ha having density of tree plantation as 2500 trees/ ha.

(xxiv) Jharkhand State Pollution Control Board had issued closure orders for all the mines of BCCL in August, 2011 and March 2012 stating that BCCL is operating all its mines without the environmental clearances. M/s BCCL filed Writ Petition in the Hon'ble High Court of Jharkhand, Ranchi for legal relief against closure of mines by JSPCB with the fact that M/s BCCL had already initiated the process of seeking environmental clearances in 2008 onwards with the approved cluster concept in 2009

(xxv) Public hearing for the project was conducted on 21st January, 2012 at Katras Club, Sijua for 3.706 MTPA (Peak) in an area of 1123.79 ha. There being no change in lease hold area for the present project, urgency for controlling the mine fires and on the request of the project proponent, the EAC recommended the ToR providing exemption from fresh public hearing

(xxvi) Regional office, MOEF&CC, Ranchi has sent the certified Compliance Report to the Ministry vide letter no.103-398/ROR-2015/189 dated 22.08.2016.

(xxvii) Mining Plan and Mine Closure Plan of Cluster-IV was approved by M/s BCCL Board, for a peak capacity of 9.55 MTPA on 3rd August, 2017 and 2nd February, 2018 respectively. The Final Mine Closure plan will be submitted 5 years before final closure

4. The Expert Appraisal Committee in its 26th meeting held on 15-16 February, 2018 has recommended the project for grant of environmental clearance. Based on recommendations of the EAC and subsequent revision of minutes in its meeting held on 17-18 May, 2018, the Ministry of Environment, Forest and Climate Change hereby accords environmental clearance to the project for expansion of Cluster-IV (Group of 5 mixed mines) Coal Mining project from 3.706 MTPA to 9.55 MTPA (Peak) of M/s Bharat Coking Coal Ltd in mine lease area of 1123.79 ha located at Tehsil Baghmara, District Dhanbad (Jharkhand), under the provisions of the Environment Impact Assessment Notification, 2006 and subsequent amendments/circulars thereto subject to the compliance of the terms & conditions and environmental safeguards mentioned below:-

(i) The environmental clearance shall be valid for a period of one year from the issue of this letter. Further extension/continuance of the project shall be based on evaluation of the action taken on each of the observations of this Ministry's Regional Office during their site visit on 22nd August, 2016.

(ii) The project proponent shall obtain Consent to establish from the State Pollution Control Boards of Jharkhand for the proposed peak capacity of 9.55 MTPA prior to commencement of the increased production.

(iii) Transportation of coal from face to Coal heap shall be carried out by truck. Further, the coal transportation from Coal heap to Coal Handling Plant shall be carried out through covered trucks.

(iv) Mitigative measures to be undertaken to control dust and other fugitive emissions all along the roads by providing sufficient numbers of water sprinklers.

(v) 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.

(vi) Solid barrier shall be left below the roads falling within the block to avoid any damage to the roads and no depillaring operation shall be carried out below the township/colony.

(vii) Depression due to subsidence resulting in water accumulating within the low lying areas shall be filled up or drained out by cutting drains.

(viii) Sufficient number of pumps of adequate capacity shall be deployed to pump out mine water during peak rain fall.

(ix) The company shall obtain approval of CGWA for use of groundwater for mining operations at its enhanced capacity of 9.55 MTPA.

(x) Continuous monitoring of occupational safety and other health hazards and the corrective actions need to be ensured.

(xi) The fire dealing operations by excavating out fire should be expedited.

4.1 The grant of EC is further subject to compliance of standard EC conditions are as under:

(a) Mining

(i) Mining shall be carried out under strict adherence to provisions of the Mines Act. 1952 and subordinate legislations made there-under as applicable.

(ii) Mining shall be carried out as per the approved mining plan(including Mine Closure Plan) abiding by mining laws related to coal mining and the relevant circulars issued by Directorate General Mines Safety (DGMS).

(iii) No mining shall be carried out in forest land without obtaining Forestry Clearance as per Forest (Conservation) Act. 1980

(iv) No change in mining method *i.e.* UG to OC, calendar programme and scope of work shall be made without obtaining prior approval of the Ministry of Environment, Forests and Climate Change (MoEFCC).

(v) Underground work place environmental conditions shall be rendered ergonomic and air breathable with adequate illumination in conformance with DGMS standards.

(b) Land reclamation and water conservation

(i) Digital Survey of entire lease hold area/core zone using Satellite Remote Sensing survey shall be carried out at least once in three years for monitoring land use pattern and report in 1:50,000 scale or as notified by the Ministry of Environment, Forest and Climate Change from time to time shall be submitted to MoEFCC/Regional Office.

(ii) The surface drainage plan including surface water conservation plan for the area of influence affected by the said mining operations, considering the presence of river/rivulet/pond/lake etc, shall be prepared and implemented by the project proponent. The surface drainage plan and/or any diversion of natural water courses shall be as per the approved Mining Plan/EIA/EMP report and with due approval of the concerned State/GoI Authority. The construction of embankment to prevent any danger against inrush of surface water into the mine should be as per the approved Mining Plan and as per the permission of DGMS or any other authority as prescribed by the law.

(iii) The final mine void depth should preferably be as per the approved Mine Closure Plan, and in case it exceeds 40 m, adequate engineering interventions shall be provided for sustenance of aquatic life therein. The remaining area shall be backfilled and covered with thick and alive top soil. Post-mining land be rendered usable for agricultural/forestry purposes and shall be diverted. Further action will be treated as specified in the guidelines for preparation of Mine Closure Plan issued by the Ministry of Coal dated 27th August, 2009.

(iv) The entire excavated area, backfilling, external OB dumping (including top soil) and afforestation plan shall be in conformity with the "during mining"/"post mining" land-use pattern, which is an integral part of the approved Mining Plan and the EIA/EMP submitted to this Ministry. Progressive compliance status vis-a-vis the post mining land use pattern shall be submitted to the MOEFCC/RO.

(v) Fly ash shall be used for external dump of overburden, backfilling or stowing of mine as per provisions contained in clause (i) and (ii) of subparagraph (8) of fly ash notification issued

vide S.O 2804 (E) dated 3rd November, 2009 as amended from time to time. Efforts shall be made to utilize gypsum generated from Flue Gas Desulfurization (FGD), if any, along with fly ash for external dump of overburden, backfilling or stowing of mines. Compliance report shall be submitted to Regional Office of MoEF&CC, CPCB and SPCB.

(vi) It shall be ensured that as per the time schedule specified in mine closure plan it should remain live till the point of utilization. The top soil shall temporarily be stored at earmarked site(s) only and shall not be kept unutilized. The top soil shall be used for land reclamation and plantation purposes. Active OB dumps shall be stabilised with native grass species to prevent erosion and surface run off. The other overburden dumps shall be vegetated with native flora species. The excavated area shall be backfilled and afforested in line with the approved Mine Closure Plan Monitoring and management of rehabilitated areas shall continue until the vegetation becomes self-sustaining Compliance status shall be submitted to the Ministry.

(vii) Post-mining land shall be rendered usable for agricultural/forestry purposes and handed over to the respective State Government, as specified in the Ministry of Coal Guidelines dated 27th August, 2009 for Preparation of Mine Closure Plan.

(viii) Regular monitoring of subsidence movement on the surface over and around the working areas and its 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 beyond the limit prescribed, appropriate effective mitigation measures shall be taken to avoid loss of life and materials. Cracks should be effectively plugged in with ballast and clay soil/suitable material

(ix) A separate team for subsidence monitoring and surface mitigation measures shall be constituted and continuous monitoring & implementation of mitigation measures be carried out.

(x) Thorough inspection of the mine lease area for any cracks developed at the surface due to mining activities below ground shall be carried out to prevent inrush of water in the mine

(xi) Native tree species shall be selected and planted over areas affected by subsidence.

(c) Emissions, effluents, and waste disposal

(i) Transportation of coal, to the extent permitted by road, shall be carried out by covered trucks/conveyors. Effective control measures such as regular water/mist sprinkling/rain gun etc shall be carried out in critical areas prone to air pollution (with higher values of PM_{10}/$PM_{2.5}$) such as haul road, loading/unloading and transfer points. Fugitive dust emissions from all sources shall be controlled regularly. It shall be ensured that the Ambient Air Quality parameters conform to the norms prescribed by the Central/State Pollution Control Board.

(ii) Greenbelt consisting of 3-tier plantation of width not less than 7.5 m shall be developed all along the mine lease area as soon as possible. The green belt comprising a mix of native species (endemic species should be given priority) shall be developed all along the major approach/ coal transportation roads.

(iii) The transportation of coal shall be carried out as per the provisions and route envisaged in the approved Mining Plan or environment monitoring plan. Transportation of the coal through the existing road passing through any village shall be avoided. In case, it is proposed to construct a 'bypass' road, it should be so constructed so that the impact of sound, dust and accidents could be appropriately mitigated.

(iv) Vehicular emissions shall be kept under control and regularly monitored. All the vehicles engaged in mining and allied activities shall operate only after obtaining 'PUC' certificate from the authorized pollution testing centres.

(v) Coal stock pile/crusher/feeder and breaker material transfer points shall invariably be provided with dust suppression system. Belt-conveyors shall be fully covered to avoid air borne dust. Side cladding all along the conveyor gantry should be made to avoid air borne dust. Drills shall be wet operated or fitted with dust extractors.

(vi) Coal handling plant shall be operated with effective control measures w.r.t. various environmental parameters. Environmental friendly sustainable technology should be implemented for mitigating such parameters.

(vii) Ground water, excluding mine water, shall not be used for mining operations. Rainwater harvesting shall be implemented for conservation and augmentation of ground water resources.

(viii) Catch and or garland drains and siltation ponds in adequate numbers and appropriate size shall be constructed around the mine working, coal heaps & OB dumps to prevent run off of water and flow of sediments directly into the river and water bodies. Further, dump material shall be properly consolidated/ compacted and accumulation of water over dumps shall be avoided by providing adequate channels for flow of silt into the drains. The drains/ ponds so constructed shall be regularly de-silted particularly before onset of monsoon and maintained properly. Sump capacity should provide adequate retention period to allow proper settling of silt material. The water so collected in the sump shall be utilised for dust suppression and green belt development and other industrial use. Dimension of the retaining wall constructed, if any, at the toe of the OB dumps within the mine to check run-off and siltation should be based on the rainfall data. The plantation of native species to be made between toe of the dump and adjacent field/habitation/water bodies.

(ix) Adequate groundwater recharge measures shall be taken up for augmentation of ground water. The project authorities shall meet water requirement of nearby village(s) after due treatment conforming to the specific requirement (standards).

(x) Solid waste/hazardous waste generated in the mines shall be addressed in accordance to the MSW Rules, 2016.

(xi) The water pumped out from the mine, after siltation, shall be utilized for industrial purpose *viz.* watering the mine area, roads, green belt development *etc.* The drains shall be regularly desilted particularly after monsoon and maintained properly.

(xi) Major approach roads shall be black topped and properly maintained.

(xii) The project proponent shall not alter major water channels around the site. Appropriate embankment shall be provided along the side of the river/nallah flowing near or adjacent to the mine. The embankment constructed along the river/nallah boundary shall be of suitable dimensions and critical patches shall be strengthened by stone pitching on the river front side, stabilized with plantation so as to withstand the peak water pressure preventing any chance of mine inundation.

(xiii) Garland drains (of suitable size, gradient and length) around the critical areas i.e. mine shaft and low lying areas, shall be designed keeping at least 50% safety margin over and above the peak sudden rainfall and maximum discharge in the area adjoining the mine sites. The

sump capacity shall also provide adequate retention period to allow proper settling of silt material of the surface runoff.

(xiv) Industrial waste water from coal handling plant and mine water shall be properly collected and treated so as to conform to the standards prescribed under the Environment (Protection) Act, 1986 and the Rules made thereunder, and as amended from time to time. Oil and grease trap shall be installed before discharge of workshop effluent. Sewage treatment plant of adequate capacity shall be installed for treatment of domestic waste water.

(d) Illumination, noise & vibration

(i) Adequate illumination shall be ensured in all mine locations (as per DGMS standards) and monitored weekly. The report on the same shall be submitted to this ministry & its RO on six-monthly basis.

(ii) Adequate measures shall be taken for control of noise levels as per noise pollution Rules, 2016 in the work environment. Workers engaged in blasting and drilling operations operation of HEMM, etc shall be provided with personal protective equipments (PPE) like ear plugs/muffs in conformity with the prescribed norms and guidelines in this regard. Adequate awareness programme for users to be conducted.

(iii) Controlled blasting techniques shall be practiced in order to mitigate ground vibrations, fly rocks, noise and air blast etc as per the guidelines prescribed by the DGMS.

(iv) The noise level survey shall be carried out as per the prescribed guidelines to assess noise exposure of the workmen at vulnerable points in the mine premises, and report in this regard shall be submitted to the Ministry/RO on six-monthly basis.

(e) Occupational health & safety

(i) The project proponent shall undertake occupational health survey for initial and periodical medical examination of the personnel engaged in the project and maintain records accordingly as per the provisions of the Mines Rules, 1955 and DGMS circulars. Besides regular periodic health check up, 20% of the personnel identified from workforce engaged in active mining operations shall be subjected to health check-up for occupational diseases and hearing impairment, if any, as amended time to time

(ii) Personnel working in core zone shall wear protective respiratory devices and shall also be provided with adequate training and information on safety and health aspects.

(f) Ecosystem and biodiversity conservation

(i) The project proponent shall take all precautionary measures during mining operation for conservation and protection of endangered/endemic flora/fauna, if any, spotted/reported in the study area. The Action plan in this regard, if any, shall be prepared and implemented in consultation with the State Forest and Wildlife Department.

(ii) The project proponent shall take all precautionary measures to ensure riverine/riparian ecosystem in and around the coal mine upto a distance of 5 km. A riverine/riparian ecosystem conservation and management plan should be prepared and implemented in consultation with the irrigation/water resource department in the State Government

(g) Public Hearing, R&R and CSR

(i) Implementation of the action plan on the issues raised during the public hearing shall be ensured. The project proponent shall undertake all the tasks/measures as per the action plan submitted with budgetary provisions during the public hearing. Land oustees shall be compensated as per the norms laid down in the R&R policy of the company/State Government/Central Government, as applicable.

(ii) The project proponent shall ensure the expenditure towards socio-economic development in and around the mine every financial year in pursuance of the Corporate Social Responsibility Policy as per the provisions under Section 135 of the Companies Act, 2013.

(iii) The project proponent shall follow the mitigation measures provided in this Ministry's OM No Z-11013/5712014-IA.II (M) dated 29th October, 2014, titled 'Impact of mining activities on habitations-issues related to the mining projects wherein habitations and villages are the part of mine lease areas or habitations and villages are surrounded by the mine lease area'

(iv) The project proponent shall make necessary alternative arrangements, if grazing land is involved in core zone, in consultation with the State government to provide alternate areas for livestock grazing, if any. In this context, the project proponent shall implement the directions of Hon'ble Supreme Court with regard to acquiring grazing land.

(h) Corporate environment responsibility

(i) The Company shall have a well laid down environment policy duly approved by Board of Directors. The environment policy should prescribe for standard operating procedures to have proper checks and balances and to bring into focus any infringements/deviation/violation of the environmental or forest norms/conditions. Also, the company shall have a defined system of reporting of non compliances/violations of environmental norms to the Board of Directors and/or shareholders/stakeholders.

(ii) The project proponent shall comply with the provisions contained in this Ministry s OM dated 1st May, 2018, as applicable, regarding Corporate Environment Responsibility

(iii) A separate environmental management cell both at the project and company headquarter level, with suitable qualified personnel shall be set-up under the control of a Senior Executive, who will report directly to the Board level executive/Head of the Organization

(iv) Action plan for implementing EMP and environmental conditions along with responsibility matrix of the company shall be prepared and shall be duly approved by competent authority. The year wise funds earmarked for environmental protection measures shall be kept in separate account and not to be diverted for any other purpose. Year wise progress of implementation of action plan shall be reported to the Ministry/Regional Office along with the Six Monthly Compliance Report.

(v) Self environmental audit shall be conducted annually. Every three years third party environmental audit shall be carried out.

(vi) Skill training as per safety norms specified by DGMS shall be provided to all workmen including the outsourcing employees to ensure high safety standards in mines.

(vii) Effective arrangement shall be made to provide and maintain at suitable points conveniently situated, a sufficient supply of drinking water for all the persons employed.

(i) Statutory Obligations

(i) This environmental clearance shall be subject to obtaining Forest Clearance from the concerned regulatory authority, Wildlife clearance from the Standing Committee of National Board for Wildlife, as applicable to the project.

(ii) The project proponent shall obtain the necessary permission from the Central Ground Water Authority (CGWA) if applicable.

(iii) The Environmental clearance shall be subject to orders of Hon'ble Supreme Court of India, Hon'ble High Courts, NGT and any other Court of Law, from time to time, and as applicable to the project.

(iv) The project proponent shall obtain Consent to Establish/Operate under the Air (Prevention & Control of Pollution) Act, 1981 and the Water (Prevention & Control of Pollution) Act, 1974 from concerned SPCB

(j) Monitoring of project

(i) Continuous ambient air quality monitoring stations as prescribed in the statue be established in the core zone as well as in the buffer zone for monitoring of pollutants, namely PM_{10}, $PM_{2.5}$, SO_2 and NO_x. Location of the stations shall be decided based on the meteorological data, topographical features and environmentally and ecologically sensitive targets in consultation with the State Pollution Control Board. Online ambient air quality monitoring stations may also be installed in addition to the regular monitoring stations as per the requirement and/or in consultation with the SPCB. Monitoring of heavy metals such as Hg, As, Ni, Cd, Cr, etc to be carried out at least once in six months.

(ii) The Ambient Air Quality monitoring in the core zone shall be carried out to ensure the Coal Industry Standards notified vide GSR 742 (E) dated 25.9.2000 and as amended from time to time by the Central Pollution Control Board. Data on ambient air quality and heavy metals such as Hg, As, Ni, Cd, Cr and other monitoring data shall be regularly reported to the Ministry/Regional Office and to the CPCB/SPCB

(iii) The effluent discharge (mine waste water, workshop effluent) shall be monitored in terms of the parameters notified under the Water Act, 1974 Coal Industry Standards vide GSR 742 (E) dated 25th September, 2000 and as amended from time to time by the Central Pollution Control Board

(iv) The monitoring data shall be uploaded on the company's website and displayed at the project site at a suitable location. The circular No. J-20012/1/2006-IA.11 (M) dated 27th May, 2009 issued by the Ministry shall also be referred in this regard for compliance.

(v) Regular monitoring of ground water level and quality shall be carried out in and around the mine lease area by establishing a network of existing wells and constructing new piezometers during the mining operations. The monitoring of ground water levels shall be carried out four times a year i.e. pre-monsoon, monsoon, post-monsoon and winter and water quality once a year, and the data thus collected shall be sent regularly to MoEFCC/RO.

(vi) Monitoring of water quality upstream and downstream of water bodies shall be carried out once in six months and record of monitoring data shall be maintained and submitted to the Ministry of Environment, Forest and Climate Change/Regional Office.

(vii) The project proponent shall submit six monthly reports on the status of the implementation of the stipulated environmental conditions to the MOEFCC/RO. For half yearly monitoring reports, the data should be monitored for the period of April to September and October to March of the financial years.

(viii) The Regional Office of this Ministry shall monitor compliance of the stipulated conditions. The project authorities should extend full cooperation to the officer (s) of the Regional Office by furnishing the requisite data / information/monitoring reports.

(k) Miscellaneous

(i) Efforts should be made to reduce energy consumption by conservation, efficiency improvements and use of renewable energy

(ii) The project authorities shall inform to the Regional Office of the MOEFCC regarding commencement of mining operations.

(iii) A copy of the environmental clearance shall be marked to concerned Panchayat. A copy of the same shall also be sent to the concerned State Pollution Control Board, Regional Office of the MOEFCC, District Industries Centre and Collector's Office/Tehsildar Office for information in public domain within 30 days.

(iv) The EC shall be uploaded on the company's website. The compliance status of the stipulated EC 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.

(v) The project authorities shall advertise at least in two local newspapers widely circulated, one of which shall be in the vernacular language of the locality concerned, within 7 days of the issue 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 also at web site of this Ministry at www.environmentclearance.nic.in and a copy of the same shall be forwarded to the Regional Office.

(vi) The environmental statement for each financial year ending 31st March in Form-V is mandated to be submitted by the project proponent for the concerned State Pollution Control Board as prescribed under the Environment (Protection) Rules, 1986, as amended subsequently, shall also be uploaded on the Company's website along with the status of compliance of EC conditions and shall be sent to the respective Regional Offices of the MoEF&CC by e-mail.

(vii) The project proponent shall abide by all the commitments and recommendations made in the EIA/EMP report and also that during their presentation to the EAC.

(viii) Concealing factual data or submission of false/fabricated data and failure to comply with any of the conditions mentioned above may result in revocation of this EC and attract action under the provisions of Environment (Protection) Act, 1986.

(ix) The above conditions will be enforced inter-alia, under the provisions of the Water (Prevention & Control of Pollution) Act, 1974, the Air (Prevention & Control of Pollution) Act, 1981, the Environment (Protection) Act, 1986 and the Public Liability Insurance Act, 1991 along with their amendments and Rules and any other orders passed by the Hon'ble Supreme Court of India/High Courts and any other Court of Law relating to the subject matter.

(x) Adequate ambient air quality monitoring stations shall be established in the core zone as well as in the buffer zone for monitoring of pollutants, namely particulates, SO2 and NOx. Location of the stations shall be decided based on the meteorological data topographical features and environmentally and ecologically sensitive receptors in consultation with the State Pollution Control Board. Monitoring of heavy metals such as Hg, As, Ni, Cd, Cr, etc. to be carried out at least once in six months. Online ambient air quality monitoring station/stations may also be installed in addition to the regular air monitoring stations as per the requirement and/or in consultation with the SPCB

5. The proponent shall obtain all necessary clearances/approvals that may be required before the start of the project. The Ministry or any other competent authority may stipulate any further condition for environmental protection. The Ministry or any other competent authority may stipulate any further condition for environmental protection.

6. The coal company/project proponent shall be liable to pay the compensation against the illegal mining, if any, and as raised by the respective State Governments at any point of time, in terms of the orders dated 2nd August, 2017 of Hon'ble Supreme Court in WP (Civil) No 114/2014 in the matter of 'Common Cause Vs Union of India & othrs'.

7. The concerned State Government shall ensure that no mining operations shall be carried out till the entire compensation for illegal mining, if any, is paid by the project proponent through their respective Department of Mining & Geology, in strict compliance of the judgment of Hon'ble Supreme Court.

8. This environmental clearance shall not be operational till such time the project proponent complies with the above said judgment of Hon'ble Supreme Court, as applicable, and other statutory requirements.

9. This environmental clearance supersedes the earlier environmental clearance granted vide letter no. J-11015/212/2010-IA-II(M) dated 6th February, 2013.

16/7/2018

(S K Srivastava)
Scientist E

Copy to

1. The Secretary, Ministry of Coal, Shastri Bhawan, New Delhi
2. The Secretary, Deptl of Environment & Forests, Govt of Jharkhand, Secretariat, Ranchi
3. The Additional PCCF, Regional office (ECZ), Ministry of Environment Forests and Climate Change, Bungalow No. A-2, Shyamali Colony, Ranchi - 834002
4. The Member Secretary, Jharkhand State Pollution Control Board, TA Building, HEC Complex, PO Dhurwa, Ranchi
5. The Member Secretary, Central Pollution Control Board, CBD-cum-Office Complex, East Arjun Nagar, Delhi - 32
6. The Member Secretary, Central Ground Water Authority, Ministry of Water Resources, Curzon Road Barracks, A-2, W-3 Kasturba Gandhi Marg, New Delhi
7. The Advisor, Coal India Ltd, SCOPE Minar, Core-I, 4th Floor, Vikas Marg, Laxmi Nagar, N Delhi
8. The District Collector, Dhanbad, Government of Jharkhand
9. Monitoring File 10 Guard File 11. Record File. 12 Notice Board

16/7/2018

(S K Srivastava)
Scientist E

A comparative representation of productions from mines in the cluster for which EC was granted and proposed productions are as given below:

Table1.1: Comparative representation of productions from nines in the cluster for which EC was granted and Proposed productions

Sl. No.	Name of Mine		Production Capacity (MTY) As per EC granted in Feb 2013		Production Capacity (MTY) Proposed		Lease Hold Area (Ha)	Remarks
			Normative	Peak	Normative	Peak		
1	Salanpur Colliery	UG	0.15	0.195	0.13	0.17	177.49	-
		OC	-	-	0.42	0.55		For curbing illegal mining
		Total	0.15	0.195	0.55	0.72		-
2	Kaitras Choltudih Colliery	UG	0.22	0.286	0.00	0.00	228.00	-
		OC	-	-	0.50	0.65		For fire dealing as per approved Master Plan
		Total	0.22	0.286	0.50	0.65		-
3	Amalgamated Keshalpur-West Mududih Colliery	UG	0.19	0.247	0.6	0.78	325.00	-
		OC	2.00	2.6	4.9	6.37		For fire dealing as per approved Master Plan
		Total	2.19	2.847	5.5	7.15		-
4	Amalgamated Angarpathra - Ramkanali colliery	UG	0.291	0.378	0.19	0.25	254.64	-
5	Gasitand Colliery	UG (Closed)	0.00	0.00	0.00	0.00	138.66	-
		OC	-	-	0.60	0.78		For fire dealing as per approved Master Plan
		Total	0.00	0.00	0.60	0.78		-
		Total UG	0.851	1.106	0.92	1.2		
		Total OC	2	2.6	6.42	8.35		
		Grand Total	2.851	3.706	7.34	9.55	1123.79	

The proposed capacity of cluster IV group of mines is as under:

Name of Project		Normative Production (In MTY)	Peak Production (In MTY)	Leasehold (In Ha)
Cluster IV Group of Mines	UG	0.92	1.2	1123.79
	OC	6.42	8.35	
	Total	7.34	9.55	

Scanned by CamScanner

Scanned by CamScanner

JH10AD
2936

Water Sprinkling at Coal Dump

Mist Sprinkler in Cluster-IV

TATA

Annexure-3A

भारत सरकार
जल शक्ति मंत्रालय
जल संसाधन, नदी विकास
और गंगा संरक्षण विभाग
केन्द्रीय भूमि जल प्राधिकरण
Government of India
Ministry of Jal Shakti
Department of Water Resources,
River Development & Ganga Rejuvenation
Central Ground Water Authority

(भूजल निकासी हेतु अनापत्ति प्रमाण पत्र)
NO OBJECTION CERTIFICATE (NOC) FOR GROUND WATER ABSTRACTION

Project Name:	Cluster Iv Mines Of Bccl		
Project Address:	Office Of The General Manager, Katras Area, M/s Bccl, Po- Sijua		
Town:	Malkera (ct)	Block:	Baghmara
District:	Dhanbad	State:	Jharkhand
Pin Code:			
Communication Address:	Office Of General Manager, Katras Area, M/s Bccl, Post Office- Sijua, Dhanbad, Dhanbad, Jharkhand - 828121		
Address of CGWB Regional Office :	Central Ground Water Board Mid Eastern Region, 6th & 7th Floor, Lok Nayak Jai Prakash Bhawan, Frazer Road Dak Banglow, Patna, Bihar - 800011		

1.	**NOC No.:**	CGWA/NOC/MIN/REN/1/2025/11517	2.	**Date of Issuence**	28/04/2025
3.	Application No.:	21-4/320/JH/MIN/2018	4.	Category: (GWRE 2024)	Semi Critical
5.	Project Status:	Existing With Additional Ground Water Requirment	6.	NOC Type:	Renewal
7.	**Valid from:**	27/12/2023	8.	**Valid up to:**	26/12/2025

9. Ground Water Abstraction Permitted:

Fresh Water		Saline Water		Dewatering		Total	
m³/day	m³/year	m³/day	m³/year	m³/day	m³/year	m³/day	m³/year
0.00	0.00			10212.00	3727380.00	10212.00	3727380.00

10. Details of ground water abstraction /Dewatering structures

	Total Existing No						Total Proposed No					
	DW	DCB	BW	TW	MP	MPu	DW	DCB	BW	TW	MP	MPu
Dewatering Structure*	0	0	0	0	4	0	0	0	0	0	2	0

*DW- Dug Well; DCB-Dug-cum-Bore Well; BW-Bore Well; TW-Tube Well; MP-Mine Pit;MPu-Mine Pumps

11.	Ground Water Abstraction/Restoration Charges paid (Rs.):	51161460.00
12.	Environment Compensation (if applicable) paid (Rs.):	0.00

13.	Number of Piezometers(Observation wells) to be constructed/ monitored & Monitoring mechanism.	No. of Piezometers	Monitoring Mechanism		
			Manual	DWLR**	DWLR With Telemetry
	**DWLR - Digital Water Level Recorder	2	0	1	1

CENTRAL GROUND WATER AUTHORITY

18/11, जामनगर हाउस, मानसिंह रोड, नई दिल्ली - 110011 / 18/11, Jamnagar House, Mansingh Road, New Delhi-110011
Phone: (011) 23383561 Fax: 23382051, 23386743
Website: cgwa-noc.gov.in

CENTRAL GROUND WATER AUTHORITY

18/11, जामनगर हाउस, मानसिंह रोड, नई दिल्ली - 110011 / 18/11, Jamnagar House, Mansingh Road, New Delhi-110011
Phone: (011) 23383561 Fax: 23382051, 23386743
Website: cgwa-noc.gov.in

(Compliance Conditions given overleaf)

This is an auto generated document & need not to be signed.

CENTRAL GROUND WATER AUTHORITY

18/11, जामनगर हाउस, मानसिंह रोड, नई दिल्ली - 110011 / 18/11, Jamnagar House, Mansingh Road, New Delhi-110011
Phone: (011) 23383561 Fax: 23382051, 23386743
Website: cgwa-noc.gov.in

Validity of this NOC shall be subject to compliance of the following conditions:

Mandatory conditions:

1) Installation of tamper proof digital water flow meter with telemetry on all the abstraction structure(s) shall be mandatory for all users seeking No Objection Certificate and intimation regarding their installation shall be communicated to the CGWA within 30 days of grant of No Objection Certificate.

2) Proponents shall mandatorily get water flow meter calibrated from an authorized agency once in a year.

3) Construction of purpose-built observation wells (piezometers) for ground water level monitoring shall be mandatory as per Section 14 of Guidelines. Water level data shall be made available to CGWA through web portal. Detailed guidelines for construction of piezometers are given in Annexure-II of the guidelines.

4) Proponents shall monitor quality of ground water from the abstraction structure(s) once in a year. Water samples from bore wells/ tube wells / dug wells shall be collected during April/May every year and analysed in NABL accredited laboratories for basic parameters (cations and anions), heavy metals, pesticides/ organic compounds etc. Water quality data shall be made available to CGWA through the web portal.

5) In case of mining projects, additional key wells shall be established in consultation with the Regional Director, CGWB for ground water level monitoring four (4) times a year (January, May, August and November) in core as well as buffer zones of the mine.

6) In case of mining project the firm shall submit water quality report of mine discharge/ seepage from Govt. approved/ NABL accredited lab.

7) The firm shall report compliance of the NOC conditions online in the website (www.cgwa-noc.gov.in) within one year from the date of issue of this NOC.

8) Industries abstracting ground water in excess of 100 m 3 /d shall undertake annual water audit through certified auditors and submit audit reports within three months of completion of the same to CGWA. All such industries shall be required to reduce their ground water use by at least 20% over the next three years through appropriate means.

9) Application for renewal can be submitted online from 90 days before the expiry of NOC. Ground water withdrawal, if any, after expiry of NOC shall be illegal & liable for legal action as per provisions of Environment (Protection) Act, 1986.

10) This NOC is subject to prevailing Central/State Government rules/laws/norms or Court orders related to construction of tube well/ground water abstraction structure / recharge or conservation structure/discharge of effluents or any such matter as applicable.

General conditions:

11) No additional ground water abstraction and/or de-watering structures shall be constructed for this purpose without prior approval of the Central Ground Water Authority (CGWA).

12) The proponent shall seek prior permission from CGWA for any increase in quantum of groundwater abstraction (more than that permitted in NOC for specific period).

13) Proponents shall install roof top rain water harvesting in the premise as per the existing building bye laws in the premise.

14) The project proponent shall take all necessary measures to prevent contamination of ground water in the premises failing which the firm shall be responsible for any consequences arising thereupon.

15) In case of industries that are likely to contaminate the ground water, no recharge measures shall be taken up by the firm inside the plant premises. The runoff generated from the rooftop shall be stored and put to beneficial use by the firm.

16) Wherever feasible, requirement of water for greenbelt (horticulture) shall be met from recycled / treated waste water.

17) Wherever the NOC is for abstraction of saline water and the existing wells (s) is /are yielding fresh water, the same shall be sealed and new tubewell(s) tapping saline water zone shall be constructed within 3 months of the issuance of NOC. The firm shall also ensure safe disposal of saline residue, if any.

18) Unexpected variations in inflow of ground water into the mine pit, if any, shall be reported to the concerned Regional Director, Central Ground Water Board.

19) In case of violation of any NOC conditions, the applicant shall be liable to pay the penalties as per Section 16 of Guidelines.

20) This NOC does not absolve the proponents of their obligation / requirement to obtain other statutory and administrative clearances from appropriate authorities.

21) The issue of this NOC does not imply that other statutory / administrative clearances shall be granted to the project by the concerned authorities. Such authorities would consider the project on merits and take decisions independently of the NOC.

22) In case of change of ownership, new owner of the industry will have to apply for incorporation of necessary changes in the No Objection Certificate with documentary proof within 60 days of taking over possession of the premises.

23) This NOC is being issued without any prejudice to the directions of the Hon'ble NGT/court orders in cases related to ground water or any other related matters.

24) Proponents, who have installed/constructed artificial recharge structures in compliance of the NOC granted to them previously and have availed rebate of upto 50% (fifty percent) in the ground water abstraction charges/ground water restoration charges, shall continue to regularly maintain artificial recharge structures.

25) Industries which are likely to cause ground water pollution e.g. Tanning, Slaughter Houses, Dye, Chemical/ Petrochemical, Coal washeries, pharmaceutical, other hazardous units etc. (as per CPCB list) need to undertake necessary well head protection measures to ensure prevention of ground water pollution as per Annexure III of the guidelines.

26) In case of new infrastructure projects having ground water abstraction of more than 20 m3/day, the firm/entity shall ensure implementation of dual water supply system in the projects.

27) In case of infrastructure projects, paved/parking area must be covered with interlocking/perforated tiles or other suitable measures to ensure groundwater infiltration/harvesting.

28) In case of coal and other base metal mining projects, the project proponent shall use the advance dewatering technology (by construction of series of dewatering abstraction structures) to avoid contamination of surface water.

29) The NOC issued is conditional subject to the conditions mentioned in the Public notice dated 27.01.2021 failing which penalty/EC/cancellation of NOC shall be imposed as the case may be.
30) This NOC is issued subject to the clearance of Expert Appraisal Committee (EAC) (if applicable).
31) In the self-compliance report, the PP shall submit details of Drilling Agency/ Agencies, which has/ have constructed BW(s)/ TW(s) along with undertaking to the effect that all necessary measures have been taken as per directions of Hon'ble Supreme Court provided in Annexure-VII of guidelines dated 24.09.2020 in respect of abandoned/ failed BW(s)/ TW(s)/Piezometer(s), if any. The PP is advised to engage registered drilling agency/ agencies. In the event of any mishap/ unfortunate incident due to negligence in taking measures for prevention of accident due to falling in Bore Well, both PP and concerned drilling agency shall jointly be held responsible and penal action as per extant Government rules shall be taken.

(Non-compliance of the conditions mentioned above is likely to result in the cancellation of NOC and legal action against the proponent.)

CENTRAL GROUND WATER AUTHORITY

Term and conditions:

i. All disputes are subject to Delhi Jurisdiction.
ii. Any complaint in regard to the rates will not be entertained.

Member-Secretary
CGWA, New Delhi

CENTRAL GROUND WATER AUTHORITY

PPE distribution details of FY 2025-26 in respect of Cluster IV group of mine

Sl No.	ITEMS	Total distribution in nos
1	Mining Shoes	450
2	GUMBOOT	90
3	HELMET	90
4	DUST MASK	700
5	Fluorescent Jackets	1100

L&T 9020

05 18 2019

732

Annexure - I

NOTING SHEET

Dept: Environment Deptt.

Ref: DyGM(Env)/F-EMP /15/ Dated 19-01-2015

Sub.: Preparation of Mine Plan, based on Feasibility Reports prepared by CMPDI for obtaining environment Clearance under cluster concept, and approval thereof

The Expert Appraisal Committee (Coal & Thermal) of MOEFCC, in its meeting on 15.01.2015 while considering proposal for EC capacity enhancement of Cluster-IV group of mines, observed that BCCL has not submitted Mining Plan approved by its Board of Directors.

It was submitted by BCCL that since almost all the collieries / mines of BCCL are taken over from the erstwhile private owners, the mine does not have structured mining plans. The mining operations are being continued as amalgamated collieries. However BCCL is submitting feasibility Reports for the purpose.

The committee agreed for granting EC enhancement to Cluster-IV but directed BCCL to submit Mine Plans of all the mines in this cluster as well as of mines of other clusters for which EC has been granted.

It is proposed to prepare Mine Plan through CMPDI, on the basis of Feasibility Reports, prepared by CMPDI and already submitted along with Form-I, while making application to MOEFCC. The Mine Plan shall be submitted to MOEFCC after approval by BCCL Board of Directors.

The committee, in the meeting, also directed BCCL to submit the Cluster concept duly approved by Company Board of Directors. The document has already been submitted to MOEFCC on 10-11-2009 and approved by MOEFCC on 2-12-2009 .It is proposed to obtain post facto approval of BCCL Board of Directors.

Competent authority is requested to direct RD CMPDI, RI-II for preparing Mine Plan for all the mines of Clusters for which EC has been granted/applied, based on Feasbility report already submitted to MOEFCC so that the same can be placed before Board of Directors of BCCL for approval. The list of Feasibility Reports prepared by CMPDI and submitted to MOEFCC is enclosed as Annexure-A.

Dy GM(Env)

Director (T)Op

RD, RI II

Copy - D.T. (Tech) - For information

This Space is not for use.

Annexure-A

List of Feasibility Reports prepared by CMPDI and submitted to MOEFCC alongwith Form-I Application

Sl No	Cluster	Name of mine	Normative Capacity	Peak Capacity	LEASE HOLD AREA
	I	Damoda Colliery (Albion OCP)	0.20	0.26	575.0 Ha
		Damoda Colliery (UG)	0.10	0.13	
		Damoda Colliery (BJ Section OCP)	0.60	0.78	
	II	Block II Colliery(Mixed)	4.45	5.785	852.00
		Jamunia OCP	1.2	1.56	55.00
		Shatabdi OCP	1.4	1.82	181.30
		Muraidih Colliery (Mixed)	5.5	7.15	536.41
		Phularitand OCP	3.0	3.90	401.00
	III	Jogidih Colliery	0.244	0.317	167.00
		Maheshpur Colliery	0.070	0.091	292.68
		South Govindpur Colliery (Closed)	Nil	Nil	182.00
		Teturiya Colliery (Closed)	Nil	Nil	123.00
		Govindpur Colliery	0.140	0.182	159.55
		New Akashkinaree Mine Opencast Project UG Mine	 1.000 0.135	 1.300 0.176	347.38
		Block-IV/Kooridih Mixed Mine Opencast Project UG Mine	 1.100 0.080	 1.430 0.104	149.00
	IV	Salanpur Colliery UG	0.13	0.17	
		Salanpur Colliery OC	0.42	0.55	
		Katras Choitudih Colliery OC	0.5	0.65	228.00
		a) Amalgamated Keshalpur& West Mududih UG b) Amalgamated Keshalpur& West Mududih OC	0.60 4.9	0.78 6.37	325.00
		Amalgamated Angarpathra & Ramkanali colliery UG	0.190	0.25	254.64
	V	Nichalpur OC Mine	0.6	0.78	150
		Tetulmari Colliery (Mixed)	0.795	1.033	317
		Mudidih Colliery (Mixed)	1.553	2.019	378.05
		Sendra Bansjore Colliery (Mixed)	0.75	0.975	249.63
		Kankanee Colliery (Mixed)	0.48	0.624	258.12
		Bansdeopur Colliery (Mixed)	0.676	0.879	104.72
		Loyabad UG Mine (closed for coal production)	0	0	499.56

	X	Bhowrah North (Mixed)	0.53	0.689	208.83
		Bhowrah South (Mixed)	0.683	0.887	571.58
		Patherdih (Mixed)	0.274	0.356	244.34
		Sudamdih Incline mine(UG)	0.09	0.117	254.27
		Sudamdih Shaft mine(UG)	0.185	0.240	391.50
		Amlabad UG mine (Closed for coal production)	0	0	386.95
		Sudamdih Coal Washery	1.6	2.08	
	XI	Gopalichuk UG Project	0.11	0.143	241.94
		Kachi Balihari 10/12 Pit UG Mine	0.09	0.117	60.00
		PB Project (UG Mine)	0.80	1.040	89.00
		Bhagabandh UG Mine	0.08	0.104	581.17
		Moonidih UG Mine	4.0	5.20	2063.45
		Kanuwadih UG Mine (Closed for production)	Nil	Nil	217.54
		Pootkee UG Mine (Closed for production)	Nil	Nil	153.77
		Kachi Balihari 5/6 Pit UG Mine (Closed for production)	Nil	Nil	120.71
		Moonidih Washery	1.60	1.60	0.27*
	XIII	Murulidih 20/21 pits	0.18	0.234	571.32
		Bhurungiya colliery	nil	nil	170.44
		Muchraidih colliery	nil	nil	83.23
		Hantoodih colliery	nil	nil	193.41
		Padugora colliery	nil	nil	17.6
		Murulidih colliery	nil	nil	547.0
		Bhatdee colliery	nil	nil	315.62
	XIV	Lohapatty UG Mine	0.03	0.039	1577.22
		Lohapatty OC Mine	0.375	0.487	
	XV	Kharkharee Colliery	0.092	0.12	584.00
		Madhuband Colliery	0.113	0.147	393.77
		Phularitand Colliery	0.120	0.156	340.88
		Dharmaband Colliery	0	0	377.90
	XVI	Dahibari Basantimata OCP	1.30	1.69	385.68
		Basantimata UG	0.21	0.273	417.00
		New Laikdih OCP-(Abandoned) -Includes prop. Dahibari Washery	0.00	0.00	305.1
		Laikdih Deep UG (Abandoned)	0.00	0.00	281.00
		Chanch UG	0.00	0.00	575.43
	XVII	Begunia UG	0	0	306.00
		Victoria West UG	0	0	310.00
		Victoria UG	0	0	223.00
		Damagora Colliery	0	0	620.0
		Proposed Kalayaneshwari OCP	4	5.2	851.83
		Proposed Kalayaneshwari Washery	3.65	3.65	15.66

	VI	East Bassuriya Colliery	1.500	1.950	141.07
		Bassuriya Colliery	0.120	0.156	162.76
		Gondudih Khas kusunda Colliery	2.000	2.600	410
		Godhar Colliery	2.000	2.6	162.72
	VII	Dhansar UG	0.372	0.484	174.12
		Dhansar OC	0.800	1.040	
		Kusunda OC	2.000	2.600	247.7
		Industry UG (Closed)	-	-	137.20
		Alkusa UG	0.115	0.150	101.77
		Ena OC	0.170	0.221	181.3
		South Jharia/ Rajapur OCP	1.300	1.690	207.48
		Burragarh UG	0.170	0.221	147.83
		Sindubahal UG	0.250	0.325	178.13
		Hurriladih UG	0.090	0.117	127.17
		Bhutgoria UG (Re-opening Proposed)	0.360	0.468	131.67
		Kustor UG (Closed)	-	-	250.71
		East Bhuggatdih UG (Closed)	-	-	242.62
		Vishwakarma OC (Proposed)	0.700	0.910	43.5 (Within Dhansar & Industry LH
	VIII	Bastacolla OCP	0.10	0.130	239.45
		Bastacolla UG	0.33	0.429	
		Bera OCP	0.15	0.195	209.56
		Bera UG	0.19	0.247	
		Dobari Colliery (UG)	0.24	0.312	146.90
		Kuya OCP	0.60	0.780	340.50
		Kuya UG	0.10	0.130	
		Golickdih (NC) OCP (Proposed)	1.2	1.560	
		Ghanoodih Colliery (OCP)	1.40	1.820	73.00
		Kujama Colliery (OCP)	0.60	0.780	191.00
	IX	Lodna (UG)	0.115	0.150	391.64
		North Tisra (UG)	0.15	0.195	246.24
		NT/ST (OCP)	1.65	2.145	256.13
		Jealgora (UG) Closed	NIL	NIL	138.00
		Bagdiga (UG)	0.11	0.143	61.00
		Joyrampur (UG)	0.153	0.199	98.04
		Jeenagora (OC)	0.7	0.91	276.05
		Basuree (UG)	0.17	0.221	475.00
		NT/ST EXPANSION (OCP)	6.0	7.8	755.15

Annexure - II

भारत कोकिंग कोल लिमिटेड
(एक मिनी रत्न कंपनी)
योजना एवं परियोजना विभाग
कोयला भवन कोयला नगर
धनबाद- 826005
दूरभाष-0326-2230276
ईमेल: gmpp@bccl.gov.in
CIN: U10101JH1972GOI000918

Bharat Coking Coal Limited
(A Mini Ratna Company)
Planning & Project Division
Koyla Bhawan, Koyla Nagar
Dhanbad- 826 005
Telephone-0326-2230276
Email- gmpp@bccl.gov.in
CIN: U10101JH1972GOI000918

पत्रांक : बी.सी.सी.एल/ मु0 महाप्रबंधक (यो. ए. परि.)/फ-15/15/ 231 Dated-17.06.2015

सेवा में
क्षेत्रीय निदेशक,
सी एम पी डी आई,
क्षेत्रीय संस्थान-II,
कोयला भवन परिसर , धनबाद

933
17.06.15

विषय: Draft Mining Plan for AKWM Colliery (Cluster IV).

महोदय,

Please find enclosed herewith the comments of Project Manager, AKWMC on the above subject. The report has been found to be in order.

This is for your kind information and further needful action at your end.

Thanking you.

भवदीय

संलग्नक यथोपरि

महाप्रबंधक (योजना एवं परियोजना)

प्रतिलिपि:
महाप्रबंधक, कतरास एरिया, बी सी सी एल, धनबाद

D:\BCCL\Letter-15

BHARAT COKING COAL LIMITED
"A Mini Ratna Company"
(A Subsidiary of Coal India Limited)
OFFICE OF THE PROJECT OFFICER/AGENT
Amalgamated Keshalpur West Modidih Colliery
KATRAS AREA, PO: Sijua, Dist: - Dhanbad (Jharkhand) – 828121

Ref.No. AKWM/ 1377 Dated: - 26/05/2015

To,
The General Manager(P&P)
Koyla Bhawan, Dhanbad

Subject:- Submission of draft Mining Plan of AKWM Colliery(Cluster-IV).

D/Sir,

After going through the draft Mining Plan, it is found OK as per our Draft Plan.

This is for your kind information and necessary action please.

Thanking you

26/05/15

PROJECT OFFICER
AKWMC

Annexure-III

A

भारत कोकिंग कोल लिमिटेड
(एक मिनी रत्न कंपनी)
योजना एवं परियोजना विभाग
कोयला भवन कोयला नगर
धनबाद- 826005
दूरभाष-0326-2230276
ईमेल: gmpp.bccl@coalindia.in
CIN: U10101JH1972GO1000918

Bharat Coking Coal Limited
(A Mini Ratna Company)
Planning & Project Division
Koyla Bhawan, Koyla Nagar
Dhanbad- 826 005
Telephone-0326-2230276
Email- gmpp.bccl@coalindia.in
CIN: U10101JH1972GO1000918

पत्रांक : बी.सी.सी.एल/महाप्रबंधक (यो. ए. परि.)/फा-76/17/ 63(H) **Dated**-02.01.2017

सेवा में
क्षेत्रीय निदेशक,
सी एम पी डी आई,
क्षेत्रीय संस्थान-II,
कोयला भवन परिसर , धनबाद.

विषय: Preparation of Mining Plan of all the mines of Cluster IV alongwith modified Mine Closure Plan for those mines.

महोदय,

The Expert appraisal committee (Coal & Thermal) of MOEFCC in its meeting on 15.01.2015 while considering proposal for EC capacity enhancement of Cluster-IV group of mines observed that BCCL has not submitted approved mining plan. The Project was accorded TOR vide letter no. J-11015/372/2013-IA.II(M) Dated 10.02.2014 exempting Public hearing for preparation of EIA/EMP report.

The proposal is for cluster IV Coal Mining Project (7.34 MTPA normative and 9.55 peak in an ML area of 1123.79 ha of Bharat Coking Coal Limited. The capacity enhancement is proposed from existing capacity of 2.851 MTPA normative & 3.708 MTPA peak.

The expansion of the project is required to implement the Master Plan to deal with the fire in Jharia Coalfield.

Empowered Sub Committee of BCCL Board pointed out during ESC meeting on 30.12.2016 that Mining Plans for all the mines of Cluster IV, alongwith modified Mine Closure Plan of all the mines of Cluster IV should be placed before the committee.

In the view of above you are requested to prepare and submit the above document on an urgent basis.

Matter most urgent.

भवदीय

महाप्रबंधक (योजना एवं परियोजना)

Annexure-IV

भारत कोकिंग कोल लिमिटेड
(कोल इंडिया लिमिटेड का एक अंग)
कोयला भवन,कोयला नगर,धनबाद – 826005
A Mini Ratna Company
पर्यावरण विभाग

Bharat Coking Coal Limited
(A Subsidiary of Coal India Limited)
Regd.Off: Koyla Bhawan, Koyla Nagar
CIN: U10101JH1972GOI000918
Environment Department

पत्र संख्या: भाकोकोलि/उप महाप्रबंधक(पर्या)/फाईल- Cluster-IV /2016/251- दिनांक : 16.01.2017
254/H)

सेवा में,
महाप्रबंधक - योजना एवं परियोजना
भा०को०को०लि० ,धनबाद ।

विषय :- Approved Mining Plan for EC Capacity enhancement of Cluster-IV

महोदय,

For EC capacity enhancement of Cluster-IV (Katras Area) from existing 3.708 MTPA peak to 9.55 MTPA peak, application was made to MoEFCC in 2013.

- TOR granted on 10th Feb 2014 with waiver of Baseline and recommendation of waiver of PH
- EMP considered in EAC meeting of 15.01.2015 and after submission of certified copy of compliance from RO, MoEFCC & Mining Plan approved by Director under delegated power, further considered on 08.01.2016.
- Expert appraisal Committee of MoEFCC desired Mining Plan approved by Board & Revised certified from R.O. MoEFCC, Ranchi for further consideration.
- R.O. MOEFCC made fresh inspection on 22.08.2016 & revised report is now uploaded

You are therefore requested to expedite Mining Plan preparation and approval for submission to MoEFCC for further consideration.

भवदीय,
16/1/17
उप महाप्रबंधक (पर्यावरण)

प्रतिलिपि:
1. क्षेत्रीय निदेशक, क्षेत्रीय संस्थान -2, सी.एम.पी.डी.आई धनबाद ।
2. महाप्रबंधक, कतरास क्षेत्र ।

Annexure - I

NOTING SHEET

Dept: Environment Deptt.

Ref: DyGM(Env)/F-RMP /15/ Dated 19-01-2015

Sub.: Preparation of Mine Plan, based on Feasibility Reports prepared by CMPDI for obtaining environment Clearance under cluster concept, and approval thereof

The Expert Appraisal Committee (Coal & Thermal) of MOEFCC, in its meeting on 15.01.2015 while considering proposal for EC capacity enhancement of Cluster-IV group of mines, observed that BCCL has not submitted Mining Plan approved by its Board of Directors.

It was submitted by BCCL that since almost all the collieries / mines of BCCL are taken over from the erstwhile private owners, the mine does not have structured mining plans. The mining operations are being continued as amalgamated collieries. However BCCL is submitting feasibility Reports for the purpose.

The committee agreed for granting EC enhancement to Cluster-IV but directed BCCL to submit Mine Plans of all the mines in this cluster as well as of mines of other clusters for which EC has been granted.

It is proposed to prepare Mine Plan through CMPDI, on the basis of Feasibility Reports, prepared by CMPDI and already submitted along with Form-I, while making application to MOEFCC. The Mine Plan shall be submitted to MOEFCC after approval by BCCL Board of Directors.

The committee, in the meeting, also directed BCCL to submit the Cluster concept duly approved by Company Board of Directors. The document has already been submitted to MOEFCC on 10-11-2009 and approved by MOEFCC on 2-12-2009. It is proposed to obtain post facto approval of BCCL Board of Directors.

Competent authority is requested to direct RD CMPDI, RI-II for preparing Mine Plan for all the mines of Clusters for which EC has been granted/applied, based on Feasibility report already submitted to MOEFCC so that the same can be placed before Board of Directors of BCCL for approval. The list of Feasibility Reports prepared by CMPDI and submitted to MOEFCC is enclosed as Annexure-A.

Dy GM(Env)

Director (T)Op

RD, RI II

Copy - D.T. (HQ) - For information

This Space is not for use

Annexure-A

List of Feasibility Reports prepared by CMPDI and submitted to MOEFCC alongwith Form-I Application

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		a) Amalgamated Keshalpur& West Mududih UG b) Amalgamated Keshalpur& West Mududih OC	0.60 4.9	0.78 6.37	325.00
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		Vishwakerma OC (Proposed)	0.700	0.910	43.5 (Within Dhansar & Industry LH
	VIII	Bastacolla OCP	0.10	0.130	239.45
		Bastacolla UG	0.33	0.429	
		Bera OCP	0.15	0.195	209.56
		Bera UG	0.19	0.247	
		Dobari Colliery (UG)	0.24	0.312	146.90
		Kuya OCP	0.60	0.780	340.50
		Kuya UG	0.10	0.130	
		Goluckdih (NC) OCP (Proposed)	1.2	1.560	
		Ghanoodih Colliery (OCP)	1.40	1.820	73.00
		Kujama Colliery (OCP)	0.60	0.780	191.00
	IX	Lodna (UG)	0.115	0.150	391.64
		North Tisra (UG)	0.15	0.195	246.24
		NT/ST (OCP)	1.65	2.145	256.15
		Jealgora (UG) Closed	NIL	NIL	138.00
		Bagdigi (UG)	0.11	0.143	61.00
		Joyrampur (UG)	0.153	0.199	98.04
		Jeenagora (OC)	0.7	0.91	276.05
		Banaree (UG)	0.17	0.221	475.00
		NT/ST EXPANSION (OCP)	6.0	7.8	755.15

Annexure-II

भारत कोकिंग कोल लिमिटेड
(एक मिनी रत्न कंपनी)
योजना एवं परियोजना विभाग
कोयला भवन कोयला नगर
धनबाद- 826005
दूरभाष-0326-2230276
ईमेल: gmpp@bccl.gov.in
CIN: U10101JH1972GO1000918

Bharat Coking Coal Limited
(A Mini Ratna Company)
Planning & Project Division
Koyla Bhawan, Koyla Nagar
Dhanbad- 826 005
Telephone-0326-2230276
Email- gmpp@bccl.gov.in
CIN: U10101JH1972GO1000918

पत्रांक : बी.सी.सी.एल/महाप्रबंधक (यो. ए. परि.)/क-16/ 194 Dated-28.03.2016

सेवा में
क्षेत्रीय निदेशक,
सी एम पी डी आई, क्षेत्रीय संस्थान-II,
कोयला भवन परिसर , धनबाद

विषय: Modification of Mining Plan of AARC Mine of Cluster-IV.

संदर्भ: Letter No. BCCL/KA-IV/GM/2016/1269 dated 09.03.2016.

महोदय,

As per the above referred letter of GM, Katras Area, a Mining Plan of AARC was prepared by CMPDI in April, 2015 which is yet to be approved by BCCL Board, the capacity as per the Mining Plan is 0.075 MTY however as per enclosed production plan of AARC the normative mine capacity of the said mine will be 0.19 MTY.

You are requested to take necessary action for modification of Mining Plan of AARC accordingly and submit the document at the earliest possible.

संलग्नक: यथोपरि

भवदीय
(सुबीर घोष)
महाप्रबंधक (योजना एवं परियोजना)

प्रतिलिपि: सूचनार्थ
महाप्रबंधक, कतरास, बी.सी.सी.एल.
विभागाध्यक्ष (पर्यावरण), बी.सी.सी.एल.

D:\BCCL\Letter-16 77

Annexure-III

A

भारत कोकिंग कोल लिमिटेड
(एक मिनी रत्न कंपनी)
योजना एवं परियोजना विभाग
कोयला भवन कोयला नगर
धनबाद- 826005
दूरभाष-0326-2230276
ईमेल: gmpp.bccl@coalindia.in
CIN: U10101JH1972GO1000918

Bharat Coking Coal Limited
(A Mini Ratna Company)
Planning & Project Division
Koyla Bhawan, Koyla Nagar
Dhanbad- 826 005
Telephone-0326-2230276
Email- gmpp.bccl@coalindia.in
CIN: U10101JH1972GO1000918

पत्रांक : बी.सी.सी.एल/महाप्रबंधक (यो. ए. परि.)/क-76/17/ 63(H) **Dated**-02.01.2017

सेवा में
क्षेत्रीय निदेशक,
सी एम पी डी आई,
क्षेत्रीय संस्थान-II,
कोयला भवन परिसर , धनबाद.

विषय: Preparation of Mining Plan of all the mines of Cluster IV alongwith modified Mine Closure Plan for those mines.

महोदय,

The Expert appraisal committee (Coal & Thermal) of MOEFCC in its meeting on 15.01.2015 while considering proposal for EC capacity enhancement of Cluster-IV group of mines observed that BCCL has not submitted approved mining plan. The Project was accorded TOR vide letter no. J-11015/372/2013-IA.II(M) Dated 10.02.2014 exempting Public hearing for preparation of EIA/EMP report.

The proposal is for cluster IV Coal Mining Project (7.34 MTPA normative and 9.55 peak in an ML area of 1123.79 ha of Bharat Coking Coal Limited. The capacity enhancement is proposed from existing capacity of 2.851 MTPA normative & 3.708 MTPA peak.

The expansion of the project is required to implement the Master Plan to deal with the fire in Jharia Coalfield.

Empowered Sub Committee of BCCL Board pointed out during ESC meeting on 30.12.2016 that Mining Plans for all the mines of Cluster IV, alongwith modified Mine Closure Plan of all the mines of Cluster IV should be placed before the committee.

In the view of above you are requested to prepare and submit the above document on an urgent basis.

Matter most urgent.

भवदीय

महाप्रबंधक (योजना एवं परियोजना)

Annexure-IV

भारत कोकिंग कोल लिमिटेड
(कोल इंडिया लिमिटेड का एक अंग)
कोयला भवन,कोयला नगर,धनबाद – 826005
A Mini Ratna Company
पर्यावरण विभाग

Bharat Coking Coal Limited
(A Subsidiary of Coal India Limited)
Regd.Off: Koyla Bhawan, Koyla Nagar
CIN: U10101JH1972GOI000918
Environment Department

पत्र संख्या: भाकोकोलि/उप महाप्रबंधक(पर्या)/फाईल- Cluster-IV /2016/251- दिनांक : 16.01.2017
254/H)

सेवा में,
महाप्रबंधक - योजना एवं परियोजना
भा०को०को०लि० ,धनबाद ।

विषय :- Approved Mining Plan for EC Capacity enhancement of Cluster-IV

महोदय,

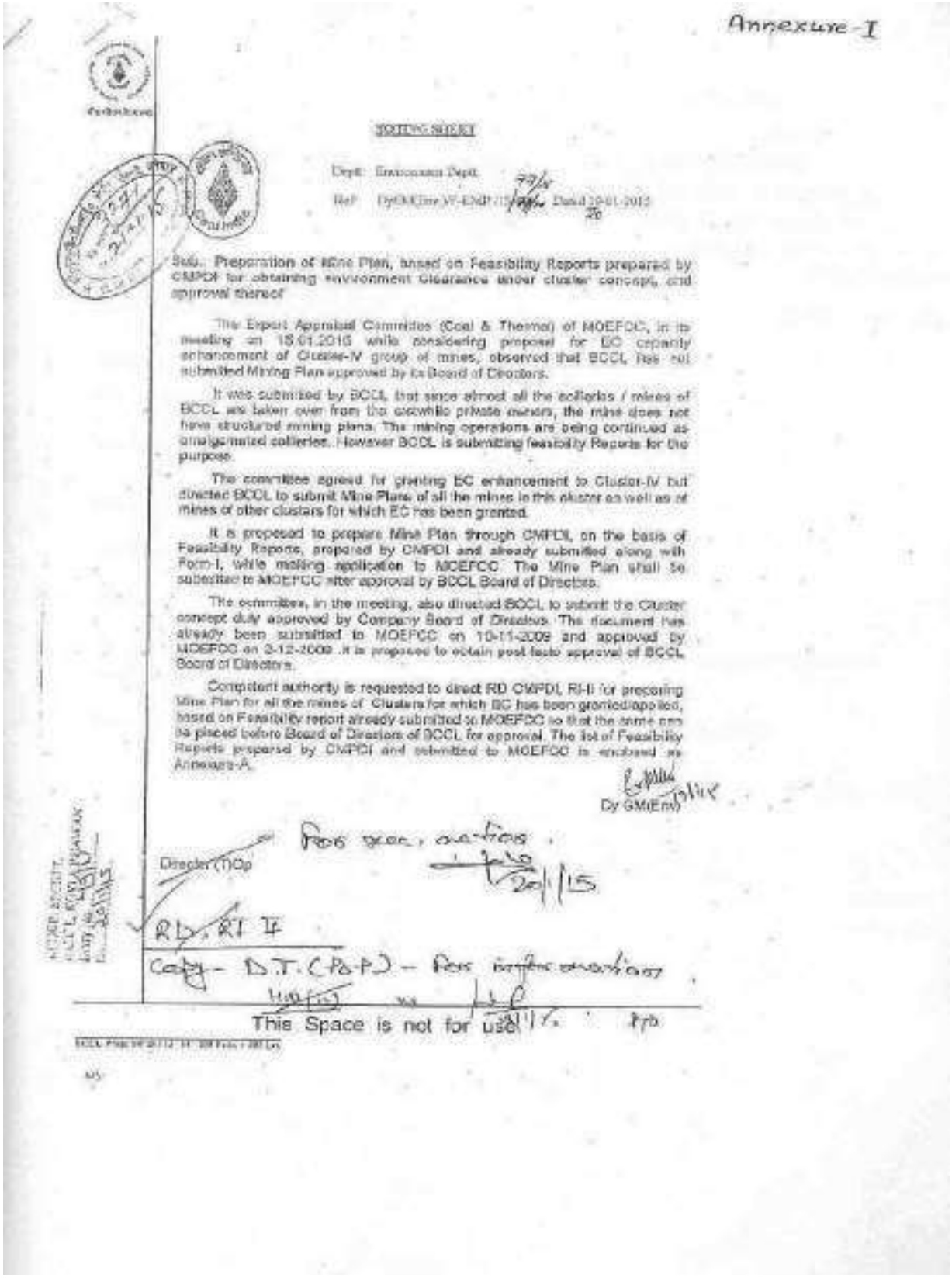
For EC capacity enhancement of Cluster-IV (Katras Area) from existing 3.708 MTPA peak to 9.55 MTPA peak, application was made to MoEFCC in 2013.

- TOR granted on 10th Feb 2014 with waiver of Baseline and recommendation of waiver of PH
- EMP considered in EAC meeting of 15.01.2015 and after submission of certified copy of compliance from RO, MoEFCC & Mining Plan approved by Director under delegated power, further considered on 08.01.2016.
- Expert appraisal Committee of MoEFCC desired Mining Plan approved by Board & Revised certified from R.O. MoEFCC, Ranchi for further consideration.
- R.O. MOEFCC made fresh inspection on 22.08.2016 & revised report is now uploaded

You are therefore requested to expedite Mining Plan preparation and approval for submission to MoEFCC for further consideration.

भवदीय,
16/1/17
उप महाप्रबंधक (पर्यावरण)

प्रतिलिपि:
1. क्षेत्रीय निदेशक, क्षेत्रीय संस्थान -2, सी.एम.पी.डी.आई धनबाद ।
2. महाप्रबंधक, कतरास क्षेत्र ।



Annexure-I

NOTING SHEET

Dept: Environment Dept.

Ref: Dy(M)Env/VF-ENVT/15/ Dated 20-01-2015

Sub.: Preparation of Mine Plan, based on Feasibility Reports prepared by CMPDI for obtaining environment Clearance under cluster concept, and approval thereof

The Expert Appraisal Committee (Coal & Thermal) of MOEFCC, in its meeting on 16.01.2015 while considering proposal for EC capacity enhancement of Cluster-IV group of mines, observed that BCCL has not submitted Mining Plan approved by its Board of Directors.

It was submitted by BCCL that since almost all the collieries / mines of BCCL are taken over from the erstwhile private owners, the mine does not have structured mining plans. The mining operations are being continued as amalgamated collieries. However BCCL is submitting Feasibility Reports for the purpose.

The committee agreed for granting EC enhancement to Cluster-IV but directed BCCL to submit Mine Plans of all the mines in this cluster as well as of mines of other clusters for which EC has been granted.

It is proposed to prepare Mine Plan through CMPDI, on the basis of Feasibility Reports, prepared by CMPDI and already submitted along with Form-I, while making application to MOEFCC. The Mine Plan shall be submitted to MOEFCC after approval by BCCL Board of Directors.

The committee, in the meeting, also directed BCCL to submit the Cluster concept duly approved by Company Board of Directors. The document has already been submitted to MOEFCC on 10-11-2009 and approved by MOEFCC on 3-12-2009. It is proposed to obtain post facto approval of BCCL Board of Directors.

Competent authority is requested to direct RD CMPDI, RI-II for preparing Mine Plan for all the mines of Clusters for which EC has been granted/applied, based on Feasibility report already submitted to MOEFCC so that the same can be placed before Board of Directors of BCCL for approval. The list of Feasibility Reports prepared by CMPDI and submitted to MOEFCC is enclosed as Annexure-A.

Dy GM(Env)

Director (Tech)Op

Pls see, as-fars.

20/1/15

RD, RI II

Copy - D.T.(P&P) - For information & n/a

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Annexure-II

18

BCCL

भारत कोकिंग कोल लिमिटेड
(एक मिनी रत्न कंपनी)
(कोल इण्डिया लिमिटेड का एक उपक्रम)
महाप्रबंधक का कार्यालय, कतरास क्षेत्र
पोस्ट: सिजुआ, धनबाद पिन: 828121
CIN U10101JH1972GOI000918
www.bccl.gov.in

सन्दर्भ : मा०को०को०लि०/म०प्र०/क०क्षे०/15/A-2/1210 दिनांक : 11.04.2015

सेवा में,
The Chief General Manager (P&P)
BCCL/Koyla Bhawan
Dhanbad.

विषय : Draft Mining Plan for Gaslitand Colliery.

Ref: Your letter no. BCCL/CGM/(P&P)/F-15/15/46 Dated 31/03/1015.

महाशय,

The Draft Mining Plan sent by you, has been checked from our side. The relevant mining data with respect to Gaslitand mine seems to be in order.

You are requested to please do the needful from your end for finalization of plan by RI-II, CMPDI.

आपका विश्वासी

महाप्रबंधक
कतरास क्षेत्र

संलग्नक :

1. Draft Mining Plan

प्रतिलिपि :

(1) Project Officer, GTC – without enclosure.
(2) Office Copy

ANNEXURE-I

NOTING SHEET

Deptt: Environment Deptt.

Ref: DyGM(Env.)/F-EMP/15/77/N Dated 19-01-2015

Sub.: Preparation of Mine Plan, based on Feasibility Reports prepared by CMPDI for obtaining environment Clearance under cluster concept, and approval thereof

The Expert Appraisal Committee (Coal & Thermal) of MOEFCC, in its meeting on 15.01.2015 while considering proposal for EC capacity enhancement of Cluster-IV group of mines, observed that BCCL has not submitted Mining Plan approved by its Board of Directors.

It was submitted by BCCL that since almost all the collieries / mines of BCCL are taken over from the erstwhile private owners, the mine does not have structured mining plans. The mining operations are being continued as amalgamated collieries. However BCCL is submitting feasibility Reports for the purpose.

The committee agreed for granting EC enhancement to Cluster-IV but directed BCCL to submit Mine Plans of all the mines in this cluster as well as of mines of other clusters for which EC has been granted.

It is proposed to prepare Mine Plan through CMPDI, on the basis of Feasibility Reports, prepared by CMPDI and already submitted along with Form-I, while making application to MOEFCC. The Mine Plan shall be submitted to MOEFCC after approval by BCCL Board of Directors.

The committee, in the meeting, also directed BCCL to submit the Cluster concept duly approved by Company Board of Directors. The document has already been submitted to MOEFCC on 10-11-2009 and approved by MOEFCC on 2-12-2009 .It is proposed to obtain post facto approval of BCCL Board of Directors.

Competent authority is requested to direct RD CMPDI, RI-II for preparing Mine Plan for all the mines of Clusters for which EC has been granted/applied, based on Feasibility report already submitted to MOEFCC so that the same can be placed before Board of Directors of BCCL for approval. The list of Feasibility Reports prepared by CMPDI and submitted to MOEFCC is enclosed as Annexure-A.

Dy GM(Env)

Director (T)Op

RD, RI II

copy- D.T. (P&P) – for information

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Annexure - I

NOTING SHEET

Dept: Environment Deptt.

Ref: DyGM(Env)/F-RMP /15/77/h Dated 19-01-2015

Sub.: Preparation of Mine Plan, based on Feasibility Reports prepared by CMPDI for obtaining environment Clearance under cluster concept, and approval thereof

The Expert Appraisal Committee (Coal & Thermal) of MOEFCC, in its meeting on 15.01.2015 while considering proposal for EC capacity enhancement of Cluster-IV group of mines, observed that BCCL has not submitted Mining Plan approved by its Board of Directors.

It was submitted by BCCL that since almost all the collieries / mines of BCCL are taken over from the erstwhile private owners, the mine does not have structured mining plans. The mining operations are being continued as amalgamated collieries. However BCCL is submitting feasibility Reports for the purpose.

The committee agreed for granting EC enhancement to Cluster-IV but directed BCCL to submit Mine Plans of all the mines in this cluster as well as of mines of other clusters for which EC has been granted.

It is proposed to prepare Mine Plan through CMPDI, on the basis of Feasibility Reports, prepared by CMPDI and already submitted along with Form-I, while making application to MOEFCC. The Mine Plan shall be submitted to MOEFCC after approval by BCCL Board of Directors.

The committee, in the meeting, also directed BCCL to submit the Cluster concept duly approved by Company Board of Directors. The document has already been submitted to MOEFCC on 10-11-2009 and approved by MOEFCC on 2-12-2009. It is proposed to obtain post facto approval of BCCL Board of Directors.

Competent authority is requested to direct RD CMPDI, RI-II for preparing Mine Plan for all the mines of Clusters for which EC has been granted/applied, based on Feasibility report already submitted to MOEFCC so that the same can be placed before Board of Directors of BCCL for approval. The list of Feasibility Reports prepared by CMPDI and submitted to MOEFCC is enclosed as Annexure-A.

Dy GM(Env)

Director (T)Op

RD, RI II

Copy - D.T. (Plg.) - for information

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Annexure-A

List of Feasibility Reports prepared by CMPDI and submitted to MOEFCC alongwith Form-I Application

Sl No	Cluster	Name of mine	Normative Capacity	Peak Capacity	LEASE HOLD AREA
	I	Damoda Colliery (Albion OCP)	0.20	0.26	575.0 Ha
		Damoda Colliery (UG)	0.10	0.13	
		Damoda Colliery (BJ Section OCP)	0.60	0.78	
	II	Block II Colliery(Mixed)	4.45	5.785	852.00
		Jamunia OCP	1.2	1.56	55.00
		Shatabdi OCP	1.4	1.82	181.30
		Muraidih Colliery (Mixed)	5.5	7.15	536.41
		Phularitand OCP	3.0	3.90	401.00
	III	Jogidih Colliery	0.244	0.317	167.00
		Maheshpur Colliery	0.070	0.091	292.68
		South Govindpur Colliery (Closed)	Nil	Nil	182.00
		Teturiya Colliery (Closed)	Nil	Nil	123.00
		Govindpur Colliery	0.140	0.182	159.55
		New Akashkinaree Mine Opencast Project UG Mine	1.000 0.135	1.300 0.176	347.38
		Block-IV/Kooridih Mixed Mine Opencast Project UG Mine	1.100 0.080	1.430 0.104	149.00
	IV	Salanpur Colliery UG	0.13	0.17	
		Salanpur Colliery OC	0.42	0.55	
		Katras Choitudih Colliery OC	0.5	0.65	228.00
		a) Amalgamated Keshalpur& West Mududih UG b) Amalgamated Keshalpur& West Mududih OC	0.60 4.9	0.78 6.37	325.00
		Amalgamated Angarpathra & Ramkanali colliery UG	0.190	0.25	254.64
	V	Nichalpur OC Mine	0.6	0.78	150
		Tetulmari Colliery (Mixed)	0.795	1.033	317
		Mudidih Colliery (Mixed)	1.553	2.019	378.05
		Sendra Bansjore Colliery (Mixed)	0.75	0.975	249.63
		Kankanee Colliery (Mixed)	0.48	0.624	258.12
		Bansdeopur Colliery (Mixed)	0.676	0.879	104.72
		Loyabad UG Mine (closed for coal production)	0	0	499.56

	X	Bhowrah North (Mixed)	0.53	0.689	208.83
		Bhowrah South (Mixed)	0.683	0.887	571.58
		Patherdih (Mixed)	0.274	0.356	244.34
		Sudamdih Incline mine(UG)	0.09	0.117	254.27
		Sudamdih Shaft mine(UG)	0.183	0.240	391.50
		Amlabad UG mine (Closed for coal production)	0	0	386.95
		Sudamdih Coal Washery	1.6	2.08	
	XI	Gopalichak UG Project	0.11	0.143	241.94
		Kachi Balihari 10/12 Pit UG Mine	0.09	0.117	60.00
		PB Project (UG Mine)	0.80	1.040	89.00
		Bhagabandh UG Mine	0.08	0.104	581.17
		Moonidih UG Mine	4.0	5.20	2063.45
		Kandwadih UG Mine (Closed for production)	Nil	Nil	217.54
		Pootkee UG Mine (Closed for production)	Nil	Nil	153.77
		Kachi Balihari 5/6 Pit UG Mine (Closed for production)	Nil	Nil	120.71
		Moonidih Washery	1.60	1.60	0.27*
	XIII	Murulidih 20/21 pits	0.18	0.234	571.32
		Bhurungiya colliery	nil	nil	170.44
		Muchraidih colliery	nil	nil	83.23
		Hantoodih colliery	nil	nil	193.41
		Padugora colliery	nil	nil	17.6
		Murulidih colliery	nil	nil	547.0
		Bhatdee colliery	nil	nil	315.62
	XIV	Lohapatty UG Mine	0.03	0.039	1577.22
		Lohapatty OC Mine	0.375	0.487	
	XV	Kharkharee Colliery	0.092	0.12	584.00
		Madhuband Colliery	0.113	0.147	393.77
		Phularitand Colliery	0.120	0.156	340.88
		Dharmaband Colliery	0	0	377.90
	XVI	Dahibari Basantimata OCP	1.30	1.69	385.68
		Basantimata UG	0.21	0.273	417.00
		New Laikdih OCP-(Abandoned) -Includes prop. Dahibari Washery	0.00	0.00	305.1
		Laikdih Deep UG (Abandoned)	0.00	0.00	281.00
		Chanch UG	0.00	0.00	575.43
	XVII	Begunia UG	0	0	306.00
		Victoria West UG	0	0	310.00
		Victoria UG	0	0	223.00
		Damagoria Colliery	0	0	620.0
		Proposed Kalayaneshwari OCP	4	5.2	851.83
		Proposed Kalayaneshwari Washery	3.65	3.65	15.66

	VI	East Bassuriya Colliery	1.500	1.950	141.07
		Bassuriya Colliery	0.120	0.156	162.76
		Gondudih Khas kusunda Colliery	2.000	2.600	410
		Godhar Colliery	2.000	2.6	162.72
	VII	Dhansar UG	0.372	0.484	174.12
		Dhansar OC	0.800	1.040	
		Kusunda OC	2.000	2.600	247.7
		Industry UG (Closed)	-	-	137.20
		Alkusa UG	0.115	0.150	101.77
		Ena OC	0.170	0.221	181.3
		South Jharia/ Rajapur OCP	1.300	1.690	207.48
		Burragarh UG	0.170	0.221	147.83
		Sinlabahal UG	0.250	0.325	178.13
		Hurriladih UG	0.090	0.117	127.17
		Bhutgoria UG (Re-opening Proposed)	0.360	0.468	131.67
		Kustor UG (Closed)	-	-	250.71
		East Bhuggatdih UG (Closed)	-	-	242.62
		Vishwakerma OC (Proposed)	0.700	0.910	43.5 (Within Dhansar & Industry LH
	VIII	Bastacolla OCP	0.10	0.130	239.45
		Bastacolla UG	0.33	0.429	
		Bera OCP	0.15	0.195	209.56
		Bera UG	0.19	0.247	
		Dobari Colliery (UG)	0.24	0.312	146.90
		Kuya OCP	0.60	0.780	340.50
		Kuya UG	0.10	0.130	
		Goluckdih (NC) OCP (Proposed)	1.2	1.560	
		Ghanoodih Colliery (OCP)	1.40	1.820	73.00
		Kujama Colliery (OCP)	0.60	0.780	191.00
	IX	Lodna (UG)	0.115	0.150	391.64
		North Tisra (UG)	0.15	0.195	246.24
		NT/ST (OCP)	1.65	2.145	256.15
		Jealgora (UG) Closed	NIL	NIL	138.00
		Bagdigi (UG)	0.11	0.143	61.00
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		Jeenagora (OC)	0.7	0.91	276.05
		Banaree (UG)	0.17	0.221	475.00
		NT/ST EXPANSION (OCP)	6.0	7.8	755.15

Annexure-II

भारत कोकिंग कोल लिमिटेड
(एक मिनी रत्न कंपनी)
योजना एवं परियोजना विभाग
कोयला भवन कोयला नगर
धनबाद- 826005
दूरभाष-0326-2230276
ईमेल: gmpp@bccl.gov.in
CIN: U10101JH1972GO1000918

Bharat Coking Coal Limited
(A Mini Ratna Company)
Planning & Project Division
Koyla Bhawan, Koyla Nagar
Dhanbad- 826 005
Telephone-0326-2230276
Email- gmpp@bccl.gov.in
CIN: U10101JH1972GO1000918

पत्रांक: बी.सी.सी.एल/ मु0 महाप्रबंधक (यो. ए. परि.)/फ-15/15/61 Dated-07.04.2015

सेवा में
क्षेत्रीय निदेशक,
सी एन पी डी आई,
क्षेत्रीय संस्थान-II,
कोयला भवन परिसर , धनबाद

18/4/15

विषय: **Draft Mining Plan for Salanpur Colliery.**

महोदय,

Please find enclosed herewith the comments of General Manager, Katras Area on the above subject. The report has been found to be in order.

This is for your kind information and further needful action at your end.

Thanking you.

भवदीय

7/4/15

(आर एन प्रसाद)
मुख्य महाप्रबंधक (योजना एवं परियोजना)

संलग्नक: यथोपरि

प्रतिलिपि:
महाप्रबंधक, कतरास एरिया, बी सी सी एल, धनबाद
श्री एस के अग्रवाल, वरीय प्रबंधक(खनन), योजना एवं परियोजना

Annexure-III

A

भारत कोकिंग कोल लिमिटेड
(एक मिनी रत्न कंपनी)
योजना एवं परियोजना विभाग
कोयला भवन कोयला नगर
धनबाद- 826005
दूरभाष-0326-2230276
ईमेल: gmpp.bccl@coalindia.in
CIN: U10101JH1972GO1000918

Bharat Coking Coal Limited
(A Mini Ratna Company)
Planning & Project Division
Koyla Bhawan, Koyla Nagar
Dhanbad- 826 005
Telephone-0326-2230276
Email- gmpp.bccl@coalindia.in
CIN: U10101JH1972GO1000918

पत्रांक : बी.सी.सी.एल/महाप्रबंधक (यो. ए. परि.)/फा-76/17/ 63(H) **Dated**-02.01.2017

सेवा में
क्षेत्रीय निदेशक,
सी एम पी डी आई,
क्षेत्रीय संस्थान-II,
कोयला भवन परिसर , धनबाद.

विषय: Preparation of Mining Plan of all the mines of Cluster IV alongwith modified Mine Closure Plan for those mines.

महोदय,

The Expert appraisal committee (Coal & Thermal) of MOEFCC in its meeting on 15.01.2015 while considering proposal for EC capacity enhancement of Cluster-IV group of mines observed that BCCL has not submitted approved mining plan. The Project was accorded TOR vide letter no. J-11015/372/2013-IA.II(M) Dated 10.02.2014 exempting Public hearing for preparation of EIA/EMP report.

The proposal is for cluster IV Coal Mining Project (7.34 MTPA normative and 9.55 peak in an ML area of 1123.79 ha of Bharat Coking Coal Limited. The capacity enhancement is proposed from existing capacity of 2.851 MTPA normative & 3.708 MTPA peak.

The expansion of the project is required to implement the Master Plan to deal with the fire in Jharia Coalfield.

Empowered Sub Committee of BCCL Board pointed out during ESC meeting on 30.12.2016 that Mining Plans for all the mines of Cluster IV, alongwith modified Mine Closure Plan of all the mines of Cluster IV should be placed before the committee.

In the view of above you are requested to prepare and submit the above document on an urgent basis.

Matter most urgent.

भवदीय

महाप्रबंधक (योजना एवं परियोजना)

Annexure-IV

भारत कोकिंग कोल लिमिटेड
(कोल इंडिया लिमिटेड का एक अंग)
कोयला भवन,कोयला नगर,धनबाद – 826005
A Mini Ratna Company
पर्यावरण विभाग

Bharat Coking Coal Limited
(A Subsidiary of Coal India Limited)
Regd.Off: Koyla Bhawan, Koyla Nagar
CIN: U10101JH1972GOI000918
Environment Department

पत्र संख्या: भाकोकोलि/उप महाप्रबंधक(पर्या)/फाईल- Cluster-IV /2016/251- दिनांक : 16.01.2017
254/H)

सेवा में,
महाप्रबंधक - योजना एवं परियोजना
भा०को०को०लि० ,धनबाद ।

विषय :- Approved Mining Plan for EC Capacity enhancement of Cluster-IV

महोदय,

For EC capacity enhancement of Cluster-IV (Katras Area) from existing 3.708 MTPA peak to 9.55 MTPA peak, application was made to MoEFCC in 2013.

- TOR granted on 10th Feb 2014 with waiver of Baseline and recommendation of waiver of PH
- EMP considered in EAC meeting of 15.01.2015 and after submission of certified copy of compliance from RO, MoEFCC & Mining Plan approved by Director under delegated power, further considered on 08.01.2016.
- Expert appraisal Committee of MoEFCC desired Mining Plan approved by Board & Revised certified from R.O. MoEFCC, Ranchi for further consideration.
- R.O. MOEFCC made fresh inspection on 22.08.2016 & revised report is now uploaded

You are therefore requested to expedite Mining Plan preparation and approval for submission to MoEFCC for further consideration.

भवदीय,
16/1/17
उप महाप्रबंधक (पर्यावरण)

प्रतिलिपि:
1. क्षेत्रीय निदेशक, क्षेत्रीय संस्थान -2, सी.एम.पी.डी.आई धनबाद ।
2. महाप्रबंधक, कतरास क्षेत्र ।

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
ईमेल: cos.bccl@coalindia.in

बोर्ड सचिवालय /Board Secretariat

पत्रांक : बीसीसीएल/सीएस/एफ– 1(A)/2022/1433(11) दिनांक: 23.09.2022

सेवा में,
विभागाध्यक्ष (परियोजना व योजना),
बीसीसीएल, कोयला भवन

विषय : **Certified copy of Minutes of 392nd Board Meeting held on 12.09.2022.**

Dear Sir,

We send herewith certified copy of Minutes of **Item No.392.6B, 392.POT-1 & 392.POT-2** of 392nd Meeting of the Board of Directors of Bharat Coking Coal Limited held at Koyla Bhavan, Dhanbad on 12.09.2022 for taking necessary action at your end.

You are requested to send the Action Taken Report (ATR) on implementation of the above decision / decisions of Board Meeting(s) for placing before the next Board Meeting.

भवदीय,

बी.के.पारूई
कंपनी सचिव

Encl: As above

GM(P&P)
15671
23/9/22
24.9.22

Sri Bahera

Item No. 392.6B

Approval of Power of Attorney for signing of ESCROW Agreement with Coal Controller of India in respect of Approved /Modified Mine Closure Plans.

Background:

Ministry of Coal has issued guidelines for preparation of Mine Closure Plan- REG. vide no. 55011-01-2009-CPAM dated 7th January, 2013 from Under Secretary to the Govt. of India, Ministry of Coal, New Delhi(Annexure 'A').

As per Clause 6(iii) of the Annexure of the said guidelines "An agreement, outlining detailed terms and conditions of operating the Escrow Account shall be executed amongst the mining company, the Coal Controller and the concerned bank in order to give effect to this. The agreement shall be executed before the grant of permission by the Coal Controller to open the mine".

In view of the above the company needs to authorized an executive by executing a power of attorney in his favour to execute the tripartite Escrow Agreement with Coal Controller of India on behalf of BCCL in respect of the Mine Closure Plans approved/modified by BCCL Board for the purpose and to authorized Company Secretary to affix the common seal of the Company on the above Power of Attorney.

BCCL Board had earlier approved nomination of Sri Niraj Kumar, HOD(P&P), BCCL as the authorised representative of the Company/owner in the matter and execute the Power of Attorney for the same in its 359th held on 17.01.2020 . Special power of attorney was executed in favour of Shri Niraj Kumar for a period of 2 years.

BCCL Board is requested to re-nominate Sri Niraj Kumar, HOD(P&P), BCCL as the authorised representative of the Company/owner in the matter and execute the Power of Attorney for the same.

Decision:

The Matter was discussed at length. The Board, after discussion, agreed to re-nominate Shri Niraj Kumar, HOD(P&P), BCCL as the authorised representative of BCCL in the matter and execute the Power of Attorney for the same.

The Board passed the following resolution:

"RESOLVED that Sri Niraj Kumar, Chief Manager (Min)/ HOD(P&P) ,BCCL be and is hereby authorized to execute Power of attorney and to act as the authorized representative of the Company/owner to execute the tripartite Escrow Agreement between Coal Controller of India, a nationalized Bank and Bharat Coking Coal Limited.

Resolved further that the Common Seal of the company be affixed on above Power of Attorney executed in favour of Shri Niraj Kumar, HOD(P&P), BCCL in presence of Director(Technical) and Company Secretary of the Company".

Item No.392.PoT-1

Approval of Mining Plan along with Mine Closure Plan of Katras Choitudih Colliery.

Background:

Katras Choitodih Colliery was one of the existing/operating mines under the administrative control of Katras Area, BCCL. Katras Choitodih Colliery came into existence w.e.f. 1st May'1972 under Section-2 of Coking Coal Mines Nationalization (CCMN) Act 1972.

The Dhanbad-Chandrapura Rly line lies in the north of the project area. Mohuda -Bhaga railway line lies in the south of the project area.

At present a hired Patch B upto 13 Seam is in operation in the south eastern side. After completion of the hired patch a quarry with XIII seam as base can be opened up from rise side

Certified to be True Copy

B. K. Pandi
Company Secretary
Bharat Coking Coal Limited
Koyla Bhawan

Decision:

The Board agreed to the recommendation of the ESC (T) Committee and approved the Mining Plan along with Mine Closure Plan of Katras Choitudih Colliery having Peak Capacity 0.65 MTPA, Lease hold Area 228 Ha , Balance Life 10 Years and the total Mine Closure cost being ₹2184.924 Lakhs, (including the already deposited amount of ₹753.00 lakhs only) as recommended by the Empowered Sub Committee to the BCCL Board.

Board also advised that entire mining operation will be carried out as per the Statutory provision given under Mines Act 1952, Coal Mine Regulation 2017 and wherever specific permission will be required and the company will approach the concerned authorities for the same.

Item No.392.PoT-2

Approval of revised Project Report of Amalgamated NT ST KUJAMA OCP (Capacity-8.5 MTY), Lodna Area, BCCL

Background:

NT ST OCP is a running mine situated in Jharia Coal field and is under the administrative control of the Lodna Area of Bharat Coking Coal Limited (BCCL). NT-ST OC Project having production capacity of 6.0 MTY was approved by BCCL Board in its 304th meeting held on 03.02.2014 and subsequently approved by CIL Board in its 304th meeting held on 12.02.2014 at a total Capital outlay of Rs.555.52 Crores with an IRR of 18.59% to be worked on hired HEMM basis. The Project is in operation and presently it comprises of two Hired HEMM Patches.

It is proposed to reorganize the leasehold area of BCCL in Jharia Coal Field into seven Blocks (Block A to Block G) to optimize the coal production of BCCL keeping in view the important surface features like river/jore, and important surface infrastructures like rail, road etc. Block-G comprises the property of NT/ST, Kujama and Amalgamated Joyrampur OCP i.e. from existing mining position of NT/ST Mine to Dhanbad -Sindri road on the west.

In view of the above, it was decided to prepare a Revised PR of NT/ST portion as Phase-1 of Block G, comprising of Amalgamated NTST Kujama OCP with target production capacity of 8.5 Mty considering major area of Amalgamated NT ST Jeenagora OC Mine (679.63 Ha), part area of Kujama Colliery (75.96 Ha) and some part area of Amalgamated Joyrampur Colliery (38.61 Ha).

The approved Project Report namely "Project Report for North Tisra/South Tisra (Expn.) OCP (6 Mty) will be dovetailed in Revised Project Report of Amalgamated NTST Kujama OCP (8.5 Mty).

A Revised Project Report (RPR) of Amalgamated NTST Kujama OCP (8.5 Mty), submitted by CMPDI, was approved by BCCL Board in its meeting held on 18.04.2022 for variant-III (MDO mode of operation) with some suggestions and Board recommended for approval of CIL Board.

Certified to be True Copy

B. K. Pandey
Company Secretary
Bharat Coking Coal Limited
Koyla Bhawan

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**.**

BHARAT COKING COAL LIMITED

MINING PLAN OF KATRAS CHOITUDIH COLLIERY

JULY 2022

CENTRAL MINE PLANNING & DESIGN INSTITUTE LTD.

(A Subsidiary of Coal India Limited)

Gondwana Place, Kanke Road, Ranchi - 834031(Jharkhand), INDIA

CHAPTER	PARTICULARS	PAGE NO.
	Content	i
	List of Plates	ii
1	Introduction	1-7
2	Exploration, Geology, Seam Sequence, Coal Quality & Reserve	1-31
3	Mining	1-15
4	Safety Management	1-4
5	Infrastructure	1-8
6	Land Requirement	1-5
7	Environmental Management	1-17
8	Progressive and final Mine Closure Plan	1-10
	PLANS	

LIST OF PLATES

PLATES	
I	Location Plan
II	Surface Plan
III	Leasehold KML
IV	Geological Plan
V	Lithologs
VI A – VI T	Floor Contour Plan
VII A- VII T	Seam Folio Plan
VIII	Cross Section
IX	Initial Stage Quarry Plan
X	Intermediate Stage Quarry Plan
XI	Final Stage Quarry Plan
XII	Final Stage Dump Plan
XIII	Existing Land Use Plan
XIV	Final Land Use Plan
XV	Land Ownership Plan

CHAPTER – I

1.1 INTRODUCTION

BACKGROUND OF THE MINING COMPANY

Bharat Coking Coal Limited, a subsidiary of Coal India Limited, is a Central Public Sector undertaking, owned by the Govt. of India, engaged for extraction of coking coal and allied activities in Jharkhand and West Bengal.

It occupies an important place in coal mining industry in India, as it produces bulk of the coking coal mined in the country. BCCL was incorporated in January, 1972 to operate coking coal Mines operating in the Jharia & Raniganj Coalfields, taken over by the Govt. of India on 16th Oct, 1971 to ensure planned development of the scarce coking coal resources in the country.

BACKGROUND OF THE MINE

Katras Choitodih Colliery was one of the existing/operating mines under the administrative control of Katras Area, BCCL. Katras Choitodih Colliery came into existence w.e.f. 1st May'1972 under Section-2 of CCMN Act 1972.

The Dhanbad-Chandrapura Rly line lies in the north of the project area. Mohuda –Bhaga railway line lies in the south of the project area.

1.1.1 NAME OF COAL BLOCK AND ITS BOUNDARY

Katras Choitudih Colliery is located in Kumari geological block.

Total area of Katras Choitudih Colliery is 228 Ha (as per colliery records).

North: Amalgamated Keshalpur West Mudidih Colliery
South: Tata Amalgamated Bhelatand Colliery.
East: Gaslitand Colliery
West: New Akashkinaree Colliery.

1.1.2 NAME OF THE COAL FIELD

Katras Choitudih Colliery is located in Jharia coalfield.

1.1.3 BASE DATE OF MINING PLAN/MINE CLOSURE PLAN AND ZERO DATE

The Zero Date of the Mining Plan is 01.06.2022.

1.1.4 LINKED END USE PLANTS

The ROM coal will be sent to Mohuda and Moonidih washery as well as washery of Tata. The coal will also be sold through road sale.

1.1.5 DISTANCE OF END USE PLANT FROM THE PIT HEAD OF THE PROJECT

1.1.6 MODE OF COAL TRANSPORT

Road

1.1.7 COAL WASHING:

Coal Handling and washing is not available in Katras Choitudih Colliery.

1.1.8 SCOPE OF THE REPORT:

This mining plan and mine Closure plan has been prepared to facilitate environmental clearance process.

The scope of the mining plan is limited to opencast extraction of Seam VIII C and above with floor of Seam VIIIC as base of the quarry. The life of the mine will be 24 years.

1.2 LOCATION, TOPOGRAPHY & COMMUNICATION

1.2.1 LOCATION OF COAL DEPOSIT

Katras Choitudih Colliery is located in Katras area of BCCL. The colliery lies at around 11km from Dhanbad town.

1.2.2 COMMUNICATION

NATIONAL HIGHWAY & PWD ROADS

Katras Choitudih Colliery is well connected by rail and road. Dhanbad town is located at a distance of about 11 Km east of this colliery.

RAILWAY LINES

The Dhanbad-Chandrapura line of Eastern Railway passes from the northern part of the colliery and Mohuda Bhaga rail line of SE railway passes from the southern part of the colliery..

MAJOR TOWNSHIP

Dhanbad town is located at a distance of about 11 Km east of this colliery.

1.2.4 PROMINENT PHYSIOGRAPHIC FEATURES

There is no remarkable physiographic features existing in the area demarcated for mining.

1.2.5 LAND USE & OWNERSHIP/OCCUPANCY AND INVOLVEMENT OF FOREST OF LAND

Existing land use as provided by colliery authority is tabulated below:

SL NO	Land Use	Area (IN Ha)
1	Excavation Area	24.44
2	Backfilled Area	27.15
3	Excavated Void	1.02
4	Without Plantation	0.00
5	Top Soil Dump	0.00
6	External Dump	23.31
7	Safety Zone	0.00
8	Haul Road between quarries	0.00
9	Road Diversion	0.00
10	Diversion/ below River/ Nala/ canal	0.60
11	Settling pond / Pond	1.78
12	Railway, Road & Infrastructure area	36.24
13	Rationalisation area	0.00
14	Drains	0.99

SL NO	Land Use	Area (IN Ha)
15	Embankment	0.90
16	Green Belt (Social Forestry)	0.00
17	Water Reservoir near Pit	0.01
18	UG Entry	1.15
19	Undisturbed/ Mining right for UG / Barren Land	95.23
20	Resettlement*/ Homestead Land	15.18
21	Pit Head Power Plant	0.00
22	Water harvesting	0.00
23	Agricultural Land	0.00
24	OB Dump Area	0.00
	Total	**228.00**

The details of land distribution under different category are shown in the table below.

OWNERSHIP WISE DISTRIBUTION OF LAND

Sl. no.	Particulars	Area (in Ha)
1.	BCCL Owned Land (including in RS)	169.75
2.	Forest Land	
3.	Govt./Rly Land	29.12
4.	LA Land	0.70
5.	Tenancy Land	21.22
6.	Others (including GM and disputed)	7.21
	TOTAL	**228**

INVOLVEMENT OF FOREST LAND

No forest land is involved.

1.2.6 IMPORTANT SURFACE FEATURES , MAJOR DIVERSION OR SHIFTING INVOLVED AND CONSTRUCTION

DB Road :

The DB road passes through the leasehold in Katras Choitudih section. It will have to be diverted along the western boundary of the leasehold. Lakarka Drain will have to be diverted leaving sufficient distance from quarry northern edge.

The diverted route is given in the surface plan.

BRIDGE

A bridge will have to be constructed over Katri River to carry OB material for dumping in Gaslitand**.**

1.4 DETAILS OF THE ALLOTMENT AGREEMENT

	Parameters	**Details**
1.3.1	Name the Allottee	NA
1.3.2	Status of the Applicant Company	NA
1.3.3	Details of allotment / vesting order	NA
1.3.4	Name and address of the applicant	NA
1.3.5	Relationship between the applicant and allottee company	NA

1.3.6	Name of the previous allottee of the Block	NA
1.3.7	Starting Date of the Mine as per CMDPA	NA
1.3.8	Rated Capacity as per CMDPA	NA
1.3.9	Production Schedule as per opening permission (meeting provisions of CMDPA if any)	NA
1.3.10	End Use of Coal/Lignite as per allotment order if any	NA

1.5 PARAMETERS OF APPROVED MINING PLAN VIS-À-VIS PROPOSED MININ PLAN

	Parameters	**Details**	
		Approved Mining Plan	Proposed Mining Plan
1.5.1	Block Area in “Ha”	228	228
1.5.2	Block Area Projectised in “Ha”	83.72	176.80
1.5.3	Lease area in “Ha”	228	228
1.5.4	Project Area in “Ha”	83.72	176.80
1.5.5	Life of the Project in “Yrs”	6	24
1.5.6	Minimum and Maximum Depth of working in “m”	0-130	Min-160 Max-240
1.5.7	Net Geological Block in “Ha”		

	Parameters	Details	
		Approved Mining Plan	Proposed Mining Plan
1.5.8	Peak Production Target in "MTPA"	0.65	0.65
1.5.9	Seams Available "As per GR"		XVI T, XVI B, XV T, XV B, XV, XIV, XIII, XIII/XIV, XII, XI, X, VIII C, VIII A, VIII, VII, V/VI, IV, III, II T, II M, II B, I M, 0
1.5.10	Seams not considered for Mining with Reasons		Seam below VIIIC seam has not been considered as it is not possible to extract below VIII C seam with the available strike length. Parting between VIII C and next lower seam is on average 40m. Seams below VIIIC seam can be mined if adjacent mines are amalgamated in future
1.5.11	Gross Geological Reserve "Mt"		129.49 MT - Coking coal 149.68 MT- Non Coking coal
1.5.12	Net Geological Reserve "Mt"		117.72 MT - Coking coal 136.08 MT- Non Coking coal
1.5.13	Blocked Reserve "Mt"		30.31 MT
1.5.14	Minable Reserve "Mt"	1.209 Mt	14.83 MT - Coking coal
1.5.15	Extractable Reserve "Mt"	1.209 Mt	14.83 MT - Coking coal
1.5.16	% of Extraction /recovery		90%
1.5.17	Reserve Depleted (till the base date) Reserves "Mt"		NA
1.5.18	Balance Extractable reserves "Mt"	1.209 Mt-Coking coal	14.83 Mt - Coking coal
1.5.19	Average Grade	W-II	W-III
1.5.20	OB in Mm^3	17.186	178.43
1.5.21	SR m^3/te		12.03
1.5.22	Mining Technology		Shovel-Dumper combination

	Parameters	Details	
		Approved Mining Plan	Proposed Mining Plan
1.5.23	Coal Beneficiation envisaged		NA
1.5.24	Handling of Rejects		N.A
1.5.25	Reason for revision		Life as per last mining plan will expire soon.

Chapter – 2

EXPLORATION, GEOLOGY, SEAM SEQUENCE, COAL QUALITY & RESERVE

2.1 DETAILS OF THE BLOCK

2.1.1 Particulars of the block

The present report is confined to the assessment of the part area (South-western part of original Kumari Block (GR, September 1986), and Katras-Choitudih Block (GR, June 1998)) of Jharia Coalfield for mining of seams by opencast method. Both constitute leasehold area of Katras choitudih colliery.

Jharia coalfield is located in Dhanbad and Bokaro districts of Jharkhand. After nationalization and formation of Bharat Coking Coal Ltd. (BCCL), a feasibility report for reconstruction and development of the collieries (FR ’78) of this coalfield was prepared in collaboration with the Polish consultants, wherein amalgamation of the erstwhile collieries including virgin area was envisaged. In this FR, 9 large opencast blocks and 21 large underground blocks were envisaged. However, this could not be implemented in full due to various constraints. The katras-choitudih UG block and Kumari opencast block are two of these originally envisaged blocks (plate-I).

Katras choitudih Colliery shares its boundary with following collieries:

North: AKWMC
South: Amalgamated Tata Bhelatand colliery
East: Gaslitand
West: New Akashkinari Colliery

2.1.2 Location of the Block

The area under consideration is located in central part of Jharia coalfield, District: Dhanbad, Jharkhand. The colliery area lies between Latitude 23°46'40.50" to 23°47'52.40" (N) and Longitude 86°17'31.61" to 86°18'36.89"

(E). The area falls in Survey of India Toposheet No. 73I/5 of Jharia coalfield (RF 1:5000).

2.1.3 Area of the Block

According to colliery records the leasehold area under consideration has a total surface area of about 228 Ha.

2.1.4 Area of the block projectized

As per the surface extent of proposed quarry, area of the colliery proposed to be projectized is about 176.81 Ha.

2.1.5 Balance area yet to be projectized

Katras choitudih colliery has a mining history since pre-nationalization period. Underground mining has been done in the past in almost every part of the colliery leasehold. In this Mining Plan, 176.80 Ha out of 228 Ha has been considered for opencast mining. Rest area could not be considered due to statutory distance to be left form road, rail river etc.

2.1.6 Reserve in the area yet to be projectized

Seam XVI Top to seam VIII C has been proposed for mining in this report. Seams below seam VIII C (VIIIB to I Mid) have not been proposed for mining in this project. Net Geological Resource of seams below VIII C seam within the entire leasehold area of Katras-choitidih Colliery is 207.11 million tons. Net Geological Resource for seams XVI Top to VIII C outside proposed area to be projectized is 16.87 million tons (considering vertical boundary of the quarry). This resource is blocked under road, river and village.

2.1.7 Geo-Referenced UTM Co-ordinates of the Block Boundary

ID	x	y
0	429576.720865289	2630602.45236285
1	429572.761676519	2630571
2	429572.5	2630565
3	429571.691258982	2630558.95496359

4	429571.3	2630554.96200187
5	429570.959061223	2630549.14487889
6	429570.193662934	2630543.03828425
7	429569.373423519	2630536.92662666
8	429569.026308952	2630533.49835936
9	429568.724772032	2630531.43952816
10	429568.240245938	2630526.26015871
11	429567.272292062	2630516.33483202
12	429566.673980152	2630511.39135271
13	429565.893539068	2630504
14	429565.086930159	2630498.15118943
15	429564.321615653	2630491.04101978
16	429563.704131345	2630486.13806428
17	429563.615176011	2630484.40211625
18	429562.797808524	2630475.60516929
19	429561.257121246	2630458.59869692
20	429558.398784024	2630439.30960398
21	429557.946804666	2630433.29132043
22	429557.802391769	2630428.67201471
23	429557.262851543	2630421.45560713
24	429556.6	2630416.22247079
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32	429553.540685882	2630354.46169299
33	429556.397986502	2630350.35740711
34	429560.777218503	2630344
35	429567.994783185	2630334.08910713
36	429572.298753106	2630327.92658571
37	429575.715301559	2630323.34741681
38	429578.330105371	2630319.56458337
39	429583.3	2630313
40	429585.586819786	2630309.44524426
41	429589.854393785	2630303.64186391
42	429589.278591348	2630301.32298417
43	429587.909845119	2630293.92598129
44	429585.981917397	2630282.32300026
45	429584.927452836	2630275.90475951
46	429583.330869981	2630268.26506045
47	429582.286705038	2630261.18857838
48	429581.840762475	2630258

49	429580.937998774	2630253.16382577
50	429578.682163035	2630241.12485463
51	429576.755200541	2630229.71036814
52	429575.589062404	2630222.97722397
53	429574.455153461	2630215.24617686
54	429573.491148291	2630209.58155508
55	429570.492343109	2630191.87618329
56	429568.713391822	2630181.07696842
57	429566.716808856	2630169.36150967
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59	429563.512996618	2630149.71492152
60	429562.336098256	2630143.93930569
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66	429563.723950141	2630097
67	429563.907057346	2630094
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91	429568.1	2629925.06675294
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109	429440.558176182	2629869.17934746
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117	429143.985194339	2630046.59051043
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132	428489.795797609	2630386.57322342
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135	428238.436533723	2630545.57956452
136	428005.8	2630693.25168453
137	427879.850255703	2630693.68884846
138	427942.458749533	2630854
139	427982.097004188	2630954.22602562

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141	428007.740380617	2630995.42236537
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147	428083.242582129	2631270.77497042
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150	428114.888177411	2631344.93931092
151	428123.807262431	2631366.65344278
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155	428154.447858343	2631439.63699855
156	428174.887410042	2631476.35821998
157	428184.230667573	2631493
158	428187.904451733	2631506.43267297
159	428201.962007697	2631550.40183618
160	428213.000323343	2631585.47025048
161	428218.214966019	2631603.53754722
162	428221.673423789	2631612
163	428234.959286628	2631648.68486321
164	428255.840025572	2631705.37726841
165	428275.572251659	2631756.71818149
166	428296.1	2631808.10297225
167	428324.7	2631808.91215766
168	428336.366783587	2631859.37979105
169	428342.937077385	2631876.97568084
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171	428382.959032978	2631974.90231385
172	428385.770667877	2631978.80914629
173	428458.306732876	2631921.16636239
174	428532.6	2631919.71448453
175	428548.575499685	2631973
176	428542.341988414	2631981.54328566
177	428544.428155273	2631994.30108123
178	428565.3	2631998
179	428573.052425682	2632026.36509909
180	428602.083480823	2632027.97240665
181	428607.8	2631969.80082674
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183	428737.564013012	2631903.13176917
184	428757.611964585	2631893.52095533

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188	429107.573548864	2631680.68388826
189	429221.680532231	2631657
190	429311.022616998	2631638.65291846
191	429331.527007381	2631638.17593885
192	429313.100105303	2631513
193	429374.342049412	2631433.11694018
194	429420.153062244	2631373.78119898
195	429477.235997478	2631322.53402859
196	429529.430976646	2631277.00019838
197	429526.116053592	2631273.82841692
198	429521.645631018	2631269.32547733
199	429525.4	2631265.07725468
200	429527.062682371	2631263.44389716
201	429533.442438011	2631256.38993115
202	429539.228673757	2631249.81055484
203	429543.366393144	2631245.17927229
204	429586.932835768	2631197.25418826
205	429590.065444573	2631193.34155367
206	429596.051167095	2631186.95169455
207	429610.754571916	2631170
208	429656.233412749	2631119.41801938
209	429661.083321204	2631114.10989629
210	429681.934061229	2631086.48215781
211	429693.536007937	2631070.87173905
212	429729.208450221	2631023.02704078
213	429722.897905105	2631003.66332657
214	429715.505218276	2630981.18649384
215	429711.326005452	2630968.34305412
216	429710.311436554	2630965.16230071
217	429707.806747085	2630957.58619603
218	429704.594935774	2630947.61151551
219	429701.2	2630937.25758937
220	429700.346494238	2630934.53984216
221	429698.320457541	2630928.06538707
222	429692.449136208	2630911.01331711
223	429691.099927457	2630906.45878582
224	429689.987455752	2630903
225	429688.708666058	2630899.50196196
226	429687.428456841	2630896
227	429685.7	2630889.30976839
228	429684.114910464	2630885
229	429682.154851236	2630878.93874222
230	429680.182920919	2630873.45103084

231	429679.172128959	2630870.37022332
232	429675.342516668	2630858.48926306
233	429671.118366699	2630845.18913073
234	429667.323631608	2630832.61765743
235	429664.491249694	2630823.92987469
236	429663.459911268	2630820.55454593
237	429662.086619306	2630816.68211331
238	429659.113924235	2630807.75280717
239	429657.453662606	2630803.24703277
240	429655.016327657	2630795.28844345
241	429650.583790284	2630781.98384376
242	429648.583696993	2630775.94248165
243	429648.539576142	2630774.96272219
244	429646.907098613	2630771.50504758
245	429645.853387677	2630769.71546388
246	429644.567380964	2630767.15441947
247	429641.268334702	2630759.89729318
248	429633.989240241	2630744.92137211
249	429629.166457302	2630734.40157521
250	429624.325599411	2630724.10031736
251	429616.978772493	2630709
252	429613.143579497	2630700.91669433
253	429609.415081609	2630690.93733416
254	429607.4	2630685.47118195
255	429605.493123574	2630680.64967009
256	429603.599633736	2630675.82673235
257	429597.424898873	2630659.41409257
258	429595.965502125	2630654.66405456
259	429594.725072799	2630651.66560833
260	429593.276817147	2630647.37558844
261	429591.789713791	2630644.00865458
262	429590.710057772	2630639.98884527
263	429589.091208911	2630636.33186744
264	429587.797206363	2630632.54265078
265	429576.720865289	2630602.45236285

2.1.8 Geo-Referenced UTM Co-ordinates of the Proposed project area of the Mining Plan

Surface Extent		
ID	x	y
0	428096.408499116	2630701.74374895
1	428020.529885292	2630883.84348178
2	428030.844915896	2630909.84492354
3	428048.754169808	2630920.03576322
4	428065.300446635	2630973.82172063
5	428091.875986064	2631061.08846169
6	428085.507587088	2631075.91452099
7	428098.349810395	2631115.93215427
8	428125.380245388	2631199.33866177
9	428134.341973866	2631228
10	428139.596293122	2631245.75437089
11	428152.047231647	2631274.33046679
12	428163.112415144	2631300.91926417
13	428169.969069122	2631317.37893664
14	428178.832459499	2631339.10203226
15	428186.143075704	2631356.85348559
16	428195.826529672	2631379.90095549
17	428204	2631400.04126558
18	428207.525005802	2631408.17854689
19	428226.461488092	2631442.53258869
20	428238.732112446	2631464.93541243
21	428243.731257614	2631483.33577119
22	428257.1	2631526.08861301
23	428267.875607621	2631561.60231702
24	428272.156030223	2631577.06878463
25	428273.408802186	2631580.18057709
26	428330.6	2631632.96858654
27	428345.854476476	2631634.25810986
28	428540.712119268	2631649.69558214
29	428675.3	2631649.03971514
30	428817.222558123	2631659.70016089
31	429168.684012217	2631651.27157301
32	429307.110028085	2631621.86427448
33	429292.776609607	2631500.79832326
34	429320.534627726	2631424.21755043
35	429329.5	2631406.27830045
36	429338.555364094	2631391.74629999
37	429346.335092907	2631382.07507657
38	429349.271582984	2631377.37690773

39	429356.598190337	2631361.89743323
40	429361.376063956	2631348.00275139
41	429372.385363942	2631323.24129248
42	429386.132850422	2631300.31028139
43	429398.482075194	2631285.68063761
44	429417.680318511	2631271.83252302
45	429450.811510323	2631252.03837446
46	429451.3	2631251.71172424
47	429472.178560349	2631231.19589012
48	429492.735041132	2631216.64041755
49	429511.700498133	2631207.53544341
50	429529.391257852	2631201.00522602
51	429545.676769424	2631198.73728535
52	429547.971672843	2631196.54227699
53	429562.517579943	2631184.27914131
54	429574.460656616	2631175.82201146
55	429590.183741861	2631166.33061542
56	429602.912929806	2631158.51892422
57	429616.605213368	2631149.85345986
58	429627.5	2631143.57221221
59	429629.808521567	2631138.64310571
60	429636.701877913	2631115.78215525
61	429652.613040071	2631076.64339544
62	429664.780460753	2631046.53434285
63	429670.864000232	2631029.63108423
64	429672.591173351	2631009.00262164
65	429672.120032716	2630979.34056407
66	429671.9	2630966.17907741
67	429669.1	2630944
68	429668.351809523	2630942.12600567
69	429663.006449825	2630928.58944464
70	429653.185022821	2630908.66562927
71	429648.2	2630893.32052374
72	429626.707887758	2630853.99039811
73	429602.307176247	2630804.67061728
74	429581.141443307	2630773.90058857
75	429568.639124968	2630757.92666446
76	429548.358282513	2630723.21611465
77	429534.474981646	2630686.59736983
78	429510.567808395	2630624.79121037
79	429513.167659945	2630573
80	429511.380040563	2630537.73056683
81	429508.383717767	2630510.60490799
82	429503.608314371	2630468.11819395
83	429502.351871356	2630454.19695068
84	429500.074093526	2630427.73343707

85	429504.189728435	2630384.04790643
86	429515.291204157	2630330.44652923
87	429519.554997837	2630308.94441592
88	429528.435651313	2630270.25715973
89	429530.600337082	2630254.08887977
90	429529.2	2630249.22582701
91	429524.226701344	2630216.20696392
92	429523.359920422	2630209.37288822
93	429504.360309784	2630214.30187047
94	429445.676539832	2630229.71702852
95	429289.311508621	2630252.20338459
96	429229.826980926	2630271.11865464
97	429128.261904789	2630280
98	429011.901530208	2630290.95885506
99	428947.734691361	2630291.83680692
100	428766.866343896	2630286.30038449
101	428720.912749794	2630303.23212775
102	428645.633855089	2630341.51562968
103	428518.396762424	2630421.05497481
104	428438.181162133	2630472.78063259
105	428382.258728744	2630520.24122215
106	428272.834339528	2630589
107	428235.414191325	2630613.34987696
108	428096.408499116	2630701.74374895

2.1.9 KML file of the proposed lease and geological block

Available.

2.1.10 Whether the proposed project area is confined within the allotted block boundary

Yes

2.1.11 If project extends outside the allotted block boundary

Not applicable

2.1.12 Type of Project and year of starting

Opencast mining patch is running in the colliery at present in which seams from Top up to seam XIII have been proposed for mining.

2.2 EXPLORATION, GEOLOGY AND ASSESSMENT OF RESERVE

2.2.1 Regional Geology of the Area

The Jharia coalfield (453 Km^2) is sickle shaped on plan and occurs in the form of syncline with its axis trending broadly in E-W direction and plunging towards west. The southern flank of this coalfield is truncated by boundary fault having maximum throw about 2.5 Km at Mohuda Basin. The non-coal bearing Talchir formation is mainly exposed along the northern and western portion of the coalfield. The Barakar formation covering an area of 218 Km^2 which is exposed in the northern, eastern and south-eastern part of the coalfield area contains over 40 coal horizons including local and persistent seams, some of which are exclusively store house of metallurgical coal in India. The Barakar formation is successively overlain by Barren Measure formation which is devoid of workable coal seams. This is mainly exposed in the central part of the coalfield. The Barren Measure is overlain by the coal bearing Raniganj formation (54 Km^2). These are exposed within a sub elliptical basin the south-western part of the coalfield

Stratigraphy

The Regional stratigraphic succession of Jharia coalfield is given in table no. 2.1

Archeans: The Archeans, consisting of gneisses and mica schists are exposed all along the periphery of Jharia Coalfield. The metamorphics are profusely intruded by quartz veins.

Talchir: In an Archean basement, the lower Gondwana sediments are deposited with a pronounced unconformity. The lowermost Gondwana sediments of Talchir formation are represented by variegated shale and greenish sandstones which at times show laths of unaltered feldspars. They are exposed all along the northern fringe of the coalfield. Near Lutipahar in the north-western part of the coalfield, Talchir formation is comparatively well developed in a large area and boulder bed shows exposures of spheroidal weathering.

Barakar: In the eastern, northern and north-eastern parts of the block, the Barakar are extensively developed. All along the southern boundary they are extending under the thick over of Barren Measures. The Barakar formation comprises pebbly sandstones, conglomerate, grit, coarse to fine grained sandstones, shales, carbonaceous shales and coal seams. Verma *et. al*. (1989) has observed a gradual decrease in thickness of Barakar from east to west. Its maximum thickness of more than 1250 m has been observed in the south-eastern part of the coalfield in Tasra region. Barakar is the most important geological formation as it contains more than 40 coal horizons having thickness more than 50 cm. In general seam X (Ten) and younger seams are better quality coal.

Barren Measure: The Barren Measure formation lying conformably over the Barakar formation consists of massive multistoried sandstone alternating with carbonaceous shale, grey shale and sandstone/ shale intercalations with occasionally very thin, impersistent and non-workable coal horizons in the lower part of the formation. The Barren Measures show a widespread development extending from the central part of the coalfield up to the southern margin. The maximum thickness of the Barren Measure has been estimated to be around 625m in the central part of the basin. It gradually decreases westward and eastward.

Raniganj: Raniganj formation is deposited in sub elliptical basin that is called Mohuda basin the south-western part of the coalfield. The formation is represented by sandstone, shale, carbonaceous shale and coal seams. There are 24 coal seams reported from this formation. These seams comprise high volatile, high moisture, medium coking coal. The maximum thickness around 725m of Raniganj formation has been observed.

Igneous Intrusive: Mica peridotite and dolerite are the two most common Post Gondwana intrusives. The mica peridotite occurs as dyke and sill throughout the entire coalfield and has caused widespread devolatilization of the coal seams. The dolerite dykes are mostly confined in the western part of the coalfield and has limited effect on coal seams. The mica peridotite sills have devolatilized the extensive reserve of good quality coal in the coalfield.

As mentioned earlier most of the area is covered by sandy soil and alluvium. The thickness of soil varies from 1.0 m to 9.0 meter.

Table-2.1

Geological Succession of Jharia coalfield

Stratigraphic Division	Age	Formation	Lithological characters
	Recent	Alluvium/Soil/Sand	
	Cretaceous to Jurassic	Mica Peridotite/Dolerite Dyke	
	---------- Unconformity ----------		
Lower Gondwana	Upper Permian	Raniganj Formation	Mainly fine to medium grained grey current bedded sandstone with shale and coal seam
	Middle Permian	Barren Measures	Black carbonaceous micaceous shale with clay, ironstone and sandstone.
	Lower Permian	Barakar Formation	Coarse grained to conglomeratic white sandstone with shale and coal seams
	Lower Permian	Talchir Formation	Coarse grained sandstone, white or slightly variegated at Top, green shale with undecomposed feldspar, boulder bed etc.
	---------- Unconformity ----------		
	Archeans		Granites, gneisses and schists.

2.2.2 Local Geology

The area under consideration is located in the north central part of the Jharia coalfield, and includes rocks of Barakar formation which is overlain by thin layers of sandy soil and clay. Based on available borehole data, thickness of soil ranges between 3.23m. (KC-15) to 13.95 m. (AP-92) with average thickness of about 7.89 m. The rocks of Barakar formations can be divided into the top argillaceous strata- fine to medium grained with repeated intercalation of shales and lenses of sandstones as observed in the Quarries of seam XIV and XIII and bottom arenaceous strata- coarse grained to pebbly. Coal seams XVI Top to I (Middle) occur within the project area and seams XVI Top to X are under the

purview of this Geological note for their extraction by opencast method (Plate No. G-III). Incrop of seam XII touches the north-western corner of the colliery boundary. Incrop positions of the coal seams have been taken on the basis of geological plan viz. geological cross section, floor contour and quarry/incline positions and are interpretative. Geology and correlation of the seams have been established mainly on the basis of sub-surface data obtained from borehole and mine workings.

Table-2.2

Sequence of Coal Seams (within the colliery boundary)

SEAM/PARTING	VERTICAL THICKNESS (m)		AVERAGE THICKNESS (m)	NUMBER OF BH INTERSECTION
	MINIMUM	MAXIMUM		
XVIT	2.45 (KC009)	2.45 (KC009)	2.45	1
P	1.93	1.93	1.93	1
XVIB	0.67 (KC009)	0.67 (KC009)	0.67	1
P	39.2	39.2	39.2	1
XVA	1.20 (KC009)	1.24 (KC020)	1.22	2
P	17.4	26.51	21.95	2
XVT	2.09 (KC020)	2.45 (KC009)	2.32	3
P	2.45	2.5	2.47	2
XVB	1.18 (KC011)	1.52 (KC009)	1.37	3
P(XVT-XIV)	43.56	43.56	43.56	1
P(XVB-XIV)	45.7	54.29	50.81	3
XIV	2.38 (KC010)	7.04 (KC009)	5	12
P	4.33	13.11	9.46	11
XIII	0.60 (AP076)	4.86 (KC020)	2.79	11
P(XIV-XII)	47.85	47.85	47.85	1
P(XIII-XII)	29.65	43.26	35.82	8
XII	1.25 (KC013)	2.85 (KC011)	1.88	13
P(XIII-XI)	49.59	49.59	49.59	1
P(XII-XI)	9.34	13.76	11.76	13
XI	0.66 (KC015)	3.50 (AP092)	1.88	15
P	55.13	75.2	66.02	6
X	3.90 (KC004)	8.60 (KC013)	6.52	13

P	5.2	8.86	7.52	12
VIIIC	0.92 (KC004)	3.70 (AP098)	2.48	12
P(VIIIC-VIIIA)	11.32	28.98	19.4	11
VIIIA	3.02 (KC009)	4.28 (AP098)	3.64	11
P(X-VIIIT)	15.6	15.6	15.6	1
P(VIIIC-VIIIT)	25.31	25.31	25.31	1
P(VIIIA-VIIIT)	1.92	8.39	4.85	11
VIIIT	0.58 (KC013)	2.45 (AP095)	1.67	13
P	14.77	14.77	14.77	1
VIIIBOT	1.05 (AP076)	1.05 (AP076)	1.05	1
P(XI-VII)	107.05	107.05	107.05	1
P VIIIT- VII)	19.42	30.05	26.45	8
P(VIIIBOT- VII)	5.77	5.77	5.77	1
VII	1.52 (KC015)	4.53 (KC004)	3.4	14
P	30.63	30.63	30.63	1
V/VI	6.3 (AP076)	10.31 (AP095)	8.44	12
IV/V/VI	19.33 (KC009)	19.33 (KC009)	19.33	1
P(V/VI-IV)	4.33	10.18	6.64	12
IV	15.55 (KC015)	18.25 (KC019)	17.01	12
P	4.23	19.45	9.2	6
III	1.35 (KC020)	4.21 (KC020)	3.1	6
P	17.56	17.56	17.56	1
IIT	0.45 (AP098)	0.45 (AP098)	0.45	1
P(III-IIM)	38.96	38.96	38.96	1
P(IIT-IIM)	17.51	17.51	17.51	1
IIM	3.34 (KC010)	4.75 (KC020)	4.22	5
P	16.73	16.73	16.73	1
IM	2.15 (KC010)	4.29 (AP076)	3.3	3

Note-

1. Seam VIII B and seam IX has not been intersected in any borehole within the colliery leasehold.

Geological Structure of the Block

Strike & Dip

The intersecting structural details of the area explored are repetition of outcrops of seams by major strike-fault. The general strike of the strata is generally N65°W – S65°E. The dip direction is generally towards South direction and its amount generally varies from 3° to 16°.

Faults

Based on boreholes/colliery data 9 nos. of faults have been interpreted within the project area. Throw of these faults varies from 10m to 65 m. The details of faults are given in Table No–2.3.

Table- 2.3

Description of faults

Sl. No.	Fault No.	Extent & Location	Trend/Dip	Max. Throw (m)	Nature & Evidence
1	F1-F1'		NE-SW with ESE dip.	20m	Dip Fault 1. Encountered in the working of IX, X & XI/XII, X, IX. 2. Encountered in workings of VIIC of East Katras Colliery. 3. Encountered in workings of VIIIC of East Katras Colliery. 4. Encountered in quarry of VII& V/VI seams in Salanpur Colliery 5. III seam roof faulted in AP-73. Seams in East Katras and adjoining Katras Choitudih Colliery.
2	F2-F2'		NE-SW with ESE dip.	20m	Dip Fault 1. Shifting of incrop of seams. 2. Omission of X seam in KC-14. 3. Omission of XIII Bot seam in KC-6 4.Encountered in the workings of IX/X, XI/XII, XIIIT & XIV. 5. Encountered in the workings of VIIC seam in East Katras and Katras-Choitudih collieries. 6. The fault extends into Katras U/G Project area.

3	F3-F3'	0.21	NNE-SSW with NNW Dip	10m	1. Omission of part of Seam X from roof as well as reduction in parting between seam X and XI in BH KC-14. 2. Omission of seam-XI from roof in AP-97
4	F4-F4'	0.24	NE-SW with north-westerly dip	10m	Occurrence of FRLs of various seams at some level in boreholes KC-18 & KC-19, as well as displacement of stratum contours of various seams between BHs KC-10 & KC-13, & AP-95
5	F5-F5'	0.63	WNW-ESE with NNE dip	25m	Strike slip Fault Intersected in AP-50 omitting seam II (Top) and II (Middle).
6	F15-F15'	1.36	NNW-SSE with dip towards ENE	65m	Strike Fault 1. Encountered in workings XVI(T), XVI(BOT) of Gaslitand Colliery. 2. Intersected in AP-51 omitting seam XVII and in AP-85 omitting part of seam III from floor.
7	F17-F17'	0.34	E-W with Southerly dip	20m	Roof of XI/XII seam is faulted in KC-4
8	F18-F18'	0.6	E-W with Southerly dip	45m	Curvilinear Fault 1. Intersected in JSG-2 omitting seam XI and XII and thus reducing parting between seam X and XIII in AP-89 omitting seam IV and III thus reducing parting between seams V/VI and APL-22. 2. Omission of all the seam from XVII to XVIB/C in KC-4
9	F20-F20'	1.2	E-W with northerly dip	40m	Curvilinear Fault 1. Encountered in workings of Seam XIV, XIII, XV(T), XV(BOT) of Gaslitand Colliery.

Additionally, existence of other minor faults (throw up to 5m) in the project area cannot be ruled out.

2.2.3 Geological Block Area

Katras choitudih Colliery falls in Katras-Choitudih and partly in Kumari Block of Jharia Coalfield. As per colliery records total surface area of Katras choitudih colliery is about 176.81 Ha.

2.2.4 Status of Exploration of the block

The entire area under consideration has been covered by detailed exploration and data is partly available in the “Geological Report on exploration for coal in Kumari Open Cast Block, Jharia coalfield, Dhanbad (September, 1986)”, prepared by MECL and partly by Geological Report on Exploration for coal Katras Choitudih (UG 3) Block, Jharia coalfield, Dhanbad (June 1998) prepared by CMPDI.

2.2.5 Area covered by detailed exploration within the block

The entire area under consideration has been covered by detailed exploration.

2.2.6 Whether entire area covered by detailed exploration

Yes.

2.2.7 No. of boreholes drilled within the block

A total of 93 boreholes of AP and JSG have been drilled within Kumari OCP geological block, out of which 4 boreholes fall within the leasehold of Katras choitudih Colliery involving a total meterage of 1265.50 and total 18 boreholes of KC series have been drilled within Katras choitudih Block, out of which 11 boreholes fall within the leasehold of Katras choitudih colliery involving a total meterage of 3900.17.

Table- 2.4

Status of Exploration

Serial No.	Year	BH series	No. of BH in Katras choitudih colliery	Meterage drilled in Katras choitudih Colliery
1	1979-1985	AP	04	1265.50
2	1978-1981	KC	11	3900.17
Total			15	5165.67

2.2.8 Whether any further exploration is required or not

Seams below seam IV in the southwestern corner of the colliery leasehold fall in indicated category. But drilling may not be possible due to multiple sections of working in the upper seams.

2.2.9 Year wise future program of exploration

Not applicable.

2.2.10 Borehole density within the block (no./sq. km)

Within the colliery leasehold, the borehole density is approximately 7 BHs/Km^2.

2.2.11 No. of Seams available as per GR

The lay and deposition of coal seams is based primarily on the data available in the "Geological report on Exploration for coal in Kumari Open Cast Block" Jharia coalfield, Dhanbad (September-1986, prepared by MECL) and Geological report on Exploration for coal Katras Choitudih (UG3) Block Jharia coalfield (June-1998 prepared by CMPDI) and updated mine data provided by colliery authorities.

Coal seams XVIT to I (Middle) occur within the colliery (Table-2.2). Incrop of seam XII touches the north-western corner of the colliery boundary. Seam IX and VIIIB has not been intersected in any borehole within the leasehold. Seam XV is splited into XV Top and XV Bottom, and seam II is splited into II Top, II Mid and II Bottom. Standard geological name of coal seams and corresponding colliery nomenclature is given in Table-2.5.

Table – 2.5

Nomenclature of coal seams Vis-À-Vis Colliery Nomenclature

Standard Nomenclature (Geological)	Nomenclature (Geological) Katras choitudih	Nomenclature (Geological) Kumari ocp	KATRAS CHOITHUDIH Colliery Nomenclature
XVI TOP	XVI-I	XVI TOP	XVI A
XVI BOT	XVI-H	XVI BOT	XVI

L-4	XVI-G		
XV-A	XVI-E	XV-A	XV-A
XV T	XVI-C	XV TOP	XV (T)
XVB	XVI-B	XVBOT	XV (B)
XIV	XVI/XVIA	XIV	XIV
XIII	XV	XIII	XIII
XII	XIV	XII	XII
XI	XIII TOP	XI	XI
APL-8	XIII BOT	APL-8	XIA
XA		XA	
X	XI/XII	X	X
VIII-C	X	VIII-C	IX
VIII-B	L	VIII-B	
VIII-A	IX	VIII-A	VIIIB
VIII TOP	VIII-C	VIII TOP	
VIII BOT & VIII		VIII BOT & VIII	
VII	VIII-B	VII	VIIIT
APL-3	VIII-A		VIIIB
V/VI	VII	V/VI	
IVT	V/VI	IV	IV
III	IV TOP	III	
II TOP		II TOP	
II MID	IVB	II TOP& IITOP/IIMID	
I MID	III	I MID	
0	I/II		

Quality

As per the GR of Kumari OCP, seams XVIT, XVIB, XV, XIV, XIII, XII, XI, X exhibit good coking characteristics and have been categorized as coking in the area where UVM is > 20%, seam VIIIC, VIIIA, VIII Top, VIII Bot, VII, V/VI and IV have been considered both Coking as well as non-coking and seam III, IITop, IIMid, IIBot and I M have been considered non-coking where UVM is < 20%. within the colliery boundary. Seamwise average in-band thickness (I-100), average grade and GCV is given in Table No-2.7. Details of seam thickness and quality is available in seam folio plans (Plate No: G-VII).

To arrive at the in-band thickness of the coal seams as per opencast norms, all combustible dirt bands up to 1.00 m thickness occurring within the seam have been included. Dirt bands having thickness more than 1.00 m occurring within the seam have been excluded.

If the non-combustible bands that are developed within the seam persist in a considerable area, the seam has been considered as split and line of split or merger has been drawn in relevant floor contour and seam folio plans.

Due to unavailability of Gross Calorific Values (GCV) that have been determined in the laboratory, it has been calculated by the following formula (Majumder's formula for low moisture coal).

$$GCV = \frac{165F+136(VM-0.1A)-108M}{1.8} \quad \text{..... (i)}$$

Where:

F = Fixed carbon %, VM = Volatile Matter %

A = Ash %, M = Moisture %

Specific Gravity of coal has been calculated by the following empirical formula–

SG =1.28+ (0.01A) ..... (ii)

Where:

A = Ash%

Exploitation Status

Presently, seams from top to XIII are being worked by Open cast method. Seam XVIT, XVIB, XV, XIV, XIII, have been worked in the past primarily by underground method and also by opencast method at places in the past and XII, XI, X, VIIIC, VIIIA and VII have been worked in the past by underground method. Underground working of seam X is in two sections. Thin and impersistent seams such as seam XVA, VIIIB, VII, II Top, II Bot, I Top, and I Mid have not been exploited. Seam IX is not developed in the leasehold area. Details of working and quarry of each seam is available in floor contour plans (Plate No: G-VI) and seam folio plans (Plate No: G-VII).

An element of approximation exists in location and extent of mine workings when matched with borehole location plan. Surface features like quarries, Incline, roads etc. shown on the plan supplied by colliery do not well match with Survey of India Topo sheet available.

Seams Considered for Mining

Only seams XVI Top to seam VIII C has been proposed to be projectized within the proposed area. Floor extents of proposed quarry of each seam is available in floor contour plans (Plate No: G-VI) and seam folio plans (Plate No: G-VII).

2.2.12 Seams not considered for Mining

Seam VIII A, VIII Top, VIII Bot, VII, V/VI, IV, III, II Top, II Mid, II Bot and I mid in entire part of the leasehold has not been considered within the area to be projectized. Therefore, these seams have not been considered for mining.

In addition to that, Seam IX, VIII B and 0 seam is not persistent within the colliery leasehold and seam thickness is also less than 0.5 m in major part of its persistence.

2.2.13 Strike & Dip of the Seam

The general strike of the strata is generally N65°W – S65°E. The dip direction is generally towards South direction and its amount generally varies from 3° in northern part to 16° in eastern part. Local variation in the strike and dip have been observed particularly near incrops and faults.

The relevant details of strike and dip of seams can be seen from the floor contour plans and geological cross sections (Plate-G-V & G-VI).

2.2.14 Seam wise thickness, depth and reserve

Seam wise summary of in-band thickness (I-100) based on borehole data, depth range and reserve within Katras choitudih colliery leasehold are given in Table- 2.6 for their extraction by opencast method. 10 percent of the net geological resource available within the proposed quarry has been considered as mining losses. Therefore, 90 percent of net geological resource available within the proposed quarry has been considered as minable reserve.

Table – 2.6

Seam wise thickness, depth and reserve within colliery leasehold

Seam	In-Band Thickness Range (m)	Depth Range (m)	Net Geological Reserve (Mt)	Blocked Reserve Below (Mt)			Min Reserve (Mt)		Mining Losses
				Highwall/Batter	Nala/River/Road/ Village/Barrier	Total	UG	OC	
XVI TOP	1.5	INCROP-105	0.5007	0.47	0.02	0.49	NIL		
XVI BOT	2.45	INCROP-125	0.1828	0.15	0.01	0.16	`	0.00801	0.08
XV TOP	2.02-2.45	INCROP-185	2.6589	0.74	0.29	1.03	NIL	1.45467	0.14
XVBOT	1.18-1.52	INCROP-185	1.86	0.78	1.07	1.85	NIL		
XIV	4.0-7.04	INCROP-255	8.3953	2.35	1.48	3.83	NIL	4.18995	0.41
XIII	1.55-4.82	INCROP-265	3.284	1.17	0.38	1.55	NIL	1.5543	0.15
XII	1.1-2.85	INCROP-315	2.6513	1.21	0.62	1.83	NIL	0.73161	0.07
XI	0.66-2.66	20-305	2.8674	1	0.97	1.97	NIL	0.80181	0.08
X	3.9-8.30	90-365	18.3075	4.1	8.71	12.81	NIL	4.94325	0.49
VIII-C	0.92-3.05	100-365	5.9798	1.38	3.32	4.7		1.14201	0.11
VIII-A	3.02-4.06	120-395	14.2528	Not Proposed for mining					
VIII TOP	1.04-2.55	130-405	5.5134						
VIII BOT	0.65-2.48	140-435	5.1776						
VII	1.52-4.53	160-445	10.12						
V/VI	7.92-10.31	200-465	27.81						
IV/V/VI	19.33								
IV	15.88-18.25	220-505	108.5334						
III	1.35-4.21	230-505	9.97						
II TOP		240-335							
IIMID	3.34-4.75	260-505	12.32						
IIBOT			3.67						
I MID	2.15	300-495	6.52						
0			3.23						
TOTAL			**253.8049**	**13.35**	**16.87**	**30.22**		**14.82561**	**1.53**

2.2.15 Methodology of Reserve estimation

Reserve Estimation Criteria

A) The seam wise status of developed, depillared and goaved areas in addition to virgin patches has been identified on the basis of seam working plan provided by the concerned area/colliery officials. These have been clearly marked on the seam folio plans and floor contour plans of all the seams proposed for quarrying in the area.

B) Goaf & Quarries: These areas have been considered as devoid of coal, however in case of goaf the devoid zone is considered according to the height of the goaf.

C) Developed Areas: In developed areas, where reserves are standing on pillars, seam wise dimension of extraction (height & width) have been decided on the basis of seam working plan made available by area/collieries authorities and after detailed discussion with them. And only after that percentage of extraction factor for each seam has been arrived which ranges from 25 % to 30 %. For standing on pillars an average of 30% extraction of coal have been considered and accordingly Net Geological Reserve has been calculated.

D) Thickness: - Only the In-band (I100) thickness of the seam has been considered for reserve estimation.

Areas having thickness less than 0.5 m have not been considered for reserve estimation.

Methodology of Reserves Calculation

The reserve has been estimated through “MINEX” software.

1. The reserve has been calculated using “Detailed resource reporting” menu of **MINEX 6.1.3** software along with separate template for each individual seam.

2. A deduction of 10% from the 'gross reserves' of coal has been made to account for unidentified geological uncertainties like structural disturbances, washout zones etc. to arrive at the 'net geological reserves.'

3. The seam wise status of developed, depillared areas in addition to virgin patches has been identified on the basis of seam working plan supplied by the concerned area/colliery officials. These have been clearly marked on the seam folio plans and floor contour plans of all the seams.

4. Heave Zone: The areas falling within the heave zone of a fault has been excluded for the purpose of reserve estimation.

5. Reserve is calculated within the proposed project boundary demarcated by the mining department.

2.2.16 Average GCV

Seam wise average quality/GCV parameters of available coal resource of Katras choitudih colliery leasehold are given in Table No.-2.7.

Table No. - 2.7

Seam wise average grade

Seam	Average Thickness (m)	Average Ash% (Coking)	Average GCV(Kcal/Kg)	Average Grade
XVI TOP	1.5	21		W-II
XVI BOT	2.45	18.465		W-I
XV-A	1.22	27.19		W-III
XV TOP	2.29	21.19		W-II
XVBOT&XV	1.37	26.45		W-III
XIV	5.54	24.07		W-III
XIII	2.83	24.37		W-III
XII	1.91	19.53		W-I
XI	1.45	25.53		W-III
X	6	27.49		W-III
VIII-C (Coking)	2.21	29.63		W-IV
VIII-C (non-Coking)	3.05	26.9	6064.644	G5

VIII-A(Coking)	3.62	25.63		W-III
VIII-A (non-Coking)	3.7	28.45	5932.35	G5
VIII TOP(Coking)	1.69	33.1		W-IV
VIII TOP (non-Coking)	1.8	33.68	5601	G6
VII (non-Coking)	3.92	31.8	5889.333	G5
V/VI (Coking)	8.79	35.23		W-V
IV(Coking)	16.645	35.87		W-V
IV (non-Coking)				
III	3.15			
II TOP	0.74			

2.2.17 Gross Geological Reserve of the block

Seamwise – Gradewise gross geological reserve of non-coking and coking coal within the leasehold of Katras choitudih colliery at present is given below in Table-2.8(A) and Table- 2.8 (B) respectively.

Table No. - 2.8 (A)

Gross Resource of Non Coking Coal (in Million Tonne) within Leasehold Boundary													
Seam	**G1**	**G2**	**G3**	**G4**	**G5**	**G6**	**G7**	**G8**	**G9**	**G10**	**G11**	**G 12**	**TOTAL**
VIII-C					0	0							**0**
VIII-A					3.806	1.562							**5.368**
VIII TOP													
VIII BOT									0.429	2.431			**2.86**
VII				2.981	3.355	2.354	1.694	0.748					**11.132**
V/VI	3.212	6.666	8.118	7.194	3.366	2.024	0.011						**30.591**
IV						38.511	21.95						**60.456**
III								0.055	3.289	5.676	1.947		**10.967**
II TOP													
IIMID					0.286	5.984	5.764	1.518					**13.552**
IIBOT			1.551	2.387	0.099								**4.037**
I MID		0.044	1.848	4.73	0.55								**7.172**
0	2.387	0.286	0.253	0.209	0.187	0.132	0.077	0.022					**3.553**
TOTAL	**5.599**	**6.996**	**11.77**	**17.5**	**11.649**	**50.567**	**29.49**	**2.343**	**3.718**	**8.107**	**1.947**		**149.688**

Table No. - 2.8 (B)

Gross Resource of Coking Coal (in Million Tonne) within Leasehold Boundary								
SEAM	**S-I**	**S-II**	**W-I**	**W-II**	**W-III**	**W-IV**	**W-V**	**TOTAL**
XVI TOP			0.55077					**0.55077**
XVI BOT	0.01969	0.02486	0.01276	0.01243	0.02607	0.08052	0.02475	**0.20108**
XV TOP	0.06666	1.10583	0.25289	0.3641	0.86273	0.27258		**2.92479**
XV BOT			0.01155	0.3432	0.61688	1.07437		**2.046**
XV			0	0	0	0		
XIV			0.26257	5.34171	3.36325	0.2673		**9.23483**
XIII		0.1474	1.05039	1.25829	1.08372	0.0726		**3.6124**
XIII/XIV								
XII		0.70928	0.9878	0.75834	0.31262	0.14839		**2.91643**
XI		0.01947	0.16258	0.83765	1.60204	0.5324		**3.15414**
X			0	1.06634	13.4827	5.55423	0.03498	**20.13825**
VIII-C			0.0418	0.28105	3.16338	2.50008	0.59147	**6.57778**
VIII-A			0.97922	1.41284	7.07333	0.84469		**10.31008**
VIII TOP					0.14289	4.4473	1.47455	**6.06474**
VIII BOT					0.00341	1.54506	1.28689	**2.83536**
VII								
V/VI								
IV						36.11872	22.81202	**58.93074**
TOTAL	**0.08635**	**2.00684**	**4.31233**	**11.67595**	**31.73302**	**53.45824**	**26.22466**	**129.497**

2.2.18 Net Geological Reserve of the block

Seamwise – Gradewise net geological reserve of non-coking and coking coal within the leasehold of Katras choitudih colliery at present is given in Table-2.9(A) and Table- 2.8 (B) respectively.

Table No.- 2.9 (A)

Net Geological Resource of Non Coking Coal (in Million Tonne) within Leasehold Boundary													
Seam	**G1**	**G2**	**G3**	**G4**	**G5**	**G6**	**G7**	**G8**	**G9**	**G10**	**G11**	**G12**	**TOTAL**
VIII-C													
VIII-A					3.46	1.42							**4.88**
VIII TOP													
VIII BOT									0.39	2.21			**2.6**
VII				2.71	3.05	2.14	1.54	0.68					**10.12**
V/VI	2.92	6.06	7.38	6.54	3.06	1.84	0.01						**27.81**
IV						35.01	19.95						**54.96**
III								0.05	2.99	5.16	1.77		**9.97**
II TOP													
IIMID					0.26	5.44	5.24	1.38					**12.32**
IIBOT			1.41	2.17	0.09								**3.67**
I MID		0.04	1.68	4.3	0.5								**6.52**
0	2.17	0.26	0.23	0.19	0.17	0.12	0.07	0.02					**3.23**
TOTAL	**5.09**	**6.36**	**10.7**	**15.91**	**10.59**	**45.97**	**26.81**	**2.13**	**3.38**	**7.37**	**1.77**		**136.08**

Table No.- 2.9 (B)

Net Geological Resource of Coking Coal (in Million Tonne) within Leasehold Boundary								
SEAM	**S-I**	**S-II**	**W-I**	**W-II**	**W-III**	**W-IV**	**W-V**	**TOTAL**
XVI TOP			0.5007					**0.5007**
XVI BOT	0.0179	0.0226	0.0116	0.0113	0.0237	0.0732	0.0225	**0.1828**
XV TOP	0.0606	1.0053	0.2299	0.331	0.7843	0.2478		**2.6589**
XV BOT			0.0105	0.312	0.5608	0.9767		**1.86**
XV								
XIV			0.2387	4.8561	3.0575	0.243		**8.3953**
XIII		0.134	0.9549	1.1439	0.9852	0.066		**3.284**
XIII/XIV								
XII		0.6448	0.898	0.6894	0.2842	0.1349		**2.6513**
XI		0.0177	0.1478	0.7615	1.4564	0.484		**2.8674**
X				0.9694	12.257	5.0493	0.0318	**18.3075**
VIII-C			0.038	0.2555	2.8758	2.2728	0.5377	**5.9798**
VIII-A			0.8902	1.2844	6.4303	0.7679		**9.3728**
VIII TOP					0.1299	4.043	1.3405	**5.5134**
VIII BOT					0.0031	1.4046	1.1699	**2.5776**
VII								
V/VI								
IV						32.8352	20.7382	**53.5734**
TOTAL	**0.0785**	**1.8244**	**3.9203**	**10.6145**	**28.8482**	**48.5984**	**23.8406**	**117.7249**

2.2.19 Minable Geological Reserve of the block

Seamwise – Gradewise mineable reserve by opencast method of coking coal within the leasehold of Katras choitudih colliery at present is given in Table-2.10 (A). Mineable reserve has been estimated as 90 percent of net geological reserve estimated within proposed quarry extent.

Table No.- 2.10 (A)

MINABLE RESOURCE OF COKING COAL(IN MT) WITHIN PROPOSED FLOOR LIMIT EXTENT COMBINED								
Seam	**S-I**	**S-II**	**W-I**	**W-II**	**W-III**	**W-IV**	**W-V**	**TOTAL**
XVI TOP								
XVI BOT	0.0027	0.00342	0.00189					**0.00801**
XV TOP	0.03303	0.58005	0.1314	0.17001	0.35955	0.18063		**1.45467**
XV BOT								
XV								
XIV			0.1287	1.3401	2.62413	0.09702		**4.18995**
XIII			0.35514	0.57078	0.61065	0.01773		**1.5543**
XIII/XIV								
XII		0.11484	0.351	0.19323	0.07254	0		**0.73161**
XI			0.02007	0.27891	0.30465	0.19818		**0.80181**
X				0.65934	3.90654	0.37737		**4.94325**
VIII C					0.57528	0.31302	0.25371	**1.14201**
TOTAL	**0.03573**	**0.69831**	**0.9882**	**3.21237**	**8.45334**	**1.18395**	**0.25371**	**14.82561**

2.2.20 Blocked Reserve

Seamwise – Gradewise blocked reserve of coal within the leasehold of Katras choitudih colliery at present is given in Table-2.11.

Table No.- 2.11

BLOCKED RESOURCE OF COKING COAL(IN MT) WITHIN PROPOSED FLOOR LIMIT EXTENT COMBINED								
Seam	**S-I**	**S-II**	**W-I**	**W-II**	**W-III**	**W-IV**	**W-V**	**TOTAL**
XVI TOP	0	0	0.5007					**0.5007**
XVI BOT	0.0149	0.0188	0.0095	0.0113	0.0237	0.0732	0.0225	**0.1739**
XV TOP	0.0239	0.3608	0.0839	0.1421	0.3848	0.0471		**1.0426**
XV BOT			0.0105	0.312	0.5608	0.9767		**1.86**
XV								
XIV			0.0957	3.3671	0.2391	0.1352		**3.8371**
XIII		0.134	0.5603	0.5097	0.3067	0.0463		**1.557**
XIII/XIV								
XII		0.5172	0.508	0.4747	0.2036	0.1349		**1.8384**
XI		0.0177	0.1255	0.4516	1.1179	0.2638		**1.9765**
X				0.2368	7.9164	4.63	0.0318	**12.815**
VIII C			0.038	0.2555	2.2366	1.925	0.2558	**4.7109**
TOTAL	**0.0388**	**1.0485**	**1.9321**	**5.7608**	**12.9896**	**8.2322**	**0.3101**	**30.3121**

2.2.21 Corresponding extractable reserve of the block

For opencast mining extractable reserve is considered same as minable reserve in Table- 2.10(A) and Table- 2.10(B).

2.2.22 Percentage of extraction

For opencast mining percent of extraction is considered 100 percent.

2.2.23 Reserve already depleted

Not applicable.

Note- Mining activities are going on in Katras choitudih colliery since pre-nationalization period. Resource in the present work is estimated after deducting already depleted reserves.

2.2.24 Balance Reserve

Since, depleted resource is already accounted for in resource estimation, Balance reserve in Katras choitudih colliery is considered same as minable reserve in Table: -2.10 (A), 2.10(B) and Table: - 2.10(C).

CHAPTER - III

MINING

3.1 MINING METHOD

3.1.1 Existing Method of Mining if the Mine is Under Operation:

The mine is being worked by opencast method by means of hiring of HEMM.

3.1.2 Proposed Method of Mining with Justification on Suitability of Method of Mining

Present status of seams within the boundary of Katras Choitudih Colliery is detailed below:

Seam	Status
XVI Top	The seam outcrops at the northern side of Mahuda – Bhaga Line. Only 3-4 Nos. of pillars had been developed before nationalization from outcrop region by Inclines and rest is virgin. Inclines are filled up. No approach exists.
XVI Bottom	The seam outcrops at the northern side of Mahuda – Bhaga Line. The seam has been developed through inclines from the outcrop region. Part of the area on the outcrop region in the east had been caved while the area on the west and the dip side is standing on pillars. A small part of outcrop has been quarried. No approach exists.
XVA	The seam is partly quarried and rest is virgin.
XV Top and Bottom	The seam outcrops near village no. 2. 15 Top seam is developed upto the boundary and also quarried out in most of the area. 15 Bottom seam was developed in a limited area, however it has been quarried later on.

XIV	In Katras Choitudih section, the seam outcrops at the southern side of no 8, 9 & 6 Pit. The seam has been fully developed in single lift and mostly depillared. During the year 1963, on the south side of 6 Pit towards Lakurka village, fire occurred in the edge of the XIV seam quarry. The quarry edge and surface have been filled up with mutti and a water pool is being maintained over this. The outcrop region has been quarried in three separate patches along the strike. In the southern side the seam has been quarried out.
XIII	In Katras Choitudih section seam outcrops near pit no.6. Pit. The seam has been mostly depillared by caving, partly standing on pillar and stook out. Some of the area has been sealed off due to heating in the year 1953. In southern side, seam has been quarried out.
XII	Seam outcrops at the northern side of the property (Beneath the Dhanbad Chandrapura Railway line). The seam has been fully developed, partly caved, and partly splitted and rest SOP. The seam is connected to XI seam of New Akaskinaree colliery.
XI	Seam outcrops beyond the northern boundary of the colliery. The seam has been mostly developed and partly depillared. The dip side area is virgin. Water dam has been provided at inset of XI Seam in 6 Pit, 5 Pit & 2 Pit. No approach exists. The seams from XV to XI are interconnected through drifts/caved goaves.
X **(Top and bottom section)**	The seam has been mostly developed in one/two sections in the entire area and SOP. Rest is virgin. The workings are connected to X seam workings of New Akashkinari, AKWMC and Salanpur Collieries. There are three connections between KCC section and Salanpur. 4 nos. water dam and one isolation stopping with door have been provided and the door is used as escape route for the mine. There are two connections between KCC and New Akashkinari through drift across fault. 2 dams have been provided. .There is one connection between KCC section and AKWMC between X Bot. (KCC section) and X Top (AKWMC). One water dam has been provided. Presently dewatering is going on through 2Pit. North of S.E. Railway line had been extensively developed in two sections (2.5 m each) leaving about 3 m of coal parting in-between and had been partly

	depillared with stowing or caving and partly standing on pillars and waterlogged. South side of S.E. Railway line is virgin.
VIII C	Sseam is mostly developed and SOP and rest virgin.
VIII B	Seam is developed in west-central portion and standing on pillars. Rest portion is virgin.
VIII A	In the leasehold the seam is partly developed in north western and central region and standing on pillar. In rest of the area seam is virgin.
Seam below VIII A	Virgin

In this mining plan, it is proposed to extract the VIIIC seam and all above occurring seams in the mine through opencast operation.

Thus, seam XVI T to VIIIC is proposed to be worked by opencast method of working.

BCCL management can decide whether the operation of opencast would be done departmentally or by outsourcing means.

- **Choice of mining method**

  Considering the dip of beds which varies from 5^{O} to 8^{O} and mining of multiple seam separated by multi partings, the shovel dumper combination with horizontal slicing is being proposed for mining. Presently the opencast is being operated with Shovel-Dumper System of mining by hired HEMM.

- **Optimisation of targeted capacity**

  As per the current mining parameters of the mine, the normative production of the mine is 0.5 MTY. The peak production from the mine will be about 30% higher than the normal production (0.65 MTY) which will be achieved by better

utilization of resources and favourable geo-mining conditions. The OB from the shovel benches will be transported to internal dump through flank roads.

Sequence of mining

At present a hired Patch B upto 13 Seam is in operation in the south eastern side. After completion of the hired patch a quarry with VIII C seam as base can be opened up from rise side.

Production scheduling

The mining schedule has been formulated based upon the adopted sequence of mine development and optimum condition of mining operation for the entire life of opencast project.

The normative target production of the mine will be 0.50 MTY. However the peak production capacity of 0.65 MTY.

The year wise production from the AGKCC is given below:

	Coal (Mt)	**OB (Mm3)**
Y1	0.49	7.26
Y2	0.51	7.00
Y3	0.52	7.20
Y4	0.5	6.50
Y5	0.52	6.11
Y6	0.65	7.64
Y7	0.65	7.63
Y8	0.65	7.64
Y9	0.65	7.63
Y10	0.65	7.64
Y11	0.65	7.63
Y12	0.65	7.64
Y13	0.65	7.63
Y14	0.65	7.64

	Coal (Mt)	OB (Mm3)
Y15	0.65	7.63
Y16	0.65	7.64
Y17	0.65	7.63
Y18	0.65	7.64
Y19	0.65	7.63
Y20	0.65	7.64
Y21	0.65	7.63
Y22	0.65	7.64
Y23	0.65	7.63
Y24	0.59	6.93
Total	**14.83**	**178.43**

The average stripping ratio of the mine is 12.03 cum/Te.

Equipment configuration

There is no existing departmental HEMM available at Katras Choitudih Colliery.

In this mining plan, additional provisioning of HEMM has not been made.

- **Description of all mining operation**

a) Wining

Coal Extraction:

Considering the thickness range, number of seams to be worked, status of exploitation of seams and status of production level, Shovel will be used for extraction of coal after proper drilling and blasting.

All the seams considered for exploitation will be mined in separate single benches wherever possible.

Drilling in coal benches will be done by 100 mm/ 160mm drills or as decided by the outsourcing agency and after proper drilling & blasting, the blasted coal will be loaded by hydraulic Shovels on to 35t/60t dumpers or as decided by the outsourcing agency for transportation up to the surface stock yard.

OB Excavation

O.B. will be excavated in benches after proper drilling & blasting. Drilling in OB benches will be done by 160mm drills or as decided by the outsourcing agency. The blasted OB will be dozed, heaped and loaded on to 35t/ 60t dumpers or as decided by the outsourcing agency for transportation to OB dumps.

Variation in thickness of OB will make it difficult to maintain uniform bench height in OB horizons. However, it is proposed to have a ceiling on OB bench height from safety reasons. The height of the bench generally shall not exceed the boom height of shovel. The height of the OB bench is proposed as 10 m. Height of the coal bench will be equal to seam thickness subject to maximum bench height as 10 m.

Height of each deck for OB dumps will be 30 m and slope of individual dump benches will be 37^0. Width of berm between two adjacent benches will be about 30 m. Dumping will be done by End-Tipping method. The OB removal is totally by shovel dumper combination.

The working benches of OB and coal will be kept at a slope angle of 70^o and 80^0 respectively during operation.

The effect of inter bench access roads on the quantity of Coal extracted and OB removed is not incorporated in the Pit layout determination.

However, a scientific study should be carried out before starting a mechanised opencast working, including its method of working, ultimate pit slope, dump slope and monitoring of slope stability.

b) Transport

Coal Transportation:

Coal will be transported to Mohuda, Moonidih or Tata washery by road.

OB Transportation

Ob will be transported to dumps from face by means of dumpers.

c) Blasting

The drilling and blasting operations for loosening of coal and OB are necessary before excavation by shovels. The sufficient number of dozers provided in the project will carry out the site preparation. The blast-hole drilling will be done in patterns decided in advance depending on the strata hardness and the requirement of DGMS for drilling on the developed galleries. DGMS circulars issued in this regard may be referred (DGMS (Tech) Circular No. 3 & 4 of 1980, DGMS (Tech) Circular No. 11 of 1979 etc.).

The standard practice involving the electric detonators for the initiation of detonating cord, detonating relays to achieve hole-to-hole delays, use of Heavy ANFO, slurry or emulsion explosives as the column charge will be used for blasting as per the DGMS circular.

All necessary precautions as mandated through DGMS circulars will have to be taken while blasting in hot strata if any.

Elements of drilling & blasting in OB & Coal

The blast hole pattern (along with Burden & Spacing) will depend on actual site condition. However, specific consumption of explosives has been

envisaged as 0.3 kg/cum. for OB from Shovel benches and 0.2 kg/cum. for coal from coal seams.

d) Overburden Removal & Disposal

In-situ OB to be excavated	178.43 Mm^3
Loose OB to be handled	9.39 Mm^3
Stripping ratio (in-situ OB)	12.03

OB dump is to be dumped internally as well as in the adjoining Gaslitand Colliery of Cluster IV.

The dump parameters of internal OB dump (m) are given below:

Maximum internal Dump height	:	230 RL (30 m above ground level)
Individual Dump bench angle		37^o
Height of individual bench (m)	:	30 m
Berm width	:	30 m

Time frame for commencement of Backfilling & Justification therefor:

Internal dumping has been proposed in this mine plan and the distance of Internal dumping is not less than 100m from the toe of the active mine working in most places.

Life of the mine

As per calendar plan considering period of gradual build-up, existing hiring patch schedule and tapering down of production, the total life of the project will be 24 years at projected level of production.

Geological & extractable reserve

For furnishing account of reserves, geological and mineable reserves have been defined as follows:

Net Geological Reserve (NGR)

The reserves have been estimated upto the Seam VIIIC within delineated quarry using Minex model. It has been calculated using "Detailed resource reporting" menu of MINEX software along with separate template for each individual seam.

Mineable Reserve (MR):

A part of net geological reserve (NGR) is lost during process of exploitation. Therefore, the part of NGR that can be exploited successfully and transported to pit head coal stockyard is termed as mineable reserve (MR) [Mineable Reserve = Extraction Factor x Net Geological Reserve]. Extraction Factor is taken as 0.90.

Within the proposed quarry, the Net Geological Reserves (NGR) has been assessed at 16.47 MT upto Seam VIII C, all of which is coking coal.

Summarised account of reserves is as follows:

Sl. No.	Particulars	Total
1.	Surface Area of the Mining Block (Ha.)	228
2.	Net Geological Reserves (MT)	253.80
3.	Net Geological Reserves (MT) within quarry limit	16.47
4.	Mineable Reserves (MT)	14.83

Net Geological Reserve of the block

Seamwise – Gradewise net geological reserve of non-coking and coking coal within the leasehold of Katras Choitudih colliery at present is tabulated below:

Net Geological Resource of Non Coking Coal (in Million Tonne) within Leasehold Boundary													
Seam	**G1**	**G2**	**G3**	**G4**	**G5**	**G6**	**G7**	**G8**	**G9**	**G10**	**G11**	**G12**	**TOTAL**
VIII-C													
VIII-A					3.46	1.42							**4.88**

Net Geological Resource of Non Coking Coal (in Million Tonne) within Leasehold Boundary													
Seam	**G1**	**G2**	**G3**	**G4**	**G5**	**G6**	**G7**	**G8**	**G9**	**G10**	**G11**	**G12**	**TOTAL**
VIII TOP													
VIII BOT									0.39	2.21			**2.6**
VII				2.71	3.05	2.14	1.54	0.68					**10.12**
V/VI	2.92	6.06	7.38	6.54	3.06	1.84	0.01						**27.81**
IV						35.01	19.95						**54.96**
III								0.05	2.99	5.16	1.77		**9.97**
II TOP													
IIMID					0.26	5.44	5.24	1.38					**12.32**
IIBOT			1.41	2.17	0.09								**3.67**
I MID		0.04	1.68	4.3	0.5								**6.52**
0	2.17	0.26	0.23	0.19	0.17	0.12	0.07	0.02					**3.23**
TOTAL	**5.09**	**6.36**	**10.7**	**15.91**	**10.59**	**45.97**	**26.81**	**2.13**	**3.38**	**7.37**	**1.77**		**136.08**

Net Geological Resource of Coking Coal (in Million Tonne) within Leasehold Boundary								
SEAM	**S-I**	**S-II**	**W-I**	**W-II**	**W-III**	**W-IV**	**W-V**	**TOTAL**
XVI TOP			0.5007					**0.5007**
XVI BOT	0.0179	0.0226	0.0116	0.0113	0.0237	0.0732	0.0225	**0.1828**
XV TOP	0.0606	1.0053	0.2299	0.331	0.7843	0.2478		**2.6589**
XV BOT			0.0105	0.312	0.5608	0.9767		**1.86**
XV								
XIV			0.2387	4.8561	3.0575	0.243		**8.3953**
XIII		0.134	0.9549	1.1439	0.9852	0.066		**3.284**
XIII/XIV								
XII		0.6448	0.898	0.6894	0.2842	0.1349		**2.6513**
XI		0.0177	0.1478	0.7615	1.4564	0.484		**2.8674**
X				0.9694	12.257	5.0493	0.0318	**18.3075**
VIII-C			0.038	0.2555	2.8758	2.2728	0.5377	**5.9798**

Net Geological Resource of Coking Coal (in Million Tonne) within Leasehold Boundary								
SEAM	**S-I**	**S-II**	**W-I**	**W-II**	**W-III**	**W-IV**	**W-V**	**TOTAL**
VIII-A			0.8902	1.2844	6.4303	0.7679		**9.3728**
VIII TOP					0.1299	4.043	1.3405	**5.5134**
VIII BOT					0.0031	1.4046	1.1699	**2.5776**
VII								
V/VI								
IV						32.8352	20.7382	**53.5734**
TOTAL	**0.0785**	**1.8244**	**3.9203**	**10.6145**	**28.8482**	**48.5984**	**23.8406**	**117.7249**

Average stripping ratio

Mineable reserve, OB volume & average stripping ratio of the proposed quarry are as follows:

Sl. No.	Description	Unit	Quantity
1	Total mineable Reserve	Mt	14.83
2	Total OB volume (Loose + In situ)	Mm^3	178.43 (in-situ) 9.39 (loose)
3	Av. Stripping Ratio (considering only in situ)	m^3/te	12.03

Quarry parameters

The broad parameters of Katras Choitudih Colliery are given here

Mine boundaries delineation

The quarry limits of the AGKCC on the surface is delineated within the leasehold boundary as under:

North : 45m from railway acquired land

South : 45 m from railway acquired land.

East : 45 m from diverted DB Road

West : 60 m from Katri River

Considering the dip of the seams, it is proposed to excavate the OB from advance benches by horizontal slicing. The variation in thickness of OB will make it difficult to maintain uniform bench height in OB horizons. However, it is proposed to have a ceiling on OB bench height from safety reasons. The height of the bench generally should not exceed the boom height of the shovel. But due to variation in thickness of parting / cover, the bench height sometimes may exceed the boom height by few meters temporarily for effective utilization of shovel in certain cases (with due regard to safety). Necessary relaxation in this regard will have to be obtained from DGMS.

The slope angle of the working benches is adopted as 80^o and 70^o for coal and OB respectively, while for OB dump deck it is adopted as $37^o \pm 1^0$. In the light of the experience gained the elements of mining system can be modified during the actual mining operations depending upon the physical and mechanical properties of rock.

Mining parameters of the quarry is given below:

Sl.NO.	Description	Unit	Value
1	Area of Excavation	Ha	176.8
2	Strike Length	m	980-1600
3	Dip rise width	m	980-1300
4	Min and Maximum depth	m	160-240
5	Base of quarry	Floor of VIII C seam	

3.1.3 Coal Production Capacity Proposed “Mtpa”:

The peak coal production capacity of the AGKCC has been proposed as 0.65 MTY.

3.1.4 Calendar Year from Which the Production will Start:

Katras Choitudih colliery is already under operation.

3.1.5 Coal Production Plan "MT":

	Coal (Mt)	OB (Mm3)
Y1	0.49	7.26
Y2	0.51	7.00
Y3	0.52	7.20
Y4	0.5	6.50
Y5	0.52	6.11
Y6	0.65	7.64
Y7	0.65	7.63
Y8	0.65	7.64
Y9	0.65	7.63
Y10	0.65	7.64
Y11	0.65	7.63
Y12	0.65	7.64
Y13	0.65	7.63
Y14	0.65	7.64
Y15	0.65	7.63
Y16	0.65	7.64
Y17	0.65	7.63
Y18	0.65	7.64
Y19	0.65	7.63
Y20	0.65	7.64
Y21	0.65	7.63
Y22	0.65	7.64
Y23	0.65	7.63

	Coal (Mt)	OB (Mm3)
Y24	0.59	6.93
Total	**14.83**	**178.43**

3.1.6 Peak Rated Capacity:

- By OC: 0.65 MTY
- By UG: Nil
- Overall: 0.65 MTY

3.1.7 Life of the Mine:

- By OC: 24 Years
- By UG: Nil
- Overall: 24 Years

3.1.8 Whether the Proposed External OB Dump Site is Coal/Lignite Bearing: If So, Whether Coal/Lignite Below Waste Disposal Area is Extractable:

No external dump proposed

3.1.9 Whether Negative Proving for Coal / Lignite in the Proposed Site for OB Dump/Infrastructure has been Done:

Not applicable

3.1.10 Results of Any Investigation Carried Out for Scientific Mining, Conservation of Minerals and Protection of Environment; Future Proposals:

No such results are available for any scientific study in the area under consideration. The slopes of the quarry and dumps have been proposed on the basis of experience in the adjoining areas. However, to ascertain optimum slope angles for stability of quarry batter and dumps a scientific study need be

carried out. Similarly hydro-geological study of the area is to be done for the mine as none is available at present.

3.1.11 Type of Equipment/HEMM Proposed:

No equipment is proposed in the mining plan.

CHAPTER - IV
SAFETY MANAGEMENT

4.1 MINING METHOD

Elaborate safety measures have been laid out as per statute concerning safety in mines. In addition to existing provisions, reference has been made here to some special precautionary measures which have been considered important and require special attention for the safety of men and mine.

Safety of men and machine deployed in the mining area should be properly taken care of irrespective of whether the mining activities are performed by departmental or by outsourcing option.

All the provisions and precautionary measures as stipulated in CMR 2017, (especially Reg. 106 to 110) and orders made there under shall be strictly complied with. The important safety aspects have been deliberated subsequently.

In addition to those relevant clauses as stipulated in Act & Regulation, all clauses and sub clauses as mentioned in the permission granted by DGMS, Min. of Labour and Employment, GOI for working of Katras Choitudih Colliery shall be followed strictly.

The other rules / regulation applicable to mining industry shall be comply with like CEA Regulation 2010, Explosive Act etc.

4.1.1 Important Safety Aspects:

a) Proximity to river

Katri river flows southwards to the east of the leasehold and also governs the drainage system of the area. The eastern boundary of quarry is delineated leaving 60 m distance from the bank of Katri river.

b) Adjacent working

The AKWMC Collliery, Gaslitand colliery, New Akashkinaree colliery and Tata Bhelatand amalgamated mine situated in North, East, West, and south of the mine respectively. These neighboring mines have old underground working.

c) Geo-mining disturbances

The mine is generally free from pyrolisation.

d) Slope stability and remedial measures suggested

The slopes of the quarry and dumps have been proposed on the basis of experience in the adjoining areas. However, to ascertain optimum slope angles for stability of quarry batter and dumps a scientific study need be carried out (Ref. Regulation 106(2) of CMR 2017). Recommendation of this report should be followed strictly to avert any slope failure in the mine. DGMS (Tech.) circular No. 03 of 2020 dated 16.01.2020 and other circular issued from time to time for slope stability should be adhered.

Monitoring being the most effective mitigation measures against any impending slope failure, a constant vigil in this regard should be maintained in this regard.

e) Disaster management

Mining is a hazardous industry. There is risk to life and property associated with various mining and allied activities of the project. The Mining Plan has been drawn in conformity with the prevailing statutory provisions as per Mines Act, 1952 & CMR 2017 applicable for safety in mines. A detailed study has been carried out covering identification and assessment of risk, and recommendation of measures to prevent damage to life and property against such risks.

Safety Audit is an integrated component of Risk Assessment and Safety Management, which is required to be undertaken on regular basis by System Study and Safety Audit (SYSSA). Such System Study and Safety Audit (SYSSA) should be conducted at least once in every year, after every major

accident or disaster or dangerous occurrence, before implementation of any new technology or use of any new system or machinery in the mine. Such Study may be subject wise as well as an integrated report of the mine incorporating all subjects such as mining, mechanical, electrical, personal, occupational Health & Hygiene, and any other subject applicable to the mine and the system prevailing or to be used therein.

Risk Reduction Programme (RRP) is an ongoing process to achieve Zero Harm Status of Safety in any mine and should be incorporated in the Disaster Management Programme.

f) Danger from inrush of water

Although adequate precaution has been taken into account while deciding the quarry boundary and the final pit floor boundary so that the operational area of the quarry does not come within 60m of any underground workings which is likely to contain an accumulation of water or other liquid matter or any material that is likely to flow when wet. For the above said 60m, the distance between the said workings shall mean the shortest distance between the workings of the same seam or between any two seams or sections, as the case may be, measured in any direction whether horizontal, vertical or inclined. However, during operation, advance drills holes need to be provided while approaching underground workings as per statutes to prevent inadvertent connections.

g) Existing underground mine fire (if any)

During implementation of the fire dealing measures and excavation & dumping of hot materials, monitoring of status of fire, its movement, temperature condition and efficiency of fire dealing measures, is to be done regularly. Even on dump sites, such a monitoring is required so that quenching can be done in time to avoid dump fire. Necessary precaution should be done to quench / stop the fire.

In addition to statutory provisions, the measures for fire fighting and prevention of fires are as follows:

1) Organisation of special cell for systematic observations to examine and prevent fire.

2) Removal of spillage of coal on benches and cleaning of coal horizons to prevent cases of coal heating.

3) Storage of lubricants and cotton waste in enclosed fireproof containers in working places.

4) Provision of fire extinguishers

The recommendation made in the DGMS (Approval) Circular No. 02, 2013 should strictly be followed in the mine to prevent fire in HEMM. It says that "all types of fire fighting and fire suppression system including automatic fire detection and suppression systems to be used in HEMMs, materials and chemicals to be used in fire fighting or suppression system in mines both on surface and below ground including oil and gas mines/fields shall conform to the following minimum requirement";

a) All types of fire fighting and fire suppression systems including automatic fire detection and suppression systems to be used in HEMMs. Materials and chemicals to be used in fire fighting or suppression systems shall have valid test certificate(s) from any Government or Government approved Laboratory in compliance with relevant Indian Standards.

b) All material used in the fire fighting/ fire suppressant systems shall be non-toxic and in no manner harmful to human beings during handling and use.

c) The high pressure storage vessels and hoses, if used with fire-fighting and fire suppressant systems, shall conform to the requirements stipulated in the relevant Indian Standards.

4.2.2 Commitment from the Company Board

A Commitment from the Company Board that entire mining operation will be carried out as per the Statutory provision given under Mines Act 1952, Coal Mine Regulation 2017 and wherever specific permission will be required and the company will approach the concerned authorities for the same.

The same will be furnished as a part of Annexure during the approval of the Mining Plan.

CHAPTER - V

INFRASTRUCTURE FACILITIES

5.1 Mine infrastructure required e.g. Equipment maintenance planning, Office buildings, Workshop, Power supply arrangement, Water supply etc.

5.1.1 Existing Infrastructure facilities available

A. Road-

a) D.B.Road – A D.B roads exists from Dhanbad to Katras, nearly 0-1 Km from mine.

b) National Highway – No national highway passes through the property of mine, however distance of nearby national highway is 12 km from the mine.

c) Colliery Road –No separate colliery road exists inside the colliery property

B. Rail-

Katras Railway station, exists as Railway infrastructure 2 KM distant from the the colliery property

C. Water Storage

Water supply arrangement - Total colony and colliery water requirement, which is 2500 GPM are being fulfilled by mine water (2000 GPM) and river water(500 GPM).

Water consumption and usage -

i) Industrial - **60 KLD.**
ii) Domestic - Drinking- Nil

Non-Drinking- **1570 KLD**

D. Coal Stock Yard and its Locations-

Coal staking/heap name

Sl. No.	Heap number	Distance from quarry	Capacity in te	Location
01.	17	1.2 Km	30000	North- west side within OC Patch B

E. Existing effluent treatment plant & sewage treatment plant

At present there is no ETP & STP available in the mine.

F. Pit / Shaft in the Leasehold Area

Exists but, sealed off

5.1.2 WORKSHOP & STORE

WORKSHOP

Regional workshop & Store exists at AWS, Choitudih, while central workshop & Store is situated at Ekra colliery which is 10 km distant from the mine.

5.1.3 MAGAZINE – LOCATION, CAPACITY AND AREA

There is Keshalpur Central Magazine from where Explosive and Detonators are being used at the mine.

5.2 POWER SUPPLY & ILLUMINATION

5.2.1 PRESENT POWER SUPPLY

I. Power Supply: At present, the AGKC colliery of Katras Area is receiving power at 33 KV from DVC Putki Sub-station through two Nos. Single circuit 33 KV O/H Line (Ramkanali feeder and Sendra feeder). In addition to these, there is a tie feeder (connecting KC2 Pit substation and Ramkinali Substation) feeding from Malkera feeder.

Both Ramkanali substation and KC 2 Pit substation are independently feeding power to Katras-Chaitudih Colliery.

II. Existing Power Supply System:

Presently, there are single Substation KC 2 Pit substation to cater all electrical equipment & lighting loads of the Colliery.

- **33/ 6.6 kV KC 2 Pit regional Substation, Katras Area:-**
  There are main two transformers which are receiving power at 33 kv from the Ramkanali sub station and DVC Putki(Malkera) are given below:-

  1. 7.5/10 MVA, 33 /6.6 kV transformer
  2. 5/7.5 MVA, 33/6.6 kV transformer

- Power is being supplied to all the electrical equipment, lighting &domestic loads of Chaitudih Colliery and Area III from different feeder of the above sub-station. Details are given Below:-

1. Feeder No. 06 is supplying power to 1 PIT Water Plant, Katras – Chaitudih.

(i) One no. 1000 kVA, 6.6/0.550 kV transformer is being used for supplying power to Rampur Basti, Pasitand Basti and lighting transformer of

a. 250 KVA,0.550/0.440 KV Transformer for Lighting Loads of Pasitand Colony.

2. Feeder No. 06 is supplying power to 2 PIT Sub-station, Katras – Chaitudih.

(i) One no. 300 kVA, 6.6/0.550 kV transformer is being used for supplying power to Lal Dhowra Basti,KC-2 Pit Colony and Malkera New Qtrs.

(ii) One no. 1000 kVA, 6.6/0.550 kV transformer for supplying power to 02 nos. 200 HP Sumbersible Pump.

3. **Feeder No. 09 is supplying power to 6 PIT Sub-station, Katras –Chaitudih.**

   (i) One no. 500 kVA, 6.6/0.440 kV transformer for supplying power to 6&9 Pit lakarka and Lakarka Nichhe Basti.

   (ii) One no. 1000 kVA, 6.6/0.550 kV transformer is being used for supplying power to Lakarka Upper Basti, New Qtr Lakarka,,Loading Dhowra,13 Seam Habitation area Katri River and 170 HP Submersible Pump.

4. **Feeder No. 11 is supplying power to all the electrical loads of AREA-III of BCCL.**

5. **Feeder No. 17 is supplying power to following Sub-station.**

   (1) Regional Store Area-IV Sub-station:-

   (i) One no. 750 kVA, 6.6/0.440 kV transformer for supplying power to Area-IV.
   (ii) One no. 300 kVA, 6.6/0.440 kV transformer for supplying power to Area-IV.

   (2) 5 PIT Substation:-

   (i) One no. 1500 kVA, 6.6/0.440 kV transformer for supplying power to Area-IV Loads.

   (3) Hadadia Substation:-

   (ii) One no. 1000 kVA, 6.6/0.550 kV transformer for supplying power to following pumps
   (a) 150 HP Pump:-01 No.
   (b) 180 HP Pump:-02 Nos.

   (4) AGKCC Office Substation:-

(i) One no. 250 KVA, 6.6/0.440 kV transformer for supplying power to Office Colony.

(ii) One no. 300 KVA ,6.6/0.550 kV transformer for supplying power to Area work shop-KCC.

(iii) One no. 500 KVA ,6.6/0.440 kV transformer for supplying power to 10 Nos. Qtrs, AGKCC Office & CISF.

(iv) One no. 1000 KVA ,6.6/0.440 kV transformer for supplying power to Kathal Dhowra Lal Dhowra & Kodia Basti and 8 Nos. Basti &16&8 Nos. Colony.

6. Feeder No. 24 is supplying power to 500 KVA 6.6/0.550 KV Transformer for following Loads.

(i) Two nos. 10 kVA, 0.550/0.220 kV transformer for supplying power to Bengali Dhowrah.

(ii) One no. 50 kVA, 0.550/0.440 kV transformer for supplying power to Weigh Bridge.

(iii) One no. 150 kVA, 0.550/0.440 kV transformer for supplying power to 2 No. dhowrah.

(iv) 2x65 HP Motor pump

III. Existing Electrically Operated HEMM Equipment in KCC:

Nil

5.2.2 PROPOSED POWER SUPPLY

In the proposed system the existing supply system will continue.

Existing Sub-Station inside Quarry Area will be shifted to South - west corner of Lease Hold Area of Mines and all HT & LT Line will be shifted/diverted along the DB Road.

5.3 Drainage & Pumping: Assessment of Volume of Water for Pumping, Pumping Capacity and Pump Selection

5.3.1 PRESENT PUMPING ARRANGEMENT

Make of water-

SEASON	Make of water (GPM)	Distribution	colony supply	Dust Suppression/Fire fighting
MONSOON	8000	Use of water(GPM)	-----	------
OTHER DAYS	2500	use of water (GPM)	2000	500

The following pumps currently exists at Mine to pump out water .

Sl. No.	Pumping capacity (GPM)	Head(m)	Location	Power (kw/hp)	Voltage	purpose	Quantity(Nos.)
1.	1000	200	2 pit kcc	200 hp	550 v	Colony supply	01
2.	500	200	6 pit kcc	170 hp	550 v	Colony supply	01
3.	500	150	Mine ocp	100 hp	550 v	Fire fighting	01
4.	500	150	River side	65 hp	550 v	Colony supply	01

PROPOSED PUMPING ARRANGEMENT

Estimation of Surface Make of Water for Quarry

Sl. No.	Particulars	Unit	Value
1	**Water accumulation in the quarry:**		
1.1	**Maximum daily rainfall, h :**	m	0.180
1.2	**Catchment Areas :**		
a)	Maximum depth, d :	m	240
b)	Total Quarry Area to be Excavated, A	m^2	1768000
c)	Maximum exposed area at any point of time = A1 (33% of total quarry area)	m^2	583440
d)	Area beyond Excavation = A2 (5% Of A)	m^2	88400

e)	Internal Dump Area A3	m^2	859200
1.3	**Assumed Run-off co-efficients:**		
a)	For level terrain with thick soil cover	n_1	0.70
b)	For area beyond Excavation	n_2	0.15
c)	For Internal dump area	n_3	0.10
1.4	**Volume of Water accumulation in mine Q :**		
a)	Volume of water likely to fall in Quarry, Q = ($A_1xn_1xh + A_2xn_2xh + A_3xn_3xh$) Cum/day per day	Cum/day	91366
b)	Considering 10% seepage from surrounding strata, total water accumulation will be Q_1 = 1.1Q	Cum/day	100502
2.1	**Pumping capacity in Quarry :**		
a)	Water accumulation in the quarry,	Cum/day	100502
b)	Pumping capacity required to dewater the above accumulated water in 5 days with 18 hours of pumping per day.	Cum/min	19
		GPM	4000
c)	Considering 25% as stand- bye capacity	GPM	1000
d)	Total pumping capacity	GPM	5000

Proposed Pumping Arrangement

As in future total pumping requirement will be around 5000 GPM, hence additional 2500 GPM will be required for de watering of sump water, for this purpose following pumping arrangement are being proposed.

Sl. No.	Pumping capacity (GPM)	Head(m)	Power (kw/hp)	Voltage	Total in Numbers
1.	1000	200	200 hp	550 v	02 nos.
2.	500	200	170 hp	550 v	01 no.

5.4 Coal Handling Arrangement: Brief detail of the CHP/Mode of Dispatch, Coal quality and Coal staking and handling arrangement

At present produced coal is being brought to coal dump/stock yard from coal face by contractual dumper (Volvo- 30 te dumper)

As produced coal are being dispatched to different Non power sectors, so from the stock yard, coal is being transferred through Contractual dumper to Railway siding for final dispatch to customers.

At present, no crushing arrangement available at site.

5.5 Coal Washing and the proposed handling/ disposal of rejects.

No existing coal washing arrangement exists at colliery also there is no proposal for washing of coal is in this mine plan.

CHAPTER VI
LAND REQUIREMENT

6.1 LAND REQUIREMENT

6.1.1

Sl. no.	Particulars	Area (in Ha)
1.	BCCL Owned Land (including in RS)	169.75
2.	Forest Land	
3.	Govt./Rly Land	29.12
4.	LA Land	0.70
5.	Tenancy Land	21.22
6.	Others (including GM and disputed)	7.21
	TOTAL	**228**

Ownership wise land data not provided by colliery authority.

6.1.2 Landuse Details

Existing land use as provided by colliery authority is tabulated below:

SL NO.	TYPE	Area (in Ha)
1	Excavation Area	24.44
2	Backfilled Area	27.15
3	Excavated Void	1.02
4	External Dump	23.31
5	Diversion/ below River/ Nala/ canal	0.60
6	Settling pond / Pond	1.78

SL NO.	TYPE	Area (in Ha)
7	Railway, Road & Infrastructure area	36.24
8	Drains	0.99
9	Embankment	0.90
10	Water Reservoir near Pit	0.01
11	UG Entry	1.15
12	Undisturbed/ Mining right for UG / Barren Land	95.23
13	Resettlement*/ Homestead Land	15.18
	Total	**228.00**

6.1.3 Surface Features Over the Block Area

Important surface features are as follows:

Road: DB Road and colliery road

Rail: Dhanbad Chandrapura Railway Line , Mohuda Bhaga rail line

DB Road will have to be diverted along the western boundary of the mine.

6.1.4 No. of Villages/Houses to be Shifted

1) Lakarka village no. 1

2) Lakarka village no. 2

6.1.5 Population to be Affected by the Project

The village/ location wise affected people who needs rehabilitation are given in the following table:

Sl. No.	Site Code	Area Name	Colliery/Unit Name	Site Name	NON- LTH	LTH	BCCL qtrs
1	I/105	Katras	Katras-Chaitudih	Bastee No.4/11	102	0	18
2	I/106	Katras	Katras-Chaitudih	Kathal Dhowrah/08	84	0	18
3	I/107	Katras	Katras-Chaitudih	Lakurka Vill. No.1/12	12	283	0
4	I/108	Katras	Katras-Chaitudih	Lakurka Vill. No.2/13	49	113	0
5	I/109	Katras	Katras-Chaitudih	Lal Dhowra To Pokherpar/03	16	0	11
6	I/110	Katras	Katras-Chaitudih	Near 3 Pit Habitation/02	91	0	12
7	I/111	Katras	Katras-Chaitudih	North of 1 Pit/04	91	0	15
8	I/112	Katras	Katras-Chaitudih	Ramakant Bhartiya House/18	0	0	0
9	I/113	Katras	Katras-Chaitudih	Yule Pit Qtrs./07	33	0	18
10	II/99	Katras	Katras-Chaitudih	2 Pit Dhowrah /06	130	0	7
11	II/100	Katras	Katras-Chaitudih	5 No. Pit Area/10	0	0	0
12	II/101	Katras	Katras-Chaitudih	Bengali Dhowrah /05	139	0	15
13	II/102	Katras	Katras-Chaitudih	Dhowra of SW portion of 9 Pit/15	18	0	12
14	II/103	Katras	Katras-Chaitudih	Habitation North of 13 Seam Quarry/17	73	0	6
15	II/104	Katras	Katras-Chaitudih	Lakurka Bunglow Surrounding Area/09	71	236	16
16	II/105	Katras	Katras-Chaitudih	Lakurka Staff Qtrs./14	95	0	88
17	II/106	Katras	Katras-Chaitudih	Loading Dhowrah (Lakurka Section)/16	113	0	31
Total					**1117**	**632**	**267**

Note: The data is as per the data supplied by area/ mine official and may be verified by conducting proper socio-economic survey of the area before commencement of actual rehabilitation program.

6.1.6 Proposed Rehabilitation Programme

The actual site of re-settlement is yet be decided by Area/BCCL.

6.2	**DETAILS OF LEASE**	
6.2.1	Status of Lease	Renewed upto 7th December 2030
6.2.2	Existing Lease Area "Ha"	228 Ha
6.2.3	Period for which Mining Lease has been granted/~~is to be renewed/is to be applied for.~~	30 years from 8th December 2000
6.2.4	Date of expiry of earlier Mining Lease, if any	7th December 2030
6.2.5	Whether the lease boundary/required boundary is same as mentioned in the allotment order	NA
6.2.6	Lease Area (~~applied~~/required) as per the Mining Plan under consideration (Ha)	228
6.2.7	Whether the applied lease area falls within the allotted block	NA
6.2.8	Area (Ha) of lease which falls outside the delineated block/sub-block	NA
6.2.9	**Details of outside area:**	No outside block area has been considered for project area of this mine
	▪ Whether forms part of any other coal block	Not Applicable
	▪ Whether it contains any coal/lignite	Not Applicable

	reserves	
	▪ Purpose for which it is required, e.g. roads/ OB dumps/ service buildings/ colony/ safety zone/ others(specify)	Not Applicable
6.2.10	**Whether some part(s) of the allotted block has not been applied for mining lease.**	The whole area in the existing lease area has been proposed for mining lease
	- Total area in Ha of such part(s).	Not Applicable
	- Total reserves in such part(s). (Mt)	Not Applicable
	- Brief reasoning for leaving such part(s)	Not Applicable

Chapter 7: ENVIRONMENTAL MANAGEMENT

<table>
<tr><td></td><td>Parameters</td><td>Details</td></tr>
<tr><td>16</td><td colspan="2">ENVIRONMENTAL MANAGEMENT</td></tr>
<tr><td>a.</td><td>Commitment from the project proponent that the company will comply Environment and Forest Condition stipulated in the respective clearances</td><td>
<u>Air Quality Management:</u>
Sources
• Operational Phase
<table>
<tr><td>(i)</td><td>Drilling & Blasting</td><td>:</td><td>Noise & Dust SO2 NO2</td></tr>
<tr><td>(ii)</td><td>Handling of coal</td><td>:</td><td>Noise, Dust and SO2 NO2</td></tr>
<tr><td>(iii)</td><td>Movement of vehicles</td><td>:</td><td>Noise, Dust and SO2 NO2</td></tr>
</table>
• Post Operational Stage
<table>
<tr><td>(i)</td><td>Movement of dozers for physical reclamation of subsided area</td><td>:</td><td>Noise, Dust and SO2 NO2</td></tr>
<tr><td>(ii)</td><td>Movement of vehicles for shifting and salvaging operation of OC Machineries and other equipment</td><td>:</td><td>Noise, Dust and SO2 NO2</td></tr>
<tr><td>(iii)</td><td>Movement of vehicles for clearing of coal and other materials</td><td>:</td><td>Noise, Dust and SO2 NO2</td></tr>
</table>
</td></tr>
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Impact Assessment

The ambient air quality is influenced due to the presence of PM10, PM2.5, SO_2, NO2, etc., which are generated from above sources in operational and post operational stage.

Further, the ambient air quality is affected to a varying degree due to the mining activities of other nearby opencast and underground coalmines of the same coalfield. The concentration of pollutants may vary depending upon the various micro-meteorological parameters and the seasons of a year.

Fortnightly Ambient Air Quality Monitoring of KCC Mine as a part of Cluster IV is being carried out at following stations as part of routine Environmental Monitoring by CMPDI RI-II, Dhanbad:

Core Zone:

- **Govindpur Village (A7): Industrial Area**
- **Katras Chotudih (A37): Industrial Area**

Buffer Zone:

- **Block IV (A6) : industrial area**
- **Nichitpur (A8): Industrial Area**
- **Rudhi Basti(A18): Residential Area**

Air quality monitoring data at above stations for the period Jan 2022 to March 2022 is as given in the following tables.

Station Name: A7, Govindpur		Zone: Core		Category: Industrial	
Sl. No.	**Dates of sampling**	**PM 10**	**PM 2.5**	**SO2**	**NOx**
1	06.01.2022	118	64	12	23
2	17.01.2022	94	52	<10	23
3	11.02.2022	88	51	10	29
4	25.02.2022	97	54	10	24
5	04.03.2022	90	44	12	29
6	24.03.2022	119	56	11	25
	NAAQ Standard	100	60	80	80

Station Name: A37, Katras Chotudih		Zone: Core		Category: Industrial	
Sl. No.	**Dates of sampling**	**PM 10**	**PM 2.5**	**SO2**	**NOx**
1	07.01.2022	178	72	11	22
2	17.01.2022	126	67	<10	24
3	11.02.2022	155	71	<10	29
4	25.02.2022	111	63	11	34
5	11.03.2022	127	69	13	20
6	24.03.2022	93	50	12	26
	NAAQ Standard	100	60	80	80

Station Name: A6,Block IV		Zone: Buffer		Category: Industrial	
	Dates of sampling	**PM 10**	**PM 2.5**	**SO2**	**NOx**
1	07.01.2022	88	50	13	25
2	17.01.2022	85	49	10	20
3	10.02.2022	122	65	<10	26
4	24.02.2022	95	54	12	33
5	11.03.2022	93	47	14	26
6	23.03.2022	115	57	10	23
	NAAQ Standards	100	60	80	80

Station Name: A8,Nichitpur		Zone: Buffer		Category: Industrial	
Sl. No.	**Dates of sampling**	**PM 10**	**PM 2.5**	**SO2**	**NOx**
1	10.01.2022	86	48	13	32
2	27.01.2022	89	51	10	25
3	14.02.2022	85	51	10	30
4	28.02.2022	88	52	13	31
5	15.03.2022	121	58	11	23
6	25.03.2022	91	44	<10	27
	NAAQ Standards	100	60	80	80

Station Name: A18,Rudhi Basti		Zone: Buffer		Category: Residential	
Sl. No.	**Dates of sampling**	**PM 10**	**PM 2.5**	**SO2**	**NOx**
1	04.01.2022	85	50	<10	19
2	18.01.2022	98	57	<10	22
3	02.02.2022	90	53	13	27
4	16.02.2022	95	54	10	31
5	01.03.2022	88	45	15	24
6	21.03.2022	92	47	12	20
	NAAQ Standards	100	60	80	80

Following measures will be adopted to mitigate Air pollution from KCC Mine:

- At the points of dust generation, Fog Cannon/Mist Sprinklers shall be installed along with water sprinkling / spraying.
- Water sprinkling on surface roads, coal handling area, loading site, railway siding and coal stock yard to be done for minimizing fugitive dust emission
- Reclamation of subsided area (for UG mines).
- Proper maintenance of all Machines etc. will be undertaken so as to reduce harmful exhaust and noise.
- Personal protective gears will be given to workmen exposed to dusty and noise work environment.
- Development of green belt around infrastructure, colony, along roads and in vacant land against villages would be undertaken for arresting dust and noise propagation.

- Appropriate design of the geometry of blast holes.
- Coal transportation will be done through covered trucks/conveyor belt to washery and also to the siding.

Water Quality Management:

Sources

(i)	Sanitary (domestic) wastewater	:	Suspended solids and BOD.
(ii)	Water pumped out from Mine	:	Suspended solids of coal, clay and oil.
(iii)	Surface run-off passing through coal stockpiles	:	Suspended solids.
(iv)	Storm water from leasehold area and built-up area	:	Suspended solids.

Water Quality Report

Any adverse impact or pollution consequence of water will have serious effect on the environment. Hence, it becomes important to assess the water quality periodically in the mining area. Thus, to assess the water quality, samples were collected from two (02) locations (for mine water) and analysed for physico-chemical characteristics.

The water sampling points in Cluster IV were selected by consultation between BCCL & JSPCB officials. The different sources of water were identified for water quality characterization depending on their use for potable/industrial purposes and considering likely impact on these sources due to project activities. Based on these considerations, it was thought necessary to assess the existing quality of different water sources in the study area including both up & down stream of surface water body, ground water and mine water.

Name of the Cluster: **Cluster -IV**		Month: **Jan' 2022**	Name of the Station: **Mine Discharge of Chotudih**	
Sl. No.	**Parameters**	**MW4** First Fortnight 10.01.2022	**MW4** Second Fortnight 17.01.2022	**As per MOEF General Standards for schedule VI**
1	Total Suspended Solids	44	42	100 (Max)
2	pH	8.05	8.03	5.5 - 9.0
3	Oil & Grease	<2.0	<2.0	10 (Max)
4	COD	12	36	250 (Max)

Name of the Cluster: **Cluster -IV**		Month: **Feb' 2022**	Name of the Station: **Mine Discharge of Chotudih**	
Sl. No.	**Parameters**	**MW4** First Fortnight 07.02.2022	**MW4** Second Fortnight 21.02.2022	**As per MOEF General Standards for schedule VI**
1	Total Suspended Solids	49	50	100 (Max)
2	pH	7.95	7.91	5.5 - 9.0
3	Oil & Grease	<2.0	<2.0	10 (Max)
4	COD	36	24	250 (Max)

Name of the Cluster: **Cluster -IV**		Month: **March 2022**	Name of the Station: **Mine Discharge of Chotudih**	
Sl. No.	**Parameters**	**MW4** First Fortnight 14.03.2022	**MW4** Second Fortnight 21.03.2022	**As per MOEF General Standards for schedule VI**
1	Total Suspended Solids	38	36	100 (Max)
2	pH	7.95	7.84	5.5 - 9.0
3	Oil & Grease	<2.0	<2.0	10 (Max)
4	COD	32	32	250 (Max)

Water pollution control measures:

- Oil & Grease trap to treat effluent from Workshop.
- Entire domestic effluent will be treated in septic tanks and soaked into soak pits.
- Leak proof containers for storage and transportation of waste oil/grease.
- Regular testing of mine, surface and ground water will be carried out.
- Industrial water will be put into a closed circuit.
- Properly designed system to collect and divert the storm water shall be provided.

Ground water resources

In coal mines, the different aquifers overlying the working coal seam would be contributing groundwater to the mine by gravity drainage which need to be pumped out for safe operation of the mines.

Generally steep draw down cone would be formed in poor potential aquifers thereby the influence area is to small distance and reverse is established in respect of aquifers with high hydraulic conductivity. The Impact of mining activities is likely to be pronounced in the dip side which are estimated by utilising aquifer and mine parameters at final mine depth. It may be appropriate to mention here that the presence of prominent boundaries/water bodies, faults and also interfringing of sandstone and shale beds may restrict the propagation of draw down cone.

Further, the ground water level decline is more in the close vicinity of the pit. The effect will be pronounced in the down – dip side and milder in the up – dip side. But

this effect will be temporary in nature and once the project is over, after 2-3 rains, the regime will regain its almost original status.

Any shortage of water in the affected villages during the temporary period will be supplemented through supply of treated water pumped out from the mine.

Water conservation measures

- Provision of Rain water Harvesting system has been made for conservation of water.
- Settling pond for surface run-off with drainage system shall be provided.
- Closed water circuit will be provided.

Impact on Noise level

Fortnightly Noise Level Monitoring of KCC Mine as a part of Cluster IV is being carried out at following stations as part of Routine Environmental Monitoring by CMPDI RI-II, Dhanbad:

Core Zone:

- **Govindpur Village (A7): Industrial Area**
- **Katras Chotudih (A37): Industrial Area**

Buffer Zone:

- **Block IV (A6) : industrial area**
- **Nichitpur (A8): Industrial Area**
- **Rudhi Basti(A18): Residential Area**

Noise level data at the aforementioned stations is as given below:

Name of the Project : **Cluster -IV**			**Station Name: A7, Govindpur**	
Sl. No.	**Category of area**	**Date**	**Noise level dB(A)LEQ**	***Permissible Limit of Noise level in dB(A)***
1	**Industrial area**	06.01.22	59.8	75
2	**Industrial area**	17.01.22	60.3	75
3	**Industrial area**	11.02.22	59.9	75
4	**Industrial area**	25.02.22	60.6	75
5	**Industrial area**	07.03.2022	59.3	75
6	**Industrial area**	24.03.2022	57.3	75

Name of the Project : **Cluster -IV**			**Station Name: A37, Katras Chotudih**	
Sl. No.	**Category of area**	**Date**	**Noise level dB(A)LEQ**	***Permissible Limit of Noise level in dB(A)***
1	**Industrial area**	06.01.22	57.1	*75*
2	**Industrial area**	24.01.22	61.2	*75*
3	**Industrial area**	11.02.22	61.5	*75*
4	**Industrial area**	25.02.22	62.1	*75*
5	**Industrial area**	03.03.2022	60.3	*75*
6	**Industrial area**	24.03.2022	58.2	*75*

Name of the Project : **Cluster -IV**			**Station Name: A6,Block IV**	
Sl. No.	**Category of area**	**Date**	**Noise level dB(A)LEQ**	***Permissible Limit of Noise level in dB(A)***
1	**Industrial area**	10.01.22	56.6	*75*
2	**Industrial area**	17.01.22	60.2	*75*
3	**Industrial area**	11.02.22	58.8	*75*
4	**Industrial area**	25.02.22	59.3	*75*
5	**Industrial area**	11.03.2022	59.3	*75*
6	**Industrial area**	24.03.2022	57.6	*75*

Name of the Project : **Cluster -IV**			**Station Name: A8,Nichitpur**	
Sl. No.	**Category of area**	**Date**	**Noise level dB(A)LEQ**	***Permissible Limit of Noise level in dB(A)***
1	**Industrial area**	10.01.22	58.6	*75*
2	**Industrial area**	24.01.22	59.4	*75*
3	**Industrial area**	15.02.22	58.2	*75*
4	**Industrial area**	28.02.22	59.4	*75*
5	**Industrial area**	12.03.2022	60.2	*75*
6	**Industrial area**	26.03.2022	56.8	*75*

Name of the Project : **Cluster -IV**			**Station Name: A18,Rudhi Basti**	
Sl. No.	**Category of area**	**Date**	**Noise level dB(A)LEQ**	***Permissible Limit of Noise level in dB(A)***
1	**Residential area**	03.01.22	52.3	*75*
2	**Residential area**	19.01.22	53.4	*75*
3	**Residential area**	01.02.22	54.1	*75*
4	**Residential area**	16.02.22	53.7	*75*
5	**Residential area**	01.03.2022	54.6	*75*
6	**Residential area**	21.03.2022	52.4	*75*

Noise pollution control measures

- Adequate and regular maintenance of plants and machineries will be carried out.
- The noise absorbing pads at foundations will be provided.
- Green belt has been proposed to prevent the propagation of sound and also to dampening its intensity.
- Proper blasting techniques by designing a suitable blasting pattern after actual field observation would be followed to minimize adverse effects of ground vibration and noise if required.
- Personal protective gears are given to workmen exposed to dusty and noise work environment.

Hazardous Waste:

Details of Hazardous waste generated and their method of disposal:

Sl. No.	Waste description	Method of disposal
1.	Used oil	Will be stored in drums safely in store for disposal through auction to the authorized re-processors
2.	Oil and grease	
3.	Used batteries	To be stored safely for auction to the authorized re-processors.
4.	Oily sludge	Disposal in accordance with Hazardous Waste Management rules 2016 & any futher applicable
5.	Filters & filter materials containing oil during maintenance of vehicles	

Door to door Municipal Solid Waste will be collected and subsequently this waste will be disposed by Municipal Corporation as per existing Rules.

Sewage will be treated in Septic Tank cum Soak Pit prior to disposal

Socio-Economic Issues:

The project is likely to give a boost to the economy of the area by providing primary and secondary employment to local people . The infra-structural facilities including healthcare facilities provided by the project will benefit local villagers. The progressive mine closure activity is likely to significantly reduce the impact of mining

activity on the land apart from increasing the green cover and surface water availability. The yearly CSR expenditure as per existing CIL Policy ie 2% of average net profit of the company for the immediate three preceeding years or 2.00 per tonne of coal production of previous year whichever is higher, which is proposed to be spent in vicinity will help in bringing about better socio-economic benefits to the local population.

Biological reclamation

For successful biological reclamation of the reclaimed area, preference will be given to endemic species and mixed culture. The species will be selected carefully from the following groups for quick reclamation :

- Nitrogen fixing tree species for fuel wood, timber and fodder
- Fruit bearing tree species
- Tree species with dense foliage for shade
- Flowering and ornamental tree species.

Plantation Program of KCC mine is given in the following table:

Plantation Details	Year	PLANTATION		Total Plantation
		Area (ha)	Trees/ saplings	
PLANTATION SITE-1	1	0.54	1350	1350
	2	0.54	1350	1350
	3	0.54	1350	1350
	4	0.54	1350	1350
	5	0.54	1350	1350
	6	0.54	1350	1350

		7	0.54	1350	1350
		8	0.54	1350	1350
		9	0.54	1350	1350
		10	0.54	1350	1350
		11	0.54	1350	1350
		12	0.54	1350	1350
	PLANTATION SITE-2	13	0.6	1500	1500
		14	0.6	1500	1500
		15	0.6	1500	1500
		16	0.6	1500	1500
		17	0.6	1500	1500
		18	0.6	1500	1500
		19	0.6	1500	1500
		20	0.6	1500	1500
		21	0.6	1500	1500
		22	0.6	1500	1500
		23	0.6	1500	1500
		24	0.6	1500	1500
	Post Mining	PC1	1.8	4500	4500
		PC2	1.1	2750	2750
		PC3	0.6	1500	1500
		TOTAL	**17.18**	**42950**	**42950**

Plantation program has been delineated in Plate No XIV

Monitoring & Management Organisation:

To have a close watch on the environmental condition and implementation of the various measures suggested, a multi-disciplinary approach is essential.

ORGANISATION CHART

Sl. No.	Measures/Actions		Agency
1.	Environmental Pollution Control	1	General Manager, Katras Area
		2	Officer in Charge, (Environment), Katras Area
		3	Project Officer, KCC Colliery
		4	Area Manager (Civil), Katras Area
		5	Environment Cell (BCCL H.Q.)
2.	Environmental Monitoring	1	General Manager, Katras Area
		2	Area Manager (Civil), Katras Area
		3	Officer in Charge, (Environment), Katras Area
		4	Project Officer, KCC Colliery
		5	Environment Cell of BCCL Headquarters
		6	Environmental Laboratory of CMPDI, RI-II, Dhanbad
3.	Reclamation	1	Project Officer, KCC Colliery
		2	Officer in Charge (Environment), Katras Area

CHAPTER VIII

PROGRESSIVE AND FINAL MINE CLOSURE PLAN

- Mine Closure Plan has two components viz. i) Progressive or Concurrent Mine Closure Plan, and ii) Final Mine Closure Plan. Progressive mine Closure Plan would include various land use activities to be done concurrently and sequentially during the entire period of the mining operations, whereas the Final mine Closure activities would start towards the end of mine life, and may continue even after the reserves are exhausted and/or mining is discontinued till the mining area is restored to an acceptable level. The Mine Closure details of the Mining Plan should be oriented towards the restoration of land back to its original condition as far as practicable.

- Mining is to be carried out in a phased manner along with reclamation and afforestation work in the mined out area.

- This Progressive mine closure plans shall be reviewed after a period of every five years. These plans would be examined periodically in every five years period and to be subjected to the third party monitoring by the agencies approved by the Central Government, like Central Mine Planning and Design Institute Ltd. (CMPDIL), National Environmental Engineering Research Institute (NEERI), Indian Institute of technology (IIT-ISM) or any other institutes/organizations/agencies specified from time to time for the purpose.

- Various project specific activities viz. mined-out land details & their technical and biological restoration plan, water quality management, infrastructure to be retained and demolished, disposal of mining machinery, etc. have been furnished in the relevant paras. As the backfilling of the mine void is being carried out as part of regular mining operation, it shall not be included in the list of progressive mine closure activities. However, in case, if the backfilling of mine void is being carried out specifically for closure of the mine in future due any reason, the same shall be included in the list of activities to be taken up for mine closure.

	Parameters	*Details*
8.1	**Land Degradation and restoration Schedule**	

8.1.1 Land Degradation and Technical Reclamation (Commutative Area "Ha")

Stage/Year	Land Degraded				Technically Reclaimed Area			
	Excav	Dump (Extn+Top Soil)	Infra/others*	Total	Backfill	Dump (Extn+Top Soil)	Infra/others	Total
Up to Base year*	46.93	23.70						
Y-5	85.43		0.5					
Y-15	133.43				40.4			
Y-24	176.80				85.4			

8.1.2 Biological Reclamation (Cumulative in "Ha")

Stage/Year	Biologically Reclaimed Area					Forest land (Return)	Un Distrubed/To be left for Public/com Use	Total
	Agriculture	Plantation	Water Body	Public Company Use	Total			
Up to Base year*								
Y-1		0.54						
Y-2		0.54						
Y-3		0.54						
Y-4		0.54						
Y-5		0.54						
Y-6		0.54						
Y-7		0.54						
Y-8		0.54						
Y-9		0.54						
Y-10		0.54						
Y-11		0.54						
Y-12		0.54						
Y-13		0.6						
Y-14		0.6						
Y-15		0.6						
Y-16		0.6						
Y-17		0.6						
Y-18		0.6						
Y-19		0.6						
Y-20		0.6						

Y-21			0.6							
Y-22			0.6							
Y-23			0.6							
Y-24			0.6							
Post Closure										
Y-25			1.8	32.4						
Y-26			1.1							
Y-27			0.6							

8.2	**Post Closure Water Quality management:**	Routine Environmental Monitoring will be carried out for water quality analysis of following samples: **S. No. / Sample / Frequency** 1 – Mine Water – Fortnightly Mine Water – Half Yearly 2. – Surface Water – Quarterly 3. – Ground Water – Quarterly If any discrepancy from statutory standards is observed, necessary corrective measures will be undertaken by the management.
8.3	**Post Closure Air Quality management:**	Fortnightly Air Quality Monitoring will be carried out at 03 Air Quality monitoring Stations during three years post closure period.
8.4	**Waste Management** (Figures in MM3)	

Stage/Year		OB Removal (Cumulative)			External Dump (Cumulative)		Internal Backfilling (Cumulative)		Embankment (Cumulative)	
		Top Soil	OB	Total	Top Soil	OB	Top Soil	OB	Top Soil	OB
Up to Base year*		0.23	24.84	25.07						
Y-1		0.23	32.1	32.33						
Y-3		0.23	46.3	46.53						
Y-5		0.24	58.9	59.14						
Y-10		0.36	96.96	97.32						
Y-15		0.51	134.98	135.49			0.10			
Y-20		0.66	173.01	173.67	0.12		0.22			
Y-24		**0.68**	**202.82**	203.5	0.24	123.92	0.42	78.9		
Post Closure										

8.5

Top Soil Management – (Including Action Plan for Top Soil Management)

(All Figures are Cumulative and in MM3)

Stage/Year	Top Soil Removal Plan	Top Soil Used				
		Spreading Over Embankment	Spreading Over Backfill area	Spreading over External OB Dump area	Used in Green Belt Area	Total Utilised
Up to Base year*	0.23					
Y-1	0.23				0.001	
Y-3	0.23				0.003	
Y-5	0.24				0.005	
Y-10	0.36				0.008	
Y-15	0.51		0.10		0.01	
Y-20	0.66		0.22	0.12	0.015	
Y-24	**0.68**		0.42	0.24	0.02	
Post Closure						

Top Soil removed will be used in Plantation activities, Spreading over External OB Dump area, Spreading Over Backfill area and also in Green Belt Area.

8.6	Management of Coal Rejects.	There is no washery.

8.7 Restoration of Land used for Infrastructure

The other entire infrastructure related to the opencast coal mining operation will be dismantled, after end of the mineable reserve/ mine life. The list of infrastructure to be dismantled at the end of the mine life is given in the following table:

Sl. No.	**Particulars**
1.	Workshop, Mine Office & Stores

8.8 Disposal of Mining Machinery

After end of production life of Cluster IV group of mines, all mining machinery will be shifted to other mines of BCCL as per requirements.

8.9 Safety & Security

Fencing around Opencast Workings:

i) The top edge of the opencast working shall be kept fenced with wire rope strands or barbed wire, supported by posts of timber, iron or concrete (movable). The gap between the adjacent rope strand or wires shall not be more than 0.30 m and bottom most rope, strand or wire shall not be more than 0.25 m and the topmost rope, strand or wire shall not be less than 1.0 m from ground level.

ii) At the finishing stage, opencast working shall be fenced with a masonry wall using lime mortar not less than 0.40 m thick and not less than 1.2 m high, with a parapet top.

8.10 Abandonment Cost and Financial Assurance

8.10.1 Abandonment Cost: Cost of Activities to be taken up for closure of the mine**

Head	Parameters	Unit	Quantity	Escalated rate (in Rs. Crs.)	Escalated Amount (in Rs. Crs.)
Progressive Closure	Water Quality Management	LS	1	0.39	0.3893925
	Air Quality Management	LS	1	0.74	0.7417000
	Waste Management	MM3		-	-
	Barbed wire fencing around dump	m	1000	0.000332669	0.3326691
	Barbed wire fencing around the pit	m		0.000332669	-
	Filling of Void- Rehandling of Crown Dump	MM3		0	-
	Top Soil Management	MM3	0.5	7.42	3.7084999
	Technical and biological Reclamation of Mined cut of land and OB Dump	Ha	50	0.13	6.4898748
	Plantation over virgin area including green belt	Ha	14	0.06	0.8307040
	Manpower Cost and supervision	Year	24	0.19	4.4501999
	Toe wall around the dump	m	1000	0.001762865	1.7628651

Head	Parameters	Unit	Quantity	Escalated rate (in Rs. Crs.)	Escalated Amount (in Rs. Crs.)
	Garland Drain	m	1000	0.00	0.0927125
	Garland Drain around the dump	m		-	-
	Subsidence management	LS		0.55627	0.5562750
	Any other Activity(Avenue Plantation)	Nos.	1000	0.00046	0.4635625
Dismantling of Infrastructure & Disposal / rehabilitation of Mining Machinery	Dismantling of workshop and washery	sq m	12375	0.00002	0.2294634
	Rehabilitation of the Dismantled facilities	LS	15	0.01	0.1390687
	Dismantling of pumps /other facilities	No.	25	0.01	0.1390687
	Dismantling of pipes/other facilities	Km	10	0.01	0.1297975
	Dismantling of Stowing Bunker, provisioning of pumps for bore well pumping arrangement	CUM		0.00	-
	Dismantling of UG equipment	L.S.		-	-
	Rearranging water pipeline to dump top park / Agriculture land (Assumed Data)	Km	10	0.01	0.0834412
	Dismantling of power lines (33KV H.T. Line)	*km*	*7*	0.01	0.0778785
Safety and Security	Barbed wire fencing around dump	m		-	-
	Barbed wire fencing around the pit	m		0.000332669	-
	Barbed wire fencing with masonry pillar	m	1000	0.0007417	0.7417000
	Concrete wall with Masonry pillars around the pit	m		0.001162615	-
	Securing air shaft and installation of bore well pump	sqm	750	0.000463562	0.3476719
	Securing incline	sqm	750	0.000463562	0.3476719
	Concrete wall fencing around water body	m		-	-
	Boundary wall around the water body	m		-	-
	Stabilization (viz benching, pitching etc.) of side walls of the water body	sqm		-	-
	Toe wall around the dump	m		0.00	-
	Garland Drain	m		0.00	-
	Garland Drain around the dump	m	1000	9.27125E-05	0.0927125
	Drainage Channel from main OB Dump (Assumed Data)	m		-	-
Technical and Biological Reclamation of Mined Out of land and OB Dump	Filling of Void			-	-
	Top Soil Management	Ha		-	-
	OB Rehandling for backfilling			-	-
	Terracing, Blanketing with soil and vegetation of External OB Dump	sqm		0.00	-
	Peripheral road, gates, view point cemented steps on bank	m	1000	0.00185425	1.8542500
	Expenditure on development of Agricultural land	Ha		-	-
	Landscaping and Plantation	Ha	3.5	0.06	0.2076760
Post Closure management and supervision	Power Cost	LS	1	0.09	0.0927125
	Post Mining Water quality management		114	0.00	0.1220957
	Post Mining Air quality management		216	0.01	1.1503678
	Subsidence monitoring for 5 years	LS		-	-
	Waste Management		0	-	-
	Manpower Cost and supervision	Year	3	1.11	3.3376499
Others	Entrepreneurship development (Vocational/ Skill development training for sustainable income of affected people)	1.6684185			

Head	Parameters	Unit	Quantity	Escalated rate (in Rs. Crs.)	Escalated Amount (in Rs. Crs.)
	Golden Handshake/ Retrenching benefits to 100 employees of OC				
	Golden Handshake/ Retrenching benefits to 200 employees of UG				
	Onetime financial grant to societies/institutions/organizations which is dependent upon the project				
	Provide jobs in other mines of the Company				
	Continuation of other services like running of Schools etc.				
Total		**30.5801**			

Note: ** The cost shown above is only estimated and the exact cost for these activities can be established at the time of execution only. If the total cost at the time of execution of above mentioned activities exceed the total estimated cost, the shortfall shall be borne by the company.

8.10.2 Financial Assurance: Amount to be deposited in Escrow account as a security against the mine activities to be carried out of the closure of the mine

COST CALCULATION- KCC OC MINE			
WPI as on	Apr-19		121.1
WPI as on base date	Mar-22		148.9
Escalation rate of Closure cost			1.229562
	UG	OC	
Base Rate of Closure Cost "Rs . Crs/Ha"	0.015	0.09000	
Closure Cost "Rs. Crs/Ha"	0.0184434	0.11066	
Project Area	39.83	176.800	
Amount to be deposited into Escrow Account "Rs. in Crs.	0.734602	19.56480	
Amount already deposited into Escrow Account "Rs. in Crs.		7.53000	
Amount already released from Escrow Account "Rs. in Crs.			
Net Amount to be deposited into Escrow Account "Rs. in Crs.	0.734602	12.03480	
Rate of compounding of Annual Closure Cost		5.00%	
Balance Life of the project "in yrs"		24	

Amount to be deposited into escrow account annually				
Year	**OC**	**Year**	**UG**	**Total**
Y1	0.50145	Y-1	0.73460	1.23605
Y2	0.52652	Y-2		0.52652
Y3	0.55285	Y-3		0.55285
Y4	0.58049	Y-4		0.58049
Y5	0.60952	Y-5		0.60952
Y6	0.63999	Y-6		0.63999
Y7	0.67199	Y-7		0.67199
Y8	0.70559	Y-8		0.70559
Y9	0.74087	Y-9		0.74087
Y10	0.77791	Y-10		0.77791
Y11	0.81681	Y-11		0.81681
Y12	0.85765	Y-12		0.85765
Y13	0.90053	Y-13		0.90053
Y14	0.94556	Y-14		0.94556

Annual Closure Cost	0.73460	0.50145		
Amount to be deposited into Excrow Account after compounding @ of 5% "Rs. in Crs"		**23.05012**		

Y15	0.99284	Y-15		0.99284
Y16	1.04248	Y-16		1.04248
Y17	1.09460	Y-17		1.09460
Y18	1.14933	Y-18		1.14933
Y19	1.20680	Y-19		1.20680
Y20	1.26714	Y-20		1.26714
Y21	1.33050	Y-21		1.33050
Y22	1.39702	Y-22		1.39702
Y23	1.46687	Y-23		1.46687
Y24	1.54022	Y-24		1.54022
Total	22.31552		0.73460	23.05012

Mining and Mine Closure Plan of Katras Choitodih Colliery was prepared and approved by BCCL Board. And as per the approved Mine Closure Plan total deposited amount in the Escrow Account till **31.3.2022** was **Rs. 753.0 Lakhs**. The amount already accrued in account shall be adjusted against the new closure cost calculated.

The amount calculated above shall be deposited every year by BCCL in the Escrow Account in the name of Katras Chotudih OC Mine.

Thus, total amount that shall be deposited for final mine closure activities of **KCC Group of mines during the life of 24 years stands out to be Rs. 23.05012 Crores** as per the present status of the mine.

The amount already deposited in the escrow account will also be available for mine closure activities and should be included to arrive at the total funds available for mine closure activities.

	Amount (Rs. in Lakhs)	
	UG Section	**OC Section**
Amount Already Deposited in Escrow Account		**753.0**
Amount to be Deposited in the Escrow Account in the Future	**73.460**	**2231.552**
Total Amount available for Mine Closure Activities	**73.460**	**2984.552**
Grand Total	**3058.012**	

The amount deposited in Escrow Accounts is appended below:

Name of Mine: Katras Chatudihl OC Mine Escrow account no: 00150100010086			
S.No :	Year	Rs. in Lakhs	
		OC	Total
1	2013-2014	-	-
2	2014-2015	82.12	82.12
3	2015-2016	86.23	86.23
4	2016-2017	90.54	90.54
5	2017-2018	114.64	114.64
6	2018-2019	120.37	120.37
7	2019-2020	126.39	126.39
8	2020-2021	132.71	132.71
9	**2021-2022**	**-**	**-**
Total		**753.0**	**753.0**

The money deposited in the Escrow Account has to deal with the following:

- Cost of closure activities.
- Cost towards organization for executing the closure activities.
- Cost of the post project monitoring.
- Creation of a corpus fund for final mine closure

Mine Closure Plan of following two mines have been approved by BCCL Board are mentioned below:

Name of Mine	BCCL Board No.	Date	Escrow A/c at Bank of Baroda, Dhanbad Branch
Katras Choitudih OC Mine	312th Board of BCCL	13.12.2014 02.02.2018	00150100010086

- **Implementation of the approved Mine Closure Plan shall be sole responsibility of the mine owner**. Mining is to be carried out in a phase manner i.e. continuation of mining activities from one phase to another indicating the sequence of operations depending on the geo-mining conditions of the mine. Up to 50% of the total deposited amount including interest accrued in the escrow account may be released after every five years in line

with the periodic examinations of the closure plan. The amount released should be equal to expenditure incurred on the progressive mine closure in past five years or 50% whichever is less. The balance amount shall be released to the mine owner//leaseholder at the end of the final mine closure on compliance of all provisions of Closure Plan. This compliance report should be duly signed by the lessee and certify that said closure of mine complied all statutory rules, regulations order made by the central or state government, statutory organizations, court etc. and certified by the coal controller.

Final Mine Closure would be considered to be completed only after acceptance of the third party audit report by the coal controller on the compliance of all provisions on Mine Closure Plan. Any institute/ Organization/ Agency as may be notified by the Government for this purpose may be engaged for third party audit.

BHARAT COKING COAL LIMITED
(A Subsidiary of Coal India Limited)
Office of the General Manager
Katras Area.
CIN U10301JH19/GOI100918

Ref.IV/GM/EST/Legal/17/ 8257

To,

D.F.O
Combined Building
DHANBAD

Sub: Details of Jungle Jari under Katras Area of BCCL

Dear Sir,

Enclosed herewith please find details of Jungle Jari land under Baghmara Circle received from Circle Office, Baghmara. (Annex 1) .The record of Jungle Jhari land received from Circle Office, Baghmara shows that Jungle Jhari land exist only in Mouza Nagrikalan 230 which is partly under Katras Area after reorganization of the areas by DGMS . So, after reorganization of the areas of Katras & Sijua Areas by DGMS, plot No 1 & 3 in Mouza Nagrikalan 230 is under the jurisdiction of Sijua Area where Jungle Jhari exists as per the above record of Circle Office, Baghmara . Hence there is no Jungle Jhari land under the jurisdiction of Katras Area, BCCL .

The Mouzas of land under the jurisdiction of Katras Area, BCCL is also enclosed herewith for your reference please.

This is for your information please.

Yours faithfully,

15/3/17

Chief Manager (Env.)
Katras Area
BCCL

15/3/17

Encl. As above

General Manager
Katras Area,BCCL

Cc to: The General Manager, Katras Area
Cc to: The AM(Estate), Katras Area
Cc to: Office copy

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Annexure-1

(1)

गैरमजरुआ जंगल–झाड़ी (Deemed Forest) भूमि की विवरणी (प्रपत्र III)

अंचल का नाम – बाघमारा, जिला का नाम – धनबाद

क्रमांक	अंचल	मौजा	थाना नं0	खाता	प्लॉट	रकबा	किस्म	बंदोबस्त / हस्तांतरित / लीज भूमि की विवरणी			की विवरणी (7–9)			अभियुक्त
								खाता	प्लॉट	रकबा	खाता	प्लॉट	रकबा	
1	2	3	4	5	6	7	8	9			10			11
1	बाघमारा	गोपालपुर	62	–	37,111,38,613,438 447,201,614,300,255,2	270.88								
2	सोहनडीह		63		15,34	23.84								
3	घोराडी		65		1,158	21.4								
4	तिलैया		69		87,7,18,29,725,747,699, 663,701,702,603,602	19.52								
5	नारायणपुर		70		2,53,191,184,202, 408,453,394,299, 309,314	60.98								
6	दग्घो		71		2,308,373,433,503, 521,500,452,31	283.5								
7	हुरसोडीह		72		123,127,156,179	47.68								
8	खानूडीह		73		20,23,212,238,236 ,237,67,68,673,672 ,671,869,898,1064 ,1061,983,1062,239	336.32								
9	माटीगढ़ा		74		5,6,113,114,115 ,118,119,32,33, 116,120,112	443.2								
10	डोमचलकरो		75		48,52,37,38,55,51,1,46	246.91								
11	भीमकनाली		76		2,6,248,355,261,262,273	195.03								
12	बक्सपुरा		80		3,11,219,28	80.7								

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क्रमांक	अंचल	मौजा	थाना नं0	खाता	प्लॉट	रकबा	किस्म	बंदोबस्त / हस्तांतरित / लीज भूमि की विवरणी			की विवरणी (7–9)			अभियुक्ति
								खाता	प्लॉट	रकबा	खाता	प्लॉट	रकबा	
1	2	3	4	5	6	7	8	9			10			11
13	लुत्तीपहाड़ी		81		2,1,3,148,160,5,14	73.44								
14	आमटीह		64		5,154	12.1								
15	टामंझलाडीह		66		1,3,75,82,201,203,85,246,288,130,99	131.55								
16	नावाडीह		102		327,328,331,389	61.2								
17	बेहराकुदर		117		1077	12.55								
18	झगराही		118		475	9.83								
19	बरमसिया		105		340,339,357,356,345,275,337,374,4	107.97								
20	महेशपुर		308		4	15.82								
21	जरमुनई		181		1	4.8								
22	महेशपुर		185		118	1.72								
23	कर्णपुरा		186		1,71	5.75								
24	लालधक		207		142,119,86,87,80,78,74,402	14.47								
25	बागदाड़ा		217		2163,2940,2970,2966,2967,2968,2960,2971,2975,2980,2935,2063,2331,2324,3452	60.12								
			217		3434,3433,3421,3231,3230,3227,3216,3208									

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क्रमांक	अंचल	मौजा	थाना नं0	खाता	प्लॉट	रकबा	किस्म	बंदोबस्त/हस्तांतरित/लीज भूमि की विवरणी			की विवरणी (7–9)			अभियुक्ति
								खाता	प्लॉट	रकबा	खाता	प्लॉट	रकबा	
1	2	3	4	5	6	7	8	9			10			11
			217		3203,3436,3215,2972,2946 , 1482									
26	बौआकला		228		1,11,2326,2715,2400,2420, 2711,2712,2794,78,	85.34								
27	महतोटांड		180		3,40	18.8								
28	तिलाटांड		213		389,383,395,1387,1,2,3,4,7 , 65,77,78,89,80,81,82,132,1 38, 134,135,383,384,385	132.11								
29	फाटामाड़ुल		222		137,148,626,1633,1954	76.67								
30	गोविन्दाडीह		221		833,1,1362,2094	200.57								
31	घारजोरी		225		1,200,2421,2449,2641	21.92								
32	पंचरुखी		220		774	50								
33	नगरीकला		230		1,3	35.3								
34	हरिणा		101		225,226	34								
35	मधुगोड़ा		214		454,343	54.25								
36	चुगी		191		519,1232	8.81								
37	लोहपिट्टी		319		17,26,32,83,1604,2294, 2078,3278	59.96								

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क्रमांक	अंचल	मौजा	थाना न0	खाता	प्लॉट	रकबा	किस्म	बंदोबस्त / हस्तांतरित / लीज भूमि की विवरणी			की विवरणी (7–9)			अभियुक्ति
								खाता	प्लॉट	रकबा	खाता	प्लॉट	रकबा	
1	2	3	4	5	6	7	8	9			10			11
38	तेलमच्चें		320		2782,2796,2755,2943,2962 , 2942,2754,2797,2807	102.9								
39	घुजी		321		1,3,25,764,26,435,131,135, 142,436,434,650,614,612,7 01 ,800,801,751,695,794,255, 739,	167.48								
40	तारगा		306		1352,1676,1411,	68.96								
					कुल	3678.35								

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Project Report

On

Delineation of Surface Coal Fire and associated Land Subsidence in Jharia Coalfield (2022-2024), Jharkhand using satellite based remote-sensing techniques

A collaborative project between

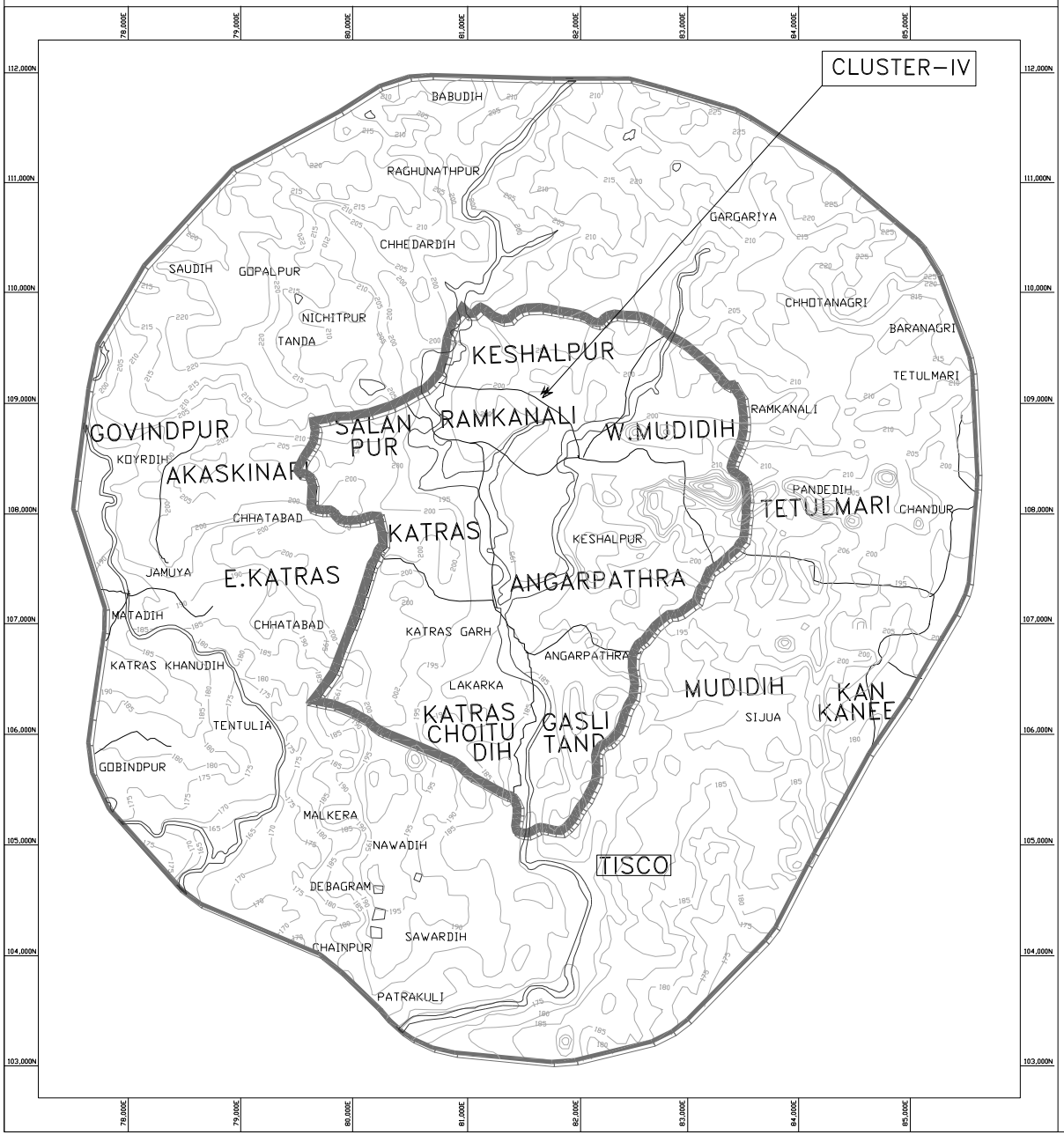
National Remote Sensing Centre (NRSC)
Indian Space Research Organisation (ISRO)
Hyderabad - 500 037

Bharat Coking Coal Limited

Bharat Coking Coal Limited
Koyla Bhawan, Koyla Nagar
Dhandbad, Jharkhand

May, 2025

STUDY AREA OF CLUSTER - IV SHOWING DRAINAGE CONTOUR



INDEX

POND

RIVER

PROPOSED PROJECT (CORE ZONE)

2 KM. ZONE

CONTOUR(m)

PLATE NO -11

A/C No.:- D\CLUSTER_IV\
\CLUSTER_IV DRAINAGE CONTOUR

WATER TABLE CONTOUR MAP OF CLUSTER-IV

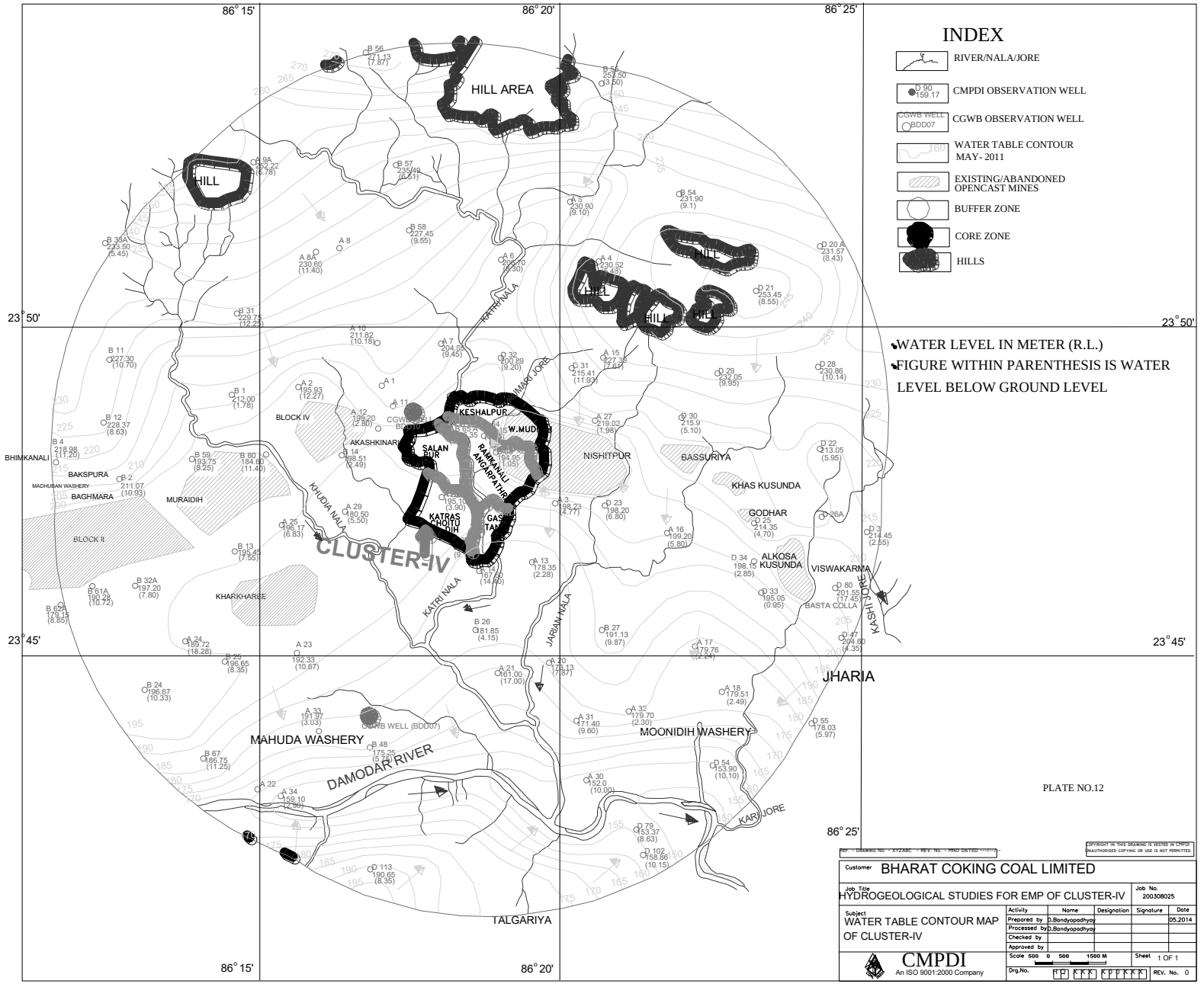


PLATE NO.12

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Customer: BHARAT COKING COAL LIMITED

Job Title: HYDROGEOLOGICAL STUDIES FOR EMP OF CLUSTER-IV

Job No.: 200308025

Subject: WATER TABLE CONTOUR MAP OF CLUSTER-IV

Activity	Name	Designation	Signature	Date
Prepared by	D.Bandyopadhyay			05.2014
Processed by	D.Bandyopadhyay			
Checked by				
Approved by				

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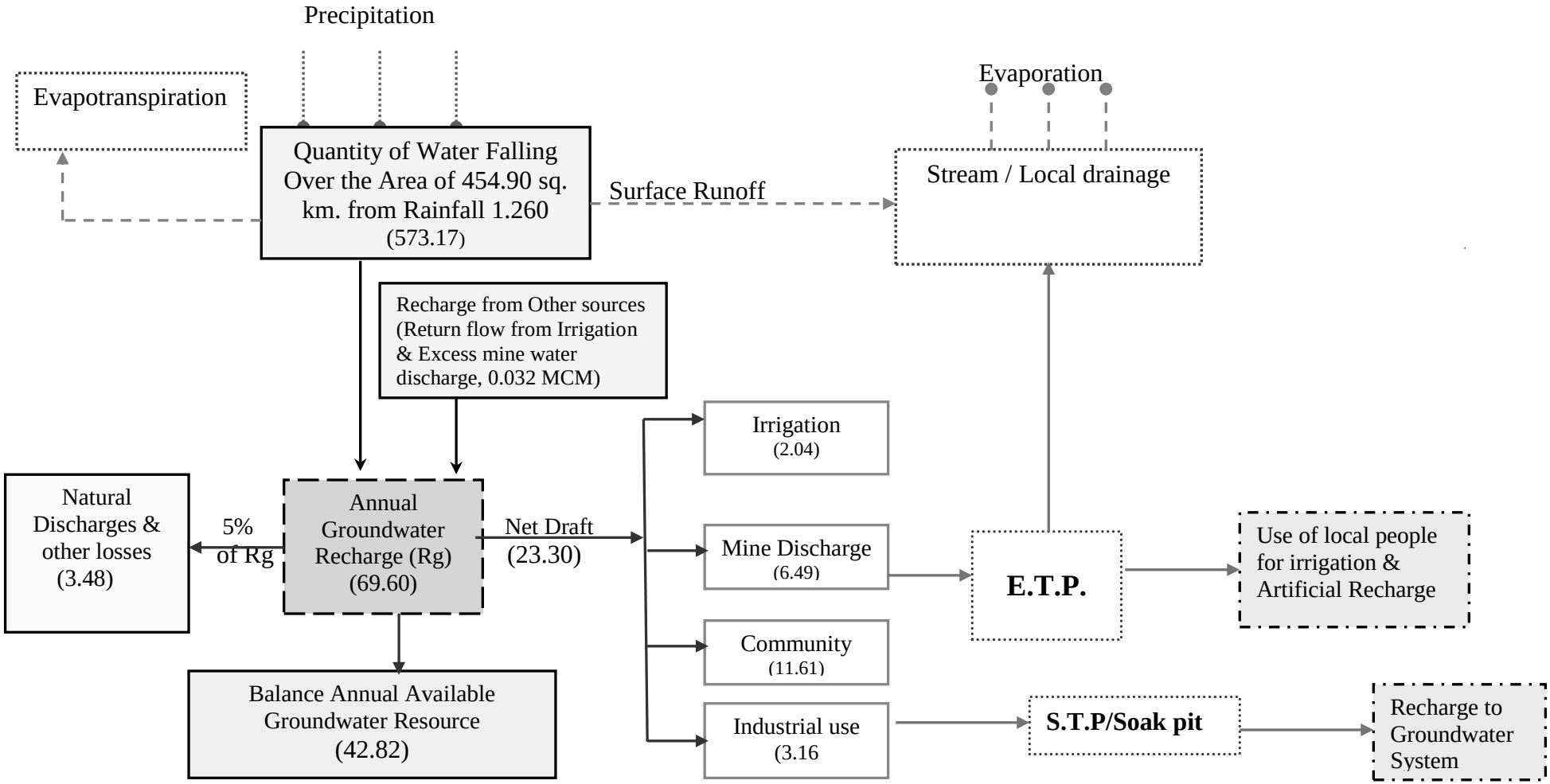
Scale 500 0 500 1000 M

Sheet 1 OF 1

Drg.No. [illegible] REV. No. 0

GROUNDWATER BALANCE FLOW DIAGRAM, BUFFER ZONE OF CLUSTER-IV

(All Values are in M.Cu.m)



Job No - 200308025

PLATE NO: 13

CMPDI

WATER USAGE DIAGRAM OF CLUSTER-IV MINES

(All Values are in m^3 / day)

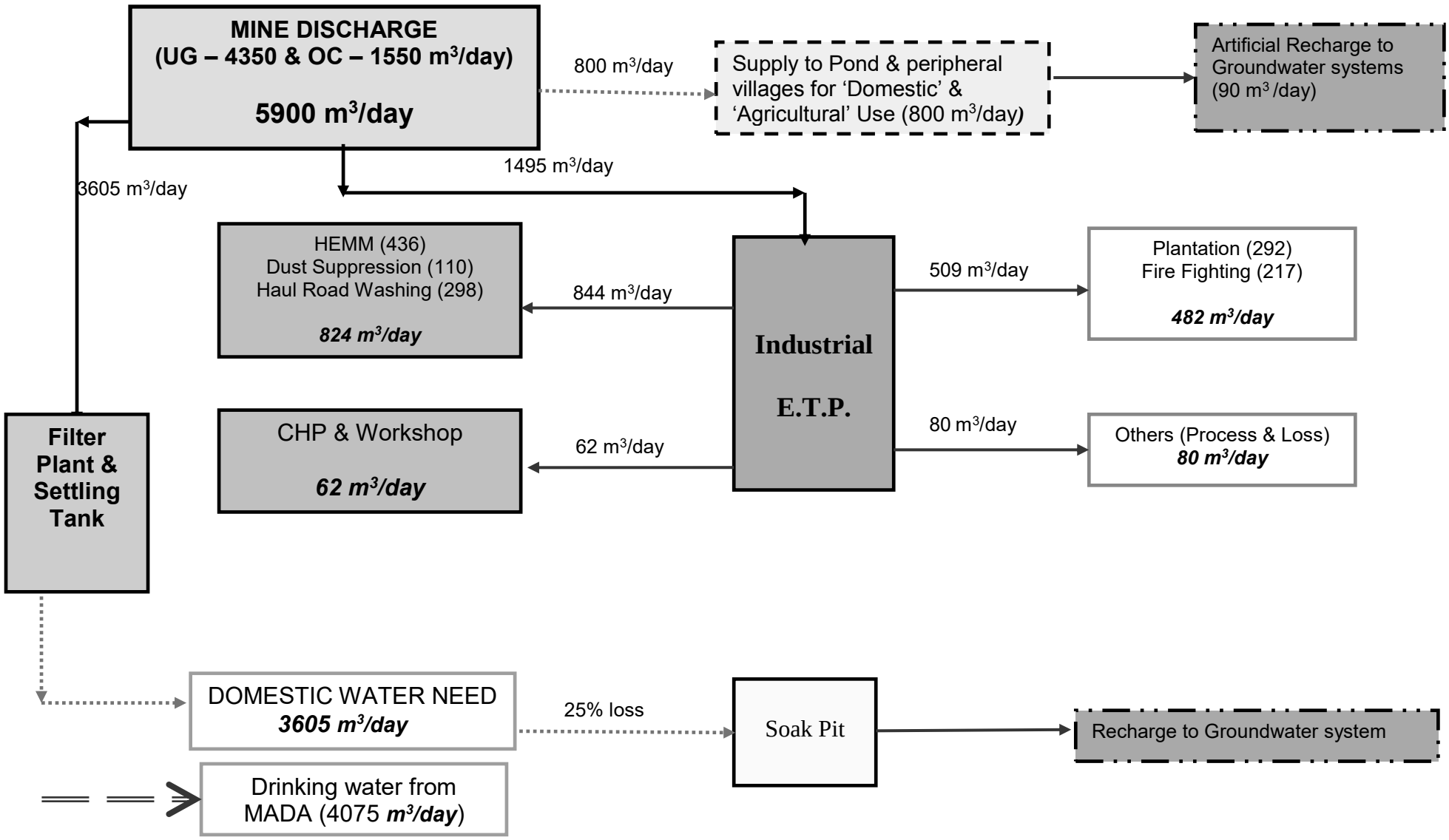


PLATE NO: 14

JOB NO - 200308025

GROUND WATER RECHARGE BALANCE - BUFFER ZONE OF Cluster IV
(Mcum &%)

Net ground water Recharge 66.12

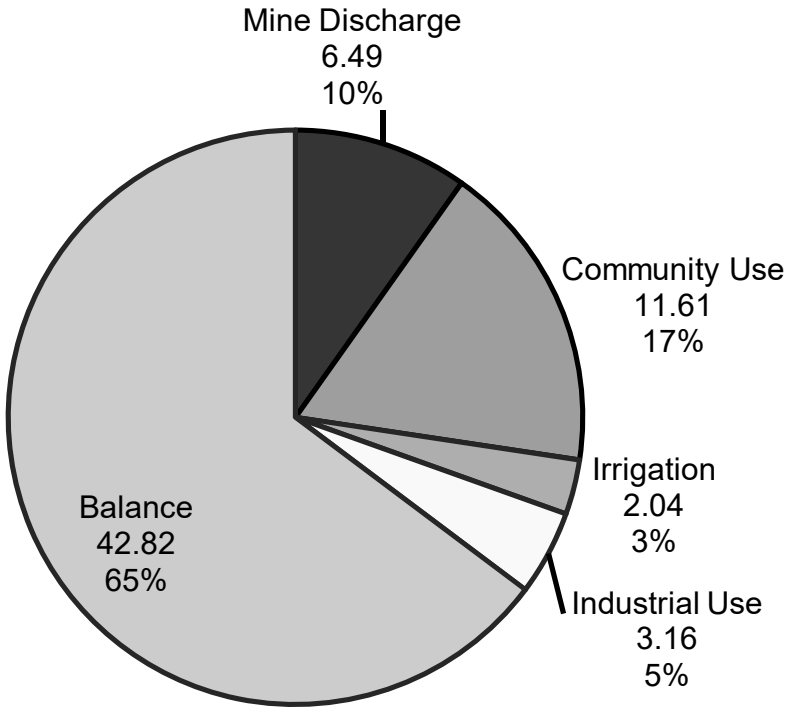
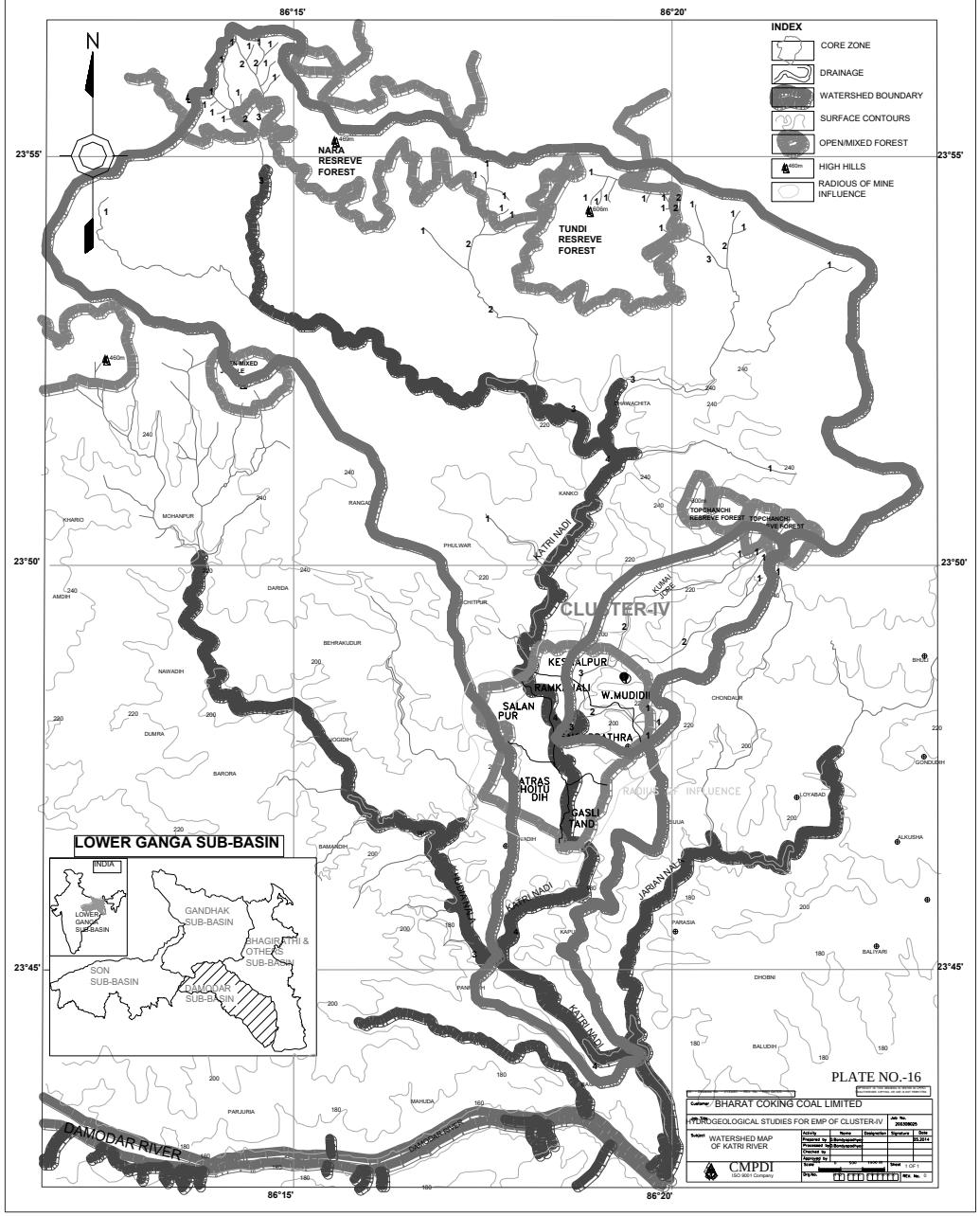
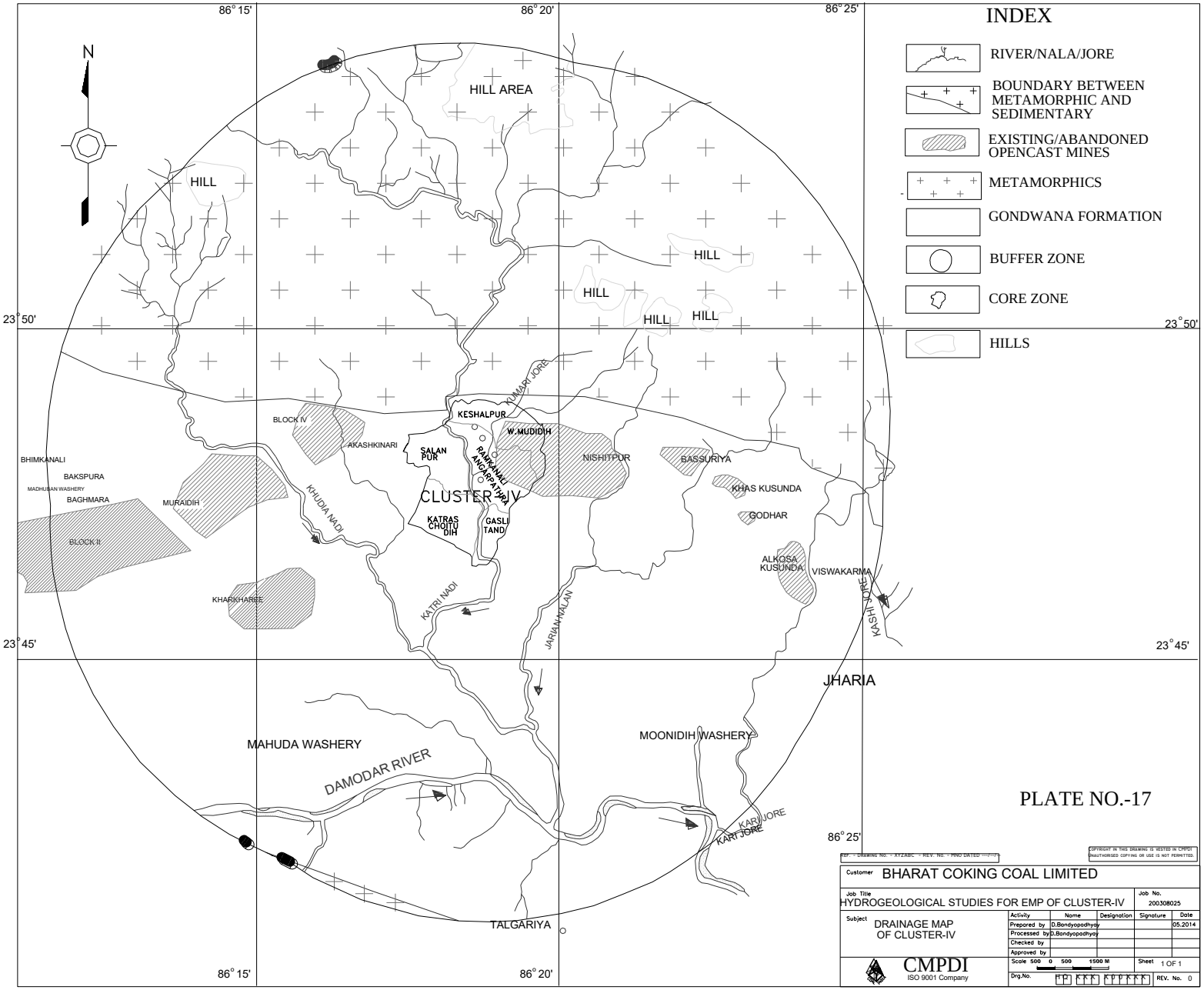


PLATE NO-15

WATERSHED MAP OF CLUSTER IV



DRAINAGE MAP OF THE CLUSTER-IV



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Customer: BHARAT COKING COAL LIMITED

Job Title: HYDROGEOLOGICAL STUDIES FOR EMP OF CLUSTER-IV

Job No.: 200308025

Subject: DRAINAGE MAP OF CLUSTER-IV

Activity	Name	Designation	Signature	Date
Prepared by	D.Bandyopadhyay			05.2014
Processed by	D.Bandyopadhyay			
Checked by				
Approved by				

Scale 500 0 500 1500 M

Sheet 1 OF 1

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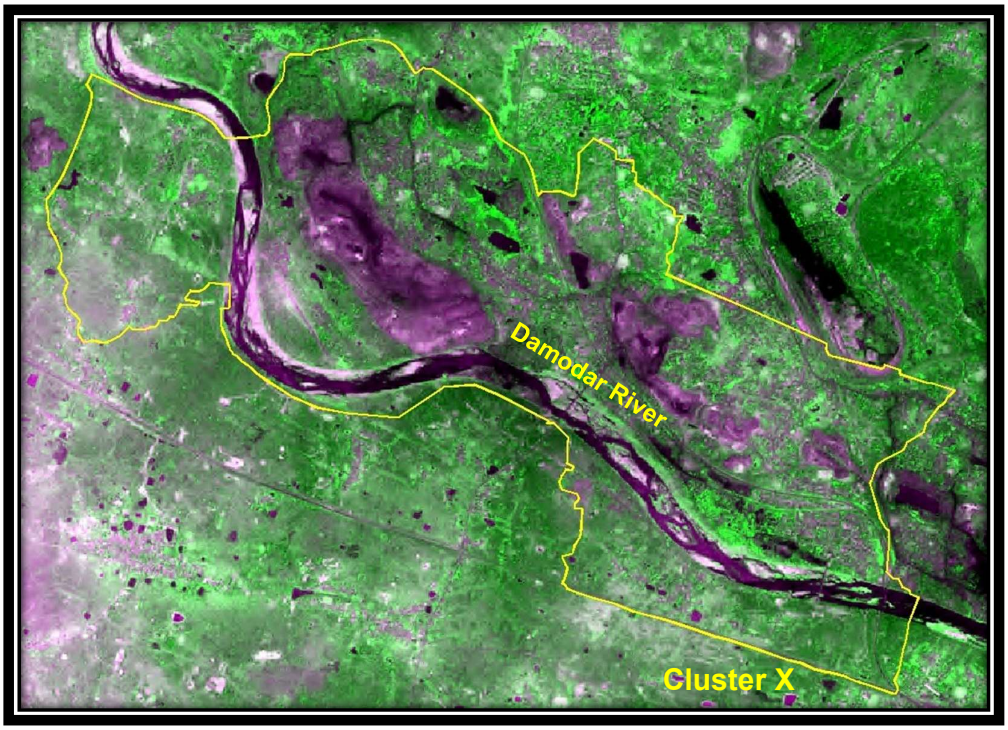
Drg.No. [illegible] REV. No. 0

भारत कोकिंग कोल लिमिटेड के ५ मिलियन घन मीटर (कोल+अधिभार) से कम उत्पादन क्षमतावाले ०५ क्लस्टर (खुली + भूमिगत खदानों के समूह) का भूमि पुनरुद्धार हेतु वर्ष २०२४ के उपग्रह डाटा के आधार पर निगरानी का प्रतिवेदन

Land Reclamation/ Restoration Monitoring of five Clusters of (Opencast + Underground) Coal Mines of Bharat Coking Coal Limited based on Satellite Data of the Year 2024



Submitted to

Bharat Coking Coal Limited

भारत कोकिंग कोल लिमिटेड के ५ मिलियन घन मीटर (कोल+अधिभार) से कम उत्पादन क्षमतावाले ०५ क्लस्टर (खुली + भूमिगत खदानों के समूह) का भूमि पुनरुद्धार हेतु वर्ष २०२४ के उपग्रह डाटा के आधार पर निगरानी का प्रतिवेदन

Land Reclamation/ Restoration Monitoring of five Clusters of (Opencast + Underground) Coal Mines of Bharat Coking Coal Limited based on Satellite Data of the Year 2024

March - 2025

Remote Sensing Cell
Geomatics Division
CMPDI, Ranchi

CONTENTS

कार्यकारी सारांश iv

१ परियोजना iv
२ उद्देश्य iv
३ मुख्य निष्कर्ष iv

Executive Summary vi

1 Background 1
2 Objective 2
3 Methodology 3
4 Land Reclamation Status in Bharat Coking Coal Ltd. 6

List of Tables

Table -1 Cluster wise Land Reclamation Status viii
Table -1.1 Cluster wise Land Reclamation Status in remaining 10 Clusters ix
Table -2 Area Statistics of Land Use Classes in Clusters 9

List of Figures

Figure-1 Cluster wise Land Reclamation Status-2024 (BCCL) x
Figure-2 Pie-chart Showing Distribution of Total Excavated Area xi
Figure-3 Methodology of Land Reclamation Monitoring 3
Figure-4 Bar-chart of Land Reclamation Status of Cluster I 15
Figure-5 Bar-chart of Land Reclamation Status of Cluster IV 15
Figure-6 Bar-chart of Land Reclamation Status of Cluster VII 16
Figure-7 Bar-chart of Land Reclamation Status of Cluster X 16
Figure-8 Bar-chart of Land Reclamation Status of Cluster XI 17

List of Plates

Plate -1: Land Use Map of Cluster I 10
Plate -2: Land Use Map of Cluster IV 11
Plate -3: Land Use Map of Cluster VII 12
Plate -4: Land Use Map of Cluster X 13
Plate -5: Land Use Map of Cluster XI 14

List of Photographs

Photo-1:	Plantation on OB Dump, Cluster I	17
Photo-2:	Plantation on OB Dump, Cluster I	18
Photo-3:	Plantation on Backfill, Cluster IV	18
Photo-4:	Plantation on OB Dump, Cluster IV	19
Photo-5:	Plantation on Backfill, Cluster VII	19
Photo-6:	Social Forestry Plantation, Cluster VII	20
Photo-7:	Plantation on Backfill, Cluster X	20
Photo-8:	Plantation on OB Dump, Cluster X	21
Photo-9:	Social Forestry Plantation, Cluster X	21
Photo-10:	Plantation on Backfill, Cluster XI	22
Photo-11:	Social Forestry Plantation, Cluster XI	22

शब्द-कोष 23

Abbreviations 25

Glossary 26

कार्यकारी सारांश

१ परियोजना भारत कोकिंग कोल लिमिटेड के ५ मिलियन घन मीटर (कोल + अधिभार) से कम उत्पादन क्षमतावाले ०५ क्लस्टर अर्थात (भूमिगत + खुली) खदानों के समूह के पुनरुद्धार हेतु वर्ष २०२४ के उपग्रह डाटा पर आधारित तीन साल के अन्तराल पर नियमित निगरानी।

२ उद्देश्य भूमि पुनरुद्धार (लैंड रिक्लेमेशन) का उद्देश्य कुल पट्टाक्षेत्र में बैकफील, वृक्षारोपण, सामाजिक वानिकी, सक्रिय खनन क्षेत्र, जल निकाय (वाटर ड्रेनेज), बंजर भूमि, कृषि भूमि और जंगल के विभिन्न प्रकार के वितरण प्रणाली के क्षेत्र का आकलन करने के लिए है। यह अध्ययन उपरोक्त सभी क्लस्टरों के भूमि पुनरुद्धार (लैंड रिक्लेमेशन) का निगरानी के प्रगति का आकलन करने में मदद करेगा तथा इसके अतिरिक्त पर्यावरण संरक्षण के लिए आवश्यक उपचारात्मक उपायों को क्रियान्वित करने में भी सहायता करेगा।

३ मुख्य निष्कर्ष

- वर्ष २०२४-२५ में भूमि पुनरुद्धार (लैंड रिक्लेमेशन) हेतु चयन किये गए कुल ०५ क्लस्टरों का कुल पट्टाक्षेत्र अथवा माइन लीज होल्ड एरिया ९४११.५४ हेक्टेयर है, जिसमें १४६१.७७ हेक्टेयर उत्खनन क्षेत्र के अंतर्गत है तथा इस उत्खनन क्षेत्र में से ८१.०६ हेक्टेयर (५.५५%) क्षेत्र में जैविक पुनरुद्धार (बैकफील पर बृक्ष।रोपण) किया गया है तथा ९२३.४८ हेक्टेयर (६३.१८%) क्षेत्र में तकनीकी पुनरुद्धार (बैकफीलिंग) का कार्य प्रगति पर है और शेष ४५७.२३ हेक्टेयर (३१.२८%) क्षेत्र सक्रिय खनन के अन्तर्गत है। क्लस्टरवार भूमि पुनरुद्धार (लैंड रिक्लेमेशन) के निगरानी का वर्णन विस्तार रूप से तालिका संख्या ०१ में दर्शाया गया है ।

- सिआईएल से प्राप्त कार्य आदेश के खंड २.(ii) अनुसार तीन-वर्षीय चक्र में निगरानी के अंतर्गत आने वाले शेष १० क्लस्टरों की समग्र भूमि पुनरुद्धार स्थिति तालिका १.१ में दी गई है, ताकि सभी क्लस्टरों से संबंधित जानकारी हर वर्ष उपलब्ध कराई जा सके।

- वर्ष २०२४ के उपग्रह डाटा के विश्लेषण से यह देखा गया है कि तकनीकी पुनरुद्धार (बैकफ़िलिंग) के तहत क्षेत्र ७१२.९० हेक्टेयर (वर्ष २०२१) से बढ़कर ९२३.४८ हेक्टेयर (वर्ष २०२४) हो गया है जो वर्ष २०२१ के संबंध में २१०.५८ हेक्टेयर की वृद्धि दर्शाता है।

- जैविक पुनरुद्धार (बैकफील पर बृक्ष।रोपण) के तहत क्षेत्र ६१.९२ हेक्टेयर (वर्ष २०२१) से बढ़कर ८१.०६ हेक्टेयर (वर्ष २०२४) हो गया है जो वर्ष २०२१ के संबंध में १९.१४ हेक्टेयर की वृद्धि दर्शाता है।

- अधिभार पर किए गए वृक्षारोपण के तहत क्षेत्र १४९.८४ हेक्टेयर (वर्ष २०२१) से घटकर ९८.६९ हेक्टेयर (वर्ष २०२४) हो गया है जो वर्ष २०२१ के संबंध में ५१.१५ हेक्टेयर की कमी दर्शाता है।

- सामाजिक वानिकी के अंतर्गत वृक्षारोपण के तहत क्षेत्र ७५७.१८ हेक्टेयर (वर्ष २०२१) से घटकर ७५२.६२ हेक्टेयर (वर्ष २०२४) हो गया है जो वर्ष २०२१ के संबंध में ४.५६ हेक्टेयर की कमी दर्शाता है।

- सक्रिय खनन के अंतर्गत क्षेत्र ४४३.३६ हेक्टेयर (वर्ष २०२१) से बढ़कर ४५७.२३ हेक्टेयर (वर्ष २०२४) हो गया है जो वर्ष २०२१ के संबंध में १३.८७ हेक्टेयर की वृद्धि दर्शाता है।

- कुल उत्खनन क्षेत्र १२१८.१८ हेक्टेयर (वर्ष २०२१) से बढ़कर १४६१.७७ हेक्टेयर (वर्ष २०२४) हो गया है जो वर्ष २०२१ के संबंध में २४३.५९ हेक्टेयर की वृद्धि दर्शाता है।

- कुल वृक्षारोपण अथवा हरित आवरण के तहत कुल क्षेत्र ९६८.९४ हेक्टेयर (वर्ष २०२१) से घटकर ९३२.३७ हेक्टेयर (वर्ष २०२४) हो गया है जो वर्ष २०२१ के संबंध में ३६.५७ हेक्टेयर की कमी दर्शाता है।

- निगरानी के लिए बनाई गई तालिका-१ में उल्लिखित बिसीसीएल की विभिन्न क्लस्टरों में वर्ष २०२४ के लिए भूमि पुनरुद्धार की स्थिति की तुलना वर्ष २०२१ से करने पर, विश्लेषण से यह स्पष्ट है कि भूमि पुनरुद्धार के तहत क्षेत्र ७७४.८२ हेक्टेयर (वर्ष २०२१) से बढ़कर १००४.५४ हेक्टेयर (वर्ष २०२४) हो गया है।

- इस रिपोर्ट और निष्कर्षों को आगे की निगरानी और सुधार संबंधी गतिविधियों के लिए आधार माना जाएगा।

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 the total mine leasehold area of 9411.54 Ha. of the 05 clusters producing less than 5mcm (Coal+OB) annually considered for monitoring during the year 2024-25; total excavated area is 1461.77 Ha. out of which 81.06 Ha. area (5.55%) has been planted on backfill (Biological Reclamation) and 923.48 Ha. area (63.18%) is under backfilling (Technical Reclamation) and 457.23 Ha. area (31.28%) under active mining. Cluster wise details of land reclamation of the above Clusters is given in Table-1.

- A composite land reclamation status of the remaining 10 Clusters that are covered under monitoring in the three-year cycle is given in Table 1.1 so that information related to all Clusters will be made available every year as per clause 2.(ii) of the received work order from CIL.

- It has been observed from the analysis of Satellite Data of the year 2024 that area under technical reclamation (backfilling) has increased from 712.90 Ha. (Yr.2021) to 923.48 Ha. (Yr.2024)

which indicates an increase of 210.58 Ha. with respect to the year 2021.

- Area under biological reclamation has increased from 61.92 Ha. (Yr.2021) to 81.06 Ha. (Yr.2024) which indicates an increase of 19.14 Ha. with respect to the year 2021.

- Plantation on OB dump has decreased from 149.84 Ha. (Yr.2021) to 98.69 Ha. (Yr.2024) which indicates a decrease of 51.15 Ha. with respect to the year 2021.

- Plantation under social forestry has decreased from 757.18 Ha. (Yr.2021) to 752.62 Ha. (Yr.2024) which indicates a decrease of 4.56 Ha. with respect to the year 2021.

- Area under active mining has increased from 443.36 Ha. (Yr.2021) to 457.23 Ha. (Yr.2024) which indicates an increase of 13.87 Ha. with respect to the year 2021.

- Total excavated area has increased from 1218.18 Ha. (Yr.2021) to 1461.77 Ha. (Yr.2024) which indicates an increase of 243.59 Ha. with respect to the year 2021.

- Total area under plantation (green cover) has decreased from 968.94 Ha. (Yr.2021) to 932.37 Ha. (Yr.2024) which indicates a decrease of 36.57 Ha. with respect to the year 2021.

- On comparing the status of land reclamation for the year 2024 with respect to the year 2021 in different Clusters of BCCL mentioned in Table 1, undertaken for monitoring, it is evident from the analysis that area under land reclamation has increased from 774.82 Ha. (Yr.2021) to 1004.54 Ha. (Yr.2024).

- 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 2024

(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)*	
		2021	2024	2021	2024	2021	2024	2021	2024	2021	2024	2021	2024	2021	2024	2021	2024	2021	2024
1	Cluster I	575.00	575.00	11.10	31.80	7.29	8.53	45.21	32.94	25.53	25.53	27.61	29.60	46.00	69.93	78.03	67.00	18.39	40.33
				24.13%	45.47%	15.85%	12.20%					60.02%	42.33%			13.57%	11.65%	39.98%	57.67%
2	Cluster IV	1123.79	1123.79	176.03	259.63	0.00	7.29	27.11	27.45	165.09	160.53	152.29	117.13	328.32	384.05	192.20	195.27	176.03	266.92
				53.62%	67.60%	0.00%	1.90%					46.38%	30.50%			17.10%	17.38%	53.62%	69.50%
3	Cluster VII	2127.70	2127.70	351.68	362.12	25.47	8.56	11.43	1.33	238.67	238.67	183.42	198.90	560.57	569.58	275.57	248.56	377.15	370.68
				62.74%	63.58%	4.54%	1.50%					32.72%	34.92%			12.95%	11.68%	67.28%	65.08%
4	Cluster X	2057.47	2057.47	143.64	217.71	29.16	54.25	66.09	36.00	140.75	140.75	45.71	74.17	218.51	346.13	236.00	231.00	172.80	271.96
				65.74%	62.90%	13.34%	15.67%					20.92%	21.43%			11.47%	11.23%	79.08%	78.57%
5	Cluster XI	3527.58	3527.58	30.45	52.22	0.00	2.43	0.00	0.97	187.14	187.14	34.33	37.43	64.78	92.08	187.14	190.54	30.45	54.65
				47.01%	56.71%	0.00%	2.64%					52.99%	40.65%			5.31%	5.40%	47.01%	59.35%
	TOTAL (A)	**9411.54**	**9411.54**	**712.90**	**923.48**	**61.92**	**81.06**	**149.84**	**98.69**	**757.18**	**752.62**	**443.36**	**457.23**	**1218.18**	**1461.77**	**968.94**	**932.37**	**774.82**	**1004.54**
				58.52%	**63.18%**	**5.08%**	**5.55%**					**36.40%**	**31.28%**			**10.30%**	**9.91%**	**63.60%**	**68.72%**

(% is calculated with respect to Excavated Area as applicable)

Note: In reference of the above Table, different parameters are classified as follows:

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”.
6. Leasehold Boundaries of the above 5 clusters are as per EC.

Table 1.1 Composite Land Reclamation Status in remaining ten Clusters (Underground + Opencast Mines) of BCCL as per clause 2.(ii) of the received work order from CIL

(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		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)*	
		2020	2023	2020	2023	2020	2023	2020	2023	2020	2023	2020	2023	2020	2023	2020	2023	2020	2023
6	Cluster III	1552.53	1420.61	60.37	68.71	3.89	4.96	21.11	28.67	162.33	141.36	104.79	84.88	169.05	158.55	187.33	174.99	64.26	73.67
				35.71%	43.34%	2.30%	3.13%					61.99%	53.54%			12.07%	12.32%	38.01%	46.46%
7	Cluster V	1724.52	1957.08	187.59	193.60	7.19	7.41	23.85	19.84	105.29	158.45	103.52	182.86	298.30	383.87	136.33	185.70	194.78	201.01
				62.89%	50.43%	2.41%	1.93%					34.70%	47.64%			7.91%	9.49%	65.30%	52.36%
8	Cluster VIII	1331.95	1183.92	206.91	198.08	9.93	4.08	21.97	16.86	24.70	22.63	124.49	151.45	341.33	353.61	56.60	43.57	216.84	202.16
				60.62%	56.02%	2.91%	1.15%					36.47%	42.83%			4.25%	3.68%	63.53%	57.17%
9	Cluster IX	1967.22	1942.12	77.53	108.00	6.80	3.23	41.79	22.40	168.58	151.33	217.24	240.24	301.57	351.47	217.17	176.96	84.33	111.23
				25.71%	30.73%	2.25%	0.92%					72.04%	68.35%			11.04%	9.11%	27.96%	31.65%
10	Cluster XVII	1412.00	1397.18	125.09	125.09	0.00	0.00	5.00	5.00	43.33	43.33	65.40	65.40	190.49	190.49	48.33	48.33	125.09	125.09
				65.67%	65.67%	0.00%	0.00%					34.33%	34.33%			3.42%	3.46%	65.67%	65.67%
	TOTAL (B)	**7988.22**	**7900.91**	**657.49**	**693.48**	**27.81**	**19.68**	**113.72**	**92.77**	**504.23**	**517.10**	**615.44**	**724.83**	**1300.74**	**1437.99**	**645.76**	**629.55**	**685.30**	**713.16**
				50.55%	**48.23%**	**2.14%**	**1.37%**					**47.31%**	**50.41%**			**8.08%**	**7.97%**	**52.69%**	**49.59%**
		2019	2022	2019	2022	2019	2022	2019	2022	2019	2022	2019	2022	2019	2022	2019	2022	2019	2022
11	Cluster II	2260.54	2025.71	422.51	422.00	86.42	87.42	43.28	47.29	154.37	128.03	129.98	148.85	638.91	658.27	284.07	262.74	508.93	509.42
				66.13%	64.11%	13.53%	13.28%					20.34%	22.61%			12.57%	12.97%	79.66%	77.39%
12	Cluster VI	831.83	876.55	134.15	134.15	0.00	0.00	5.89	9.70	26.79	28.41	77.75	70.36	211.90	204.51	32.68	38.11	134.15	134.15
				63.31%	65.60%	0.00%	0.00%					36.69%	34.40%			3.93%	4.35%	63.31%	65.60%
13	Cluster XIV	1418.25	1577.22	0.00	0.00	0.00	0.00	0.00	0.00	74.13	72.42	0.00	0.00	0.00	0.00	74.13	72.42	0.00	0.00
				0.00%	0.00%	0.00%	0.00%					0.00%	0.00%			5.23%	4.59%	0.00%	0.00%
14	Cluster XV	-	1696.55	-	0.00	-	0.00	-	0.00	-	80.72	-	0.00	-	0.00	-	80.72	-	0.00
					0.00%		0.00%						0.00%				4.76%		0.00%
15	Cluster XVI	2008.4	1964.21	67.57	65.25	25.36	27.68	13.31	13.31	51.26	51.26	65.77	75.14	158.70	168.07	89.93	92.25	92.93	92.93
				42.58%	38.82%	15.98%	16.47%					41.44%	44.71%			4.48%	4.70%	58.56%	55.29%
	TOTAL (C)	**6519.02**	**8140.24**	**624.23**	**621.40**	**111.78**	**115.10**	**62.48**	**70.30**	**306.55**	**360.84**	**273.50**	**294.35**	**1009.51**	**1030.85**	**480.81**	**546.24**	**736.01**	**736.50**
				61.83%	**60.28%**	**11.07%**	**11.17%**					**27.09%**	**28.55%**			**7.38%**	**6.71%**	**72.91%**	**71.45%**
***GRAND TOTAL (A+B+C)**		**23918.78**	**25452.69**	**1994.62**	**2238.36**	**201.51**	**215.84**	**326.04**	**261.76**	**1567.96**	**1630.56**	**1332.30**	**1476.41**	**3528.43**	**3930.61**	**2095.51**	**2108.16**	**2196.13**	**2454.20**
				56.53%	**56.95%**	**5.71%**	**5.49%**					**37.76%**	**37.56%**			**8.76%**	**8.28%**	**62.24%**	**62.44%**

Grand Total (A+B+C) is the composite value of all 15 clusters of BCCL covered in 3 years cycle of Land Reclamation Monitoring ***(% is calculated with respect to Excavated Area as applicable)***

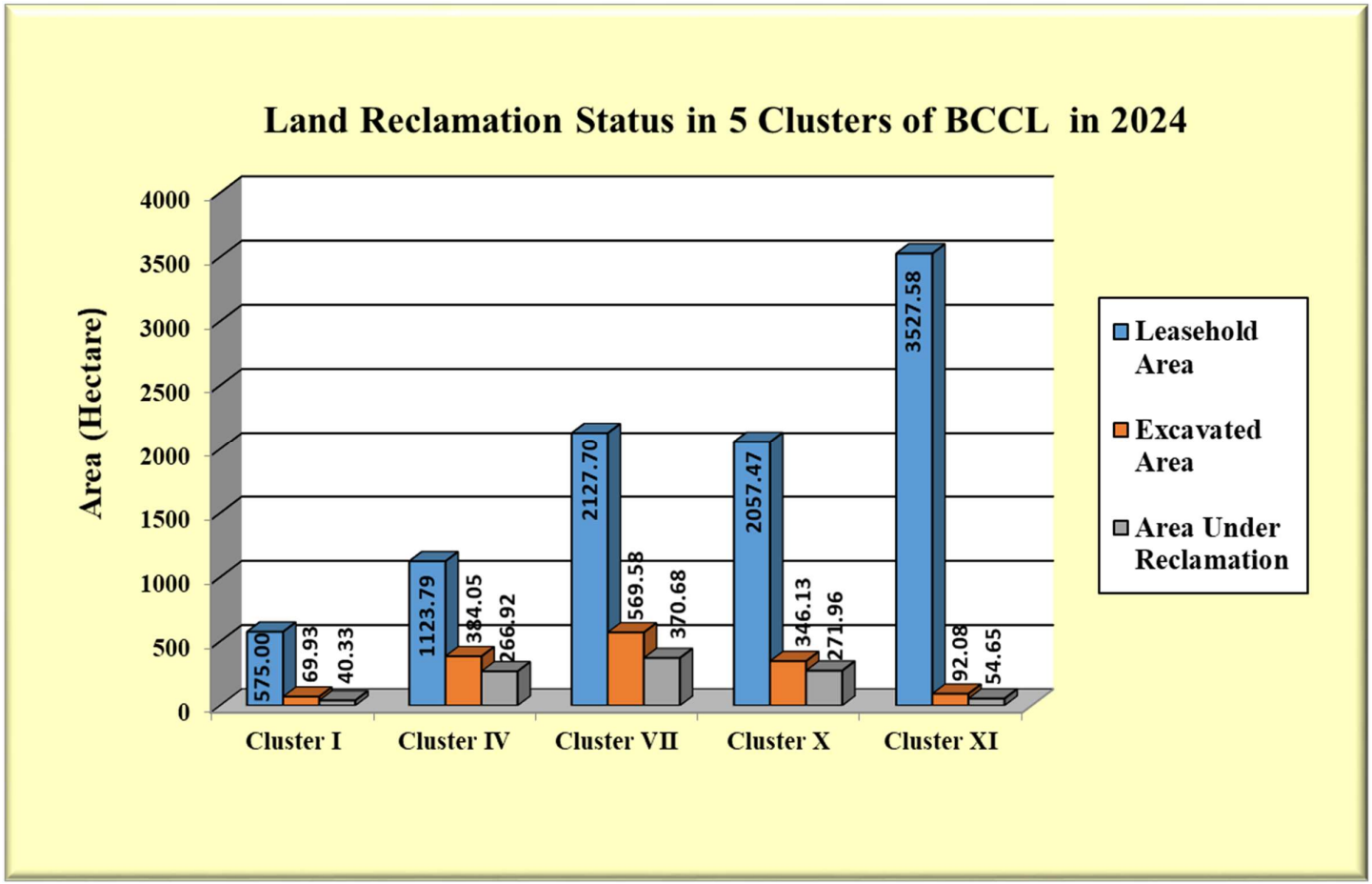


Fig. 1: Cluster wise Land Reclamation Status in five Clusters - 2024 (BCCL)

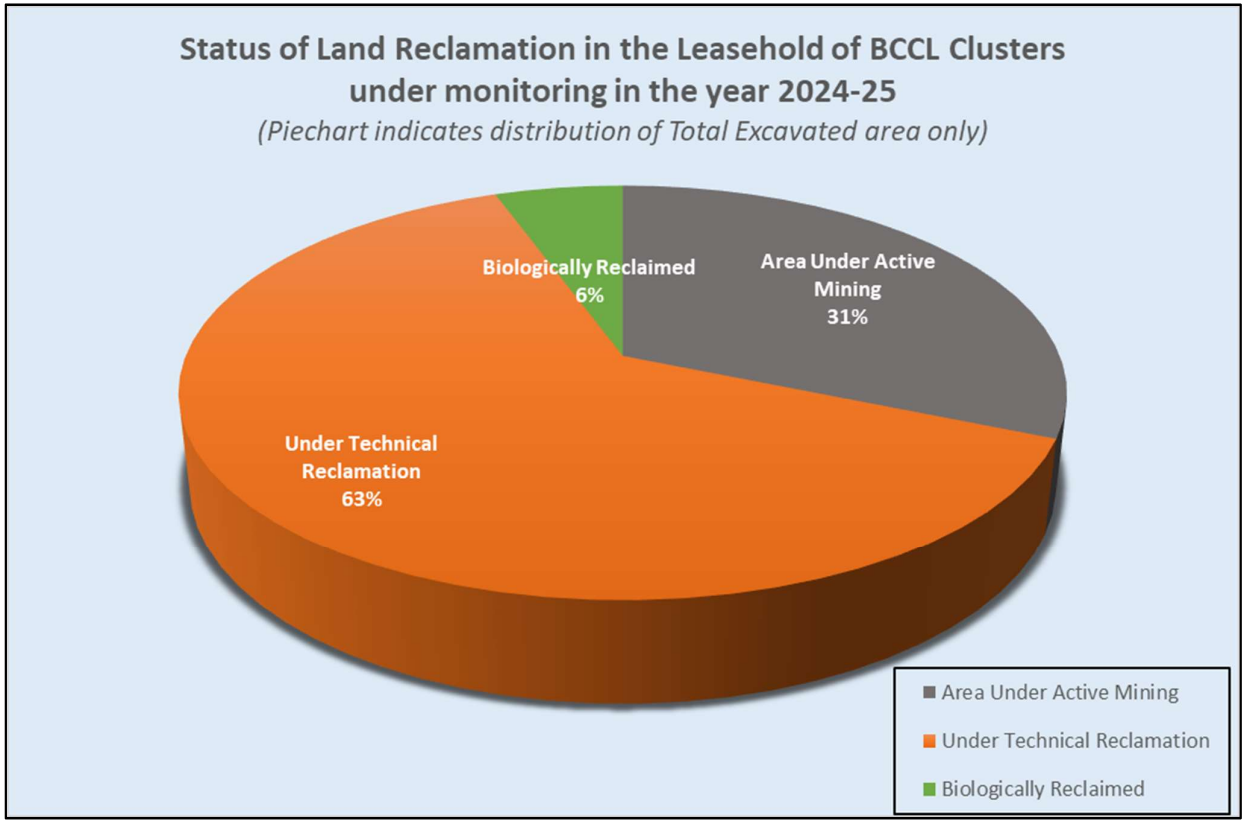


Fig. 2: Pie Chart showing distribution of total Excavated area in BCCL Clusters

1.0 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 capacities, 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. After this, the work order was renewed periodically, and the latest work order is issued vide letter no. CIL/ENV/11463 dated 03.07.2024 from Coal India Limited for the period 2024-25 to 2026-27. According to this work order, 75 OC projects having more than 5 million cu. m (coal +OB) per annum capacity shall be monitored every year and also land reclamation monitoring of 39 (mines + clusters) having less than 5 million cu. m (coal +OB) per

annum capacity, totaling 114 (OC mines & clusters) will be monitored in 2024-25 covering all the subsidiaries of Coal India Ltd. 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 clusters of 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 2024 carried out for five clusters of mines comprising both underground and opencast projects of Bharat Coking Coal Ltd.

2.0 Objective

Objective of the land reclamation/restoration monitoring is to assess the area under backfilling, plantation, OB dumps, social forestry, active mining area, settlements, 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.

3.0 Methodology

There are number of steps involved between 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 satellite data through its website Bhoonidhi, 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:

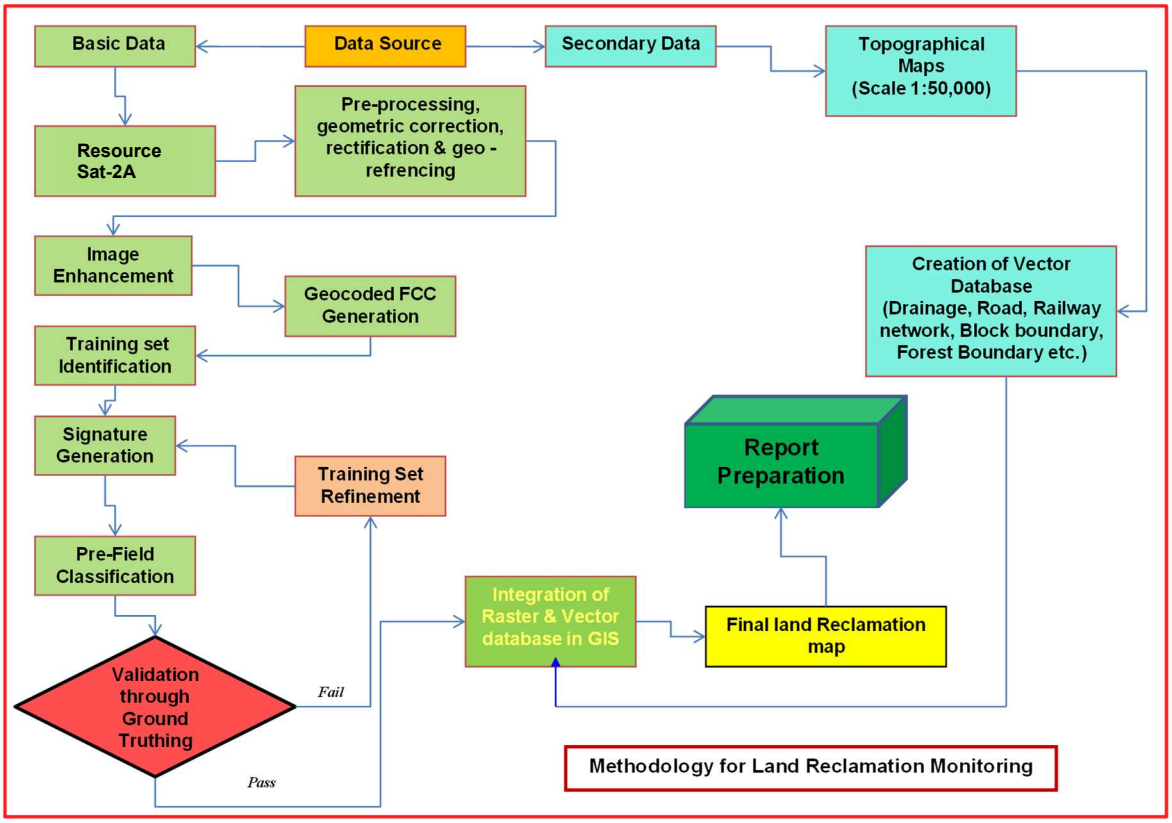


Fig. 3: Methodology of Land Reclamation Monitoring

3.1 Data Procurement: After browsing the data quality and date of pass on internet, data is downloaded from Bhoonidhi. 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 2022 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 2022 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. 2022 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 is 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.

4.0 Land Reclamation Status in Bharat Coking Coal Ltd.

4.1 Following 5 clusters of mines comprising both opencast and underground projects of Bharat Coking Coal Ltd. have been taken up for land reclamation monitoring during the year 2024-25:

- **Cluster I** (Damoda Colliery)
- **Cluster IV** (Amalgamated Keshalpur West Mudidih Colliery, Amalgamated Angarpathra Ramkanali Colliery, Salanpur Colliery, Katras Choitudih Colliery, Gaslitand Colliery)
- **Cluster VII** (Kusunda Colliery, Alkusa Colliery, Amalgamated Dhansar Industry Colliery, Ena Colliery, Kustore Colliery, ROCP/South Jharia, Amalgamated East Bhuggatdih Simlabahal Colliery, Burragarh Colliery, Hurriladih Colliery, Bhutgoria Colliery)
- **Cluster X** (Bhowrah North UG & OC, Bhowrah South UG & OC, Amalgamated Sudamdih Patherdih OC, Sudamdih Shaft UG, Amlabad UG)
- **Cluster XI** (Kendwadih Colliery, Gopalichak Colliery, Pootkee Colliery, 5/6 Pit KB, 5/7 Pit SB, 10/12 Pit KB Colliery, Bhagaband Colliery, Moonidih Colliery)

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 and Fig 2. Cluster wise Land Reclamation status of the remaining 10 clusters that are covered under monitoring in the 3-year cycle is given in Table 1.1. Area statistics of different land use classes present in the mine leasehold of the above clusters for the year 2024 are shown in Table 2. Land use maps derived from the satellite data are shown in Plate 1 - 5. Both national grid and UTM grid are used in the maps. Different land use classes based on satellite data are depicted in bar charts in Fig. 4 - 8.

4.3 Study reveals that out of total mine leasehold area of 9411.54 ha. of the 5 clusters of mines (Opencast + Underground) of BCCL mentioned above taken for this study in 2024-25, total excavated area is 1461.77 ha. out of

which 81.06 ha. (5.55%) has been planted (*Biologically Reclaimed*), 923.48 ha. (63.18%) is under backfilling (*Technically Reclaimed*) and balance 457.23 ha. (31.28%) is under active mining.

4.4 The leasehold boundaries of the above mentioned 5 clusters are as per EC.

4.5 It is seen that technical reclamation in the above 5 Clusters has increased from 712.90 ha. (Year 2021) to 923.48 ha. (Year 2024).

4.6 Study indicates that Cluster I, Cluster IV, Cluster X and Cluster XI of BCCL considered for this study in the year 2024-25 indicate increasing trend in Biological Reclamation (plantation on backfill) with respect to the year 2021. Whereas in Cluster VII plantation on backfill has decreased from 25.47 ha. (Year 2021) to 8.56 ha. (Year 2024) due to rehandling of backfill. But in this Cluster new plantations has been started by BCCL but their height and canopy cover are not enough to be captured in satellite imagery.

4.7 On comparing the status of plantation on OB dumps for the year 2024 with respect to the year 2021 in the above Cluster of mines of BCCL, it is evident from the analysis that area under plantation on OB dumps has decreased from 45.21 ha. (Year 2021) to 32.94 ha. (Year 2024) in Cluster I and from 11.43 ha. (Year 2021) to 1.33 ha. (Year 2024) in Cluster VII due to rehandling of OB dumps. In Cluster IV plantation on OB dumps has increased marginally from 27.11 ha. (Year 2021) to 27.45 ha. (Year 2024). The decrease in area under plantation on OB in Cluster X is due to reclassification of plantation on OB to plantation on backfill classes (updated as per surface plan received from RI II and area). In Cluster XI plantation on OB dumps has been started during the last three-year duration.

4.8 It is seen that total plantation under social forestry has decreased from 757.18 ha. (Year 2021) to 752.62 ha. (Year 2024) which is due to decrease in plantation under social forestry in Cluster IV from 165.09 ha. (Year 2021) to 160.53 ha. (Year 2024). This decrease in 4.56 ha. in Cluster IV is due to

increase in mining area. In all the other Clusters there is no change or plantation under social forestry is static during the last three-year duration.

4.9 It is seen that total excavated area has increased from 1218.18 ha. (Year 2021) to 1461.77 ha. (Year 2024).

4.10 After analyzing the satellite data of the year 2021 vs 2024, it reveals that area under total plantation (Green cover) carried out on backfilled area, OB dumps as well as under social forestry in the above clusters of BCCL has decreased from 968.94 ha. (10.30%) to 932.37 ha. (9.91%) in span of last three years. The reason for this reduction in area under green cover has been described separately earlier in point no. 4.6, 4.7 and 4.8.

4.11 On comparing the status of land reclamation for the year 2024 with respect to the year 2021 it is evident from the analysis that total area under land reclamation has increased from 774.82 ha. (Year 2021) to 1004.54 ha. (Year 2024). This increase of 229.72 ha. area under land reclamation is due to increase in reclamation activities in Cluster I, Cluster IV, Cluster X & Cluster XI. In Cluster VII, it is seen that total area under reclamation has decreased from 377.15 ha. (Year 2021) to 370.68 ha. (Year 2024). This decrease of 6.47 ha. area is due to rehandling of area under backfilling in this cluster.

4.12 The area under total plantation (Green Cover) is maximum in Cluster IV (17.38%) followed by Cluster VII with (11.68%), Cluster I with (11.65%), Cluster X with (11.23%) and Cluster XI with (5.40%).

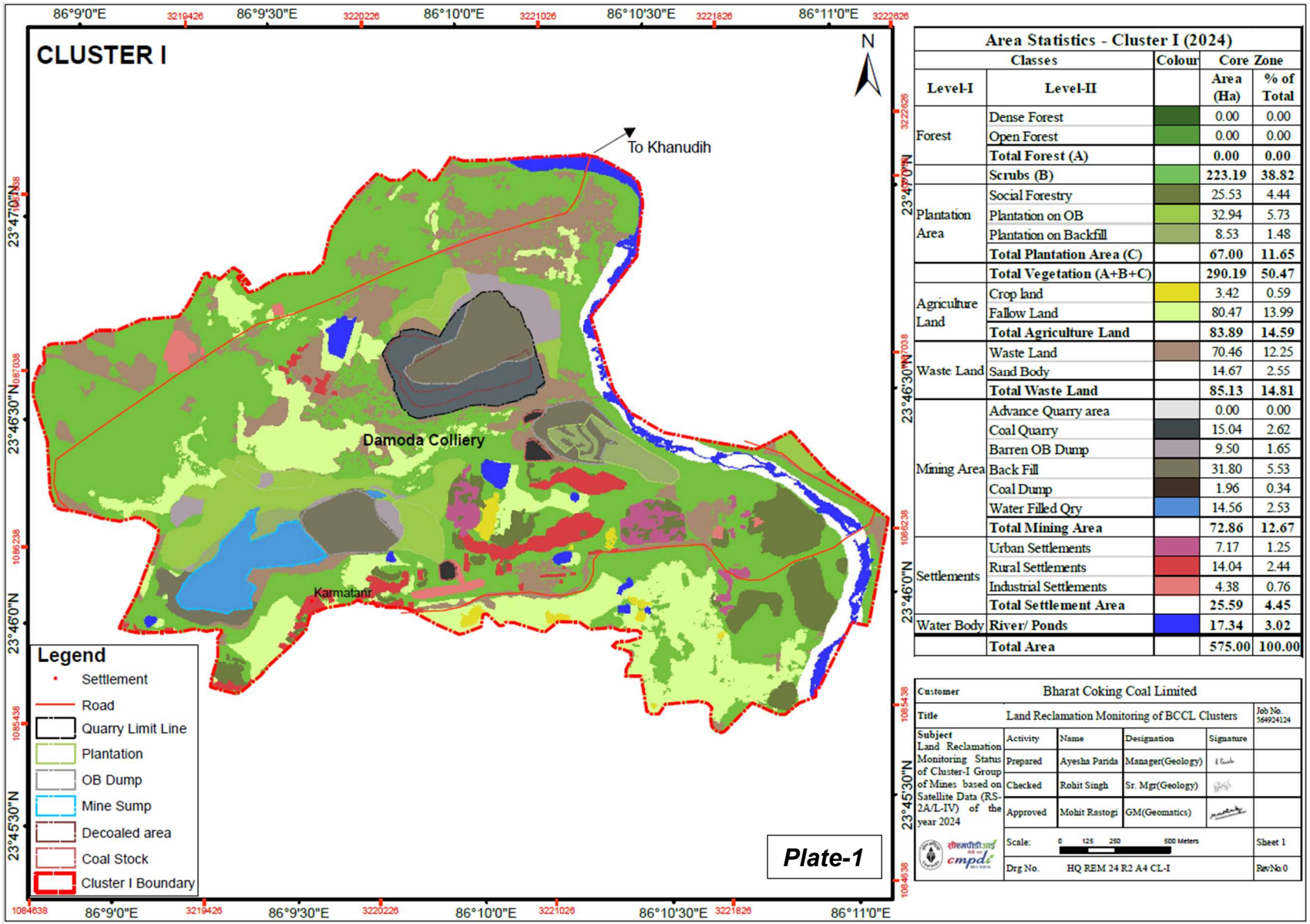
4.13 Out of the 5 Clusters in BCCL considered for satellite data based land reclamation monitoring in 2024-25, Cluster X tops with 78.57% reclamation followed by Cluster IV with 69.50%, Cluster VII with 65.08%, Cluster XI with 59.35% and Cluster I with 57.67%.

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 2024

(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	61.92	3.01	0.00	0.00	61.92	0.66
	Total Forest (A)	0.00	0.00	0.00	0.00	0.00	0.00	61.92	3.01	0.00	0.00	61.92	0.66
SCRUBS	**Scrubs (B)**	223.19	38.82	160.93	14.32	553.54	26.02	641.93	31.20	1169.43	33.15	2749.02	29.21
PLANTATION	Social Forestry/Avenue Plantation	25.53	4.44	160.53	14.28	238.67	11.22	140.75	6.84	187.14	5.31	752.62	8.00
	Plantation on OB Dump	32.94	5.73	27.45	2.44	1.33	0.06	36.00	1.75	0.97	0.03	98.69	1.05
	Plantation on Backfill (Biological Reclamation)	8.53	1.48	7.29	0.65	8.56	0.40	54.25	2.64	2.43	0.07	81.06	0.86
	Total Plantation (C)	67.00	11.65	195.27	17.38	248.56	11.68	231.00	11.23	190.54	5.40	932.37	9.91
	Total Vegetation (A+B+C)	**290.19**	**50.47**	**356.20**	**31.70**	**802.10**	**37.70**	**934.85**	**45.44**	**1359.97**	**38.55**	**3743.31**	**39.77**
	Coal Dump	1.96	0.34	0.00	0.00	12.51	0.59	1.12	0.05	1.66	0.05	17.25	0.18
ACTIVE MINING	Coal Quarry	15.04	2.62	97.49	8.68	194.77	9.15	62.59	3.04	36.74	1.04	406.63	4.32
	Advance Quarry Site	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.69	0.02	0.69	0.01
	Quarry Filled With Water	14.56	2.53	19.64	1.75	4.13	0.19	11.58	0.56	0.00	0.00	49.91	0.53
	Total Area under *Active Mining*	**29.60**	**5.15**	**117.13**	**10.42**	**198.90**	**9.35**	**74.17**	**3.60**	**37.43**	**1.06**	**457.23**	**4.86**
	Barren OB Dump	9.50	1.65	57.64	5.13	47.62	2.24	25.28	1.23	34.10	0.97	174.14	1.85
RECLAIMED	Area Under Backfilling (Technical Reclamation)	31.80	5.53	259.63	23.10	362.12	17.02	217.71	10.58	52.22	1.48	923.48	9.81
	Total Area under Mine Operation	**72.86**	**12.67**	**434.40**	**38.65**	**621.15**	**29.19**	**318.28**	**15.47**	**125.41**	**3.56**	**1572.10**	**16.70**
WASTELAND	Waste Lands	70.46	12.25	90.67	8.07	189.11	8.89	142.45	6.92	673.11	19.08	1165.80	12.39
	Fly Ash Pond / Sand Body	14.67	2.55	0.00	0.00	0.00	0.00	53.69	2.61	15.83	0.45	84.19	0.89
	Total Wasteland	**85.13**	**14.81**	**90.67**	**8.07**	**189.11**	**8.89**	**196.14**	**9.53**	**688.94**	**19.53**	**1249.99**	**13.28**
WATERBODIES	Reservoir, Nallah, Ponds	17.34	3.02	15.32	1.36	21.67	1.02	180.72	8.78	63.87	1.81	298.92	3.18
	Total Waterbodies	**17.34**	**3.02**	**15.32**	**1.36**	**21.67**	**1.02**	**180.72**	**8.78**	**63.87**	**1.81**	**298.92**	**3.18**
AGRICULTURE	Crop Lands	3.42	0.59	3.45	0.31	36.41	1.71	17.28	0.84	81.12	2.30	141.68	1.51
	Fallow Lands	80.47	13.99	34.35	3.06	17.18	0.81	105.99	5.15	821.68	23.29	1059.67	11.26
	Total Agriculture	**83.89**	**14.59**	**37.80**	**3.36**	**53.59**	**2.52**	**123.27**	**5.99**	**902.80**	**25.59**	**1201.35**	**12.76**
SETTLEMENTS	Urban Settlement	7.17	1.25	171.01	15.22	409.25	19.23	228.39	11.10	336.58	9.54	1152.40	12.24
	Rural Settlement	14.04	2.44	18.15	1.62	9.41	0.44	54.55	2.65	14.68	0.42	110.83	1.18
	Industrial Settlement	4.38	0.76	0.24	0.02	21.42	1.01	21.27	1.03	35.33	1.00	82.64	0.88
	Total Settlements	**25.59**	**4.45**	**189.40**	**16.85**	**440.08**	**20.68**	**304.21**	**14.79**	**386.59**	**10.96**	**1345.87**	**14.30**
	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 (2024)

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)		**223.19**	**38.82**
Plantation Area	Social Forestry		25.53	4.44
	Plantation on OB		32.94	5.73
	Plantation on Backfill		8.53	1.48
	Total Plantation Area (C)		**67.00**	**11.65**
	Total Vegetation (A+B+C)		**290.19**	**50.47**
Agriculture Land	Crop land		3.42	0.59
	Fallow Land		80.47	13.99
	Total Agriculture Land		**83.89**	**14.59**
Waste Land	Waste Land		70.46	12.25
	Sand Body		14.67	2.55
	Total Waste Land		**85.13**	**14.81**
Mining Area	Advance Quarry area		0.00	0.00
	Coal Quarry		15.04	2.62
	Barren OB Dump		9.50	1.65
	Back Fill		31.80	5.53
	Coal Dump		1.96	0.34
	Water Filled Qry		14.56	2.53
	Total Mining Area		**72.86**	**12.67**
Settlements	Urban Settlements		7.17	1.25
	Rural Settlements		14.04	2.44
	Industrial Settlements		4.38	0.76
	Total Settlement Area		**25.59**	**4.45**
Water Body	River/ Ponds		17.34	3.02
	Total Area		**575.00**	**100.00**

Customer	Bharat Coking Coal Limited				
Title	Land Reclamation Monitoring of BCCL Clusters				Job No. 564924124
Subject	Activity	Name	Designation	Signature	
Land Reclamation Monitoring Status of Cluster-I Group of Mines based on Satellite Data (RS-2A/L-IV) of the year 2024	Prepared	Ayesha Parida	Manager(Geology)		
	Checked	Rohit Singh	Sr. Mgr(Geology)		
	Approved	Mohit Rastogi	GM(Geomatics)		
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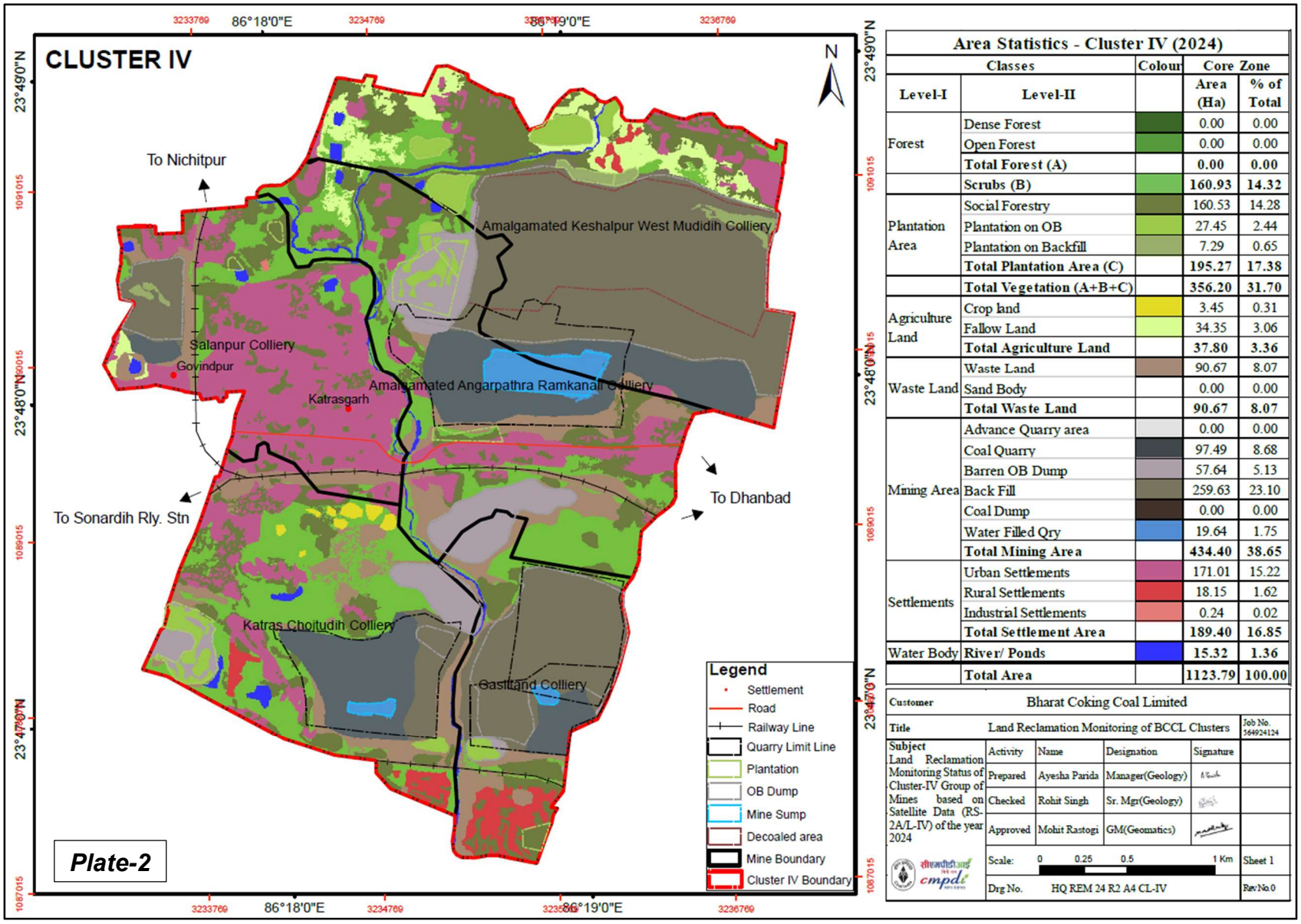
	Drg No. HQ REM 24 R2 A4 CL-I				RevNo 0



Area Statistics - Cluster IV (2024)

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)		**160.93**	**14.32**
Plantation Area	Social Forestry		160.53	14.28
	Plantation on OB		27.45	2.44
	Plantation on Backfill		7.29	0.65
	Total Plantation Area (C)		**195.27**	**17.38**
	Total Vegetation (A+B+C)		**356.20**	**31.70**
Agriculture Land	Crop land		3.45	0.31
	Fallow Land		34.35	3.06
	Total Agriculture Land		**37.80**	**3.36**
Waste Land	Waste Land		90.67	8.07
	Sand Body		0.00	0.00
	Total Waste Land		**90.67**	**8.07**
Mining Area	Advance Quarry area		0.00	0.00
	Coal Quarry		97.49	8.68
	Barren OB Dump		57.64	5.13
	Back Fill		259.63	23.10
	Coal Dump		0.00	0.00
	Water Filled Qry		19.64	1.75
	Total Mining Area		**434.40**	**38.65**
Settlements	Urban Settlements		171.01	15.22
	Rural Settlements		18.15	1.62
	Industrial Settlements		0.24	0.02
	Total Settlement Area		**189.40**	**16.85**
Water Body	**River/ Ponds**		**15.32**	**1.36**
	Total Area		**1123.79**	**100.00**

Customer	Bharat Coking Coal Limited			
Title	Land Reclamation Monitoring of BCCL Clusters			Job No. 564924124
Subject: Land Reclamation Monitoring Status of Cluster-IV Group of Mines based on Satellite Data (RS-2A/L-IV) of the year 2024	Activity	Name	Designation	Signature
	Prepared	Ayesha Parida	Manager(Geology)	
	Checked	Rohit Singh	Sr. Mgr(Geology)	
	Approved	Mohit Rastogi	GM(Geomatics)	
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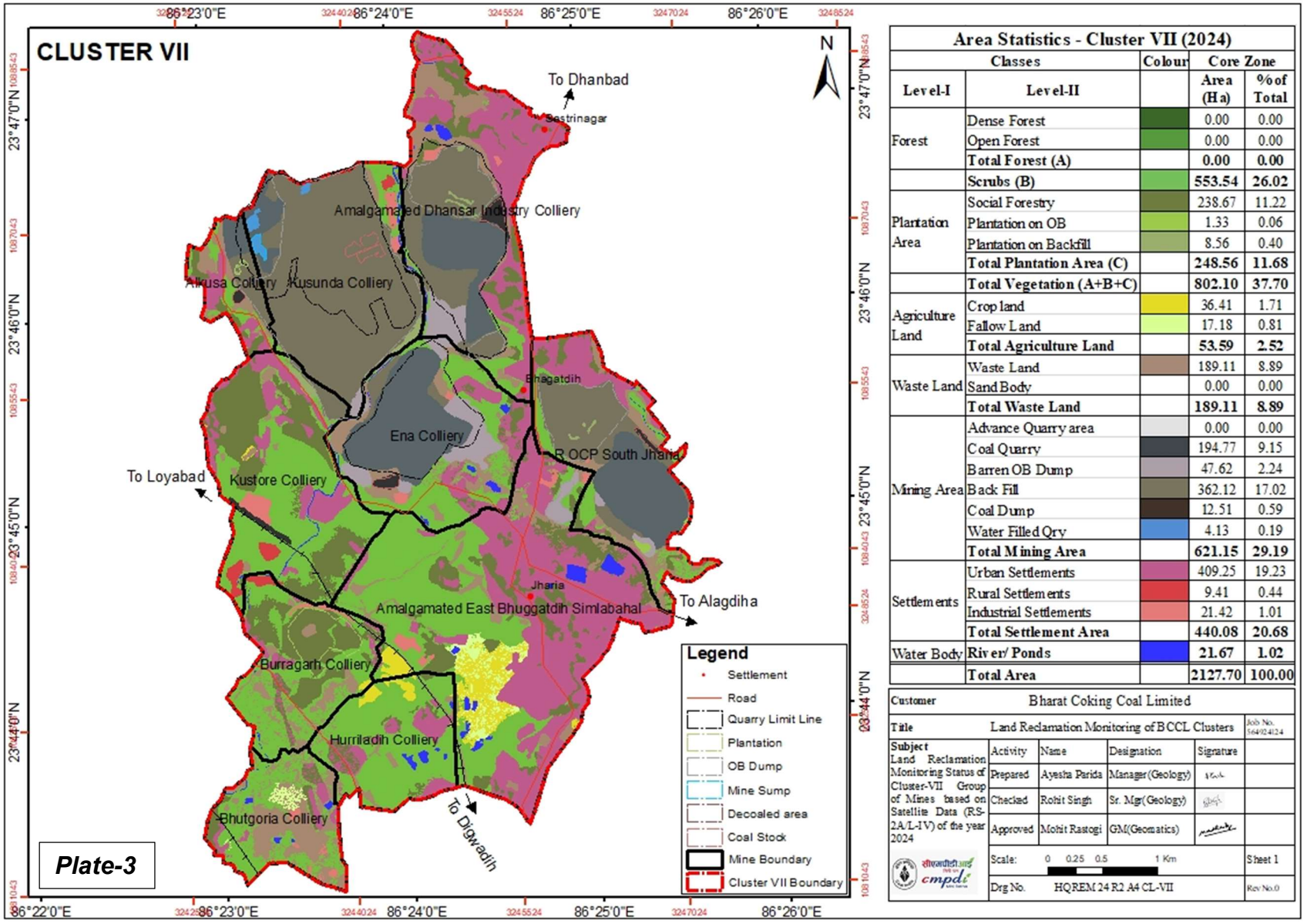
	Drg No. HQ REM 24 R2 A4 CL-IV			Rev No.0



Area Statistics - Cluster VII (2024)

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)		**553.54**	**26.02**
Plantation Area	Social Forestry		238.67	11.22
	Plantation on OB		1.33	0.06
	Plantation on Backfill		8.56	0.40
	Total Plantation Area (C)		**248.56**	**11.68**
	Total Vegetation (A+B+C)		**802.10**	**37.70**
Agriculture Land	Crop land		36.41	1.71
	Fallow Land		17.18	0.81
	Total Agriculture Land		**53.59**	**2.52**
Waste Land	Waste Land		189.11	8.89
	Sand Body		0.00	0.00
	Total Waste Land		**189.11**	**8.89**
Mining Area	Advance Quarry area		0.00	0.00
	Coal Quarry		194.77	9.15
	Barren OB Dump		47.62	2.24
	Back Fill		362.12	17.02
	Coal Dump		12.51	0.59
	Water Filled Qry		4.13	0.19
	Total Mining Area		**621.15**	**29.19**
Settlements	Urban Settlements		409.25	19.23
	Rural Settlements		9.41	0.44
	Industrial Settlements		21.42	1.01
	Total Settlement Area		**440.08**	**20.68**
Water Body	**River/ Ponds**		**21.67**	**1.02**
	Total Area		**2127.70**	**100.00**

Customer	Bharat Coking Coal Limited				
Title	Land Reclamation Monitoring of BCCL Clusters				Job No. 564924124
Subject: Land Reclamation Monitoring Status of Cluster-VII Group of Mines based on Satellite Data (R.S-2A/L-IV) of the year 2024	Activity	Name	Designation	Signature	
	Prepared	Ayesha Parida	Manager (Geology)		
	Checked	Rohit Singh	Sr. Mgr(Geology)		
	Approved	Mohit Rastogi	GM(Geomatics)		
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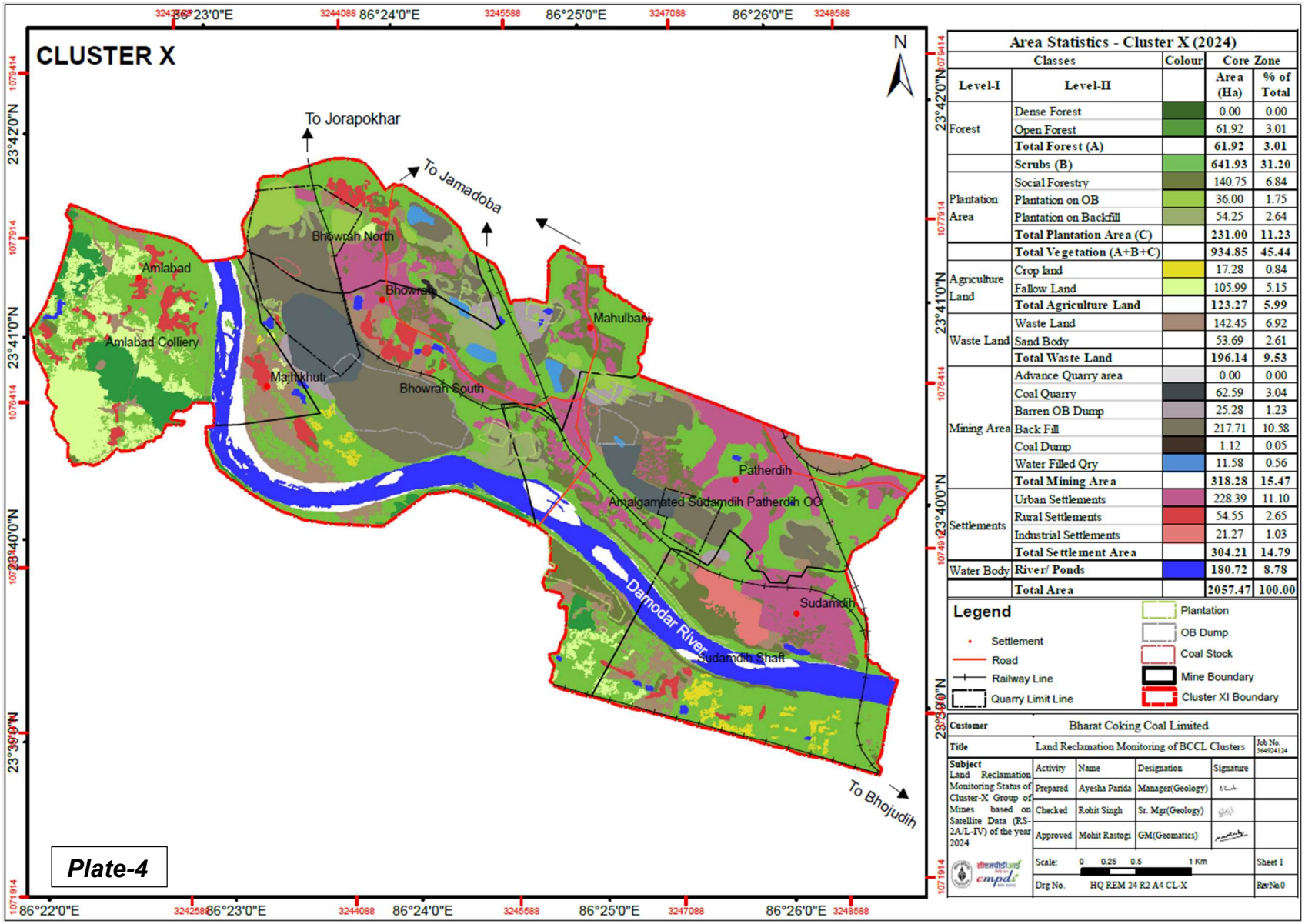
	Drg No. HQ/REM/24/R2/A4/CL-VII				Rev No.0



Area Statistics - Cluster X (2024)

Classes		Colour	Core Zone	
Level-I	Level-II		Area (Ha)	% of Total
Forest	Dense Forest		0.00	0.00
	Open Forest		61.92	3.01
	Total Forest (A)		**61.92**	**3.01**
	Scrubs (B)		641.93	31.20
Plantation Area	Social Forestry		140.75	6.84
	Plantation on OB		36.00	1.75
	Plantation on Backfill		54.25	2.64
	Total Plantation Area (C)		**231.00**	**11.23**
	Total Vegetation (A+B+C)		**934.85**	**45.44**
Agriculture Land	Crop land		17.28	0.84
	Fallow Land		105.99	5.15
	Total Agriculture Land		**123.27**	**5.99**
Waste Land	Waste Land		142.45	6.92
	Sand Body		53.69	2.61
	Total Waste Land		**196.14**	**9.53**
Mining Area	Advance Quarry area		0.00	0.00
	Coal Quarry		62.59	3.04
	Barren OB Dump		25.28	1.23
	Back Fill		217.71	10.58
	Coal Dump		1.12	0.05
	Water Filled Qry		11.58	0.56
	Total Mining Area		**318.28**	**15.47**
Settlements	Urban Settlements		228.39	11.10
	Rural Settlements		54.55	2.65
	Industrial Settlements		21.27	1.03
	Total Settlement Area		**304.21**	**14.79**
Water Body	River/ Ponds		180.72	8.78
	Total Area		**2057.47**	**100.00**

Legend

- Settlement
- Road
- Railway Line
- Quarry Limit Line
- Plantation
- OB Dump
- Coal Stock
- Mine Boundary
- Cluster XI Boundary

Customer	Bharat Coking Coal Limited				
Title	Land Reclamation Monitoring of BCCL Clusters				Job No. 564924124
Subject: Land Reclamation Monitoring Status of Cluster-X Group of Mines based on Satellite Data (RS-2A/L-IV) of the year 2024	Activity	Name	Designation	Signature	
	Prepared	Ayesha Parida	Manager(Geology)		
	Checked	Rohit Singh	Sr. Mgr(Geology)		
	Approved	Mohit Rastogi	GM(Geomatics)		
	Scale: 0 0.25 0.5 1 Km				Sheet 1
	Drg No. HQ REM 24 R2 A4 CL-X				Rev No 0

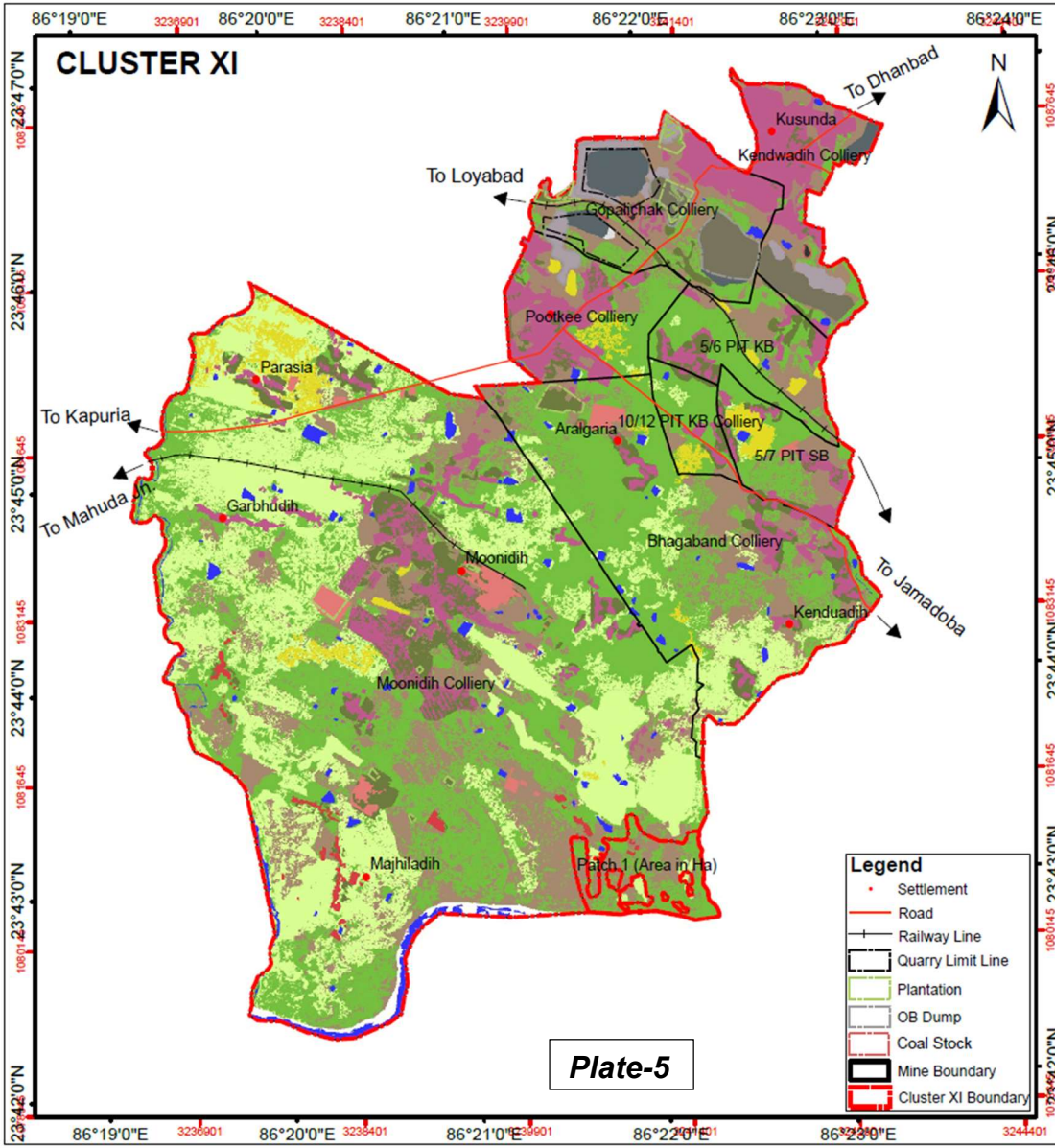


Plate-5

Area Statistics - Cluster XI (2024)

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)		**1169.43**	**33.15**
Plantation Area	Social Forestry		187.14	5.31
	Plantation on OB		0.97	0.03
	Plantation on Backfill		2.43	0.07
	Total Plantation Area (C)		**190.54**	**5.40**
	Total Vegetation (A+B+C)		**1359.97**	**38.55**
Agriculture Land	Crop land		81.12	2.30
	Fallow Land		821.68	23.29
	Total Agriculture Land		**902.80**	**25.59**
Waste Land	Waste Land		673.11	19.08
	Sand Body		15.83	0.45
	Total Waste Land		**688.94**	**19.53**
Mining Area	Advance Quarry area		0.69	0.02
	Coal Quarry		36.74	1.04
	Barren OB Dump		34.10	0.97
	Back Fill		52.22	1.48
	Coal Dump		1.66	0.05
	Water Filled Qry		0.00	0.00
	Total Mining Area		**125.41**	**3.56**
Settlements	Urban Settlements		336.58	9.54
	Rural Settlements		14.68	0.42
	Industrial Settlements		35.33	1.00
	Total Settlement Area		**386.59**	**10.96**
Water Body	River/ Ponds		63.87	1.81
	Total Area		**3527.58**	**100.00**

Customer	Bharat Coking Coal Limited				
Title	Land Reclamation Monitoring of BCCL Clusters				Job No. 564924124
Subject: Land Reclamation Monitoring Status of Cluster-XI Group of Mines based on Satellite Data (RS-2A/L-IV) of the year 2024	Activity	Name	Designation	Signature	
	Prepared	Ayesha Parida	Manager(Geology)		
	Checked	Rohit Singh	Sr. Mgr(Geology)		
	Approved	Mohit Rastogi	GM(Geomatics)		
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	Drg No. HQ REM 24 R2 A4 CL-XI				Rev No.0

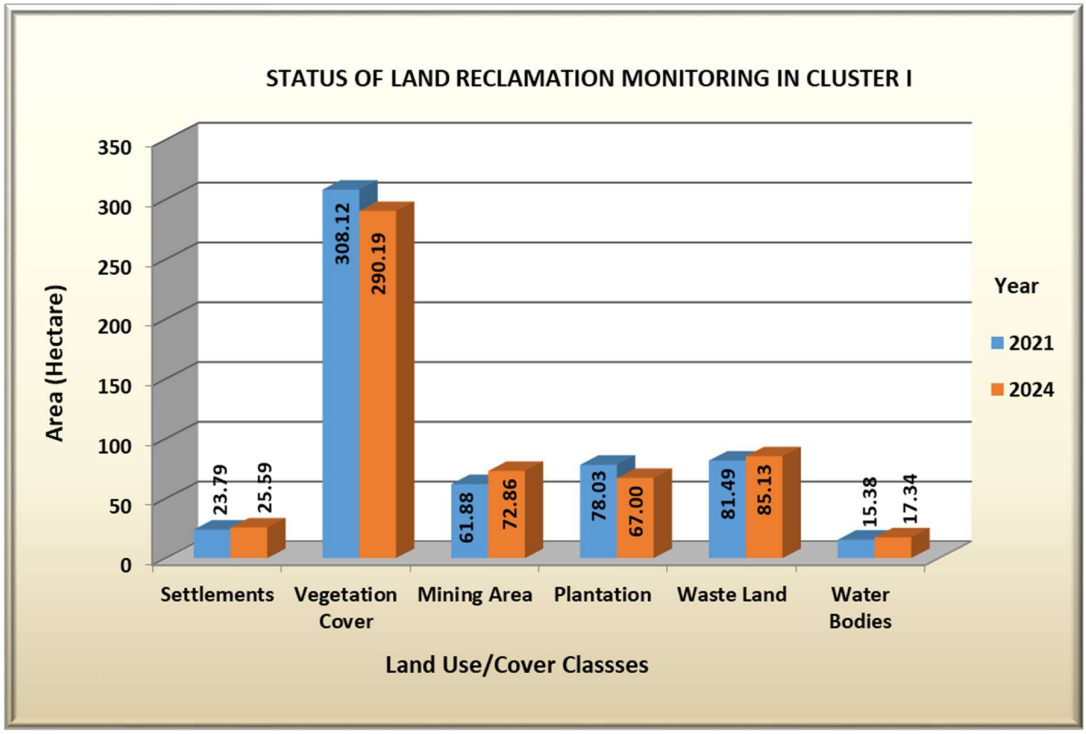


Fig. 4: Land Reclamation Status of Cluster I

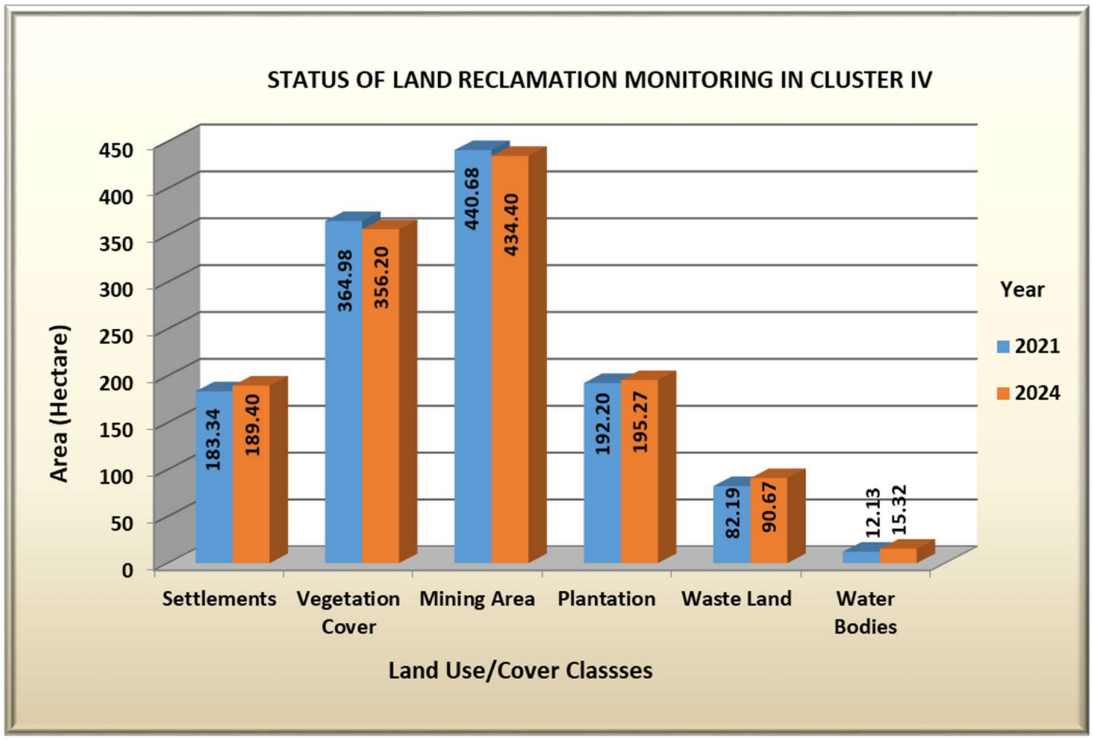


Fig.5: Land Reclamation Status of Cluster IV

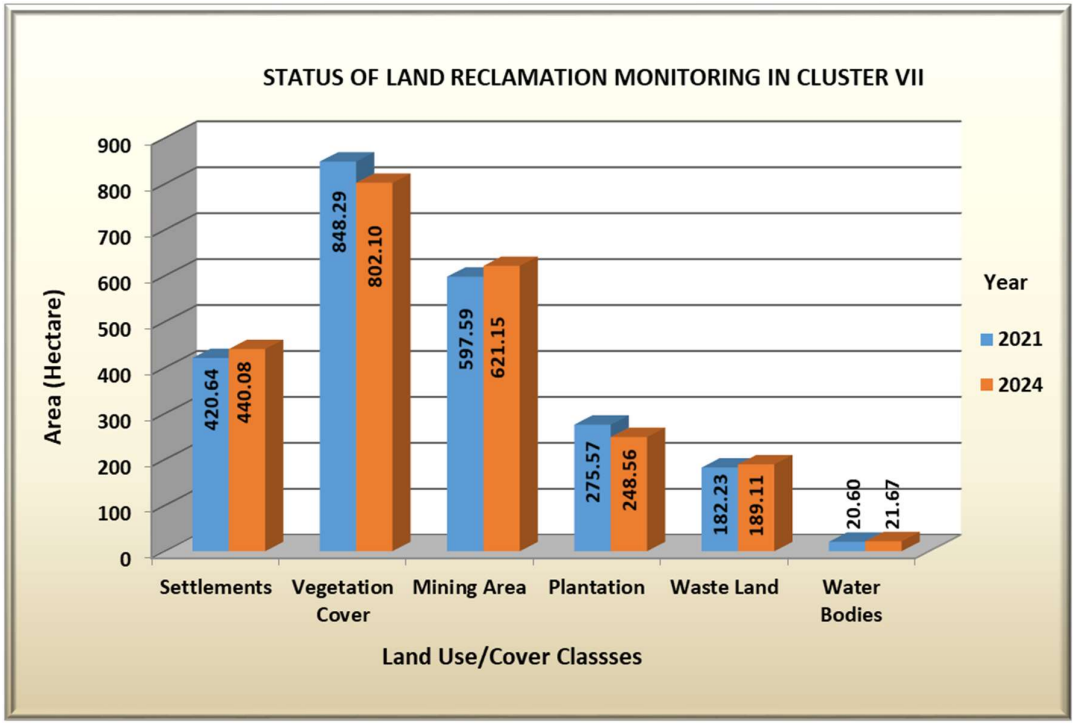


Fig. 6: Land Reclamation Status of Cluster VII

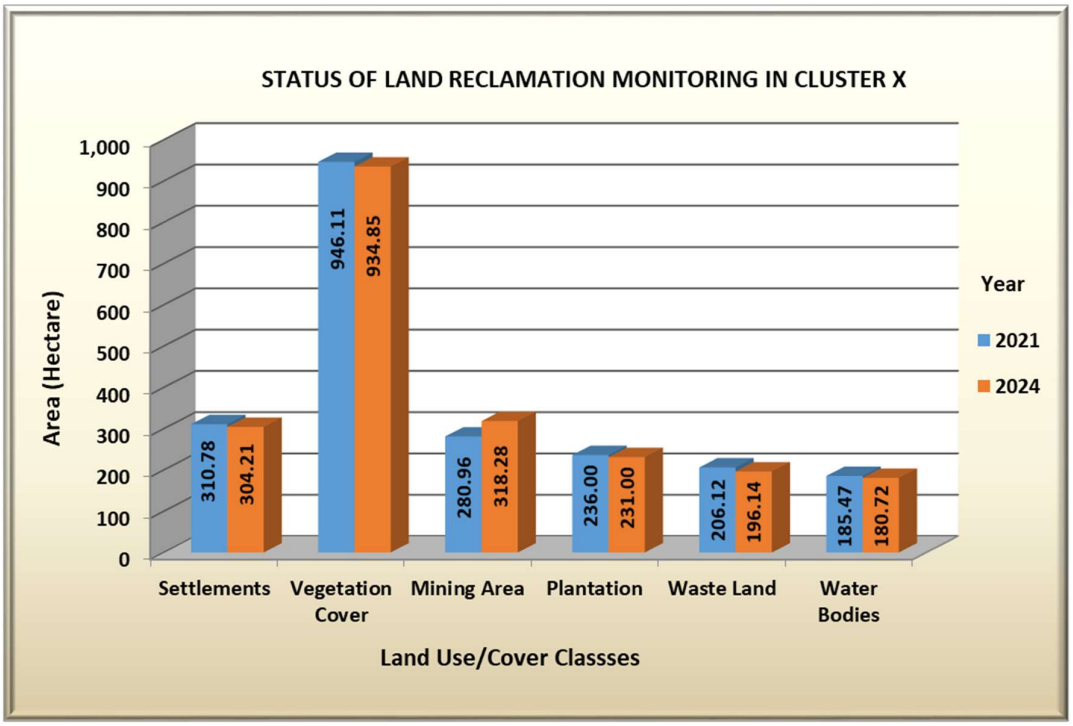


Fig. 7: Land Reclamation Status of Cluster X

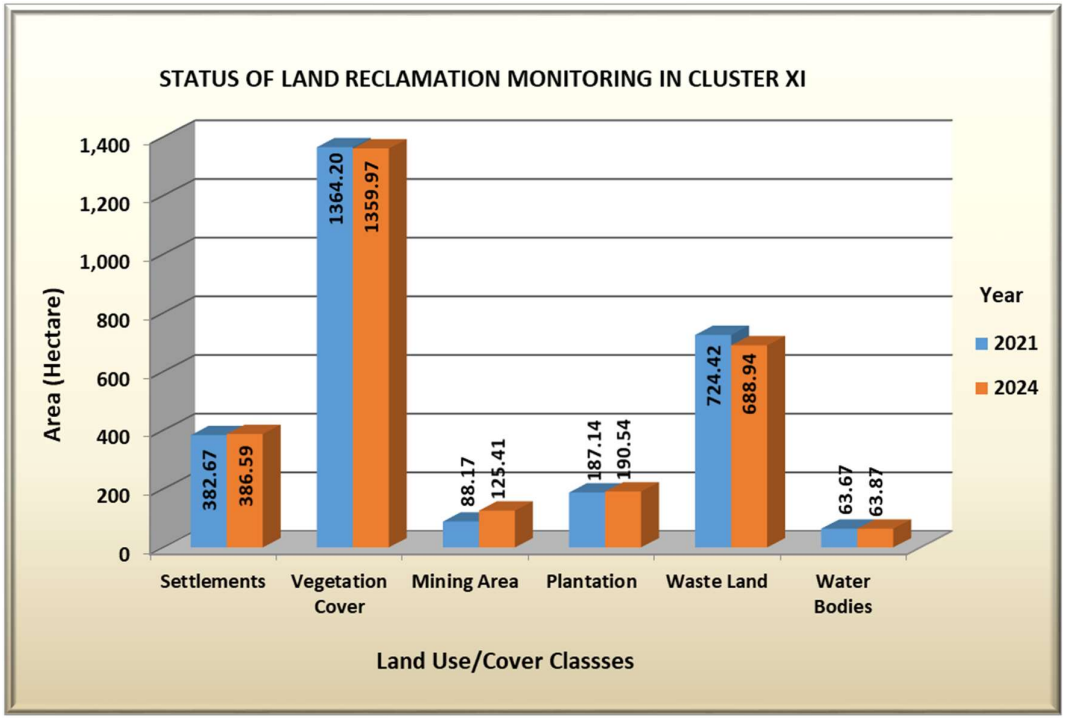


Fig. 8: Land Reclamation Status of Cluster XI

Photo 1: Plantation on OB dump, Cluster I

Photo 2: Plantation on OB dump, Cluster I

Photo 3: Plantation on Backfill, Cluster IV

Photo 4: Plantation on OB Dump, Cluster IV

Photo 5: Plantation on Backfill, Cluster VII

Photo 6: Social Forestry Plantation, Cluster VII

Photo 7: Plantation on Backfill, Cluster X

Photo 8: Plantation on OB Dump, Cluster X

Photo 9: Social Forestry Plantation, Cluster X

Photo 10: Plantation on Backfill, Cluster XI

Photo 11: Social Forestry Plantation, Cluster XI

शब्द-कोष

1	Land Reclamation	भूमि पुनरुद्धार
2	Over Burden	अधिभार
3	Monitoring	निगरानी
4	Report	प्रतिवेदन
5	Executive Summary	कार्यकारी सारांश
6	Opencast Mine	खुली खदान
7	Objective	उद्देश्य
8	Methodology	कार्य प्रणाली अथवा प्रक्रिया
9	Table	तालिका
10	List of Tables	तालिकाओं की सूची
11	Map	मानचित्र
12	Social Forestry	सामाजिक वानिकी
13	Plantation	पौधारोपण
14	Million	घनमीटर
15	Background	पृष्टभूमि
16	Planning	योजनाबद्ध
17	Asses	आकलन
18	Status	स्थिति
19	Regularly	निरंतर
20	Satellite	उपग्रह
21	Subsidiary	अनुषांगिक
22	Production	उत्पादन
23	Biological Reclamation	जैविक पुनरुद्धार
24	Technical Reclamation	तकनिकी पुनरुधार
25	Leasehold Area	पट्टाक्षेत्र
26	Excavated Area	उत्खनन क्षेत्र
27	Active mining	सक्रिय खनन
28	Environmental Protection	पर्यावरण संरक्षण
29	Remedial Measure	उपचारात्मक उपाय
30	Interval	अंतराल
31	Systematic Error	व्यवस्थित त्रुटियँ।
32	Error	अशुद्धियाँ
33	Curvature	वक्रता
34	Geometric	ज्यामितिक
35	Distortion	विरुपण
36	Plantation	पौधारोपण

शब्द-कोष		
37	Capacity	क्षमता
38	Software	सॉफ्टवेयर
39	Class	वर्ग
40	Accuracy	सटीकता
41	Statistical Separation	सांख्यिकीय पृथक्करण
42	Cubic meter	घनमीटर
43	Depicted	दर्शाया गया
44	Percentage	प्रतिशत
45	Salient Findings	मुख्य निष्कर्ष
46	Methodology	पद्धति
47	Data Procurement	डाटाक्रय
48	Satellite data Processing	उपग्रह डाटा प्रसंस्करण
49	Rectification and geo-referencing	सुधार और भूसन्दर्भ-
50	Image enhancement	छवि गुण वृद्धि
51	Training set selection	प्रशिक्षण सेट का चयन
52	Classification and Accuracy assessment	वर्गीकरण और मूल्यांकन की सटीकता
53	Area calculation	क्षेत्र गणना
54	Temporal	लौकिक
55	Processing	प्रसंस्करण
56	Overlay of Vector data base	वेक्टर डाटाबेस का अरोपन
57	Pre-field map preparation	क्षेत्र जाने के पहले नक्शे की त्तैयारी
58	Ground Truthing	भू-सत्यापन
59	Ground Information	भू- सुचना
60	Interpretation	व्याख्या
61	Eco-system	पारिस्थितिकी तंत्र
62	Minor	मामुली
63	Water Drainage	जलनिकाय
64	Interval	अंतराल
65	Maximum	अधिकतम
66	Coal field	कोयला क्षेत्र
67	Design	परिकल्पना
68	Superimpose	आरोपित
69	Update	अद्यतनीकरण/नवीनीकरण
70	Cumulative	संचयित
71	Embankment	तटबंध
72	Cluster	खुली तथा भूमिगत खदानों के समूह

ABBREVIATIONS

SoI	Survey of India
MoEF & CC	Ministry of Environment, Forest & Climate Change
CIL	Coal India Limited
ECL	Eastern Coalfields Limited
BCCL	Bharat Coking Coal Limited
CCL	Central Coalfields Limited
WCL	Western Coalfields Limited
SECL	South Eastern Coalfields Limited
NCL	Northern Coalfields Limited
MCL	Mahanadi Coalfields Limited
NEC	North Eastern Coalfields
CMPDIL	Central Mine Planning & Design Institute Ltd
NRSC	National Remote Sensing Centre
R2/ R2A	Resource Sat Satellites
LISS - 4	Linear Imaging and Self Scanning Sensor
FCC	False Color Composite
OCP	Opencast Project
UGP	Underground Project
OB	Over Burden
GCP	Ground Control points
GIS	Geographic Information System
WGS-84	World Geodetic System
UTM	Universal Transverse Mercator

GLOSSARY

Sl.	Term	Definition
1.	Land Reclamation	To manage, reclaim and restore mined out/ degraded land as close as possible to its original stage.
2.	Over Burden	The material that lies above the coal seam/ deposit
3.	Monitoring	A process of evaluation to check or keep record for a period of time.
4.	Opencast Coal Mine	Open-pit mining, also known as opencast mining, is a surface mining technique that extracts minerals from an open pit in the ground.
5.	Social Forestry	Social forestry is the management and protection of forests and afforestation of barren and deforested lands with the purpose of helping environmental, social and rural development. Plantation (Social/ Avenue or other) carried out outside mining area.
6.	Biological Reclamation	Plantation on Backfilled areas (Stabilized Internal Dumps)
7.	Technical Reclamation	Area under backfilling (Over burden dumped inside the mine voids) in mining area.
8.	Green Cover Generated	Total Plantation carried out in the lease area of Project. This includes Plantation on Backfill, Plantation on OB and Social Forestry.
9.	Leasehold Area	The area, for which lease is granted for the purpose of undertaking mining and allied operations.
10.	Excavated area	Mined out area which includes active mining, area under backfilling and plantation on backfilled areas
11.	Active Mining	Mining areas which include Coal Quarry, Advance Quarry, Quarry Filled with Water etc.
12.	Environmental Protection	It is the practice of protecting the natural environment by individuals, organizations and governments. Its objectives are to conserve natural resources and the existing natural environment and, where possible, to mitigate damage and reverse trends.
13.	Remedial Measure	Any measure or action required or undertaken to investigate, monitor, clean up, remove, treat, prevent, contain or otherwise remediate the presence or release of any hazardous substance or activity.
14.	Systematic Error	Every measurement differing from the true measurement in the same direction, and even by the same amount in some cases.

Sl.	Term	Definition
15.	Geometric Distortion	It refers to the improper positioning of any image with respect to their true geographic position when viewed in a properly scaled common image display plane.
16.	Land Use/ Cover Class	Land cover is what covers the surface of the earth and land use describes how the land is used.
17.	Accuracy	The closeness of agreement between a measured quantity value and a true quantity value.
18.	Environmental Clearance	Environmental Clearance (EC) for any developmental projects like coal mining projects etc. has been made mandatory by the Ministry of Environment, Forests and Climate Change (MoEF & CC) through its Notification issued on 27.01.1994 under the provisions of Environment (Protection) Act, 1986.
19.	Rectification and Geo-referencing	Geo-referencing is the assigning of absolute location of a data point or data points. Geo-rectification refers to the removal of geometric distortions between sets of data points, most often the removal of terrain, platform, and sensor induced distortions from remote sensing imagery.
20.	Image Enhancement	It is the process of modifying digital images so that the results are more suitable for processing or further image analysis.
21.	Training set selection	It is a portion of a data set used to fit or train a model for prediction or classification of values that are known in the training set, but unknown in other (future) data.
22.	Image Classification	It refers to the task of extracting information classes from a multiband raster image. The resulting raster from image classification can be used to create thematic maps.
23.	Temporal Changes	The 'temporal change' means the change in any entity with a period of time.
24.	Ground Truthing	Collection of primary/ basic information from ground realities for satellite image interpretation and thematic mapping.
25.	Cluster	Group of opencast and/ or underground mines clubbed together for administrative purposes.
26.	Arc GIS	GIS Software used for Map preparation
27.	ERDAS IMAGINE	Satellite Image Data Classification Software

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

Top Soil Dump is demarcated
81400E
107200N
B6
B5
B4
B7
B8
B.H NO. A.P.-79 DIA =150mm DIP= 286.00m
B.H NO. 4 SURFACE TO 10 SEAM DIA =150mm DIP= 34.67m
AP15-45 AIR SHAFT UP TO 10 SEAM DEP=17.88
AIRSHAFT
B.H AP.-41
D. B. ROAD
H.T. LINE 11 KV
12 SEAM INC FILLED UP
189.00 m
183.512
188.722
176.071
187.305
181.829
192.653
171.616
XI Seam
81800E
QUARTER
FLAT
BUNG
RLY QRT
RLY OHT
RLY QRT
RLY QRT
RLY QR

Bharat Coking Coal Ltd.
(*A Subsidiary of Coal India Limited)*
Office of the General Manager, Katras Area
P.O. KATRAS, P.S.- Jogta, Dhanbad-828121
CIN: U1010JH1972GOI000918
Phone/Fax No.: 0326-2371213
Email ID: cgmkatras@bccl.gov.in

Yearwise (2014-15 to 2025-26) Plantation details of Cluster IV

Year	Biological reclamation (in Ha)/Afforestation	Location	Mode	Remarks
2014-15	3.4	West mudidih, AKWMC	Departmentally	
2015-16	3.02	Keshalpur, AKWMC	Departmentally	
2016-17	5.7	AKWMC (near suryamandir, Katras)	Departmentally	
2016-17			1160+525 = 1685 Nos of Gabion plantation done by DFO, Dhanbad	
2018-19	3.47	AKWMC	Departmentally	
2019-20			600 Nos of Gabion plantation, done by DFO, Dhanbad	
2019-20	0.6	Shahid mriti Upwan, Gaslitand	Departmentally	
2020-21	1	Keshalpur, Sneh Smriti Upwan site, AKWMC	Departmentally	
2020-21	0.5	Parasnath udyan		Plantation done over extended portion of Parasnath Udhyan
2020-2021	11	AKWMC	By DFO, Dhanbad	
2021-2022	13	KCC	By DFO, Dhanbad	
2022-23	*4.5*	*AKWMC*	*Depatmentally*	
2023-24	*2.5*	*AKWMC*	*Departmentally*	

In FY 2024-25 total 2.4 Ha and Fy 2025-26 total 2.3Ha plantation has been done departmentally.Apart of that total 2285 nos of gabion plantation has also been done in the above mentioned period.

CHAPTER - XII

PROGRESSIVE AND FINAL MINE CLOSURE PLAN

12.0 MINE CLOSURE PLANNING

12.1 OBJECTIVES OF CLOSURE PLANNING

Mine closure planning has to be carried out at the starting of the mine and needs periodic reviewing and revision during its life cycle to cope with the geo-technical constraints, safety and economic risks, social and environmental challenges. Various other objectives are as follows:

- To allow a productive and sustainable after-use of the site which is acceptable to the mine owner and the regulatory authority;
- To protect public health and safety;
- To alleviate or eliminate environmental damage and thereby encourage environmental sustainability;
- To minimize adverse socio-economic impacts.

12.2 DIFFERENT ASPECTS OF MINE CLOSURE PLANNING

The mine closure planning broadly involves the following aspects:

(a) <u>Technical aspects:</u>

The following technical aspects would be reviewed in the final mine closure planning. Details can be worked in closure plans envisaged to be prepared.

- **Safety hazards including management of fire and subsidence**: In the mine closure plan, action will be taken to cover all the safety aspects including management of fire & subsidence and mine inundation.

- **Management of Pit Slopes:** During operation of the mine, overall slope will be maintained at an angle not exceeding 22^0-28^0. Vegetation cover will also be provided along the slopes to arrest any failure.

Backfilling has already started in the OCP and the final level of reclaimed backfill will be matched with the levels of surrounding areas leaving a final residual void which will also serve as a lagoon which may be utilised as water reservoir for the locality. Most of the back filled area shall be afforested by selecting proper plant species in consultation with State Forest Department. A part of the back filled area would also be developed for agricultural purpose with the help of the concerned State Authority.

- **Management of hydrology and hydro-geology**: In the mine closure plan, the surface flow pattern of precipitation and mine water would be clearly developed and water channel suitably laid down so that it does not disturb the general hydrology of the area.

  Mining operation may reduce the water table of the area. To recharge the water table, it is proposed that the mine water during operation will be discharged into surface water settling tank over flow of settled water from the tank will be used for water sprinkling, plantation, domestic purpose, etc. Therefore, the excess over flow water will be discharged into the nearby river. After closure of the mine vegetation will be grown on the entire vacant area.

- **Details of decommissioning of the infrastructures:** The decommissioning of the various infrastructures developed for the mine like office complex, roads, pipelines and transmission line etc. shall be planned in details so that the land occupied by these infrastructures are released. However, before such decommissioning, the possibility of re-use of these infrastructures for the neighbouring mines shall be explored.

- **Closure of entry to the open-cast mine:** At the end of the mine life, end pit slope within the seam and every exposed mouths of development gallery along the length of the bench / box-cut should be closed with non-combustible material (OB rock & mutti), compacted properly and sprayed with Thermoseal (a mica based sealant).

(b) Environmental aspects

This would include the following:

- **Management of final voids**: In the mine closure plan, voids due to mining are to be dealt and the final land use plan will include filling of the voids for land reclamation where possible and for hydro reclamation where feasible.

- **Reclamation of forests/vegetation:** It is to be ensured that in the final land use plan, all vacant land acquired for the project is afforested.

- **Channelisation of available water:** If the mine is having sufficient water and if on closure, the mine water flows into the surface water courses, channelising this water for surrounding community for their irrigational/domestic uses may be taken up. This can be planned by providing structures involving one time costing.

- **Management of Recharge Areas**: The pre-mining and post mining scenario on the hydrogeological recharge system would be included in the closure plan.

- **Acceptable Surface and Ground Water Flows**: In the final closure plan of the mine, wherever the mine water is likely to flow out to surface and meet the surface water sources; the quality of water from such mines would be assessed and flow pattern designed in the final plan.

(c) Social aspects

The social aspects of land use planning relating to mine closure would include the following:

- **Re-deployment of Workforce:** The company employees will be gainfully engaged in the neighbouring projects after cessation of mining activities.

- **Management of Community Facilities:** In view of the short life of the project no new community facility will be created. However, the existing facilities of adjoining areas will be strengthened.

(d) Financial aspects:

There are two types of Closure, namely, Progressive Mine Closure (Concurrent) and Final Mine Closure. The cost of Progressive Closure activities is realized by levying a cost of 2.50/Te of coal for UG Mines.

The Final Mine closure cost has to deal with the following:

- Cost of closure activities.
- Cost towards organization for executing the closure activities.
- Cost of the post project monitoring.
- Creation of a corpus fund for the final mine closure.

12.3 MINE CLOSURE OBLIGATIONS

There is need to define the liabilities, responsibilities and authorities of the mine management, other regulatory bodies, Central and State Governments after mine closure. Some obligations relating to the Mine Management Companies are as follows:

(a) **Health & Safety :** Regulation Nos. 6, 61, 106, 112 of Coal Mines Regulations, 1957 and its related DGMS Circulars;

(b) **Environment :** Water (Prevention & Control of Pollution) Act, 1974; Air (Prevention & Control of Pollution) Act, 1981; Environmental (Protection) Act, 1986 and Environmental Protection (Amendment) Rule, 2000; DGMS Directives on Noise & Ground Vibration;

(c) **Forest :** Forest (Conservation) Act, 1980.

(d) **Rehabilitation :** CIL's policy, however, applicable for land oustees only.

(e) **Decommissioning/asset disposal, etc.**

12.4 IMPACT ASSESSMENT REMEDIAL MEASURES

Post-Mining Land Use Plan has been shown in Chapter IX. Environmental Impact on Landscape, Water Source, air and noise pollution during mine life has been discussed earlier. It is imperative that the environmental monitoring may be continued for 3 years after closure of UG in order to assess corrective measures to be implemented to sustain pre-mining ecosystem and environment in the core and buffer zone (to the extent possible).

12.5 STAKEHOLDERS INVOLVEMENT

Various stakeholders effected due to mine closure need to be identified and they may be as follows :

The Company	:	Employees, Management & Stakeholders
The Community	:	Local business and service providers, landholders, neighbours and nearby residents, local Government and NGOs and Community Groups.
The State	:	The State Government. The Central Government and concerned Government Agencies.

There is need of regular consultations between the stakeholders to evolve the needs of the stakeholders and their involvement in the process.

12.6 CLOSURE ACTION PLAN

Closure planning is a whole-of-life exercise that begins at the start of a mine and continues till post-closure. The dynamic nature of closure planning requires regular and critical review to reflect changing circumstances as a result of any operational change, new regulation, and new technology and remain flexible enough to cope with unexpected events.

The following steps have to be undertaken in relation to Mine Closure Planning:

- Prior to the surface demolition/restoration a surface audit should be undertaken on all surface structures, spoil heaps, lagoons, etc. to assess whether there are any hazardous materials that could cause problems; viz. explosives, chemicals, etc. A list of surface assets should be prepared and made available to potential purchasers, prospective purchasers could be invited and asked to submit sealed bids, this could ensure that the sale of assets give better financial gain.
- In order to identify potential impact, necessary hydro-geological studies into post-mining ground water recharge have to be done.
- Work force on roll of BCCL may be re-deployed for gainful utilization in the same or other mines of BCCL.
- As a detailed component of the Closure Plan, a Decommissioning Plan is to be developed towards the final stages preferably 5 years prior to tentative closure of the mine. Once established, it may be updated annually.

12.7 PROTECTIVE MEASURES TO BE TAKEN

Protective measures must include the following :

- The protection of mine Entries , building and other structure on the project site against access by unauthorized persons;
- The maintenance of all mechanical, hydraulic and waste management system;
- The continuation of all monitoring programmes;
- The control of all contaminated effluents;
- The securing of all petroleum products, chemicals and waste;
- The rendering of all tailings, dams and piles of earth, rock and waste resulting from work done on the project site in a stable and safe condition.

12.8 CLOSURE COSTS

As per MOC guidelines, a corpus escrow account @ ₹ 1.0 lakhs (August, 2009 Price Level) per Ha (for UG) and @ ₹ 6.0 lakhs (for OC) of the project area shall be opened with the coal controller organization to meet the expenses of mine closure. The current Guidelines read as:

"It has been estimated that typically closure cost for an opencast mine will come around Rs. 6.00 lakh per Hectare of the project area and it would be Rs. 1.00 lakh per Hectare for underground mine project area at current price levels (August, 2009) and these rates will stand modified based on Wholesale Price Index as notified by Government of India from time to time".

There is already a mine closure plan approved by the 305th BCCL Board, Dated 12.03.2014. According to the approved mine closure plan the total life of the mine was considered to be 7 years and total mine closure cost up to the considered life of the mine was calculated to be ₹ 1484.114 Lakhs. As per the directives ₹ 814.801 (Principal amount) Lakhs were deposited in to the Escrow Account Number 150100009051 by 31st March 2017. Further, the same escrow account shall be continued for AKWM Colliery and the amount already accrued shall be adjusted against the new closure cost calculated.

A revised mine closure plan is prepared incorporating all the major current and proposed changes in the mining activities. As per the data furnished by the mine/area, the project area and leasehold area in respect AKWM Colliery is the same and the closure cost is calculated accordingly. The mine closure cost for the revised mine closure plan is calculated in following way:

In AKWM colliery, the existing leasehold area and project area is 325.10 Ha. An area of 207.50 Ha is required for opencast operations in the leasehold of AKWMC. Also, **4.27 Ha** of the Project Area is now abandoned quarry. Thus, out of the project area of 325.10 Ha, **211.77 Ha** (207.50+4.27) area has been considered for the calculation of closure cost **as per Open cast norms** and the remaining **113.33 Ha** has been considered for the calculation of closure cost of the area as **per Underground norms**.

The overlapping area (where UG & OC operations have been done in different vertical levels) has been considered for calculation of closure cost as per opencast norms.

12.8.1 The total amount that shall be further deposited for final mine closure activities of **AKWM Colliery** in case of underground workings during the considered period of 28 years stands out to be **₹ 276.798 lakhs** and in case of opencast workings during the considered period of 8 years stands out to be **₹ 1228.382 lakhs** as per the present status of the mine.

Table No. 12.1 Break-Up cost of Mine Closure of AKWM Colliery

Year	UG Section	OC Section	Total
1	4.739	128.638	133.378
2	4.976	135.07	140.047
3	5.225	141.824	147.049
4	5.487	148.915	154.402
5	5.761	156.361	162.122
6	6.049	164.179	170.228
7	6.351	172.388	178.739
8	6.669	181.007	187.676
9	7.002		7.002
10	7.352		7.352
11	7.720		7.72
12	8.106		8.106
13	8.511		8.511
14	8.937		8.937
15	9.384		9.384
16	9.853		9.853
17	10.346		10.346
18	10.863		10.863
19	11.406		11.406
20	11.976		11.976
21	12.575		12.575
22	13.204		13.204
23	13.864		13.864
24	14.557		14.557
25	15.285		15.285
26	16.050		16.050
27	16.852		16.852
28	17.695		17.695
Total	**276.798**	**1228.382**	**1505.18**

The amount already deposited in the escrow account will also be available for mine closure activities and should be included to arrive at the total funds available for Mine Closure Activities.

Table No. 12.2 Total Amount available for Mine Closure Activities of AKWMColliery

	Amount (in ₹ lakhs)	
	UG Section	**OC Section**
Amount Already Deposited in Escrow Account	29.157	785.644
Amount to be Deposited in the Escrow Account in the Future	276.798	1228.382
Total Amount available for Mine Closure Activities	**305.955**	**2014.026**

12.11.2 Based on the existing mine closure planning norms, the above calculated cost at Final WPI of January 2017 on mine closure may be tentatively grouped under different heads as given in Table No. 12.3 A and 12.3 B for underground and opencast respectively, as per guidelines of CMPDI(HQ).

Table 12.3 A Break up costs of Mine Closure Activities for AKWM Colliery (Underground)

Sl. No.	Activity	Mine Closure Cost (₹ in Lakhs)
A	**Dismantling of Structures**	
	Service Buildings	10.708
	Residential Buildings	32.370
	Industrial Structures like CHP, Workshop, field sub-station, cap lamp room, haulage, fan installation etc.	19.367
B	**Permanent Sealing of mine entries(incline mouth and air shaft)**	
	Sealing of incline mouths and air shafts	16.277
C	***Subsidence Management**	14.533
D	**LANDSCAPING**	
	Landscaping of the cleared land for improving its esthetic	26.924
E	***Plantation**	
	Plantation over the cleared area obtained after dismantling and on other barren spaces	39.774
F	**Monitoring/Testing of parameters for three years**	
	Air Quality	20.897
	Water Quality	19.398
G	***Enterpreneuship Development(Vocational/skill development training for sustainable income of affected people**	23.406
H	***Miscellaneous and other mitigative measures**	44.669
I	**Manpower Cost for Supervision**	37.632
	TOTAL	**305.955**

Note: * : To be covered under Progressive Mine Closure activities also

Table 12.3 B Break up costs of Mine Closure Activities for AKWM Colliery (Opencast including Abandoned Quarry)

Sl. No.	Activity	Mine Closure Cost (₹ in Lakhs)
A	**Dismantling of Structures**	
	Service Buildings	4.028
	Residential Buildings	53.774
	Industrial Structures like CHP, Workshop, field sub-station, etc.	6.042
B	**Permanent Fencing of Mine Void and other dangerous area**	
	Random Ruble masonry of height 1.2 metre including levelling up in cement concrete 1:6:12 in mud mortar	30.210
C	**Grading of Highwall slopes**	
	Levelling and grading of highwall slopes	35.648
D	***OB Dump Reclamation**	
	Handling/Dozing of external OB Dump into mine void	1785.635
	Bio-Reclamation including soil spreading, plantation and maintenance	8.056
E	**LANDSCAPING**	
	Landscaping of the cleared land for improving its esthetic	6.042
F	***Plantation**	
	Plantation over area obtained after dismantling	10.070
	Plantation around fencing	4.028
	Plantation over the cleared external OB Dump	0.403
G	**Monitoring/Testing of parameters for three years**	
	Air Quality	4.431
	Water Quality	4.028
H	***Enterpreneuship Development(Vocational/skill development training for sustainable income of affected people**	5.236
I	***Miscellaneous and other mitigative measures**	40.281
J	**Manpower Cost for Supervision**	16.112
	TOTAL	**2014.026**

Note: * : To be covered under Progressive Mine Closure activities also

12.8.3 Progressive Closure Costs

The break up costs of Progressive Closure Activities undertaken by BCCL in AKWM Colliery as per earlier approved Mine Closure Plan is given in the following table:

Table 12.4 Break up costs of Mine Closure Activities for AKWM Colliery (earlier approved) and Expenditure incurred during Progressive Closure Activities

Sl. No.	Activity	Mine Closure Cost (₹ in Lakhs)			Amount Claimed (Lakhs) (2014-15)	Amount Claimed (Lakhs) (2015-16)
		OC	UG	Total		
A	**Dismantling of Structures**					
	Service Buildings	2.968	15.730	**18.698**		
	Residential Buildings	39.626	47.549	**87.175**		
	Industrial Structures like CHP, Workshop, field sub-station, etc.	4.452	28.449	**32.901**		
B	**Permanent Fencing of Mine Void and other dangerous area**					
	Random Ruble masonry of height 1.2 metre including levelling up in cement concrete 1:6:12 in mud mortar	22.262		**22.262**		
C	**Permanent Sealing of mine entries(incline mouth and air shaft)**					
	Sealing of incline mouths and air shafts		23.909	**23.909**		
D	**Subsidence Management**		21.348	**21.348**		
E	**Grading of Highwall slopes**					
	Levelling and grading of highwall slopes	26.269		**26.269**		
F	**OB Dump Reclamation**			**0.000**		
	Handling/Dozing of external OB Dump into mine void	1315.815		**1315.815**		1524.638
	Bio-Reclamation including soil spreading, plantation and maintenance	5.936		**5.936**		
G	**LANDSCAPING**					
	Landscaping of the cleared land for improving its esthetic	4.452	39.550	**44.002**		2.071
H	**Plantation**					
	Plantation over area obtained after dismantling	7.421	58.425	**65.846**		
	Plantation around fencing and around quarry area	2.968		**2.968**	67.94789	
	Plantation over the cleared external OB Dump	0.297		**0.297**		82.844
I	**Monitoring/Testing of parameters for three years**					
	Air Quality	3.265	30.696	**33.961**		
	Water Quality	2.968	28.494	**31.462**		
J	**Enterpreneuship Development(Vocational/skill development training for sustainable income of affected people**	3.859	34.381	**38.240**	16.62778	8.285
K	**Miscellaneous and other mitigative measures**	29.682	65.616	**95.298**		
L	**Manpower Cost for Supervision**	11.873	55.279	**67.152**		
	TOTAL(%)	**1484.113**	**449.426**	**1933.539**	**84.57567**	**1617.838**

The estimate of total expenditure incurred upon the progressive closure activities are provided by BCCL.

CHAPTER - XII

PROGRESSIVE AND FINAL MINE CLOSURE PLAN

12.0 MINE CLOSURE PLANNING

12.1 OBJECTIVES OF CLOSURE PLANNING

Mine closure planning has to be carried out at the starting of the mine and needs periodic reviewing and revision during its life cycle to cope with the geo-technical constraints, safety and economic risks, social and environmental challenges. Various other objectives are as follows:

- To allow a productive and sustainable after-use of the site which is acceptable to the mine owner and the regulatory authority;
- To protect public health and safety;
- To alleviate or eliminate environmental damage and thereby encourage environmental sustainability;
- To minimize adverse socio-economic impacts.

12.2 DIFFERENT ASPECTS OF MINE CLOSURE PLANNING

The mine closure planning broadly involves the following aspects:

(a) Technical aspects;

The following technical aspects would be reviewed in the final mine closure planning. Details can be worked in closure plans envisaged to be prepared.

- **Safety hazards including management of fire and subsidence**: In the mine closure plan, action for control of likely fire areas of the mines will be discussed.

  Action will also be suggested to cover all the safety aspects.

  Following steps will be taken as precaution against fire and subsidence while mining:-

  i. Panel size will be so designed so that depillaring with caving will be completed within the incubation period of the coal seam.
  ii. Panel will be isolated in proper fashion before depillaring takes place.
  iii. Surface will be properly dozed and leveled wherever there are cracks and fissures so that air does not breathe in through surface.

- **Management of Pit Slopes**: As per the available records, there are 8 nos. of small quarries in the area which are proposed to be filled upto the required depth. Hence after the closure of the mine, there is little likelihood of any slope failure.
- **Management of hydrology and hydro-geology**: In the mine closure plan, the surface flow pattern of precipitation and mine water would be clearly developed and water channel suitably laid down so that it does not disturb the general hydrology of the area.

  Mining operation may reduce the water table of the area. To recharge the water table, it is proposed that the mine water during operation will be discharged into surface water settling tank over flow of settled water from the tank will be used for water sprinkling, plantation, domestic purpose, etc. Therefore, the excess over flow water will be discharged into the nearby river. After closure of the mine vegetation will be grown on the entire vacant area.
- **Details of decommissioning of the infrastructures:** The decommissioning of the various infrastructures developed for the mine like office complex, roads, pipelines and transmission line etc. shall be planned in details so that the land occupied by these infrastructures are released. However, before such decommissioning, the possibility of re-use of these infrastructures for the neighbouring mines shall be explored.

- **Closure of entry to the open-cast mine:** Not applicable.

(b) Environmental aspects

This would include the following:

- **Management of final voids**: In the mine closure plan, voids due to mining are to be dealt and the final land use plan will include filling of the voids for land reclamation where possible and for hydro reclamation where feasible.

- **Reclamation of forests/vegetation:** It is to be ensured that in the final land use plan, all vacant land acquired for the project is afforested.

- **Channelisation of available water:** If the mine is having sufficient water and if on closure, the mine water flows into the surface water courses, channelising this water for surrounding community for their irrigational/domestic uses may be taken up. This can be planned by providing structures involving one time costing

- **Management of Recharge Areas**: The pre-mining and post mining scenario on the hydrogeological recharge system would be included in the closure plan.

- **Acceptable Surface and Ground Water Flows**: In the final closure plan of the mine, wherever the mine water is likely to flow out to surface and meet the surface water sources; the quality of water from such mines would be assessed and flow pattern designed in the final plan.

(c) Social aspects;

The social aspects of land use planning relating to mine closure would include the following:

- **Re-deployment of Workforce:** The company employees will be gainfully engaged in the neighbouring projects after cessation of mining activities.
- **Management of Community Facilities:** In view of the short life of the project no new community facility will be created. However, the existing facilities of adjoining areas will be strengthened.

(d) Financial aspects.

There are two types of Closure, namely, Progressive Mine Closure (Concurrent) and Final Mine Closure.

The Final Mine closure cost has to deal with the following:

- Cost of closure activities.
- Cost towards organization for executing the closure activities.
- Cost of the post project monitoring.
- Creation of a corpus fund for the final mine closure.

12.3 MINE CLOSURE OBLIGATIONS

There is need to define the liabilities, responsibilities and authorities of the mine management, other regulatory bodies, Central and State Governments after mine closure. Some obligations relating to the Mine Management Companies are as follows:

(a) **Health & Safety:** Regulation Nos. 6, 61, 106, 112 of Coal Mines Regulations, 1957 and its related DGMS Circulars;

(b) **Environment :** Water (Prevention & Control of Pollution) Act, 1974; Air (Prevention & Control of Pollution) Act, 1981; Environmental (Protection) Act, 1986 and Environmental Protection (Amendment) Rule, 2000; DGMS Directives on Noise & Ground Vibration;

(c) **Forest:**
Forest (Conservation) Act, 1980.

(d) **Rehabilitation:**
CIL's policy, however, applicable for land oustees only.

(e) Decommissioning/asset disposal, etc.

12.4 IMPACT ASSESSMENT REMEDIAL MEASURES

Environmental Impact on Landscape, Water Source, air and noise pollution during mine life has been discussed earlier. It is imperative that the environmental monitoring may be continued for 3 years after closure of UG in order to assess corrective measures to be implemented to sustain pre-mining ecosystem and environment in the core and buffer zone (to the extent possible).

12.5 STAKEHOLDERS INVOLVEMENT

Various stakeholders effected due to mine closure need to be identified and they may be as follows:

The Company : Employees, Management & Stakeholders

The Community : Local business and service providers, landholders, neighbours and nearby residents, local Government and NGOs and Community Groups.

The State : The State Government. The Central Government and concerned Government Agencies.

There is need of regular consultations between the stakeholders to evolve the needs of the stakeholders and their involvement in the process.

12.6 CLOSURE ACTION PLAN

Closure planning is a whole-of-life exercise that begins at the start of a mine and continues till post-closure. The dynamic nature of closure planning requires regular and critical review to reflect changing circumstances as a result of any operational change, new regulation, and new technology and remain flexible enough to cope with unexpected events.

The following steps have to be undertaken in relation to Mine Closure Planning:

- Prior to the surface demolition/restoration a surface audit should be undertaken on all surface structures, spoil heaps, lagoons, etc. to assess whether there are any hazardous materials that could cause problems; viz. explosives, chemicals, etc. A list of surface assets should be prepared and made available to potential purchasers, prospective purchasers could be invited and asked to submit sealed bids, this could ensure that the sale of assets give better financial gain.
- In order to identify potential impact, necessary hydro-geological studies into post-mining ground water recharge have to be done.
- Work force on roll of BCCL may be re-deployed for gainful utilization in the same or other mines of BCCL.
- As a detailed component of the Closure Plan, a Decommissioning Plan is to be developed towards the final stages preferably 5 years prior to tentative closure of the mine. Once established, it may be updated annually.

12.7 PROTECTIVE MEASURES TO BE TAKEN

Protective measures must include the following:

- The protection of mine Entries , building and other structure on the project site against access by unauthorized persons;
- The maintenance of all mechanical, hydraulic and waste management system;
- The continuation of all monitoring programmes;
- The control of all contaminated effluents;
- The securing of all petroleum products, chemicals and waste
- The rendering of all tailings, dams and piles of earth, rock and waste resulting from work done on the project site in a stable and safe condition.

12.8 CLOSURE COSTS

As per MOC guidelines, a corpus escrow account @ ₹ 1.0 lakhs (August, 2009 Price Level) per Ha (for UG) and @ ₹ 6.0 lakhs (for OC) of the project area shall be opened with the coal controller organization to meet the expenses of mine closure. The current Guidelines read as:

"It has been estimated that typically closure cost for an opencast mine will come around Rs. 6.00 lakh per Hectare of the project area and it would be Rs. 1.00 lakh per Hectare for underground mine project area at current price levels (August, 2009) and these rates will stand modified based on Wholesale Price Index as notified by Government of India from time to time".

There is already a mine closure plan approved by the 305th BCCL Board, Dated 12.03.2014. According to the approved mine closure plan the total life of the mine was considered to be 13 years and total mine closure cost up to the considered life of the mine was calculated to be Rs 361.094 Lakhs. As per the directives Rs.112.46 Lakhs (Principal amount) were deposited in to the Escrow Account Number 150100009053 by 31st March 2017. **Further, the same escrow account shall be continued for AAR Colliery.**

A revised mine closure plan is prepared incorporating all the major current and proposed changes in the mining activities. As per the data furnished by the mine/area, the project area and leasehold area in respect of AAR Colliery differs and is given below and the closure cost is calculated accordingly. The mine closure cost for the revised mine closure plan is calculated in following way:

In AAR colliery, the existing leasehold area is 254.64 Ha. As per data furnished by the mine, the present Project area is 175.57 Ha excluding the area falling under DC Railway line, DB road and River and Barrier (79.07 Ha). **An area of 91.34 Ha is required for opencast operations** in the leasehold of AARC. Based on the land use of TOR, 64 Ha is abandoned, not backfilled quarry. However, as per the data furnished by the mine/area, only **1.56 Ha** of the Project Area is now abandoned quarry which is not backfilled at present. **Thus, out of the project area of 175.57 Ha, 92.90 (91.34+1.56) Ha area has been considered for the calculation of closure cost as per Open cast norms and the remaining 82.67 Ha has been considered for the calculation of closure cost of the area as per Underground norms.**

The overlapping area (where UG & OC operations have been done in different vertical levels) has been considered for calculation of closure cost as per opencast norms.

The money deposited in the Escrow Account has to deal with the following:

- Cost of closure activities.
- Cost towards organization for executing the closure activities.
- Cost of the post project monitoring.
- Creation of a corpus fund for the final mine closure

12.11.1 Thus, total amount that shall be further deposited for mine closure activities of **AAR Colliery** in case of underground workings during the considered period of 21 years stands out to be **₹ 64.83 lakhs** and in case of opencast workings during the considered period of 8 years stands out to be **₹ 903.250 lakhs** as per the present status of the mine.

Table No. 12.1 Break-Up cost of Mine Closure of AAR Colliery

Year	UG Section	OC Section	Total
1	1.815	95.45	97.265
2	1.906	100.223	102.129
3	2.001	105.234	107.235
4	2.101	110.496	112.597
5	2.206	116.02	118.226
6	2.316	121.821	124.137
7	2.432	127.912	130.344
8	2.554	134.308	136.862
9	2.682		2.682
10	2.816		2.816
11	2.956		2.956
12	3.104		3.104
13	3.259		3.259
14	3.422		3.422
15	3.594		3.594
16	3.773		3.773
17	3.962		3.962
18	4.160		4.16
19	4.368		4.368
20	4.586		4.586
21	4.816		4.816
	64.830	**911.464**	**976.294**

The amount already deposited in the escrow account will also be available for mine closure activities and should be included to arrive at the total funds available for Mine Closure Activities.

Table No. 12.2 Total Amount available for Mine Closure Activities of AAR Colliery

	Amount (in ₹ lakhs)	
	UG Section	**OC Section**
Amount Already Deposited in Escrow Account	79.958	32.500
Amount to be Deposited in the Escrow Account in the Future	64.830	911.464
Total Amount available for Mine Closure Activities	**144.788**	**943.964**

12.11.2 Based on the existing mine closure planning norms, the above calculated cost at Final WPI of January 2017 on mine closure may be tentatively grouped under different heads as given in Table No. 12.3 A and 12.3 B for underground and opencast respectively, as per guidelines of CMPDI(HQ).

Table 12.3 A Break up costs of Mine Closure Activities for AAR Colliery (Underground)

Sl. No.	Activity	Mine Closure Cost (₹ in Lakhs)
A	**Dismantling of Structures**	
	Service Buildings	5.068
	Residential Buildings	15.319
	Industrial Structures like CHP, Workshop, field sub-station, cap lamp room, haulage, fan installation etc.	9.165
B	**Permanent Sealing of mine entries(incline mouth and air shaft)**	
	Sealing of incline mouths and air shafts	7.703
C	***Subsidence Management**	6.877
D	**LANDSCAPING**	
	Landscaping of the cleared land for improving its esthetic	12.741
E	***Plantation**	
	Plantation over the cleared area obtained after dismantling and on other barren spaces	18.822
F	**Monitoring/Testing of parameters for three years**	
	Air Quality	9.889
	Water Quality	9.180
G	***Enterpreneuship Development(Vocational/skill development training for sustainable income of affected people**	11.076
H	***Miscellaneous and other mitigative measures**	21.139
I	**Manpower Cost for Supervision**	17.809
	TOTAL	**144.788**

Note: * : To be covered under Progressive Mine Closure activities also

Table 12.3 B Break up costs of Mine Closure Activities for AAR Colliery (Opencast)

Sl. No.	Activity	Mine Closure Cost (₹ in Lakhs)
A	**Dismantling of Structures**	
	Service Buildings	1.888
	Residential Buildings	25.204
	Industrial Structures like CHP, Workshop, field sub-station, etc.	2.832
B	**Permanent Fencing of Mine Void and other dangerous area**	
	Random Ruble masonry of height 1.2 metre including levelling up in cement concrete 1:6:12 in mud mortar	14.159
C	**Grading of Highwall slopes**	
	Levelling and grading of highwall slopes	16.708
D	***OB Dump Reclamation**	
	Handling/Dozing of external OB Dump into mine void	836.918
	Bio-Reclamation including soil spreading, plantation and maintenance	3.776
E	**LANDSCAPING**	
	Landscaping of the cleared land for improving its esthetic	2.832
F	***Plantation**	
	Plantation over area obtained after dismantling	4.720
	Plantation around fencing	1.888
	Plantation over the cleared external OB Dump	0.189
G	**Monitoring/Testing of parameters for three years**	
	Air Quality	2.077
	Water Quality	1.888
H	***Enterpreneuship Development(Vocational/skill development training for sustainable income of affected people**	2.454
I	***Miscellaneous and other mitigative measures**	18.879
J	**Manpower Cost for Supervision**	7.552
	TOTAL	**943.964**

Note: * : To be covered under Progressive Mine Closure activities also

12.8.3 Progressive Closure Costs

The break up costs of Progressive Closure Activities undertaken by BCCL in AAR Colliery as per earlier approved Mine Closure Plan is given in the following table:

Table 12.4 Break up costs of Mine Closure Activities for AAR Colliery (earlier approved) and Expenditure incurred during Progressive Closure Activities

Sl. No.	Activity	Mine Closure Cost (₹ in Lakhs)	Amount Claimed (Lakhs) (2014-15)	Amount Claimed (Lakhs) (2015-16)
A	**Dismantling of Structures**			
	Service Buildings	11.501		4.2
	Residential Buildings	34.765		
	Industrial Structures like CHP, Workshop, field sub-station, cap lamp room, haulage, fan installation etc.	20.8		
B	**Permanent Sealing of mine entries(incline mouth and air shaft)**			
	Sealing of incline mouths and air shafts	17.481		
C	**Subsidence Management**	15.608	2.69877	2.55357
D	**LANDSCAPING**			
	Landscaping of the cleared land for improving its esthetic	28.916		66.08629
E	**Plantation**			
	Plantation over the cleared area obtained after dismantling and on other barren spaces	42.717		
F	**Monitoring/Testing of parameters for three years**			
	Air Quality	22.443		
	Water Quality	20.833		
G	**Enterpreneuship Development(Vocational/skill development training for sustainable income of affected people**	25.137	74.94412	8.69345
H	**Miscellaneous and other mitigative measures**	47.975		
I	**Manpower Cost for Supervision**	40.417		
J	**Reclamation of Abandoned Quarry**	32.5		
	TOTAL	**361.094**	**77.64289**	**81.53331**

The estimate of total expenditure incurred upon the progressive closure activities are provided by BCCL.

CHAPTER - XII

PROGRESSIVE AND FINAL MINE CLOSURE PLAN

12.0 MINE CLOSURE PLANNING

12.1 OBJECTIVES OF CLOSURE PLANNING

Mine closure planning has to be carried out at the starting of the mine and needs periodic reviewing and revision during its life cycle to cope with the geo-technical constraints, safety and economic risks, social and environmental challenges. Various other objectives are as follows:

- To allow a productive and sustainable after-use of the site which is acceptable to the mine owner and the regulatory authority;
- To protect public health and safety;
- To alleviate or eliminate environmental damage and thereby encourage environmental sustainability;
- To minimize adverse socio-economic impacts.

12.2 DIFFERENT ASPECTS OF MINE CLOSURE PLANNING

The mine closure planning broadly involves the following aspects :

(a) Technical aspects;

The following technical aspects would be reviewed in the final mine closure planning. Details can be worked in closure plans envisaged to be prepared.

Safety hazards including management of fire and subsidence: In the mine closure plan, action will be taken to cover all the safety aspects including management of fire & subsidence and mine inundation.

Management of Pit Slopes: During operation of the mine, overall slope will be maintained at an angle not exceeding 22^0-28^0. Vegetation cover will also be provided along the slopes to arrest any failure.

As regards stability of back-filled dumps, the final level of reclaimed backfill will be matched with the levels of surrounding areas leaving a final residual void which will serve as a lagoon which may be utilised as water reservoir for the locality.

During operation, the external and internal OB dump will be developed with 40 m berm width and maximum height of 60m in case of external OB dump and the overall dump slope shall not exceed 22 to 28 degrees. The waste dumps will be provided with toe wall and garland drains. The dump will be technically reclaimed and vegetation will be grown after spreading the top soil. The above measures will prevent slope failure and improve the aesthetic value.

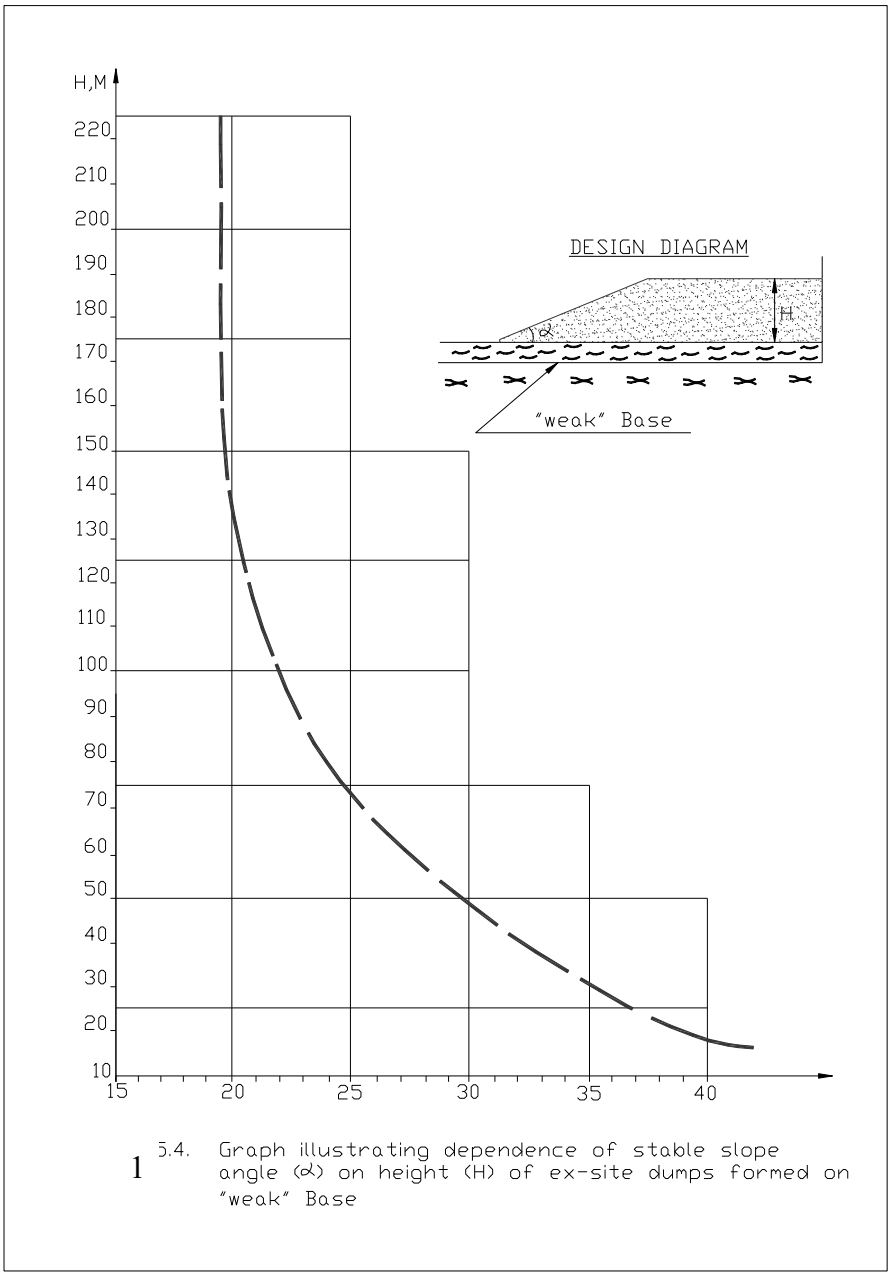


Fig. 5.4. Graph illustrating dependence of stable slope angle (α) on height (H) of ex-site dumps formed on "weak" Base

Backfilling has already started in the OCP and the final level of reclaimed backfill will be matched with the levels of surrounding areas leaving a final residual void which will also serve as a lagoon which may be utilised as water reservoir for the locality. Most of the back filled area shall be afforested by selecting proper plant species in consultation with State Forest Department. A part of the back filled area would also be developed for agricultural purpose with the help of the concerned State Authority.

- **Management of hydrology and hydro-geology**: In the mine closure plan, the surface flow pattern of precipitation and mine water would be clearly developed and water channel suitably laid down so that it does not disturb the general hydrology of the area.

  Mining operation may reduce the water table of the area. To recharge the water table, it is proposed that the mine water during operation will be discharged into surface water settling tank over flow of settled water from the tank will be used for water sprinkling, plantation, domestic purpose, etc. Therefore, the excess over flow water will be discharged into the nearby river. After closure of the mine vegetation will be grown on the entire vacant area..

- **Details of decommissioning of the infrastructures:** The decommissioning of the various infrastructures developed for the mine like office complex, roads, pipelines and transmission line etc. shall be planned in details so that the land occupied by these infrastructures are released. However, before such decommissioning, the possibility of re-use of these infrastructures for the neighboring mines shall be explored.

i) **Closure of entry to the open-cast mine :** After closure of the mining activities, all the entries to the mine will be effectively sealed off to avoid any accident and to prevent access to any unauthorized person. The area that is not reclaimed shall be properly fenced/ sealed to prevent any unauthorized entry into the area. However, the guidelines / instructions from DGMS, if any, will be followed.

(b) Environmental aspects

This would include the following:

- **Management of final voids**: In the mine closure plan, voids due to mining are to be dealt and the final land use plan will include filling of the voids for land reclamation where possible and for hydro reclamation where feasible.

- **Reclamation of forests/vegetation:** It is to be ensured that in the final land use plan, all vacant land acquired for the project is afforested

- **Channelisation of available water:** If the mine is having sufficient water and if on closure, the mine water flows into the surface water courses, channelising this water for surrounding community for their irrigational/domestic uses may be taken up. This can be planned by providing structures involving one time costing

- **Management of Recharge Areas**: The pre-mining and post mining scenario on the hydrogeological recharge system would be included in the closure plan.

- **Acceptable Surface and Ground Water Flows**: In the final closure plan of the mine, wherever the mine water is likely to flow out to surface and meet the surface water sources; the quality of water from such mines would be assessed and flow pattern designed in the final plan.

(c) Social aspects;

The social aspects of land use planning relating to mine closure would include the following:

- **Re-deployment of Workforce:** The company employees will be gainfully engaged in the neighboring projects after cessation of mining activities.

- **Management of Community Facilities:** In view of the short life of the project no new community facility will be created. However, the existing facilities of adjoining areas will be strengthened.

(d) Financial aspects.

Mine Closure activities would be a constant exercise for the mine which would begin with the commencement of mining operations and continue till post closure. The mine closure activities would naturally entail certain expenditures, which will have to be borne by the mine operator. There are two types of Closure, namely, Progressive Mine Closure (Concurrent) and Final Mine Closure. This would cover the activities which are being executed along with normal mining operation and would continue to be executed in course of execution of the project.

The Final Mine closure cost has to deal with the following:

- Cost of closure activities.
- Cost towards organization for executing the closure activities.
- Cost of the post project monitoring.
- Creation of a corpus fund for the final mine closure.

12.3 MINE CLOSURE OBLIGATIONS

There is need to define the liabilities, responsibilities and authorities of the mine management, other regulatory bodies, Central and State Governments after mine closure. Some obligations relating to the Mine Management Companies are as follows :

(a) **Health & Safety :** Regulation Nos. 6, 61, 106, 112 of Coal Mines Regulations, 1957 and its related DGMS Circulars;

(b) **Environment :** Water (Prevention & Control of Pollution) Act, 1974; Air (Prevention & Control of Pollution) Act, 1981; Environmental (Protection) Act, 1986 and Environmental Protection (Amendment) Rule, 2000;

DGMS Directives on Noise & Ground Vibration;

(c) **Forest :**

Forest (Conservation) Act, 1980.

(d) **Rehabilitation :**

CIL's policy, however, applicable for land oustees only.

(e) Decommissioning/asset disposal, etc.

12.4 IMPACT ASSESSMENT REMEDIAL MEASURES

Post-Mining Land Use Plan has been shown in Chapter IX. Environmental Impact on Landscape, Water Source, air and noise pollution during mine life has been discussed earlier. It is imperative that the environmental monitoring may be continued for 3 years after closure of mines in order to assess corrective measures to be implemented to sustain pre-mining ecosystem and environment in the core and buffer zone (to the extent possible).

12.5 STAKEHOLDERS INVOLVEMENT

Various stakeholders effected due to mine closure need to be identified and they may be as follows :

The Company	:	Employees, Management & Stakeholders
The Community	:	Local business and service providers, landholders, neighbours and nearby residents, local Government and NGOs and Community Groups.
The State	:	The State Government. The Central Government and concerned Government Agencies.

There is need of regular consultations between the stakeholders to evolve the needs of the stakeholders and their involvement in the process.

12.6 CLOSURE ACTION PLAN

Closure planning is a whole-of-life exercise that begins at the start of a mine and continues till post-closure. The dynamic nature of closure planning requires regular and critical review to reflect changing circumstances as a result of any operational change, new regulation, and new technology and remain flexible enough to cope with unexpected events.

The following steps have to be undertaken in relation to Mine Closure Planning:

Prior to the surface demolition/restoration a surface audit should be undertaken on all surface structures, spoil heaps, lagoons, etc. to assess whether there are any hazardous materials that could cause problems; viz. explosives, chemicals, etc. A list of surface assets should be prepared and made available to potential purchasers, prospective purchasers could be

invited and asked to submit sealed bids, this could ensure that the sale of assets give better financial gain.

In order to identify potential impact, necessary hydro-geological studies into post-mining ground water recharge have to be done.

Work force on roll of BCCL may be re-deployed for gainful utilization in the same or other mines of BCCL.

As a detailed component of the Closure Plan, a Decommissioning Plan is to be developed towards the final stages preferably 5 years prior to tentative closure of the mine. Once established, it may be updated annually.

12.7 PROTECTIVE MEASURES TO BE TAKEN

Protective measures must include the following :

- The protection of mine Entries , building and other structure on the project site against access by unauthorized persons;
- The maintenance of all mechanical, hydraulic and waste management system;
- The continuation of all monitoring programmes;
- The control of all contaminated effluents;
- The securing of all petroleum products, chemicals and waste;
- The rendering of all tailings, dams and piles of earth, rock and waste resulting from work done on the project site in a stable and safe condition.

12.8 CLOSURE COSTS

As per MOC guidelines, a corpus escrow account @ 6.0 lakhs (August, 2009 Price Level) per Ha of the property leasehold shall be opened with the coal controller organization to meet the expenses of final mine closure. In 7th June 2011, MOC issued a revised guideline to replace the Para 6.2 of the original guidelines issued on 27.08.2009 by the following Para:

"It has been estimated that typically closure cost for an opencast mine will come around Rs. 6.00 lakh per Hectare of the property leasehold and it would be Rs. 1.00 lakh per Hectare for underground mine leasehold at current price levels (August, 2009) and these rates will stand modified based on Wholesale Price Index as notified by Government of India from time to time. The mine closure cost for overlapping area of the mine would be deposited in the Escrow Account as applicable for opencast area and no separate cost for underground portion of the overlapping area is payable".

It is difficult to conclusively predict the mining parameters on a long term basis owing to rapidly changing mining technology, developments in the field of clean coal technologies and R&D activities in development of alternative energy sources.

As per the latest Guidelines issued by the MoC, GoI(dt. 07.01.2013) the *"annual closure cost is to be computed considering the total project area at the above mentioned rates and dividing the same by the entire life of the mine in years for new projects and balance life of mine in years for operating/existing mines."*

In this Mining plan only opencast operation is taken into consideration and therefore Mine closure cost is computed based on opencast operation. At present u/g operation is closed due to fire and water, the life based on u/g working is not considered for determination of Mine Closure cost. The mine has adequate reserve to be mined in future. The underlying seams cannot be worked by underground method until the fire has been taken care off and only after that the underground mine will be restarted again. If so happens, a fresh new Mine Closure Plan will be submitted incorporating all the changes.

In Gaslitand Colliery, the existing leasehold area is 138.66 Ha, out of which 70.00 Ha is for opencast project. There is an abandoned quarry (Backfilled) of 6.50 Ha in the northern side of the leasehold area. The remaining 62.16 Ha of leasehold area (excluding Opencast Project and the abandoned backfilled quarry) has not been considered for the calculation of closure cost as the underground section is not operational, hence not considered as the existing project area. The cost of closure of 70.00 Ha (Opencast Project Area) is calculated as per the Open cast norms.

The Closure cost is estimated to be approximately **Rs. 674.523 lakhs**. The amount has been escalated based on WPI of October, 2016 (183.6) vis-à-vis WPI of August ’09 (129.6).

The tentative break up cost of activities as per the current guideline is given below in Table No. 12.1:

Table 12.1: Break up costs of the Mine Closure Activities of Gaslitand Colliery

Sl. No.	Activity	Mine Closure Cost (Rupees in Lakhs)
A	**Dismantling of Structures**	
	Service Buildings	**1.349**
	Residential Buildings	**18.010**
	Industrial Structures like CHP, Workshop, field sub-station, etc.	**2.024**
B	**Permanent Fencing of Mine Void and other dangerous area**	
	Random Ruble masonry of height 1.2 metre including levelling up in cement concrete 1:6:12 in mud mortar	**10.118**
C	**Grading of Highwall slopes**	
	Levelling and grading of highwall slopes	**11.939**
D	***OB Dump Reclamation**	
	Handling/Dozing of external OB Dump into mine void	**598.032**
	Bio-Reclamation including soil spreading, plantation and maintenance	**2.698**
E	***LANDSCAPING**	
	Landscaping of the cleared land for improving its esthetic	**2.024**
F	***Plantation**	
	Plantation over area obtained after dismantling	**3.373**
	Plantation around fencing	**1.349**
	Plantation over the cleared external OB Dump	**0.135**
G	**Monitoring/Testing of parameters for three years**	
	Air Quality	**1.484**
	Water Quality	**1.349**
H	***Entrepreneurship Development (Vocational/skill development training for sustainable income of affected people**	**1.754**
I	***Miscellaneous and other mitigative measures**	**13.490**
J	**Manpower Cost for Supervision**	**5.396**
	TOTAL	**674.523**

Note: *: To be covered under Progressive Mine Closure activities also.

CHAPTER VIII

PROGRESSIVE AND FINAL MINE CLOSURE PLAN

- Mine Closure Plan has two components viz. i) Progressive or Concurrent Mine Closure Plan, and ii) Final Mine Closure Plan. Progressive mine Closure Plan would include various land use activities to be done concurrently and sequentially during the entire period of the mining operations, whereas the Final mine Closure activities would start towards the end of mine life, and may continue even after the reserves are exhausted and/or mining is discontinued till the mining area is restored to an acceptable level. The Mine Closure details of the Mining Plan should be oriented towards the restoration of land back to its original condition as far as practicable.

- Mining is to be carried out in a phased manner along with reclamation and afforestation work in the mined out area.

- This Progressive mine closure plans shall be reviewed after a period of every five years. These plans would be examined periodically in every five years period and to be subjected to the third party monitoring by the agencies approved by the Central Government, like Central Mine Planning and Design Institute Ltd. (CMPDIL), National Environmental Engineering Research Institute (NEERI), Indian Institute of technology (IIT-ISM) or any other institutes/organizations/agencies specified from time to time for the purpose.

- Various project specific activities viz. mined-out land details & their technical and biological restoration plan, water quality management, infrastructure to be retained and demolished, disposal of mining machinery, etc. have been furnished in the relevant paras. As the backfilling of the mine void is being carried out as part of regular mining operation, it shall not be included in the list of progressive mine closure activities. However, in case, if the backfilling of mine void is being carried out specifically for closure of the mine in future due any reason, the same shall be included in the list of activities to be taken up for mine closure.

	Parameters	*Details*
8.1	**Land Degradation and restoration Schedule**	

8.1.1 Land Degradation and Technical Reclamation (Commutative Area "Ha")

Stage/Year	Land Degraded				Technically Reclaimed Area			
	Excav	Dump (Extn+Top Soil)	Infra/others*	Total	Backfill	Dump (Extn+Top Soil)	Infra/others	Total
Up to Base year*	46.93	23.70						
Y-5	85.43		0.5					
Y-15	133.43				40.4			
Y-24	176.80				85.4			

8.1.2 Biological Reclamation (Cumulative in "Ha")

Stage/Year	Biologically Reclaimed Area					Forest land (Return)	Un Distrubed/To be left for Public/com Use	Total
	Agriculture	Plantation	Water Body	Public Company Use	Total			
Up to Base year*								
Y-1		0.54						
Y-2		0.54						
Y-3		0.54						
Y-4		0.54						
Y-5		0.54						
Y-6		0.54						
Y-7		0.54						
Y-8		0.54						
Y-9		0.54						
Y-10		0.54						
Y-11		0.54						
Y-12		0.54						
Y-13		0.6						
Y-14		0.6						
Y-15		0.6						
Y-16		0.6						
Y-17		0.6						
Y-18		0.6						
Y-19		0.6						
Y-20		0.6						

Y-21			0.6							
Y-22			0.6							
Y-23			0.6							
Y-24			0.6							
Post Closure										
Y-25			1.8	32.4						
Y-26			1.1							
Y-27			0.6							

8.2	**Post Closure Water Quality management:**	Routine Environmental Monitoring will be carried out for water quality analysis of following samples: **S. No. / Sample / Frequency** 1 – Mine Water – Fortnightly Mine Water – Half Yearly 2. – Surface Water – Quarterly 3. – Ground Water – Quarterly If any discrepancy from statutory standards is observed, necessary corrective measures will be undertaken by the management.
8.3	**Post Closure Air Quality management:**	Fortnightly Air Quality Monitoring will be carried out at 03 Air Quality monitoring Stations during three years post closure period.
8.4	**Waste Management** (Figures in MM3)	

Stage/Year		OB Removal (Cumulative)			External Dump (Cumulative)		Internal Backfilling (Cumulative)		Embankment (Cumulative)	
		Top Soil	OB	Total	Top Soil	OB	Top Soil	OB	Top Soil	OB
Up to Base year*		0.23	24.84	25.07						
Y-1		0.23	32.1	32.33						
Y-3		0.23	46.3	46.53						
Y-5		0.24	58.9	59.14						
Y-10		0.36	96.96	97.32						
Y-15		0.51	134.98	135.49			0.10			
Y-20		0.66	173.01	173.67	0.12		0.22			
Y-24		**0.68**	**202.82**	203.5	0.24	123.92	0.42	78.9		
Post Closure										

8.5

Top Soil Management – (Including Action Plan for Top Soil Management)

(All Figures are Cumulative and in MM3)

Stage/Year	Top Soil Removal Plan	Top Soil Used				
		Spreading Over Embankment	Spreading Over Backfill area	Spreading over External OB Dump area	Used in Green Belt Area	Total Utilised
Up to Base year*	0.23					
Y-1	0.23				0.001	
Y-3	0.23				0.003	
Y-5	0.24				0.005	
Y-10	0.36				0.008	
Y-15	0.51		0.10		0.01	
Y-20	0.66		0.22	0.12	0.015	
Y-24	**0.68**		0.42	0.24	0.02	
Post Closure						

Top Soil removed will be used in Plantation activities, Spreading over External OB Dump area, Spreading Over Backfill area and also in Green Belt Area.

8.6	Management of Coal Rejects.	There is no washery.

8.7 Restoration of Land used for Infrastructure

The other entire infrastructure related to the opencast coal mining operation will be dismantled, after end of the mineable reserve/ mine life. The list of infrastructure to be dismantled at the end of the mine life is given in the following table:

Sl. No.	**Particulars**
1.	Workshop, Mine Office & Stores

8.8 Disposal of Mining Machinery

After end of production life of Cluster IV group of mines, all mining machinery will be shifted to other mines of BCCL as per requirements.

8.9 Safety & Security

Fencing around Opencast Workings:

i) The top edge of the opencast working shall be kept fenced with wire rope strands or barbed wire, supported by posts of timber, iron or concrete (movable). The gap between the adjacent rope strand or wires shall not be more than 0.30 m and bottom most rope, strand or wire shall not be more than 0.25 m and the topmost rope, strand or wire shall not be less than 1.0 m from ground level.

ii) At the finishing stage, opencast working shall be fenced with a masonry wall using lime mortar not less than 0.40 m thick and not less than 1.2 m high, with a parapet top.

8.10 Abandonment Cost and Financial Assurance

8.10.1 Abandonment Cost: Cost of Activities to be taken up for closure of the mine**

Head	Parameters	Unit	Quantity	Escalated rate (in Rs. Crs.)	Escalated Amount (in Rs. Crs.)
Progressive Closure	Water Quality Management	LS	1	0.39	0.3893925
	Air Quality Management	LS	1	0.74	0.7417000
	Waste Management	MM3		-	-
	Barbed wire fencing around dump	m	1000	0.000332669	0.3326691
	Barbed wire fencing around the pit	m		0.000332669	-
	Filling of Void- Rehandling of Crown Dump	MM3		0	-
	Top Soil Management	MM3	0.5	7.42	3.7084999
	Technical and biological Reclamation of Mined cut of land and OB Dump	Ha	50	0.13	6.4898748
	Plantation over virgin area including green belt	Ha	14	0.06	0.8307040
	Manpower Cost and supervision	Year	24	0.19	4.4501999
	Toe wall around the dump	m	1000	0.001762865	1.7628651

Head	Parameters	Unit	Quantity	Escalated rate (in Rs. Crs.)	Escalated Amount (in Rs. Crs.)
	Garland Drain	m	1000	0.00	0.0927125
	Garland Drain around the dump	m		-	-
	Subsidence management	LS		0.55627	0.5562750
	Any other Activity(Avenue Plantation)	Nos.	1000	0.00046	0.4635625
Dismantling of Infrastructure & Disposal / rehabilitation of Mining Machinery	Dismantling of workshop and washery	sq m	12375	0.00002	0.2294634
	Rehabilitation of the Dismantled facilities	LS	15	0.01	0.1390687
	Dismantling of pumps /other facilities	No.	25	0.01	0.1390687
	Dismantling of pipes/other facilities	Km	10	0.01	0.1297975
	Dismantling of Stowing Bunker, provisioning of pumps for bore well pumping arrangement	CUM		0.00	-
	Dismantling of UG equipment	L.S.		-	-
	Rearranging water pipeline to dump top park / Agriculture land (Assumed Data)	Km	10	0.01	0.0834412
	Dismantling of power lines (33KV H.T. Line)	*km*	*7*	0.01	0.0778785
Safety and Security	Barbed wire fencing around dump	m		-	-
	Barbed wire fencing around the pit	m		0.000332669	-
	Barbed wire fencing with masonry pillar	m	1000	0.0007417	0.7417000
	Concrete wall with Masonry pillars around the pit	m		0.001162615	-
	Securing air shaft and installation of bore well pump	sqm	750	0.000463562	0.3476719
	Securing incline	sqm	750	0.000463562	0.3476719
	Concrete wall fencing around water body	m		-	-
	Boundary wall around the water body	m		-	-
	Stabilization (viz benching, pitching etc.) of side walls of the water body	sqm		-	-
	Toe wall around the dump	m		0.00	-
	Garland Drain	m		0.00	-
	Garland Drain around the dump	m	1000	9.27125E-05	0.0927125
	Drainage Channel from main OB Dump (Assumed Data)	m		-	-
Technical and Biological Reclamation of Mined Out of land and OB Dump	Filling of Void			-	-
	Top Soil Management	Ha		-	-
	OB Rehandling for backfilling			-	-
	Terracing, Blanketing with soil and vegetation of External OB Dump	sqm		0.00	-
	Peripheral road, gates, view point cemented steps on bank	m	1000	0.00185425	1.8542500
	Expenditure on development of Agricultural land	Ha		-	-
	Landscaping and Plantation	Ha	3.5	0.06	0.2076760
Post Closure management and supervision	Power Cost	LS	1	0.09	0.0927125
	Post Mining Water quality management		114	0.00	0.1220957
	Post Mining Air quality management		216	0.01	1.1503678
	Subsidence monitoring for 5 years	LS		-	-
	Waste Management		0	-	-
	Manpower Cost and supervision	Year	3	1.11	3.3376499
Others	Entrepreneurship development (Vocational/ Skill development training for sustainable income of affected people)	1.6684185			

Head	Parameters	Unit	Quantity	Escalated rate (in Rs. Crs.)	Escalated Amount (in Rs. Crs.)
	Golden Handshake/ Retrenching benefits to 100 employees of OC				
	Golden Handshake/ Retrenching benefits to 200 employees of UG				
	Onetime financial grant to societies/institutions/organizations which is dependent upon the project				
	Provide jobs in other mines of the Company				
	Continuation of other services like running of Schools etc.				
Total		**30.5801**			

Note: ** The cost shown above is only estimated and the exact cost for these activities can be established at the time of execution only. If the total cost at the time of execution of above mentioned activities exceed the total estimated cost, the shortfall shall be borne by the company.

8.10.2 Financial Assurance: Amount to be deposited in Escrow account as a security against the mine activities to be carried out of the closure of the mine

COST CALCULATION- KCC OC MINE			
WPI as on	Apr-19		121.1
WPI as on base date	Mar-22		148.9
Escalation rate of Closure cost			1.229562
	UG	OC	
Base Rate of Closure Cost "Rs . Crs/Ha"	0.015	0.09000	
Closure Cost "Rs. Crs/Ha"	0.0184434	0.11066	
Project Area	39.83	176.800	
Amount to be deposited into Escrow Account "Rs. in Crs.	0.734602	19.56480	
Amount already deposited into Escrow Account "Rs. in Crs.		7.53000	
Amount already released from Escrow Account "Rs. in Crs.			
Net Amount to be deposited into Escrow Account "Rs. in Crs.	0.734602	12.03480	
Rate of compounding of Annual Closure Cost		5.00%	
Balance Life of the project "in yrs"		24	

Amount to be deposited into escrow account annually				
Year	**OC**	**Year**	**UG**	**Total**
Y1	0.50145	Y-1	0.73460	1.23605
Y2	0.52652	Y-2		0.52652
Y3	0.55285	Y-3		0.55285
Y4	0.58049	Y-4		0.58049
Y5	0.60952	Y-5		0.60952
Y6	0.63999	Y-6		0.63999
Y7	0.67199	Y-7		0.67199
Y8	0.70559	Y-8		0.70559
Y9	0.74087	Y-9		0.74087
Y10	0.77791	Y-10		0.77791
Y11	0.81681	Y-11		0.81681
Y12	0.85765	Y-12		0.85765
Y13	0.90053	Y-13		0.90053
Y14	0.94556	Y-14		0.94556

Annual Closure Cost	0.73460	0.50145		
Amount to be deposited into Excrow Account after compounding @ of 5% "Rs. in Crs"		**23.05012**		

Y15	0.99284	Y-15		0.99284
Y16	1.04248	Y-16		1.04248
Y17	1.09460	Y-17		1.09460
Y18	1.14933	Y-18		1.14933
Y19	1.20680	Y-19		1.20680
Y20	1.26714	Y-20		1.26714
Y21	1.33050	Y-21		1.33050
Y22	1.39702	Y-22		1.39702
Y23	1.46687	Y-23		1.46687
Y24	1.54022	Y-24		1.54022
Total	22.31552		0.73460	23.05012

Mining and Mine Closure Plan of Katras Choitodih Colliery was prepared and approved by BCCL Board. And as per the approved Mine Closure Plan total deposited amount in the Escrow Account till **31.3.2022** was **Rs. 753.0 Lakhs**. The amount already accrued in account shall be adjusted against the new closure cost calculated.

The amount calculated above shall be deposited every year by BCCL in the Escrow Account in the name of Katras Chotudih OC Mine.

Thus, total amount that shall be deposited for final mine closure activities of **KCC Group of mines during the life of 24 years stands out to be Rs. 23.05012 Crores** as per the present status of the mine.

The amount already deposited in the escrow account will also be available for mine closure activities and should be included to arrive at the total funds available for mine closure activities.

	Amount (Rs. in Lakhs)	
	UG Section	**OC Section**
Amount Already Deposited in Escrow Account		**753.0**
Amount to be Deposited in the Escrow Account in the Future	**73.460**	**2231.552**
Total Amount available for Mine Closure Activities	**73.460**	**2984.552**
Grand Total	**3058.012**	

The amount deposited in Escrow Accounts is appended below:

Name of Mine: Katras Chatudihl OC Mine Escrow account no: 00150100010086			
S.No :	Year	Rs. in Lakhs	
		OC	Total
1	2013-2014	-	-
2	2014-2015	82.12	82.12
3	2015-2016	86.23	86.23
4	2016-2017	90.54	90.54
5	2017-2018	114.64	114.64
6	2018-2019	120.37	120.37
7	2019-2020	126.39	126.39
8	2020-2021	132.71	132.71
9	**2021-2022**	**-**	**-**
Total		**753.0**	**753.0**

The money deposited in the Escrow Account has to deal with the following:

- Cost of closure activities.
- Cost towards organization for executing the closure activities.
- Cost of the post project monitoring.
- Creation of a corpus fund for final mine closure

Mine Closure Plan of following two mines have been approved by BCCL Board are mentioned below:

Name of Mine	BCCL Board No.	Date	Escrow A/c at Bank of Baroda, Dhanbad Branch
Katras Choitudih OC Mine	312th Board of BCCL	13.12.2014 02.02.2018	00150100010086

- **Implementation of the approved Mine Closure Plan shall be sole responsibility of the mine owner**. Mining is to be carried out in a phase manner i.e. continuation of mining activities from one phase to another indicating the sequence of operations depending on the geo-mining conditions of the mine. Up to 50% of the total deposited amount including interest accrued in the escrow account may be released after every five years in line

with the periodic examinations of the closure plan. The amount released should be equal to expenditure incurred on the progressive mine closure in past five years or 50% whichever is less. The balance amount shall be released to the mine owner//leaseholder at the end of the final mine closure on compliance of all provisions of Closure Plan. This compliance report should be duly signed by the lessee and certify that said closure of mine complied all statutory rules, regulations order made by the central or state government, statutory organizations, court etc. and certified by the coal controller.

Final Mine Closure would be considered to be completed only after acceptance of the third party audit report by the coal controller on the compliance of all provisions on Mine Closure Plan. Any institute/ Organization/ Agency as may be notified by the Government for this purpose may be engaged for third party audit.

CHAPTER—XII

PROGRESSIVE AND FINAL MINE CLOSURE PLAN

12.0 Need of Mine Closure Planning -

Mining is a hazardous operation as it offsets the equilibrium of natural depositional environment viz. in-situ stress field, ground water, surface drainage system as well as the socio-economic condition. Although mining activities are usually short term phenomena, they are liable to leave long lasting impacts on landscape, ecology and on the mine set of local inhabitants. Thus, it is imperative that any mining venture should have adequate closure plan addressing issues viz. Reclamation and environmental protection, rehabilitation of disturbed area. Community implementation of mine closure plan will incur some extra cost, neglecting this aspect will lead to future problems of attending compensation or expensive socio-economic problems.

Mine closure encompasses restoration process designed to restore physical, chemical and biological quality, disturbed by the mining activities. Mine closure is not just something that happens at the end of a mine's life rather mine closure is an ongoing series of decisions and activities beginning in the pre-mining stage of mine and ending with a creation of self-sustainable site that can be returned to the community.

Thus, a mine closure plan needs to define the liabilities, responsibilities and authorities of the different agencies like the mine management, other regulatory bodies, Central and State Governments after mine closure.

Hence, efforts have been made to identify the likely impacts on geo-environmental and socio-political set-up due to closure of the proposed mine during the planning stage itself, so that it will offer an opportunity to generate resources for mitigative measures during closure of the mine.

12.1 Reasons for closure-

Major part of the leasehold area of Salanpur Colliery falls beneath important surface features like Katras Township, DC Railway Line and Nichitpur link line of EC Railway, Railway Colony (Katrasgarh RS), IOW (Katrasgarh), RK siding line (abandoned in Aug. 2003), Salanpur Village, Guhi Bandh Village, Rampujan Village, MADA Water Tank, State Govt. Offices, DB Road etc (Refer Surface cum Topographical Plan).

The Railways are not permitting development beneath its property. Permission for depillaring in the area is not being granted by DGMS resulting in closure of underground mining operation. It is being considered to shift DC Railway line from the existing alignment on account of fire in some mines and a study by RITES is underway to firm up an alternate alignment on non-coal bearing area. This may result in vacation of the major surface area in future and pave the way for future mining. However, no approved plan exists in place as of now and the scenario of future mining in the leasehold area appears very bleak at present.

At present, Seam III and II(Top) is being developed. In this mining plan, II(Top) is not proposed for development due to thinness of the seam. The total development reserves has been estimated as 1.362 Mt considering Seam-III, II(Bot) & Seam-I. The life of the Mine life would be 11 years with normative production of 0.13 Mty Depillaring is not possible due to major surface constraint within the lease hold area.

The mine may be closed in future on account of exhaustion of economically recoverable coal reserves in the lease hold area. The mine may also be closed on account of other unforeseen reasons i.e. Force Majeure or directives from statutory organizations or court etc. for which information and notices shall be served to concerned Government authorities and departments. As per guidelines of Ministry of Coal, Govt. of India, Mine Closure Plan has to be submitted along with the mine plan for getting competent approval within one or two years of date of approval of mine plan.

12.2 Life Cycle Concepts-

Mining projects have a definite life cycle. All the mines have to eventually close their operation. The reasons for the closure may be many including economic conditions, depletion of mine-able resource or any other unforeseen safety reasons.

In the present project proposal the mine life cycle planning is governed by the extractable reserves of the proposed mining area. In general, the total extractable reserve is estimated considering both development as well as depillaring reserves of identified workable seams. In this mine, depillaring has not been done in past due to surface constrain and unless overlying seams are depillared, lower seams can not be depillared. This is mainly due to major surface constrain like Katras Town, Private basti, Rly land etc, Considering the development reserves Seam-III, II(Bottom) & Seam-I and its production

schedule, the life is estimated as 11 years from the date of obtaining Environmental Clearance from MoEFCC. The life of the mine will extent further and may be more if surface constrain is removed in future. It is suggested that the activities for closure will be initiated at an early stage of project life in a gradual/ planned manner.

12.3 Objectives of Closure Planning-

The mine closure phase is supposed to be closed when the mine is decommissioned, facilities at site are removed, the mine entries are sealed/ fenced off, the management of waste dump/ tailing is completed and the site is released in ecologically sustainable state suitable for proposed land use.

Mine closure planning has to be carried out at the starting of the mine and needs periodic reviewing and revision during its life cycle to cope with the geo-technical constraints, safety and economic risks, social and environmental challenges. Various other objectives are as follows:

- To allow a productive and sustainable after-use of the site which is acceptable to the mine owner and the regulatory authority;
- To protect public health and safety;
- To alleviate or eliminate environmental damage and thereby encourage environmental sustainability;
- To minimize adverse socio-economic impacts.

12.4 Different aspects of Mine Closure Planning-

The mine closure planning broadly involves the following aspects :

(a) Technical aspects;

The following technical aspects would be reviewed in the final mine closure planning. Details can be worked in closure plans envisaged to be prepared.

- **Safety hazards including management of subsidence**:-

  Action will also be suggested to cover all the safety aspects.

Following steps will be taken as precaution subsidence while mining:-

i. Panel size will be so designed so that depillaring with caving (if done in future) will be completed within the incubation period of the coal seam. Depillaring is possible only when surface constrain is removed and land is acquired.
ii. Panel will be isolated in proper fashion before depillaring takes place.
iii. Surface will be properly dozed and leveled wherever there are cracks and fissures so that air does not breathe in through surface.

❖ **Management of Pit Slopes (for existing as well as proposed quarry):**

The final quarry slopes shall be so designed and then subsequently developed that after the closure of the mine, there is no likelihood of any slope failure. The final slope of the quarry has been designed with above consideration. However, strict compliance with the proposed final slope of quarry and subsequent slope stability studies would be made.

❖ **Management of hydrology and hydro-geology**:

In the mine closure plan, the surface flow pattern of precipitation and mine water would be clearly developed and water channel suitably laid down so that it does not disturb the general hydrology of the area.

Mining operation may reduce the water table of the area. To recharge the water table, it is proposed that the mine water during operation will be discharged into surface water settling tank Over flow of settled water from the tank will be used for water sprinkling, plantation, domestic purpose, etc. Therefore, the excess over flow water will be discharged into the nearby Katri River flowing southerly on west side of the property. After closure of this mine (if depillaring in underground working is done in future or quarry is made) , the entire surface area will be back filled, dozed and vegetation will be grown.

❖ **Details of decommissioning of the infrastructures:**

The decommissioning of the various infrastructures developed for the mine like office complex, roads, pipelines and transmission line etc. shall be planned in details so that the land occupied by these infrastructures are released. However, before such decommissioning, the possibility of re-use of these infrastructures for the neighbouring mines shall be explored.

❖ **Closure of entry to the open-cast mine and underground mine:**

All entries to the mine (UG or OC/ Quarry) must be planned to be effectively closed so that illegal mining from these openings and safety hazards by way of entry of fire and water etc, will be prevented in the abandoned mines.

(b) Environmental aspects:

This would include the following-

❖ **Management of final voids in case of quarry**: -

In the mine closure plan, voids due to mining are to be dealt and the final land use plan will include filling of the voids for land reclamation where possible and for hydro reclamation where feasible. The study on slope study will be made by some scientific agency and in final closure plan their suggestions will be incorporated.

❖ **Reclamation of forests/vegetation: -**

It is to be ensured that in the final land use plan, all vacant land acquired for the project is afforested

❖ **Channelisation of available water: -**

If the mine (UG/OC/Quarry) is having sufficient water and if on closure, the mine water flows into the surface water courses, channelising this water for surrounding community for their irrigational/domestic uses may be taken up. This can be planned by providing structures involving one time costing

❖ **Management of recharge areas**: -

The pre-mining and post mining scenario on the hydro-geological recharge system would be included in the closure plan.

❖ **Acceptable Surface and Ground Water Flows**:

In the final closure plan of the mine, wherever the mine water is likely to flow out to surface and meet the surface water sources; the quality of water from such mines would be assessed and flow pattern designed in the final plan.

(c) Social aspects:-

The social aspects of land use planning relating to mine closure would include the following:

❖ **Re-deployment of Workforce:**

The company employees will be gainfully engaged in the neighbouring projects after cessation of mining activities.

❖ **Management of Community Facilities:**

In view of the short life of the project, no new community facility will be created. However, the existing facilities of adjoining areas will be strengthened.

(d) Financial aspects.

There are two types of Closure, namely, Progressive Mine Closure and Final Mine Closure. The cost of Progressive Closure activities is realized by levying a cost of Rs. 2.50/Te of coal for UG Mines. The Final Mine closure cost has been dealt with at the end of this Chapter. It has to deal with the following:

- Cost of closure activities.
- Cost towards organization for executing the closure activities.
- Cost of the post project monitoring.
- Creation of a corpus fund for the final mine closure.

12.4 Mine Closure Obligations:-

There is need to define the liabilities, responsibilities and authorities of the mine management, other regulatory bodies, Central and State Governments after mine closure. Some obligations relating to the Mine Management Companies are as follows :

(a)	**Health & Safety**:	i)	Regulation Nos. 6, 61, 106, 112 of Coal Mines
		ii)	Regulations, 1957 and its related DGMS Circulars;
(b)	**Environment :**	i)	Water (Prevention & Control of Pollution) Act, 1974;
		ii)	Air (Prevention & Control of Pollution) Act, 1981;
		iii)	Environmental (Protection) Act, 1986
		iv)	Environmental Protection (Amendment) Rule , 2000;

v) DGMS Directives on Noise & Ground Vibration;

(c) **Forest :** Forest (Conservation) Act, 1980.

(d) **Rehabilitation :** CIL's policy, however, applicable for land oustees only.

(e) **Decommissioning/asset disposal**, etc**.**

12.5 Impact assessment remedial measures:

Post-Mining Land Use Plan has been given in Chapter IX. Environmental Impact on Landscape, Water Source, air and noise pollution during mine life has been discussed earlier. It is imperative that the environmental monitoring may be continued for 1-2 years after closure of UG in order to assess corrective measures to be implemented to sustain pre-mining ecosystem and environment in the core and buffer zone (to the extent possible).

12.6 Practice after the closure of the mine-

As the sources of dust and fume generation would no longer be present, the present practice of arresting the air pollution, as enumerated in Chapter-XI. However, water sprinkling would be done on the roads, which remain in use after the mine closure.

Quality of air would be monitored for a period of 3 years after cessation of mining activity. Three samples at fortnight frequency for 3 years, one sample in core zone and one sample each in upwind and downwind direction will be collected and analysed.

12.6.1 Dump Reclamation -

Most of the back filled area shall be afforested by selecting proper plant species in consultation with State Forest Department. A part of the back filled area would also be developed for agricultural purpose with the help of the concerned State Authority. The existing void will serve as a lagoon and may be utilised as water reservoir for the locality. The entire area shall be suitably fenced.

The present mine is an underground unit and generally no solid waste will be generated during the mining operation except stone generates during drift drivage .

12.6.2 Details of Surface Structures proposed for dismantling-

12.6.2.1 Infrastructure details -

As far as possible, industrial structures shall be utilised by the adjacent mine. However, if these structures are not found fit at the end of mine life, the same will be dismantled and salvaged. The equipments will be removed and used somewhere else. Every effort will be made to restore the area to economic utilization value in line with mine closure plan.

A. Service Buildings: The service buildings/ structures, viz. workshop, stores, office building, cap-lamp room, Pit Top office, winding rooms, etc. are to be demolished after collecting all re-useable items, or be used for some other projects and the land covered by them restored for productive use. However, it has to be ensured that as and when a service building is vacated/ abandoned, the same should be demolished to prevent any unauthorized occupation.

B. Other Infrastructures: All other infrastructures like sub-stations, transformers, community services, pump-houses, water-treatment/ filtration plants, waterlines, power lines, roads etc. will be utilized for the neighbouring projects.

However, possibility shall be explored for handing over the buildings and other infrastructures including the reclaimed land to the State Government for the benefit of local villagers and strengthening the area infrastructures. The end use of these facilities shall be decided by the State Government with the help of District Authorities and Village Panchayat. The peripheral village community facilities developed by the Mine Authorities will be left to the Local Body/ State Government for their management and public use.

Prior to surface demolition/ restoration, a surface audit will be undertaken on all surface structures, spoil heaps etc. to assess whether there is any hazardous material that could cause problem, i.e. explosive, asbestos, chemical, oil, etc.

A list of surface and UG assets (Plant & Machinery) will be prepared and made available to potential purchasers or transferred to other new/ working mines of the company. This will ensure that the assets perform during their economic life.

12.6.2.2 Post closure disposal / Re-use of the Buildings, Plants & Machineries-

a. Disposal or reuse of existing HEMM, CHP, workshop and railway siding for OC-
No quarry is in operation in Salanpur Mine.

b. Disposal or reuse of haulage, ventilation, workshop and railway siding for UG-

At the time of closure of the mine, it is expected that most of the equipments would complete its rated life and would be surveyed off as per the Company's guidelines. The surveyed off equipments would be auctioned as per prevalent norms.
However, if some of the equipments would not have covered their rated life, they would be diverted to the neighbouring projects for gainful utilisation.

There is a abandoned R K Railway siding in the leasehold area which is under dismantling with due care.

c. Disposal or reuse of transmission lines and sub-station-
As per the electricity demand of the existing neighbouring projects, an analysis would be made as to whether the existing sub-station and transmission lines could be gainfully used or not. If the scope of gainful utilization is not found, they will be dismantled and the usable items/spares/conductors etc. would be dispatched to needy Areas/Projects.

d. Disposal or reuse of residential and non-residential buildings-

At the time of final closure, a list of surface buildings would be prepared in detail. Thereafter following steps would be taken in chorological order in respect of the available buildings:-

- An assessment would be made to find that whether the available buildings can be used by the existing neighboring projects or any new project that might have come up in the vicinity.

- In case, the listed assets cannot be utilized by the nearby project, efforts would be made to sale these assets after making the list available to potential purchasers and asking the interested purchasers to submit sealed bids.
- Thereafter, the state agencies/local agencies may be asked to take possession of the buildings, if they required few of them.
- When there would be no takers, the buildings would be demolished and usable items would be recovered for future use.

12.7 Safety and Security Arrangement

12.7.1 Mine entry-

After closure of the mining activities, all the entries to the mine will be effectively sealed off to avoid any accident and to prevent access to any unauthorized person. The area that is not reclaimed shall be properly fenced/ sealed to prevent any unauthorized entry into the area. Flags/Boards with warning signals shall be posted at vulnerable places to avoid chances of accidents. However, the guidelines / instructions from DGMS, if any, will be followed.

Sealing details and dimensions shall also be prepared for the purpose. The minimum thickness of mine sealing will be 100cm RCC (M20) with nominal reinforcement. For incline entry, the mine entry path of 5 m will be filled with debris and clay before sealing the mine.

12.7.2 Details of fencing around abandoned quarry, indicating the length of the fencing-

At present, no quarry exist in Mine area. If re-opened in future then the void of the existing quarry would be properly fenced to avoid any inadvertent entry of animals or human beings. Sufficient Boards and danger signs shall be placed all around.

Later on, the responsibility of keeping the fencing secured would be entrusted on the State Authorities.

12.7.3 Slope stability arrangement for high wall and back filled dumps

As regards stability of existing back-filled dumps, the final level of reclaimed backfill will be matched with the levels of surrounding hill ranges leaving a final residual void which will serve as a lagoon which may be utilised as water reservoir for the locality. For the stability of the back-filled dump, the slope of the dump will be maintained at a stable angle. Vegetation cover will also be provided along the slopes to arrest any failure.

12.7.4 Providing one time lighting arrangement-

Sufficient lighting as per standard is provided at all the required places, i.e., Mine office, haulage room, fan house, cap lamp room, mine entry, workshop, sub-station, haul road in quarry etc.

After closure of the mine, the lighting arrangements will be kept maintained at all locations which are not required to be demolished or dismantled like sub-stations, transformers, community services, pump-houses, water-treatment/ filtration plants, waterlines, power lines, roads etc. to be utilised for the neighbouring projects and local communities.

12.7.5 Survey records of workings-

All the mine workings including subsidence areas, roads, ponds, tanks etc. shall be resurveyed and records shall be updated. Copy of such records shall also be submitted to the appropriate competent authorities, such as DGMS and State Authorities.

12.7.6 Disposal management of hazardous material-

At the time of closure, assessment would be made as to find whether there is any hazardous material that could cause problem. Such hazardous material e.g. explosives, chemicals, oil etc. shall be appropriately disposed off.

12.8 Stakeholders Involvement -

Various stakeholders effected due to mine closure need to be identified and they may be as follows:

The Company	:	Employees, Management & Stakeholders
The Community	:	Local business and service providers, land holders, neighbours and nearby residents, local Government and NGOs and Community Groups.
The State	:	The State Government, the Central Government and its concerned Government Agencies.

There is need of regular consultations between the stakeholders to evolve the needs of the stakeholders and their involvement in the process.

12.9 Closure Action Plan-

Closure planning is an exercise that begins at the start of a mine opening and continues till post-closure. The dynamic nature of closure planning requires regular and critical review to reflect changing circumstances as a result of any operational change, new regulation, and new technology and remain flexible enough to cope with unexpected events.

The following proposal / steps have to be undertaken in relation to Mine Closure Planning:

Prior to the surface (including infra-structure) demolition/restoration, a surface audit should be undertaken on all surface structures, spoil heaps, lagoons, etc. to assess whether there are any hazardous materials that could cause problems; viz. explosives, chemicals, waste material, etc. A list of surface assets should be prepared and made available to potential purchasers, prospective purchasers could be invited and asked to submit sealed bids, this could ensure that the sale of assets give better financial gain.

In order to identify potential impact, necessary hydro-geological studies into post-mining ground water recharge have to be done.

Work force on roll of BCCL may be re-deployed for gainful utilization of employees of BCCL.

As a detailed component of the Closure Plan, a Decommissioning Plan is to be developed towards the final stages preferably 5 years prior to tentative closure of the mine. Once established, it may be updated annually.

12.10 Protective Measures to be taken-

Protective measures must include the following:

- Protection of mine Entries , building and other structure on the project site against access by unauthorized persons;
- Maintenance of all mechanical, hydraulic and waste management system;
- Continuation of all monitoring programmes;
- Control of all contaminated effluents;
- Securing of all petroleum products, chemicals and waste;

12.11 Mine Closure Cost:

Mine Closure activities would be a constant exercise for the mine which would begin with the commencement of mining operations and continue till post closure. The mine closure activities would naturally entail certain expenditures, which will have to be borne by the mine operator.

There would be two types of expenditures on account of mine closure activities in respect of Salanpur Colliery.

A) Revenue expenditures

This would cover the activities which are being executed along with normal mining operation and would continue to be executed in course of execution of the project. The cost of progressive mine closure activities is already part of the project cost.

B) Expenditures to be incurred just prior to actual mine closure and in the post closure period

As per MOC guidelines, a corpus escrow account @Rs.1.0 lakhs (August, 2009 Price Level) per Ha (for UG) and @ Rs.6.0 lakhs (for OC) of the project area shall be opened with the coal controller organization to meet the expenses of final mine closure. The current Guidelines read as:

"It has been estimated that typically closure cost for an opencast mine will come around Rs. 6.00 lakh per Hectare of the project area and it would be Rs. 1.00 lakh per Hectare for underground mine project area at current price levels (August, 2009) and these rates will stand modified based on Wholesale Price Index as notified by Government of India from time to time".

There is already a mine closure plan approved by the 305th BCCL Board, Dated 12.03.2014. According to the approved mine closure plan the total life of the mine was considered to be 12 years and total mine closure cost up to the considered life of the mine was calculated to be Rs 369.439 Lakhs. As per the directives Rs 142.90049 Lakhs (Principal Rs 125.296 lakhs and Interest Rs 17.604 lakhs) were deposited in to the Escrow Account Number 150100009050 by the year 2016. Further, the same escrow account shall be continued for Salanpur Colliery.

As per the data furnished by the mine/area, leasehold area and project area in respect of Salanpur UG mine is the same and the closure cost is calculated accordingly.

In Salanpur Colliery, the existing leasehold and project area is 177.49 Ha. Out of this, 5.46 Ha is abandoned and not backfilled quarry, 21.00 Ha is considered for suspended opencast patch and the remaining 151.03 Ha is considered for underground operations. Thus, out of the project area of 177.49 Ha, 26.46 (5.46 + 21.00) Ha area has been considered for the calculation of closure cost as per Open cast norms and the remaining 151.03 Ha has been considered for the calculation of closure cost of the area as per Underground norms.
The overlapping area (where UG & OC operations have been done in different vertical levels) has been considered for calculation of closure cost as per opencast norms.

The money deposited in the Escrow Account has to deal with the following:-

- Cost of closure activities.
- Cost towards organization for executing the closure activities.
- Cost of the post project monitoring.
- Creation of a corpus fund for the final mine closure

12.11.1 The total amount that shall be further deposited for final mine closure activities of **Salanpur Colliery** in case of underground workings during the considered period of 11 years stands out to be **₹ 198.309 lakhs** and in case of opencast workings during the considered period of 5 years stands out to be **₹ 176.585 lakhs** as per the present status of the mine. The year-wise break-Up cost of Mine Closure of Salanpur Colliery is given in Table No. 12.1.

Table No. 12.1

Break-Up cost of Mine Closure of Salanpur Colliery

Year	Amount to be Deposited (in ₹ lakhs)		
	UG Section	OC Section	Total
1	13.959	31.958	45.916
2	14.657	33.555	48.212
3	15.390	35.233	50.623
4	16.159	36.995	53.154
5	16.967	38.845	55.812
6	17.815		17.815
7	18.706		18.706
8	19.641		19.641
9	20.623		20.623
10	21.655		21.655
11	22.737		22.737
	198.309	**176.585**	**374.895**

The amount already deposited in the escrow account will also be available for mine closure activities and should be included to arrive at the total funds available for Mine Closure Activities.

Table No. 12.2

Total Amount available for Mine Closure Activities of Salanpur Colliery

	Amount (in ₹ lakhs)	
	UG Section	OC Section
Amount Already Deposited in Escrow Account	60.296	65.000
Amount to be Deposited in the Escrow Account in the Future	198.309	176.585
Total Amount available for Mine Closure Activities	**258.605**	**241.585**

12.11.2 Based on the existing mine closure planning norms, the above calculated cost at Final WPI of November 2016 on mine closure may be tentatively grouped under different heads as given in Table No. 12.3 A and 12.3 B for underground and opencast respectively, as per guidelines of CMPDI(HQ).

Table 12.3 A

Break up costs of Mine Closure Activities for Salanpur Colliery (Underground)

Sl. No.	Activity	Mine Closure Cost (₹ in Lakhs)
A	**Dismantling of Structures**	
	Service Buildings	9.051
	Residential Buildings	27.360
	Industrial Structures like CHP, Workshop, field sub-station, cap lamp room, haulage, fan installation etc.	16.370
B	**Permanent Sealing of mine entries(incline mouth and air shaft)**	
	Sealing of incline mouths and air shafts	13.758
C	***Subsidence Management**	12.284
D	**LANDSCAPING**	
	Landscaping of the cleared land for improving its esthetic	22.757
E	***Plantation**	
	Plantation over the cleared area obtained after dismantling and on other barren spaces	33.619
F	**Monitoring/Testing of parameters for three years**	
	Air Quality	17.663
	Water Quality	16.396
G	***Enterpreneuship Development(Vocational/skill development training for sustainable income of affected people**	19.783
H	***Miscellaneous and other mitigative measures**	37.756
I	**Manpower Cost for Supervision**	31.808
	TOTAL	**258.605**

Note: * : To be covered under Progressive Mine Closure activities also

Table 12.3 B

Break up costs of Mine Closure Activities for Salanpur Colliery (Opencast)

Sl. No.	Activity	Mine Closure Cost (₹ in Lakhs)
A	**Dismantling of Structures**	
	Service Buildings	0.483
	Residential Buildings	6.450
	Industrial Structures like CHP, Workshop, field sub-station, etc.	0.725
B	**Permanent Fencing of Mine Void and other dangerous area**	
	Random Ruble masonry of height 1.2 metre including levelling up in cement concrete 1:6:12 in mud mortar	3.624
C	**Grading of Highwall slopes**	
	Levelling and grading of highwall slopes	4.276
D	***OB Dump Reclamation**	
	Handling/Dozing of external OB Dump into mine void	214.189
	Bio-Reclamation including soil spreading, plantation and maintenance	0.966
E	**LANDSCAPING**	
	Landscaping of the cleared land for improving its esthetic	0.725
F	***Plantation**	
	Plantation over area obtained after dismantling	1.208
	Plantation around fencing	0.483
	Plantation over the cleared external OB Dump	0.048
G	**Monitoring/Testing of parameters for three years**	
	Air Quality	0.531
	Water Quality	0.483
H	***Enterpreneuship Development(Vocational/skill development training for sustainable income of affected people**	0.628
I	***Miscellaneous and other mitigative measures**	4.832
J	**Manpower Cost for Supervision**	1.933
	TOTAL	**241.585**

Note: * : To be covered under Progressive Mine Closure activities also

12.11.3 *The break up costs of Progressive Closure Activities undertaken by BCCL in Salanpur Colliery as per earlier approved Mine Closure Plan is given in the following table:*

Table 12.4

Break up costs of Mine Closure Activities for Salanpur Colliery (earlier approved) and Expenditure incurred during Progressive Closure Activities

Sl. No.	Activity	Mine Closure Cost (₹ in Lakhs)	Amount Claimed (Lakhs) (2014-15)	Amount Claimed (Lakhs) (2015-16)
A	**Dismantling of Structures**			
	Service Buildings	10.655		
	Residential Buildings	32.21		
	Industrial Structures like CHP, Workshop, field sub-station, etc.	19.271		
B	**Permanent Sealing of mine entries(incline mouth and air shaft)**			
	Sealing of incline mouths and air shafts	16.196		
C	**Subsidence Management**	14.461		**2.56609**
D	**LANDSCAPING**			
	Landscaping of the cleared land for improving its esthetic	26.791		
E	**Plantation**			
	Plantation over area obtained after dismantling	39.577		**1.81038**
F	**Monitoring/Testing of parameters for three years**			
	Air Quality	20.793		
	Water Quality	19.301		
G	**Enterpreneuship Development(Vocational/skill development training for sustainable income of affected people**	23.29	41.80181	
H	**Miscellaneous and other mitigative measures**	44.448		**173.29465**
I	**Manpower Cost for Supervision**	37.446		
	Sub-Total(UG Part)	**304.439**		
	Abandoned Quarry Reclamation			
J	**Reclamation of the abandoned quarry**	65.000		
	Sub-Total(OC Part)	**65.000**		
	GRAND TOTAL	**369.439**	**41.802**	**177.671**

The estimate of total expenditure incurred upon the progressive closure activities are provided by BCCL.

Bharat Coking Coal Ltd.
(A Subsidiary of Coal India Limited)
Office of the General Manager, Katras Area
P.O. KATRAS, P.S.- Jogta, Dhanbad-828121
CIN: U1010JH1972GOI000918
Phone/Fax No.: 0326-2371213
Email ID: cgmkatras@bccl.gov.in

To whom it may concern

This is to certify herethat there is no mining induced subsidence movement over and around the working area of cluster-IV group of mines namely Amalgamated Keshalpur west mudidih colliery, Amalgamated Angarpathra Ramkanali colliery, Gaslitand colliery, Katras Choitudih colliery & Salanpur colliery have been observed after obtaining Environmental clearance.

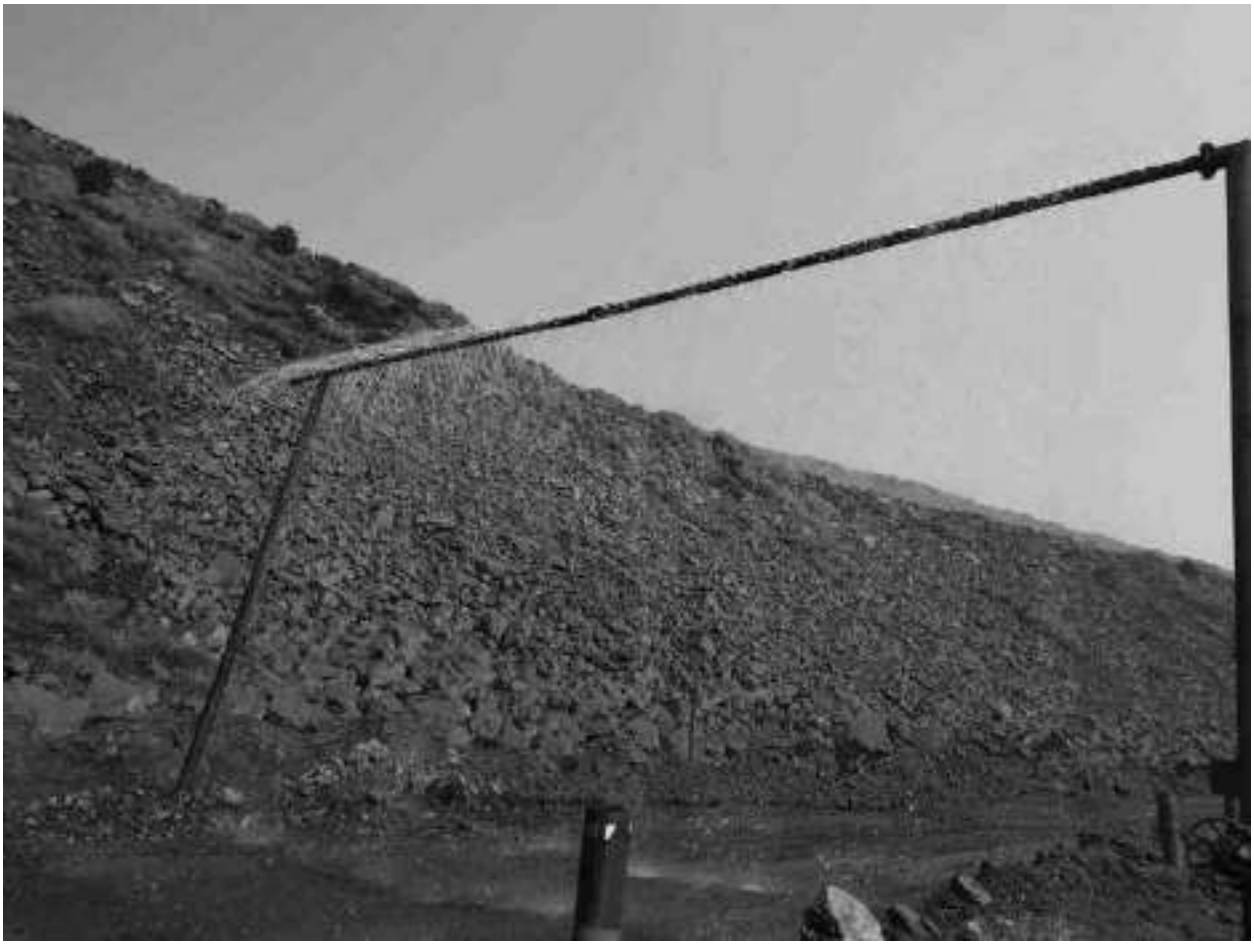
AM(Env)
Cluster IV

Scanned by CamScanner

Plantation in FY 2019-20 over 11 Ha Ob dump Area

Preparation of nursery for plantation site 13 Ha Ob dump

Hole digging for plantation site 13 Ha Ob dump



Over Head Dust Suppression Arrangement installed at Haul Road for wetting the coal loaded over trucks

Block Plantation Around CHP

Water Arrangement at CHP Hooper

Annexure-15

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

PERSONS ASSOCIATED

Poulomi Baksi
Manager (Geology)
Geology Department
CMPDI RI-II, Dhanbad

Jayjit Banerjee
Dy.Manager (Geology)
Geology Department
CMPDI RI-II, Dhanbad

Kumar Vaibhav
Manager (Environment)
Regional Institute - II
CMPDI, Dhanbad

CMPDIL
CENTRAL MINE PLANING & DESIGN INSTITUTE
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)

CONTENT

Sl. No	Contents	Page No
1	Annexure-I Details of The Report	1
2	Annexure-II Groundwater Level and Quality Report for Cluster of Mines of BCCL	2-130
3	**Chapter-1.0 Introduction**	2-7
4	1.1 Location details and brief about the report	2
5	1.2 Objective of the study	2
6	1.3 Scope of the report	2
7	1.4 Topography and Drainage	4
8	1.5 Details regarding Wetland	4
9	1.6 Climate & Rainfall	5-7
10	**Chapter-2.0 Geology & Hydrogeological Set-up of the Area**	7-10
11	2.1 Regional Geology of the Coalfield	7
12	2.2 Hydrogeological setup	8
13	2.3 Aquifers Description	8-9
14	2.4 General Aquifer Parameters	9-10
15	**Chapter-3.0 Ground Water Level data of the Cluster of Mines of BCCL**	11-43
16	3.1 Historical groundwater level	12
17	3.2 Groundwater level scenario (mining/non-mining)	13
18	3.3 Quarterly groundwater level, Cluster of mines during 2023-24	13
	A. Ground Water Levels of Cluster-I	14-15
	B. Ground Water Levels of Cluster-II	16-17
	C. Ground Water Levels of Cluster-III	18-19
	D. Ground Water Levels of Cluster-IV	20-21
	E. Ground Water Levels of Cluster-V	22-23
	F. Ground Water Levels of Cluster-VI	24-25
	G. Ground Water Levels of Cluster-VII	26-27
	H. Ground Water Levels of Cluster-VIII	28-29
	I. Ground Water Levels of Cluster-IX	30-31
	J. Ground Water Levels of Cluster-X	32-33
	K. Ground Water Levels of Cluster-XI	34-35
	L. Ground Water Levels of Cluster-XIII	36-37
	M. Ground Water Levels of Cluster-XIV	38-39

	N. Ground Water Levels of Cluster-XV	40-41
	O. Ground Water Levels of Cluster-XVI	42-43
	P. Ground Water Levels of Cluster-XVII	
19	**Chapter-4.0 Ground water level scenario**	44
20	**Chapter-5.0 Details of Piezometers**	45-46
21	**Chapter-6.0 Groundwater Quality**	46-48
22	**Chapter-7.0 Stage of Groundwater extraction**	49-50
23	**Chapter-8.0 Impact of Mining on Ground Water Regime**	51
24	8.1 General consequences of Coal Mines on ambient Hydrogeological Regime	51
25	8.2 Potential consequences of OC & UG coal mines on Hydrogeological Regime	51
26	8.3 Estimation of Radius of Mine Influence zone	52
27	**Chapter-9.0 Conservation measures & future strategy**	52-53
28	**Chapter-10.0 Existing / Proposed Rainwater harvesting structures in BCCL coal mines**	54-59
29	**Annexure-III List of RAMSAR Wetlands as given on official website of MoEF & CC**	60
30	**Annexure-IV Rainfall Data**	61-62
31	**Annexure-V Location of Hydrograph Stations (Dug Wells)**	63-64
32	**Annexure-VA Deatils of Hydrograph Stations (Dug Wells)**	65-68
	Annexure-VB Historical Water Level data of Hydrograph Stations	69-71
33	**Annexure-VI Ground Water Level Hydrographs**	72-88
	Annexure-VIA Piezometer Hydrographs	89-94
33	**Annexure-VII Ground Water Quality analysis data**	95-130
34	Abbreviations	131

LIST OF TABLES

Fig No	Contents	Page No
1	Regional Geological Succession of JCF	8
2	Generalized Hydrogeological Units developed in the study Area	9
3	Aquifer parameters considered for the study Area	10
4	Historical Groundwater Level	12
5	Depth to water table	13

6	Average hydraulic gradient	13
7	GW level data Cluster wise	44
8	GW level data in Piezometers	45-46
9A, B	Block / Cluster wise GW Development scenario	49-50

LIST OF PLATES

Sl No	Plate No	Contents	Scale
1	I	Location Map of Groundwater Level Monitoring stations	1:205000
2	II	Location Map of Groundwater Quality Monitoring stations	1:205000
3	III	Location Map of Proposed Piezometers	1:205000
4	IVA	Water table Contour Map of JCF, Pre Monsoon (May'23)	1:205000
	IVB	Water table Contour Map of JCF, Post Monsoon (Nov'23)	1:205000
5	VA	Depth to Groundwater Level map of JCF, Pre Monsoon (May'23)	1:205000
	VB	Depth to Groundwater Level map of JCF, Post Monsoon (Nov'23)	1:205000
6	VI	Drainage Map (Part of Raniganj Coalfield under BCCL Command Area)	1:180,000

LIST OF FIGURES

Table No	Contents	Page No
1 & 2	Historical Rainfall trend at Jharkhand	6-7
3 to 15	Existing / Proposed Rainwater Harvesting Structure	54-59

Annexure – I

DETAILS OF THE REPORT

Sl No.	ITEMS	INFORMATIONS
1	Geographical Area	Jharia Coalfield (JCF): 453.0 sq. km. 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. 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) Rainfall data given in **Annexure-IV**.
5	Geological Formations	Gondwana Formation (Talchir Formation, Barakar Formation, Barren Measure Formation & Raniganj Formation)
6	Aquifer System	Unconfined/Phreatic Aquifer – thickness 25 m (Avg.) Semi-confined to confined Aquifer – thickness from 50 m upto 650 m
7	Hydrogeological properties (Aquifer Pump Test)	Unconfined Aquifer: Hydraulic Conductivity – 0.50 - 0.90 m/day Transmissivity – 10 - 42 m^2/day
		Semi-confined to confined Aquifer: Hydraulic Conductivity – 0.0006-1.44 (0.05 avg.) m/day 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. 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: Pre-monsoon – 1.70 to 11.38 m (Avg. 6.33 m bgl) in '2023-24 Post-monsoon – 0.60 to 8.03 m (Avg. 3.77 m bgl) in '2023-24 RCF area (part): Pre-monsoon – 2.10 to 9.50 m (Avg. 5.22 m bgl) in '2023-24 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 (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 (5th order), Khudia nala (3rd order), Katri River (4th) and Chatkari nala (3rd order) flowing from north to south and joins Damodar River. Whereas, Barakar River and Khudia River are controlling the drainage pattern of RCF (part) and joins Damodar River in the south. Damodar River is the main drainage channel and flows from west to east along the southern boundary of JCF and RCF.

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

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

1.5 DETAILS REGARDING WETLANDS

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

1.6 CLIMATE & RAINFALL

The Jharia Coalfield (JCF) and part of Raniganj Coalfield (RCF) area in Dhanbad District belongs to sub-humid tropical climatic region. The maximum temperature during summer shoots up to 45^{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).

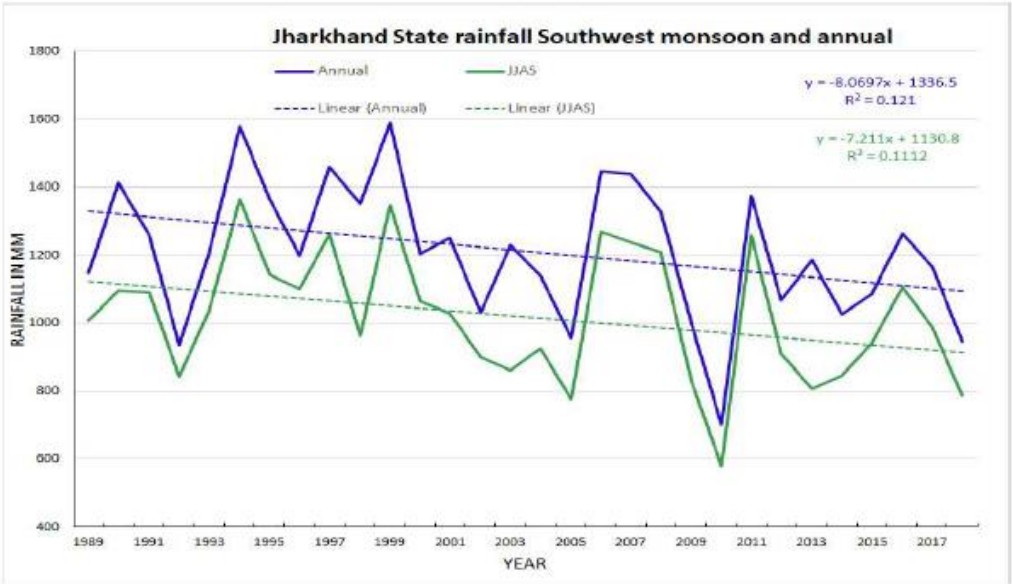


Fig-1.

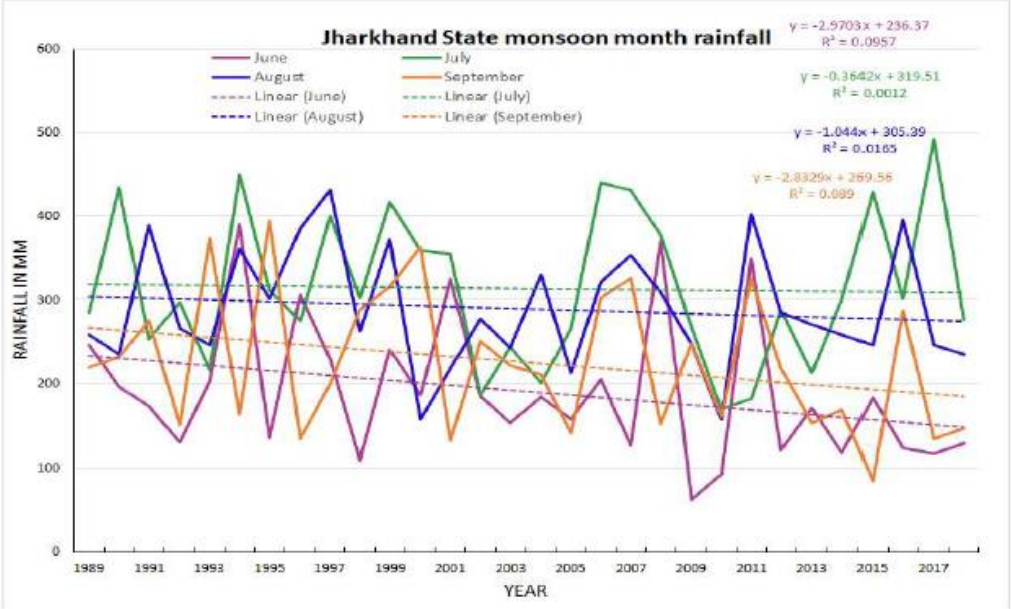


Fig-2.

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	9.71×10^{-1}	14.6
2	PZ-1B	Barakar Formation (JCF)	115	30	27	2.85	275	6.33×10^{-2}	1.9
3	PZ-2A		87	15	28.1	1.5	960	5.88×10^{-2}	0.88
4	PZ-3A		172	42	17.55	3.0	157	4.04×10^{-2}	1.70
5	PZ-4A		70	18	15.55	1.65	167	5.00×10^{-2}	0.89
6	PZ-8A		140	24	68.72	1.05	275	6.53×10^{-2}	1.57
7	PZ-9B		100	30	34.68	2.45	390	6.68×10^{-2}	2.00
8	PZ-10A		135	30	5	4.7	865	1.52×10^{-1}	4.55
9	PZ-11A	Barren Measure Formation (JCF)	300	66	60.60	3.05	300	3.9×10^{-2}	2.57
10	PZ-13A	Ranigunj Formation (JCF)	80	24	30.9	1.75	400	6.37×10^{-2}	1.53
11	PZ-14B		162	24	12.15	2.75	475	7.48×10^{-2}	1.80
12	PZ-16A	Barakar Formation (part of RCF)	90	18	31.5	2.0	385	5.59×10^{-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	1.0×10^{-3} to 2×10^{-3}
		Mining	1.0×10^{-2} to 1.5×10^{-3}
2	Metamorphics (Buffer Zone)	Peripheral part of the Coalfield	1.0×10^{-3} to 3.5×10^{-3}

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

A GROUND WATER LEVEL OF CLUSTER-I

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

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

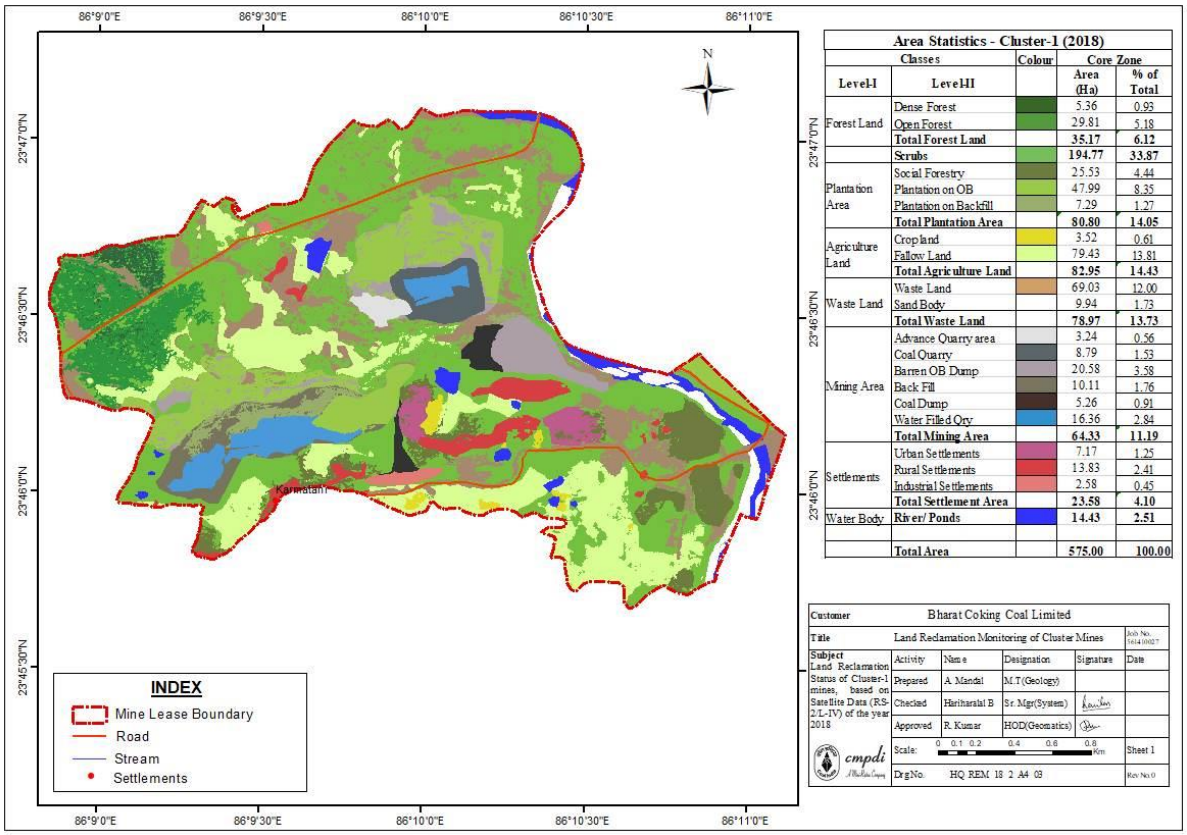
Monitoring stations (**B015, B051 and B053**) are located in the core zone of the mine area. Water level monitoring in these monitoring stations has done in the months of May'23, August'23, and Nov'23 and January'24. The Ground water level data is presented in the table below:

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.

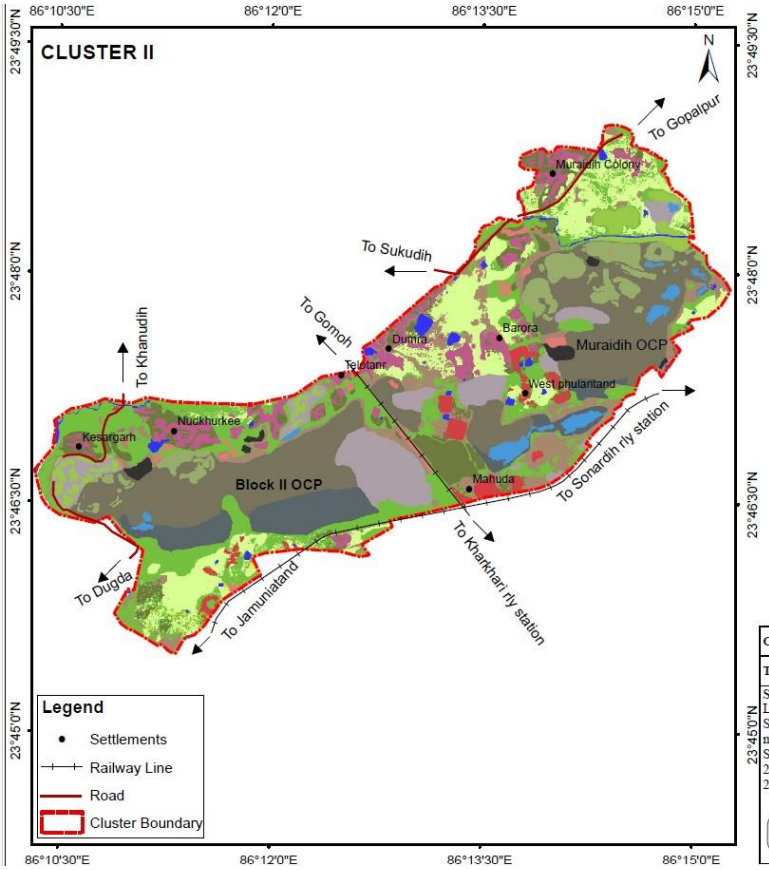
Monitoring stations (**B001, B059, B060 and B062**) are located in the core zone of the mine area. Water level monitoring in these monitoring stations has done in the months of May'23, August'23, and Nov'23 and January'24. The Ground water level data is presented in the table below:

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	Activity	Name	Designation	Signature	Date
Land Reclamation Status of Cluster-II 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 0.5 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	977.33×10^4	0.0	977.33×10^4
2	Open Land	1072.08×10^4	0.0	1072.08×10^4
3	Road/ Paved Area	140.32×10^4	0.0	140.32×10^4
4	Rooftop area of building/ sheds	70.81×10^4	0.0	70.81×10^4
5	Total	2260.54×10^4	0.0	2260.54×10^4

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.

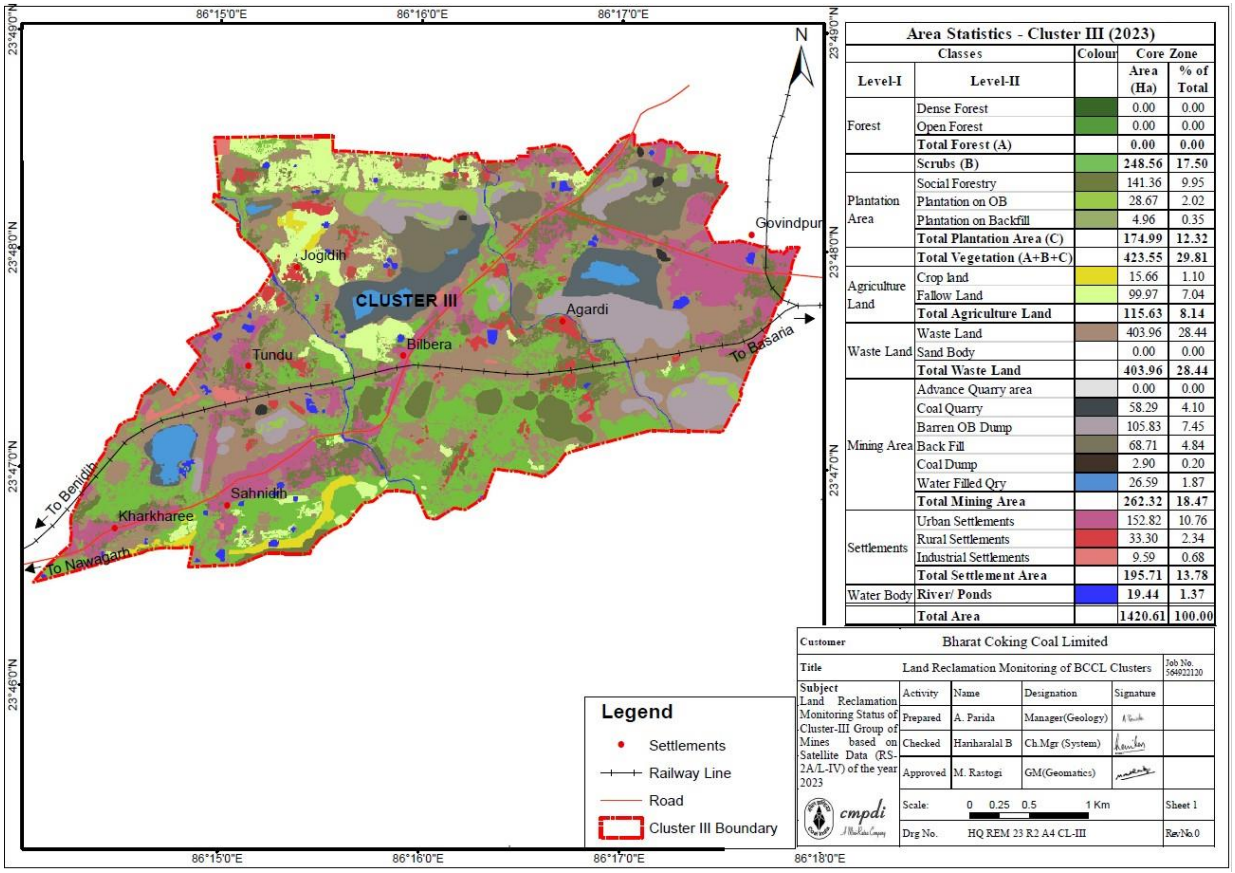
Monitoring stations (**A025, A029, B014 and B060**) are located in the core zone of the mine area. Water level monitoring in these monitoring stations has been done in the months of May'23, August'23, and Nov'23 and January'24. The Ground water level data is presented in the table below:

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	Activity	Name	Designation	Signature	
Land Reclamation Monitoring Status of Cluster-III Group of Mines based on Satellite Data (RS-2A/L-IV) of the year 2023	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.

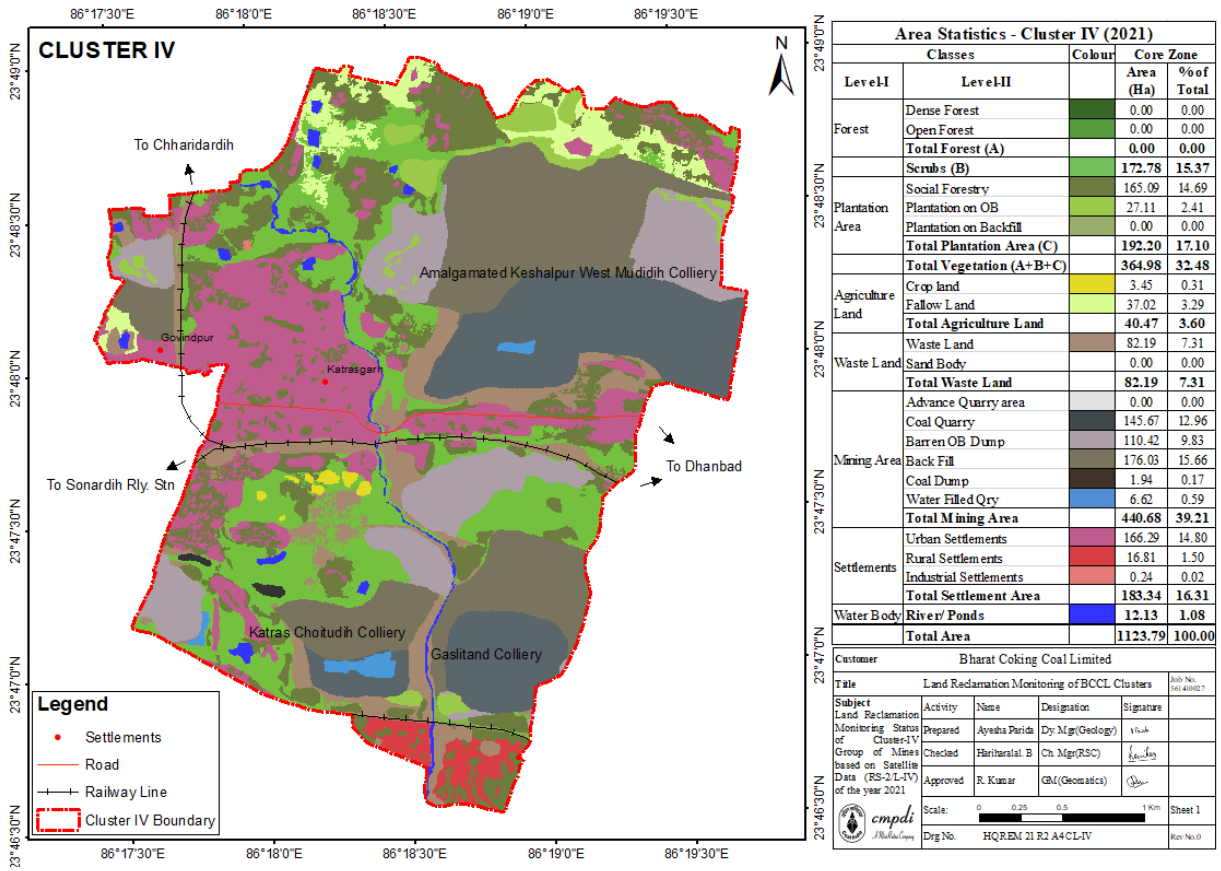
Monitoring stations (**A026, A028 and B065**) are located in the core zone of the mine area. Water level monitoring in these monitoring stations has been done in the months of May'23, August'23, and Nov'23 and January'24. The Ground water level data is presented in the table below:

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.

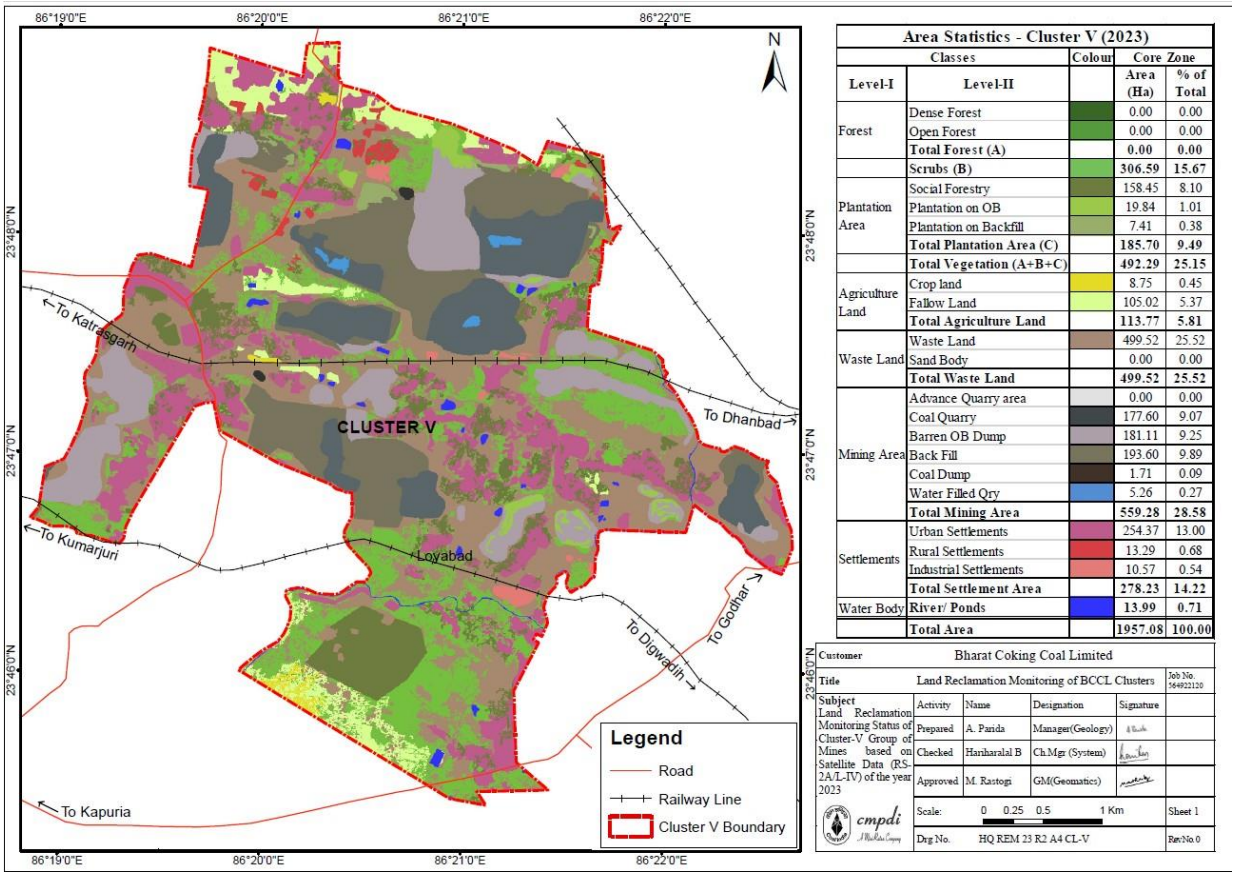
Monitoring stations (**A016 and A027**) are located in the core zone of the mine area. Water level monitoring in these monitoring stations has been done in the months of May'23, August'23, and Nov'23 and January'24. The Ground water level data is presented in the table below:

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	527.26×10^4	0.0	527.26×10^4
2	Open Land	973.52×10^4	0.0	973.52×10^4
3	Road/ Paved Area	217.50×10^4	0.0	217.50×10^4
4	Rooftop area of building/ sheds	24.24×10^4	0.0	24.24×10^4
5	Total	1724.52×10^4	0.0	1724.52×10^4

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.

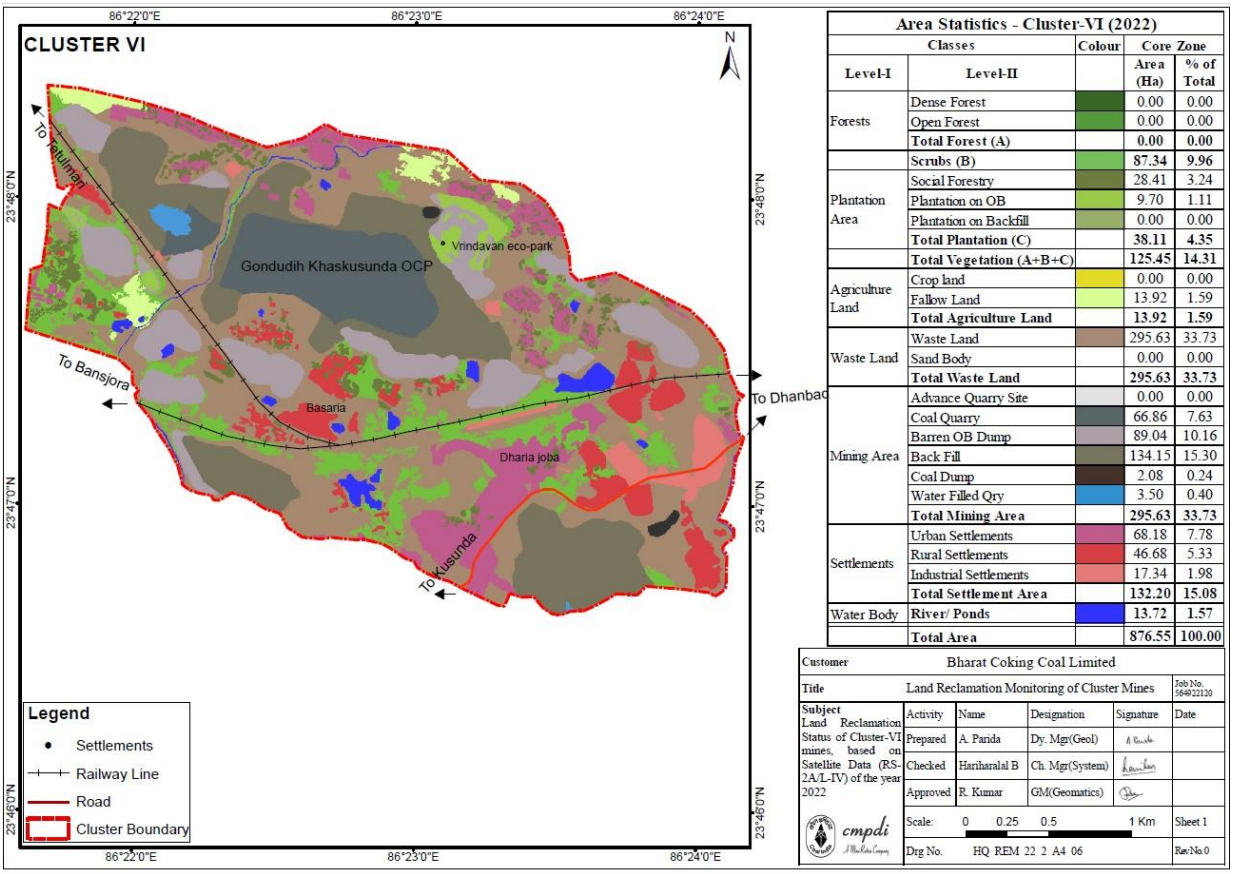
Monitoring stations (**D025, D030 and D034**) are located in the core zone of the mine area. Water level monitoring in these monitoring stations has been done in the months of May'23, August'23, and Nov'23 and January'24. The Ground water level data is presented in the table below:

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.

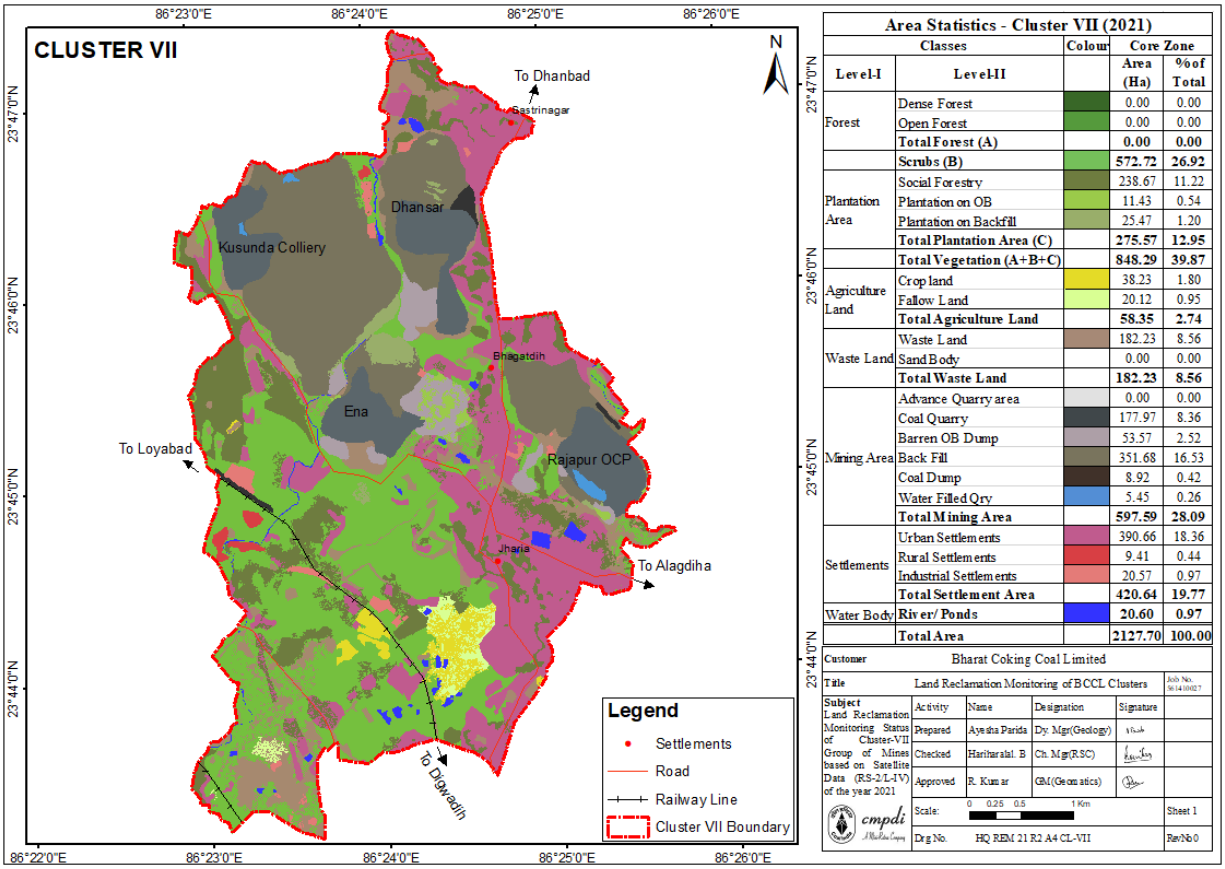
Monitoring stations (**D003, D034, D047 and D080**) are located in the core zone of the mine area. Water level monitoring in these monitoring stations has been done in the months of May'23, August'23, and Nov'23 and January'24. The Ground water level data is presented in the table below:

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. 36141002?
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.

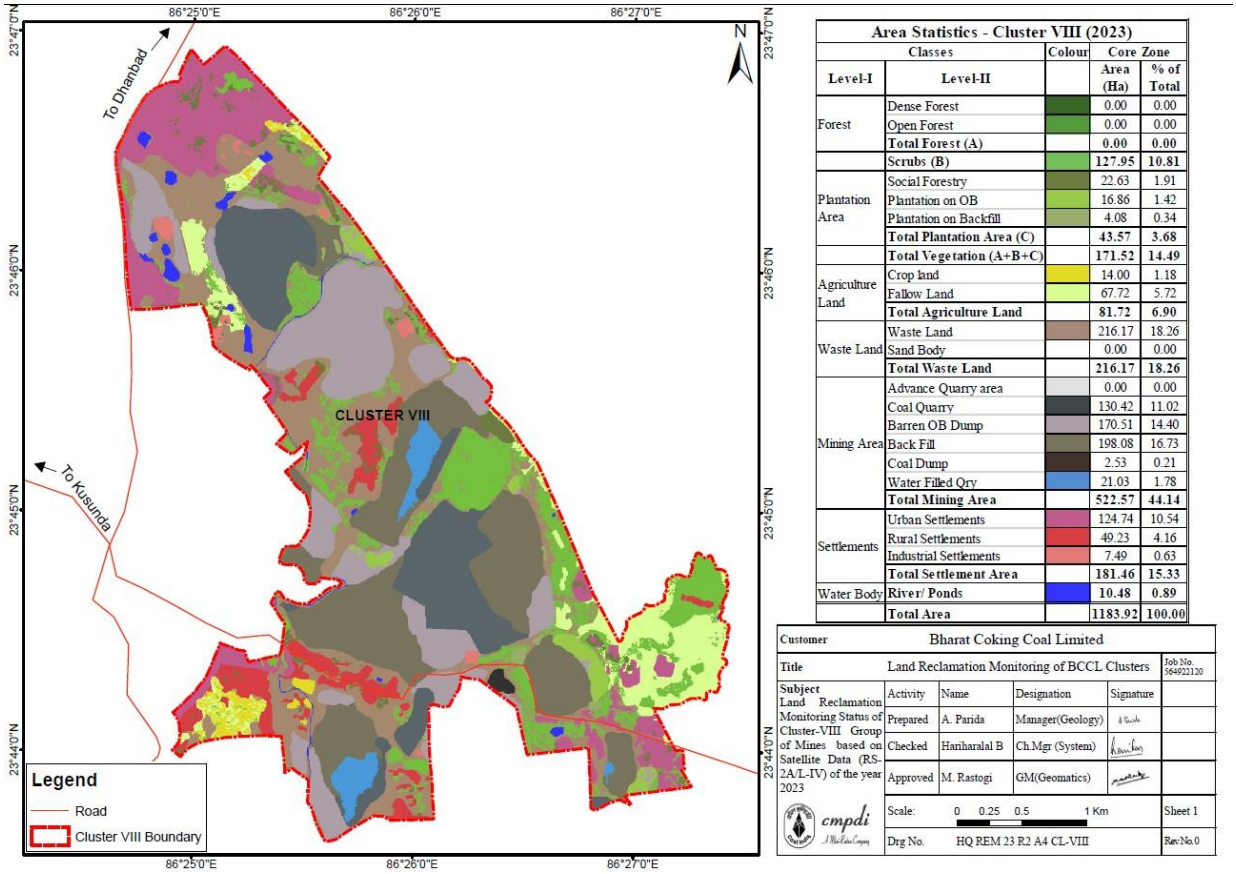
Monitoring stations (**D008 and D039**) are located in the core zone of the mine area. Water level monitoring in these monitoring stations has been done in the months of May'23, August'23, and Nov'23 and January'24. The Ground water level data is presented in the table below:

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.

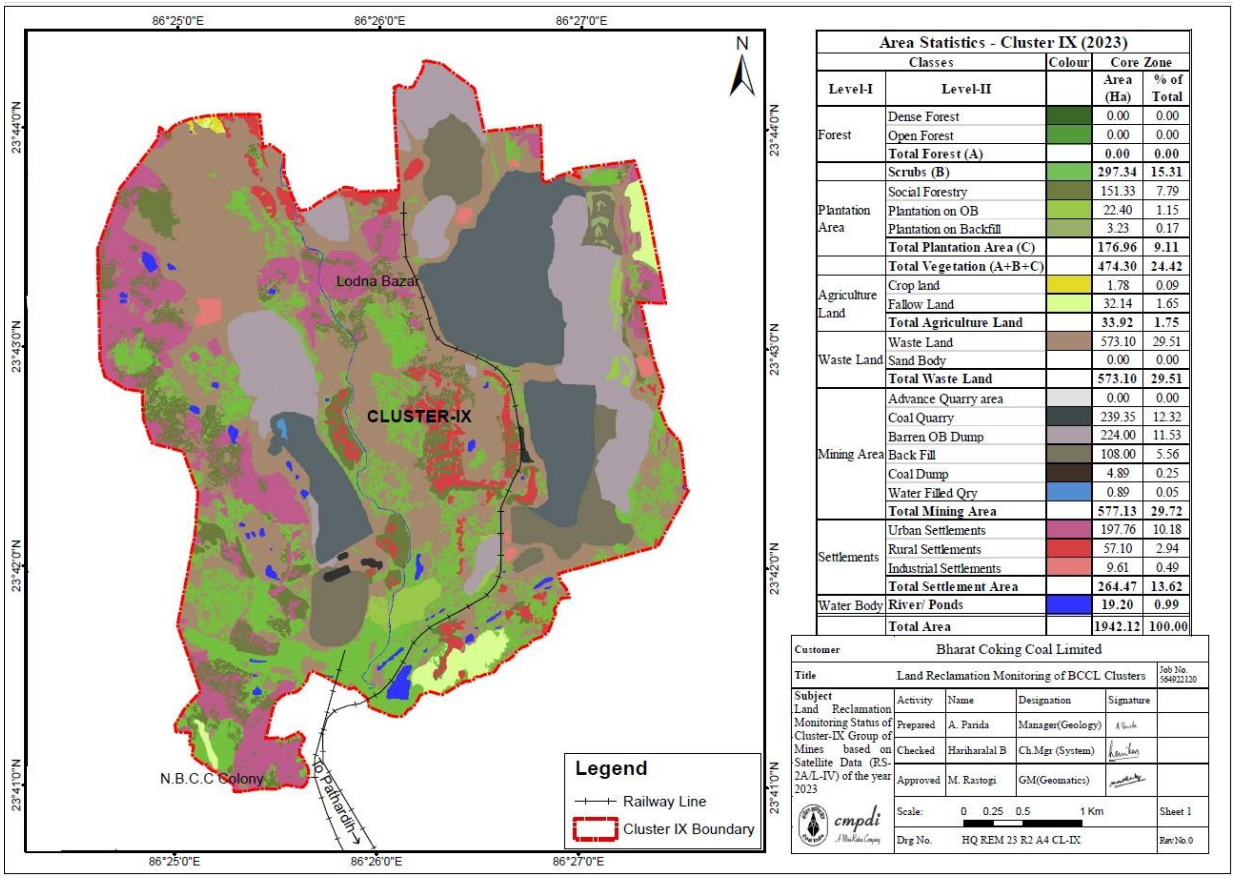
Monitoring stations (**D005, D007, D039 and D074**) are located in the core zone of the mine area. Water level monitoring in these monitoring stations has been done in the months of May'23, August'23, and Nov'23 and January'24. The Ground water level data is presented in the table below:

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	601.52×10^4	0.0	601.52×10^4
2	Open Land	1076.47×10^4	0.0	1076.47×10^4
3	Road/ Paved Area	232.31×10^4	0.0	232.31×10^4
4	Rooftop area of building/ sheds	56.92×10^4	0.0	56.92×10^4
5	Total	1967.22×10^4	0.0	1967.22×10^4

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.

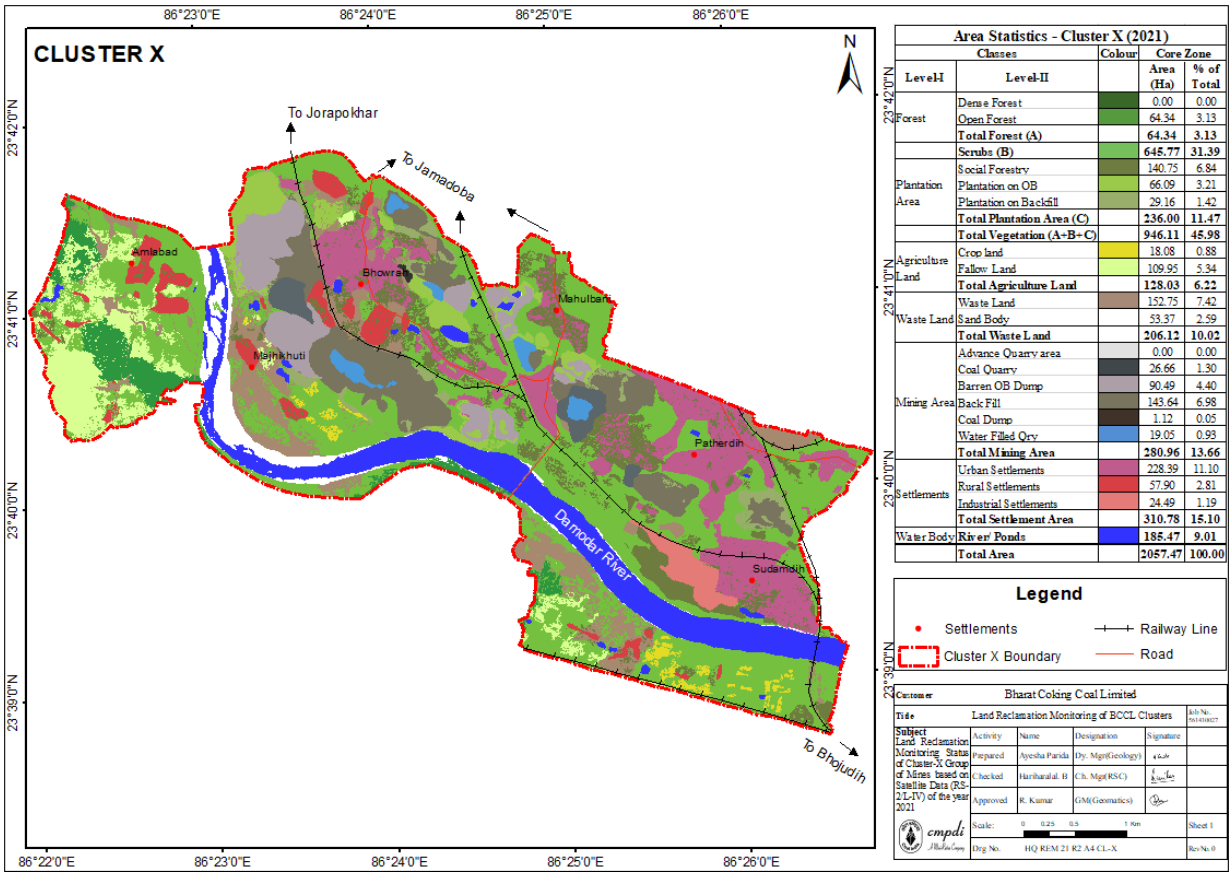
Monitoring stations (**A019, D035, D036 and D077**) are located in the core zone of the mine area. Water level monitoring in these monitoring stations has been done in the months of May'23, August'23, and Nov'23 and January'24, the Ground water level data is presented in the table below:

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**

Legend

Settlements — Railway Line

Cluster X Boundary — Road

Customer	Bharat Coking Coal Limited
Title	Land Reclamation Monitoring of BCCL Clusters
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)	

empdi

Scale: 0 0.25 0.5 1 Km

Drg No. HQ REM 21 R2 A4 CL-X

Sheet 1

Rev No. 0

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

K. GROUND WATER LEVEL OF CLUSTER-XI

Cluster–XI consists of eight coal mines; Moonidih UG, Gopalichak UG 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.

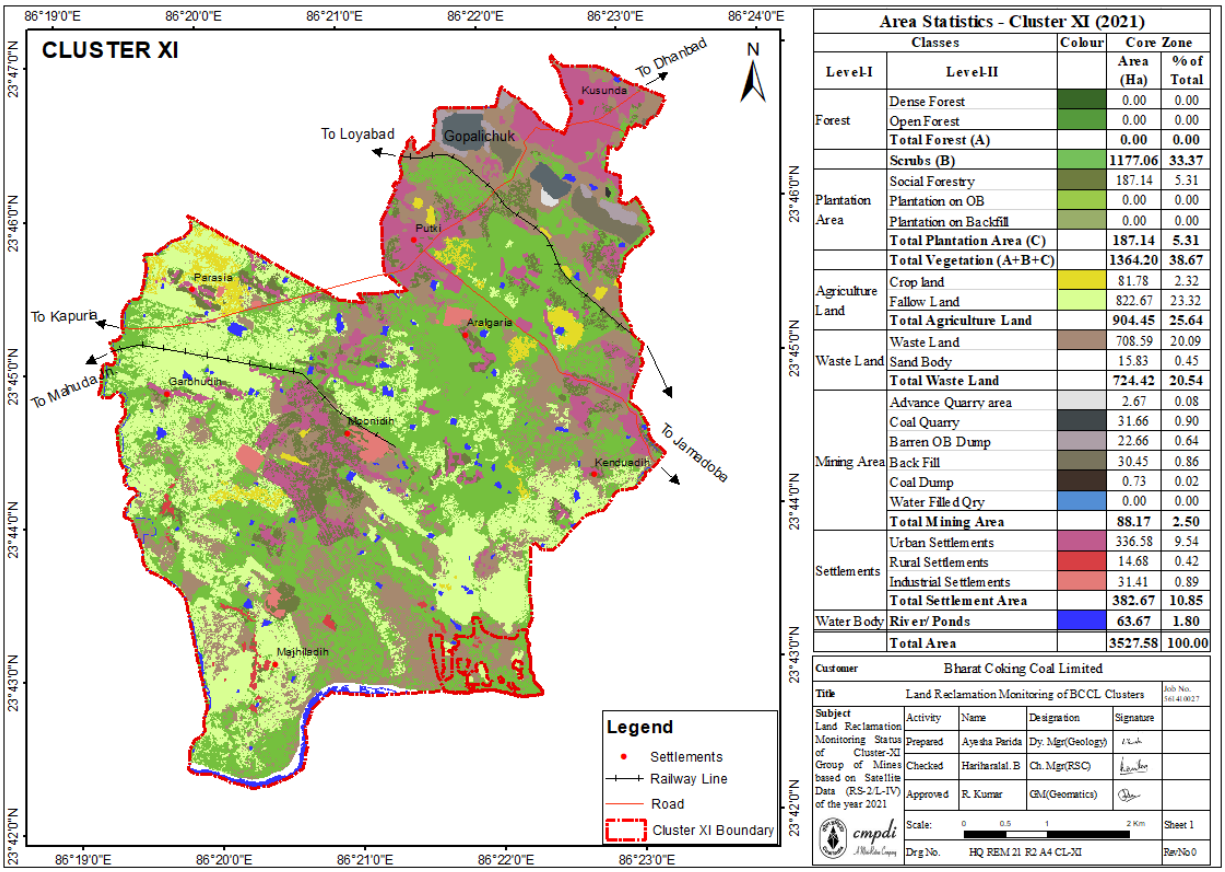
Monitoring stations (**A017, A020 and A032**) are located in the core zone of the mine area. Water level monitoring in these monitoring stations has been done in the months of May'23, August'23, and Nov'23 and January'24. The Ground water level data is presented in the table below:

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	Activity	Name	Designation	Signature	
Land Reclamation Monitoring Status of Cluster-XI 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 0.5 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.

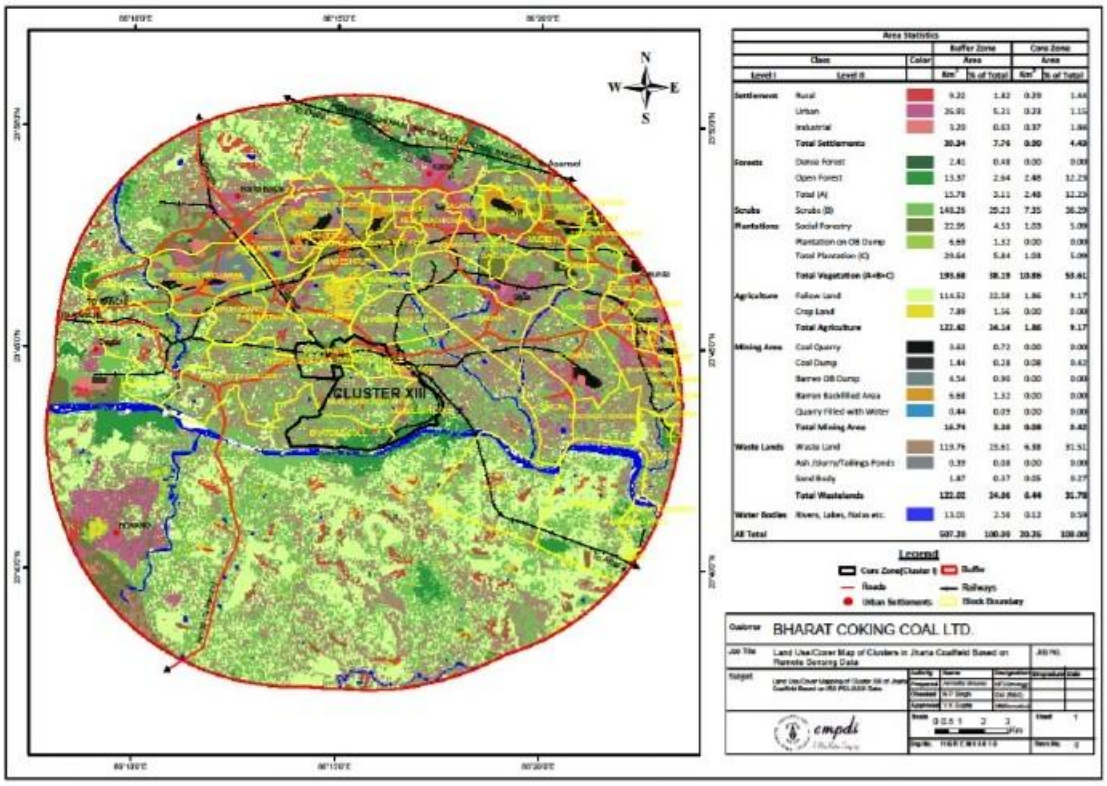
Monitoring stations (**A023, A034 and B048**) are located in the core zone of the mine area. Water level monitoring in these monitoring stations has been done in the months of May'23, August'23, Nov'23 and January'24. The Ground water level data is presented in the table below:

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	1484.41×10^4	0.0	1570.48×10^4
2	Open Land	183.28×10^4	0.0	97.22×10^4
3	Road/ Paved Area	71.84×10^4	0.0	71.83×10^4
4	Rooftop area of building/ sheds	159.09×10^4	0.0	159.09×10^4
5	Total	1898.62×10^4	0.0	1898.62×10^4

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.

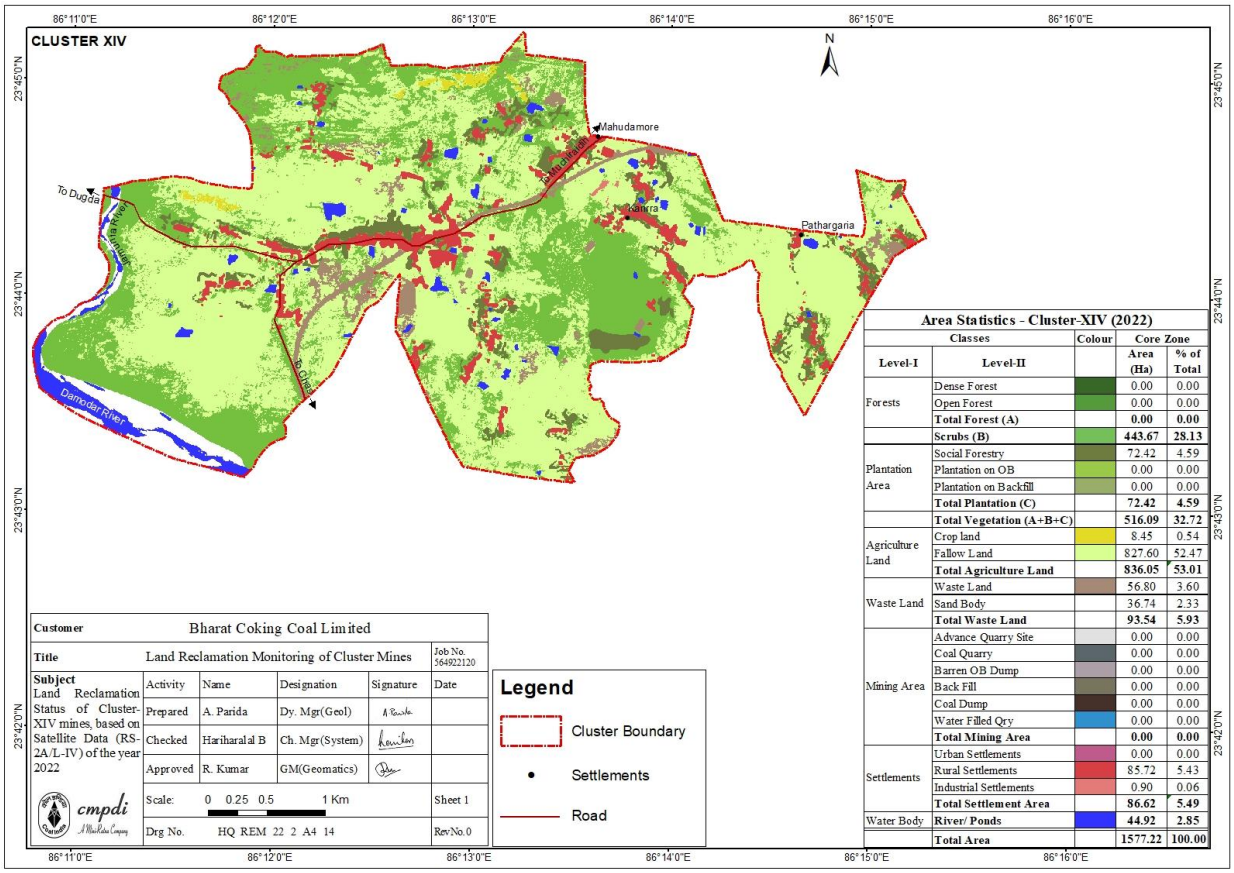
Monitoring stations (**B024 and B067**) are located in the core zone of the mine area. Water level monitoring in these monitoring stations has been done in the months of May'23, August'23, and Nov'23 and January'24. The Ground water level data is presented in the table below:

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	1251.76×10^4	0.0	1251.76×10^4
2	Open Land	79.76×10^4	0.0	79.76×10^4
3	Road/ Paved Area	85.83×10^4	0.0	85.83×10^4
4	Rooftop area of building/ sheds	0.90×10^4	0.0	0.90×10^4
5	Total	1418.25×10^4	0.0	1418.25×10^4

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.

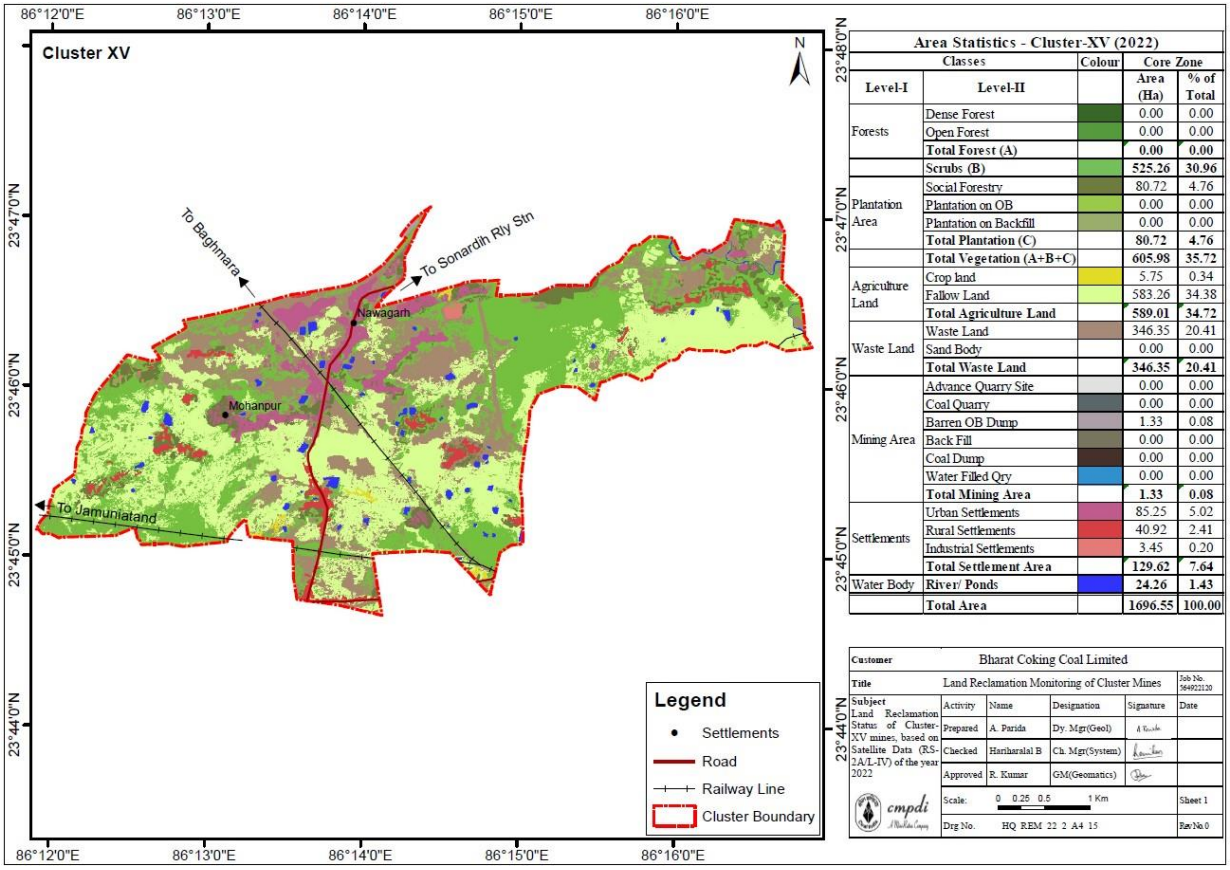
Monitoring stations (**A024, B032 and B062**) are located in the core zone of the mine area. Water level monitoring in these monitoring stations has been done in the months of May'23, August'23, and Nov'23 and January'24. The Ground water level data is presented in the table below:

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.

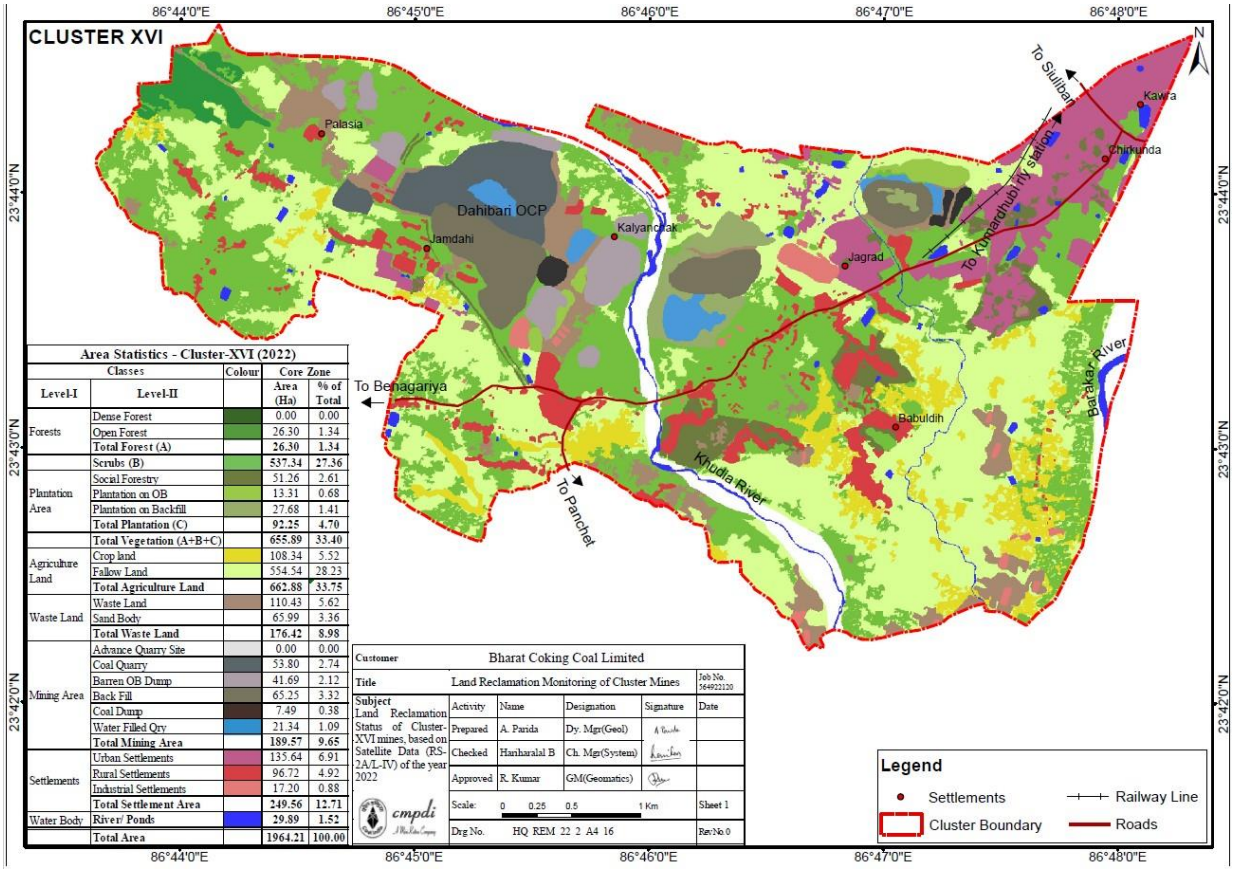
Monitoring stations (**DB022, DB023, DB024 & DB025**) are located in the core zone of the mine area. Water level monitoring in these monitoring stations has been done in the months of May'23, August'23, and Nov'23 and January'24. The Ground water level data is presented in the table below:

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



Area Statistics - Cluster-XVI (2022)

Classes		Colour	Core Zone	
Level-I	Level-II		Area (Ha)	% of Total
Forests	Dense Forest		0.00	0.00
	Open Forest		26.30	1.34
	Total Forest (A)		**26.30**	**1.34**
	Scrubs (B)		537.34	27.36
Plantation Area	Social Forestry		51.26	2.61
	Plantation on OB		13.31	0.68
	Plantation on Backfill		27.68	1.41
	Total Plantation (C)		**92.25**	**4.70**
	Total Vegetation (A+B+C)		**655.89**	**33.40**
Agriculture Land	Crop land		108.34	5.52
	Fallow Land		554.54	28.23
	Total Agriculture Land		**662.88**	**33.75**
Waste Land	Waste Land		110.43	5.62
	Sand Body		65.99	3.36
	Total Waste Land		**176.42**	**8.98**
Mining Area	Advance Quarry Site		0.00	0.00
	Coal Quarry		53.80	2.74
	Barren OB Dump		41.69	2.12
	Back Fill		65.25	3.32
	Coal Dump		7.49	0.38
	Water Filled Qry		21.34	1.09
	Total Mining Area		**189.57**	**9.65**
Settlements	Urban Settlements		135.64	6.91
	Rural Settlements		96.72	4.92
	Industrial Settlements		17.20	0.88
	Total Settlement Area		**249.56**	**12.71**
Water Body	River/ Ponds		29.89	1.52
	Total Area		1964.21	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-XVI mines, based on Satellite Data (RS-2A/L-IV) of the year 2022	Prepared	A. Parida	Dy. Mgr(Geol)		
	Checked	Hanharalal B	Ch. Mgr(System)		
	Approved	R. Kumar	GM(Geomatics)		
	Scale:	0 0.25 0.5 1 Km			Sheet 1
	Drg No.	HQ REM 22 2 A4 16			Rev No 0

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

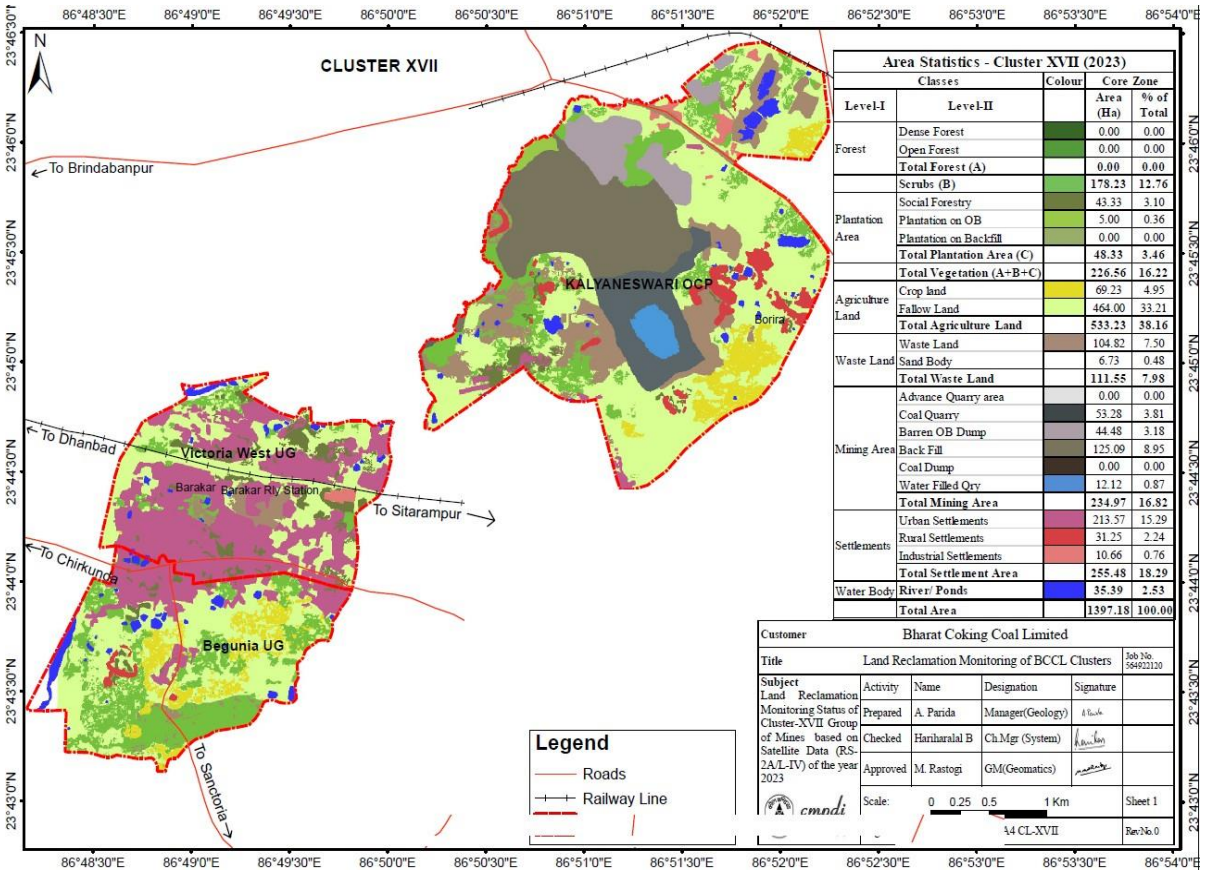
Cluster-XVII mines are under administrative control of Chanch Victoria Area, BCCL, located in western part of Raniganj coalfield in Dhanbad district of Jharkhand. Cluster–XVII consists of two closed Underground (UG) coal mines (Begunia Colliery and Victoria-West Colliery) and one opencast mines [Kalyaneshwari 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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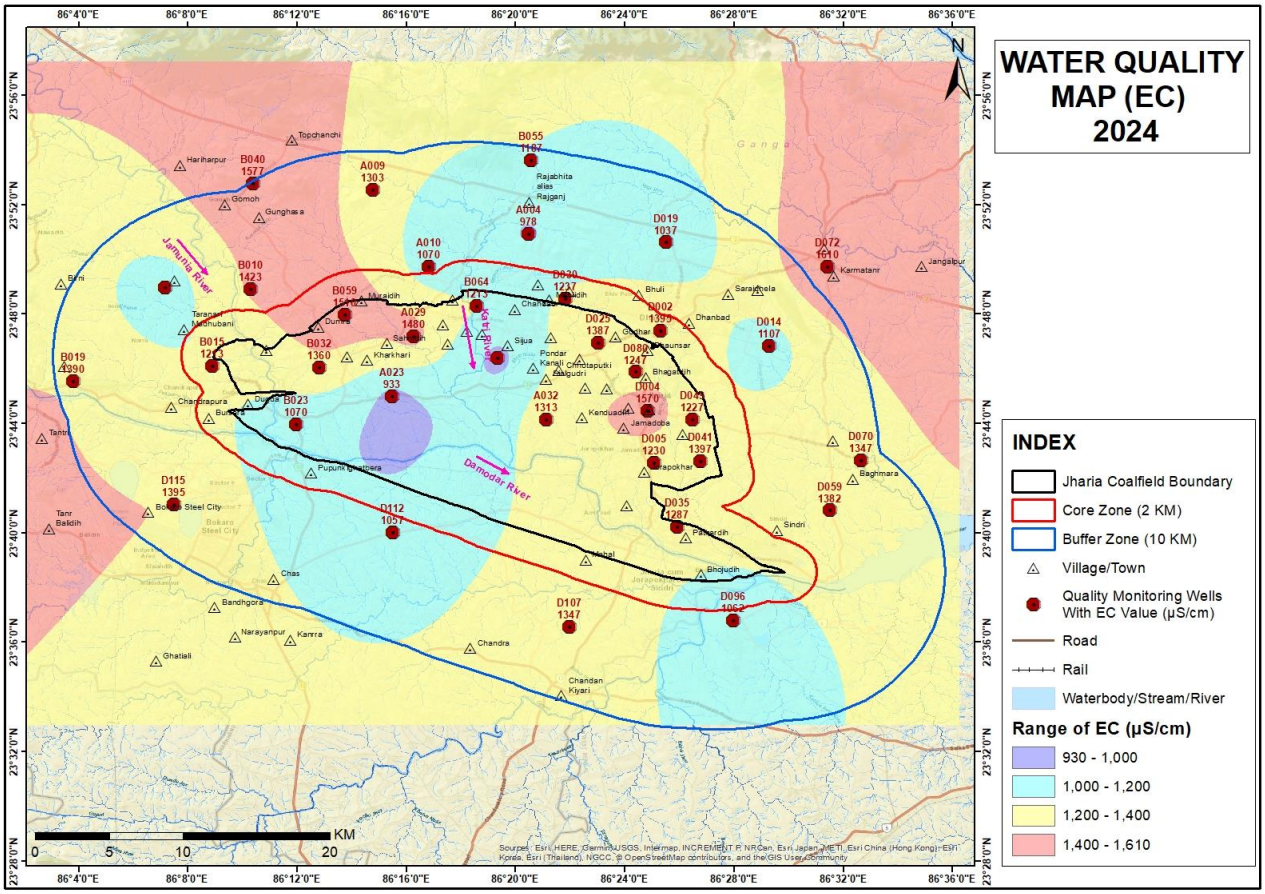
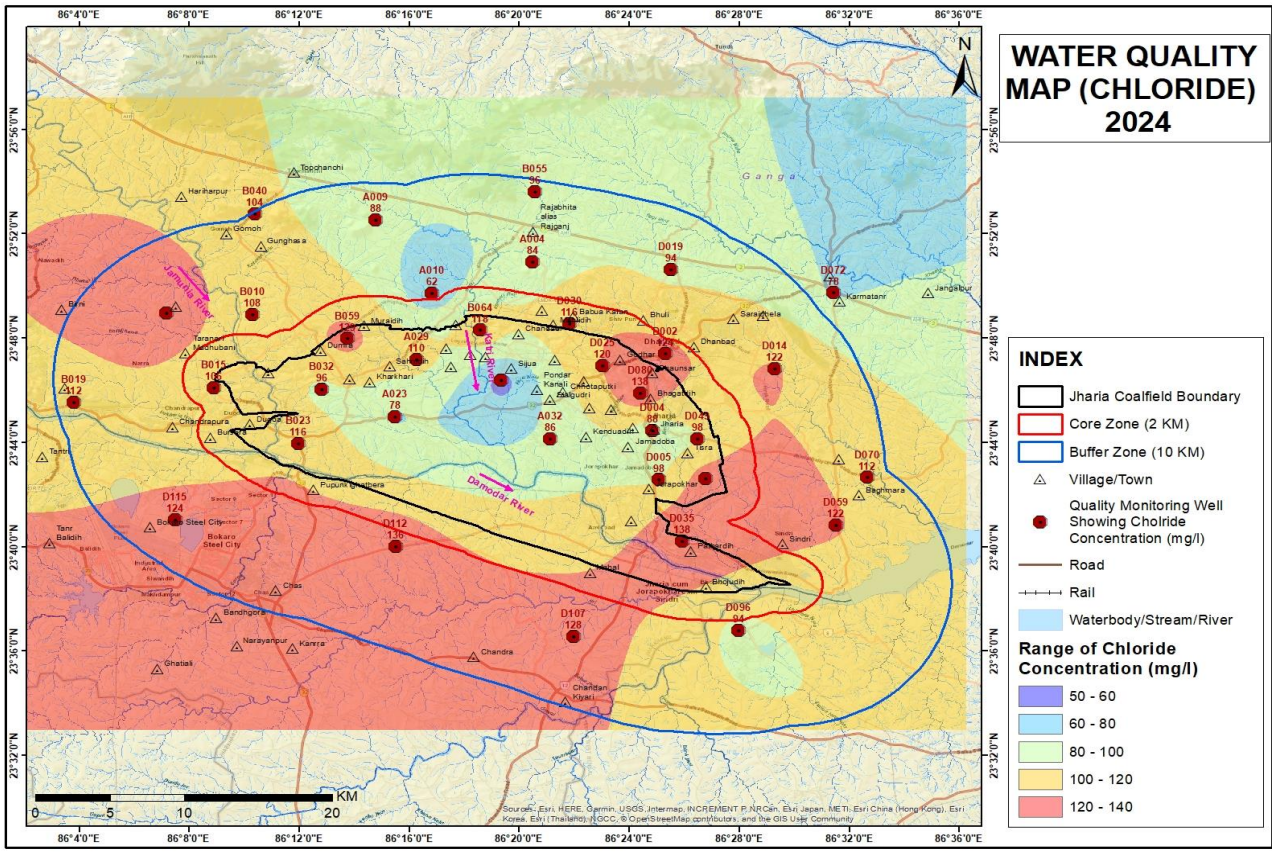
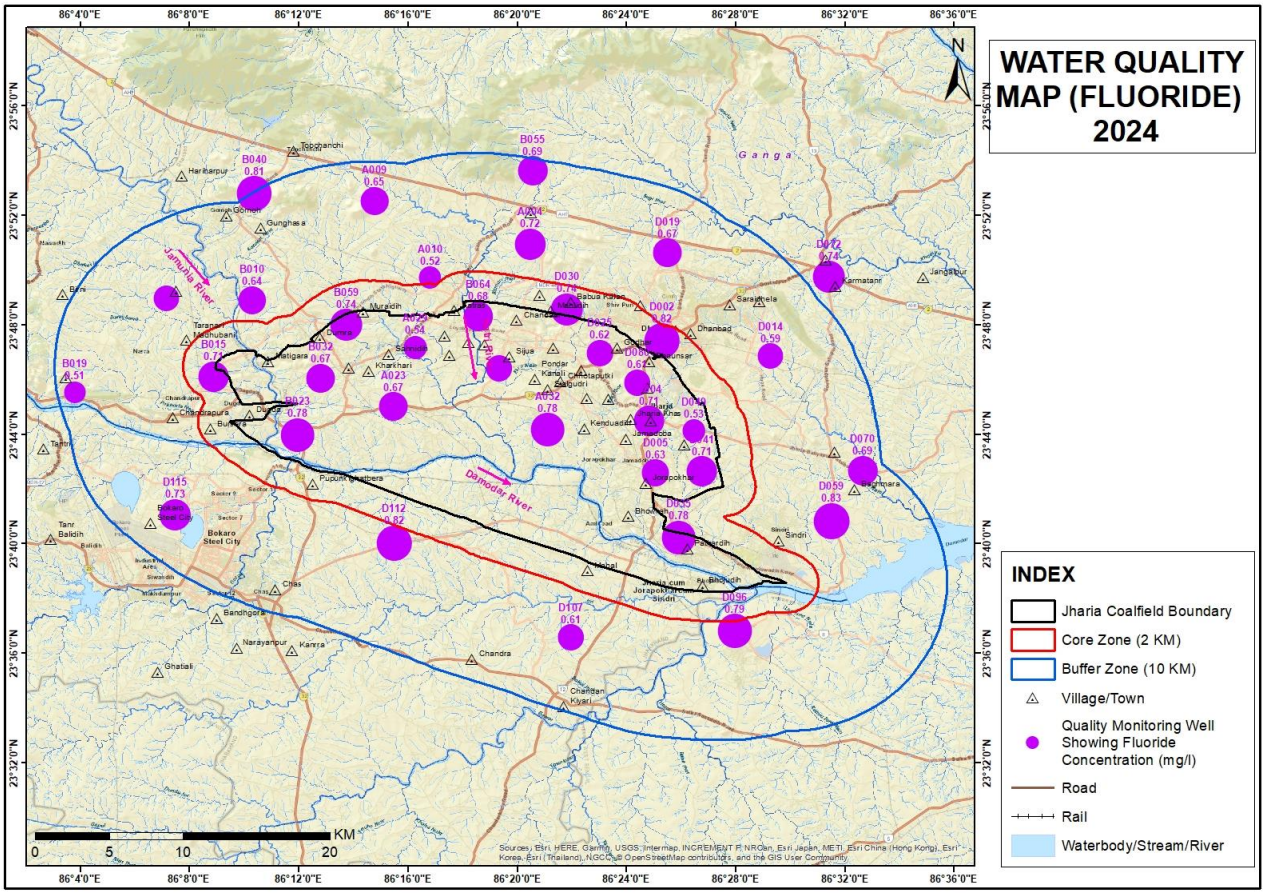
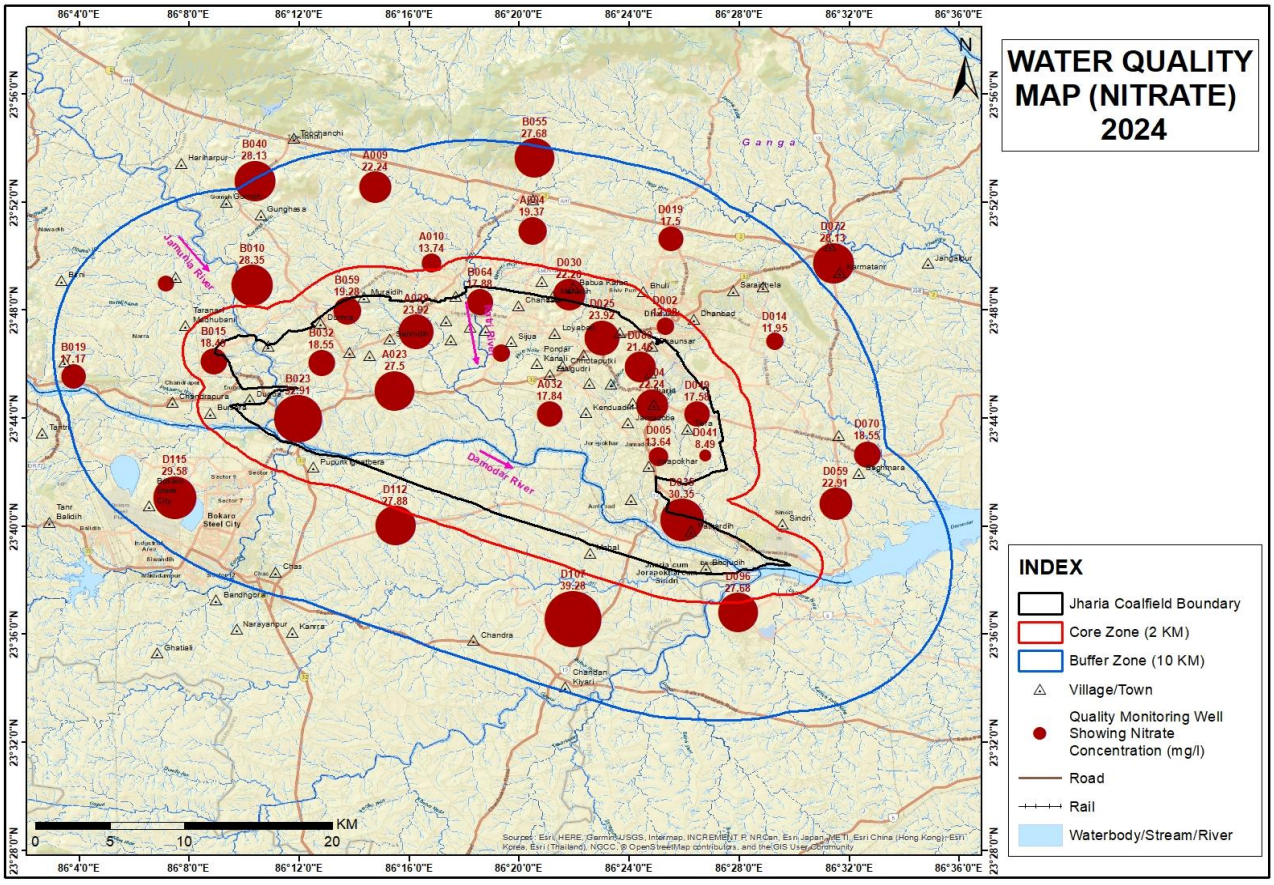
In wells of JCF concentration of magnesium in the water samples varies 103 (D-70) to 125 mg/l (D-4) and is above the permissible limit (100 mg/l) of drinking water standards. The total hardness mg/l ranges from 614 (A-09) to 824 mg/L (D-72) and is above the permissible limit of (600 mg/L) of drinking 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
Jamuniya River
Damodar River
Barakar River
Ganga
N
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
Jamuniya River
Damodar River
Barakar River
Ganga
N
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 5.7×10^{-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

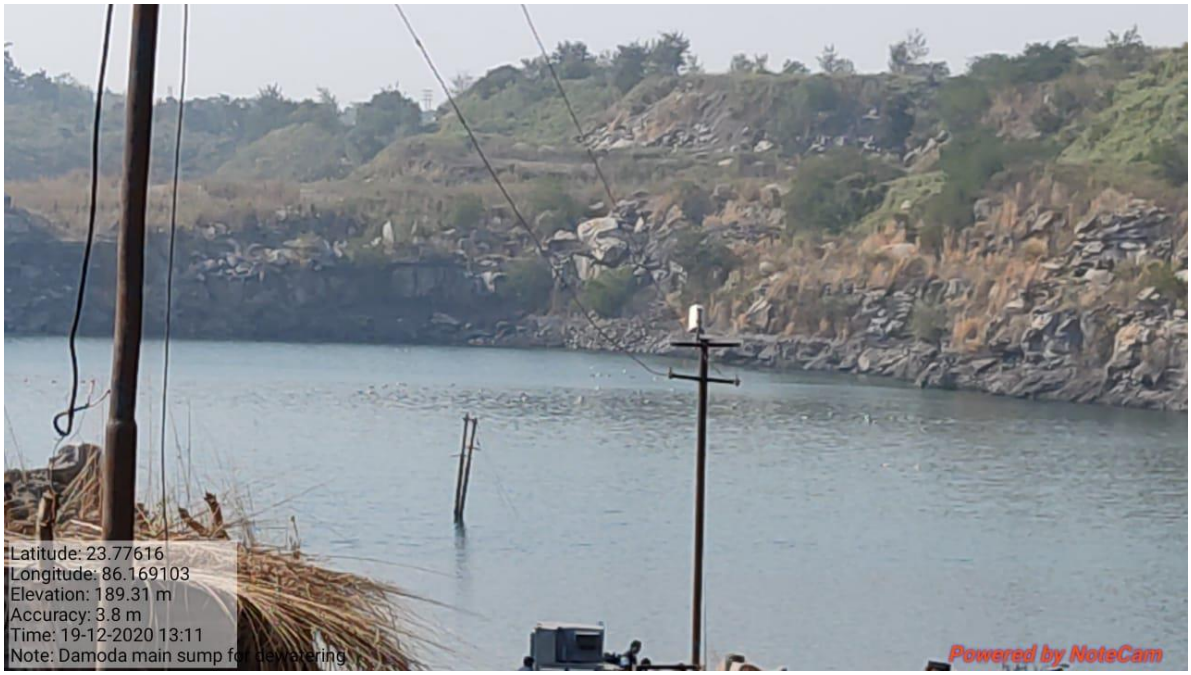
FILTER PLANT IN THE MINE AREA

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) 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

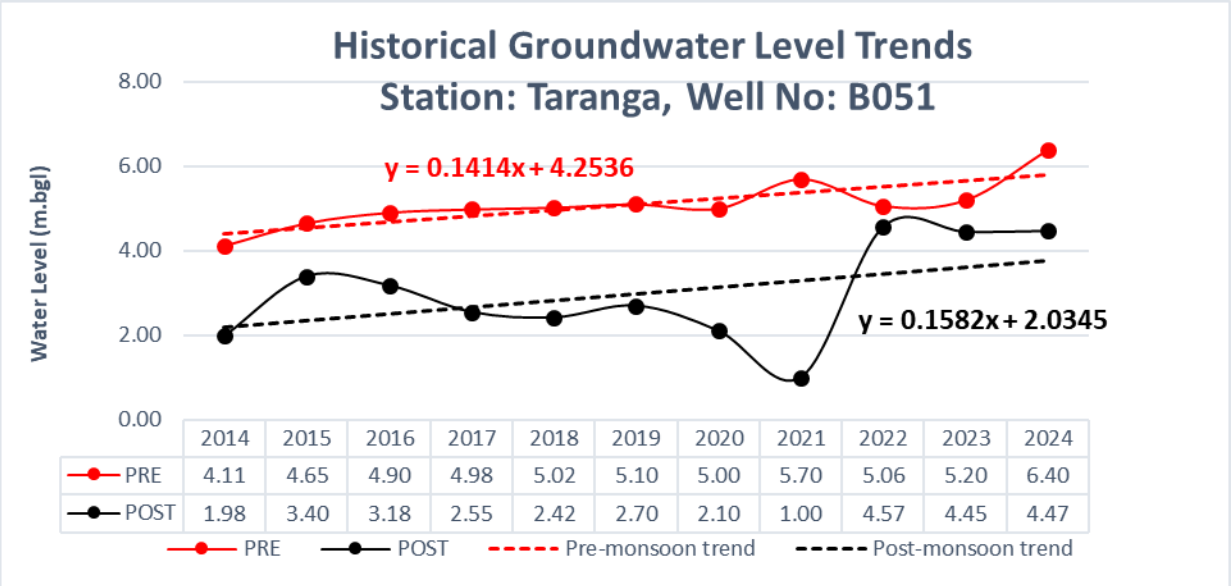
Well No	Water level below ground level (bgl) in meters																	
	May 15	Nov 15	May 16	Nov 16	May 17	Nov 17	May 18	Nov 18	May 19	Nov 19	May 20	Nov 20	May 21	Nov 21	May 22	Nov 22	May 23	Nov 23
JCF																		
A002	9.10	5.21	9.30	4.95	8.15	4.35	8.27	4.78	7.55	3.25	6.95	3.00	6.87	4.50	6.45	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

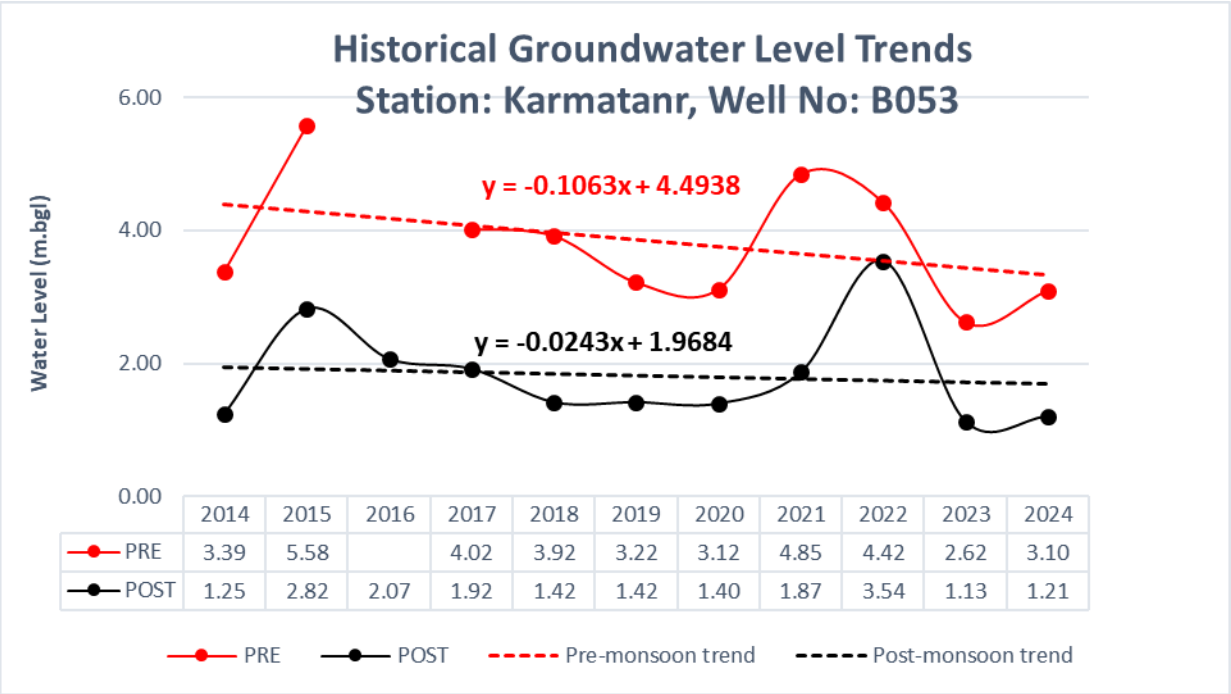
D113	6.6	3.85		3.95	7.28	2.35	6.85	3.3		3.5	6.1	3.45	6.8	2.99	7.3	4.3	5.75	3.48
D115		4.85		5.22	6.05	2.7	7.1	3.05		2.95	7.45	2.4	7.65	3.43	5.5	4.6	6.38	3.83
D117	7.86	5.34		5.67	8.8	4.37	7.92	5.02		5.02	7.52	4.79	7.87	5.11	8.7	5.5	7.27	5.25
RCF (Part)																		
DB001	5.4	4.08	4.17	3.7	4.5	3.8	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



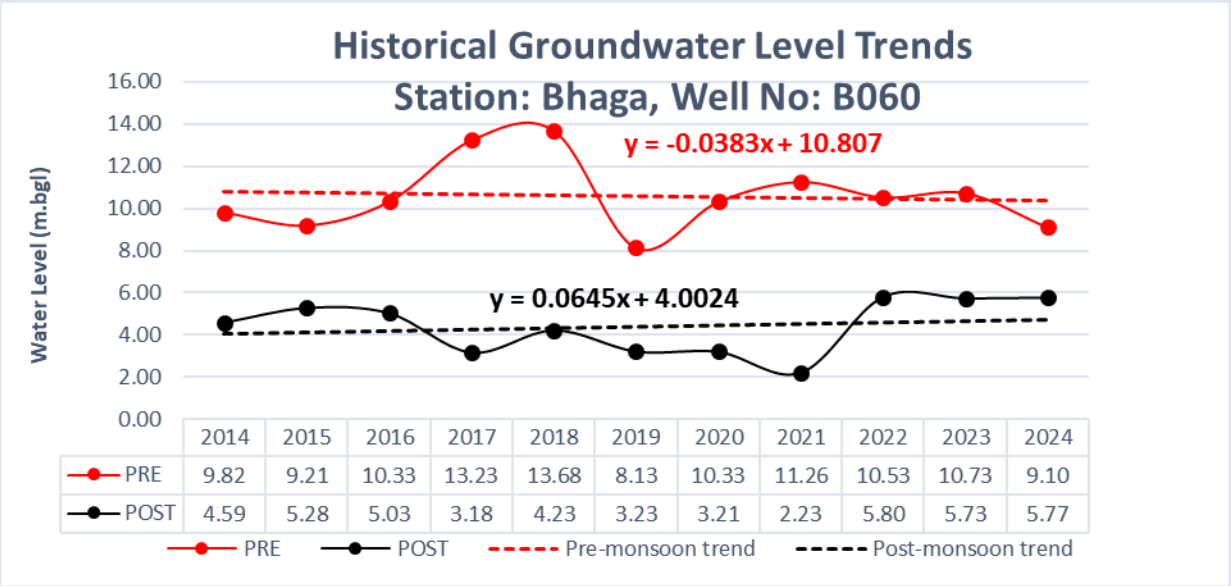
	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024
PRE	4.11	4.65	4.90	4.98	5.02	5.10	5.00	5.70	5.06	5.20	6.40
POST	1.98	3.40	3.18	2.55	2.42	2.70	2.10	1.00	4.57	4.45	4.47

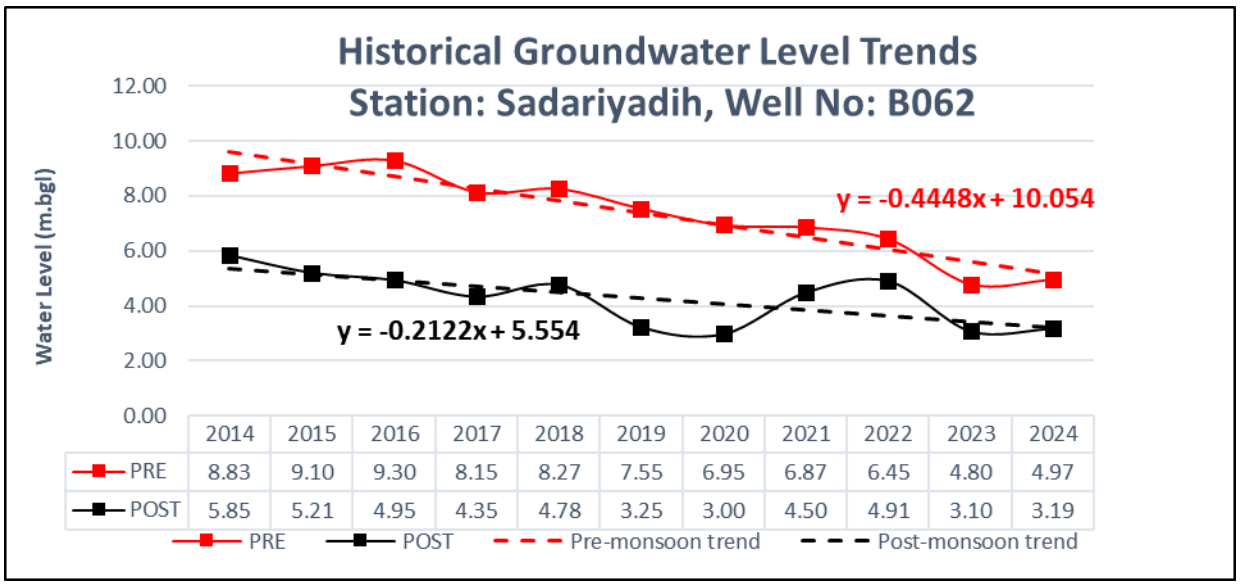


	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024
PRE	3.39	5.58		4.02	3.92	3.22	3.12	4.85	4.42	2.62	3.10
POST	1.25	2.82	2.07	1.92	1.42	1.42	1.40	1.87	3.54	1.13	1.21

Annexure – VI

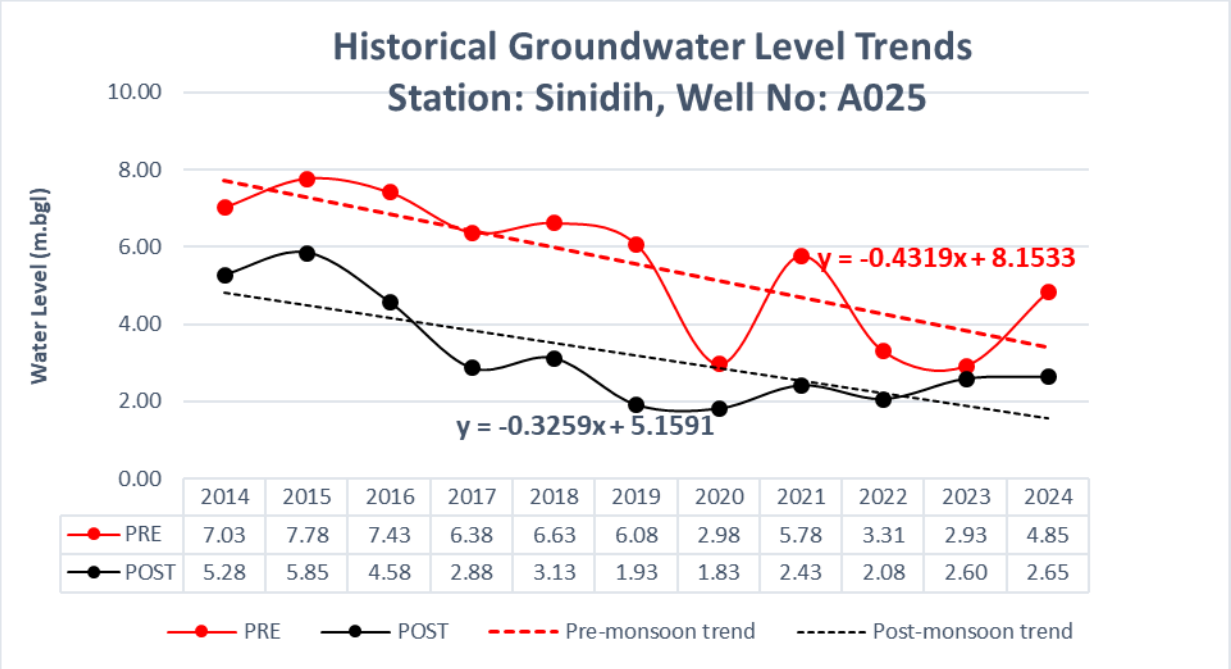
HYDROGRAPHS OF CLUSTER-II



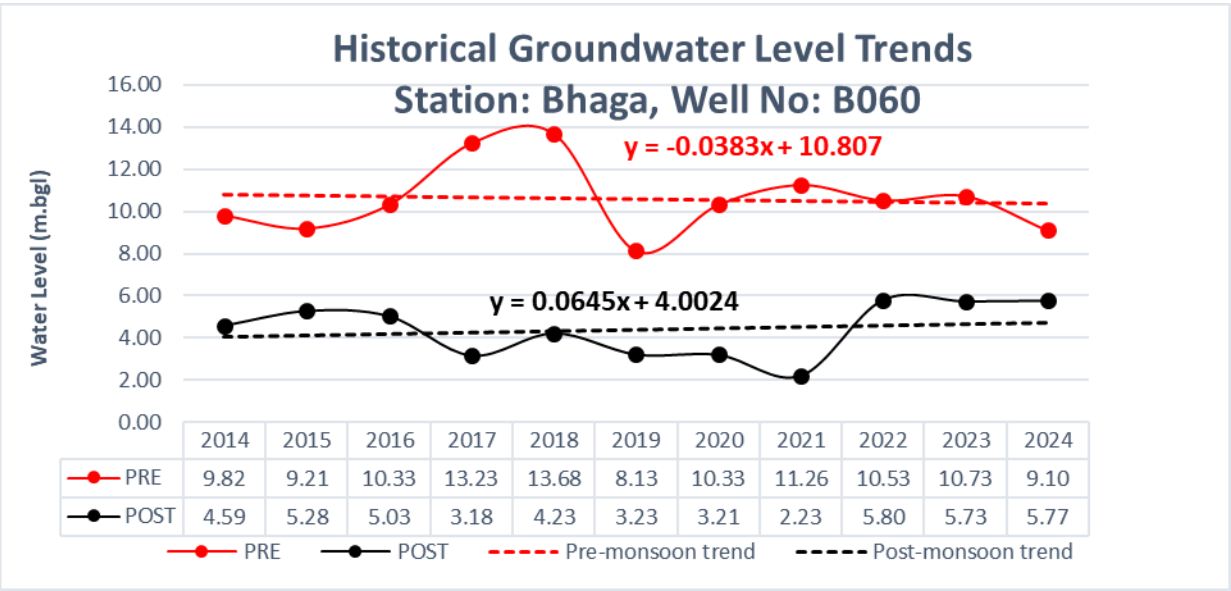


Annexure – VI

HYDROGRAPHS OF CLUSTER-III



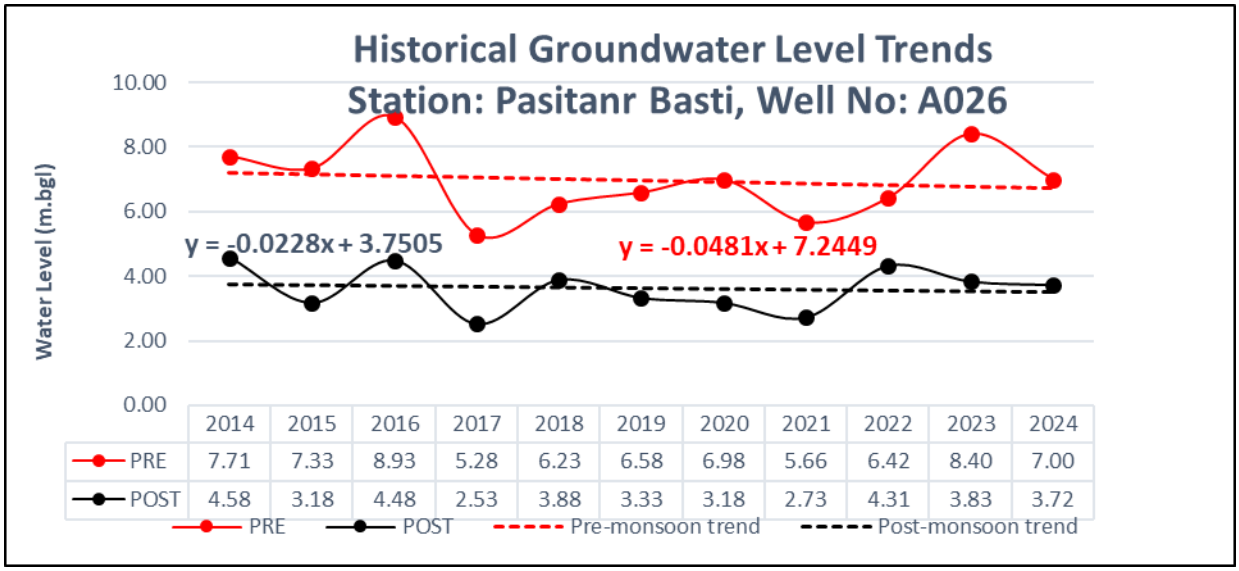
	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024
PRE	7.03	7.78	7.43	6.38	6.63	6.08	2.98	5.78	3.31	2.93	4.85
POST	5.28	5.85	4.58	2.88	3.13	1.93	1.83	2.43	2.08	2.60	2.65

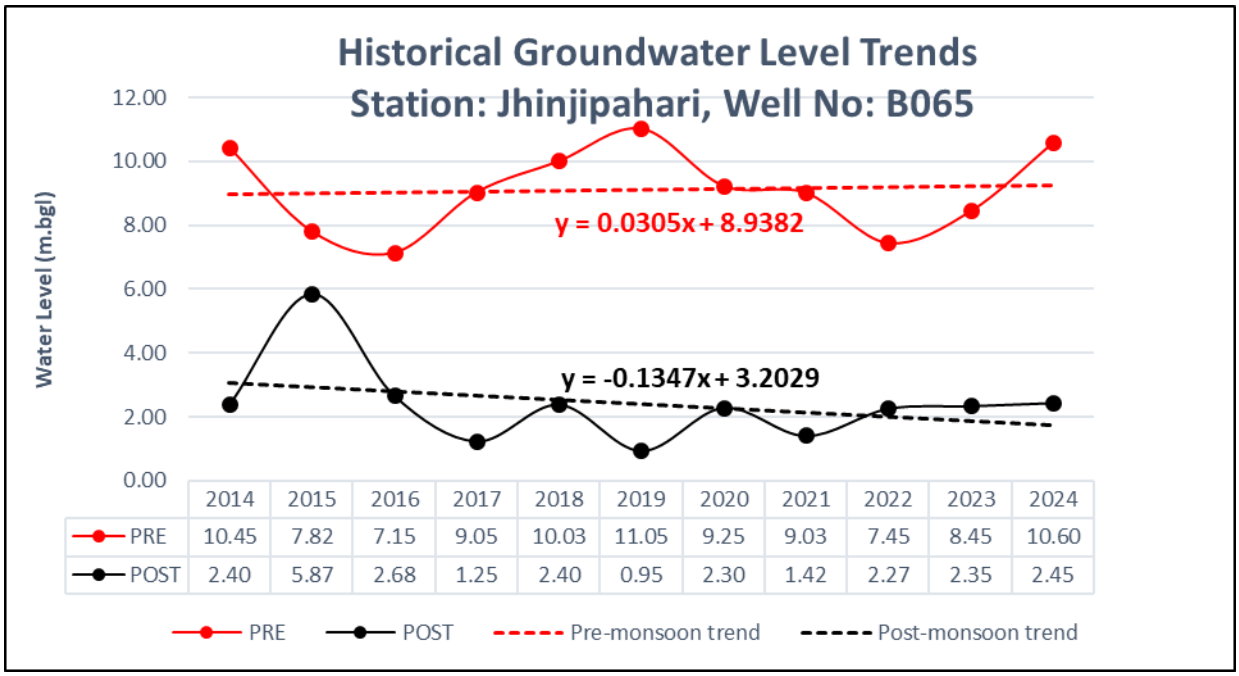


	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024
PRE	9.82	9.21	10.33	13.23	13.68	8.13	10.33	11.26	10.53	10.73	9.10
POST	4.59	5.28	5.03	3.18	4.23	3.23	3.21	2.23	5.80	5.73	5.77

Annexure – VI

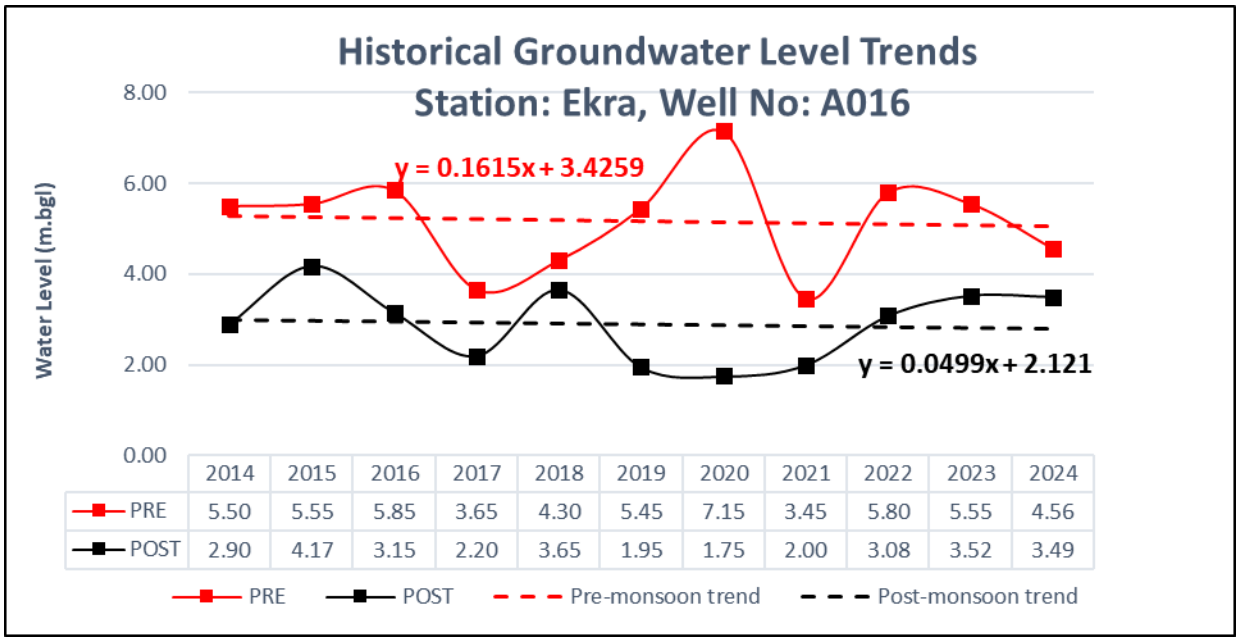
HYDROGRAPHS OF CLUSTER-IV

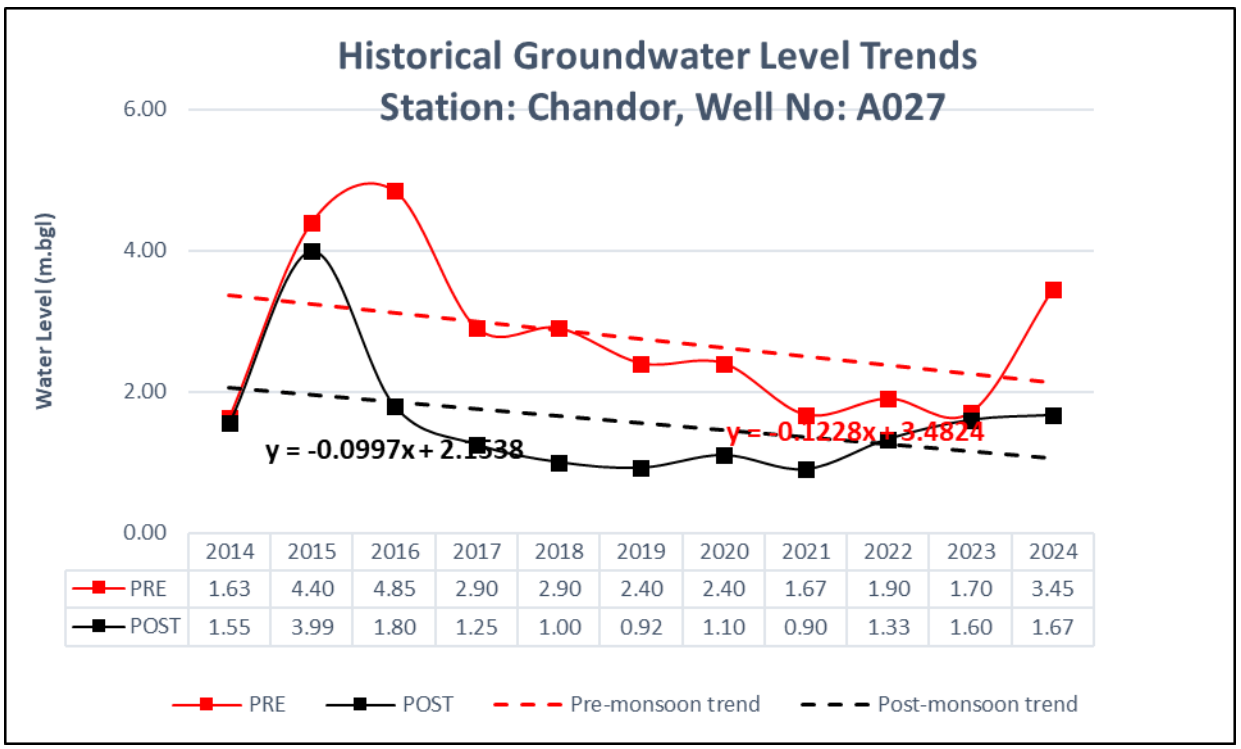




Annexure – VI

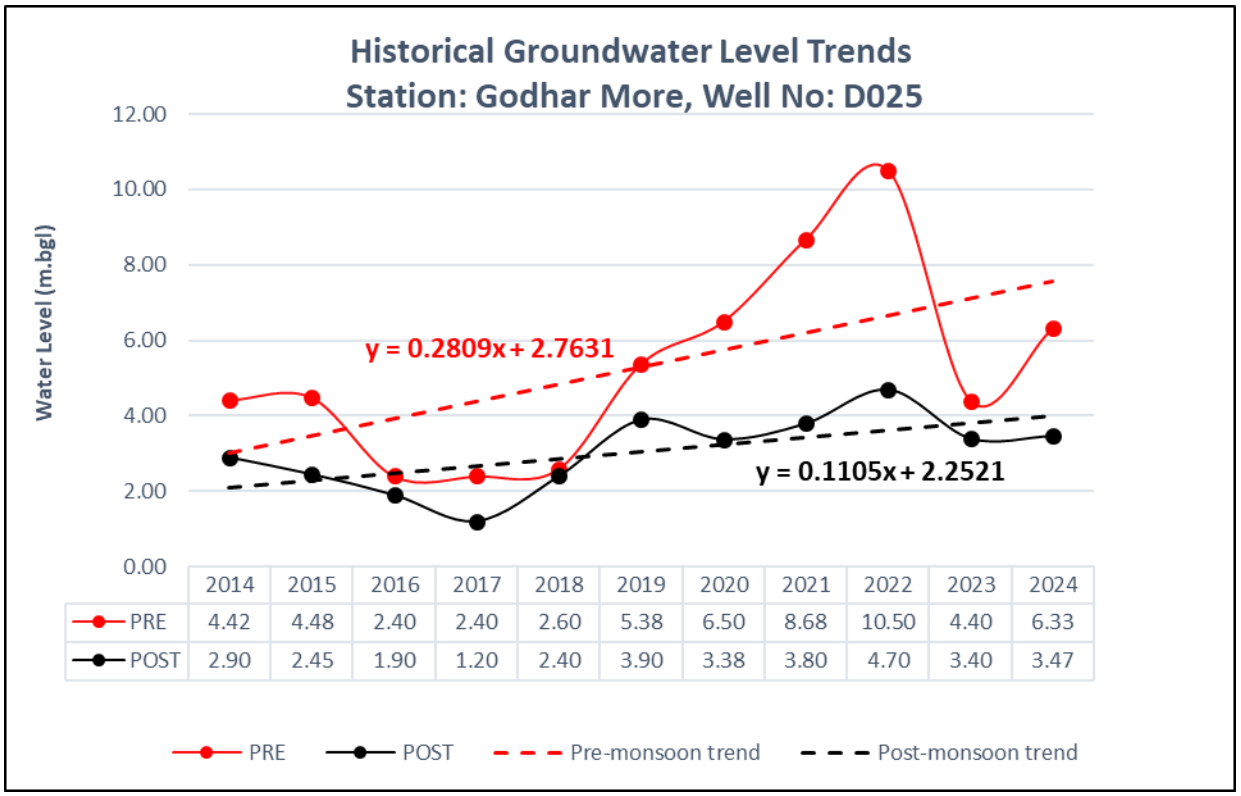
HYDROGRAPHS OF CLUSTER-V



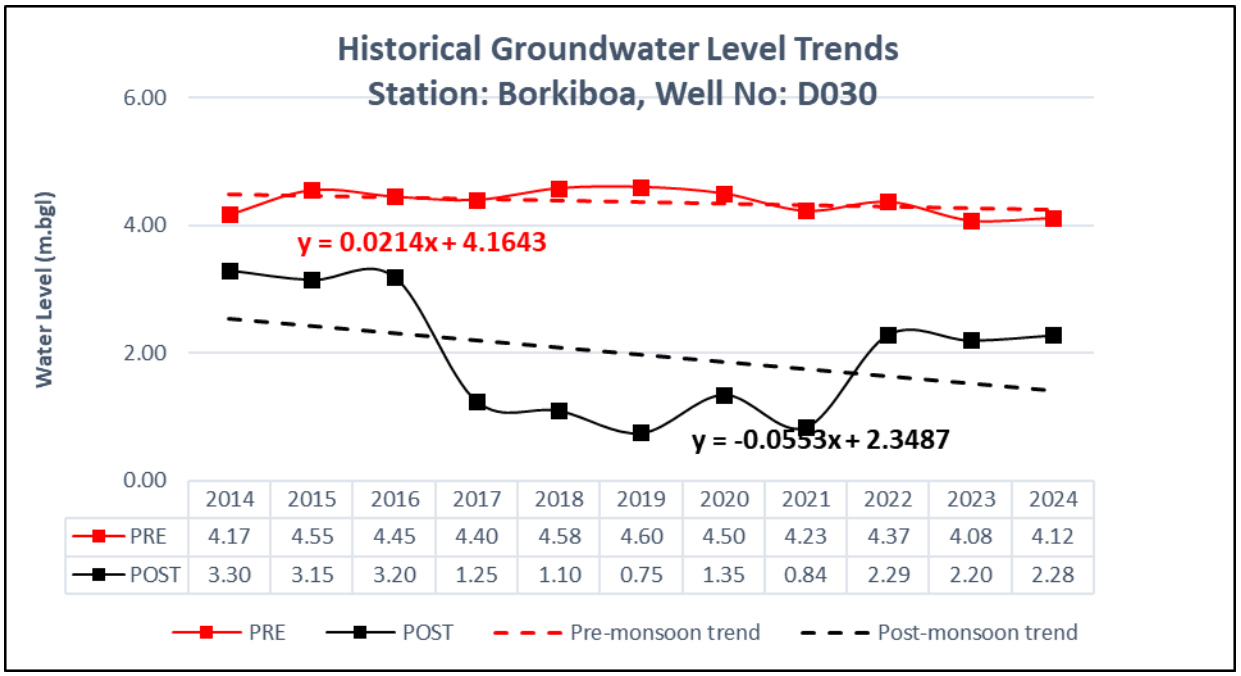


Annexure – VI

HYDROGRAPHS OF CLUSTER-VI



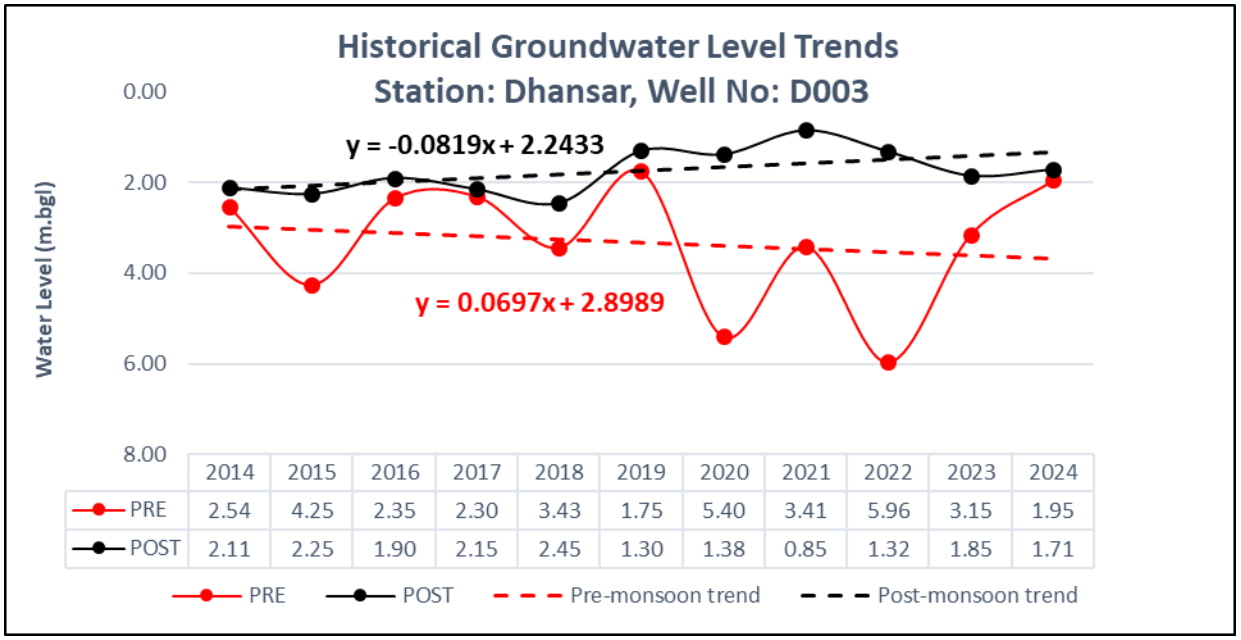
	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024
PRE	4.42	4.48	2.40	2.40	2.60	5.38	6.50	8.68	10.50	4.40	6.33
POST	2.90	2.45	1.90	1.20	2.40	3.90	3.38	3.80	4.70	3.40	3.47

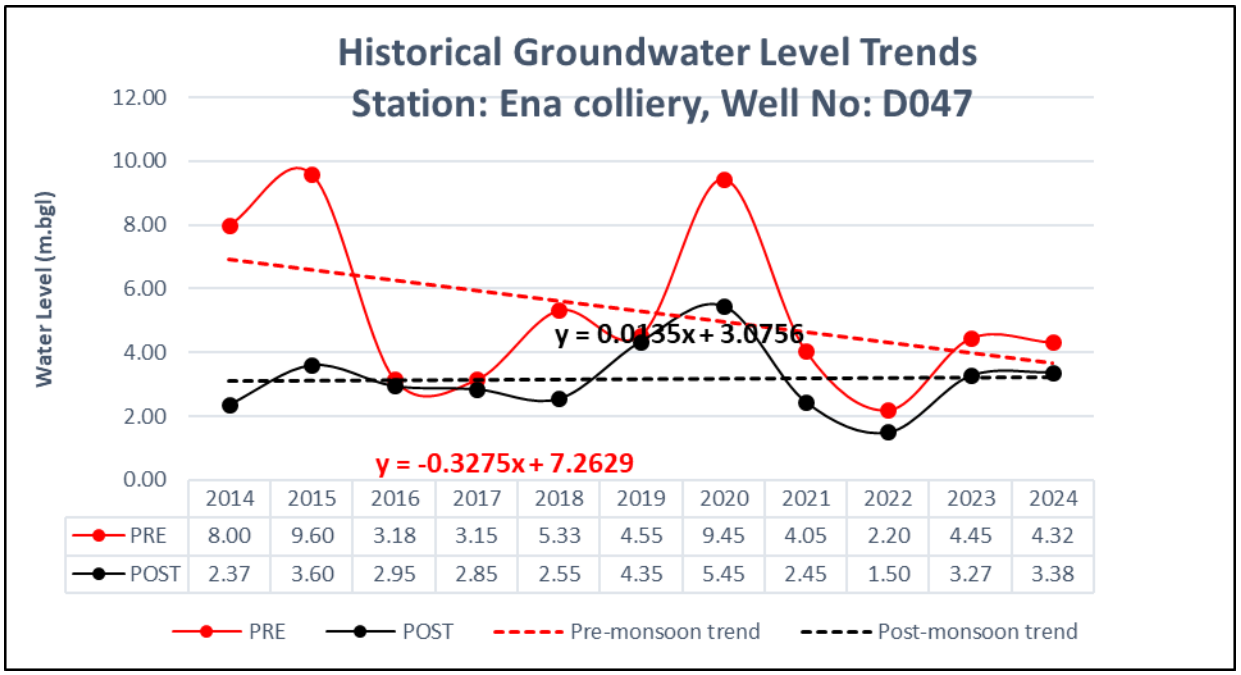


	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024
PRE	4.17	4.55	4.45	4.40	4.58	4.60	4.50	4.23	4.37	4.08	4.12
POST	3.30	3.15	3.20	1.25	1.10	0.75	1.35	0.84	2.29	2.20	2.28

Annexure – VI

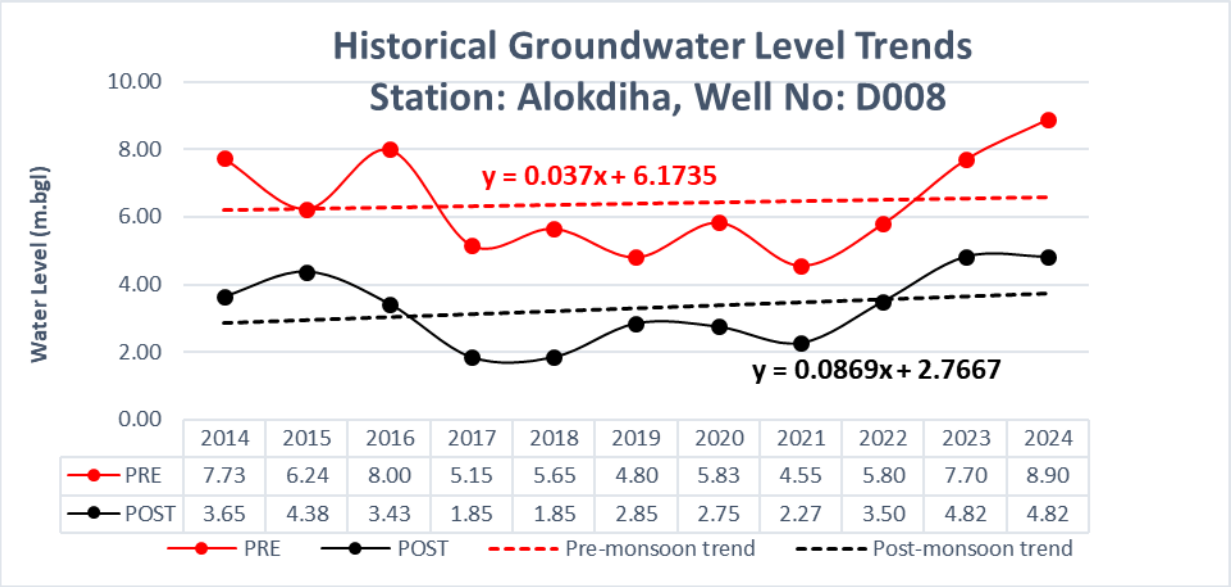
HYDROGRAPHS OF CLUSTER-VII



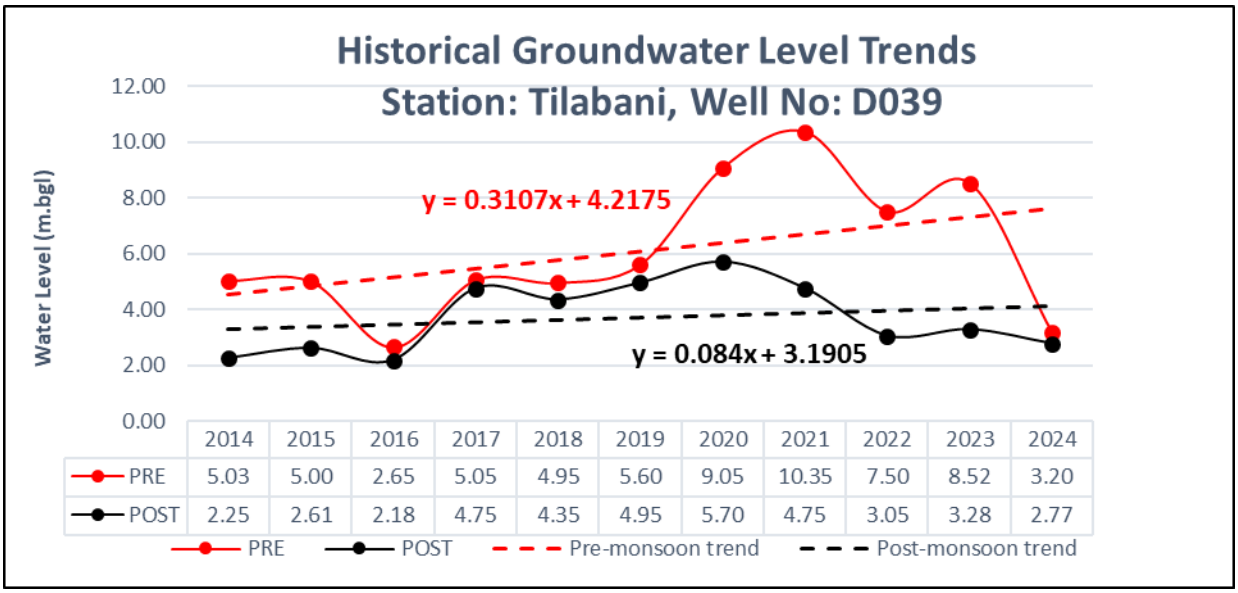


Annexure – VI

HYDROGRAPHS OF CLUSTER-VIII



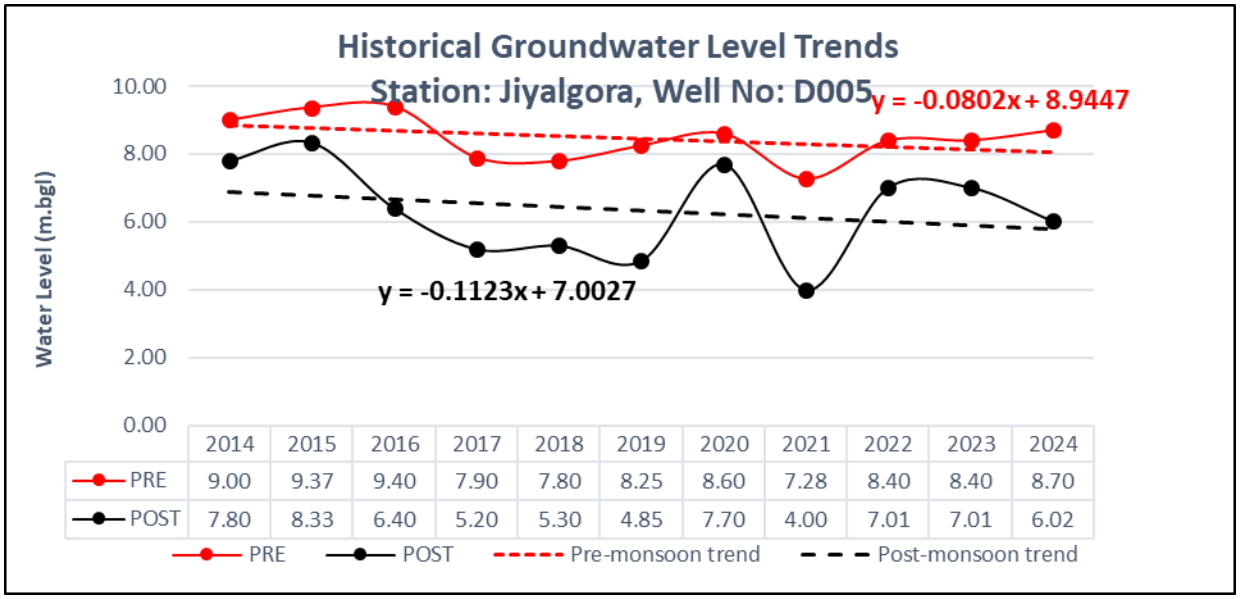
	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024
PRE	7.73	6.24	8.00	5.15	5.65	4.80	5.83	4.55	5.80	7.70	8.90
POST	3.65	4.38	3.43	1.85	1.85	2.85	2.75	2.27	3.50	4.82	4.82

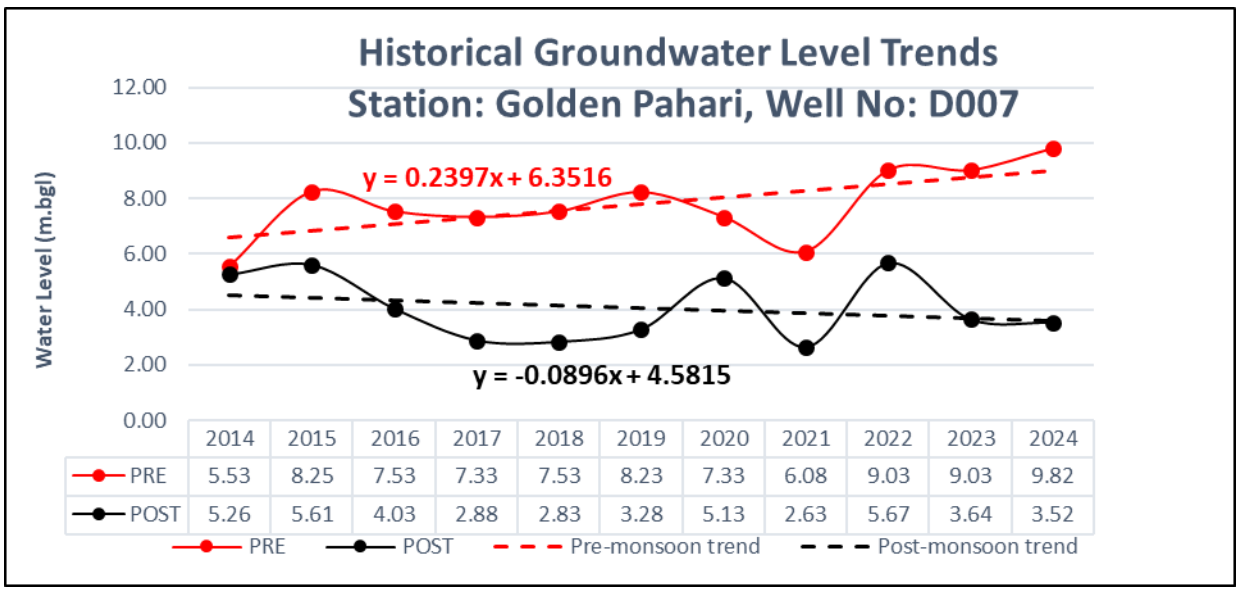


	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024
PRE	5.03	5.00	2.65	5.05	4.95	5.60	9.05	10.35	7.50	8.52	3.20
POST	2.25	2.61	2.18	4.75	4.35	4.95	5.70	4.75	3.05	3.28	2.77

Annexure – VI

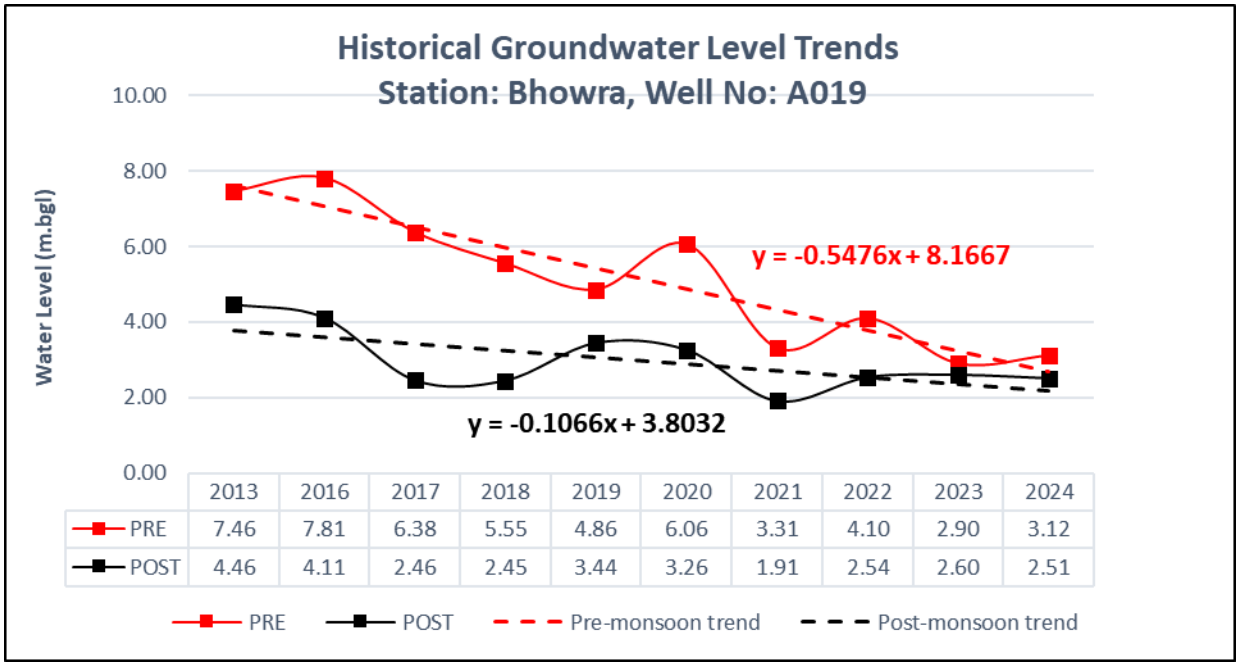
HYDROGRAPHS OF CLUSTER-IX



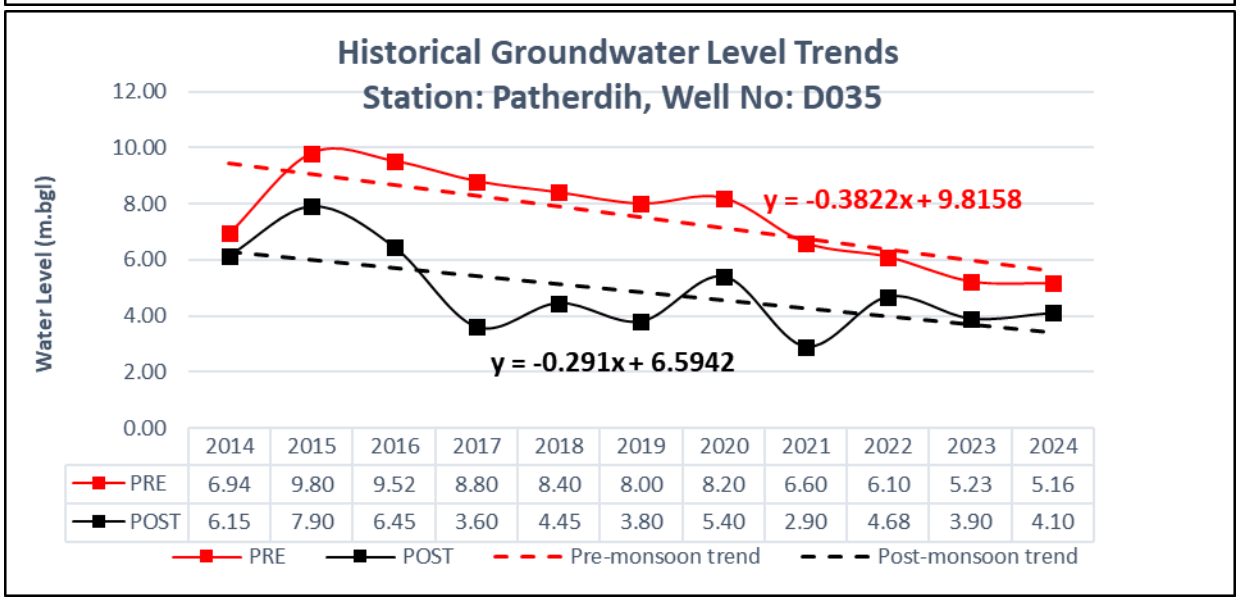


Annexure – VI

HYDROGRAPHS OF CLUSTER-X



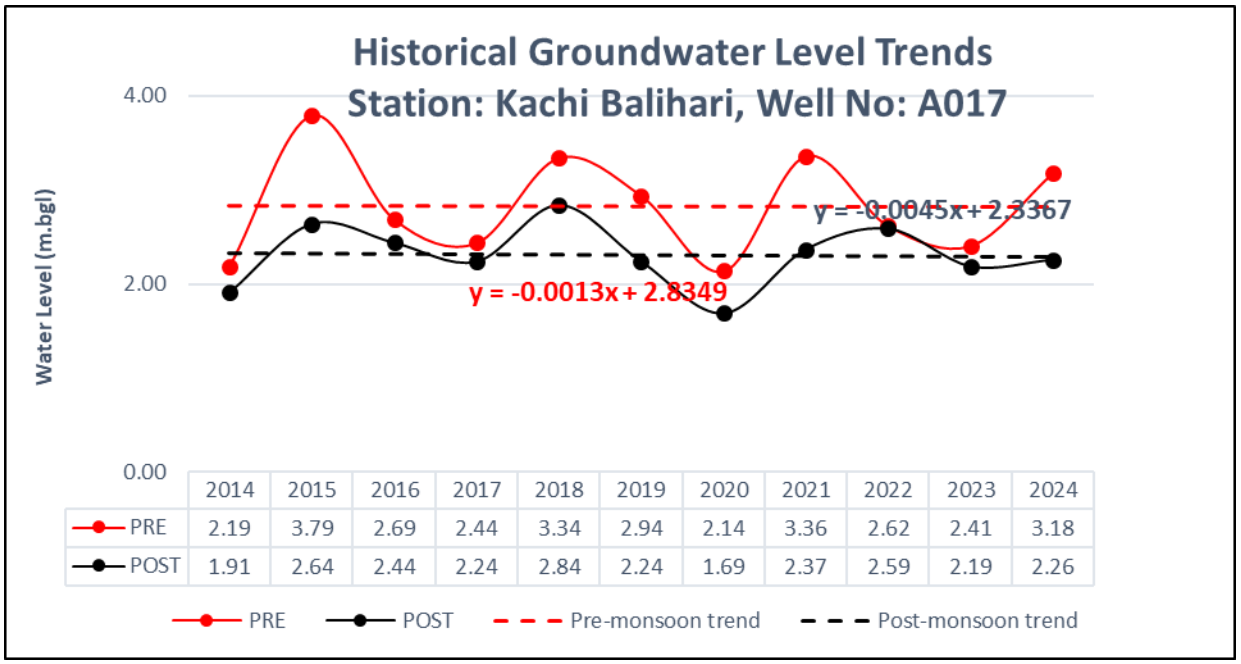
	2013	2016	2017	2018	2019	2020	2021	2022	2023	2024
PRE	7.46	7.81	6.38	5.55	4.86	6.06	3.31	4.10	2.90	3.12
POST	4.46	4.11	2.46	2.45	3.44	3.26	1.91	2.54	2.60	2.51



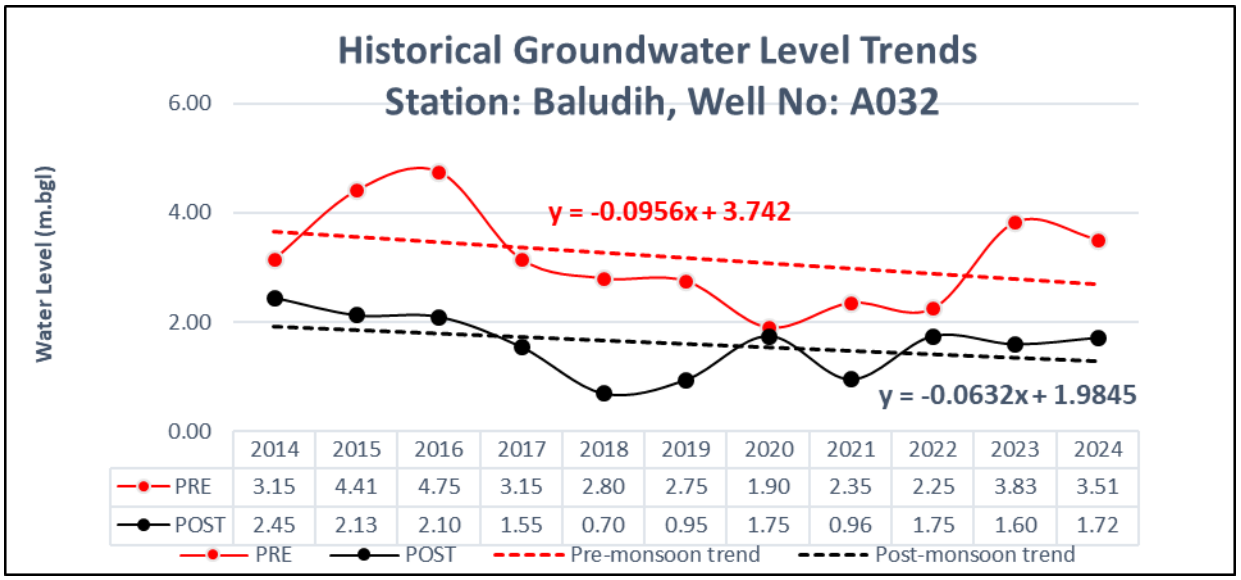
	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024
PRE	6.94	9.80	9.52	8.80	8.40	8.00	8.20	6.60	6.10	5.23	5.16
POST	6.15	7.90	6.45	3.60	4.45	3.80	5.40	2.90	4.68	3.90	4.10

Annexure – VI

HYDROGRAPHS OF CLUSTER-XI



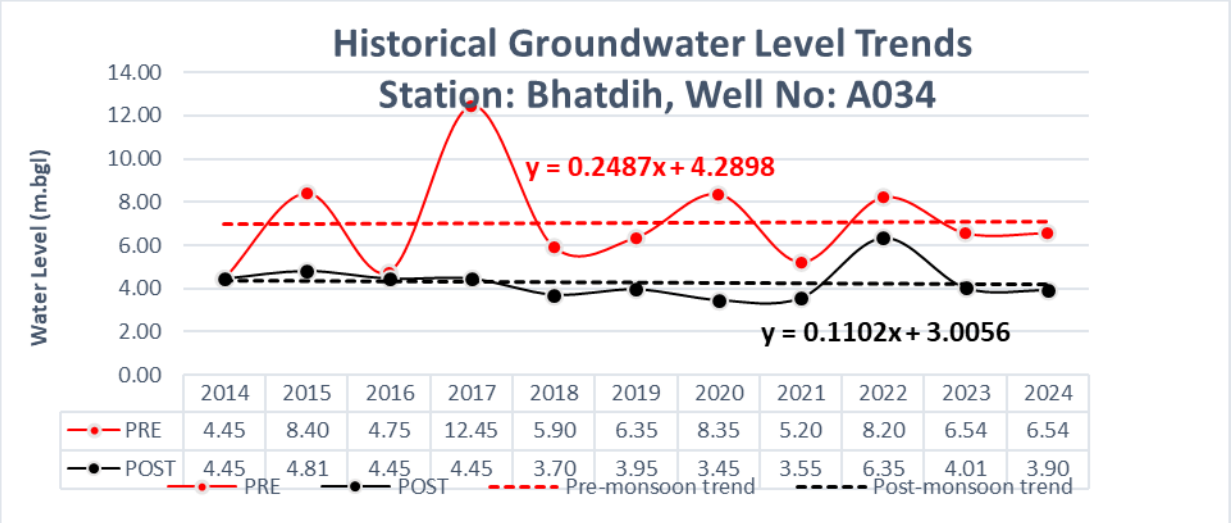
	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024
PRE	2.19	3.79	2.69	2.44	3.34	2.94	2.14	3.36	2.62	2.41	3.18
POST	1.91	2.64	2.44	2.24	2.84	2.24	1.69	2.37	2.59	2.19	2.26

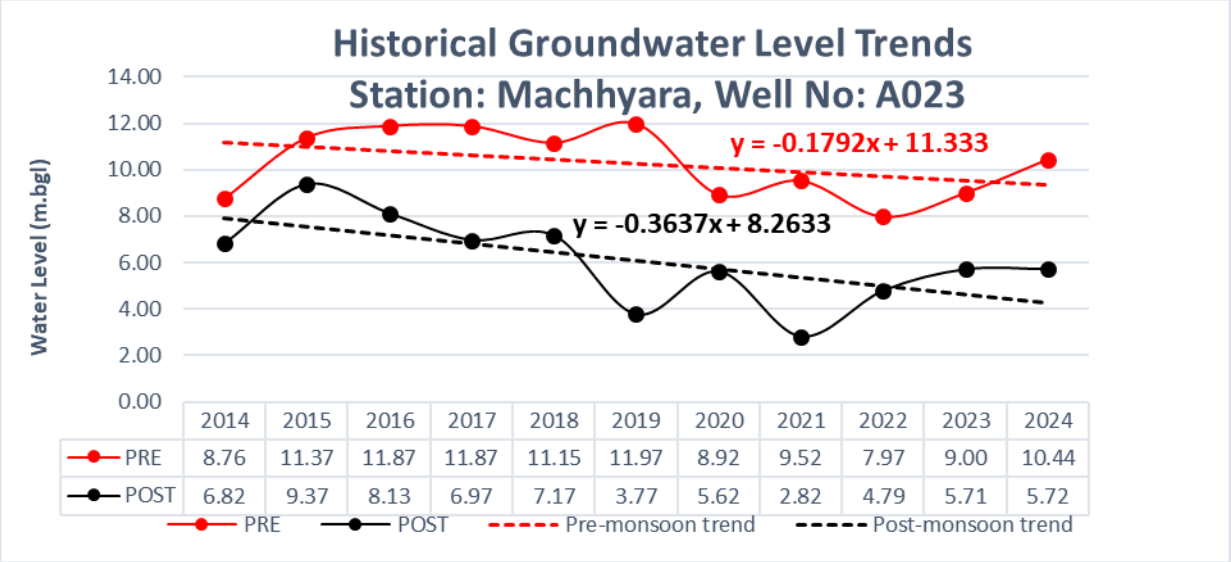


	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024
PRE	3.15	4.41	4.75	3.15	2.80	2.75	1.90	2.35	2.25	3.83	3.51
POST	2.45	2.13	2.10	1.55	0.70	0.95	1.75	0.96	1.75	1.60	1.72

Annexure – VI

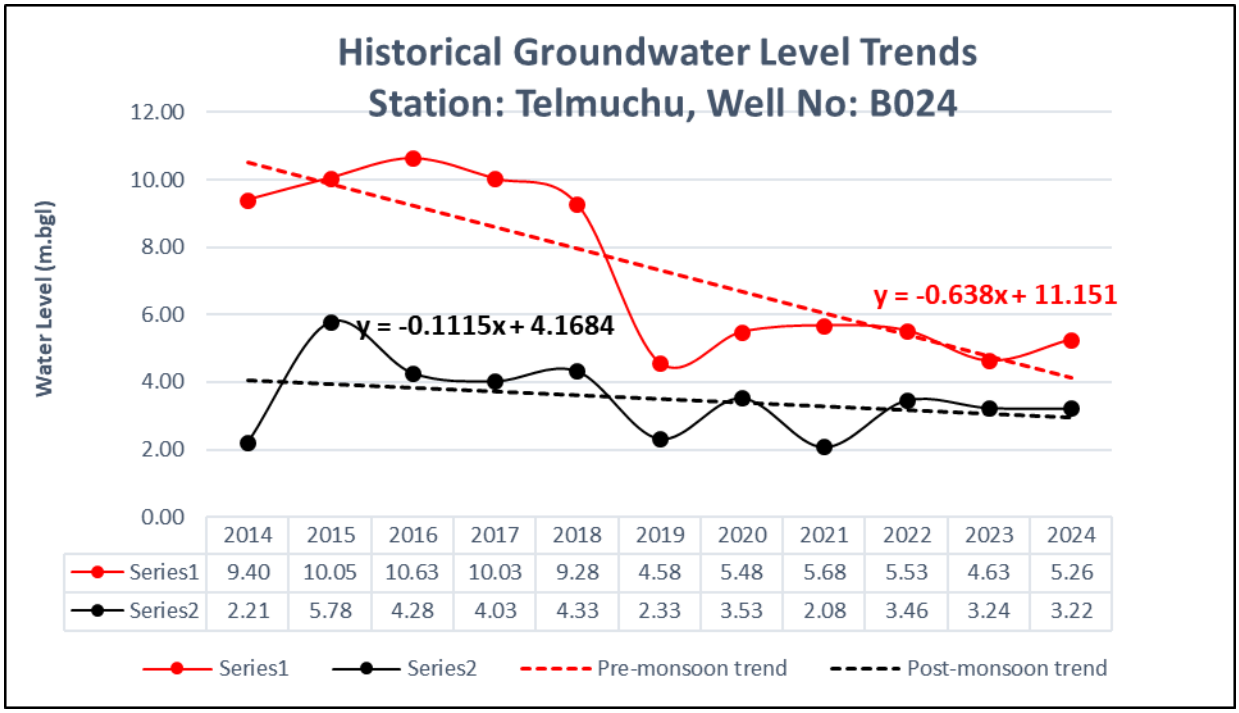
HYDROGRAPHS OF CLUSTER-XIII

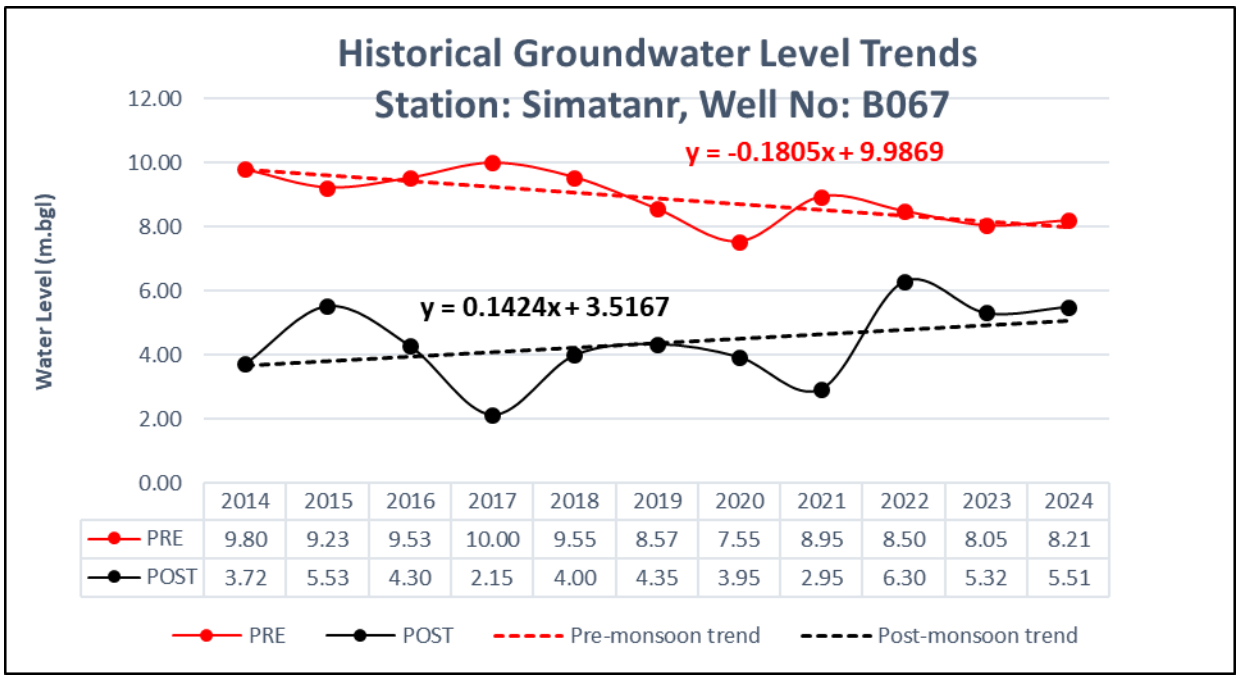




Annexure – VI

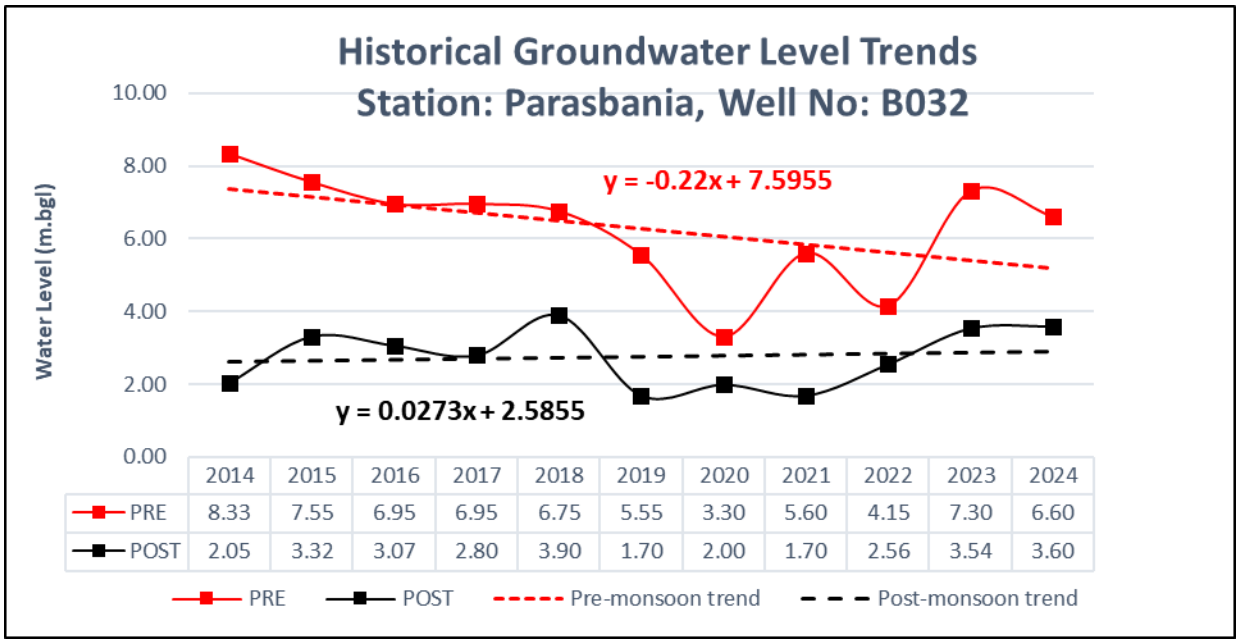
HYDROGRAPHS OF CLUSTER-XIV



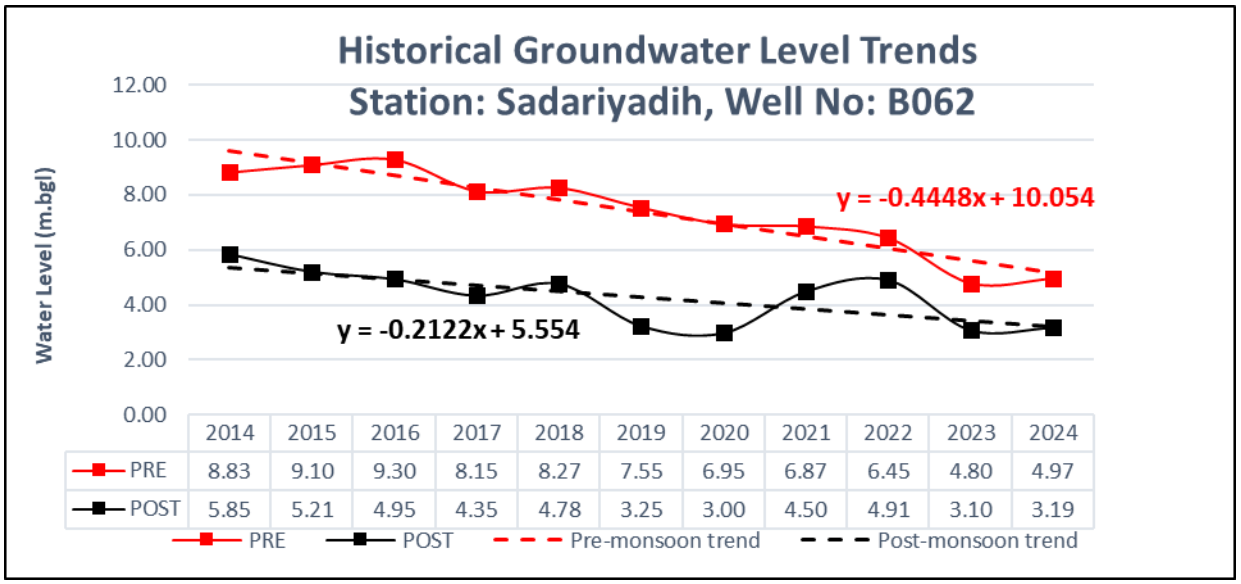


Annexure – VI

HYDROGRAPHS OF CLUSTER-XV



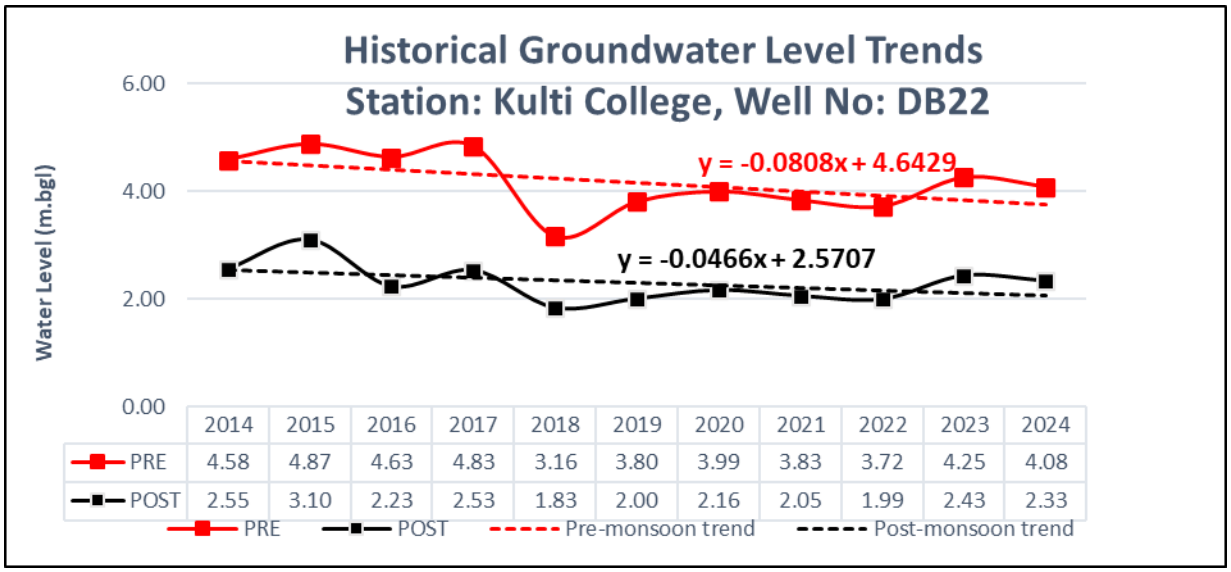
	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024
PRE	8.33	7.55	6.95	6.95	6.75	5.55	3.30	5.60	4.15	7.30	6.60
POST	2.05	3.32	3.07	2.80	3.90	1.70	2.00	1.70	2.56	3.54	3.60



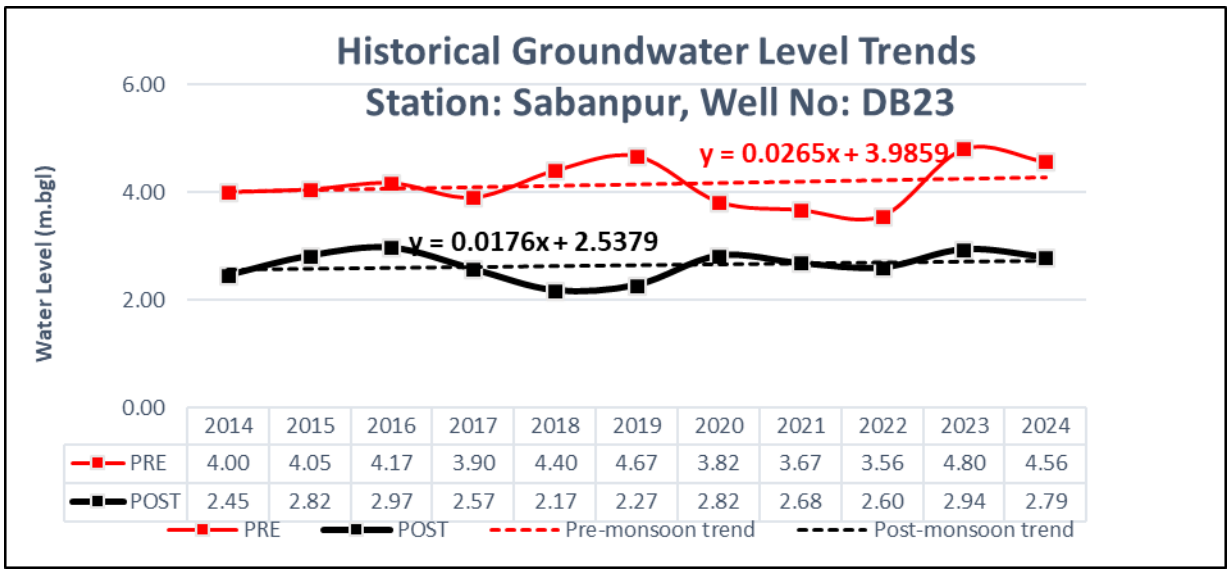
	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024
PRE	8.83	9.10	9.30	8.15	8.27	7.55	6.95	6.87	6.45	4.80	4.97
POST	5.85	5.21	4.95	4.35	4.78	3.25	3.00	4.50	4.91	3.10	3.19

Annexure – VI

HYDROGRAPHS OF CLUSTER-XVI

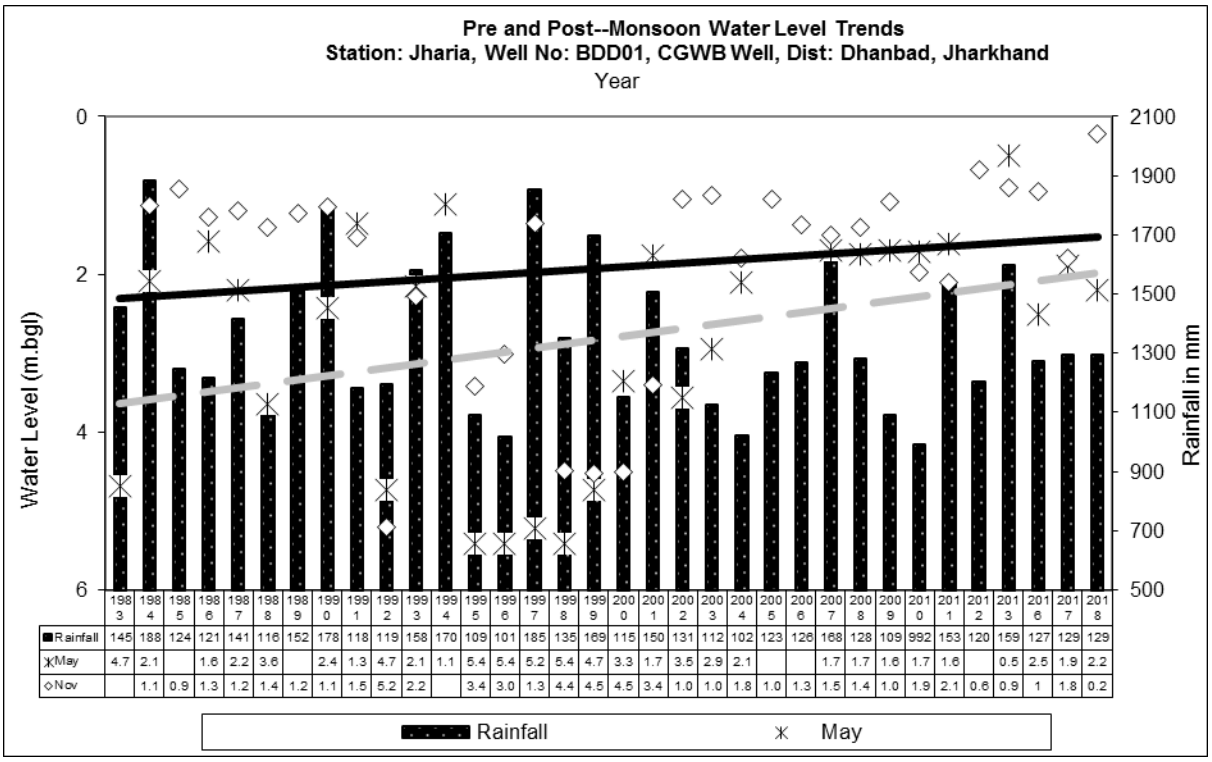


	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024
PRE	4.58	4.87	4.63	4.83	3.16	3.80	3.99	3.83	3.72	4.25	4.08
POST	2.55	3.10	2.23	2.53	1.83	2.00	2.16	2.05	1.99	2.43	2.33

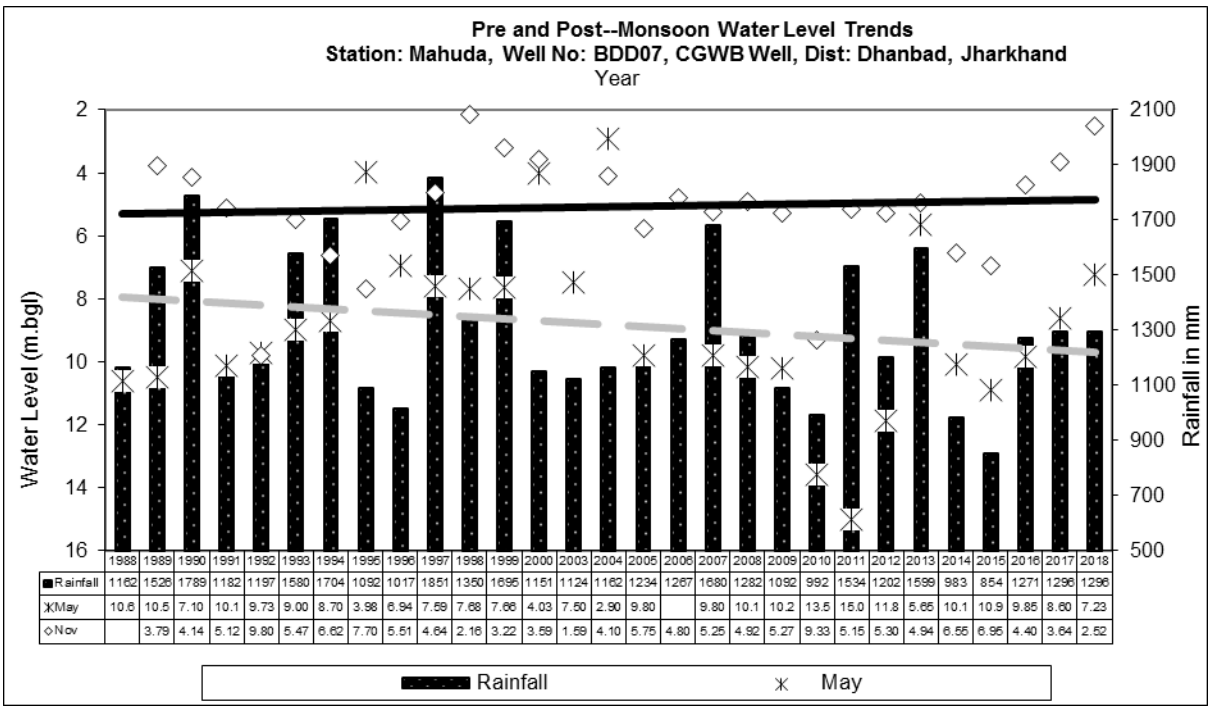


	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024
PRE	4.00	4.05	4.17	3.90	4.40	4.67	3.82	3.67	3.56	4.80	4.56
POST	2.45	2.82	2.97	2.57	2.17	2.27	2.82	2.68	2.60	2.94	2.79

HYDROGRAPHS OF CGWB PERMANENT OBSERVATION STATIONS

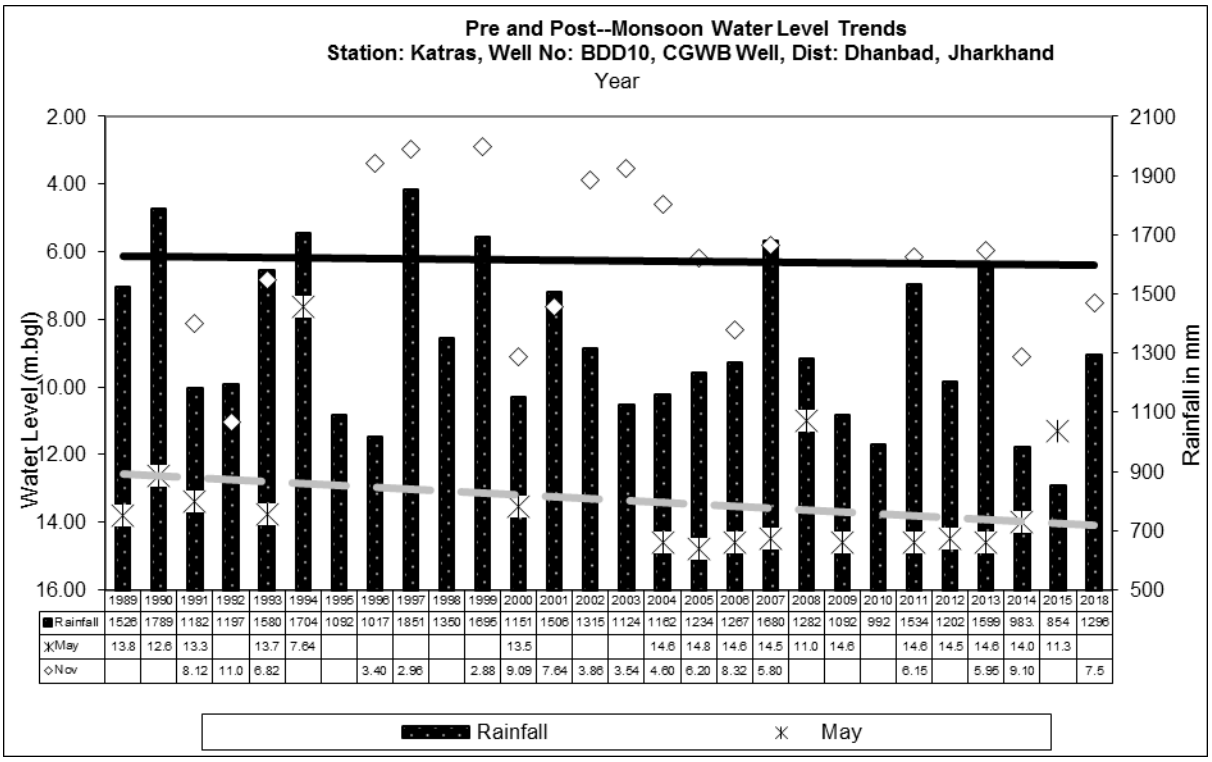


	1983	1984	1985	1986	1987	1988	1989	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018
Rainfall	145	188	124	121	141	116	152	178	118	119	158	170	109	101	185	135	169	115	150	131	112	102	123	126	168	128	109	992	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		

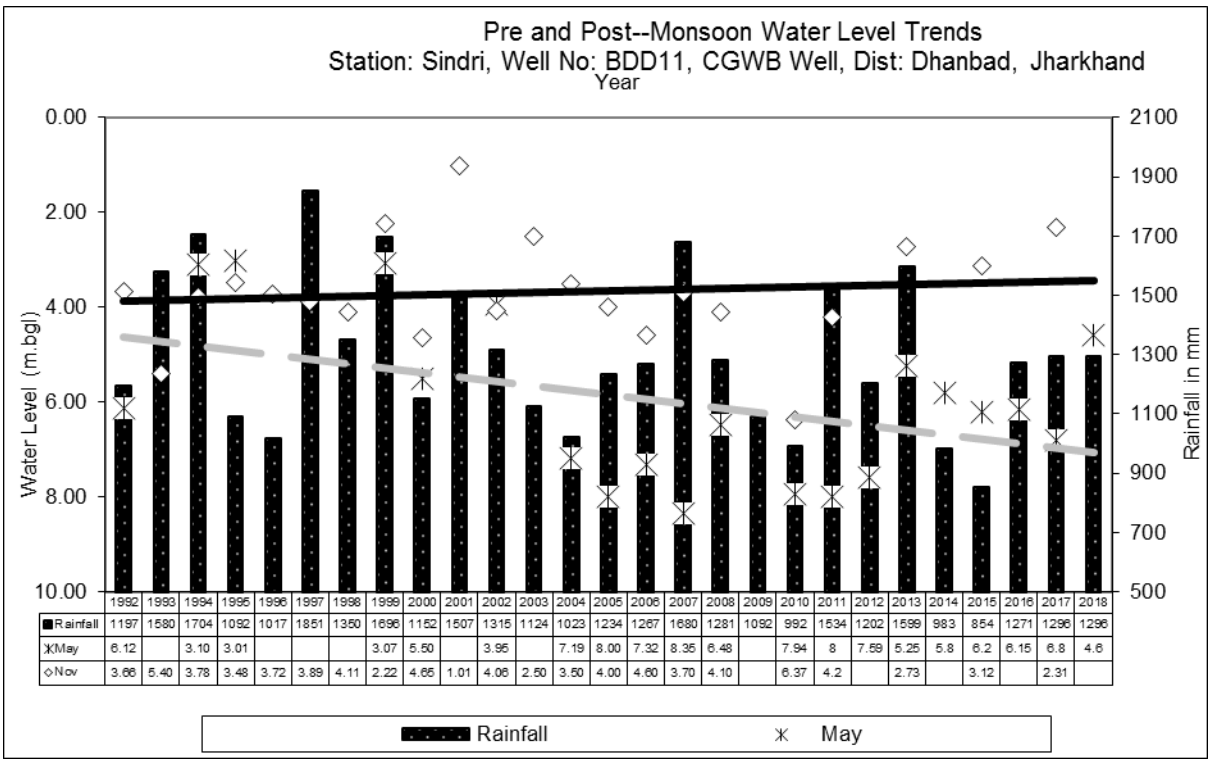


	1988	1989	1990	1991	1992	1993	1994	1996	1996	1997	1998	1999	2000	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018
Rainfall	1162	1526	1789	1182	1197	1580	1704	1092	1017	1851	1350	1695	1151	1124	1162	1234	1267	1680	1282	1092	992	1534	1202	1599	983	854	1271	1296	1296
May	10.6	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

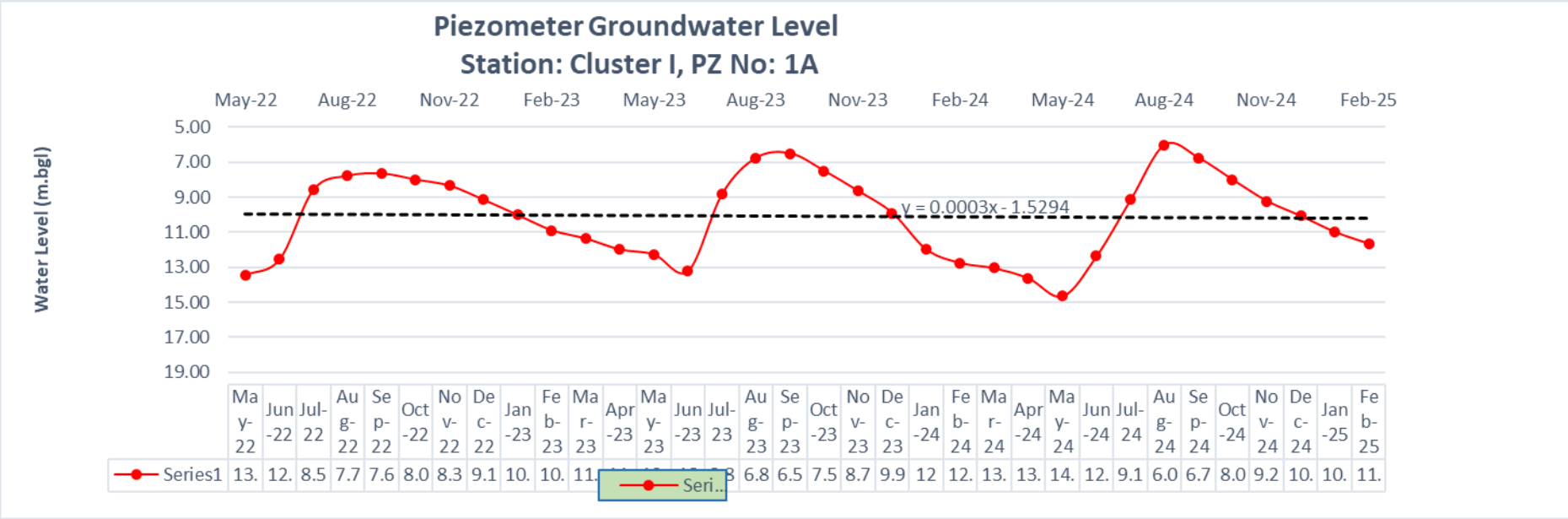


	1989	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2018
Rainfall	1526	1789	1182	1197	1580	1704	1092	1017	1851	1350	1695	1151	1506	1315	1124	1162	1234	1267	1680	1282	1092	992	1534	1202	1599	983.	854	1296
May	13.8	12.6	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



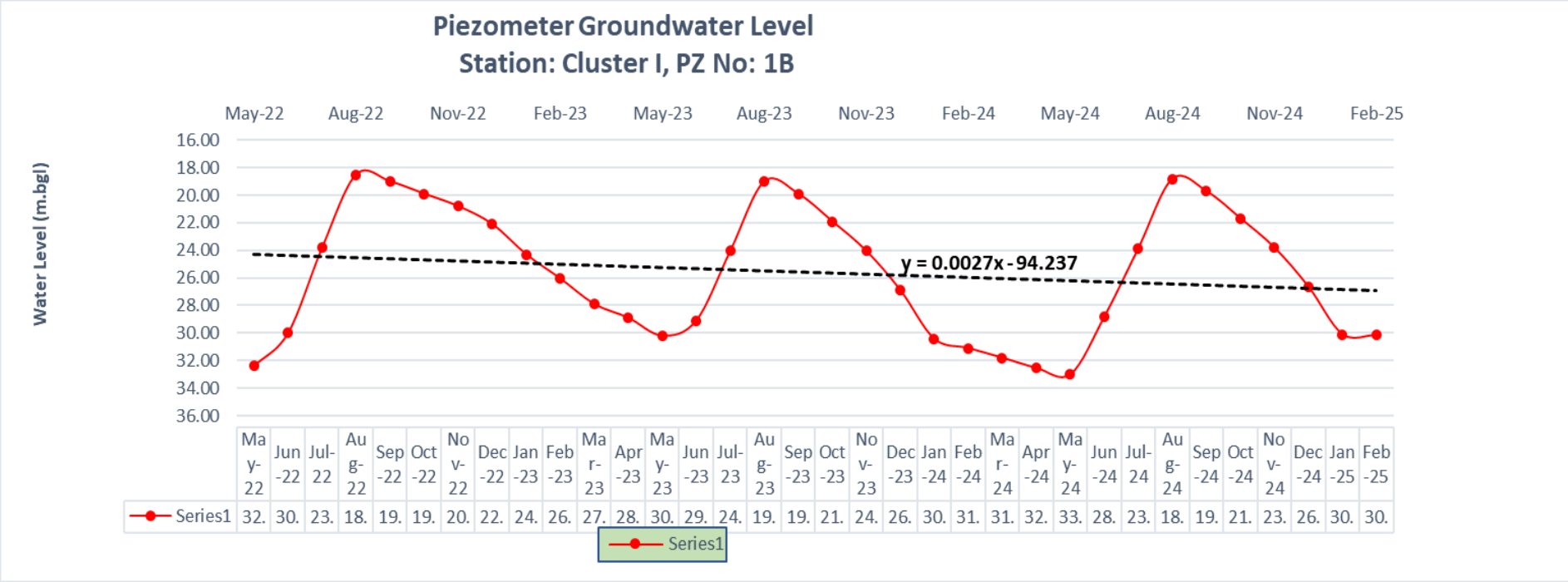
	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018
Rainfall	1197	1580	1704	1092	1017	1851	1350	1696	1152	1507	1315	1124	1023	1234	1267	1680	1281	1092	992	1534	1202	1599	983	854	1271	1296	1296
May	6.12		3.10	3.01				3.07	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

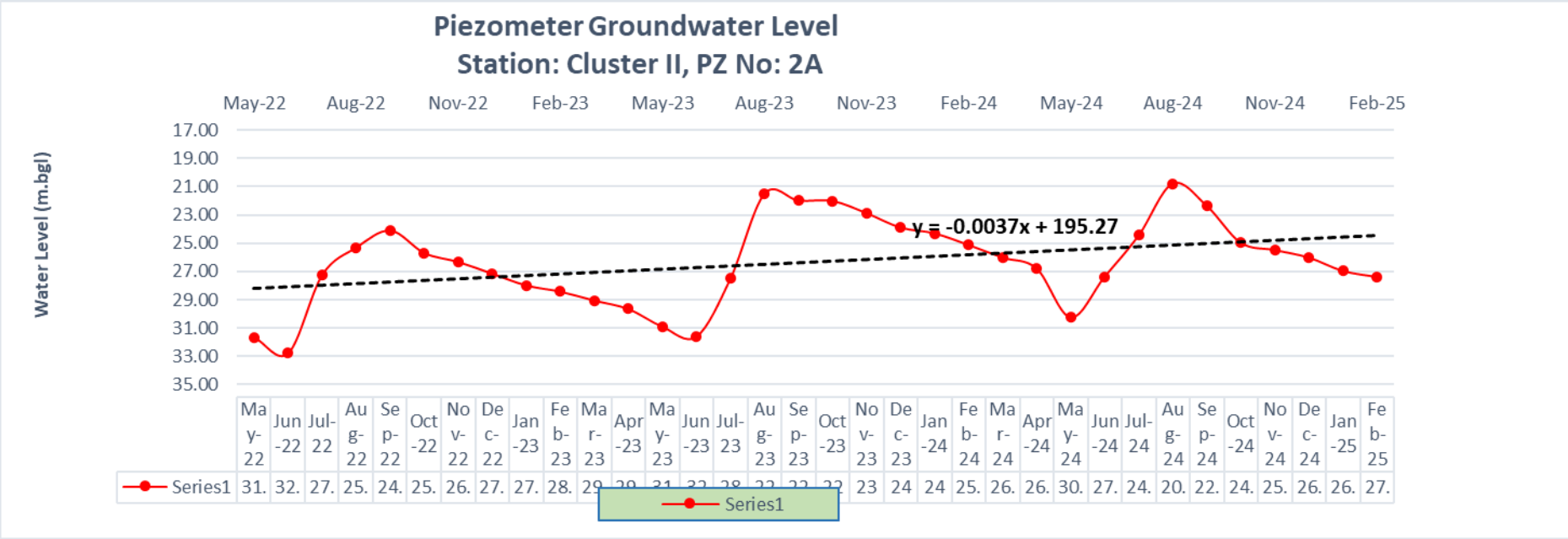


Annexure – VIA

PIEZOMETER HYDROGRAPHS



PIEZOMETER HYDROGRAPHS



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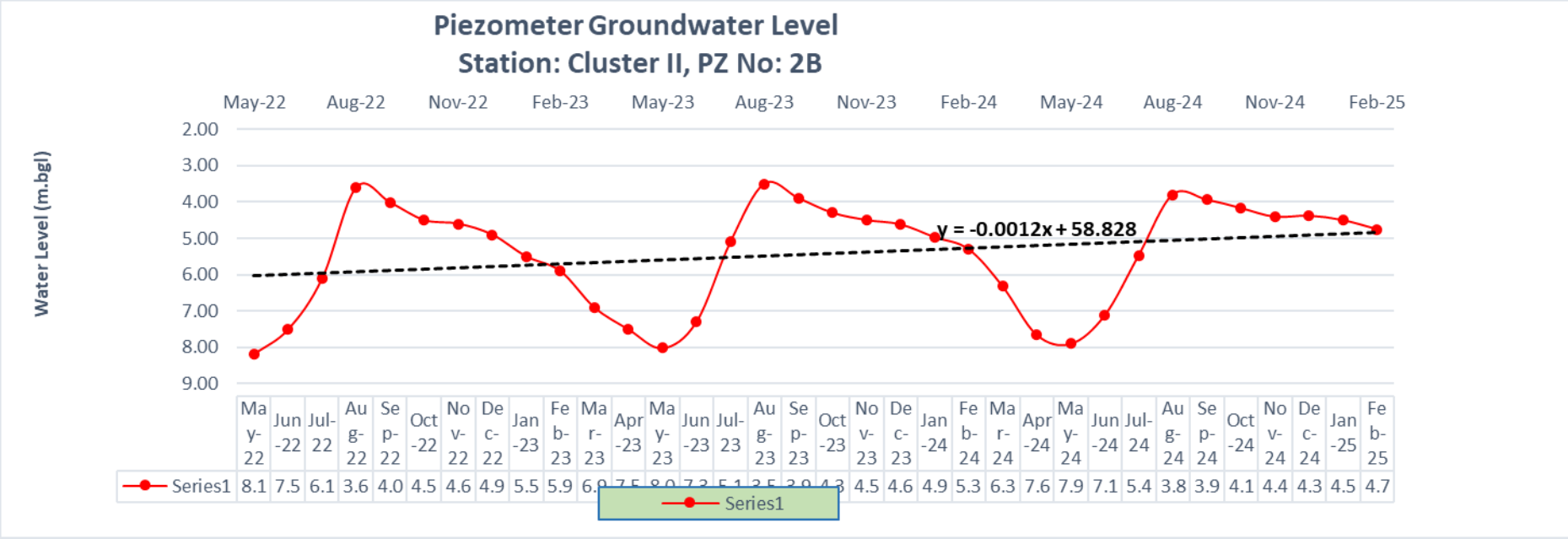

Annexure – VIA

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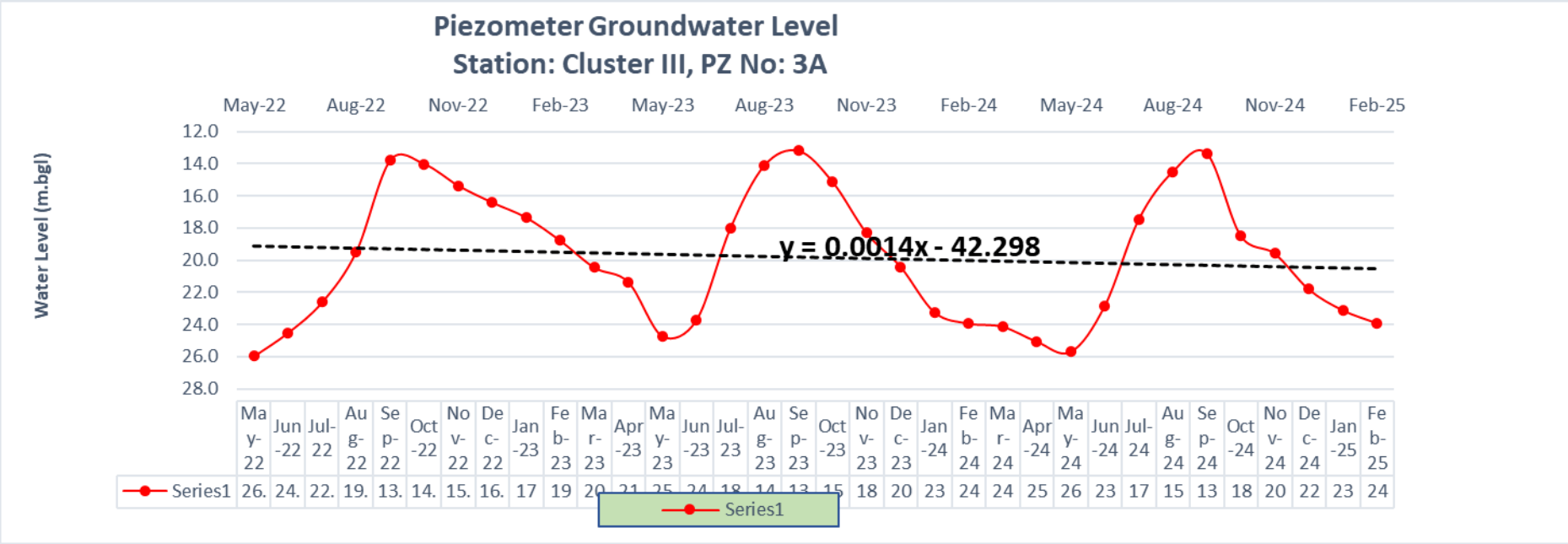

Annexure – VIA

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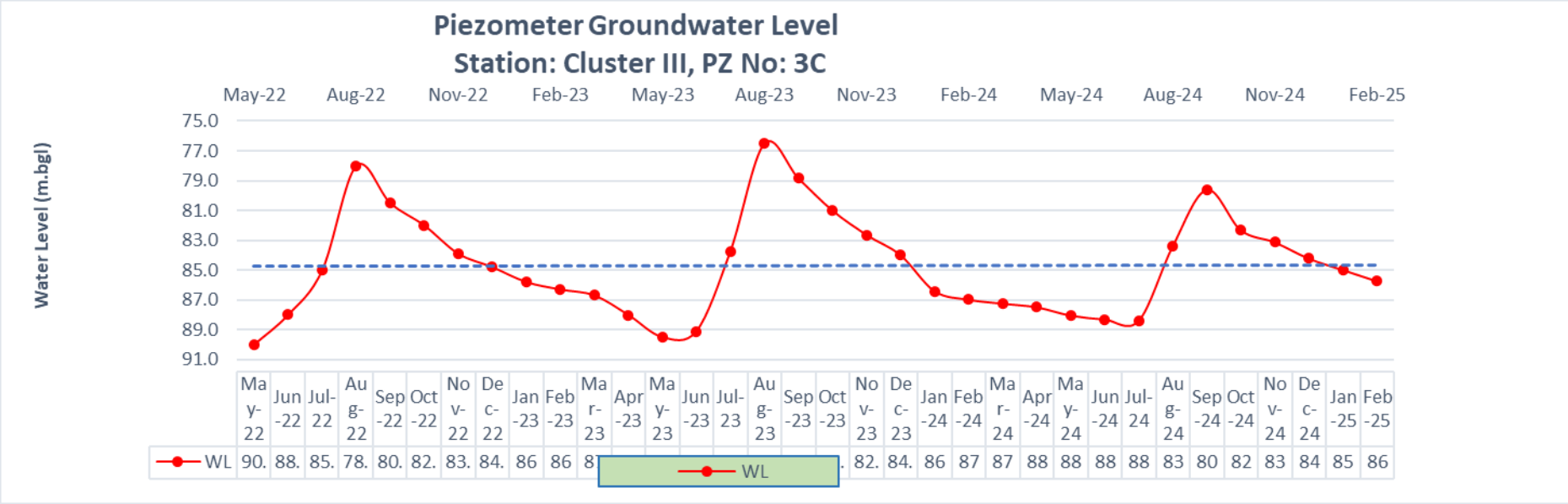

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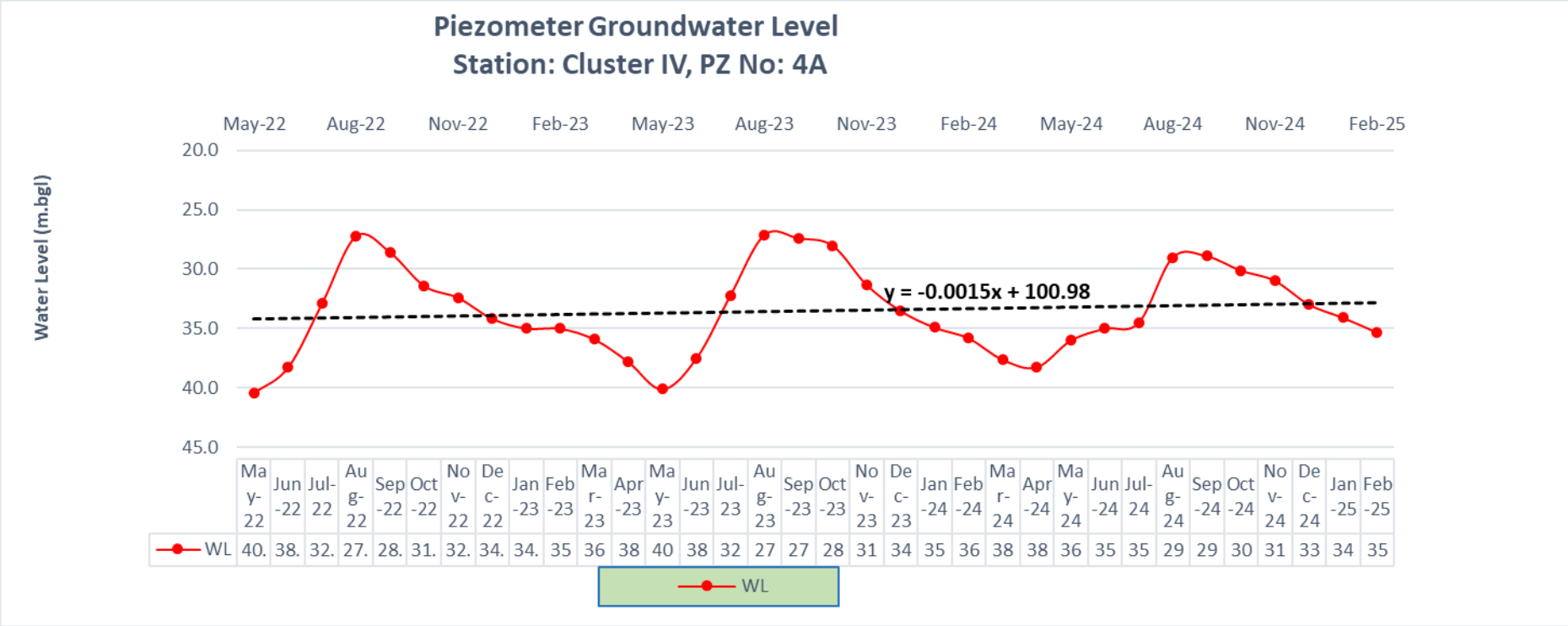

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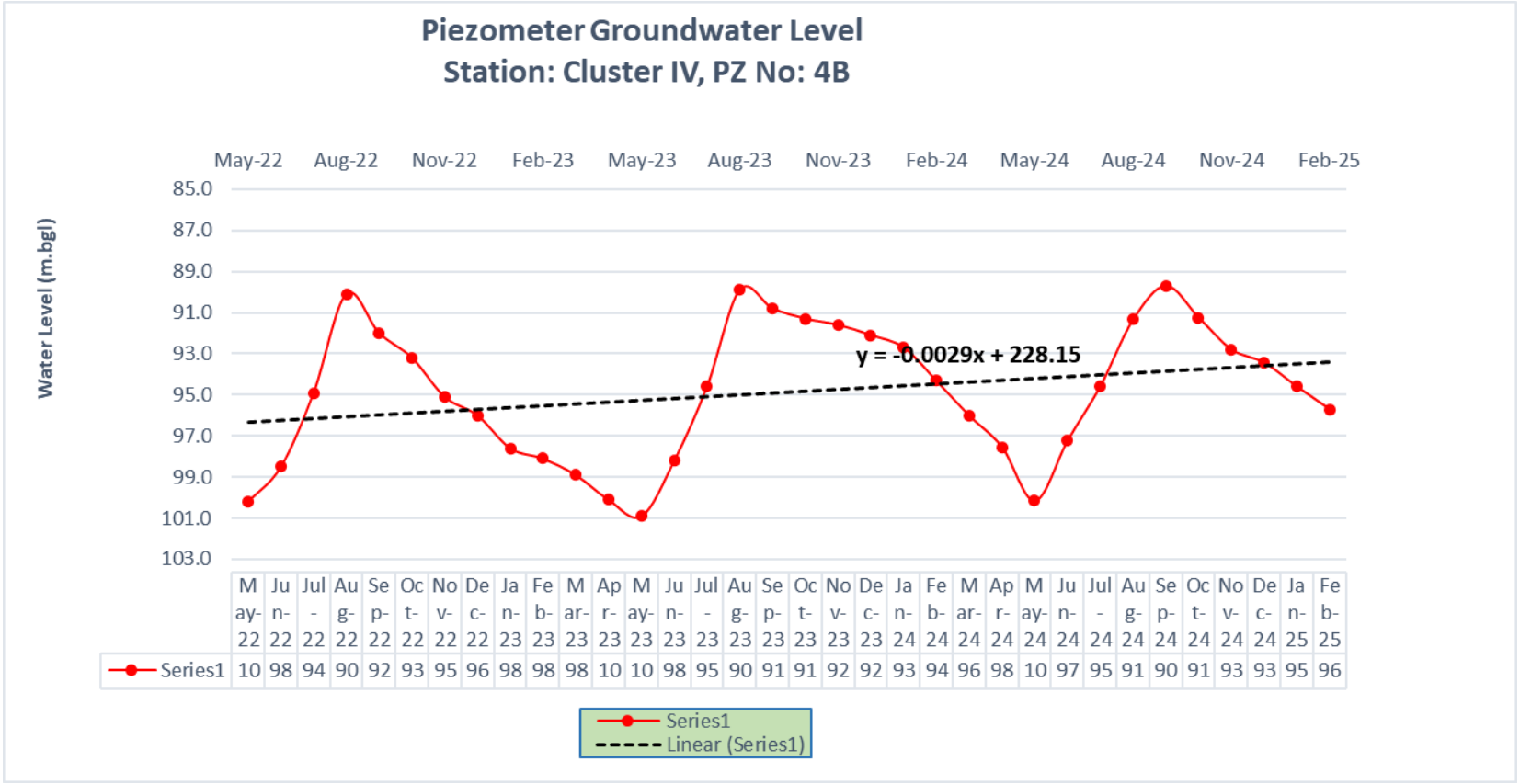

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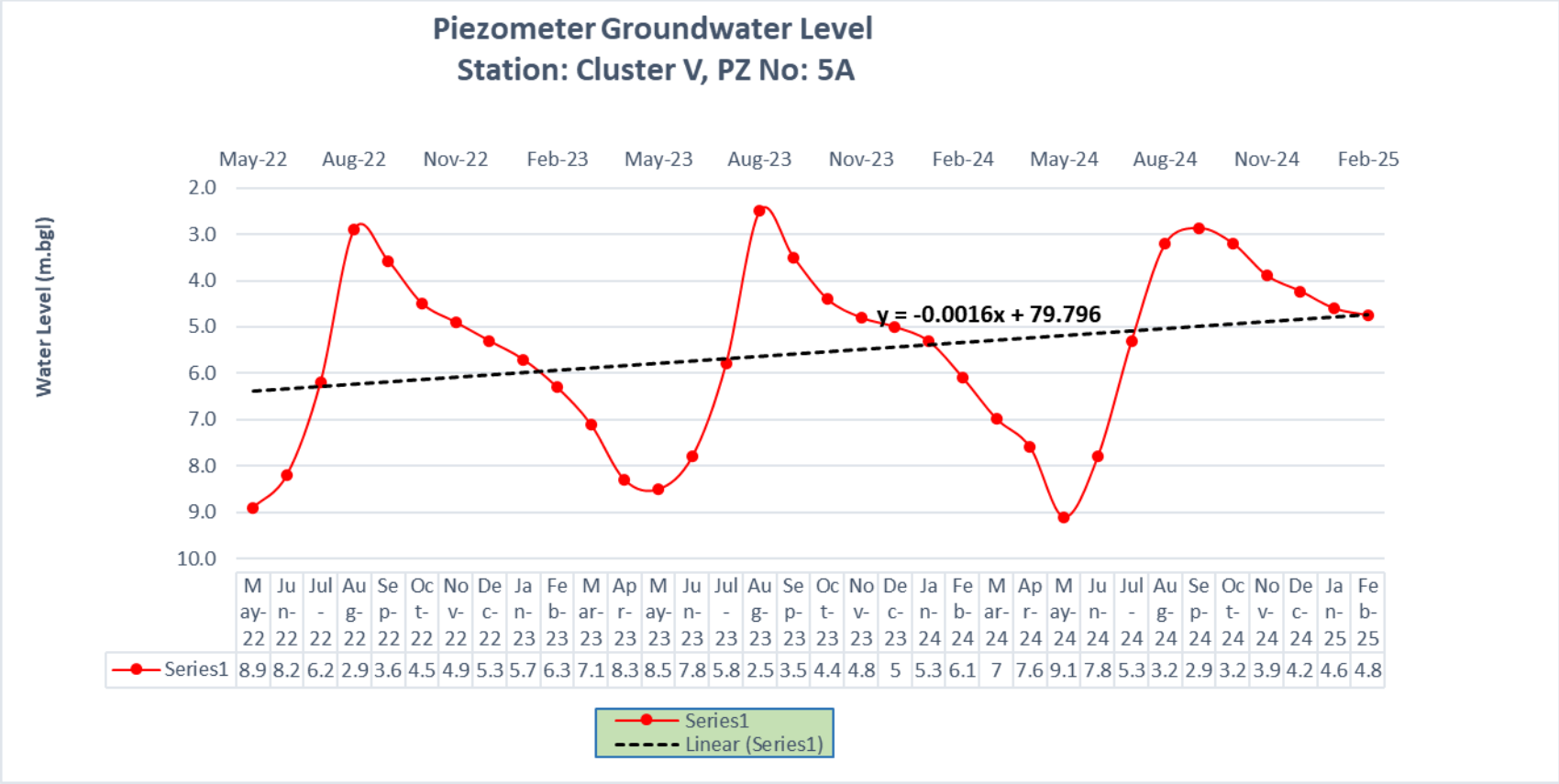

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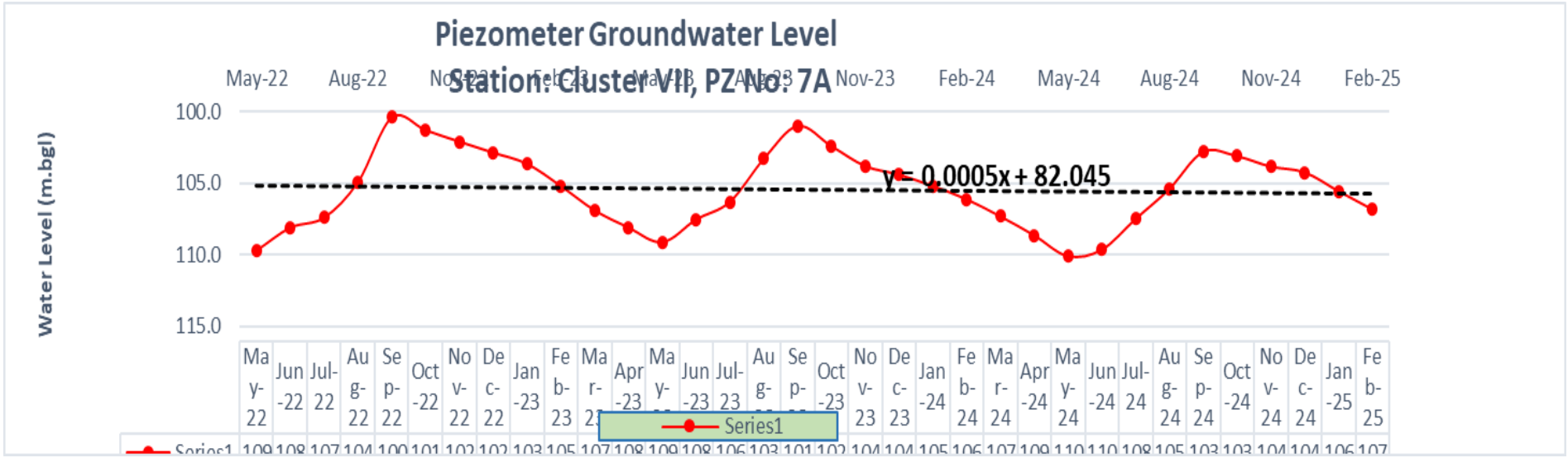

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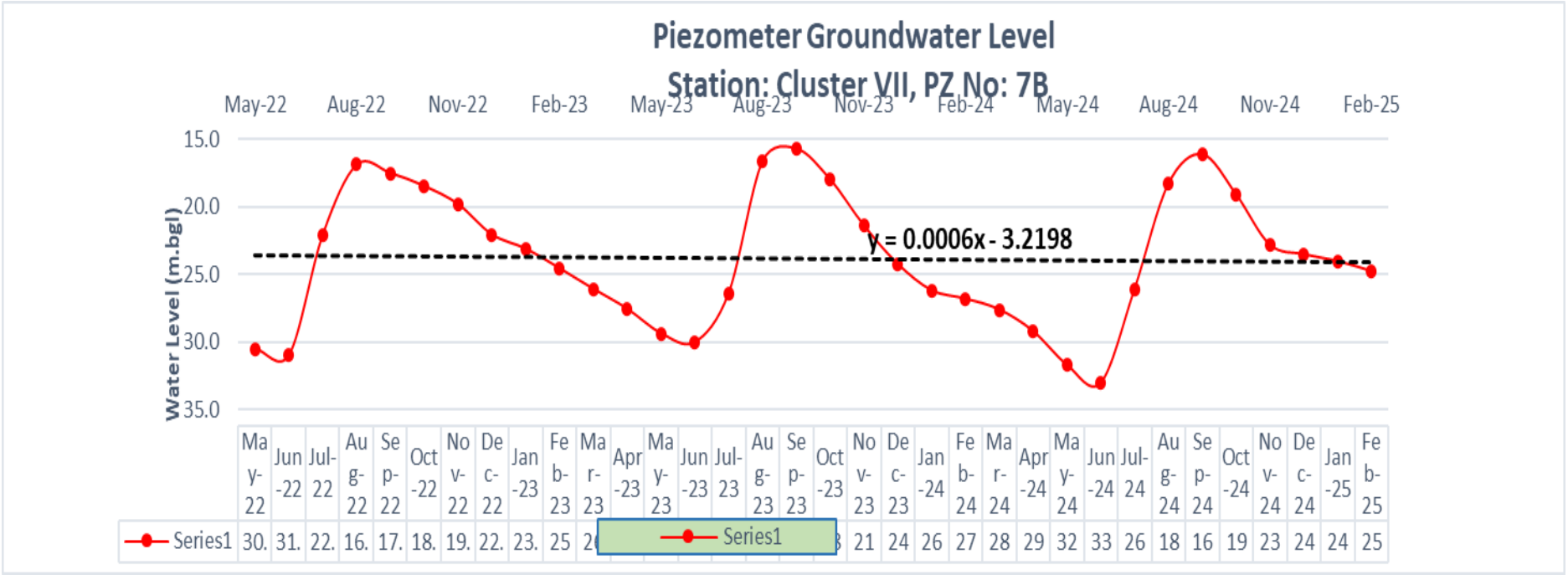

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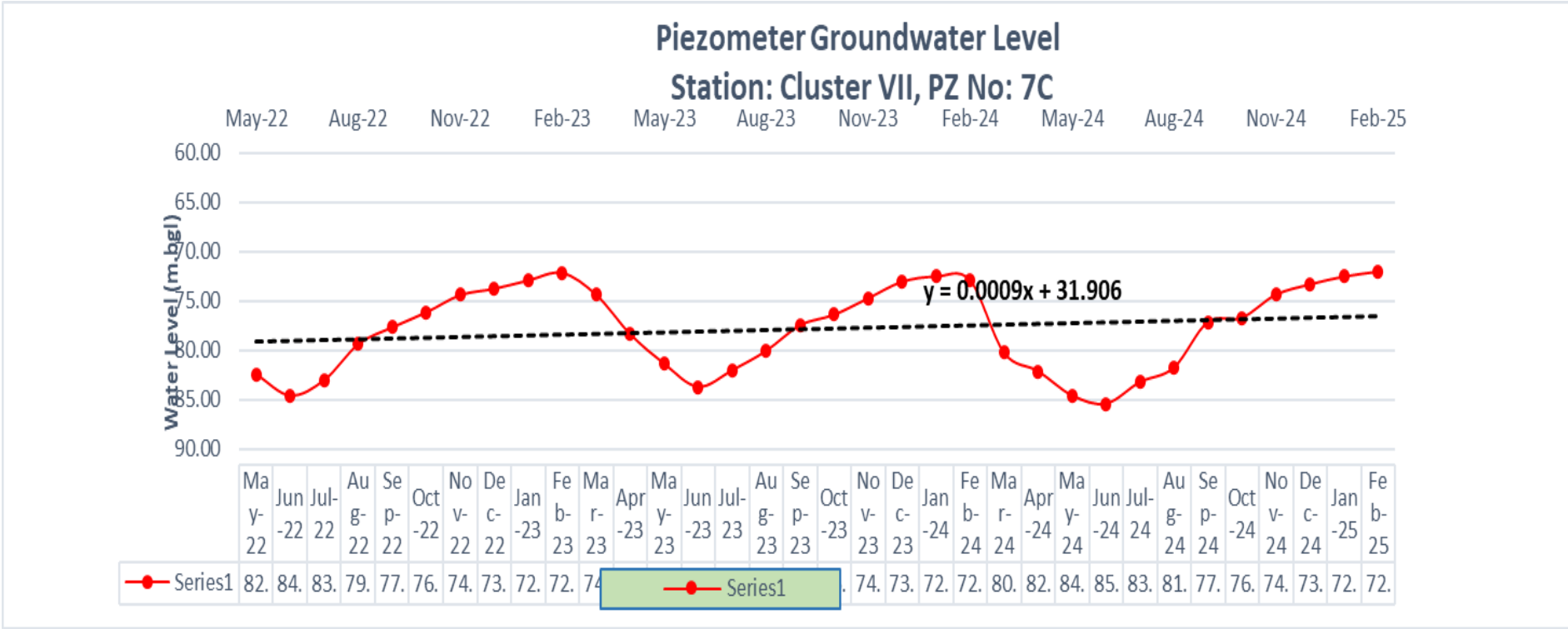

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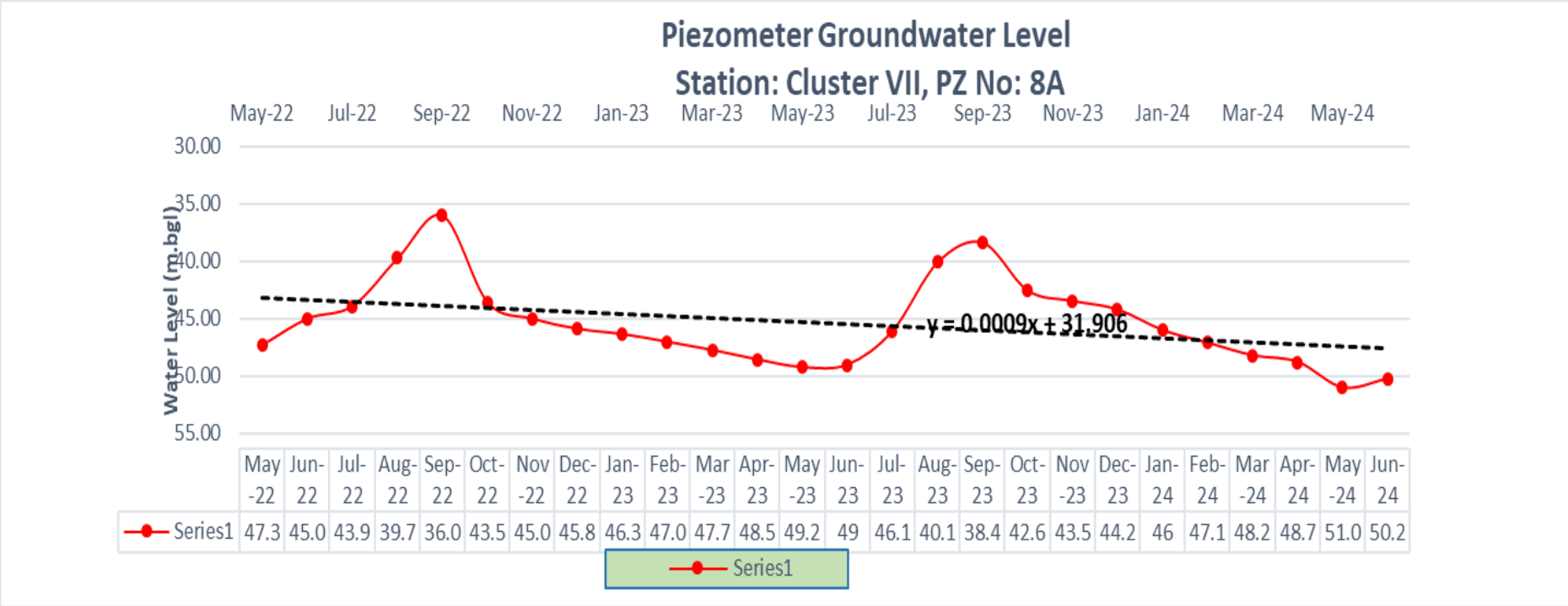
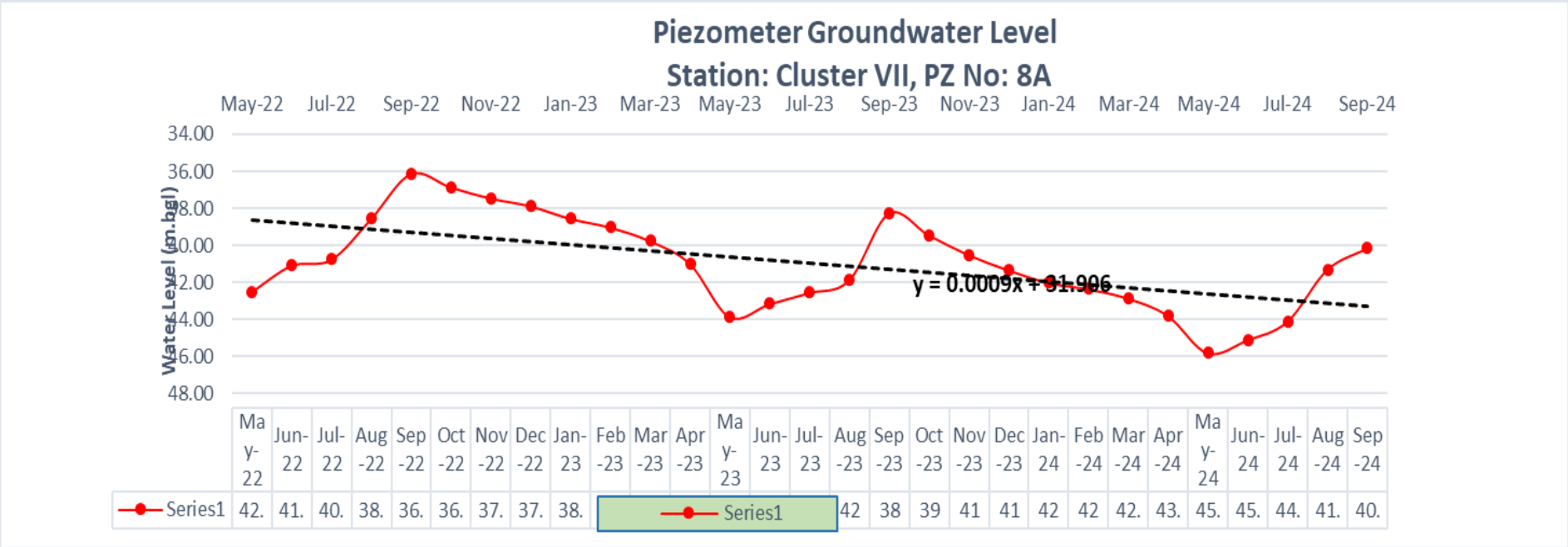


Annexure – VIA

PIEZOMETER HYDROGRAPHS



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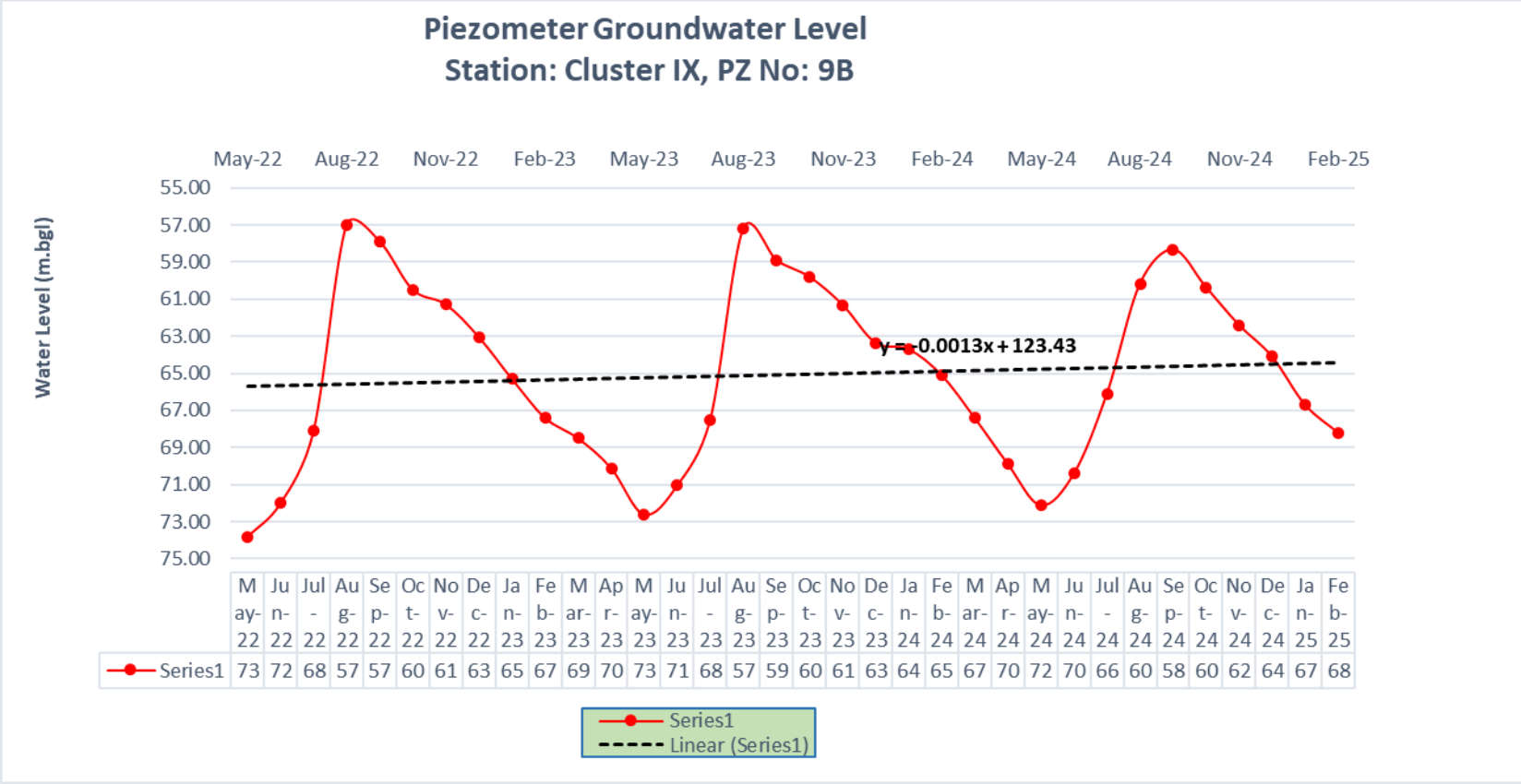

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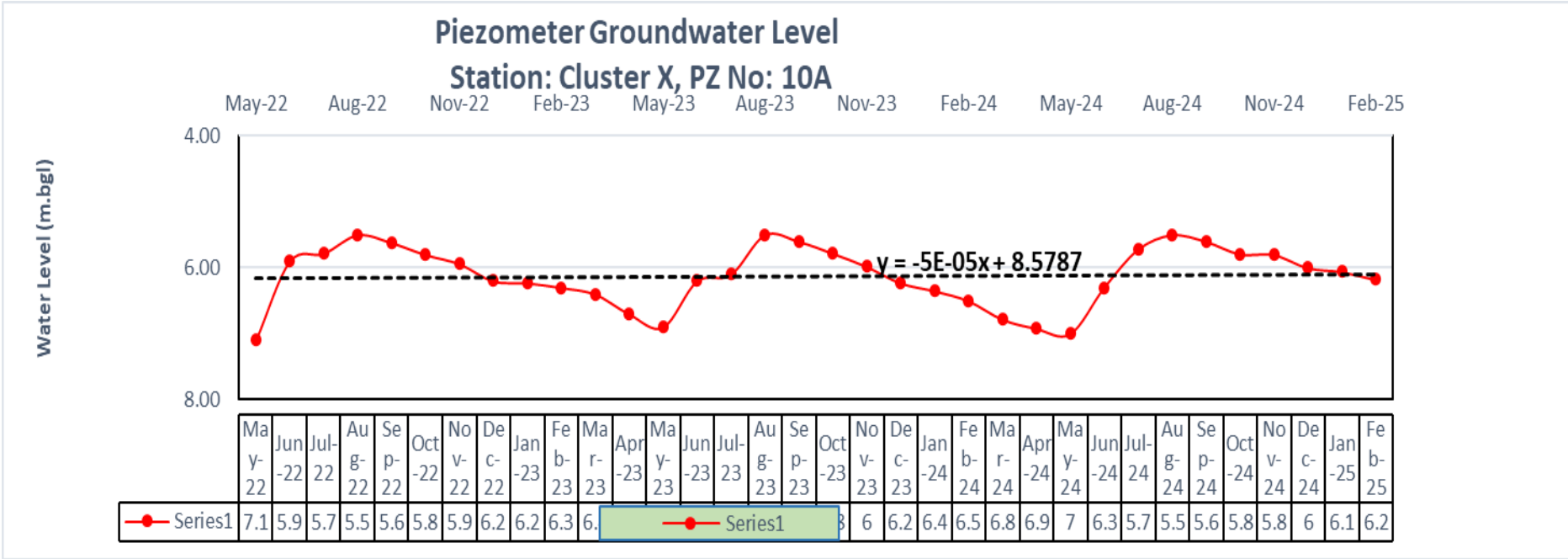
Series1	73	72	68	57	57	60	61	63	65	67	69	70	73	71	68	57	59	60	61	63	64	65	67	70	72	70	66	60	58	60	62	64	67	68

Annexure – VIA

PIEZOMETER HYDROGRAPHS



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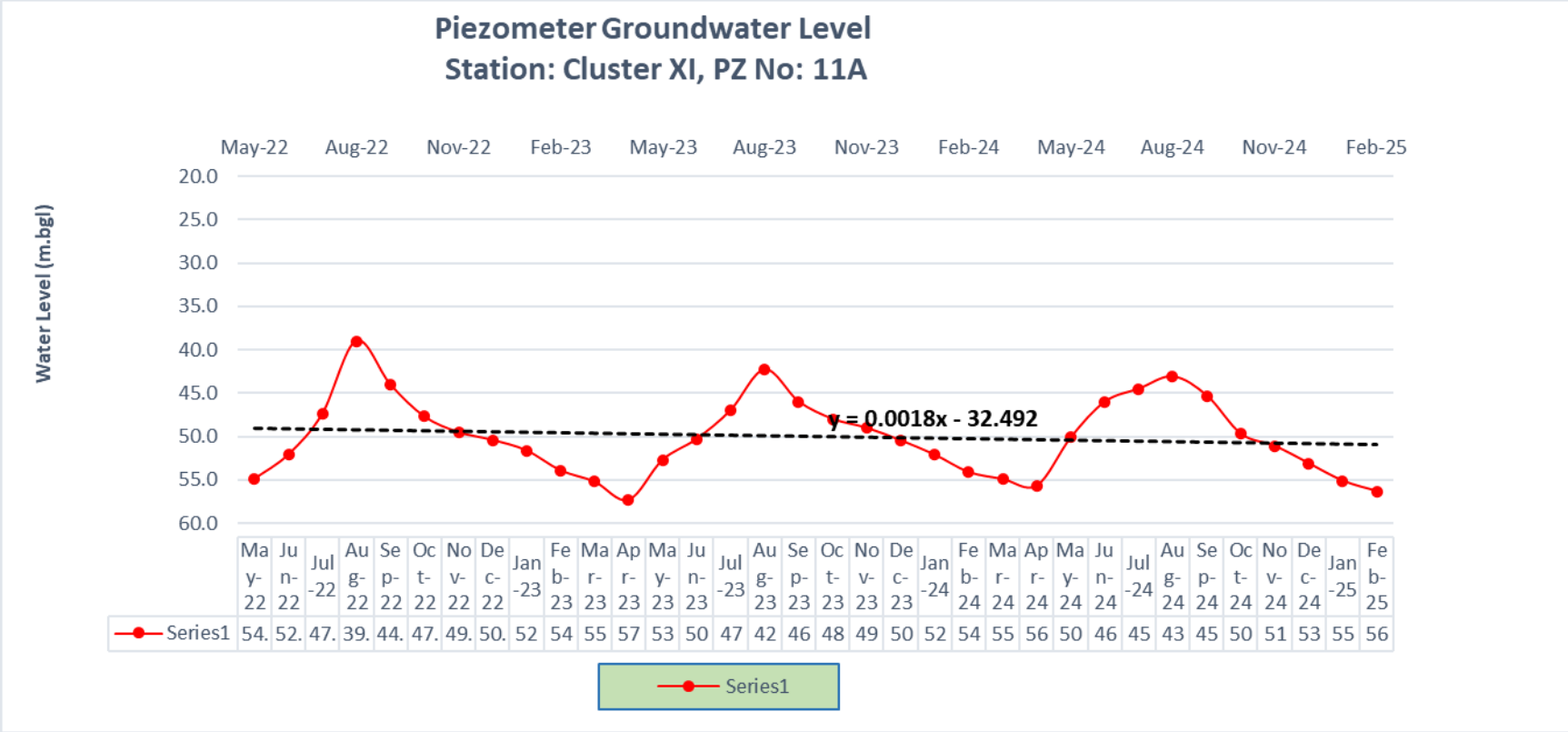

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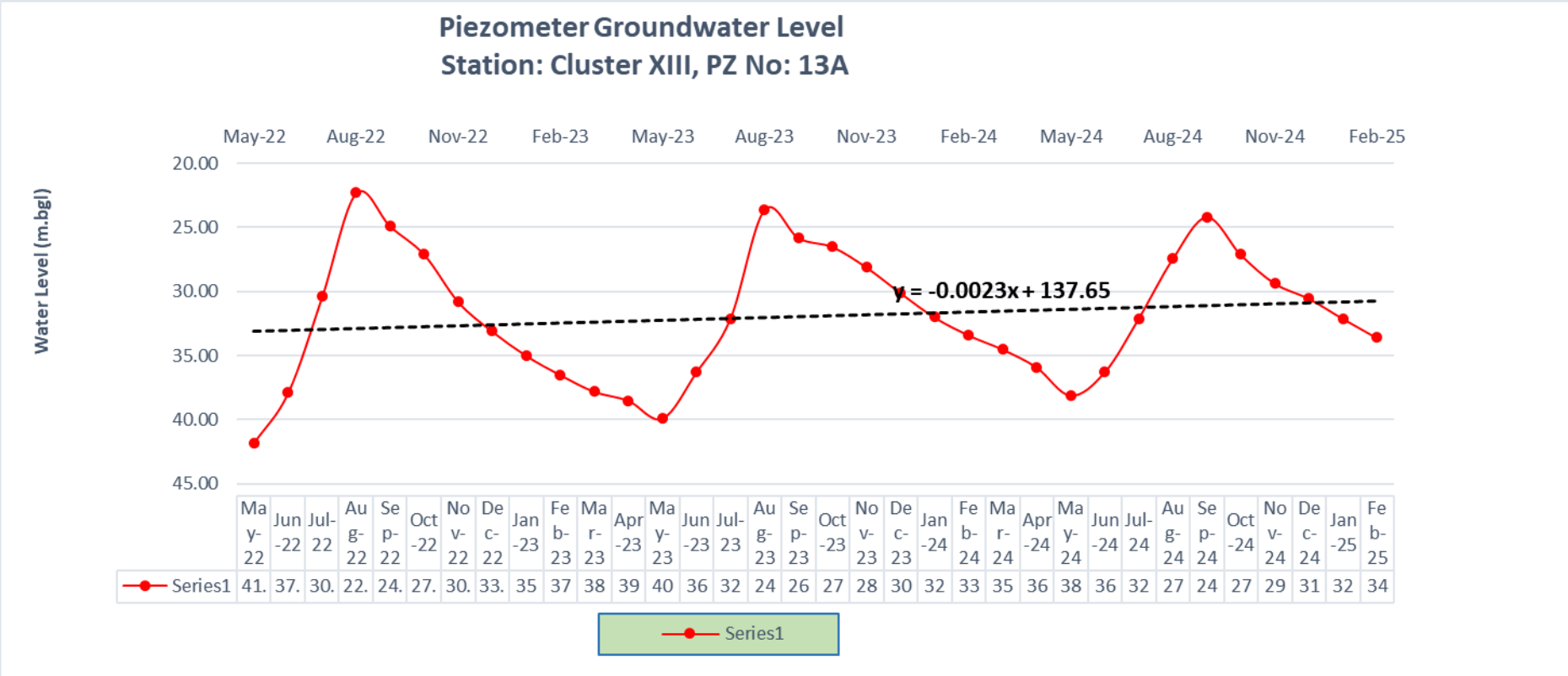

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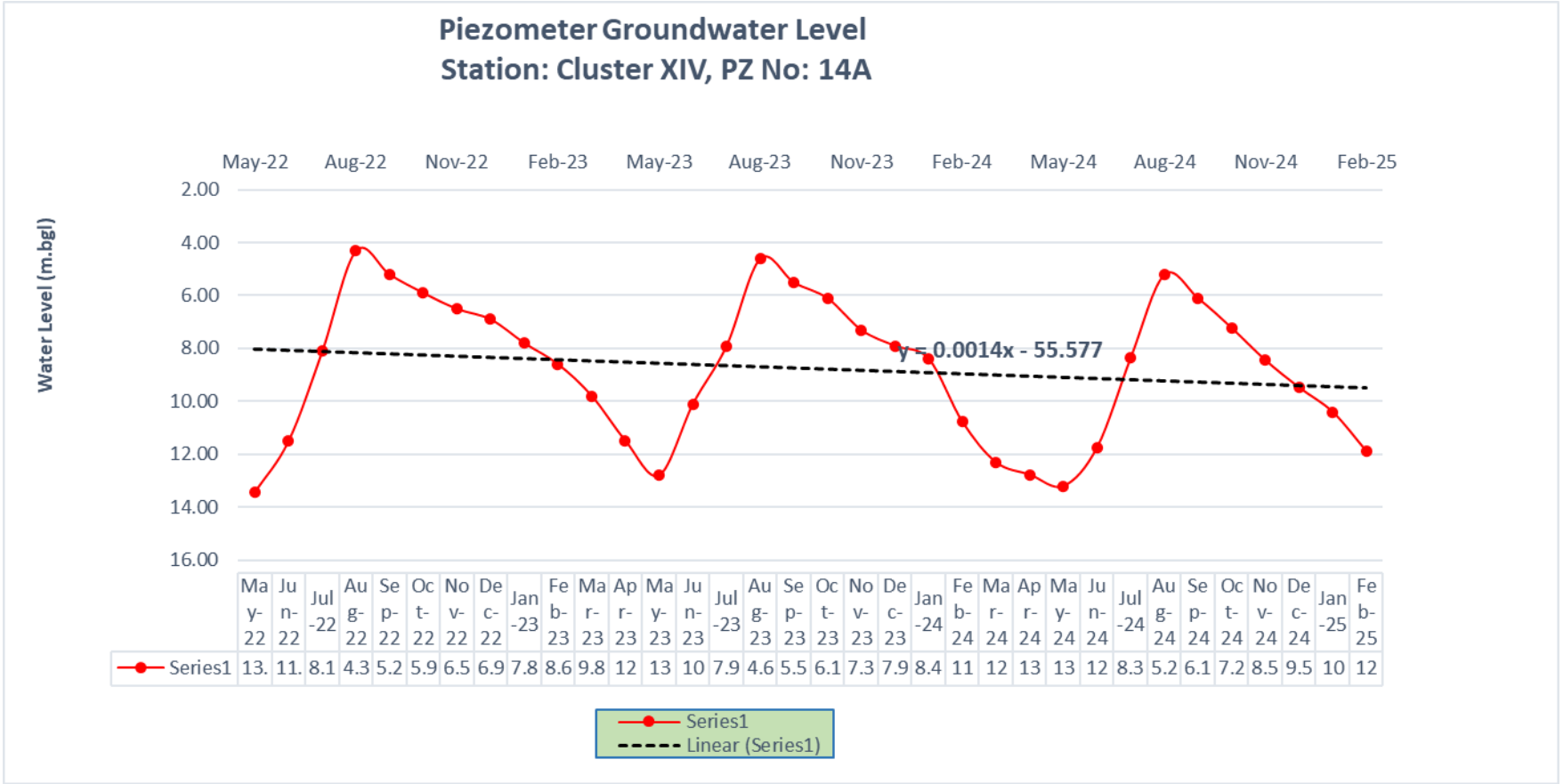

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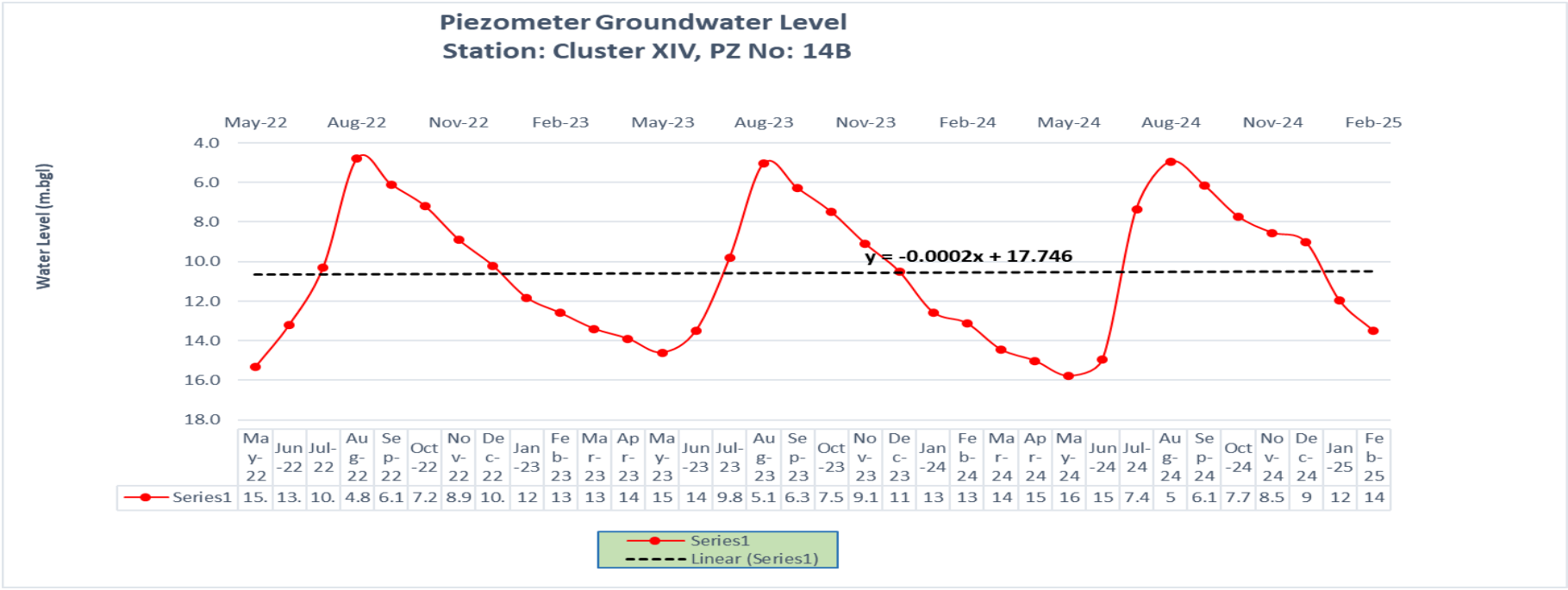
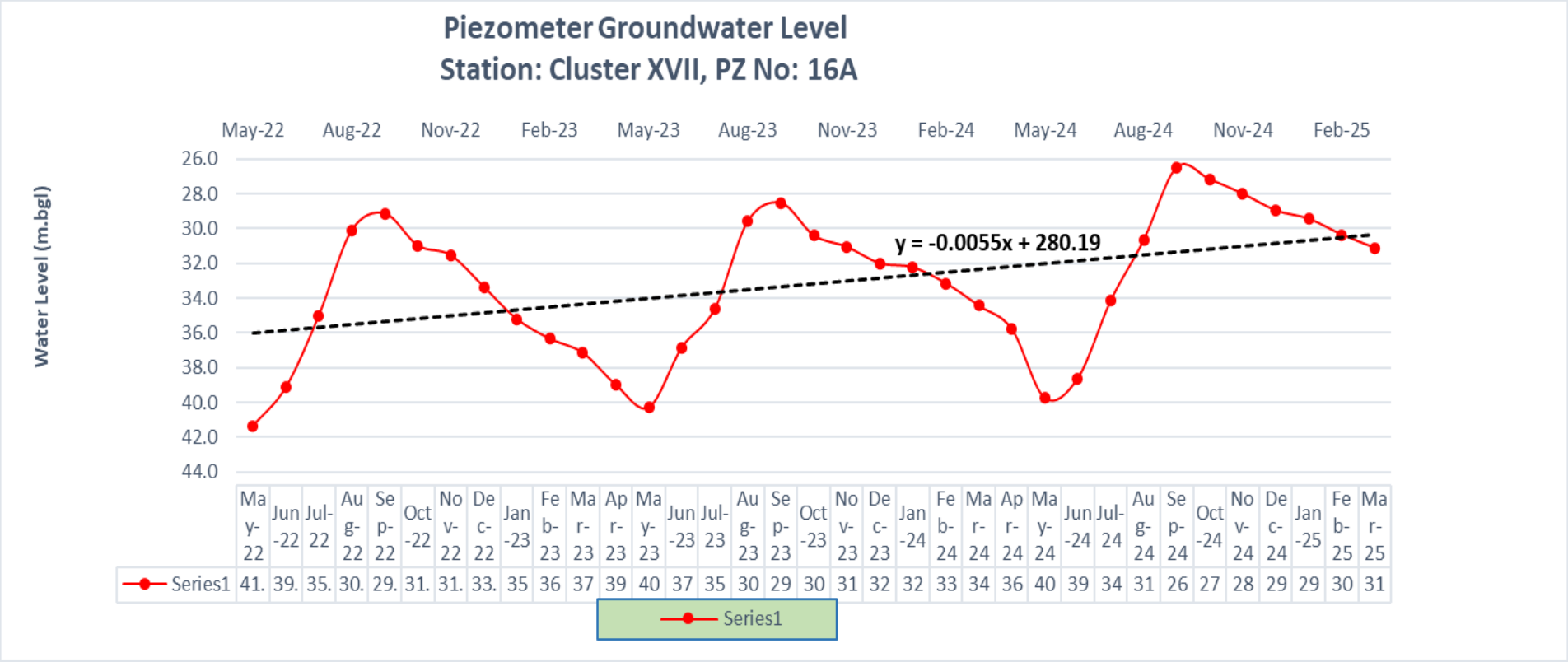


	May-22	Jun-22	Jul-22	Aug-22	Sep-22	Oct-22	Nov-22	Dec-22	Jan-23	Feb-23	Mar-23	Apr-23	May-23	Jun-23	Jul-23	Aug-23	Sep-23	Oct-23	Nov-23	Dec-23	Jan-24	Feb-24	Mar-24	Apr-24	May-24	Jun-24	Jul-24	Aug-24	Sep-24	Oct-24	Nov-24	Dec-24	Jan-25	Feb-25
Series1	15.	13.	10.	4.8	6.1	7.2	8.9	10.	12	13	13	14	15	14	9.8	5.1	6.3	7.5	9.1	11	13	13	14	15	16	15	7.4	5	6.1	7.7	8.5	9	12	14

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_{03}), 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_{O3}), 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 ($c_ac_{o_3}$), 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 ($c_ac_{O_3}$), 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	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_aco_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_ac_{03}), 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_{O3}), 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_{03}), 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_{03}), 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,*

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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 ($c_ac_{o_3}$), 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_{O3}), 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

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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 ($c_ac_{O_3}$), 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	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

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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)

CENTRAL MINE PLANNING AND DESIGN INSTITUTE LIMITED
Environment Laboratory, Regional Institute-II
CMPDIL, RI-II
KOYLA BHAWAN COMPLEX
DHANBAD. -826005
Phone:0326-223-850
email: rdri2cmpdi@coalindia.in

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

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-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

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CENTRAL MINE PLANNING AND DESIGN INSTITUTE LIMITED

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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-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

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

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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CENTRAL MINE PLANNING AND DESIGN INSTITUTE LIMITED
Environment Laboratory, Regional Institute-II
CMPDIL, RI-II
KOYLA BHAWAN COMPLEX
DHANBAD. -826005
Phone:0326-223-850
email: rdri2cmpdi@coalindia.in

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

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

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 GW-39	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	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.*

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

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.*

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(Kumar Vaibhav)
REVIEWED BY

(Amit Raj Mishra)
Authorised Signatory

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

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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.*

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

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.*

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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.**	**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.*

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(Kumar Vaibhav)
REVIEWED BY

(Amit Raj Mishra)
Authorised Signatory

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CMPDIL, RI-II
KOYLA BHAWAN COMPLEX
DHANBAD. -826005
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.**	**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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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-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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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-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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CENTRAL MINE PLANNING AND DESIGN INSTITUTE LIMITED
Environment Laboratory, Regional Institute-II
CMPDIL, RI-II
KOYLA BHAWAN COMPLEX
DHANBAD. -826005
Phone:0326-223-850
email: rdri2cmpdi@coalindia.in

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	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

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CENTRAL MINE PLANNING AND DESIGN INSTITUTE LIMITED
Environment Laboratory, Regional Institute-II
CMPDIL, RI-II
KOYLA BHAWAN COMPLEX
DHANBAD. -826005
Phone:0326-223-850
email: rdri2cmpdi@coalindia.in

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.*

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

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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CMPDIL, RI-II
KOYLA BHAWAN COMPLEX
DHANBAD. -826005
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.**	**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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CENTRAL MINE PLANNING AND DESIGN INSTITUTE LIMITED
Environment Laboratory, Regional Institute-II
CMPDIL, RI-II
KOYLA BHAWAN COMPLEX
DHANBAD. -826005
Phone:0326-223-850
email: rdri2cmpdi@coalindia.in

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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CENTRAL MINE PLANNING AND DESIGN INSTITUTE LIMITED
Environment Laboratory, Regional Institute-II
CMPDIL, RI-II
KOYLA BHAWAN COMPLEX
DHANBAD. -826005
Phone:0326-223-850
email: rdri2cmpdi@coalindia.in

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,*

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(Kumar Vaibhav)
REVIEWED BY

(Amit Raj Mishra)
Authorised Signatory

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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-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.*

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(Kumar Vaibhav)
REVIEWED BY

(Amit Raj Mishra)
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CENTRAL MINE PLANNING AND DESIGN INSTITUTE LIMITED
Environment Laboratory, Regional Institute-II
CMPDIL, RI-II
KOYLA BHAWAN COMPLEX
DHANBAD. -826005
Phone:0326-223-850
email: rdri2cmpdi@coalindia.in

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**		**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,*

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CENTRAL MINE PLANNING AND DESIGN INSTITUTE LIMITED
Environment Laboratory, Regional Institute-II
CMPDIL, RI-II
KOYLA BHAWAN COMPLEX
DHANBAD. -826005
Phone:0326-223-850
email: rdri2cmpdi@coalindia.in

GROUND WATER ANALYSIS TEST REPORT

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.*

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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.**	**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,*

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CENTRAL MINE PLANNING AND DESIGN INSTITUTE LIMITED
Environment Laboratory, Regional Institute-II
CMPDIL, RI-II
KOYLA BHAWAN COMPLEX
DHANBAD. -826005
Phone:0326-223-850
email: rdri2cmpdi@coalindia.in

GROUND WATER ANALYSIS TEST REPORT

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.*

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REVIEWED BY

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CENTRAL MINE PLANNING AND DESIGN INSTITUTE LIMITED
Environment Laboratory, Regional Institute-II
CMPDIL, RI-II
KOYLA BHAWAN COMPLEX
DHANBAD. -826005
Phone:0326-223-850
email: rdri2cmpdi@coalindia.in

GROUND WATER ANALYSIS TEST REPORT

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

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	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 ($c_a co_3$), 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,*

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REVIEWED BY

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

CENTRAL MINE PLANNING AND DESIGN INSTITUTE LIMITED

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

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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,*

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

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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

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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

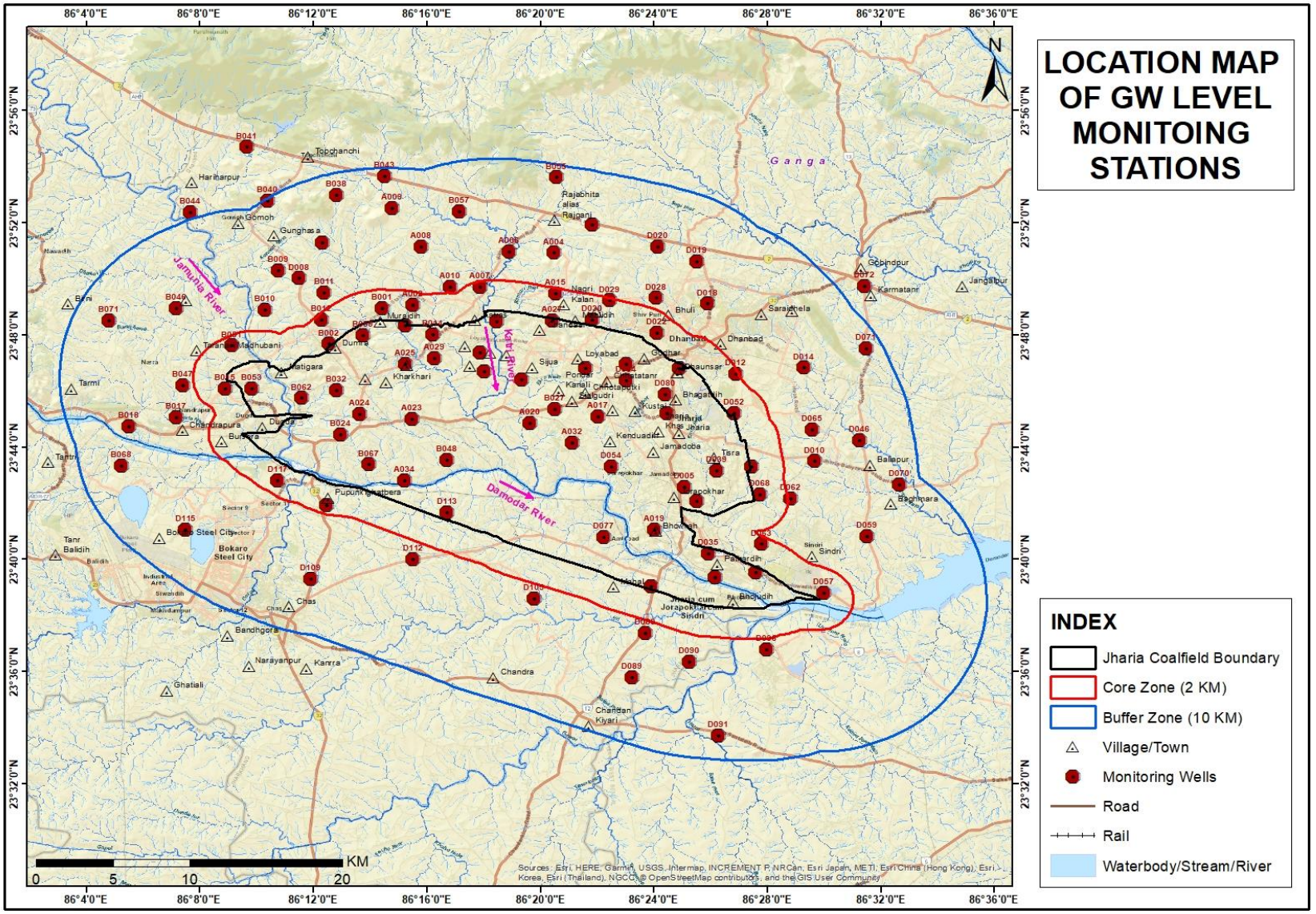


Plate- I: Location Map of Groundwater Level Monitoring stations

JOB NO: 200424005

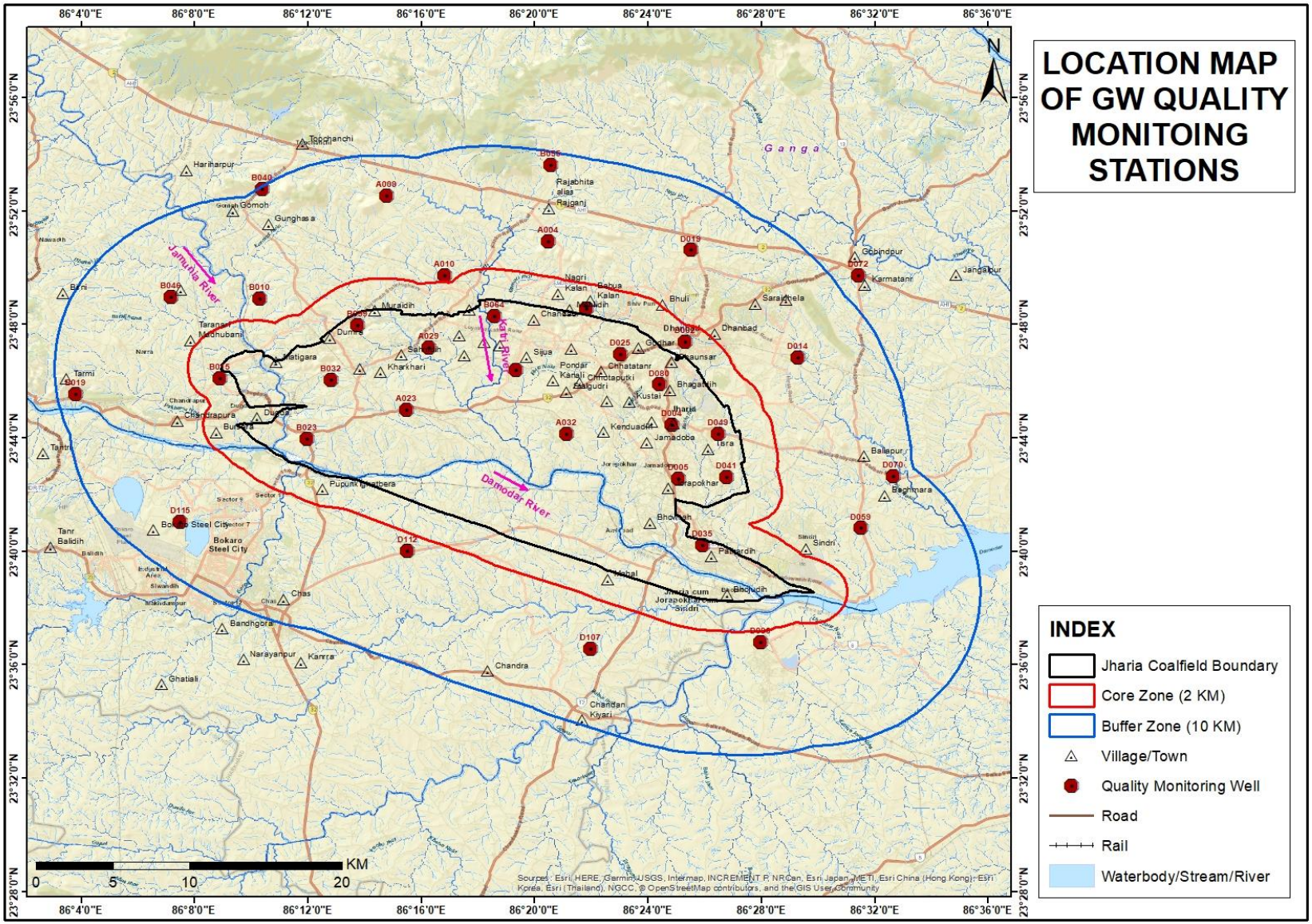


Plate- II: Location Map of Groundwater Quality Monitoring stations

JOB NO: 200424005

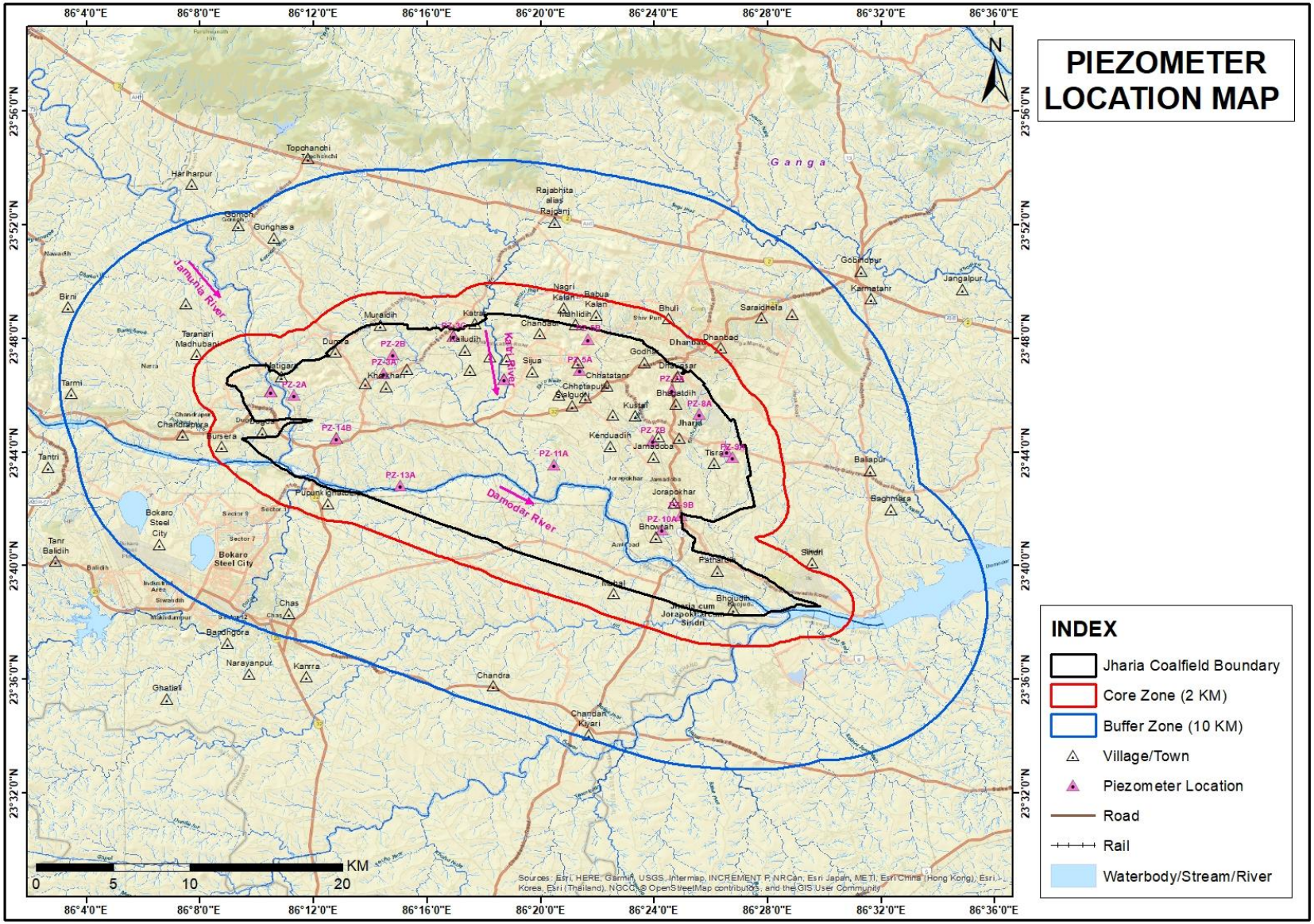


Plate- III: Location Map of Piezometers

JOB NO: 200424005

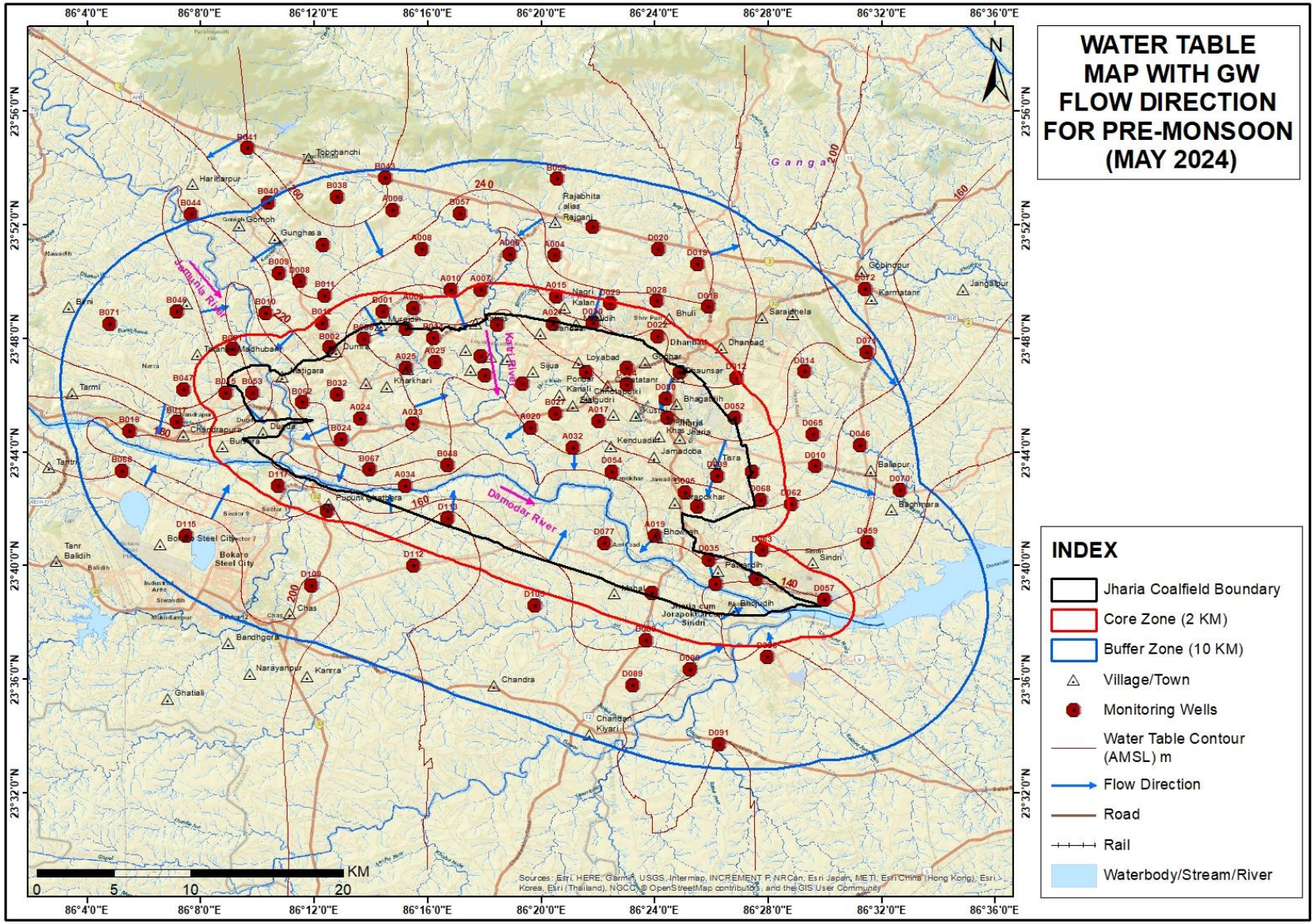


Plate- IVA: Water table Contour Map of JCF, Pre Monsoon (May'24)

JOB NO: 200424005

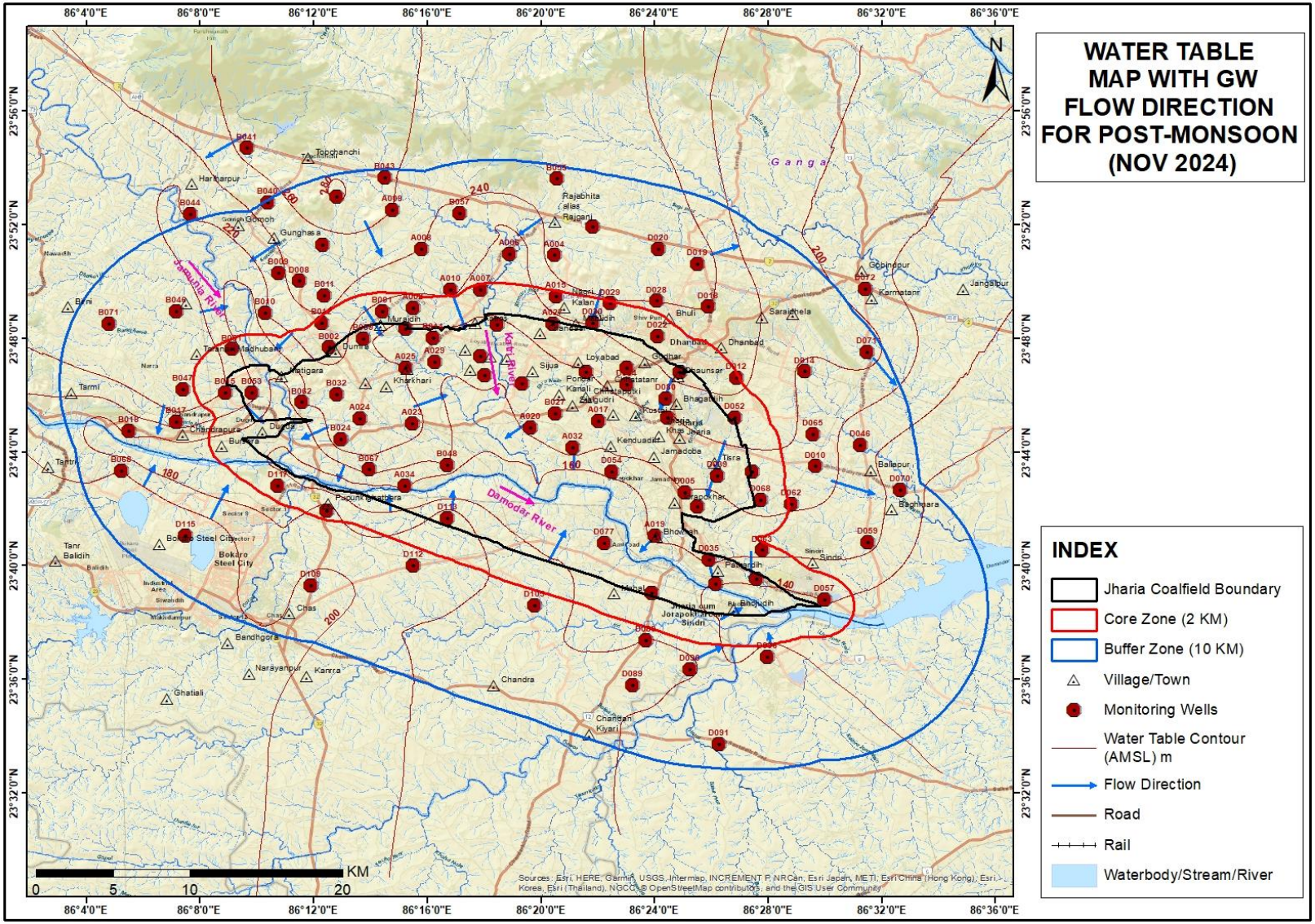


Plate- IVB: Water table Contour Map of JCF, Post Monsoon (Nov'24)

JOB NO: 200424005

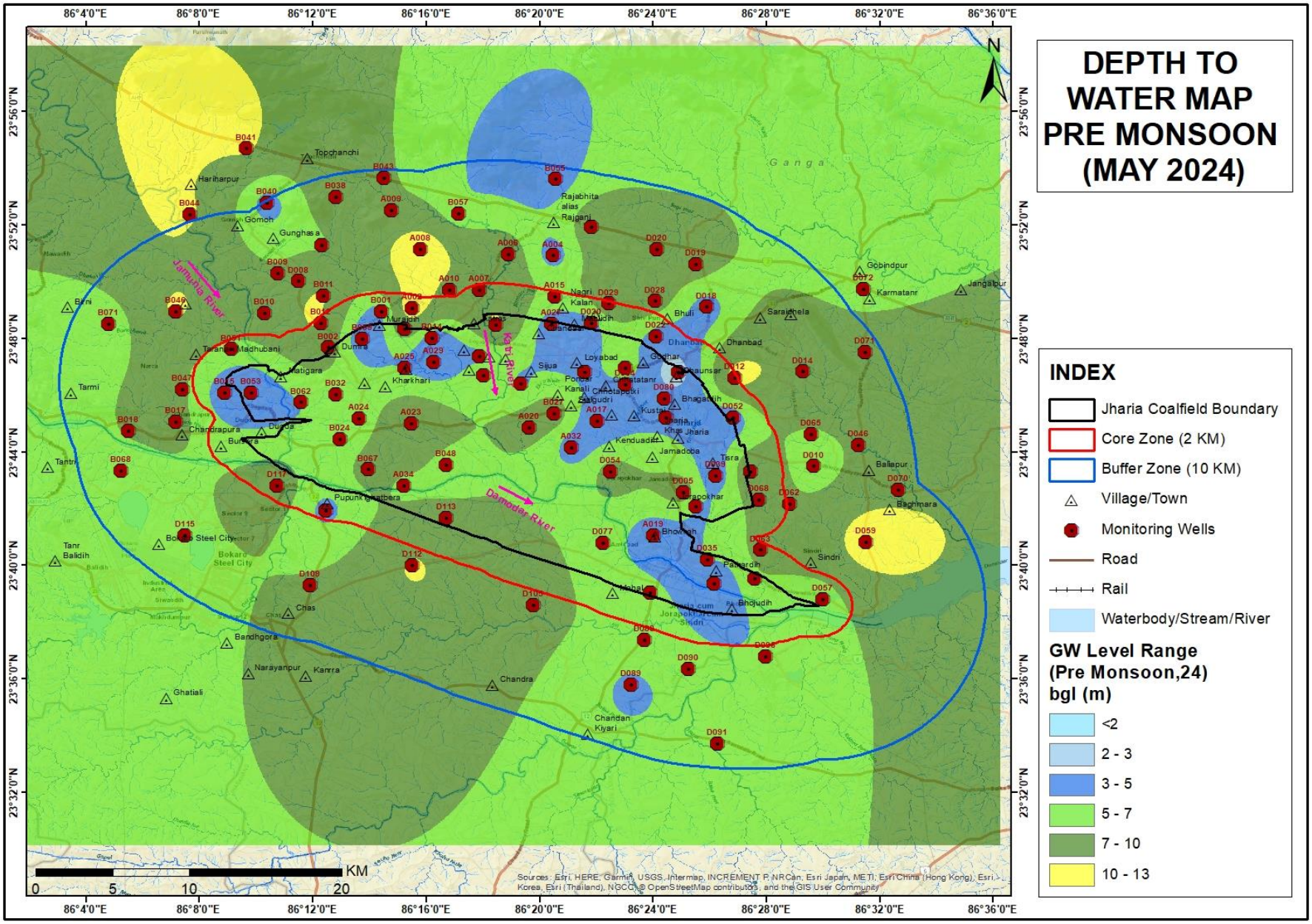


Plate- VA: Depth to Groundwater Level map of JCF, Pre Monsoon (May'24)

JOB NO: 200424005

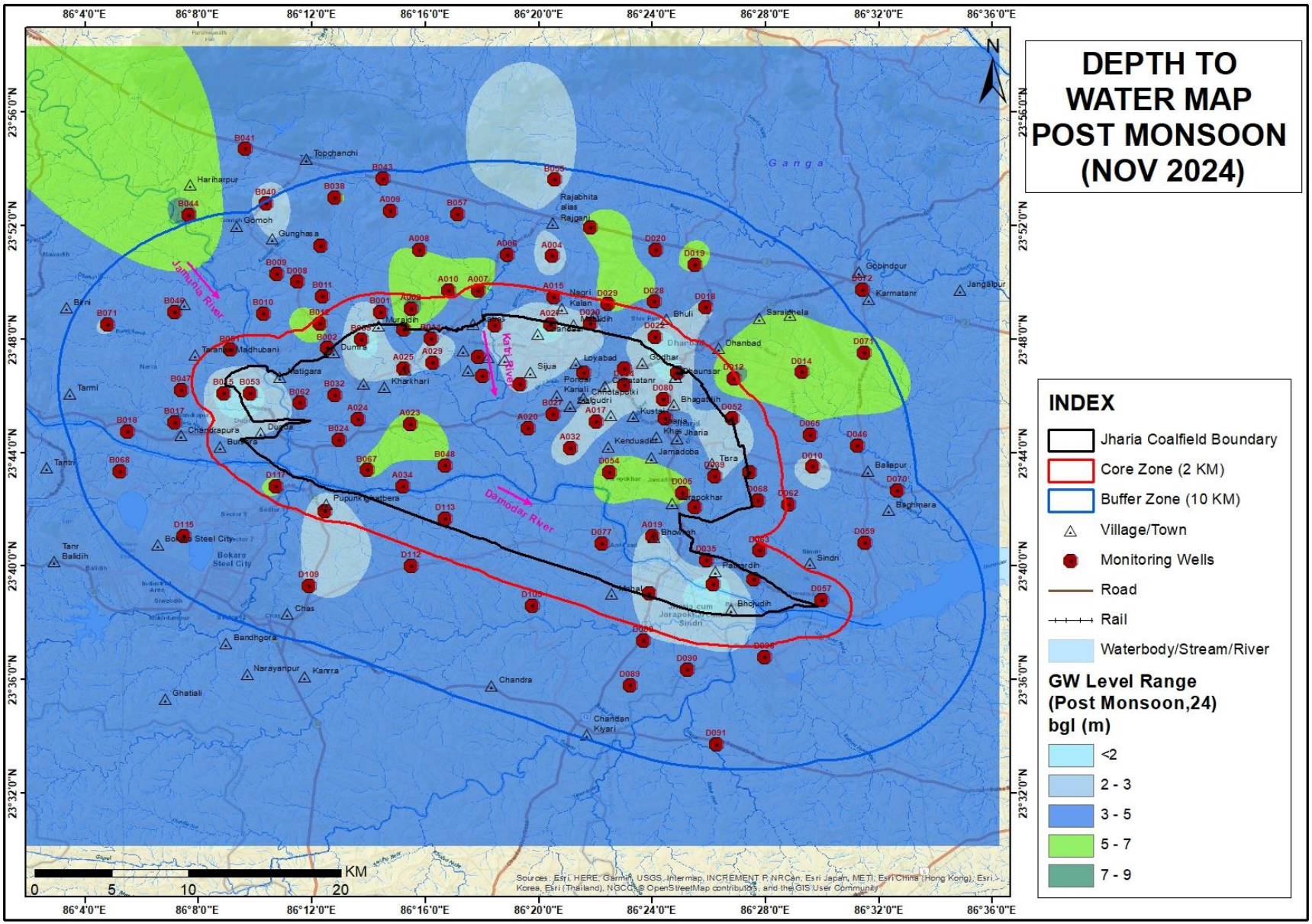


Plate- VB: Depth to Groundwater Level map of JCF, Post Monsoon (Nov'24)

JOB NO: 200424005

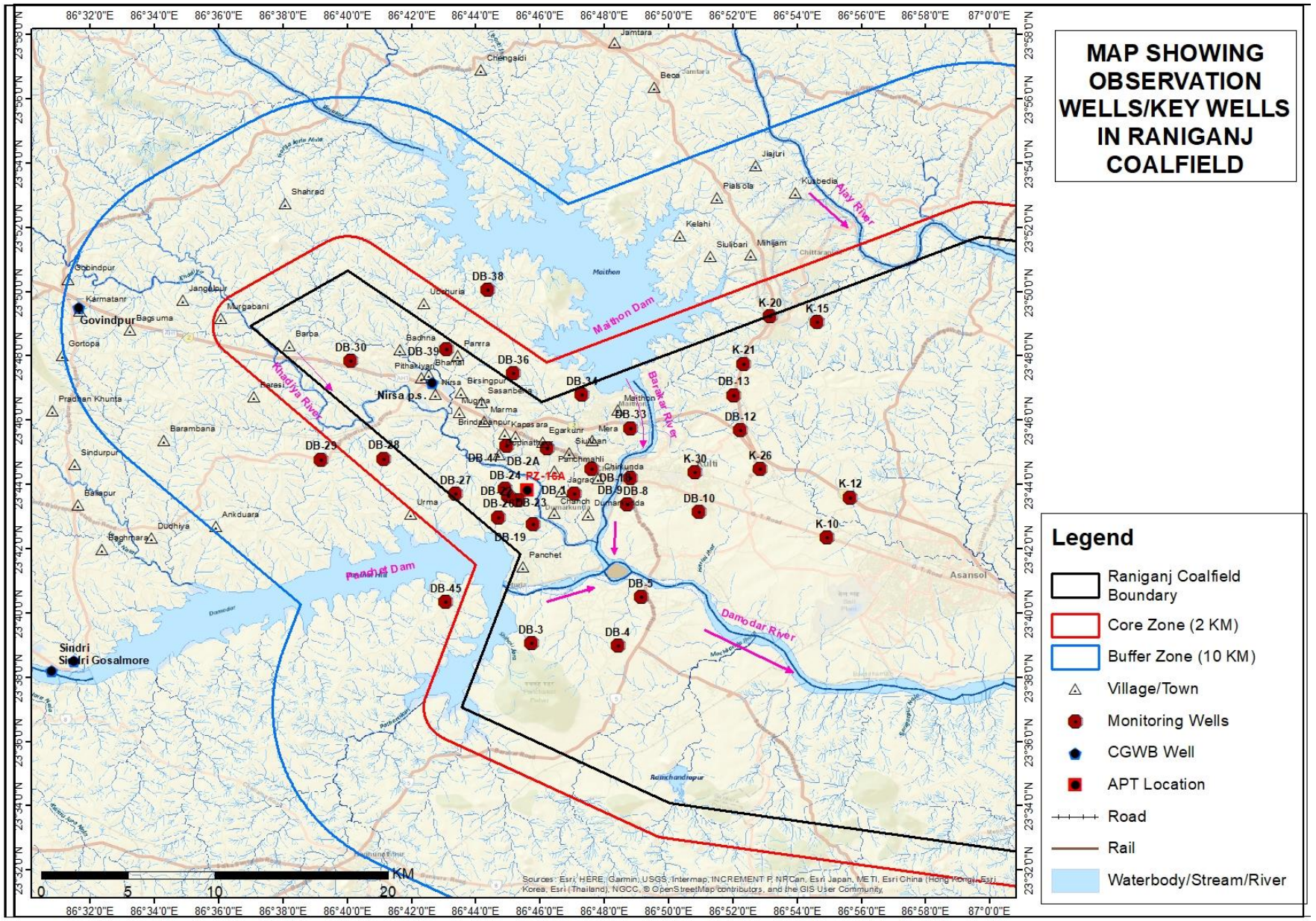


Plate- VI: Drainage Map (Part of RCF Coalfield under BCCL Command Area)

JOB NO: 200424005

Rain Water Harvesting

The recharge to semi-confined aquifers takes place due to infiltration of direct rainfall in the outcrop zones/areas of these partings and interconnections formed by faults, fractures, etc. between top unconfined aquifer and themselves. The semi-confined aquifer is confining in nature in down dip-side whereas the same aquifer is in unconfined condition in the incrop side within the mining area of Cluster-IV (Geological Plan, **Plate No-IV** and Geological Cross section, **Plate No-VI**).

The artificial recharge structure in the core zone area may not be a viable solution because of the reason that recharged water would drain into the mine at a faster rate due to the steep hydraulic gradients resulted in the mining activity. Again, it may also lead to mine inundation.

Rain Water harvesting is a deliberate collection and storage of rain water that runs off on natural and man-made catchments area. The amount of water harvested depends on the frequency and intensity of the rainfall and characteristics of the catchments to allow the precipitate to infiltrate through the sub-soil and percolate down to recharge aquifers.

The rainwater within the mining area is being accumulated in earthen water pool developed on the surface and abandoned mine void for recharging the ground water of the area. The details have been tabulated below:

Table No-21: Surface ponds / reservoirs

Name of Colliery	Area of pond/mine void		Location
	Area (Ha.)	Depth (m)	
Amalgamated Keshalpur & west Mudidih	0.60	1.75 m	Keshalpur
	0.30	1.2 m	
	0.30	1.3 m	Belaujabad
	1.0	2.0 m	West Mudidih
	0.30	1.25 m	
Amalgamated Ramkanali Angarpathra	0.90	2 m	Rampur
	1.10	3 m	
	1.0	2.5 m	
	0.60	1.75 m	Kumarjuri
	0.30	1.55 m	
Salanpur	0.42	2.0 m	Salanpur
	0.70	2.35 m	
Around 15750 cum/annum of water is added to the groundwater system within the Cluster-IV mining area due to this recharge structures. Considering average water spread area is 0.6 times of total area and recharge factor is 0.0014 m/day during 150 days in a year.			

After mine closure, void of opencast will be filled up with rainwater and will maintaining the water table in the surrounding areas and may become a source of water supply to the community.

The abandoned underground mine workings (Salanpur Colliery and Katras Chitudih Colliery) and old quarry behave as huge ground water reservoirs and contain groundwater runoff (i.e. planned recharge). The pond, tanks, stop dams etc constructed in the rehabilitated and affected villages also augment the groundwater recharge.

Roof-top rainwater harvesting (RWH) will be taken up in the project area using the administrative buildings. 138 no of quarters having roof-top area of about 14950 sq. m. is already prepared to harvest rainwater at Koyla Nagar Campus, Dhanbad. Proposal already 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.

Pipeline layouts for roof water catchments area

Roof Water collection and recharging tank

Underground pipe layout

Roof water pipeline layout

Figure No-3: Rain Water Harvesting Structure at Koyla Nagar, BCCL Township towards north-east of Cluster-IV.

Check dams/Nala bunds **(Figure No-4)** have been made in the Jogta Nala and Kari Jore for recharging ground water aquifer within the buffer zone of Cluster-IV. A check dams (Weighted area 0.95 hac) in Kari Jore near Dhansar Colliery (around 8.50 km towards east) and another one at Jogta nala (Weighted area 0.80 hac) around 1.8 km towards east of Cluster-IV boundary is provided to facilitate groundwater recharge in the mining area. Considering recharge factor of 0.0014 m/day around 3700 cum/annum of water is added to the groundwater system through this check dams or Nala bunds near to the Cluster-IV area.

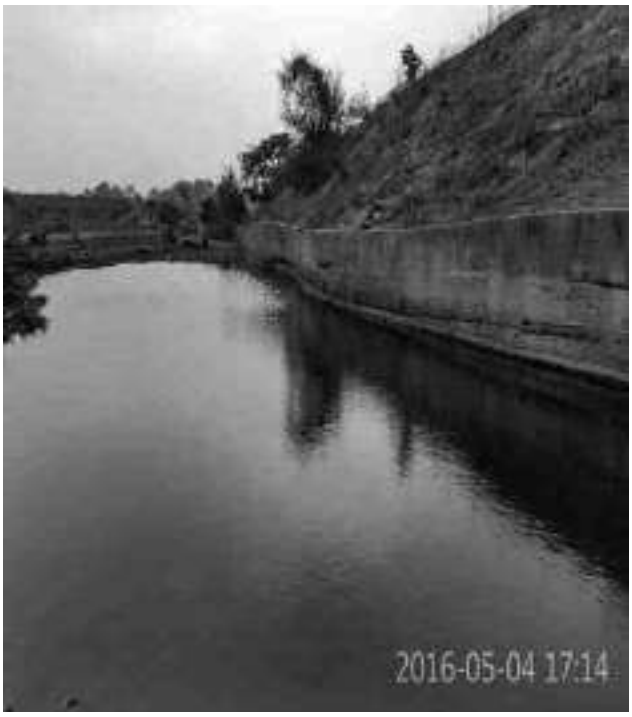
Figure No-4: Check Dams / Nala bunds at Jogta Nala, near Nischitpur OCP Mine, BCCL. This Recharge structure is within the buffer zone (1.8 km towards east of Cluster-IV).

Rain Water Harvesting Pond at Green Park,Cluster-IV

Vivo V11Pro
AI Dual Camera

Vivo V11Pro
AI Dual Camera

Water Harvesting at Cluster IV



Toe wall and Embankment at Cluster IV

Oil and Grease Trap (48 KL)

AKWMC WORKSHOP, Katras Area

OIL AND GREASE TRAP
AUTO WORKSHOP
CLUSTER-IN KATRAS AREA

Annexure-21

Illumination Survey at A.M.P. L Mixed O.C.P. on 16.04.2025

Sl.No.	Place of Illumination obtained	Height of light source	Distance of light source	Standard of Illumination	Illumination obtained	Types of light provided	Remarks
1.	At pumping station	12m	20m	H=40	H=164	Town light + metal highlight	
		— do —	25m	H=40	H=125	— do —	
		— do —	30m	H=40	H=110	— do —	
		— do —	40m	H=40	H=68	— do —	
2.	EKCHO 4BD 1100 - VIII Seam Bottom	machine Height	10m from the front side	H=15 V=25	H=26 V=31	machine light	
			20m from the front side	H=15 V=25	H=18 V=26	— do —	

for

Manager
AKWMC

Sumit
Colliery Engineer
AKWMC

Safety officer
AKWMC

Scanned with OKEN Scanner

Illumination Survey at A.M.P.L filled O.C.P. on 16.04.2025

Sl.NO	place of illumination obtained	Height of light source	Distance of light source	standard of illumination	Illumination Obtained	Type of light provided	Remarks
3.	volvo 480 1354 - I Seam	machine Height	10m from the front side	H=15 V=25	H=30 V=29	machine light	
			20m from the front side	H=15 V=25	H=24 V=26	— do —	
4.	Volvo 480 1353 I Seam	machine Height	10m from the front side	H=15 V=25	H=28 V=34	machine light	
			20m from the front side	H=15 V=25	H=20 V=30	— do —	

Manager
AKUMC

for Sumit
Colliery Engineer
AKUMC

Safety officer
AKUMC

Illumination Survey at Departmental O.C.P on 17.04.2025

Sl.No	Place of illumination obtained	Height of light source	Distance of light source	Standard of illumination	Illumination obtained	Types of light provided	Remarks
1.	Haul Road from parking pole 1 to face	18 m	10 m	H = 10	H = 12	2 × LED light	
	pole 2	18 m	10 m	H = 10	H = 13	– do –	
	pole 3	18 m	10 m	H = 10	H = 12	– do –	
	pole 4	18 m	10 m	H = 10	H = 12	– do –	
	pole 5	18 m	10 m	H = 10	H = 13	– do –	
	pole 6	18 m	10 m	H = 10	H = 10	– do –	
2.	EKG shovel 5794 Top Bench	machine Height	10m from the front side	H = 15 V = 25	H = 118 V = 129	machine light + Tower light	
			20m from the front side	H = 15 V = 25	H = 96 V = 105	– do –	

Manager
AKWMC

for
Colliery Engineer
AKWMC

Safety officer
AKWMC

Illumination survey at Departmental O.C.P on 17.04.2025

Sl.NO	place of illumination obtained	Height of light source	Distance of light source	standard of illumination	Illumination obtained	Types of light provided	Remarks
3.	EKG shovel 523 VIII Top Bench	machine Height	10m from the front side	H=15 V=25	H= 113 V= 136	machine light + Tower light	
			20m from the front side	H=15 V=25	H= 90 V= 101	— do —	
4.	EKG shovel 524 XI Seam	machine Height	10m from the front side	H=15 V=25	H=30 V=34	machine light	
			20m from the front side	H=15 V=25	H=21 V=26	— do —	

Manager
AKUMC

for
Sumit
Colliery Engineer
AKUMC

Safety Officer
AKUMC

Scanned with OKEN Scanner

Illumination survey at Dep. OCP on 16.08.25

SL NO	Place of Illumination obtained	Hight of light Source	Distance of light Source	Standard of Illumination	Illumination obtained	Types of light Provided.	Remarks.
1.	Parking yard	15m	10m	H=50	H = 15		
2.	Top bench near 579 EKG	10m	10m	H=15 V=25	H= 15 V = 21		
3.	2nd bench near 10m³ Shovel 523	10m	20m	H=15 V=25	H = 25 V = 30		
4.	3rd bench near 10m³ Shovel 524	10m	25m	H=15 V=25	H= V=		
5.	Coal bench near 1200 hydraulic Shovel	8m	20m	H=15 V=25	H=15 V=25		
6.	Haul Road	07m	10m	H=10	H=10		

Manager
AKWMC

Colliery Engr.
AKWMC

Safety Officer
AKWMC

Illumination survey at Dep. OCP on 16.08.25

SL NO	Place of Illumination obtained	Hight of light Source	Distance of light Source	Standard of Illumination	Illumination obtained	Types of light Provied	Remark
7.	Coal Dump	12m	20m, 50m	H=15 V=15	H= 12 V= 15		No light in haul road at distance of 700m from 4 Seam to coal dump.
8.	OB Dump.	—	—	H=15 V=15	H= NA V= NA		
9.	Pumping Station	7m	30m	H=40	H= 10		
10.	2nd bench near Drill #50	10m	10m	H=15 V=25	H= 12 V= 28		

Manager
AKWMC

Colliery Engineer
AKWMC

Safety Officer
AKWMC

Scanned with OKEN Scanner

Illumination survey at AMPL Hired Patch on 16.08.25

Sl No	Place of Illumination obtained	Hight of light Source	Distance of light Source	Standard of Illumination	Illumination obtained	Types of light Provided	Remark
1.	2nd bench near Volvo - 480	Machine light	10m	H=15 V=25	H=25 V=30	Machine light.	
	OB bench		20m		H=15 V=25		
2.	3rd OB bench near Shovel 480	Machine light	10m	H=15 V=25	H=25 V=32	〃	
			20m		H=18 V=28		
3.	4th bench Coal	Machine light	10m	H=15 V=25	H=31 V=35	〃	
			20m	H=15 V=25	H=22 V=28		
4.	Pumping Station East Side	07m	15m	H=40	H=25	Tower light	
	West Side.	07m	15m	H=40	H=20		

Manager
AKMC

Colliery Engg.
AKMC

Safety Officer.
AKMC

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Illumination survey at AMPL Hired Patch on 16.08.25

Sl No	Place of Illumination obtained	Hight of light Source	Distance of light Source	Standard of Illumination	Illumination obtained	Types of light Provided	Remark
5.	OB dump East Side	07 m	10 m	H = 15 V = 15	H = 05 V = 07	Tower light.	
	West Side.	07 m	15 m	H = 15 V = 15	H = 11 V = 08	"	
6.	Coal dump East side	07 m	10 m	H = 15 V = 15	H = 10 V = 08	"	
	West side.	07 m	12 m	H = 15 V = 15	H = 09 V = 11	"	

Manager
AKWMC

Colliery Engr.
AKWMC

Safety Officer
AKWMC.

Illumination survey at Dep Ocp on 20.09.25

SL.NO	Place of Illumination obtained	Hight of light Source	Distance of light Source	Standard of Illumination	Illumination Obtained	Types of light Provied	Remark
1.	Parking yard.	15m	10m	H = 50	H = 20	Town light.	
2.	Top bench EKG 579 – Bucket rest –	Machine Hight	10m From the Front Side.	H = 15 V = 25	H = 20 V = 22	Machine light + Town light.	
			20m. From the Front Side	H = 15 V = 25	H = 18 V = 20	"	
3.	Shovel 523 – Bucket rest. –	Machine Hight.	10m From the Front Side.	H = 15 V = 25	H = 42 V = 48	Machine light	
			20m From the Front Side	H = 15 V = 25	H = 30 V = 35	"	

Manager
AKWMC.

for Sumit
Colliery Engr.
AKWMC

Safety Officer
AKWMC.

Scanned with OKEN Scanner

Illumination survey at Dep. OCP.
on - 20.09.25

SL NO	Place of Illumination obtained	Hight of light Source	Distance of light Sour	Standard of Illumination	Illumination obtained	Types of light Provied	Remark
4.	Shovel 524 - Bucket rest -	Machine Hight.	10m From the Front Side	H = 15 V = 25	H = 52 V = 65	Machine light.	
			20m From the Front Side.	H = 15 V = 25	H = 39 V = 48	"	
5.	Coal dump. East Side	07m	10m	H = 15 V = 15	H = 12 V = 11	Tower Light.	
	West Side	07m	12m.	H = 15 V = 15	H = 10 V = 12	"	
6.	Pumping Station East Side.	07m	15m	H = 40	H = 22	"	
	West Side.	07m.	15m	H = 40	H = 18		

Manager
AKWMC

for Sumit
Colliery Engg.
AKWMC

Safety Colliery
AKWMC

Scanned with OKEN Scanner

Illumination survey of Dep. OCP.

on - 15.10.25

SL. NO	Place of Illumination obtained	Hight of light Source	Distance of light Source	Standard of Illumination	Illumination obtained	Types of light Provied	Remark
1.	Parking yard.	15m	10m	H=50	H=48		
			20m	"	H=41		
			30m	"	H=35		
2.	Haul road	7m	10m	H=10	H=12		
3.	Coal dump East side	7m	10m	H=15 V=15	H=14 V=12		
	West Side	7m	10m	H=15 V=15	H=10 V=13		
4.	Shovel 523 - Bucket rest -	Machine Hight.	10m From the Front Side	H=15 V=25	H=52 V=55		
	"	"	20m From the Front Side	H=15 V=25	H=50 V=51		

Manager
AKWMC

for Sumit
Colliery Engg.
AKWMC

Safety Officer
AKWMC

Scanned with OKEN Scanner

Illumination survey of Dep. Ocp.
on- 15.10.25

Sl. No	Place of Illumination obtained	Hight of light Source	Distance of Light Source.	Standard of Illumination	Illumination obtained	Types of light Provied	Remark
5.	Shovel 524 - Bucket rest -	Machine light.	10m From the Front Side.	H = 15 V = 25	H = 62 V = 55	Machine light.	
			20m From the Front Side.	H = 15 V = 25	H = 57 V = 51	11	
6.	EKG 577 - Bucket rest -	Machine. light.	10m From the Front side.	H = 15 V = 25	H = 17 V = 28		
			20m From the Front Side.	H = 15 V = 25	H = 12 V = 22		

Manager
AKWMC

for Sumit
Colliery Engg.
AKWMC

Safety Officer.
AKWMC

Scanned with OKEN Scanner

Annexure-22

REPORT ON A BLAST INDUCED GROUND VIBRATION CONDUCTED BY IOCL AT KANTAPAHARI HIRED - BCCL

Date:-30.05.2024

INTRODUCTION

The Kantapahari hired mine is situated in Katras area of BCCL. The ground vibration monitoring is determined to know the safety of nearby structure. For measuring of ground vibration micromate of series UM10858 of make Instantel is being used.

OBJECTIVE OF THE STUDY

The primary objective of the ground vibration is the monitoring of PPV levels at the neighboring areas including villages affected by the blast induced ground vibrations.

METHODOLOGY

1. For the purpose of measuring vibrations, a Micromate seismograph named 'Instantel Micromate' is being used. The instrument has a geophone for sensing ground vibrations in the three planes viz. longitudinal, transverse and vertical. The highest of the three vibrations is recorded as the peak particle velocity measured in mm/sec.
2. For recording the PPV the instrument was placed on firm ground and the sensor was directed towards the site of blast and instrument was set continuous shot modes. Based on the trigger level, the instrument recorded the waveform including the PPV at its frequency during the blast.
3. The distance to the site of blast and the maximum charge per delay deployed were separately noted for the blast.

OBSERVATIONS

The reading was taken near to bast (Daventi pasti & Angarpathra) situated at a distance of approx 100-140mtr from the current working bench. Summarized statement of the levels of PPV, and frequency recorded during the blast and its distances from blast point are as follow

CamScanner

Sl.no	Date	PPV(mm/s)	Frequency (Hz)	Charge/ hole(kg)	Maximum charge/ delay(kg)	Distance from blast site to structure(m)	Distance from structure(m)	Remarks
1	01.05.2024	2.522	4.4	30-35	35	120	50	within the limit
2	06.05.2024	1.505	4.7	40-45	45	130	40	within the limit
3	11.05.2024	2.073	10.1	40	40	140	10	within the limit
4	17.05.2024	3.035	8.1	35	35	110	50	within the limit
5	22.05.2024	3.287	8.8	40	40	100	50	within the limit
6	29.05.2024	2.688	5.0	35	35	120	40	within the limit

CONCLUSION

In the view of above readings of ground vibration the PPVs obtained were within the permissible limit as per DGMS norms, which is safe for the nearby structure.

IOCL Representative

Blasting Officer (Kantapahari hired)

CamScanner

इंडियन ऑयल कॉर्पोरेशन लिमिटेड
मौजा-माटीगढ़ा, पो.आ.-नदखुरकी
जिला-धनबाद (झारखण्ड) पिन कोड:828307

IndianOil

Indian Oil Corporation Limited
Mouza-Matigarha, P.O.-Nadkhurkee
District-Dhanbad (Jharkhand) 828307
Phone:0326-2828235/334/365/375/39

व्यवसाय विकास समुह (एक्सप्लोसिव्स)
Business Development Group (Explosives)

IOCL/BDG/KANTAPAHARI HIRED/PPV REPORTS/MAY-2024
Date. - 30.05.2024

To,

The Blasting In charge
Kantapahari Hired
Katras Area, BCCL

Subject: - Submission of Ground vibration monitoring reports for May 2024.

Dear Sir,

We have enclosed the blast induced ground vibration monitored in the month of May 2024. The Brief summary of vibration reports are furnished in below table.

1.Sl .No	Mine Name	Date	PPV (mm/s)			ZC Frequency(HZ)			PVS(mm/s)	Dist.(Mtr)
			Tran	Vert	Long	Tran	Vert	Long		
1	Kantapahari Hired	01.05.2024	1.663	2.522	1.513	4.5	4.4	5.5	2.730	120
2	Kantapahari Hired	06.05.2024	1.505	1.009	0.725	4.7	17.4	5.1	1.560	130
3	Kantapahari Hired	11.05.2024	1.419	1.395	2.073	7.2	57	10.1	2.101	140
4	Kantapahari Hired	17.05.2024	2.128	1.947	3.035	11.1	6.3	8.1	3.518	110
5	Kantapahari Hired	22.05.2024	3.287	2.215	2.688	8.8	6.9	6.9	4.003	100
6	Kantapahari Hired	29.05.2024	2.546	1.316	2.688	3.6	7.0	5.0	3.149	120

As per your requirement the above reading has been monitored during the blasting and the copies of reports are submitted for your information and assessment.

Thanking you and assuring you of our best attention and services at all times.

Yours faithfully
For Indian Oil Corporation Limited,

Viraj
Officer (Marketing)

CamScanner

Instantel

Event Report

Trig Time	Tran at 14:42:48 May 1, 2024
Trigger Source	Geo: 0.700 mm/s, Mic: 68.95 pa.(L)
Range	Geo: 254.0 mm/s
Record Time	3.0 sec at 2048 sps
Operator Setup	Operator factory MMB

Notes
Location
Client
User Name
Seriano

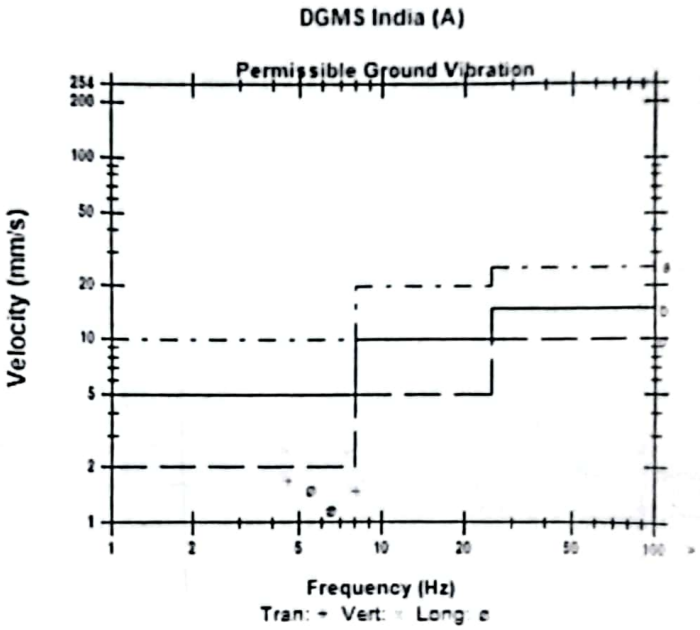
Serial Number	UM10858 V 10-77 Micromate ISEE
Battery Level	3.8 Volts
Unit Calibration	January 18, 2024 by CIMFR Dhanbad
File Name	UM10858_20230617141426.IDFW

Post Event Notes
Kantapahari hired
Distance from blasting-120mtr

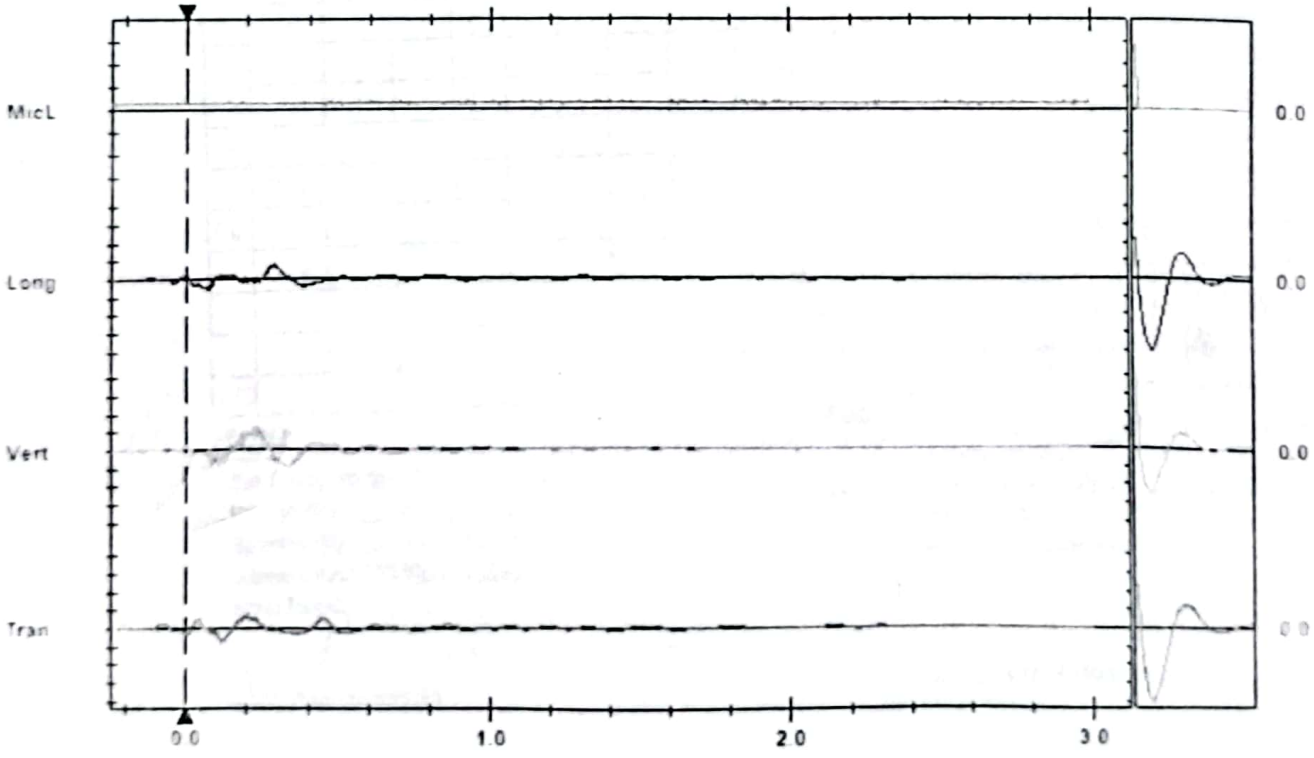
Microphone	Linear Weighting
PSPL	<0.500 pa.(L)
ZC Freq	N.A.
Channel Test	Check (Freq = 0.0 Hz Amp = 0 mv)

	Tran	Vert	Long	
PPV	1.663	2.522	1.513	mm/s
ZC Freq	4.6	4.4	5.6	Hz
Time (Rel. to Trig)	0.201	0.221	0.282	sec
Peak Acceleration	0.039	0.076	0.046	g
Peak Displacement	0.044	0.076	0.037	mm
Sensor Check	Passed	Check	Passed	
Frequency	7.5	8.2	7.7	Hz
Overswing Ratio	3.4	3.0	3.0	

Peak Vector Sum 2.730 mm/s at 0.220 sec
N.A. Not Applicable



a)Industrial Buildings
b)Domestic houses/structures
c)Historic objects, sensitive structures



Time Scale: 0.20 sec/div Amplitude Scale: Geo: 2.000 mm/s div Mic: 1.000 pa (L)/div Sensor Check

REPORT ON A BLAST INDUCED GROUND VIBRATION CONDUCTED BY IOCL AT KANTAPAHARI HIRED - BCCL

Date:-30.05.2024

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CamScanner

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CONCLUSION

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IOCL Representative

Blasting Officer (Kantapahari hired)

CamScanner

इंडियन ऑयल कॉर्पोरेशन लिमिटेड
मौजा-माटीगढ़ा, पो.आ.-नदखुरकी
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Indian Oil Corporation Limited
Mouza-Matigarha, P.O.-Nadkhurkee
District-Dhanbad (Jharkhand) 828307
Phone:0326-2828235/334/365/375/39

IndianOil
व्यवसाय विकास समूह (एक्सप्लोसिव्स)
Business Development Group (Explosives)

IOCL/BDG/KANTAPAHARI HIRED/PPV REPORTS/MAY-2024
Date - 30.05.2024

To,

The Blasting In charge
Kantapahari Hired
Katras Area, BCCL

Subject: - Submission of Ground vibration monitoring reports for May 2024.

Dear Sir,

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2	Kantapahari Hired	06.05.2024	1.505	1.009	0.725	4.7	17.4	5.1	1.560	130
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Thanking you and assuring you of our best attention and services at all times.

Yours faithfully
For Indian Oil Corporation Limited,

Viraj
Officer (Marketing)

CamScanner

Event Report

Time	Tran at 14:42:48 May 1, 2024
Trigger Source	Geo: 0.700 mm/s, Mic: 68.96 pa (L)
Range	Geo: 254.0 mm/s
Record Time	3.0 sec at 2048 sps
Operator/Setup	Operator factory MMB

Notes
Location
Client
User Name
Seria

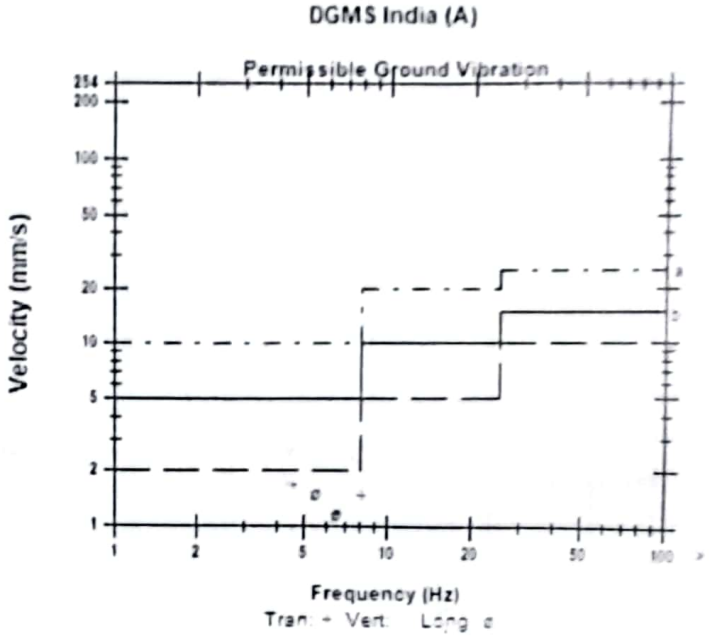
Serial Number	UM10858 V 10-77 Micromate ISEE
Battery Level	3.8 Volts
Unit Calibration	January 16, 2024 by CMRR Dhanbad
File Name	UM10858_20230617141425.IDFX

Post Event Notes
Kantapahari hired
Distance from blasting-120mtr

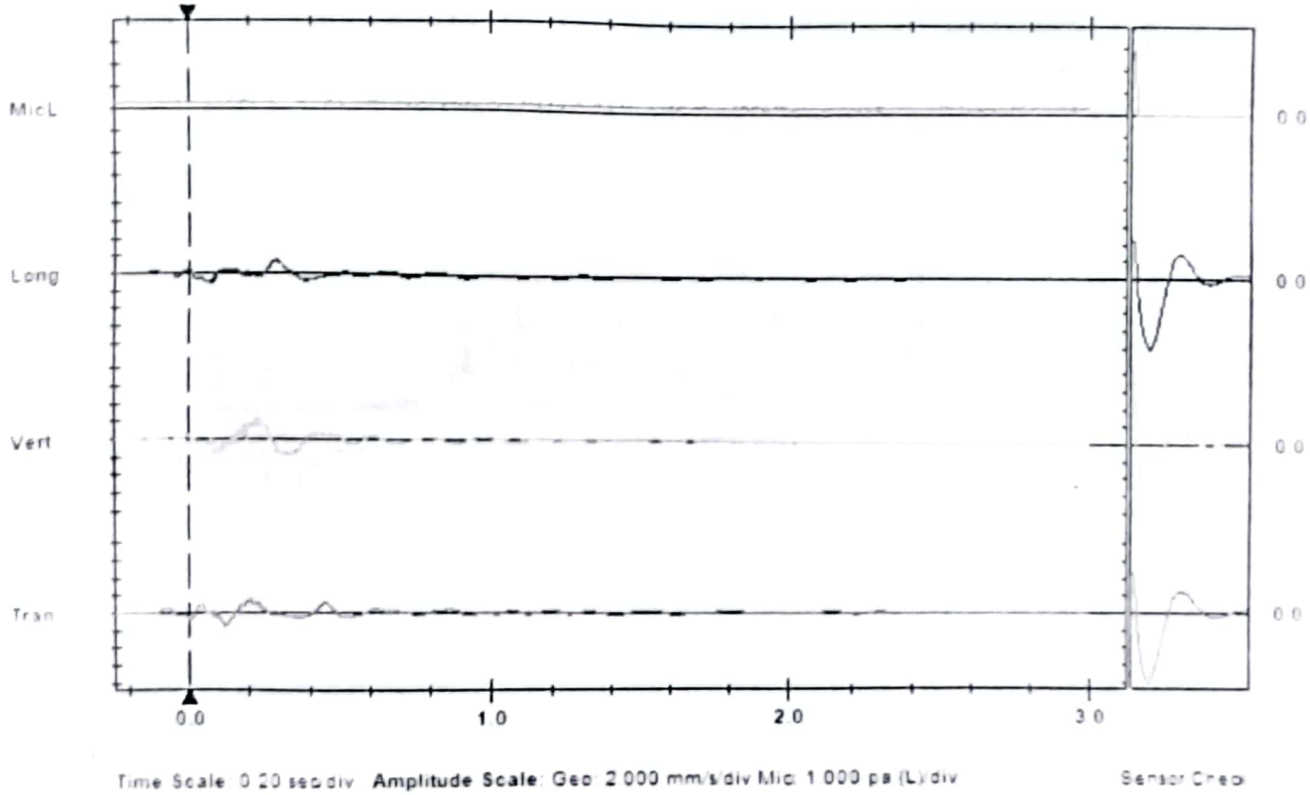
Microphone	Linear Weighting
PSPL	<0.500 pa (L)
ZC Freq	N.A.
Channel Test	Check (Freq = 0.0 Hz Amp = 0 mv)

	Tran	Vert	Long	
PPV	1.663	2.622	1.513	mm/s
ZC Freq	4.5	4.4	5.5	Hz
Time (Rel. to Trig)	0.201	0.221	0.283	sec
Peak Acceleration	0.039	0.076	0.046	g
Peak Displacement	0.044	0.076	0.037	mm
Sensor Check	Passed	Check	Passed	
Frequency	7.5	8.2	7.7	Hz
Overswing Ratio	3.4	3.0	3.0	

Peak Vector Sum: 2.730 mm/s at 0.220 sec
N.A. Not Applicable



a)Industrial Buildings
b)Domestic houses structures
c)Historic objects, sensitive structures



Time Scale: 0.20 sec/div **Amplitude Scale**: Geo: 2.000 mm/s/div Mic: 1.000 pa (L)/div Sensor Check

CamScanner

INDIAN OIL CORPORATION LIMITED

BG (Explosives), NADKHURKEE-828307

NAME OF MINE : _____ DATE : _____

BMD VEHICLE NO. _____ LOCATION : _____

DIA OF HOLE: _____ STRATA CONDITION : _____

Sl. No.	Depth (M)	Water Level (M)	Hole Temp (C)	Explosive quantity (KG)	Deck	Total	Stem Hight (M)	Sl No.	Depth (M)	Water Level (M)	Hole Temp (C)	Explosive quantity (KG)	Deck	Total	Stem Hight (M)
1															
2															
3															
4															
5															
6															
7															
8															
9															
10															
11															
12															
13															
14															
15															
16															
17															
18															
19															
20															
21															
22															
23															
24															
25															
26															
27															
28															
29															
30															

TOTAL **TOTAL** 39 holes – 1350

Bulk Cup Density (gm/cc) _____

Burden (M) _____

Spacing (M) _____

Volume of Patch (W*L*H) _____

Blast Result _____

Booster qty (kg) _____

Total Explosive qty (kg) _____

Powder Factor (m3/kg) _____

Blasting Accessories used _____

IOCL Representatives

BCCL Representatives

CamScanner

Event Report

Time	Vert at 14:20:20 May 6, 2024
Trigger Source	Geo: 0.700 mm/s, Mic: 68.95 pa (L)
Range	Geo: 254.0 mm/s
Record Time	3.0 sec at 2048 sps
Operator/Setup	Operator/factory MMB

Notes
Location
Client
User Name
Serial #

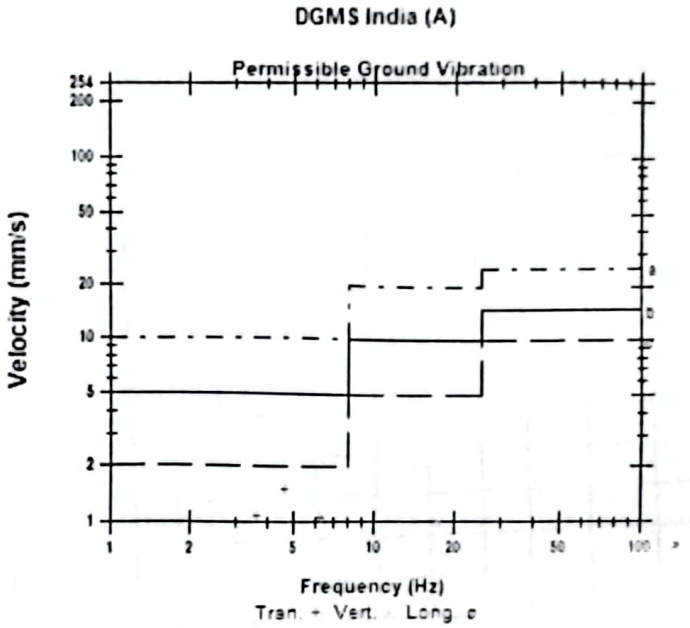
Serial Number	UM10858 V 10-77 Micromate ISEE
Battery Level	3.9 Volts
Unit Calibration	January 18, 2024 by CIMFR Dhanbad
File Name	UM10858_20230621150944.IDFW

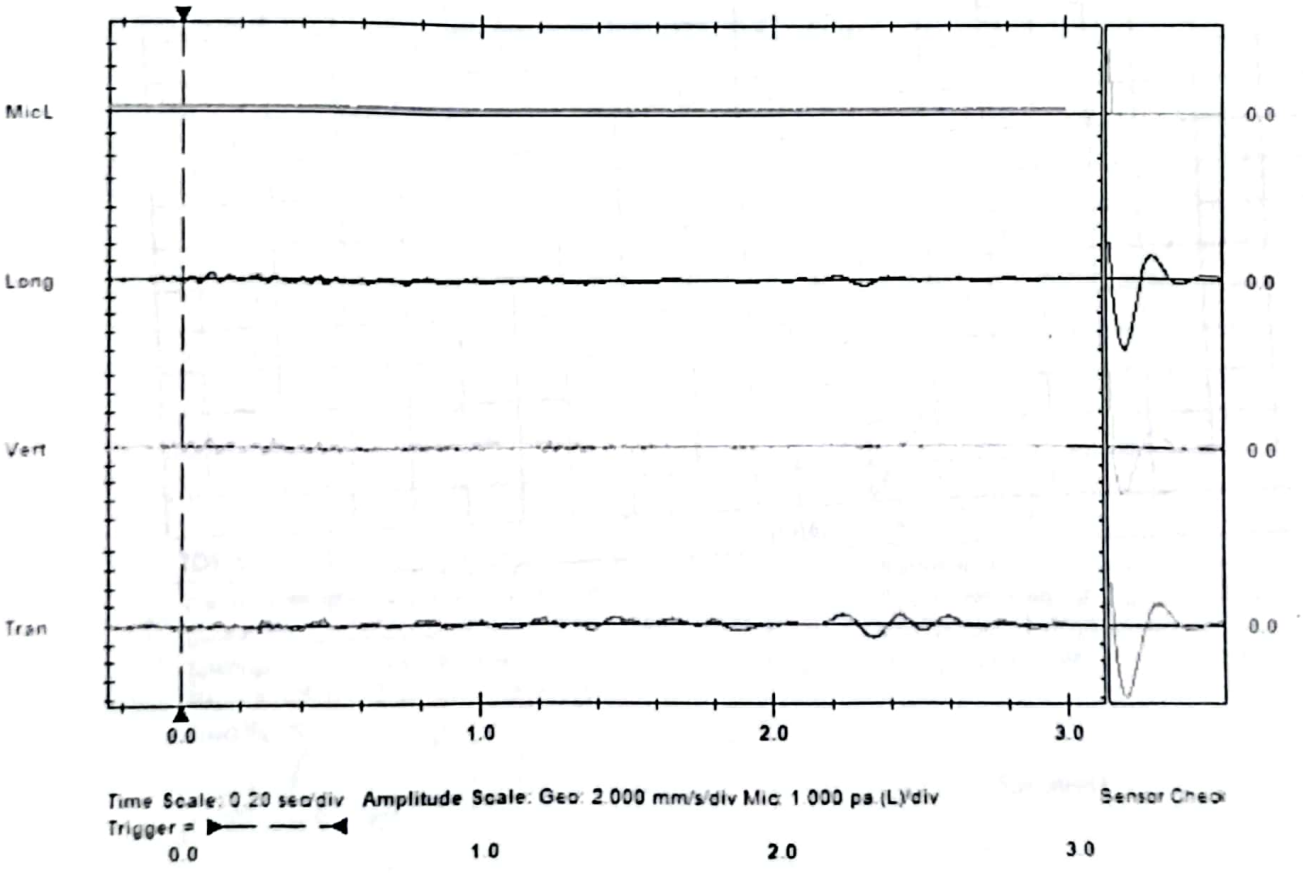
Post Event Notes
Kantapahari hired
Distance from blasting-130mtr

Microphone	Linear Weighting
PSPL	<0.600 pa (L)
ZC Freq	N.A.
Channel Test	Check (Freq = 0.0 Hz Amp = 0 mv)

	Tran	Vert	Long	
PPV	1.505	1.009	0.725	mm/s
ZC Freq	4.7	17.4	5.1	Hz
Time (Rel. to Trig)	2.339	0.274	2.314	sec
Peak Acceleration	0.026	0.030	0.018	g
Peak Displacement	0.050	0.009	0.020	mm
Sensor Check	Passed	Check	Passed	
Frequency	7.5	8.2	8.2	Hz
Overswing Ratio	3.5	3.1	3.1	

Peak Vector Sum 1.560 mm/s at 2.339 sec
N.A. Not Applicable





CamScanner

BG (E)/B-II/FORM/...

LOADING SHEET

INDIAN OIL CORPORATION LIMITED

BG (Explosives), NADKHURKEE-828307

NAME OF MINE : _____ DATE : _____

BMD VEHICLE NO. _____ LOCATION : _____

DIA OF HOLE : _____ STRATA CONDITION : _____

Sl. No.	Depth (M)	Water Level (M)	Hole Temp (C)	Explosive quantity (KG)	Deck	Total	Stem Hight (M)	Sl No	Depth (M)	Water Level (M)	Hole Temp (C)	Explosive quantity (KG)	Deck	Total	Stem Hight (M)
1								1							
2								2							
3								3							
4								4							
5								5							
6								6							
7								7							
8								8							
9								9							
10								10							
11								11							
12								12							
13								13							
14								14							
15								15							
16								16							
17								17							
18								18							
19								19							
20								20							
21								21							
22								22							
23								23							
24								24							
25								25							
26								26							
27								27							
28															

TOTAL 28 Holes — 1,160 TOTAL 27 Holes — 1110

Bulk Cup Density (gm/cc) _____

Burden (M) _____

Spacing (M) _____

Volume of Patch (W*L*H) _____

Blast Result

Booster qty (kg) _____

Total Explosive qty (kg) _____

Powder Factor (m3/kg) _____

Blasting Accessories used _____

Representatives

BCCL Representatives

CamScanner

REPORT ON A BLAST INDUCED GROUND VIBRATION CONDUCTED BY IOCL AT A K W M C - BCCL

Date: 30.05.2024

INTRODUCTION

The A K W M C mine is situated in Katras area of BCCL. The ground vibration monitoring is determined to know the safety of nearby structure. For measuring of ground vibration micromate of series UM10858 of make Instantel is being used.

OBJECTIVE OF THE STUDY

The primary objective of the ground vibration is the monitoring of PPV levels at the neighboring areas including villages affected by the blast induced ground vibrations.

METHODOLOGY

1. For the purpose of measuring vibrations, a Micromate seismograph named 'Instantel Micromate' is being used. The instrument has a geophone for sensing ground vibrations in the three planes viz. longitudinal, transverse and vertical. The highest of the three vibrations is recorded as the peak particle velocity measured in mm/sec.
2. For recording the PPV the instrument was placed on firm ground and the sensor was directed towards the site of blast and instrument was set continuous shot modes. Based on the trigger level, the instrument recorded the waveform including the PPV at its frequency during the blast.
3. The distance to the site of blast and the maximum charge per delay deployed were separately noted for the blast.

OBSERVATIONS

The reading was taken near to bast (Sijua more & Angarpathra) situated at a distance of approx 100-140mtr from the current working bench. Summarized statement of the levels of PPV, and frequency recorded during the blast and its distances from blast point are as follow

CamScanner

Sl no	Date	PPV(mm/s)	Frequency (Hz)	Charge/ hole(kg)	Maximum charge/ delay(kg)	Distance from blast site to structure(m)	Distance from structure(m)	Remarks
1	01.05.2024	1.356	33	50	50	140	10	within the limit
2	09.05.2024	1.671	13.1	170	170	130	20	within the limit
3	15.05.2024	2.286	13.8	100	100	130	20	within the limit
4	21.05.2024	2.782	7.4	90-95	95	120	30	within the limit
5	28.05.2024	2.278	10.3	160-165	165	140	10	within the limit
6	30.05.2024	1.821	4.6	180	180	100	50	within the limit

CONCLUSION

In the view of above readings of ground vibration the PPVs obtained were within the permissible limit as per DGMS norms, which is safe for the nearby structure.

IOCL Representative

Blasting Officer (A K W M C)

CamScanner

इंडियन ऑयल कॉर्पोरेशन लिमिटेड
मौजा-माटीगढ़ा, पो.आ.-नदखुरकी
जिला-धनबाद (झारखण्ड) पिन कोड:828307
Indian Oil Corporation Limited
Mouza-Matigarha, P.O.-Nadkhurkee
District-Dhanbad (Jharkhand) 828307
IndianOil
व्यवसाय विकास समूह (एक्सप्लोसिव्स)
Business Development Group (Explosives) Phone:0326-2828235/334/365/375/39

IOCL/BDG/A K W M C/PPV REPORTS/MAY-2024
Date - 30 05 2024

To,

The Blasting In charge
A K W M C
Katras Area, BCCL

Subject: - Submission of Ground vibration monitoring reports for May 2024.

Dear Sir,

We have enclosed the blast induced ground vibration monitored in the month of May 2024. The Brief summary of vibration reports are furnished in below table.

1.Sl .No	Mine Name	Date	PPV (mm/s)			ZC Frequency(HZ)			PVS(mm/s)	Dist.(Mtr)
			Tran	Vert	Long	Tran	Vert	Long		
1	A K W M C	01.05.2024	1.127	1.143	1.356	38	33	33	1.514	140
2	A K W M C	09.05.2024	1.198	0.812	1.671	12.5	8.5	13.1	1.847	130
3	A K W M C	15.05.2024	1.174	1.687	2.286	13.5	33	13.8	2.325	130
4	A K W M C	21.05.2024	2.782	1.364	1.805	7.5	12.8	8.1	3.082	120
5	A K W M C	28.05.2024	1.245	0.095	2.278	11.3	27	10.3	2.479	140
6	A K W M C	30.05.2024	1.159	0.914	1.821	7.1	11.6	4.6	2.082	100

As per your requirement the above reading has been monitored during the blasting and the copies of reports are submitted for your information and assessment.

Thanking you and assuring you of our best attention and services at all times.

Yours faithfully
For Indian Oil Corporation Limited,

Viraj
Officer (Marketing)

CamScanner

Instantel Event Report

Date/Time	Long at 14:20:34 May 1, 2024
Trigger Source	Geo: 0.700 mm/s, Mic: 68.96 pa (L)
Range	Geo: 254.0 mm/s
Record Time	3.0 sec at 2048 sps
Operator/Setup	Operator/factory MMB

Notes
Location
Client
User Name
Serial #

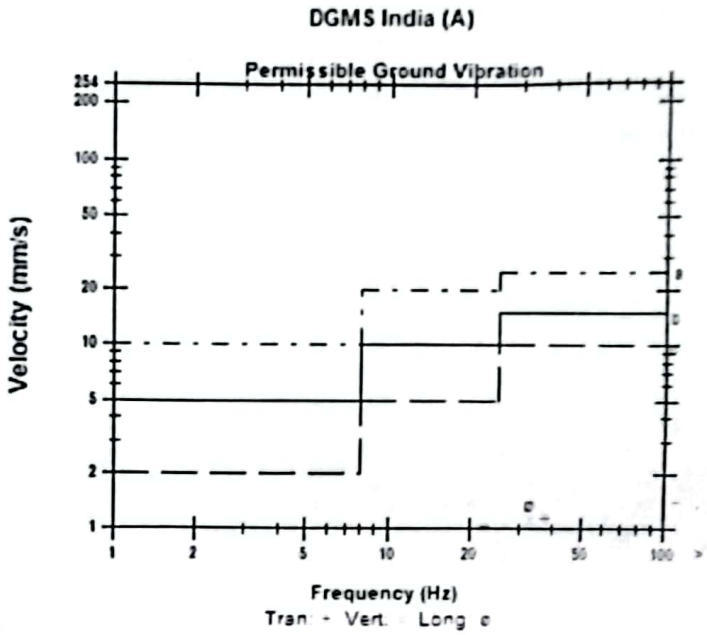
Serial Number	UM10868 V 10-77 Micromate ISEE
Battery Level	3.8 Volts
Unit Calibration	January 18, 2024 by CIMFR Dhanbad
File Name	UM10868_20230614152118.IDFW

Post Event Notes
A K W M C
Distance from blasting-140mtr

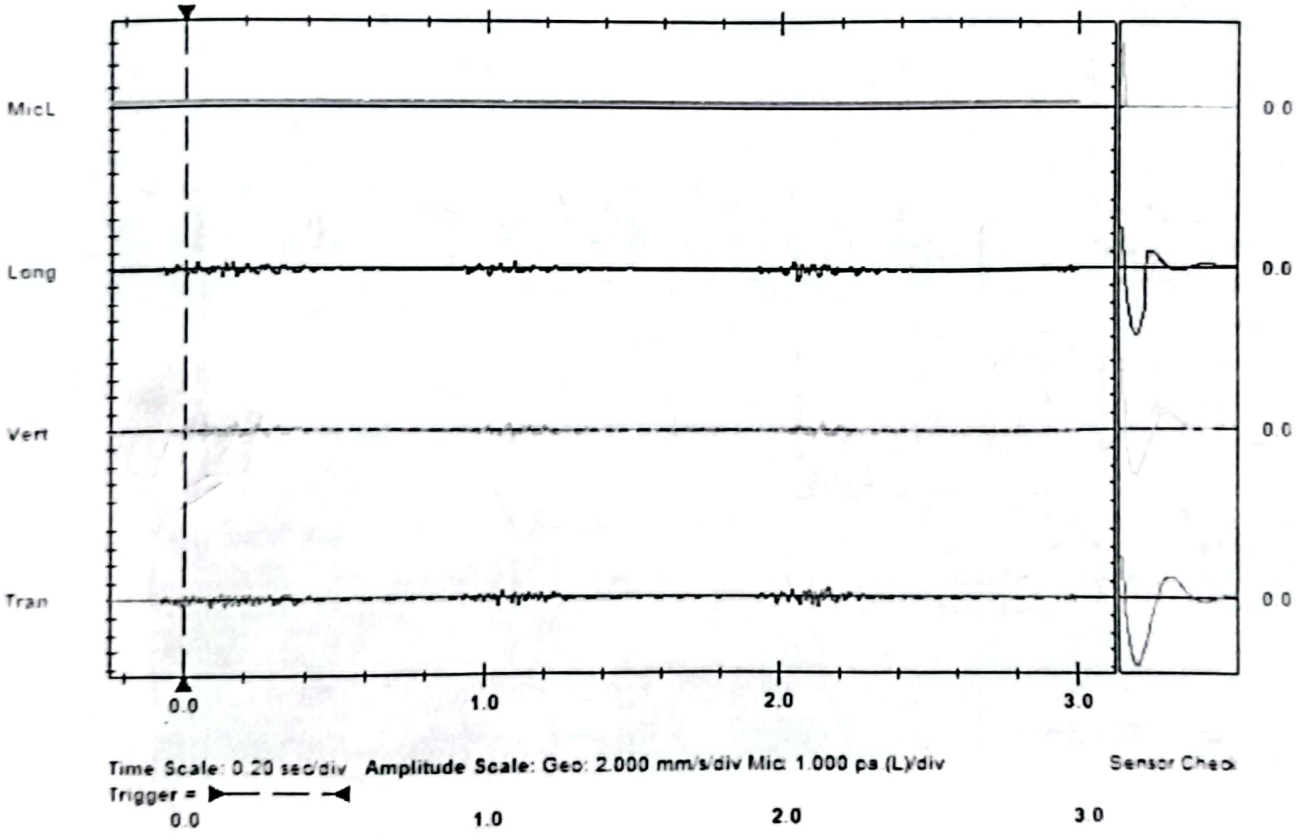
Microphone	Linear Weighting
PSPL	<0.500 pa (L)
ZC Freq	N/A
Channel Test	Check (Freq = 0.0 Hz Amp = 0 mv)

	Tran	Vert	Long	
PPV	1.127	1.143	1.356	mm/s
ZC Freq	35	33	33	Hz
Time (Rel. to Trig)	2.130	0.168	2.057	sec
Peak Acceleration	0.033	0.026	0.039	g
Peak Displacement	0.007	0.007	0.006	mm
Sensor Check	Passed	Check	Check	
Frequency	7.5	8.2	11.0	Hz
Overswing Ratio	3.4	3.0	4.4	

Peak Vector Sum 1.514 mm/s at 0.168 sec
N/A Not Applicable



a)Industrial Buildings
b)Domestic houses/structures
c)Historic objects, sensitive structures



CamScanner

LOADING SHEET
INDIAN OIL CORPORATION LIMITED
BG (Explosives), NADKHURKEE-828307

IndianOil

E OF MINE: AKWMC OCP
D VEHICLE NO: JH10BJ4098
MA OF HOLE: 110mm

DATE: 2 01/05/24
LOCATION: Jhanel Road
STRATA CONDITION: O.B

Sl. No.	Depth (M)	Water Level (M)	Hole Temp (C)	Explosive quantity (KG)	Deck	Total	Stem. Hight (M)	Sl. No.	Depth (M)	Water Level (M)	Hole Temp (C)	Explosive quantity (KG)	Deck	Total	Stem. Hight (M)
1	6.0			50											
2	6.0			50											
3	5.9			50											
4	6.0			50											
5	6.0			50											
6	5.9			50											
7	6.0			50											
8	6.0			50											
9	5.9			50											
10	6.0			50											
11	6.0			50											
12	5.9			50											
13	6.0			50											
14	6.0			50											
15	6.0			50											
16	5.9			50											
17	6.0			50											
18	6.0			50											
19	6.0			50											
20	6.0			50											
21	5.9			50											
22	6.0			50											
				1100 kg											

TOTAL **TOTAL**

Bulk Cup Density (gm/cc) 1.12gm/cc
Burden (M) 4m
Spacing (M) 4.5m
Volume of Patch (W*L*H)
Blast Result
TA3

Booster qty (kg) 2.2 kg
Total Explosive qty (kg) 1100 kg
Powder Factor (m3/kg)
Blasting Accessories used

IOCL Representatives

BCCL Representatives

CamScanner

REPORT ON A BLAST INDUCED GROUND VIBRATION CONDUCTED BY IOCL AT A K W M C - BCCL

Date - 30.05.2024

INTRODUCTION

The A K W M C mine is situated in Katras area of BCCL. The ground vibration monitoring is determined to know the safety of nearby structure. For measuring of ground vibration micromate of series UM10858 of make Instantel is being used.

OBJECTIVE OF THE STUDY

The primary objective of the ground vibration is the monitoring of PPV levels at the neighboring areas including villages affected by the blast induced ground vibrations.

METHODOLOGY

1. For the purpose of measuring vibrations, a Micromate seismograph named 'Instantel Micromate' is being used. The instrument has a geophone for sensing ground vibrations in the three planes viz. longitudinal, transverse and vertical. The highest of the three vibrations is recorded as the peak particle velocity measured in mm/sec.
2. For recording the PPV the instrument was placed on firm ground and the sensor was directed towards the site of blast and instrument was set continuous shot modes. Based on the trigger level, the instrument recorded the waveform including the PPV at its frequency during the blast.
3. The distance to the site of blast and the maximum charge per delay deployed were separately noted for the blast.

OBSERVATIONS

The reading was taken near to bast (Sijua more & Angarpathra) situated at a distance of approx 100-140mtr from the current working bench. Summarized statement of the levels of PPV, and frequency recorded during the blast and its distances from blast point are as follow

CamScanner

Sl.no	Date	PPV(mm/s)	Frequency (Hz)	Charge/ hole(kg)	Maximum charge/ delay(kg)	Distance from blast site to structure(m)	Distance from structure(m)	Remarks
1	01.05.2024	1.356	33	50	50	140	10	within the limit
2	09.05.2024	1.671	13.1	170	170	130	20	within the limit
3	15.05.2024	2.286	13.8	100	100	130	20	within the limit
4	21.05.2024	2.782	7.4	90-95	95	120	30	within the limit
5	28.05.2024	2.278	10.3	160-165	165	140	10	within the limit
6	30.05.2024	1.821	4.6	180	180	100	50	within the limit

CONCLUSION

In the view of above readings of ground vibration the PPVs obtained were within the permissible limit as per DGMS norms, which is safe for the nearby structure.

IOCL Representative

Blasting Officer (A K W M C)

CamScanner

इंडियन ऑयल कॉर्पोरेशन लिमिटेड
मौजा-माटीगढ़ा, पो.आ.-नदखुरकी
जिला-धनबाद (झारखण्ड) पिन कोड:828307

IndianOil

Indian Oil Corporation Limited
Mouza-Matigarha, P.O.-Nadkhurkee
District-Dhanbad (Jharkhand) 828307
Phone:0326-2828235/334/365/375/39

व्यवसाय विकास समूह (एक्सप्लोसिव्स)
Business Development Group (Explosives)

IOCL/BDG/A K W M C/PPV REPORTS/MAY-2024
Date - 30 05 2024

To,

The Blasting In charge
A K W M C
Katras Area, BCCL

Subject: - Submission of Ground vibration monitoring reports for May 2024.

Dear Sir,

We have enclosed the blast induced ground vibration monitored in the month of May 2024. The Brief summary of vibration reports are furnished in below table.

1.Sl .No	Mine Name	Date	PPV (mm/s)			ZC Frequency(HZ)			PVS(m m/s)	Dist.(Mtr)
			Tran	Vert	Long	Tran	Vert	Long		
1	A K W M C	01.05.2024	1.127	1.143	1.356	38	33	33	1.514	140
2	A K W M C	09.05.2024	1.198	0.812	1.671	12.5	8.5	13.1	1.847	130
3	A K W M C	15.05.2024	1.174	1.687	2.286	13.5	33	13.8	2.325	130
4	A K W M C	21.05.2024	2.782	1.364	1.805	7.5	12.8	8.1	3.082	120
5	A K W M C	28.05.2024	1.245	0.095	2.278	11.3	27	10.3	2.479	140
6	A K W M C	30.05.2024	1.159	0.914	1.821	7.1	11.6	4.6	2.082	100

As per your requirement the above reading has been monitored during the blasting and the copies of reports are submitted for your information and assessment.

Thanking you and assuring you of our best attention and services at all times.

Yours faithfully
For Indian Oil Corporation Limited,

Vijay
Officer (Marketing)

CamScanner

Event Report

Time	Long at 14:20:34 May 1, 2024
Trigger Source	Geo: 0.700 mm/s, Mic: 68.95 pa (L)
Range	Geo: 254.0 mm/s
Record Time	3.0 sec at 2048 sps
Operator/Setup	Operator factory MMB

Notes
Location
Client
User Name
General

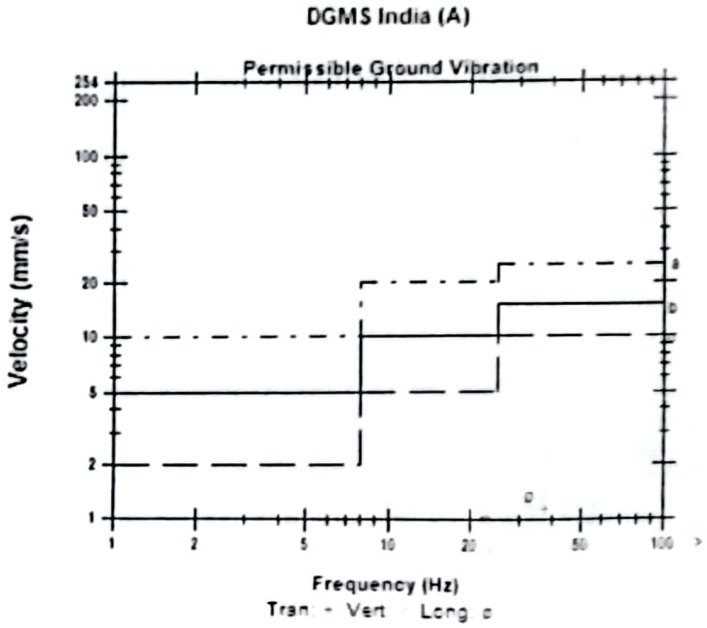
Serial Number	UM10858 V 10-77 Micromate ISEE
Battery Level	3.8 Volts
Unit Calibration	January 18, 2024 by CIMFR Dhanbad
File Name	UM10858_20230514152118.IDFW

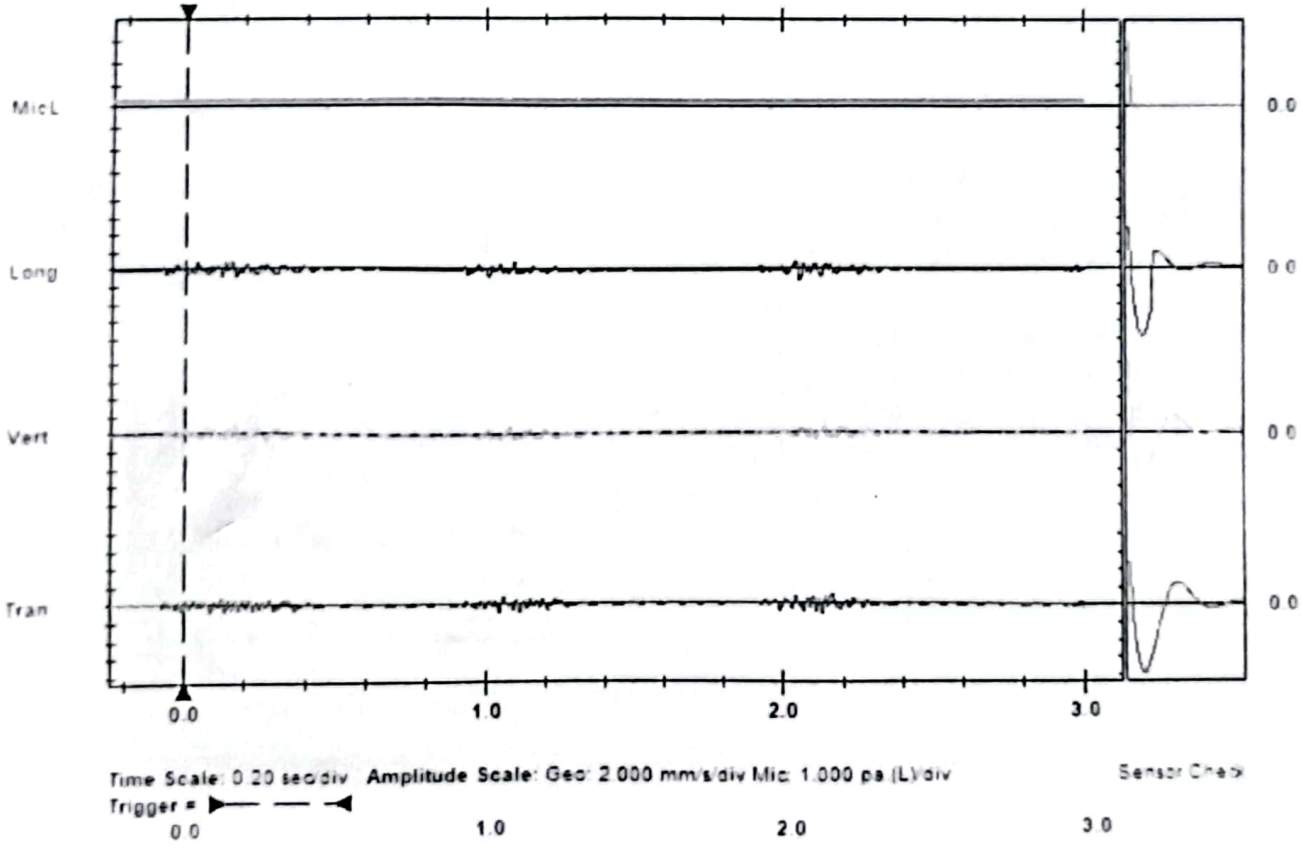
Post Event Notes
A K W M C
Distance from blasting-140mtr

Microphone	Linear Weighting
PSPL	<0.500 pa (L)
ZC Freq	N.A.
Channel Test	Check (Freq = 0.0 Hz Amp = 0 mv)

	Tran	Vert	Long	
PPV	1.127	1.143	1.356	mm/s
ZC Freq	38	33	33	Hz
Time (Rel. to Trig.)	2.130	0.168	2.057	sec
Peak Acceleration	0.033	0.026	0.039	g
Peak Displacement	0.007	0.007	0.006	mm
Sensor Check	Passed	Check	Check	
Frequency	7.5	8.2	11.0	Hz
Overswing Ratio	2.4	3.0	4.4	

Peak Vector Sum: 1.514 mm/s at 0.168 sec
N.A. Not Applicable





CamScanner

LOADING SHEET
INDIAN OIL CORPORATION LIMITED
BG (Explosives), NADKHURKEE-828307

IndianOil

E OF MINE: NAVOMI OCP
DATE: 2 01/05/24
D VEHICLE NO: MH10BJ4079
LOCATION: Shovel Bench
MA OF HOLE: 150mm
STRATA CONDITION: O.B

Sl. No.	Depth (M)	Water Level (M)	Hole Temp (C)	Explosive quantity (KG)	Deck	Total	Stem. Hight (M)	Sl. No.	Depth (M)	Water Level (M)	Hole Temp (C)	Explosive quantity (KG)	Deck	Total	Stem. Hight (M)
1	6.0			50											
2	6.0			50											
3	5.9			50											
4	6.0			50											
5	6.0			50											
6	5.9			50											
7	6.0			50											
8	6.0			50											
9	5.9			50											
10	6.0			50											
11	6.0			50											
12	5.9			50											
13	6.0			50											
14	6.0			50											
15	6.0			50											
16	5.9			50											
17	6.0			50											
18	6.0			50											
19	6.0			50											
20	6.0			50											
21	5.9			50											
22	6.0			50											
				1100 kg											

TOTAL **TOTAL**

Bulk Cup Density (gm/cc) 1.12gm/cc
Burden (M) 4m
Spacing (M) 4.5m
Volume of Patch (W*L*H)
Blast Result
TA3

Booster qty (kg) 2.2 kg
Total Explosive qty (kg) 1100 kg
Powder Factor (m3/kg)
Blasting Accessories used

IOCL Representatives

BCCL Representatives

CamScanner

REPORT ON A BLAST INDUCED GROUND VIBRATION CONDUCTED BY IOCL AT KANTAPAHARI HIRED - BCCL

Date - 30.06.2024

INTRODUCTION

The Kantapahari hired mine is situated in Katras area of BCCL. The ground vibration monitoring is determined to know the safety of nearby structure. For measuring of ground vibration micromate of series UM10858 of make Instantel is being used.

OBJECTIVE OF THE STUDY

The primary objective of the ground vibration is the monitoring of PPV levels at the neighboring areas including villages affected by the blast induced ground vibrations.

METHODOLOGY

1. For the purpose of measuring vibrations, a Micromate seismograph named 'Instantel Micromate' is being used. The instrument has a geophone for sensing ground vibrations in the three planes viz. longitudinal, transverse and vertical. The highest of the three vibrations is recorded as the peak particle velocity measured in mm/sec.
2. For recording the PPV the instrument was placed on firm ground and the sensor was directed towards the site of blast and instrument was set continuous shot modes. Based on the trigger level, the instrument recorded the waveform including the PPV at its frequency during the blast.
3. The distance to the site of blast and the maximum charge per delay deployed were separately noted for the blast .

OBSERVATIONS

The reading was taken near to basti (Angarpathra basti, kumahar basti,kacha basti) situated at a distance of approx 120-150mtr from the current working bench. Summarized statement of the levels of PPV, and frequency recorded during the blast and its distances from blast point are as follow

CamScanner

Sl.no	Date	PPV(mm/s)	Frequency (Hz)	Charge/ hole(kg)	Maximum charge/ delay(kg)	Distance from blast site to structure(m)	Distance from structure(m)	Remarks
1	02.06.2024	2.916	7.9	30-40	40	140	10	within the limit
2	05.06.2024	2.538	3.8	30	30	140	20	within the limit
3	09.06.2024	2.719	128	30-40	40	120	30	within the limit
4	12.06.2024	2.428	3.6	30	30	140	20	within the limit
5	16.06.2024	2.830	7.5	30	30	150	10	within the limit
6	22.06.2024	2.380	11.6	40-45	45	130	20	within the limit
7	27.06.2024	2.081	16.3	40-45	45	130	20	within the limit
8	30.06.2024	2.459	13.5	35-40	40	120	30	within the limit

CONCLUSION

In the view of above readings of ground vibration the PPVs obtained were within the permissible limit as per DGMS norms, which is safe for the nearby structure.

IOCL Representative

Blasting Officer (Kantapahari Hired)

CamScanner

इंडियन ऑयल कॉर्पोरेशन लिमिटेड
मौजा-माटीगढ़ा, पो.आ.-नदखुरकी
जिला-धनबाद (झारखण्ड) पिन कोड:828307
Indian Oil Corporation Limited
Mouza-Matigarha, P.O.-Nadkhurkee
District-Dhanbad (Jharkhand) 828307
Phone:0326-2828235/334/365/375/39

IndianOil
व्यवसाय विकास समूह (एक्सप्लोसिव्स)
Business Development Group (Explosives)

IOCL/BDG/KANTAPAHARI HIRED/PPV REPORTS/JUNE-2024
Date : 30.06.2024

To,

The Blasting In charge
Kantapahari Hired
Katras Area, BCCL

Subject: - Submission of Ground vibration monitoring reports for June 2024.

Dear Sir,

We have enclosed the blast induced ground vibration monitored in the month of June 2024. The Brief summary of vibration reports are furnished in below table.

1.Sl .No	Mine Name	Date	PPV (mm/s)			ZC Frequency(HZ)			PVS(mm/s)	Dist.(Mtr)
			Tran	Vert	Long	Tran	Vert	Long		
1	Kantapahari Hired	02.06.2024	1.907	0.292	2.916	8.2	4.6	7.9	3.435	140
2	Kantapahari Hired	05.06.2024	1.915	0.788	2.538	4.3	4.4	3.8	2.558	140
3	Kantapahari Hired	09.06.2024	1.521	2.719	1.632	102	128	30	2.846	120
4	Kantapahari Hired	12.06.2024	0.063	2.428	1.726	28	3.6	3.4	2.583	140
5	Kantapahari Hired	16.06.2024	2.830	0.221	1.797	7.5	114	11.0	3.230	150
6	Kantapahari Hired	22.06.2024	1.773	2.380	1.513	11.6	11.6	9.3	2.942	130
7	Kantapahari Hired	27.06.2024	1.900	2.049	2.081	18.3	8.8	16.3	2.684	130
8	Kantapahari Hired	30.06.2024	1.403	1.868	2.459	106	9.9	13.5	2.826	120

As per your requirement the above reading has been monitored during the blasting and the copies of reports are submitted for your information and assessment.

Thanking you and assuring you of our best attention and services at all times.

Yours faithfully
For Indian Oil Corporation Limited,

Suraj
Officer (Marketing)

CamScanner

Instantel

Event Report

Date/Time: Long at 14:20:44 June 2, 2024
Trigger Source: Geo: 0.700 mm/s
Range: Geo: 254.0 mm/s
Record Time: 3.0 sec at 2048 sps
Operator/Setup: Operator factory.MMB

Notes
Location:
Client:
User Name:
Details:

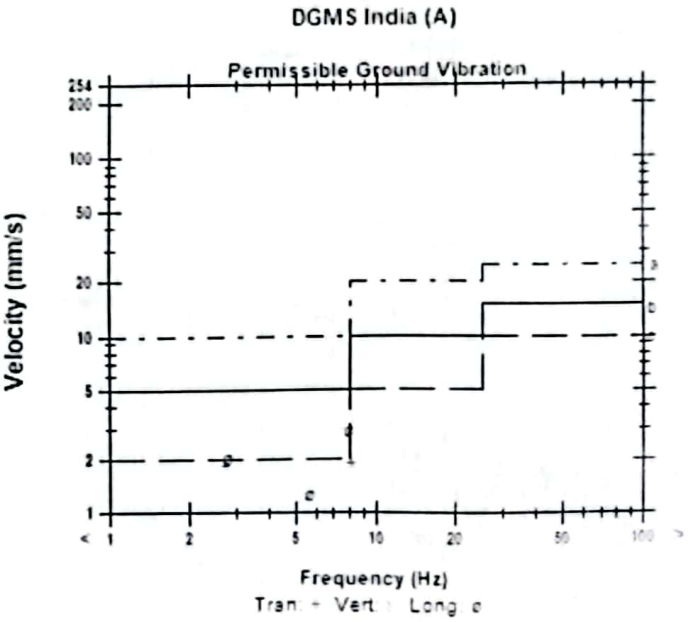
Serial Number UM16971 V 10-69 Micromate ISEE
Battery Level 3.8 Volts
Unit Calibration October 21, 2024. by UES New Delhi
File Name UM16971_20210823132043.IDFW

Post Event Notes
Kantapahari hired
Distance from blasting-140mtr

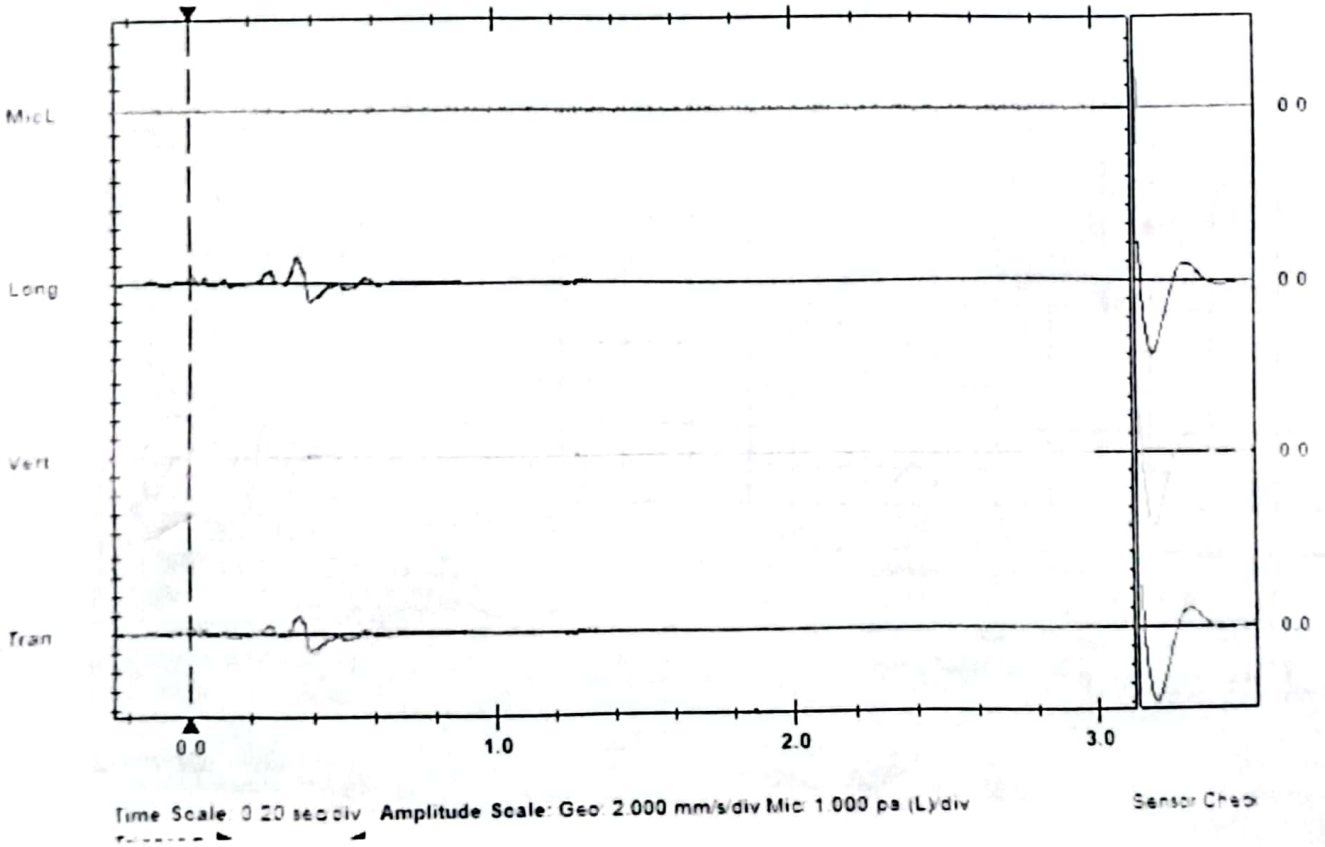
Microphone: Linear Weighting
PSPL: <0.500 pa (L)
ZC Freq: >200 Hz
Channel Test: Check (Freq = 0.0 Hz Amp = 0 mv)

	Tran	Vert	Long	
PPV	1.907	0.292	2.916	mm/s
ZC Freq	8.2	4.6	7.9	Hz
Time (Rel. to Trig)	0.355	0.465	0.348	sec
Peak Acceleration	0.031	0.016	0.031	g
Peak Displacement	0.071	0.014	0.065	mm
Sensor Check	Passed	Passed	Passed	
Frequency	7.3	7.3	7.5	Hz
Overswing Ratio	4.3	4.7	4.6	

Peak Vector Sum: 3.435 mm/s at 0.348 sec
N/A: Not Applicable



a)Industrial Buildings
b)Domestic houses structures
c)Historic objects, sensitive structures



Time Scale: 0.20 sec/div Amplitude Scale: Geo: 2.000 mm/s/div Mic: 1.000 pa (L)/div Sensor Chec

LOADING SHEET
INDIAN OIL CORPORATION LIMITED
BG (Explosives), NADKHURKEE-828307

IndianOil

NAME OF MINE : Kandhalari Hill
DATE : 11/07/24
BMD VEHICLE NO: TN 10 BY 0879
LOCATION : Blast Mark
DIA OF HOLE: 150MM
STRATA CONDITION : Hard

Sl. No.	Depth (M)	Water Level (M)	Hole Temp (C)	Explosive quantity (KG)	Deck	Total	Stem. Hight (M)
1	5.3			40			
2	5.3			40			
3	5.3			40			
4	5.0			40			
5	5.2			40			
6	5.3			40			
7	5.3			40			
8	5.1			40			
9	5.3			40			
10	5.2			40			
11	5.3			40			
12	5.3			40			
13	5.3			40			
14	5.3			40			
15	5.3			40			
16	5.3			40			
17	5.3			40			
18	5.3			40			
19	5.2			40			
20	5.1			40			
21	5.2			40			
22	5.2			40			
23	5.1			40			
24	5.2			40			
25	5.1			40			
26	5.2			40			
27	5.3			40			
28	5.2			40			

TOTAL 28 holes - 1120

Sl. No.	Depth (M)	Water Level (M)	Hole Temp (C)	Explosive quantity (KG)	Deck	Total	Stem. Hight (M)
1	4.5			30			
2	4.5			30			
3	4.5			30			
4	4.5			30			
5	5.0			30			
6	5.0			30			
7	4.5			30			
8	5.0			30			
9	4.5			30			
10	5.0			30			
11	4.5			30			
12	4.5			30			
13	5.0			30			
14	5.0			30			
15	4.5			30			
16	5.0			30			
17	5.0			30			
18	4.5			30			
19	5.0			30			
20	5.0			30			
21	4.5			30			
22	5.0			30			
23	4.5			30			
24	4.5			30			
25	5.0			30			
26	5.0			30			
27	5.0			30			

TOTAL 27 holes - 810

Bulk Cup Density (gm/cc) 1.14gm/cc
Burden (M) 2.5
Spacing (M) 2.5
Volume of Patch (W*L*H)
Blast Result Good

Booster qty (kg)
Total Explosive qty (kg) 1930
Powder Factor (m3/kg)
Blasting Accessories used ED, Boosters

IOCL Representatives

BCCL Representatives

CamScanner

REPORT ON A BLAST INDUCED GROUND VIBRATION CONDUCTED BY IOCL AT A K W M C - BCCL

Date: 30.06.2024

INTRODUCTION

The A K W M C mine is situated in Katras area of BCCL. The ground vibration monitoring is determined to know the safety of nearby structure. For measuring of ground vibration micromate of series UM10858 of make Instantel is being used.

OBJECTIVE OF THE STUDY

The primary objective of the ground vibration is the monitoring of PPV levels at the neighboring areas including villages affected by the blast induced ground vibrations.

METHODOLOGY

1. For the purpose of measuring vibrations, a Micromate seismograph named 'Instantel Micromate' is being used. The instrument has a geophone for sensing ground vibrations in the three planes viz. longitudinal, transverse and vertical. The highest of the three vibrations is recorded as the peak particle velocity measured in mm/sec.
2. For recording the PPV the instrument was placed on firm ground and the sensor was directed towards the site of blast and instrument was set continuous shot modes. Based on the trigger level, the instrument recorded the waveform including the PPV at its frequency during the blast.
3. The distance to the site of blast and the maximum charge per delay deployed were separately noted for the blast.

OBSERVATIONS

The reading was taken near to bast (Sijua more & Angarpathra) situated at a distance of approx 110-160mtr from the current working bench. Summarized statement of the levels of PPV, and frequency recorded during the blast and its distances from blast point are as follow

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Sl.no	Date	PPV(mm/s)	Frequency (Hz)	Charge/ hole(kg)	Maximum charge/ delay(kg)	Distance from blast site to structure(m)	Distance from structure(m)	Remarks
1	01.06.2024	3.405	10.6	35-40	40	120	30	within the limit
2	10.06.2024	1.970	51	30-35	35	130	20	within the limit
3	14.06.2024	1.789	6.3	185-190	190	160	40	within the limit
4	18.06.2024	3.586	24	50-55	55	130	20	within the limit
5	28.06.2024	1.813	4.7	30-35	35	130	20	within the limit
6	30.06.2024	2.144	7.2	45-50	50	110	40	within the limit

CONCLUSION

In the view of above readings of ground vibration the PPVs obtained were within the permissible limit as per DGMS norms, which is safe for the nearby structure.

IOCL Representative

Blasting Officer (A K W M C)

CamScanner

इंडियन ऑयल कॉर्पोरेशन लिमिटेड
मौजा-माटीगढ़ा, पो.आ.-नदखुरकी
जिला-धनबाद (झारखण्ड) पिन कोड:828307

IndianOil

Indian Oil Corporation Limited
Mouza-Matigarha, P.O.-Nadkhurkee
District-Dhanbad (Jharkhand) 828307
Phone:0326-2828235/334/365/375/39

व्यवसाय विकास समूह (एक्सप्लोसिव्स)
Business Development Group (Explosives)

IOCL/BDG/A K W M C/PPV REPORTS/JUNE-2024
Date - 30.05.2024

To,

The Blasting In charge
A K W M C
Katras Area, BCCL

Subject: - Submission of Ground vibration monitoring reports for June 2024.

Dear Sir,

We have enclosed the blast induced ground vibration monitored in the month of June 2024. The Brief summary of vibration reports are furnished in below table.

1.Sl .No	Mine Name	Date	PPV (mm/s)			ZC Frequency(HZ)			PVS(mm/s)	Dist.(Mtr)
			Tran	Vert	Long	Tran	Vert	Long		
1	A K W M C	01.06.2024	2.514	1.970	3.405	10.2	13.8	10.6	3.708	120
2	A K W M C	10.06.2024	1.450	0.828	1.970	23	31	51	2.115	130
3	A K W M C	14.06.2024	0.063	1.143	1.789	18.6	32	6.3	1.793	160
4	A K W M C	18.06.2024	0.071	3.586	2.948	18.0	24	1.7	3.614	130
5	A K W M C	28.06.2024	1.513	0.126	1.813	9.6	102	4.7	2.392	130
6	A K W M C	30.06.2024	2.144	2.041	2.112	7.2	5.6	8.1	3.233	110

As per your requirement the above reading has been monitored during the blasting and the copies of reports are submitted for your information and assessment.

Thanking you and assuring you of our best attention and services at all times.

Yours faithfully
For Indian Oil Corporation Limited,

Viraj
Officer (Marketing)

CamScanner

Instantel

Event Report

Date Time: Long at 14:16:52 June 1, 2024
Trigger Source: Geo: 0.700 mm/s
Range: Geo: 254.0 mm/s
Record Time: 3.0 sec at 2048 sps
Operator Setup: Operator factory MMB

Notes:
[illegible]

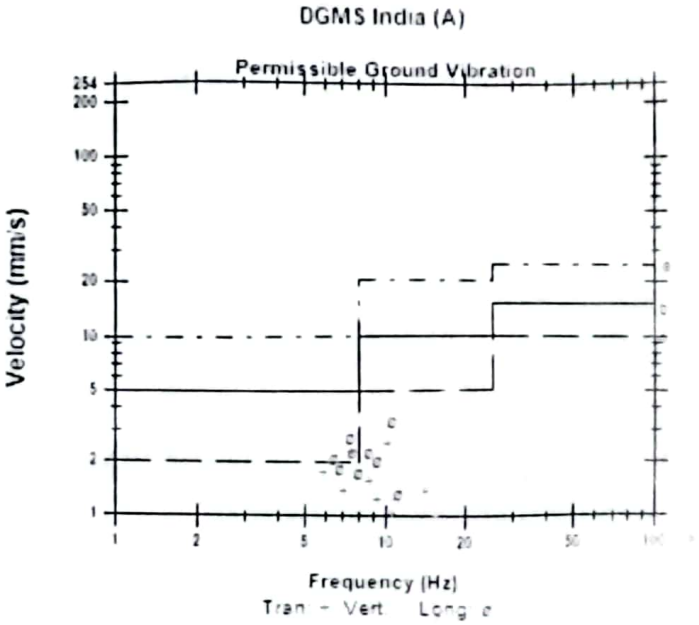
Serial Number: UM16971 V 10.99 Micromate ISEE
Battery Level: 3.8 Volts
Unit Calibration: October 21, 2024 by UES New Delhi
File Name: UM16971_20210828161659.IDFW

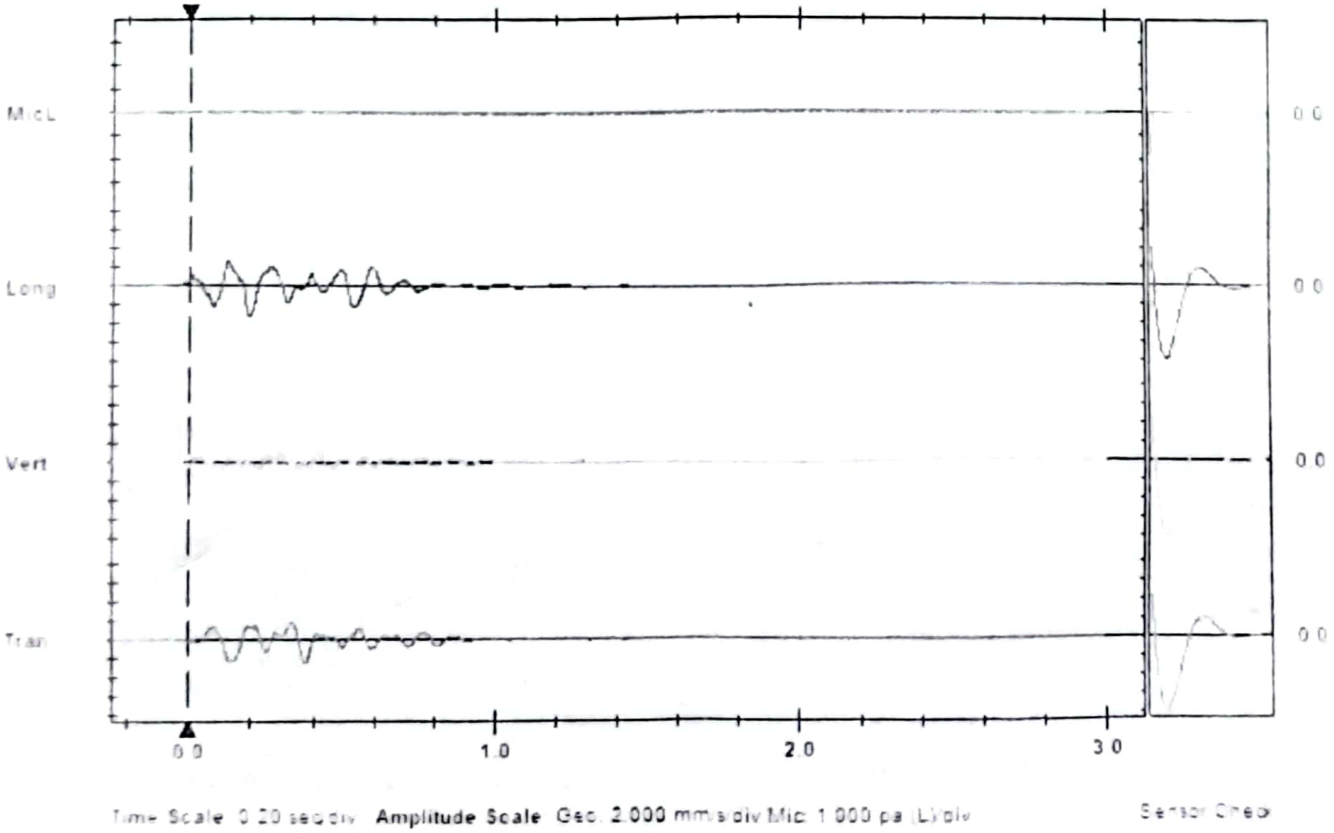
Post Event Notes
A K W M C
Distance from blasting-120mtr

Microphone: Linear Weighting
PSPL: <0.500 pa (L)
ZC Freq: >200 Hz
Channel Test: Check (Freq = 0.0 Hz Amp = 0 mv)

	Tran	Vert	Long	
PPV	2.514	1.970	3.405	mm/s
ZC Freq	10.2	13.8	10.6	Hz
Time (Rel. to Trig)	0.374	0.145	0.188	sec
Peak Acceleration	0.026	0.033	0.049	g
Peak Displacement	0.052	0.019	0.051	mm
Sensor Check	Passed	Passed	Passed	
Frequency	7.3	7.9	7.5	Hz
Overswing Ratio	4.3	4.7	4.7	

Peak Vector Sum: 3.705 mm/s at 0.188 sec
N.A. Not Applicable





Time Scale: 0.20 sec/div Amplitude Scale: Geo: 2.000 mm/s/div Mic: 1.000 pa (L)/div Sensor Check

CamScanner

BG (E)/B-II/FORM/7.5/MKT 001

LOADING SHEET

INDIAN OIL CORPORATION LIMITED

BG (Explosives), NADKHURKEE-828307

IndianOil

NAME OF MINE : AKWMC OCP

DATE : 01/06/24

BMD VEHICLE NO: MH10 BY 4116

LOCATION : Shovel Bench

DIA OF HOLE: 150 mm

STRATA CONDITION : O.B

Sl. No.	Depth (M)	Water Level (M)	Hole Temp (C)	Explosive quantity (KG)	Deck	Total	Stem. Hight (M)	Sl. No.	Depth (M)	Water Level (M)	Hole Temp (C)	Explosive quantity (KG)	Deck	Total	Stem. Hight (M)
1	6.0			40				1	6.0			40			
2	6.0			40				2	6.0			40			
3	5.9			40				3	6.0			40			
4	6.0			40				4	5.9			40			
5	6.0			40				5	6.0			40			
6	5.9			35				6	6.0			40			
7	6.0			40				7	5.9			40			
8	6.0			40				8	6.0			40			
9	5.9			40				9	6.0			40			
10	6.0			40				10	6.0			40			
11	6.0			40				11	5.9			40			
12	6.0			40				12	6.0			40			
13	5.9			40				13	6.0			40			
14	5.9			35				14	6.0			40			
15	6.0			40				15	5.4			40			
16	6.0			40				16	6.0			40			
17	5.9			40				17	6.0			40			
18	6.0			40				18	5.9			40			
19	6.0			40				19	6.0			40			
20	6.0			40				20	6.0			40			
21	5.9			35				21	6.0			40			
22	6.0			40				22	5.9			40			
23	6.0			40				23	6.0			40			
24	6.0			40				24	6.0			40			
25	5.9			35				25	5.9			40			
26	6.0			40				26	6.0			40			
27	6.0			40											
28	6.0			40								1040 kg			
29	5.0			40											
30	5.9			40											
TOTAL				1190 kg				TOTAL							

Bulk Cup Density (gm/cc) 1.12 gm/cc

Burden (M) 4 m

Spacing (M) 4.2 m

Volume of Patch (W*L*H)

Blast Result

Booster qty (kg) 5.6 kg

Total Explosive qty (kg) 2220 kg

Powder Factor (m3/kg)

Blasting Accessories used

IOCL Representatives

BCCL Representatives

CamScanner

Event Report

Date/Time	Long at 13:56:30 JULY 01,2024
Trigger Source	Geo: 0.700 mm/s Mic: 89.95 pa (L)
Range	Geo: 254.0 mm/s
Record Time	3.0 sec at 2048 sps
Operator Setup	Operator factory MMB

Serial Number	UM10858 V 10-77 Micromate ISEE
Battery Level	9.7 Volts
Unit Calibration	January 18,2024 by CMFR Chennai
File Name	UM10858_20231124135630.IDFW

Post Event Notes
KANTAPAHADI HIRED
DISTANCE FROM BLAST-100M

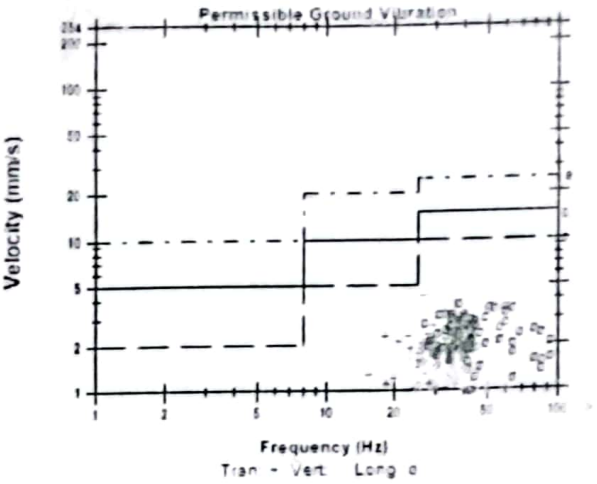
Notes
Location
Client
Job Number
Operator

Microphone Linear weighting
PSPL 40.600 pa (L)
ZC Freq N/A
Channel Test Check Freq = 0.0 Hz Amp = 0 mv

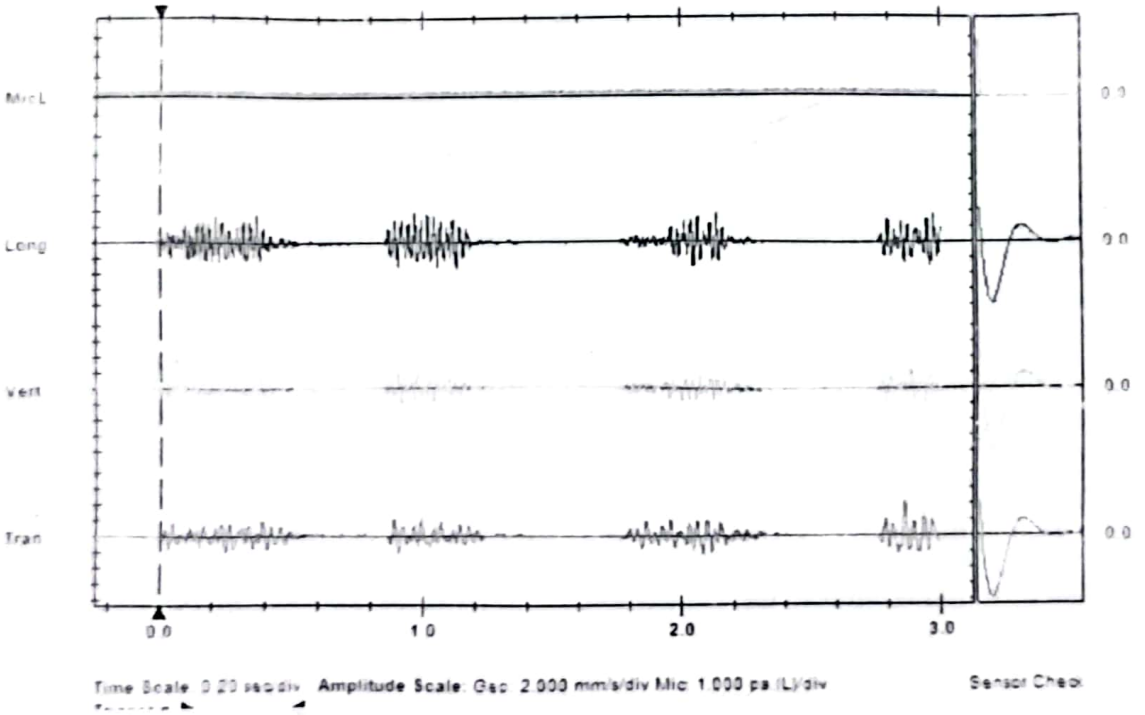
	Tran	Vert	Long	
PPV	4.481	1.630	3.799	mm/s
ZC Freq	26	33	36	Hz
Time (Rel. to Trig)	2.654	2.885	0.975	sec
Peak Acceleration	1.074	0.069	0.212	g
Peak Displacement	0.023	0.012	0.014	mm
Sensor Check	Passed	Passed	Passed	
Frequency	7.3	7.3	7.5	Hz
Overswing Ratio	4.3	4.3	4.0	

Peak Vector Sum 4.512 mm/s at 2.662 sec
N/A Not Applicable

DGMS India (A)



a)Industrial Buildings
b)Domestic houses/structures
c)Historic objects sensitive structures



Time Scale: 0.20 sec/div Amplitude Scale: Geo: 2.000 mm/s/div Mic: 1.000 pa (L)/div Sensor Check

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CamScanner

instantel

Event Report

Date Time	Unit at 14:37:44 JULY 01,2024
Trigger Source	Geo: 0.700 mm/s, Mic: 69.95 pa (L)
Range	Geo: 254.0 mm/s
Record Time	3.0 sec at 2048 sps
Operator Setup	Operator factory MMB

Notes
Client
Client
Unit Name
Serial

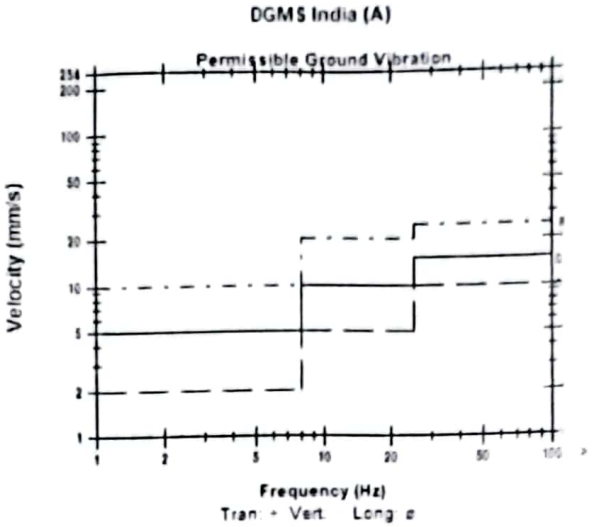
Serial Number	UM10858 V 10.77 Micromate ISEE
Battery Level	3.7 Volts
Unit Calibration	January 18,2024 by CIMFR Dhanbad
File Name	UM10858_20231204143744.IDFW

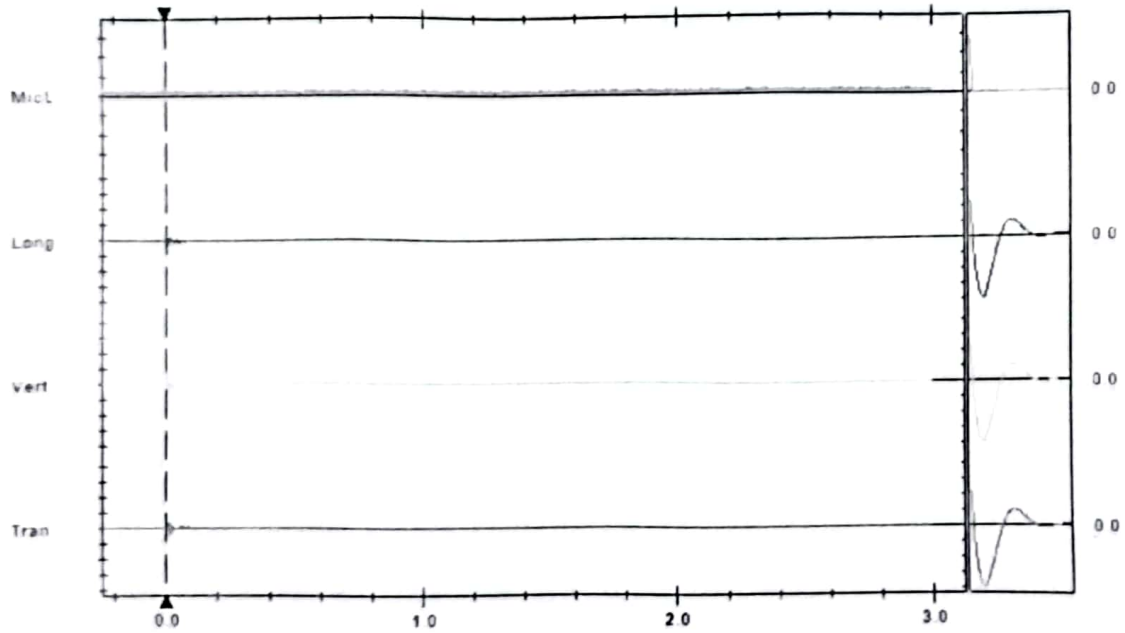
Post Event Notes
KANTAPAHADI HIRED
DISTANCE FROM BLAST- 300M

Microphone	Linear Weighting
PSPL	<0.500 pa (L)
ZC Freq	N.A.
Channel Test	Check Freq = 0.0 Hz Amp = 0 mv)

	Tran	Vert	Long	
PPV	0.938	2.270	0.485	mm/s
ZC Freq	114	>200	99	Hz
Time (Rel. to Trig)	0.005	0.004	0.004	sec
Peak Acceleration	0.089	0.299	0.041	g
Peak Displacement	0.001	0.002	0.001	mm
Sensor Check	Passed	Passed	Passed	
Frequency	7.3	7.5	7.7	Hz
Overswing Ratio	4.4	4.2	4.0	

Peak Vector Sum 2.353 mm/s at 0.004 sec
N.A. Not Applicable





Time Scale: 0.20 sec/div **Amplitude Scale:** Geo: 2.000 mm/s/div Mic: 1.000 pa (L)/div Sensor Check
Trigger =
0.0 1.0 2.0 3.0

Time Scale: 0.20 sec/div **Amplitude Scale:** Geo: 2.000 mm/s/div Mic: 1.000 pa (L)/div Sensor Check
Trigger =

CamScanner

Instantel

Event Report

Setup Time	Tue at 14:48:02 JULY 01 2024
Trigger Source	Geo: 0.700 mm/s Mic: 88.96 pa (L)
Range	Geo: 254.0 mm/s
Record Time	3.0 sec at 2048 sps
Operator Setup	Operator/factory MMB

Notes
Location
Client
User Name
Serial#

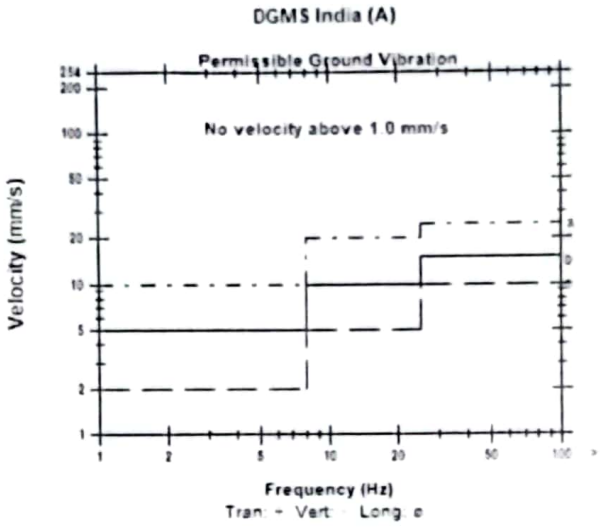
Serial Number	UM10858 V 10.77 Micromate IBEE
Battery Level	3.7 Volts
Unit Calibration	January 18 2024 by CIMFR Dhanbad
File Name	UM10858_20231217144802.IDFW

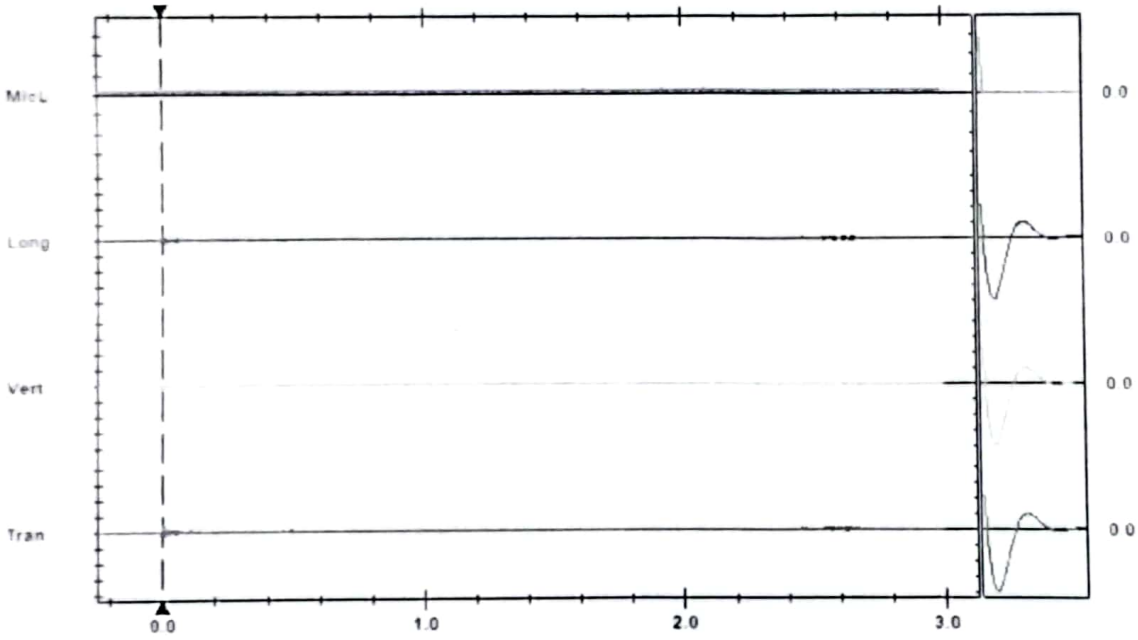
Post Event Notes
KANTAPAHADI HIRED
DISTANCE FROM BLAST- 500M

Microphone	Linear Weighting
PSPL	<0.500 pa (L)
ZC Freq	N/A
Channel Test	Check (Freq = 0.0 Hz Amp = 0 mv)

	Tran	Vert	Long	
PPV	0.820	0.236	0.504	mm/s
ZC Freq	69	114	72	Hz
Time (Rel. to Trig)	0.000	-0.004	-0.003	sec
Peak Acceleration	0.035	0.025	0.029	g
Peak Displacement	0.005	0.000	0.001	mm
Sensor Check	Passed	Passed	Passed	
Frequency	7.3	7.3	7.5	Hz
Overswing Ratio	4.3	4.3	4.1	

Peak Vector Sum 0.854 mm/s at 0.000 sec
N/A Not Applicable





Time Scale: 0.20 sec/div Amplitude Scale: Geo: 2.000 mm/s/div Mic: 1.000 pa (L)/div Sensor Check
Trigger =
0.0 1.0 2.0 3.0

Time Scale: 0.20 sec/div Amplitude Scale: Geo: 2.000 mm/s/div Mic: 1.000 pa (L)/div Sensor Check
Trigger =

CamScanner

REPORT ON A BLAST INDUCED GROUND VIBRATION CONDUCTED BY IOCL AT KANTAPAHARI HIRED - BCCL

Date:-31.07.2024

INTRODUCTION

The Kantapahari hired mine is situated in Katras area of BCCL. The ground vibration monitoring is determined to know the safety of nearby structure. For measuring of ground vibration micromate of series UM10858 of make Instantel is being used.

OBJECTIVE OF THE STUDY

The primary objective of the ground vibration is the monitoring of PPV levels at the neighboring areas including villages affected by the blast induced ground vibrations.

METHODOLOGY

1. For the purpose of measuring vibrations, a Micromate seismograph named 'Instantel Micromate' is being used. The instrument has a geophone for sensing ground vibrations in the three planes viz. longitudinal, transverse and vertical. The highest of the three vibrations is recorded as the peak particle velocity measured in mm/sec.
2. For recording the PPV the instrument was placed on firm ground and the sensor was directed towards the site of blast and instrument was set continuous shot modes. Based on the trigger level, the instrument recorded the waveform including the PPV at its frequency during the blast.

3. The distance to the site of blast and the maximum charge per delay deployed were separately noted for the blast .

OBSERVATIONS

The reading was taken near to basti (Angarpathra basti, kumahar basti,kacha basti) situated at a distance of approx 120-150mtr from the current working bench. Summarized statement of the levels of PPV, and frequency recorded during the blast and its distances from blast point are as follow

CamScanner

Sl.no	Date	PPV(mm/s)	Frequency (Hz)	Charge/ hole(kg)	Maximum charge/ delay(kg)	Distance from blast site to structure(m)	Distance from structure(m)	Remarks
1	01.07.2024	3.225	22	30	30	150	20	within the limit
2	05.07.2024	1.167	5.2	30	30	180	10	within the limit
3	10.07.2024	1.174	6.2	10	10	170	30	within the limit
4	13.07.2024	1.505	26	30	30	120	20	within the limit
5	16.07.2024	1.490	20	15-20	20	140	10	within the limit
6	18.07.2024	2.499	22	10	10	150	20	within the limit
7	27.07.2024	1.773	16.5	25	25	120	20	within the limit
8	31.07.2024	4.745	8.1	20-25	25	140	30	within the limit

CONCLUSION

In the view of above readings of ground vibration the PPVs obtained were within the permissible limit as per DGMS norms, which is safe for the nearby structure.

IOCL Representative

Blasting Officer (Kantapahari Hired)

CamScanner

इंडियन ऑयल कॉर्पोरेशन लिमिटेड
मौजा-माटीगड़ा, पो.आ.-नदखुरकी
जिला-धनबाद (झारखण्ड) पिन कोड:828307
Indian Oil Corporation Limited
Mouza-Matigarha, P.O.-Nadkhurkee
District-Dhanbad (Jharkhand) 828307
व्यवसाय विकास समूह (एक्सप्लोसिव्स) Phone:0326-2828235/334/365/375/39
Business Development Group (Explosives)

IOCL/BDG/KANTAPAHARI HIRED/PPV REPORTS/August-2024
Date : 31.07.2024

To,

The Blasting In charge
Kantapahari Hired
Katras Area, BCCL

Subject: - Submission of Ground vibration monitoring reports for August 2024.

Dear Sir,

We have enclosed the blast induced ground vibration monitored in the month of August 2024. The Brief summary of vibration reports are furnished in below table

1.Sl .No	Mine Name	Date	PPV (mm/s)			ZC Frequency(HZ)			PVS(mm/s)	Dist.(Mtr)
			Tran	Vert	Long	Tran	Vert	Long		
1	Kantapahari Hired	01.07.2024	0.063	2.648	3.255	22	29	22	3.590	150
2	Kantapahari Hired	05.07.2024	0.063	1.167	0.930	11.9	5.2	2.4	1.225	180
3	Kantapahari Hired	10.07.2024	0.899	1.167	1.174	6.6	22	6.2	1.357	170
4	Kantapahari Hired	13.07.2024	1.324	1.505	1.356	6.5	26	4.1	1.892	120
5	Kantapahari Hired	16.07.2024	1.277	1.490	1.419	6.7	20	5.2	1.782	140
6	Kantapahari Hired	18.07.2024	1.458	2.499	0.205	28	22	68	2.499	150
7	Kantapahari Hired	27.07.2024	1.245	1.773	0.181	22	16.5	11.4	1.782	120
8	Kantapahari Hired	31.07.2024	4.745	0.804	1.844	27	8.1	30	4.764	140

As per your requirement the above reading has been monitored during the blasting and the copies of reports are submitted for your information and assessment.

Thanking you and assuring you of our best attention and services at all times.

Yours faithfully
For Indian Oil Corporation Limited,

Officer (Marketing)

CamScanner

Instantel

Event Report

Date/Time Long at 13:47:22 August 01,2024
Trigger Source Geo: 0.200 mm/s
Range Geo: 254.0 mm/s
Record Time 3.0 sec at 2048 sps
Operator/Setup Operator/factory MMB

Notes
Location
Client
User Name
General

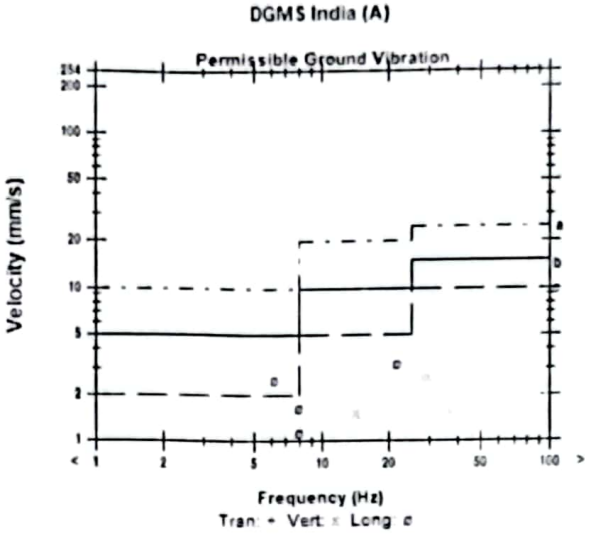
Serial Number UM16871 V 10-89 Micromate ISEE
Battery Level 3.6 Volts
Unit Calibration January 18, 2024 by CIMFR Dhanbad
File Name UM16871_20231102134722.IDFW

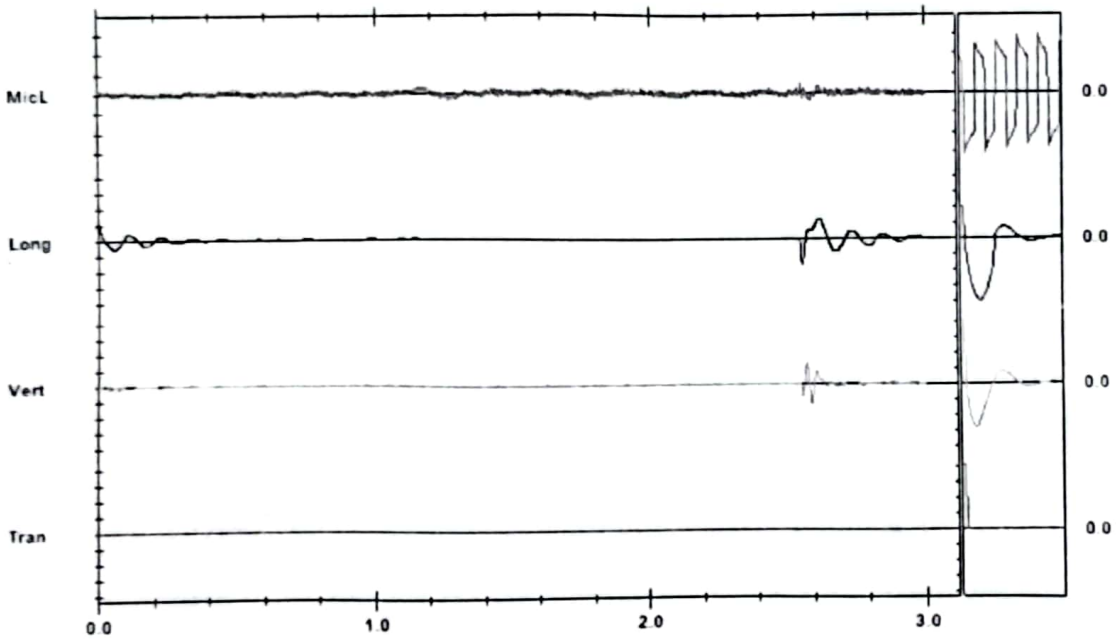
Post Event Notes
Kantapahari hired
Distance from blasting-150mtr

Microphone Linear Weighting
PSPL 0.543 pa (L) at 2.549 sec
ZC Freq 68 Hz
Channel Test Passed (Freq = 19.7 Hz Amp = 1159 mv)

	Tran	Vert	Long	
PPV	0.063	2.648	3.255	mm/s
ZC Freq	22	29	22	Hz
Time (Rel. to Trig)	2.632	2.569	2.555	sec
Peak Acceleration	0.010	0.056	0.048	g
Peak Displacement	0.000	0.059	0.059	mm
Sensor Check	Check	Check	Passed	
Frequency	1024.0	7.9	7.1	Hz
Overswing Ratio	0.0	3.8	5.7	

Peak Vector Sum 3.590 mm/s at 2.555 sec





Time Scale: 0.20 sec/div Amplitude Scale: Geo: 2.000 mm/s/div Mic: 1.000 pa (L)/div Sensor Check

Printed: September 27, 2024 (V 10.72 - 10.72)

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BG (E)/B-II/FORM/7.5/MKT 001

LOADING SHEET

INDIAN OIL CORPORATION LIMITED

BG (Explosives), NADKHURKEE-820307

IndianOil

NAME OF MINE : Kamptee Colliery

BMD VEHICLE NO: TN 19 AY 3992

DIA OF HOLE: 102mm

DATE : 01/07/24

LOCATION : Bharat Bereda

STRATA CONDITION : Hard

Sl. No	Depth (M)	Water Level (M)	Hole Temp (C)	Explosive quantity (KG)	Deck	Total	Stem Hight (M)	Sl. No	Depth (M)	Water Level (M)	Hole Temp (C)	Explosive quantity (KG)	Deck	Total	Stem Hight (M)
1	5.0			30				1	4.9			30			
2	5.0			30				2	5.0			30			
3	5.0			30				3	5.0			30			
4	5.0			30				4	5.0			30			
5	5.0			30				5	5.0			30			
6	4.9			30				6	5.0			30			
7	4.9			30				7	4.9			30			
8	5.0			30				8	4.9			30			
9	5.0			30				9	5.0			30			
10	5.0			30				10	5.0			30			
11	4.8			30				11	4.9			30			
12	4.8			30				12	5.0			30			
13	5.0			30				13	5.0			30			
14	5.0			30				14	5.0			30			
15	4.9			30				15	4.9			30			
16	5.0			30				16	5.0			30			
17	4.9			30				17	5.0			30			
18	5.0			30				18	4.9			30			
19	5.0			30				19	5.0			30			
20	4.9			30				20	5.0			30			
21	5.0			30				21	4.9			30			
22	4.9			30				22	5.0			30			
23	5.0			30				23	5.0			30			
24	4.9			30				24	4.9			30			
25	5.0			30				25	5.0			30			
26	5.0			30				26	5.0			30			
27	4.9			30				27	4.9			30			
28	5.0			30											

TOTAL 28 Holes – 840

TOTAL 27 Holes – 810

Bulk Cup Density (gm/cc) 1 Ample

Burden (M) 2.5

Spacing (M) 2.5

Volume of Patch (W*L*H)

Blast Result Good

Booster qty (kg)

Total Explosive qty (kg) 1650

Powder Factor (m3/kg)

Blasting Accessories used ED, Boosters

IOCL Representatives

BCCL Representatives

CamScanner

REPORT ON A BLAST INDUCED GROUND VIBRATION CONDUCTED BY IOCL AT A K W M C - BCCL

Date : 31.07.2024

INTRODUCTION

The A K W M C mine is situated in Katras area of BCCL. The ground vibration monitoring is determined to know the safety of nearby structure. For measuring of ground vibration micromate of series UM10858 of make Instantel is being used.

OBJECTIVE OF THE STUDY

The primary objective of the ground vibration is the monitoring of PPV levels at the neighboring areas including villages affected by the blast induced ground vibrations.

METHODOLOGY

1. For the purpose of measuring vibrations, a Micromate seismograph named 'Instantel Micromate' is being used. The instrument has a geophone for sensing ground vibrations in the three planes viz. longitudinal, transverse and vertical. The highest of the three vibrations is recorded as the peak particle velocity measured in mm/sec.
2. For recording the PPV the instrument was placed on firm ground and the sensor was directed towards the site of blast and instrument was set continuous shot modes. Based on the trigger level, the instrument recorded the waveform including the PPV at its frequency during the blast

3. The distance to the site of blast and the maximum charge per delay deployed were separately noted for the blast.

OBSERVATIONS

The reading was taken near to bast (Sijua more & Angarpathra) situated at a distance of approx 110-180mtr from the current working bench. Summarized statement of the levels of PPV, and frequency recorded during the blast and its distances from blast point are as follow

CamScanner

Sl.no	Date	PPV(mm/s)	Frequency (Hz)	Charge/ hole(kg)	Maximum charge/ delay(kg)	Distance from blast site to structure(m)	Distance from structure(m)	Remarks
1	03.07.2024	1.852	49	30-35	35	180	10	within the limit
2	07.07.2024	3.042	2.6	35-60	60	140	40	within the limit
3	11.07.2024	3.003	41	45-50	50	170	10	within the limit
4.	18.07.2024	2.325	7.4	50-55	55	170	10	within the limit
5.	26.07.2024	4.753	6.8	55	55	140	40	within the limit
6	30.07.2024	3.665	7.6	35-40	40	120	20	within the limit

CONCLUSION

In the view of above readings of ground vibration the PPVs obtained were within the permissible limit as per DGMS norms, which is safe for the nearby structure.

ICCL Representative

Blasting Officer (A K W M C)

CamScanner

IndianOil

इंडियन ऑयल कॉर्पोरेशन लिमिटेड
मौजा-माटीगढ़ा, पो.आ.-नदखुरकी
जिला-धनबाद (झारखण्ड) पिन कोड:828307

Indian Oil Corporation Limited
Mouza-Matigarha, P.O.-Nadkhurkee
District-Dhanbad (Jharkhand) 828307
Phone:0326-2828235/334/365/375/39

व्यवसाय विकास समूह (एक्सप्लोसिव्स)
Business Development Group (Explosives)

IOCL/BDG/A K W M C/PPV REPORTS/August-2024
Date: - 31.07.2024

To,

The Blasting In charge
A K W M C
Katras Area, BCCL

Subject: - Submission of Ground vibration monitoring reports for August 2024.

Dear Sir,

We have enclosed the blast induced ground vibration monitored in the month of August 2024. The Brief summary of vibration reports are furnished in below table.

1.Sl.No	Mine Name	Date	PPV (mm/s)			ZC Frequency(HZ)			PVS(mm/s)	Dist.(Mtr)
			Tran	Vert	Long	Tran	Vert	Long		
1	A K W M C	03.07.2024	0.063	1.852	0.717	60	49	79	1.917	180
2	A K W M C	07.07.2024	0.055	3.042	1.592	73	2.6	79	3.047	140
3	A K W M C	11.07.2024	0.063	1.632	3.003	171	45	41	3.285	170
4	A K W M C	18.07.2024	0.055	1.608	2.325	45	29	7.4	2.328	170
5	A K W M C	26.07.2024	0.055	1.434	4.753	33	29	6.8	4.862	140
6	A K W M C	30.07.2024	0.055	1.080	3.665	35	26	7.6	3.705	120

As per your requirement the above reading has been monitored during the blasting and the copies of reports are submitted for your information and assessment.

Thanking you and assuring you of our best attention and services at all times.

Yours faithfully
For Indian Oil Corporation Limited,

Viraj
Officer (Marketing)

CamScanner

Instantel

Event Report

Date Time	Vert at 14:18:47 August 03, 2024
Trigger Source	Geo: 0.200 mm/s
Range	Geo: 254.0 mm/s
Record Time	3.0 sec at 2048 sps
Operator/Setup	Operator/factory MMB

Notes
Location
Client
User Name
General

Serial Number	UM16971 V 10.69 Micromate ISEE
Battery Level	3.6 Volts
Unit Calibration	January 18 2024 by CIMFR Dhanbad
File Name	UM16971_20231101141847.IDFW

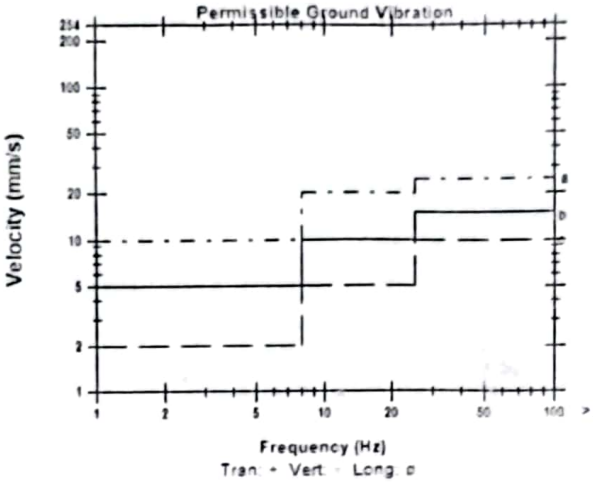
Post Event Notes
AKWMC
DIATANCE FROM BLAST- 180 mtr

Microphone	Linear Weighting
PSPL	1.800 pa (L) at 0.580 sec
ZC Freq	33 Hz
Channel Test	Passed (Freq = 19.7 Hz Amp = 1124 mv)

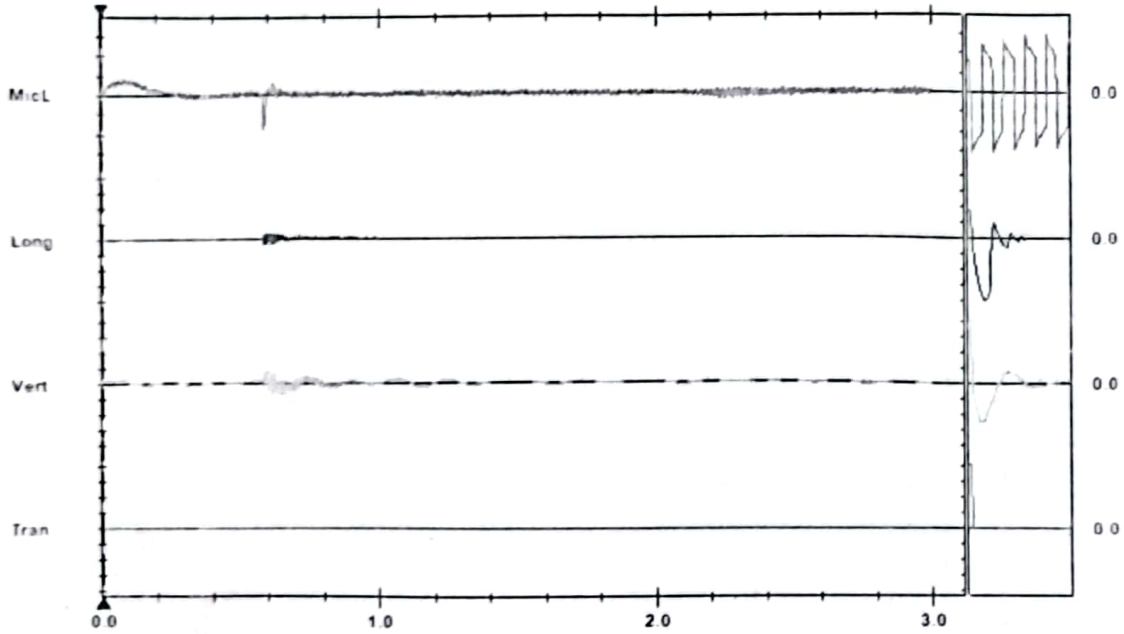
	Tran	Vert	Long	
PPV	0.063	1.852	0.717	mm/s
ZC Freq	60	49	79	Hz
Time (Rel. to Trig)	2.918	0.593	0.615	sec
Peak Acceleration	0.012	0.102	0.117	g
Peak Displacement	0.000	0.020	0.017	mm
Sensor Check	Check	Check	Check	
Frequency	1024.0	7.9	10.6	Hz
Overswing Ratio	0.0	3.6	4.0	

Peak Vector Sum 1.917 mm/s at 0.593 sec

DGMS India (A)



a)Industrial Buildings
b)Domestic houses/structures
c)Historic objects, sensitive structures



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Trigger =
0.0 1.0 2.0 3.0

Time Scale: 0.20 sec/div Amplitude Scale: Geo 2.000 mm/s/div Mic 1.000 pa (L)/div Sensor Check
Trigger =

CamScanner

BG (E)/B-II/FORM/7.5/MKT 001

LOADING SHEET

INDIAN OIL CORPORATION LIMITED

BG (Explosives), NADKHURKEE-828307

IndianOil

NAME OF MINE : JAKHMC OCP

DATE : 03/07/24

BMD VEHICLE NO: JH10BS 6156

LOCATION : Shovel Bench

DIA OF HOLE: 150 mm

STRATA CONDITION : Coal

Sl. No.	Depth (M)	Water Level (M)	Hole Temp (C)	Explosive quantity (KG)			Deck	Total	Stem Hight (M)	Sl. No	Depth (M)	Water Level (M)	Hole Temp (C)	Explosive quantity (KG)			Deck	Total	Stem Hight (M)
1	6.0			30						31	6.0			30					
2	6.0			35						32	5.9			30					
3	5.9			30						33	6.0			30					
4	6.0			30						34	6.0			30					
5	6.0			35						35	5.9			30					
6	5.9			30						36	5.9			20					
7	6.0			30						37	6.0			30					
8	5.9			30						38	5.9			20					
9	6.0			35															
10	6.0			30										1180 kg					
11	5.9			30															
12	5.9			30															
13	6.0			35															
14	6.0			30															
15	5.9			30															
16	5.8			30															
17	6.0			35															
18	6.0			30															
19	5.7			30															
20	6.0			30															
21	5.9			30															
22	6.0			35															
23	6.0			30															
24	5.9			30															
25	6.0			35															
26	6.0			30															
27	5.9			30															
28	6.0			30															
29	6.0			35															
30	6.0			30															
TOTAL										TOTAL									

Bulk Cup Density (gm/cc) 1.12 gm/cc

Burden (M) 5 m

Spacing (M) 5.5 m

Volume of Patch (W*L*H) _____

Blast Result

Booster qty (kg) 3.8 kg

Total Explosive qty (kg) 1180 kg

Powder Factor (m3/kg) _____

Blasting Accessories used

IOCL Representatives

BCCL Representatives

CamScanner

Instantel

Event Report

Date/Time	Vert at 14:19:11 August 07, 2024
Trigger Source	Geo: 0.200 mm/s
Range	Geo: 254.0 mm/s
Record Time	3.0 sec at 2048 sps
Operator/Setup:	Operator/factory MMB

Notes
Location
Client
User Name
General

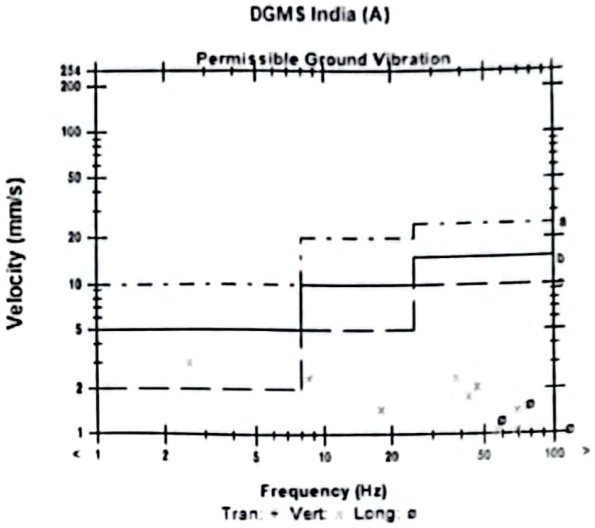
Serial Number	UM16971 V 10-89 Micromate ISEE
Battery Level	3.6 Volts
Unit Calibration	January 18, 2024 by CIMFR Dhanbad
File Name	UM16971_20231101141911.IDFW

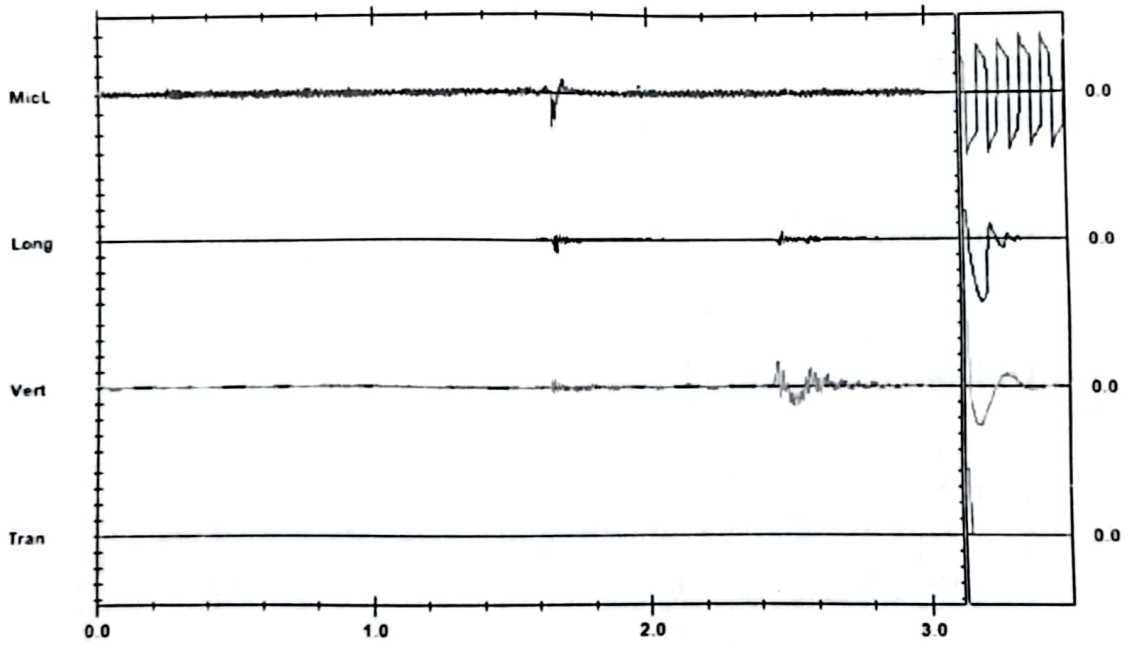
Post Event Notes
AKW/C
Distance from blast - 140 mtrs

Microphone	Linear Weighting
PSPL	1.676 pa (L) at 1.650 sec
ZC Freq	21 Hz
Channel Test	Passed (Freq = 19.7 Hz Amp = 1124 mv)

	Tran	Vert	Long	
PPV	0.055	3.042	1.592	mm/s
ZC Freq	73	2.6	79	Hz
Time (Rel. to Trig)	2.589	2.465	1.665	sec
Peak Acceleration	0.010	0.120	0.191	g
Peak Displacement	0.000	0.042	0.041	mm
Sensor Check	Check	Check	Check	
Frequency	1024.0	7.9	10.6	Hz
Overswing Ratio	0.0	3.6	4.0	

Peak Vector Sum 3.047 mm/s at 2.465 sec





Time Scale: 0.20 sec/div Amplitude Scale: Geo: 2.000 mm/s/div Mic: 1.000 pa (L)/div Sensor Check

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BG (E)/B-II/FORM/7.5/MKT 001

LOADING SHEET

INDIAN OIL CORPORATION LIMITED

BG (Explosives), NADKHURKEE-828307

IndianOil

NAME OF MINE: Akwmc ocp

DATE: 07/07/24

BMD VEHICLE NO: JH10AY7742

LOCATION: SSram

DIA OF HOLE: 150mm

STRATA CONDITION: OB

Sl. No.	Depth (M)	Water Level (M)	Hole Temp (C)	Explosive quantity (KG)	Deck	Total	Stem Hight (M)	Sl. No	Depth (M)	Water Level (M)	Hole Temp (C)	Explosive quantity (KG)	Deck	Total	Stem Hight (M)
1	10.0			60 35		95		1	9.9			60 35		95	
2	10.0			60 35		95		2	10.0			60 35		95	
3	10.1			60 35		95		3	10.0			60 35		95	
4	9.0			60 35		95		4	10.1			60 35		95	
5	9.0			60 35		95		5	9.9			60 35		95	
6	10.0			60 35		95		6	9.9			60 35		95	
7	10.1			60 35		95		7	10.0			60 35		95	
8	10.0			60 35		95		8	10.1			60 35		95	
9	9.9			60 35		95		9	10.0			60 35		95	
10	9.9			60 35		95		10	10.1			60 35		95	
11	9.9			60 35		95		11	9.9			60 35		95	
12	10.1			60 35		95		12	9.9			60 35		95	
13	10.0			60 35		95		13	10.0			60 35		95	
14	10.0			60 35		95		14	10.0			60 35		95	
15	10.1			60 35		95		15	9.9			60 35		95	
16	9.9			60 35		95		16	10.0			60 35		95	
17	10.0			60 35		95		17	10.1			60 35		95	
18	10.0			60 35		95		18	10.0			60 35		95	
19	10.1			60 35		95		19	9.9			60 35		95	
20	9.9			60 35		95		20	10.0			60 35		95	
21	9.9			60 35		95		21	9.9			60 35		95	
22	10.0			60 35		95		22	9.9			60 35		95	
23	10.1			60 35		95		23	10.1			60 35		95	
24	10.0			60 35		95		24	9.9			60 35		95	
4	10.1			60 35		95		25	10.0			60 35		95	
26	9.9			60 35		95		26	10.1			60 35		95	
27	9.9			60 35		95		27	9.9			60 35		95	
28	10.0			60 35		95		28	10.0			60 35		95	
29	10.0			60 35		95		29	10.0			60 35		95	
30	10.0			60 35		95		30	10.1			60 35		95	

TOTAL 2850 kg TOTAL 2850 kg

Bulk Cup Density (gm/cc) 1.12 gm/cc

Burden (M) 4m

Spacing (M) 4.5m

Volume of Patch (M³/H)

Blast Result

Booster qty (kg) 12 kg

Total Explosive qty (kg) 5700 kg

Powder Factor (m3/kg)

Blasting Accessories used

IOCL Representatives

BCCL Representatives

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Technical Service Report
AKWMC Mines (Katras Area)

Objective

To study and improve achieved powder factor in AKWMC Mines.

Introduction

The AKWMC Mines is situated in katras area of BCCL having an average consumption of about 100 -110 tons/month. The annual target of mines is 0.9-1.0million metric tons. The benchmark powder factor was set to 1.93 m^3/kg in OB. The mine is located in vicinity of Bhuli Basti. The bucket capacity of lifting shovels deployed at the mines are 5 - 10 cubic metres.

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Theory

Powder factor is volume of OB removed/extracted using unit explosive quantity.

Powder factor = Burden X Spacing X Depth (m3)
Explosive charged per hole (Kg)

Due to varying geological conditions, the hole depth in AKWMC Mines is limited to 6-10 meters.

Apart from improving burden and spacing, charge per hole can also be reduced to improve powder factor.

However, the charge per hole has a direct influence on the fragmentation. The mine operates majorly on sandstone and shale strata's hence, reducing charge to improve powder factor thus must be done without affecting the fragmentation of the patch.

In accordance with optimum fragmentation, attempts will be made to achieve benchmark powder factor.

Observation

The following data was observed during the inspection of patch:
Face condition: -

Date	03.10.24
Bench	Shovel bench (OB)
Strata condition	Sandstone
No. of hole	37
Bench height(m)	6.0m approx.
Burden(m)	3.7 m approx.
Spacing(m)	4.2m approx.

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Drill pattern	Rectangle
Charge per hole (Kg)	55 kg (avg)
Firing pattern	Row to Row
Blast result	Good
Charging process	Direct charging
P.F(in-situ)(m^3/kg)	1.72

Trial Blast

After due cooperation from blasting team of AKWMC departmental we were provided with a trail patch with following parameters:

Date	05.10.24
Bench	Shovel bench (OB)
Strata condition	Sandstone
No. of hole	32
Bench height(m)	6.0m approx.
Burden(m)	4.0m approx.
Spacing(m)	4.5m approx.
Drill pattern	Rectangle
Charge per hole (Kg)	56kg (avg)
Firing pattern	Row to Row
Blast result	Good
Charging process	Direct charging
P.F(in-situ)(m^3/kg)	1.95

Fragmentation on 05.10.2024

The fragmentation for an in-situ powder factor of 1.95 m3/kg is good and within the lifting capacity of deployed machinery. There is no sign of overcharging hence charged quantity is sufficient. Considering the hardness of the patch, the blast parameters (burden, spacing, depth) are suitable. Over the next 15 days, 10

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trials will be conducted on different benches of the mines with an attempt to increase the powder factor by reducing charge per hole and improving blasting parameter in accordance with the hardness of patch and other geological factors.

Fig: Post blast fragmentation

Result

Based on observations done on trial blasts, it can concluded that benchmark powder factor has been achieved by reducing charge per hole and improving blast parameters based on type of strata. Trail blast summary is attached. Charging of the patches are to be done in accordance geological factors and hardness of the underlying strata.

25/10/24.

Rohit Kumar Mondal
Officer(Marketing)
IOCL

25/10/24

Blasting Officer
AKWMC Mines

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REPORT ON A BLAST INDUCED GROUND VIBRATION CONDUCTED BY IOCL AT KANTAPAHARI HIRED - BCCL

Date:-30.09.2024

INTRODUCTION

The Kantapahari hired mine is situated in Katras area of BCCL. The ground vibration monitoring is determined to know the safety of nearby structure. For measuring of ground vibration micromate of series UM10858 of make Instantel is being used.

OBJECTIVE OF THE STUDY

The primary objective of the ground vibration is the monitoring of PPV levels at the neighboring areas including villages affected by the blast induced ground vibrations.

METHODOLOGY

1. For the purpose of measuring vibrations, a Micromate seismograph named 'Instantel Micromate' is being used. The instrument has a geophone for sensing ground vibrations in the three planes viz. longitudinal, transverse and vertical. The highest of the three vibrations is recorded as the peak particle velocity measured in mm/sec.
2. For recording the PPV the instrument was placed on firm ground and the sensor was directed towards the site of blast and instrument was set continuous shot modes. Based on the trigger level, the instrument recorded the waveform including the PPV at its frequency during the blast.
3. The distance to the site of blast and the maximum charge per delay deployed were separately noted for the blast .

OBSERVATIONS

The reading was taken near to basti (Angarpathra basti, kumahar basti,kacha basti) situated at a distance of approx 120-150mtr from the current working bench. Summarized statement of the levels of PPV, and frequency recorded during the blast and its distances from blast point are as follow

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Sl.no	Date	PPV(mm/s)	Frequency (Hz)	Charge/ hole(kg)	Maximum charge/ delay(kg)	Distance from blast site to structure(m)	Distance from structure(m)	Remarks
1	01.09.2024	1.616	7.2	30	30	140	20	within the limit
2	05.09.2024	2.601	6.7	25	25	140	20	within the limit
3	07.09.2024	2.160	7.4	10	10	130	30	within the limit
4	10.09.2024	1.600	7.1	20	20	150	10	within the limit
5	14.09.2024	2.112	5.8	30	30	150	10	within the limit
6	19.09.2024	0.938	2.2	20	20	150	20	within the limit
7	22.09.2024	0.899	10.1	25-30	30	130	30	within the limit
8	26.09.2024	2.286	7.1	30	30	140	20	within the limit
9	30.09.2024	1.025	32	35	35	130	20	within the limit

CONCLUSION

In the view of above readings of ground vibration the PPVs obtained were within the permissible limit as per DGMS norms, which is safe for the nearby structure.

IOCL Representative

Blasting Officer (Kantapahari Hired)

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इंडियन ऑयल कॉर्पोरेशन लिमिटेड
मौजा-माटीगढा, पो.आ.-नदखुरकी
जिला-धनबाद (झारखण्ड) पिन कोड:828307
Indian Oil Corporation Limited
Mouza-Matigarha, P.O.-Nadkhurkee
District-Dhanbad (Jharkhand) 828307
Phone:0326-2828235/334/365/375/39

IndianOil
व्यवसाय विकास समुह (एक्सप्लोसिव्स)
Business Development Group (Explosives)

IOCL/BDG/KANTAPAHARI HIRED/PPV REPORTS/SEPTEMBER-2024
Date: - 30.09.2024

To,
The Blasting In charge
Kantapahari Hired
Katras Area, BCCL

Subject: - Submission of Ground vibration monitoring reports for September 2024.

Dear Sir,

We have enclosed the blast induced ground vibration monitored in the month of September 2024. The Brief summary of vibration reports are furnished in below table.

1.Sl .No	Mine Name	Date	PPV (mm/s)			ZC Frequency(HZ)			PVS(mm/s)	Dist.(Mtr)
			Tran	Vert	Long	Tran	Vert	Long		
1	Kantapahari Hired	01.09.2024	0.047	1.080	1.616	7.7	9.4	7.2	1.616	140
2	Kantapahari Hired	05.09.2024	0.047	1.505	2.601	3.2	2.7	6.7	2.605	140
3	Kantapahari Hired	07.09.2024	0.047	1.190	2.160	6.6	8.1	7.4	2.165	130
4	Kantapahari Hired	10.09.2024	0.047	0.938	1.600	2.9	8.8	7.1	1.602	150
5	Kantapahari Hired	14.09.2024	0.055	1.198	2.112	6.8	3.2	5.8	2.114	150
6	Kantapahari Hired	19.09.2024	0.047	0.788	0.938	4.5	9.8	2.2	1.152	150
7	Kantapahari Hired	22.09.2024	1.261	0.796	0.899	8.1	22	10.1	1.268	130
8	Kantapahari Hired	26.09.2024	1.750	0.780	2.286	5.3	21	7.1	2.342	140
9	Kantapahari Hired	30.09.2024	0.646	1.025	0.993	2.2	32	6.0	1.070	130

As per your requirement the above reading has been monitored during the blasting and the copies of reports are submitted for your information and assessment.

Thanking you and assuring you of our best attention and services at all times.

Yours faithfully
For Indian Oil Corporation Limited,

Viraj
Officer (Marketing)

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Instantel

Event Report

Date/Time	Long at 13:46:48 September 01,2024
Trigger Source	Geo: 0.200 mm/s
Range	Geo: 254.0 mm/s
Record Time	3.0 sec at 2048 sps
Operator/Setup	Operator/factory MMB

Serial Number	UM16971 V 10-89 Micromate ISEE
Battery Level	3.6 Volts
Unit Calibration	January 18, 2024 by CIMFR Dhanbad
File Name	UM16971_20231102134648.IDFW

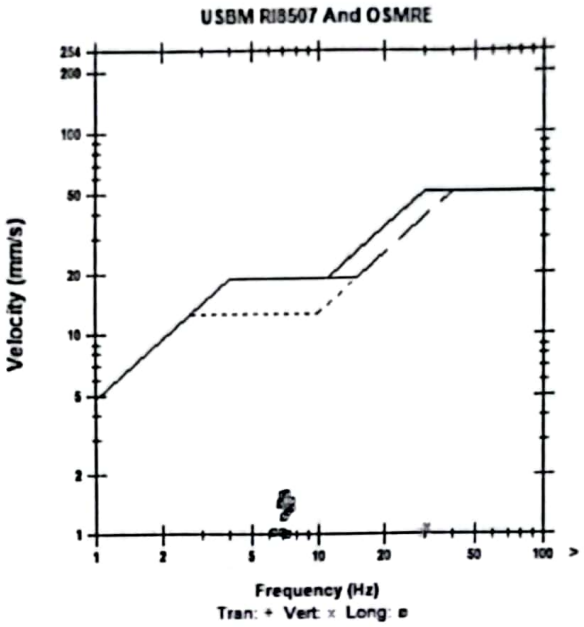
Notes
Location:
Client:
User Name:
General:

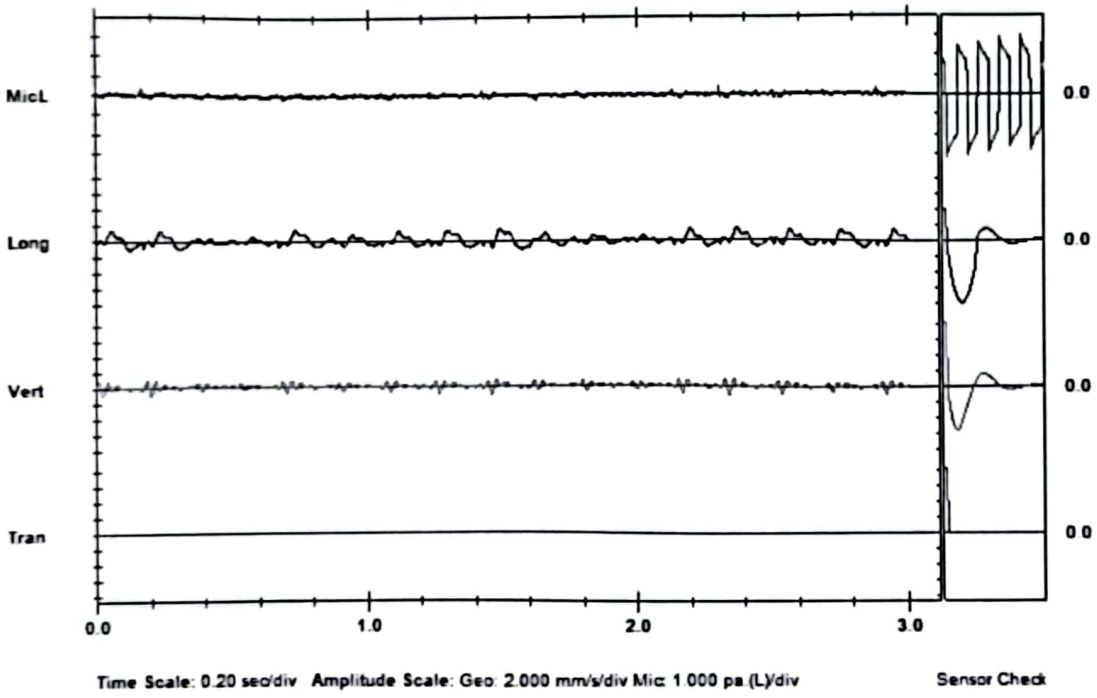
Post Event Notes
Kantapahari hired
Distance from blast - 140 mtr

Microphone	Linear Weighting
PSPL	<0.500 pa.(L)
ZC Freq	41 Hz
Channel Test	Passed (Freq = 19.7 Hz Amp = 1159 mv)

	Tran	Vert	Long	
PPV	0.047	1.080	1.616	mm/s
ZC Freq	7.7	9.4	7.2	Hz
Time (Rel. to Trig)	2.386	2.337	1.486	sec
Peak Acceleration	0.010	0.025	0.018	g
Peak Displacement	0.000	0.006	0.034	mm
Sensor Check	Check	Check	Passed	
Frequency	1024.0	7.9	7.1	Hz
Overswing Ratio	0.0	3.8	5.7	

Peak Vector Sum 1.616 mm/s at 1.487 sec
N/A: Not Applicable





Time Scale: 0.20 sec/div Amplitude Scale: Geo: 2.000 mm/s/div Mic: 1.000 pa (L)/div Sensor Check

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BG (E)/B-II/FORM/7.5/MKT 001

LOADING SHEET

INDIAN OIL CORPORATION LIMITED

BG (Explosives), NADKHURKEE-828307

NAME OF MINE: Kantalpahi Hill

DATE: 01/09/24

BMD VEHICLE NO: JH10AY9175

LOCATION: Coal Bench

DIA OF HOLE: 150 mm

STRATA CONDITION: Hard Iron

Sl. No.	Depth (M)	Water Level (M)	Hole Temp (C)	Explosive quantity (KG)	Deck	Total	Stem Hight (M)	Sl. No.	Depth (M)	Water Level (M)	Hole Temp (C)	Explosive quantity (KG)	Deck	Total	Stem Hight (M)
1	5.3			30				31	5.2			30			
2	5.2			30				32	5.2			30			
3	5.2			30				33	5.3			30			
4	5.0			30				34	5.2			30			
5	5.0			30				35	5.3			30			
6	5.0			30				36	5.2			30			
7	5.1			30				37	5.1			30			
8	5.1			30											
9	5.2			30											
10	5.1			30											
11	5.2			30											
12	5.2			30											
13	5.3			30											
14	5.3			30											
15	5.3			30											
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20	5.3			30											
21	5.2			30											
22	5.1			30											
23	5.2			30											
24	5.1			30											
25	5.2			30											
26	5.2			30											
27	5.3			30											
28	5.2			30											
29	5.2			30											
30	5.1			30											

TOTAL

TOTAL 3710 KG

Bulk Cup Density (gm/cc) 1.1 gm/cc

Burden (M) 4.2

Spacing (M) 4.4

Volume of Patch (W*L*H)

Blast Result Good

IOCL Representatives

Booster qty (kg)

Total Explosive qty (kg) 1110

Powder Factor (m3/kg)

Blasting Accessories used ED 400 MS

CKS

BCCL Representatives

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Instantel

Event Report

Date/Time	Long at 13:48:48 September 05,2024
Trigger Source	Geo: 0.200 mm/s
Range	Geo: 254.0 mm/s
Record Time	3.0 sec at 2048 sps
Operator/Setup:	Operator/factory MMB

Notes
Location:
Client:
User Name:
General:

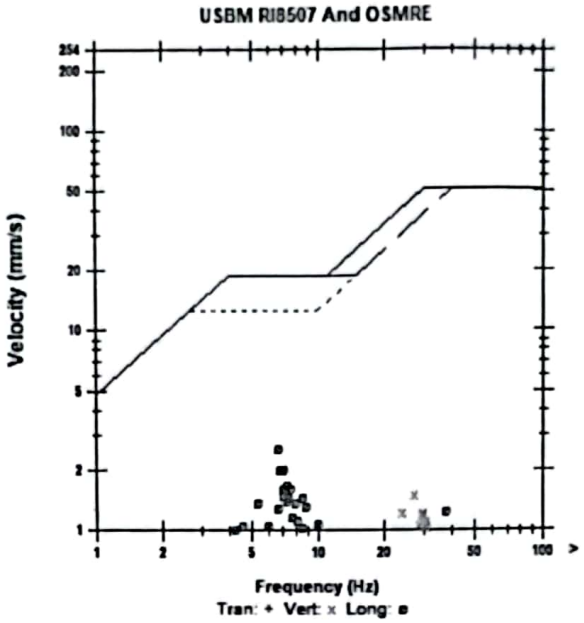
Serial Number	UM16971 V 10-89 Micromate ISEE
Battery Level	3.6 Volts
Unit Calibration	January 18, 2024 by CIMFR Dhanbad
File Name	UM16971_20231102134645.IDFW

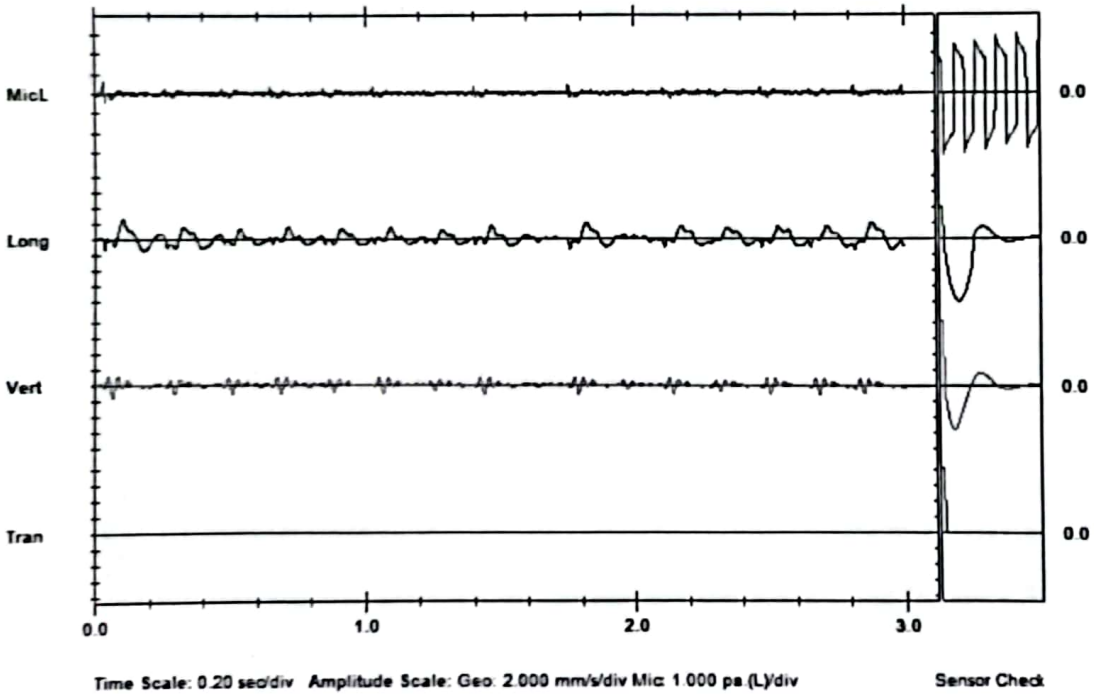
Post Event Notes
Kantapahari hired
Distance from blast - 140 mtr

Microphone	Linear Weighting
PSPL	0.574 pa (L) at 0.030 sec
ZC Freq	47 Hz
Channel Test	Passed (Freq = 19.7 Hz Amp = 1159 mv)

	Tran	Vert	Long	
PPV	0.047	1.505	2.601	mm/s
ZC Freq	3.2	2.7	6.7	Hz
Time (Rel. to Trig)	0.233	0.066	0.100	sec
Peak Acceleration	0.010	0.028	0.028	g
Peak Displacement	0.000	0.009	0.049	mm
Sensor Check	Check	Check	Passed	
Frequency	1024.0	7.9	7.1	Hz
Overswing Ratio	0.0	3.8	5.7	

Peak Vector Sum 2.605 mm/s at 0.100 sec





Time Scale: 0.20 sec/div Amplitude Scale: Geo: 2.000 mm/s/div Mic: 1.000 pa (L)/div Sensor Check

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ENVIRONMENTAL MONITORING REPORT OF BHARAT COKING COAL LIMITED, CLUSTER – IV

(FOR THE MONTH SEPTEMBER, 2025)

E. C. no. J-11015/372/2010-IA.II (M) dated 23.10.2019

CMPDI
ISO 9001 Company
Regional Institute-II
Dhanbad, Jharkhand

CONTENTS

SL. NO.	CHAPTER	PARTICULARS	PAGE NO.
1.	CHAPTER - I	EXECUTIVE SUMMARY	3-5
2.	CHAPTER-II	INTRODUCTION	6
3.	CHAPTER-III	RESULTS	7-22
4.	CHAPTER-IV	STANDARDS AND PLANS	23-24

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 analysed for four parameters on fortnightly basis. Thereafter the samples were preserved and analysed 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, are 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

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.

The Cluster IV is in the Northern part of the Jharia coalfield.It includes Salanpur colliery, KatrasChoitodih colliery(OC), Amalgamated Keshalpur – West Mudidih Mixed (OCP & UG) Mines, Amalgamated Ramkanali – Angarpathra UG mines, Gaslitand OC. The cluster– IV is situated about 25 – 30 kms from Dhanbad Railway Station. The mines of this cluster- IV are operating since pre nationalization period (prior to 1972-73). It is connected by both Railway and Road. The drainage of the area is governed by Katri Jore. The Project has Environmental Clearance from Ministry of Environment, Forest and Climate Change (MoEF&CC) for a rated capacity of 7.34 MTPA (normative) and 9.55 MTPA peak capacity of coal production vide letter no. J-11015/372/2013-IA.II (M) dated 23rd October, 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) Govindpur Village (A7): Industrial Area

The location of the sampling station is 23^0 48'34" N, 86^0 18'22" E. The sampler was placed at 1.5 m above the ground level at AARC agent Office.

ii) Katras Chotudih (A37): Industrial Area

The location of the sampling station is at the roof top of the Manager Office.

II. BUFFER ZONE Monitoring Location

i) Block IV (A6) : industrial area

The location of the sampling station is 23^0 47.916' N 86^0 15.333' E. The sampler was placed at a height of 1.5 m above the ground level in Safety office of Block IV OCP.

ii) Nichitpur (A8): Industrial Area

The location of the sampling station is 23^0 48'20" N 86^0 21'30" E. The sampler was placed at roof top at Safety office of Nichitpur.

iii) Rudhi Basti(A18): **Residential Area**

The sampler was placed at a height of 1.5 m above the ground level at Rudhi Basti.

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 IV**	**ULR No.**	**TC1432125000002135F**
Customer	**Environment Department, Bharat Coking Coal Limited (BCCL), Koyla Bhawan, Dhanbad (E-mail: gmenv.bccl@coalindia.in)**			**Date of Issue**	**31.10.2025**
Project	**Govindpur Village**	**Sample Ref. No.**	**REM/BCCL/2025/09**	**Sampling Method**	**CMPDI/RI-II/LPM 11 , (IS 5182)**
Date of Sampling	09.09.2025	24.09.2025	**Period of Analysis**	09.09.2025 to 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**
			1st FN A4522	**2nd FN A4600**				
1	PM_{10}	IS -5182(Part 23):2006, R-2017	70	73	10 µg/m³ - 1000 µg/m³	10 µg/m³	300	100
2	$PM_{2.5}$	IS -5182(Part 24):2019	34	37	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	30	06 µg/m³ - 420 µg/m³	06 µg/m³	120	80

***All units are in µg/m3, 24 hourly Average, * LDL indicates Lower 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
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 IV**	**ULR No.**	**TC1432125000002135F**
Customer	**Environment Department, Bharat Coking Coal Limited (BCCL), Koyla Bhawan, Dhanbad (E-mail: gmenv.bccl@coalindia.in)**			**Date of Issue**	**31.10.2025**
Project	**Katras Chotudih**	**Sample Ref. No.**	**REM/BCCL/2025/09**	**Sampling Method**	**CMPDI/RI-II/LPM 11 , (IS 5182)**
Date of Sampling	08.09.25	23.09.25	Period of Analysis	08.09.2025 to 25.10.2025	**Zone of Station:** **Core Zone**

Sl. No.	**Parameter**	**Method of Analysis**	**Observed Values (in µg/m³)** 1st FN **A4513**	2nd FN **A4592**	**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	86	82	10 µg/m³ - 1000 µg/m³	10 µg/m³	300	100
2	$PM_{2.5}$	IS -5182(Part 24):2019	46	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	26	29	06 µg/m³ - 420 µg/m³	06 µg/m³	120	80

***All units are in µg/m3, 24 hourly Average, * LDL indicates Lower Detection Limit,*

ANALYSED BY

(Gaurav Kant)
REVIEWED BY

(Kumar Vaibhav)
Authorised Signatory

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Page -1 of 1

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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 IV**	**ULR No.**	**TC1432125000002135F**
Customer	**Environment Department, Bharat Coking Coal Limited (BCCL), Koyla Bhawan, Dhanbad (E-mail: gmenv.bccl@coalindia.in)**			**Date of Issue**	**31.10.2025**
Project	**Block IV**	**Sample Ref. No.**	**REM/BCCL/2025/09**	**Sampling Method**	**CMPDI/RI-II/LPM 11 , (IS 5182)**
Date of Sampling	08.09.2025	23.09.2025	Period of Analysis	08.09.2025 to 25.10.2025	**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**
			1st FN A4514	**2nd FN A4593**				
1	PM_{10}	IS -5182(Part 23):2006, R-2017	75	70	10 µg/m³ - 1000 µg/m³	10 µg/m³	300	100
2	$PM_{2.5}$	IS -5182(Part 24):2019	37	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	21	23	06 µg/m³ - 420 µg/m³	06 µg/m³	120	80

***All units are in µg/m3, 24 hourly Average, * LDL indicates Lower Detection Limit,*

ANALYSED BY

(Gaurav Kant)
REVIEWED BY

(Kumar Vaibhav)
Authorised Signatory

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Page -1 of 1

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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 IV**	**ULR No.**	**TC1432125000002135F**
Customer	**Environment Department, Bharat Coking Coal Limited (BCCL), Koyla Bhawan, Dhanbad (E-mail: gmenv.bccl@coalindia.in)**			**Date of Issue**	**31.10.2025**
Project	**Nichitpur**	**Sample Ref. No.**	**REM/BCCL/2025/09**	**Sampling Method**	**CMPDI/RI-II/LPM 11 , (IS 5182)**
Date of Sampling	09.09.2025	24.09.2025	Period of Analysis	09.09.2025 TO 25.10.2025	**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**
			1st FN A4521	**2nd FN A4599**				
1	PM_{10}	IS -5182(Part 23):2006, R-2017	74	71	10 µg/m³ - 1000 µg/m³	10 µg/m³	300	100
2	$PM_{2.5}$	IS -5182(Part 24):2019	33	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	29	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)
REVIEWED BY

(Kumar Vaibhav)
Authorised Signatory

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Page -1 of 1

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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 IV**	**ULR No.**	**TC1432125000002135F**
Customer	**Environment Department, Bharat Coking Coal Limited (BCCL), Koyla Bhawan, Dhanbad (E-mail: gmenv.bccl@coalindia.in)**			**Date of Issue**	**31.10.2025**
Project	**Rudhi Basti**	**Sample Ref. No.**	**REM/BCCL/2025/09**	**Sampling Method**	**CMPDI/RI-II/LPM 11 , (IS 5182)**
Date of Sampling	03.09.25	18.09.25	Period of Analysis	03.09.2025 TO 25.10.2025	**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**
			1st FN A4531	**2nd FN A4610**				
1	PM_{10}	IS -5182(Part 23):2006, R-2017	73	80	10 µg/m³ - 1000 µg/m³	10 µg/m³	300	100
2	$PM_{2.5}$	IS -5182(Part 24):2019	31	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	30	30	06 µg/m³ - 420 µg/m³	06 µg/m³	120	80

***All units are in µg/m3, 24 hourly Average, * LDL indicates Lower Detection Limit,*

ANALYSED BY

(Gaurav Kant)
REVIEWED BY

(Kumar Vaibhav)
Authorised Signatory

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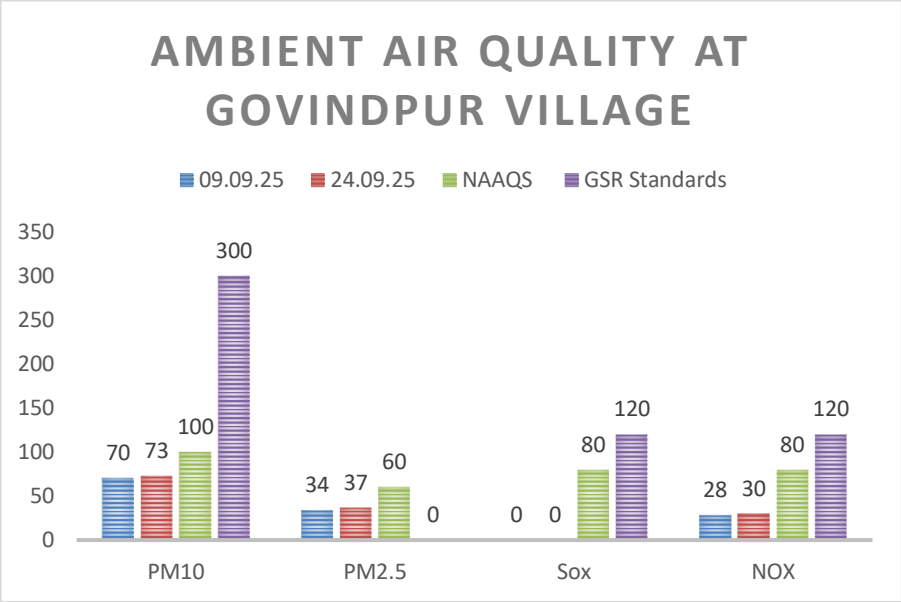
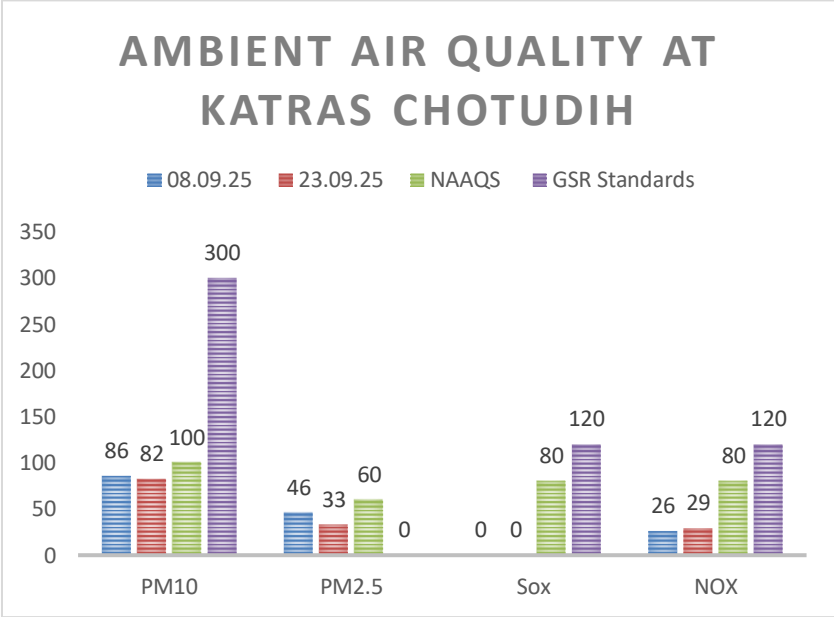
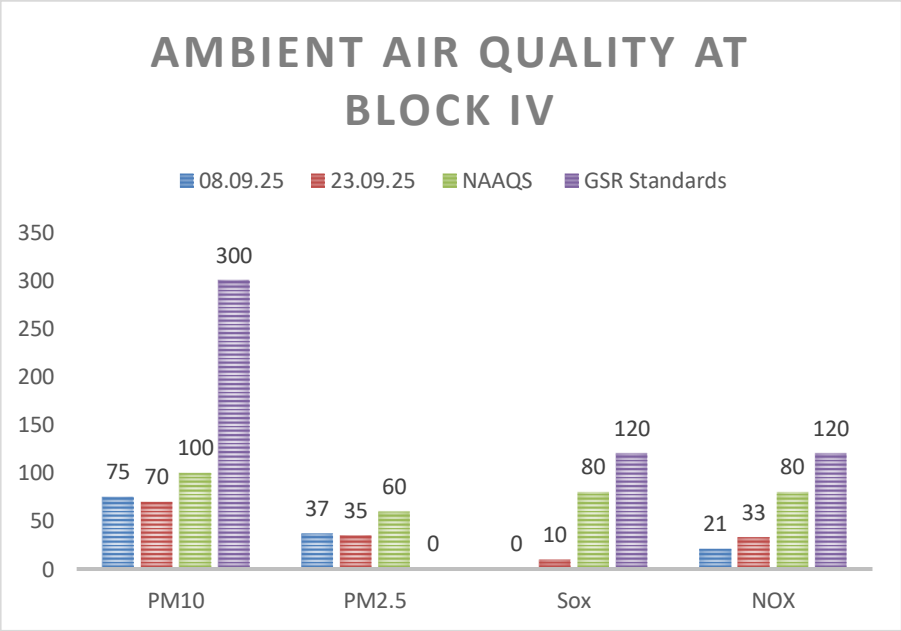
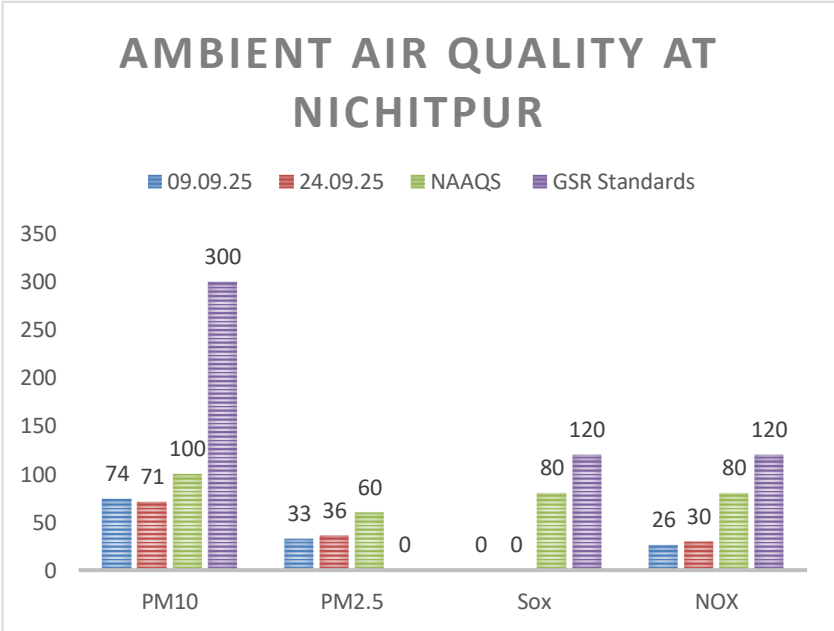
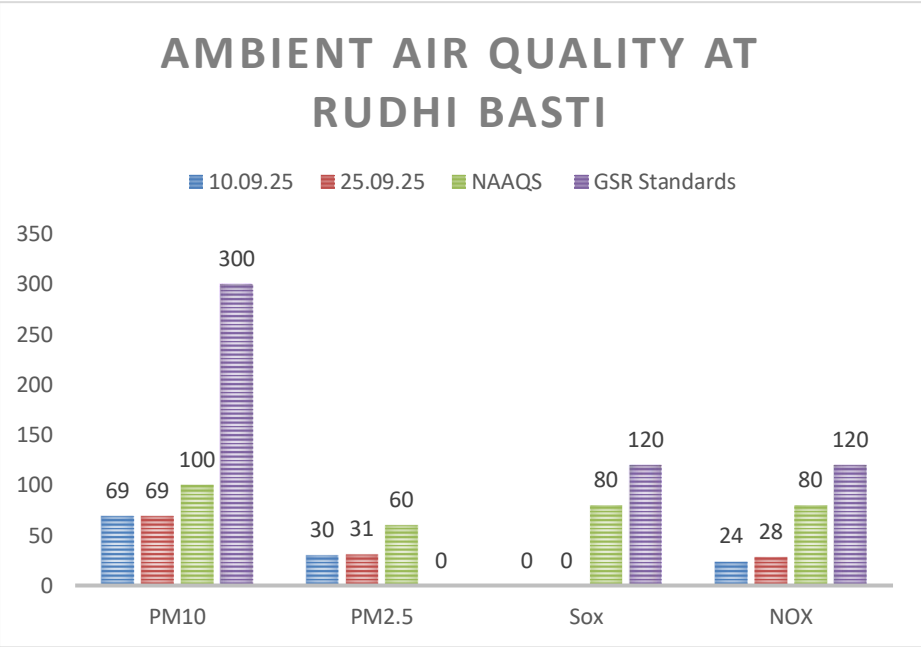
Page -1 of 1


AMBIENT AIR QUALITY AT GOVINDPUR VILLAGE
09.09.25
24.09.25
NAAQS
GSR Standards
350
300
250
200
150
100
50
0
70 73 100 300
34 37 60 0
0 0 80 120
28 30 80 120
PM10
PM2.5
Sox
NOX


AMBIENT AIR QUALITY AT KATRAS CHOTUDIH
08.09.25
23.09.25
NAAQS
GSR Standards
350
300
250
200
150
100
50
0
86 82 100 300
46 33 60 0
0 0 80 120
26 29 80 120
PM10
PM2.5
Sox
NOX


AMBIENT AIR QUALITY AT BLOCK IV
08.09.25
23.09.25
NAAQS
GSR Standards
350
300
250
200
150
100
50
0
75 70 100 300
37 35 60 0
0 10 80 120
21 33 80 120
PM10
PM2.5
Sox
NOX


AMBIENT AIR QUALITY AT NICHITPUR
09.09.25
24.09.25
NAAQS
GSR Standards
350
300
250
200
150
100
50
0
74 71 100 300
33 36 60 0
0 0 80 120
26 30 80 120
PM10
PM2.5
Sox
NOX


AMBIENT AIR QUALITY AT RUDHI BASTI
10.09.25
25.09.25
NAAQS
GSR Standards
350
300
250
200
150
100
50
0
69 69 100 300
30 31 60 0
0 0 80 120
24 28 80 120
PM10
PM2.5
Sox
NOX

WATER QUALITY MONITORING

3.1 Location of sampling sites

(Refer **Plate No. – II**)

i) Mine Discharge of Chotudih (MW4)

A sampling point is fixed to assess the effluent quality of Mine discharge. This location is selected to monitor effluent discharge in to Katri jore.

3.2 Methodology of sampling and analysis

Water samples were collected as per standard practice. The effluent samples were collected and analysed 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 parmeters are within the permissible limits.

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

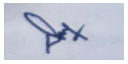
CMPDIL, RI-II
KOYLA BHAWAN COMPLEX
DHANBAD. -826005
Phone:0326-223-850
email: rdri2cmpdi@coalindia.in

Test Report for Mine Effluent samples

Month & Year	**09/2025**	**Cluster**	**Cluster IV**	**ULR No.**		**TC1432125000002153F**	
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**		
Period of Analysis	**(i)**	**Chotudih**	**Sample Collected in 2.5 Ltr Jerricane , Color as observed is transparent**			**Period of Analysis**	15.09.2025 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
			M1736	**M1763**		
1	Total Suspended Solids	IS 3025/17:1984, R :2017, Gravimetric	49	42	*100 (Max)*	10
2	pH	IS-3025/11:1983, R-2017, Electrometric	7.54	7.59	*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	44	*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)
REVIEWED BY

(Kumar Vaibhav)
Authorised Signatory

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NOISE LEVEL QUALITY MONITORING

4.1 Location of sampling sites

i) **Basseriya Managers Office (N9)**

ii) **Nichitpur (N8)**

iii) **Kusunda / Dhansar OCP (N10)**

i) **Pootki Balihari Office (N16)**

4.2 Methodology of sampling and analysis

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

4.2 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.

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

TC-14321

CENTRAL MINE PLANNING AND DESIGN INSTITUTE LIMITED

Environment Laboratory, Regional Institute-II

Ambient Noise Level Test Report

Month & Year	**09/2025**	**Cluster**	**Cluster IV**			**ULR No.**	**TC1432125000002169F**
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**	**Govindpur**	**Date of Sampling**	09.09.25	24.09.25	**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	47.3	47.1	CPCB, Protocol for Ambient Level Noise Monitoring - 2015	35 dB-135 dB	35 dB(A)	Industrial Commercial Residential Silence	75 65 55 50
2		07:00 - 08:00	49.2	49					
3		08:00 - 09:00	47.5	47.4					
4		09:00 – 10:00	48.1	50					
5		10:00 - 11:00	52.8	58.8					
6		11:00 - 12:00	56	56.4					
7		12:00 - 13:00	61.5	62.8					
8		13:00 - 14:00	60.9	59.7					
9		14:00 - 15:00	62.2	63.3					
10		15:00 - 16:00	64	64					
11		16:00 - 17:00	70.7	70.5					
12		17:00 - 18:00	50	50.3					
13		18:00 - 19:00	50.6	49					
14		19:00 - 20:00	44.8	48.6					
15		20:00 - 21:00	47.4	46.9					
16		21:00 - 22:00	48.6	46.6					
		Leq DAY	60.9	61.1					
1	Noise Level dB(A)Leq -Night	22:00-23:00	51.1	50.4	CPCB, Protocol for Ambient Level Noise Monitoring - 2015	35 dB-135 dB	35 dB(A)	Industrial Commercial Residential Silence	70 55 45 50
2		23:00- 00:00	51	50.2					
3		00:00- 01:00	48	48.1					
4		01.00-02.00	46	45.8					
5		02.00-03.00	45.5	45.5					
6		03.00-04.00	45.5	45.5					
7		04.00-05.00	47.4	47.1					
8		05:00-06:00	48.4	48.2					
		Leq NIGHT	48.4	48.0					

**LDL indicates Lower Detection Limit*

***All noise measurements are integrated for a 01 hour period, All units in dB(A)*

Sampling Assistants
ANALYSED BY

(Gaurav Kant)
REVIEWED BY

(Kumar Vaibhav)
Authorised Signatory

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TC-14321

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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 IV**	**ULR No.**	**TC1432125000002169F**
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**	**Katrash Chotudih**	**Date of Sampling**	08.09.25 – 23.09.25	**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	44.5	44.7	CPCB, Protocol for Ambient Level Noise Monitoring -2015	35 dB-135 dB	35 dB(A)	Industrial Commercial Residential Silence	75 65 55 50
2		07:00 - 08:00	46.9	46.4					
3		08:00 - 09:00	48.5	48.4					
4		09:00 – 10:00	49.3	49.3					
5		10:00 - 11:00	52.8	52.8					
6		11:00 - 12:00	53.6	54.5					
7		12:00 - 13:00	53.7	54.6					
8		13:00 - 14:00	56	56.6					
9		14:00 - 15:00	55.7	55.5					
10		15:00 - 16:00	56	56					
11		16:00 - 17:00	54.4	53.6					
12		17:00 - 18:00	53.6	52.3					
13		18:00 - 19:00	52.3	51.5					
14		19:00 - 20:00	51.9	51.7					
15		20:00 - 21:00	50.9	50.9					
16		21:00 - 22:00	50.6	50.9					
		Leq DAY	52.9	52.9					
1	Noise Level dB(A)Leq -Night	22:00-23:00	46.4	46.2	CPCB, Protocol for Ambient Level Noise Monitoring -2015	35 dB-135 dB	35 dB(A)	Industrial Commercial Residential Silence	70 55 45 50
2		23:00- 00:00	46.3	46.1					
3		00:00- 01:00	46.1	45.7					
4		01.00-02.00	45.7	45.5					
5		02.00-03.00	45.5	45					
6		03.00-04.00	45.5	45.5					
7		04.00-05.00	46.8	45.8					
8		05:00-06:00	47.2	46.5					
		Leq NIGHT	46.2	45.8					

**LDL indicates Lower Detection Limit*

***All noise measurements are integrated for a 01 hour period, All units in dB(A)*

Sampling Assistants
ANALYSED BY

(Gaurav Kant)
REVIEWED BY

(Kumar Vaibhav)
Authorised Signatory

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Page -1 of 1

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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 IV**	**ULR No.**	**TC1432125000002169F**
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**	**Block IV**	**Date of Sampling**	08.09.25 / 23.09.25	**Zone Category of Station: Buffer 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	48.3	CPCB, Protocol for Ambient Level Noise Monitoring - 2015	35 dB-135 dB	35 dB(A)	Industrial Commercial Residential Silence	75 65 55 50
2		07:00 - 08:00	48.9	46.6					
3		08:00 - 09:00	48	47.1					
4		09:00 – 10:00	51.7	50.9					
5		10:00 - 11:00	55.7	57.7					
6		11:00 - 12:00	54.1	58					
7		12:00 - 13:00	62.9	62.2					
8		13:00 - 14:00	59.9	60.1					
9		14:00 - 15:00	64	65.6					
10		15:00 - 16:00	71	69.2					
11		16:00 - 17:00	69.5	70.2					
12		17:00 - 18:00	51.5	49.7					
13		18:00 - 19:00	51.5	49.7					
14		19:00 - 20:00	46.9	46.6					
15		20:00 - 21:00	46.6	46.6					
16		21:00 - 22:00	48.1	47.4					
		Leq DAY	62.5	62.3					
1	Noise Level dB(A)Leq -Night	22:00-23:00	50.7	49.4	CPCB, Protocol for Ambient Level Noise Monitoring - 2015	35 dB-135 dB	35 dB(A)	Industrial Commercial Residential Silence	70 55 45 50
2		23:00- 00:00	49.9	47.7					
3		00:00- 01:00	48.2	47.2					
4		01.00-02.00	43.2	43.4					
5		02.00-03.00	42.8	43					
6		03.00-04.00	45.8	44.3					
7		04.00-05.00	44	43.3					
8		05:00-06:00	44.3	45.4					
		Leq NIGHT	47.1	46.1					

**LDL indicates Lower Detection Limit*

***All noise measurements are integrated for a 01 hour period, All units in dB(A)*

Sampling Assistants
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
KOYLA BHAWAN COMPLEX
DHANBAD. -826005
Phone:0326-223-850
email: rdri2cmpdi@coalindia.in

TC-14321

CENTRAL MINE PLANNING AND DESIGN INSTITUTE LIMITED

Environment Laboratory, Regional Institute-II

Ambient Noise Level Test Report

Month & Year	**09/2025**	**Cluster**	**Cluster IV**			**ULR No.**	**TC1432125000002169F**
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**	**Nichitpur**	**Date of Sampling**	09.09.25	24.09.25	**Zone Category of Station:**	**Buffer 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	46.4	CPCB, Protocol for Ambient Level Noise Monitoring - 2015	35 dB-135 dB	35 dB(A)	Industrial Commercial Residential Silence	75 65 55 50
2		07:00 - 08:00	47.5	46.7					
3		08:00 - 09:00	48.6	49.6					
4		09:00 – 10:00	50.7	50.7					
5		10:00 - 11:00	55.8	52.4					
6		11:00 - 12:00	56.4	54.5					
7		12:00 - 13:00	63.5	62.3					
8		13:00 - 14:00	61.5	61.3					
9		14:00 - 15:00	62.7	62.8					
10		15:00 - 16:00	54.4	54.3					
11		16:00 - 17:00	67.5	62.9					
12		17:00 - 18:00	49.6	46.6					
13		18:00 - 19:00	47.5	47.1					
14		19:00 - 20:00	44.5	47.2					
15		20:00 - 21:00	47.1	48.3					
16		21:00 - 22:00	46	47.5					
		Leq DAY	59.0	57.1					
1	Noise Level dB(A)Leq -Night	22:00-23:00	45.3	45.2	CPCB, Protocol for Ambient Level Noise Monitoring - 2015	35 dB-135 dB	35 dB(A)	Industrial Commercial Residential Silence	70 55 45 50
2		23:00- 00:00	45.2	44.7					
3		00:00- 01:00	44.6	44.3					
4		01.00-02.00	44.1	44					
5		02.00-03.00	44	43.9					
6		03.00-04.00	43.8	44.6					
7		04.00-05.00	44.7	45.2					
8		05:00-06:00	45.1	45.2					
		Leq NIGHT	44.6	44.7					

**LDL indicates Lower Detection Limit*

***All noise measurements are integrated for a 01 hour period, All units in dB(A)*

Sampling Assistants
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
KOYLA BHAWAN COMPLEX
DHANBAD. -826005
Phone:0326-223-850
email: rdri2cmpdi@coalindia.in

CENTRAL MINE PLANNING AND DESIGN INSTITUTE LIMITED

Environment Laboratory, Regional Institute-II

Ambient Noise Level Test Report

Month & Year	**09/2025**	**Cluster**	**Cluster IV**	**ULR No.**	**TC1432125000002169F**
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**	**Rudhi Basti**	**Date of Sampling**	03.09.25	18.09.25

Zone Category of Station: Buffer 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	49.5	CPCB, Protocol for Ambient Level Noise Monitoring - 2015	35 dB-135 dB	35 dB(A)	Industrial Commercial Residential Silence	75 65 55 50
2		07:00 - 08:00	51.8	52.1					
3		08:00 - 09:00	53.2	54.5					
4		09:00 – 10:00	49.1	49.8					
5		10:00 - 11:00	54.5	55					
6		11:00 - 12:00	58.5	57.8					
7		12:00 - 13:00	56.3	56.7					
8		13:00 - 14:00	57.8	58.3					
9		14:00 - 15:00	59.9	59					
10		15:00 - 16:00	62.3	62.7					
11		16:00 - 17:00	57.4	57.1					
12		17:00 - 18:00	54.6	55					
13		18:00 - 19:00	48.4	49.5					
14		19:00 - 20:00	48.9	49.1					
15		20:00 - 21:00	46.2	47					
16		21:00 - 22:00	46.2	47.1					
		Leq DAY	55.9	56.1					
1	Noise Level dB(A)Leq -Night	22:00-23:00	42.5	43.2	CPCB, Protocol for Ambient Level Noise Monitoring - 2015	35 dB-135 dB	35 dB(A)	Industrial Commercial Residential Silence	70 55 45 50
2		23:00- 00:00	42.6	43.2					
3		00:00- 01:00	42	42.1					
4		01.00-02.00	42	41.6					
5		02.00-03.00	41.6	41.4					
6		03.00-04.00	41.8	43					
7		04.00-05.00	41.9	42.9					
8		05:00-06:00	42	42.9					
		Leq NIGHT	42.1	42.6					

**LDL indicates Lower Detection Limit*

***All noise measurements are integrated for a 01 hour period, All units in dB(A)*

Sampling Assistants
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 ----

Page -1 of 1

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

Category	Pollutant	Time weighted average	Concentration in Ambient Air	Method of Measurement
1	2	3	4	5
III Coal mines located in the coal fields of • Jharia • Raniganj • Bokaro	Suspended Particulate Matter (SPM)	Annual Average * 24 hours **	500 µg/m^3 700 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 * 24 hours **	250 µg/m^3 300 µg/m^3	Respirable Particulate Matter sampling and analysis
	Sulphur Dioxide (SO_2)	Annual Average * 24 hours **	80 µg/m^3 120 µg/m^3	1.Improvedwest and Gaeke method 2.Ultraviolet fluorescene
	Oxide of Nitrogen as NO_2	Annual Average * 24 hours **	80 µg/m^3 120 µg/m^3	1. Jacob & Hochheiser Modified (Na-Arsenic) Method 2. Gas phase Chemilumine-scence

Note:

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

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

NATIONAL AMBIENT AIR QUALITY STANDARDS

New Delhi the 18th November 2009

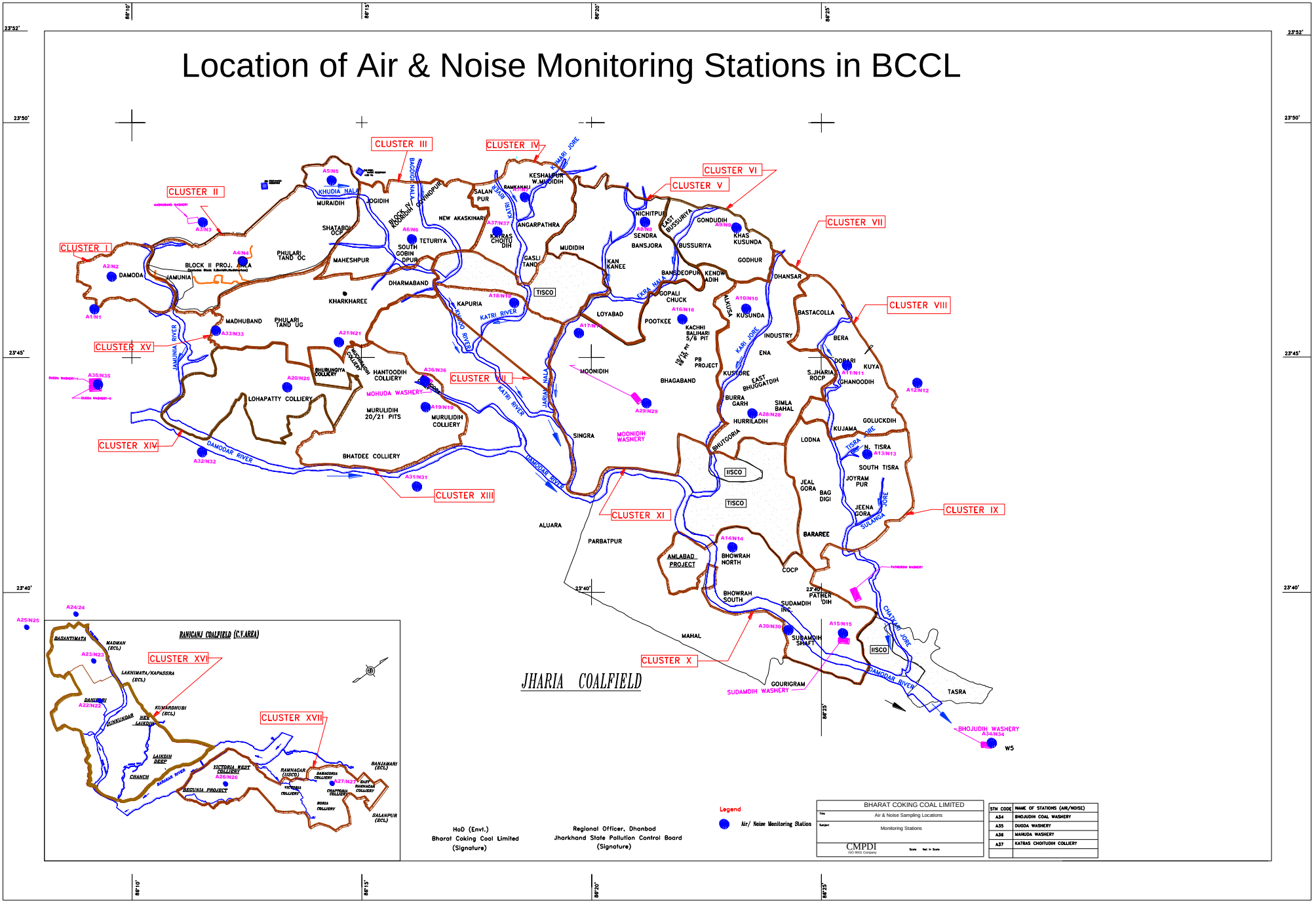
In exercise of the powers conferred by Sub-section (2) (h) of section 16 of the Air (Prevention and Control of Pollution) Act, 1981 (Act No. 14 of 1981), and in supersession of the notification No(s).S.O.384(E), dated 11th April 1994 and S.O.935(E), dated 14th November 1998, the Central Pollution Control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

Pollutant	Time Weighted Average	Concentration in Ambient Air		Methods of Measurement
		Industrial, Residential, Rural and other Areas	Ecologically Sensitive Area (Notified by Central Government)	
Sulphur Dioxide (SO_2), µg/m³	Annual * 24 Hours **	50 80	20 80	-Improved West and Gaeke Method -Ultraviolet Fluorescence
Nitrogendioxide (NO_2), µg/m³	Annual * 24 Hours **	40 80	30 80	-Jacob &Hochheiser modified ($NaOH$-$NaAsO_2$) Method -Gas Phase Chemiluminescence
Particulate Matter (Size less than 10µm) or PM_{10}, µg/m³	Annual * 24 Hours **	60 100	60 100	-Gravimetric -TEOM -Beta attenuation
Particulate Matter (Size less than 2.5µm) or $PM_{2.5}$, µg/m³	Annual * 24 Hours **	40 60	40 60	-Gravimetric -TEOM -Beta attenuation
Ozone (O_3) , µg/m³	8 Hours * 1 Hour **	100 180	100 180	-UV Photometric -Chemiluminescence -Chemical Method
Lead (Pb) , µg/m³	Annual * 24 Hours **	0.50 1.0	0.50 1.0	-AAS/ICP Method after sampling on EPM 2000 or equivalent filter paper -ED-XRF using Teflon filter
Carbon Monoxide (CO), mg/m³	8 Hours ** 1 Hour **	02 04	02 04	-Non dispersive Infrared (NDIR) Spectroscopy
Ammonia (NH_3), µg/m³	Annual * 24 Hours **	100 400	100 400	-Chemiluminescence -Indophenol blue method
Benzene (C_6H_6), µg/m³	Annual *	05	05	-Gas Chromatography (GC) based continuous analyzer -Adsorption and desorption followed by GC analysis
Benzo(a)Pyrene (BaP) Particulate phase only, ng/m³	Annual *	01	01	-Solvent extraction followed byHPLC/GC analysis
Arsenic (As), ng/m³	Annual *	06	06	-AAS/ICP Method after sampling on EPM 2000 or equivalent filter paper
Nickel (Ni), ng/m³	Annual *	20	20	-AAS/ICP Method after sampling on EPM 2000 or equivalent filter paper

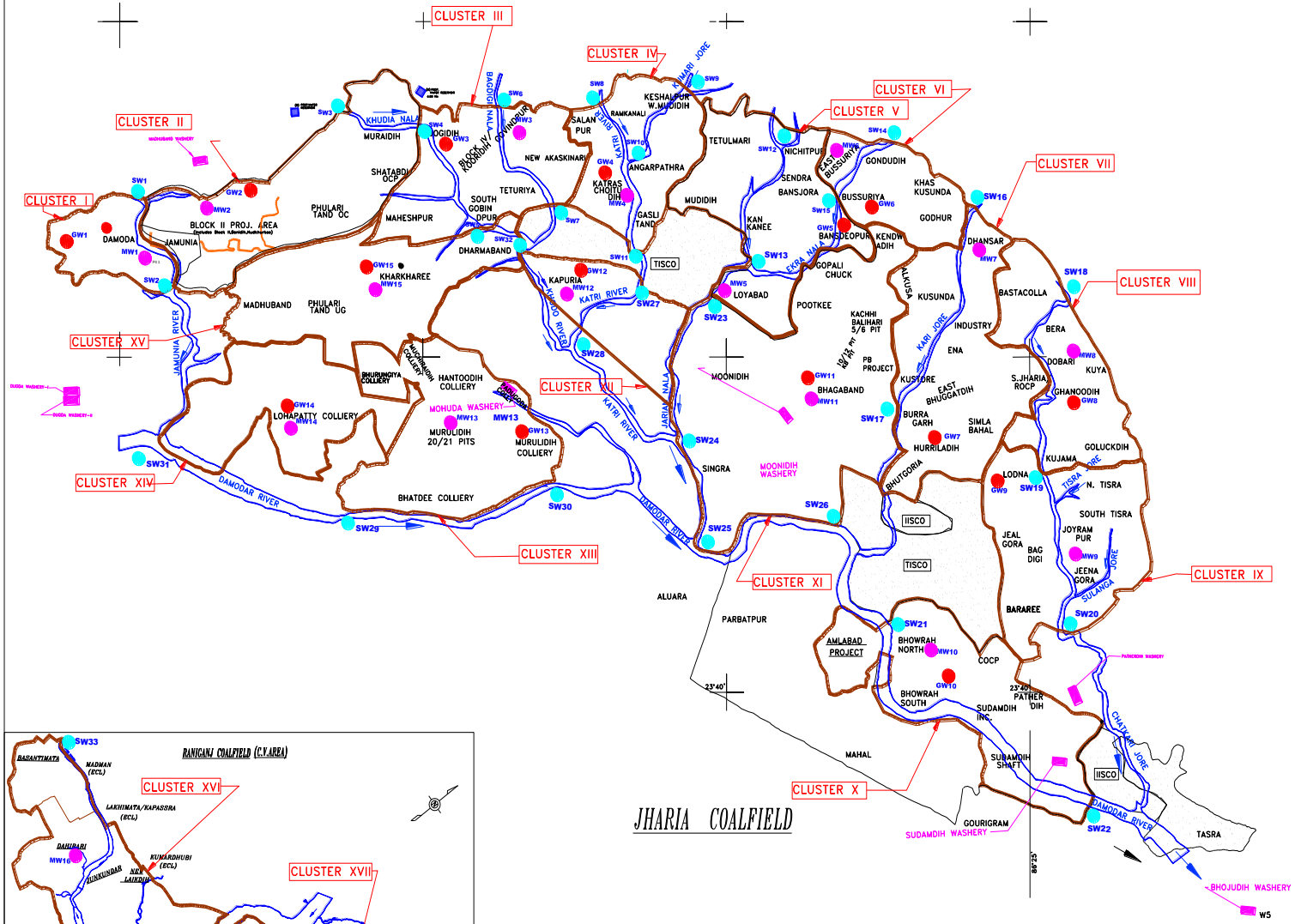
* Annual Arithmetic mean of minimum 104 measurements in a year at a particular site taken twice a week 24 hourly at uniform intervals.

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

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


Location of Air & Noise Monitoring Stations in BCCL
CLUSTER I
CLUSTER II
CLUSTER III
CLUSTER IV
CLUSTER V
CLUSTER VI
CLUSTER VII
CLUSTER VIII
CLUSTER IX
CLUSTER X
CLUSTER XI
CLUSTER XII
CLUSTER XIII
CLUSTER XIV
CLUSTER XV
CLUSTER XVI
CLUSTER XVII
JHARIA COALFIELD
RANIGANJ COALFIELD (CV AREA)
DAMODAR RIVER
KHUDIA NALA
BAGDIGI NALA
KATRI RIVER
KHARKHAREE
MAHESHPUR
PHULARI TAND OC
PHULARI TAND UG
SHATABDI OCP
MURAIDIH
JOGIDIH
DHARMABAND
KAPURIA
TISCO
LOHAPATTY COLLIERY
HANTOODIH COLLIERY
MOHUDA WASHERY
MURULIDIH 20/21 PITS
MURULIDIH COLLIERY
BHATDEE COLLIERY
MOONIDIH
MOONIDIH WASHERY
SINGRA
ALUARA
PARBATPUR
MAHAL
LODNA
BHAGABAND
KUSTORE
EAST BHUGGATDIH
BURRA GARH
HURRILADIH
SIMLA BAHAL
BHUTGORIA
IISCO
JEAL GORA
BAG DIGI
JOYRAM PUR
JEENA GORA
SOUTH TISRA
N. TISRA
GOLUCKDIH
KUJAMA
GHANOODIH
S.JHARIA ROCP
KUYA
DOBARI
BERA
INDUSTRY
ENA
BASTACOLLA
DHANSAR
GODHUR
KHAS KUSUNDA
GONDUDIH
BUSSURIYA
EAST BUSSURIYA
BANSJORA
SENDRA
NICHITPUR
KENDWADIH
BANSDEOPUR
KAN KANEE
GOPALI CHUCK
POOTKEE
KACHHI BALIHARI 5/6 PIT
LOYABAD
KUSUNDA
PB PROJECT
MUDIDIH
GASLI TAND
ANGARPATHRA
NEW AKASKINARI
KHAS KOLIARI
KESHALPUR W.MUDIDIH
RAMKANALI
SALAN PUR
TETURIYA
SOUTH GOBIN DPUR
BLOCK II PROJ. AREA
JAMUNIA
DAMODA
BARAREE
COCP
BHOWRAH NORTH
BHOWRAH SOUTH
AMLABAD PROJECT
SUDAMDIH INC.
SUDAMDIH SHAFT
SUDAMDIH WASHERY
PATHERDIH
GOURIGRAM
TASRA
BHOJUDIH WASHERY
W5
PATHERDIH WASHERY
BASANTIMATA
MADMAN (ECL)
LAKHIMATA/KAPASSRA (ECL)
DAHIBARI
KUNARDHUBI (ECL)
DUNKUNDAR
NEW LAIKDIH
LAIKDIH DEEP
CHANCH
BARAKAR RIVER
BECUNIA PROJECT
VICTORIA WEST COLLIERY
RAMNAGAR (IISCO)
BARAKORIA COLLIERY
VICTORIA COLLIERY
CHANDAUL COLLIERY
BORIA COLLIERY
EAST RAMNAGAR COLLIERY
BANJAMARI (ECL)
SALANPUR (ECL)
Legend
Air/ Noise Monitoring Station
HoD (Envt.)
Bharat Coking Coal Limited
(Signature)
Regional Officer, Dhanbad
Jharkhand State Pollution Control Board
(Signature)
BHARAT COKING COAL LIMITED
Air & Noise Sampling Locations
Monitoring Stations
CMPDI
STN CODE
NAME OF STATIONS (AIR/NOISE)
A34 BHOJUDIH COAL WASHERY
A35 DUGDA WASHERY
A36 MAHUDA WASHERY
A37 KATRAS CHOITUDIH COLLIERY

Water Sampling Locations in BCCL



INDEX

Cluster	Suface Water (U/S, D/S)	Name of River/ Nala / Jore	Mine/ Effluent	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

Customer	BHARAT COKING COAL LIMITED
Title	WATER SAMPLING LOCATIONS
Subject	MONITORING STATIONS
	CMPDI (ISO 9001 Company)
Scale	Not to Scale

Annexure-24

PME FY 2025-2026			
Name of company	Name of Area	IME/PME Target(Depart. & Contractual)	Achievement
BCCL	KATRAS(Cluster-IV)	Total-732	Total -433
		Departmental- 720	Departmental- 410
		Contractual -12	Contractual -23

Annexure-25

Annexure-26

Table 4.9 : Afforestation programme of the Cluster-IV

	Year	Quarry land (abandoned)		Active Quarry Area		OB dumped out side quarry area		Service Building/ Mine Infrastructure / Coal dump		Green belt around OCP		Barren Land		Total Plantation	Total Area Under Additional Plantation (Ha)	Total Plantation cost @ Rs.55101/Ha (in Rs.Lakhs)
		Area (ha)	Trees/ saplings	Area (ha)	Trees/ saplings	Area (ha)	Trees/ saplings	Area (ha)	Trees/ saplings	Area (ha)	Trees/ saplings	Area (ha)	Trees/ saplings			
During active mining (A)	1	2	5000							2	5000	2	5000	15000	6	3.31
	2	2	5000							2	5000	2	5000	15000	6	3.31
	3	2	5000							2	5000	2	5000	15000	6	3.31
	4	2	5000							2	5000	2	5000	15000	6	3.31
	5	2	5000							2	5000	2	5000	15000	6	3.31
	6	3	7500							2	5000	2	5000	17500	7	3.86
	7	3	7500							2	5000	2	5000	17500	7	3.86
	8	3	7500							2	5000	2	5000	17500	7	3.86
	9	3	7500							2	5000	2	5000	17500	7	3.86
	10	3	7500							2	5000	2	5000	17500	7	3.86
	11	5	12500							2	5000	2	5000	22500	9	4.96
	12	5	12500							2	5000	2	5000	22500	9	4.96
	13	5	12500							2	5000	2	5000	22500	9	4.96
	14	5	12500							2	5000	2	5000	22500	9	4.96
	15	5	12500	5	12500					2	5000	2	5000	35000	14	7.71
	16	5	12500	5	12500					3	7500	3	7500	40000	16	8.82
	17	5	12500	5	12500					3	7500	3	7500	40000	16	8.82
	18	5	12500	5	12500					3	7500	3	7500	40000	16	8.82
	19	4.75	11875	5	12500					3	7500	3	7500	39375	15.75	8.68
	20			5	12500					3	7500	3	7500	27500	11	6.06
	21			5	12500					3	7500	3	7500	27500	11	6.06
	22			5	12500					3	7500	3	7500	27500	11	6.06
	23			5	12500	2	5000			3	7500	3	7500	32500	13	7.16
	24			5	12500	2	5000			3	7500	3	7500	32500	13	7.16
	25			5	12500	2	5000			3	7500	5	12500	37500	15	8.27
	26			10	25000	2	5000			3	7500	5	12500	50000	20	11.02
	27			10	25000	2	5000			3	7500	5	12500	50000	20	11.02
	28			10	25000	2	5000			3	7500	5	12500	50000	20	11.02
	29			10	25000	2	5000			3	7500	5	12500	50000	20	11.02
	30			9.9	24750	2	5000			3	7500	8	20000	57250	22.9	12.62
	Total (A)	**69.75**	**174375**	**104.9**	**262250**	**16**	**40000**	**0**	**0**	**75**	**187500**	**90**	**225000**	**889125**	**355.65**	**195.96671**
Post mining (B)		10	25000	30	75000	4	10000	30	75000	10	25000	20	50000	260000	104	57.31
		10	25000	30	75000	4	10000	30	75000	10	25000	20	50000	260000	104	57.31
		10	25000	30	75000	4.89	12225	32.25	80625	10.55	26375	14.38	35950	255175	102.07	56.24
	Total (B)	**30**	**75000**	**90**	**225000**	**12.89**	**32225**	**92.25**	**230625**	**30.55**	**76375**	**54.38**	**135950**	**775175**	**310.07**	**170.85167**
Grand (A+B)		**99.75**	**249375**	**194.9**	**487250**	**28.89**	**72225**	**92.25**	**230625**	**105.55**	**263875**	**144.38**	**360950**	**1664300**	**665.72**	**366.81838**

CSR Works & Expenditure FY 2020-21*

(CSR Budget - ₹ 5.54 Crore)

Sl No	CSR Projects identified	District and State of Project		Amt. spent (₹ lakhs)		Direct or through agency
		District	State	Direct Exp	Overheads	
A	**Promoting education,including special education & employment enhancing vocation skills especially among children,women,elderly,and the differently abled & livelihood enhancement projects**					
1	Works in RBB School, Rajganj	Dhanbad	Jharkhand	27.57	--	Direct
B	**Rural Development Works**					
1	Construction of marriage hall at Ratanpur panchayat, Govindpur Block	Dhanbad	Jharkhand	3.73	--	Direct
2	Other Civil Works	Dhanbad	Jharkhand	1.69	--	Direct
C	**COVID-19 related initiatives**					
1	Procurement of bleaching powder	Dhanbad	Jharkhand	6.4	--	Direct
2	Procurement of face masks	Dhanbad	Jharkhand	0.16	--	Direct
3	Financial assistance to D.C. Dhanbad to combat COVID-19 situation in Dhanbad	Dhanbad	Jharkhand	200	--	Depository mode of work execution through Dhanbad district administration
	Total			**239.55**	--	

**** Figures unaudited for the FY 2020-21***

CSR Works & Expenditure FY 2020-21*

(CSR Budget - ₹ 5.54 Crore)

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	Total			**239.55**	--	

**** Figures unaudited for the FY 2020-21***

Annual CSR Action Plan for FY 2023-24								
Sl. No.	**CSR Project/Programme**	**Item from the list of the activities in schedule VII to the act**	**Estimated Budget (₹ in Lakhs)**	**Manner of execution/Executing Agency**	**Implementation Schedule**	**Monitoring and reporting mechanism**	**Details of need and impact assessment **, if any; as evaluated by BCCL**	**Remarks**
CSR projects/activities under HQ								
1	Construction of auditorium in Law college, Dhanbad	Promoting education, including special education and employment enhancing vocation skills especially among children, women, elderly, and the differently abled and livelihood enhancement projects	40.00	BCCL	2023-24 & 2024-25	BCCL	Established in 1976, the college caters to legal aspirants from in & around Dhanbad.The auditorium is expencted to benfit 580 students of the college for their induction/ orientation programs, cultural programs, in-house activities etc.	1. Location: Dhanbad 2. Outside operational Areas 3. Within 25 kms. 4. Expected to benefit both PAP as well as non PAP students
2	Construction of a library at Shahid Shakti Nath Mahto Smarak Ucch Vidyalay	Promoting education, including special education and employment enhancing vocation skills especially among children, women, elderly, and the differently abled and livelihood enhancement projects	35.00	BCCL	2023-24 & 2024-25	BCCL	The library is expected to benefit 400 students belonging to East Tundi block in Dhanbad who study in the School	1. Location: East Tundi, Dhanbad Dist. 2. Outside operational Areas 3. Beyond 25 kms but within 35 kms. 4. Expected to benefit non PAP students

3	Providing Solar Light to tribal School in Jharkhand	Promoting education, including special education and employment enhancing vocation skills especially among children, women, elderly and the differently abled and livelihood enhancement projects.	2.50	BCCL	2023-24 & 2024-25	BCCL	These tribal Schools (Ratri Pathshalas) provide free education to poor & underprivilaged students of Ranchi, Gumla & Lohardaga. On School caters to 200 students one an average. Providing solar lighting solution as a pilot in one School shall help out the students in their night education.	1. Location: Ranchi/Gumla/Lohardaga 2. Outside operational Areas 3. Beyond 25 kms but within operational state. 4. Expected to benefit non PAP students
4	Construction of multipurpose hall & deep boring including installation of pump with construction of tank at Pragha village, Belgaria	Rural Development	35.00	BCCL	2023-24 & 2024-25	BCCL	This all weather multipurpose hall with water facility is expected to cater to approximately 1000 villagers in & around Pragha village in Lodna in their social functions.	1. Location: Belgaria, Dhanbad Dist. 2. Outside operational Areas 3. Within 25 kms 4. Expected to benefit non PAP villagers
5	Procurement and distribution of sanitary pads under Pradhan Mantri Bhartiya Jan Aushadhi Pariyojna through Jan Aushadhi Suvidha	Eradicating hunger, poverty and malnutrition, [promoting health care including preventive health] and sanitation [Including contribution to the Swatch Bharat Kosh set-up by the Central Government for the promotion of sanitation] and making available safe drinking water	3.60	BCCL	2023-24 & 2024-25	BCCL	Free distribution of sanitary pads is expected to benefit 1500 girl students of Dhanbad district.	1. Location: Dhanbad Dist. 2. Both within as well as outside operational Areas 3. Both within as well as outside 25 kms., within operational state. 4. Expected to benefit both PAP as well as non PAP students

6	Skill Development training on Plastic Processing Trade at CIPET Ranchi for 80 candidates	Promoting education, including special education and employment enhancing vocation skills especially among children, women, elderly and the differently abled and livelihood enhancement projects.	60.00	BCCL	2023-24 & 2024-25	BCCL	Training at CIPET has provided more than 80% placement in the past. Training to 80 candidates is expected to provide employment opportunities to the successful candidates and thus elevate their financial condition.	1. Location: Dhanbad Dist. 2. Both within as well as outside operational Areas 3. Both within as well as outside 25 kms., within operational state. 4. Expected to benefit both PAP as well as non PAP students
7	Providing Nutritional Baskets to TB patients of Dhanbad	Eradicating hunger, poverty and malnutrition, promoting health care including preventive health care and sanitation including contribution to the Swach Bharat Kosh set-up by the Central Government for the promotion of sanitation and making available safe drinking water.	56.86	BCCL	2023-24 & 2024-25	BCCL	As per the details provided by Dhanbad Dist. TB administration, this project is expected to benefit 1053 TB patients. of Dhanbad district	1. Location: Dhanbad Dist. 2. Both within as well as outside operational Areas 3. Both within as well as outside 25 kms., within operational state. 4. Expected to benefit both PAP as well as non PAP patients

8	Proposal for drinking water security in Gharbar, a fluoride affected Panchayat in Baliapur Block, Dhanbad	Eradicating hunger, poverty and malnutrition, promoting health care including preventive health care and sanitation including contribution to the Swach Bharat Kosh set-up by the Central Government for the promotion of sanitation and making available safe drinking water.	60.00	BCCL	2023-24 & 2024-25	BCCL	Effects of fluoride contamination has been observed in various stages of progress in Gharbar Panchayat. A multipronged strategy targetting dugwells, rooftop rainwater harvesting etc. shall be an attemt to alleviate the problem in 02 hamlets targeting 120 households. This shall be a pilot project and one of its kind initiative.	1. Location: Belgaria, Dhanbad Dist. 2. Outside operational Areas 3. Within 25 kms 4. Expected to benefit non PAP villagers
9	Construction of common room/hall at Chetna Mahavidyalay Sahraj (tribal School)	Promoting education, including special education and employment enhancing vocation skills especially among children, women, elderly and the differently abled and livelihood enhancement projects.	10.00	BCCL	2023-24 & 2024-25	BCCL	A tribal School located in Sahraj in Govindpur Dist., caters to 725 students of vicinty, 80% of whom are tribals. A common room/hall shall cater to their educational/cultural needs as well as utilization as boarding during times of need.	1. Location: Dhanbad 2. Outside operational Areas 3. Within 25 kms. 4. Expected to benefit non PAP students
10	Development of Amrit Sarovar pond at Baliapur	Ensuring environmental sustainability, ecological balance, protection of flora and fauna, animal welfare, agroforestry, conservation of natural resources and maintaining quality of soil, air and water [including contribution to the Clean Ganga Fund set-up by the Central Government for rejuvenation of river Ganga]	30.00	BCCL	2023-24 & 2024-25	BCCL	As per instructions of GoI, total 75 ponds are to be developed in Dhanbad district which are being explored by Env. Dept. One pond out of 75, is proposed to be taken up under CSR which is expected to cater to more than 500 villagers in the vicinity.	1. Location: Baliapur, Dhanbad Dist. 2. Outside operational Areas 3. Within 25 kms 4. Expected to benefit non PAP villagers

11	Construction of toilets in 5 Govt. Schools of Dhanbad	Eradicating hunger, poverty and malnutrition, promoting health care including preventive health care and sanitation including contribution to the Swach Bharat Kosh set-up by the Central Government for the promotion of sanitation and making available safe drinking water.	25.00	BCCL	2023-24 & 2024-25	BCCL	Addressing the needs of Schools for toilet facilities shall address the theme of sanitation which is expected to benefit 1500 students in 05 Schools	1. Location: Dhanbad Dist. 2. Both within as well as outside operational Areas 3. Within 25 kms., within operational state. 4. Expected to benefit both PAP as well as non PAP students
12	Covid-19 (Settlement of Bill)	Eradicating hunger, poverty and malnutrition, promoting health care including preventive health care and sanitation including contribution to the Swach Bharat Kosh set-up by the Central Government for the promotion of sanitation and making available safe drinking water.	82.28	BCCL	2023-24 & 2024-25	BCCL	BCCL & Dhanbad Dist. Admin. fought hand in hand to combat COVID 19 menance in Dhanbad. Supporting Dist. Admin. reconfirms the image of BCCL as a responsible Corporate.	1. Location: Dhanbad Dist. 2. Both within as well as outside operational Areas 3. Both within as well as outside 25 kms., within operational state. 4. Benefit to both PAP as well as non PAP populace
	Sub total of HQ		**440.24**					
CSR projects/activities recommended by Areas								

13	Construction of 4 classrooms at B.K Rai Smarak Balika Uchh Vidyalaya, Katrasgarh (Katras)	Promoting education, including special education and employment enhancing vocation skills especially among children, women, elderly and the differently abled and livelihood enhancement projects.	20.00	BCCL	2023-24 & 2024-25	BCCL	Located at Katras in Dhanbad this School caters to 360 students. Construction of all weather classrooms shall provide sitting rooms for imparting education to the students.	1. Location: Katras, Dhanbad Dist. 2. Within operational Area 3. Within 25 kms. 4. Expected to benefit PAP students
14	Construction of kitchen rooms, water storage tank, laying of paver blocks and misc civil works at Rajkiya Madhya Vidyalaya, Dubrajdih Panchayat (WJ)	Promoting education, including special education and employment enhancing vocation skills especially among children, women, elderly and the differently abled and livelihood enhancement projects.	15.00	BCCL	2023-24 & 2024-25	BCCL	This project is expected to benefit 57 students of the School.	1. Location: WJ, Dhanbad Dist. 2. Within operational Area 3. Within 25 kms. 4. Expected to benefit PAP students
15	Training/learning/upskilling support to tribal women/artists/weavers of Lahbera Basti, Dhansar (Kusunda)	Promoting education, including special education and employment enhancing vocation skills especially among children, women, elderly and the differently abled and livelihood enhancement projects.	12.00	BCCL	2023-24 & 2024-25	BCCL	Providing entrepreneurial skill development support is expected to benefit 300 persons in Kusunda.	1. Location: Kusunda, Dhanbad Dist. 2. Within operational Area 3. Within 25 kms. 4. Expected to benefit PAPs
16	Development of Public Toilets, Drainage, pathway & other infrastructure works at Bauan Kalan (Uttar Panchayat) Barki Bauan, GKKC (Kusunda)	Eradicating hunger, poverty and malnutrition, promoting health care including preventive health care and sanitation including contribution to the Swach Bharat Kosh set-up by the Central Government for the promotion of sanitation and making available safe drinking water.	18.00	BCCL	2023-24 & 2024-25	BCCL	Providing public toilets is expected to benefit 500 persons in Kusunda.	1. Location: Kusunda, Dhanbad Dist. 2. Within operational Area 3. Within 25 kms. 4. Expected to benefit PAPs

17	Providing and fixing water supply pipe line for Ghutway Village near Damoda Colliery (Barora)	Eradicating hunger, poverty and malnutrition, promoting health care including preventive health care and sanitation including contribution to the Swach Bharat Kosh set-up by the Central Government for the promotion of sanitation and making available safe drinking water.	21.00	BCCL	2023-24 & 2024-25	BCCL	Providing filtered water to the villagers is expected to cater to the needs of 300 plus villagers which is also expected to address IR issues at the Area.	1. Location: Barora, Dhanbad Dist. 2. Within operational Area 3. Within 25 kms. 4. Expected to benefit PAPs
Sub total of Areas			**86.00**					
18	Contingent CSR expenditure for items listed under Schedule VII		198.00	by BCCL	2023-24 & 2024-25	BCCL	NA	
	Grand total		**724.24**					

CSR Expenditure Details FY 2024-25		
		CSR Budget 18.75 Cr.
S. No.	**CSR Project/Programme**	**Expenditure in FY 2024-25 (₹ in lakhs)**
1	Skill Development Program by National Skill Development Council (NSDC) (Loader Operator (Mining), Mine Electrician, Multi Skill Technician (Electrical), Customer Service Associate (Financial Services), Food & Beverage Service – Associate, Solar & LED Technician (Electronics) & door to door survey for need assessment (next phase of work of FY 2023-24) (HQ)	146.01
2	Skill Development Program for 75 candidates through MSME Toolroom, Kolkata (Ministry of MSME) on the trades Asst. Operator (CNC Turning), Jr. Technician (Welding), Technician CNC Machining (HQ)	85.81
3	Skill Development Program through CIPET, Ranchi for 200 candidates (HQ)	174.71
4	Skill Development training program on Medical Equipment Technician for 150 candidates (Skill training on health) (HQ)	30.77
5	Development of Strategic Interventions through Innovative Techniques to Promote STEM Education among underprivileged students with special emphasis on PAP (Project Affected Person) students in Dhanbad (HQ)	8.00
6	Construction of Auditorium at Law College, Dhanbad (work of FY 2023- 24) (HQ)	13.05
7	Providing 200 wireless sets and 1000 barricades through depository mode to Dhanbad District Administration (HQ)	227.00
8	Installation of Smart Classrooms and Information and Communication Technology (ICT) Labs in Government schools of Dhanbad district (HQ)	909.06
9	Installation of smart classes in Schools of Giridih district (HQ)	153.17
10	Procurement of statue of Bhagwan Birsa Munda (HQ)	5.84

11	Construction of drain at kharnagadha (Sanitation) (Washery div.)	14.38
12	Construction of ghat in Khodo river at Gram Panchayat Tundu (Jhajlitand and Sagriyadih) (Barora Area)	15.35
13	Infrastructure upgradation work in Chungari Free Primary School, Barakar (CV Area)	20.50
14	Financial assistance to Dhanbad district administration for depository mode procurement of wheelchairs (tricycles) (485 nos.) (HQ)	44.48
15	Financial assistance to Dhanbad District Administration for depository mode procurement for providing food and other necessary items to Polling teams/sector magistrate etc. during Lok Sabha Elections 2024. (HQ)	12.00
16	Making available food, water & other necessary items for general populace during visit of Dhanbad by Hon'ble Chief Minister, under CSR head of BCCL (HQ) visit	14.87
17	Depository mode transfer to D.C. Dhanbad towards providing woollen lowers to children in Dhanbad between ages 03-06 under CSR initiatives of BCCL	274.20
18	Financial assistance to Dhanbad District Administration for depository mode procurement for providing food and other necessary items to Polling teams/sector magistrate etc. during Vidhan Sabha Elections 2024.	15.00
19	Organizing inter village football tournament (Project Affected Persons) at Sijua Stadium	2.10
20	Thalassemia screening test organised at BCCL under CIL Thalassemia Bal Sewa Yojana	8.40
21	Livelihood opportunity to women of handloom project	0.38

22	Procurement & distribution of blankets amongst needy under CSR works of BCCL for FY 2024-25	9.95
23	Additional Civil Works in RBB High School Rajganj for Mini Science Labs under CRY	3.45
24	Desilting/deepening of Lal Bandh Pond and rehabilitation of adjoining embankment around it at Baliapur under Bastacolla area.	23.16
25	Construction of Community Hall under Harina Panchayat under Block II Area (Revised Estimate)	0.17
26	Infrastructural development works of Vinod Bihari Mahto Inter Mahila Mahavidyalay Topchanchi, Dhanbad(Revised Estimate)	3.34
	Total	**2,215.15**

CSR Expenditure for Ongoing projects of FY 2023-24 in FY 2024-25		
27	Construction of a library at Shahid Shakti Nath Mahto Smarak Ucch Vidyalay	0.53
28	Skill Development Training program on GDA for 120 candidates	8.89
29	Skill Development Training program on BFSI for 150 candidates	12.53
30	Installation of Mini Science Labs in 5 Govt Schools	11.48
31	Setting Up of MSDI Centre through NSDC at Belgharia Rehabilitation Centre	34.62
32	Skill Development training on Plastic Processing Trade at CIPET Ranchi for 80 candidates	11.20
33	Construction of Hostel at Premiya Rishikesh Amlabad Mahavidyalay by BCCL under CSR FY 2023-24	11.61
34	Development of Public Toilets, Drainage, pathway & other infrastructure works at Bauan Kalan (Uttar Panchayat) Barki Bauan, GKKC (Kusunda)	3.07
35	Construction of library at Rajendra Balika Uchh Vidyalay at Katras	10.11
36	Providing & fixing of community shed at Saraidhela Panchayat Bhawan Campus (CCWO)	1.16
37	Providing and fixing solar lights in nearby villages of PB Area	17.14

38	Providing and fixing ceiling fans in Government schools in Putki Madhya Vidyalaya and Kustore Madhya Vidyalaya	0.90
39	Proposal for supply, fitting and installation of LED based solar street lighting system in AMPC, Barora Area under CSR head (Barora)	16.92
	Total	**140.16**
	Total CSR Expenditure in FY 2024-25	**2,355.31**

NW
Samsung Triple Camera
Shot with my Galaxy A70

Few CSR works done by BCCL during Covid 19 Pandemic

BCCL
भारत कोकिंग कोल लिमिटेड
क्षेत्र संख्या 4
क्षेत्रिय चिकित्सालय कतरास
100 दिवसीय टीबी उन्मूलन कार्यक्रम
स्वस्थ आहार,
टीबी मुक्ति का आधार
टी.बी.

भारत कोकिंग कोल लिमिटेड
BCCL
क्षेत्रिय चिकित्सालय कतरास
YOURSELF
15 Feb 2025, 11:22 am

कतरास क्षेत्र के विभिन्न इकाइयों का कॉर्पोरेट कल्याण समिति के सदस्यों ने किया निरीक्षण

नई पत्र वार्ता प्रतिनिधि

कतरासः बीसीसीएल कॉरपोरेट कल्याण समिति के सदस्यों के द्वारा शुक्रवार को कतरास क्षेत्र के रामकनाली वाटर फिल्टर प्लांट, पारसनाथ उद्यान, रीजनल अस्पताल तिलाटांड, दुर्गा कॉलोनी सहित कई ईकाइयों का निरीक्षण किया गया. अधिकारियों ने निरीक्षण के दौरान कई आवश्यक दिशा निर्देश दिए. निरीक्षण करने वालों में मुख्य रूप से यूनियन प्रतिनिधि निताई महतो, संजीत सिंह, लक्षमण महतो, विपिन कुमार राय, एसएस डे, अशोक कुमार साव, गंगा सागर राय एवं मुख्यालय कल्याण विभाग के प्रभात कुमार, प्रबंधक कार्मिक, श्रीमति संगीता डेका, प्रबंधक कार्मिक, विनोद कुमार उपस्थित शामिल थे. कतरास क्षेत्र के महाप्रबंधक राजकुमार अग्रवाल ने सभी का स्वागत किया. मौके पर अवर महाप्रबंधक यूके सिंह, मुख्य प्रबंधक योजना संजय कुमार सिंह, क्षेत्रीय कार्मिक प्रबंधक उमंग कुमार ठक्कर, प्रबंधक कार्मिक राणा एसके सिंह, अभियंता,अभिमन्यु कुमार , निष्कर्ष राय आदि उपस्थित थे.

मलबे पर उद्यान, अपशिष्ट से सजावटी सामान

सुधीर सुमन • जागरण

केशलपुर स्थित पार्श्वनाथ उद्यान, टायरों से लग रहा आकर्षक • जागरण

केशलपुर स्थित पार्श्वनाथ उद्यान में झूले का आनंद उठाते बच्चे • जागरण

कतरास : धनबाद जिले के कतरास क्षेत्र में है केशलपुर पार्श्वनाथ उद्यान। यह पर्यावरण संरक्षण की दिशा में सराहनीय कदम है। मलबों के ढेर पर बने इस उद्यान की खास विशेषताएं हैं। कोयला खनन परियोजना से निकले ओवर बर्डन (ओबी) के पहाड़ पर हरियाली की चादर बिछाई गई है। भारत कोकिंग कोल लिमिटेड (बीसीसीएल) के बड़े वाहनों के स्क्रैप को आकर्षक आकार देकर सजाया गया है। भूतल से करीब 38 मीटर ऊंचाई पर फैली हरियाली धनबादवासियों को लुभा रही है।

यहां आम, बेर, अमरूद, बेल, शीशम, सागवान, महुआ, कचनार, जामुन, पीपल, करंज, अशोक, हरसिंगार, पथलचट्टा आंवला, चंदन, इलायची, एलोवेरा समेत अन्य पेड़ पौधे मिल जाएंगे। हालपैक, डोजर जैसे भारी वाहनों के 162 टायरों से इसकी घेराबंदी की गई है। पार्क के बीच में डोजर के चैन से चबूतरा बनाया गया। बैठने के लिए कन्वेयर बेल्ट है। साढ़े तीन हेक्टेयर में फैला इस उद्यान में करीब सात हजार से अधिक पेड़-पौधे हैं। ऊपर से आसपास के क्षेत्रों को देखा जा सकता है।

बीसीसीएल की रामकनाली कोलियरी के परियोजना पदाधिकारी एस चटर्जी ने इसकी कल्पना की थी। उन्होंने ही यहां ओबी गिरवाया था। निजी खर्च से पौधे लगवाए थे। उसके बाद कतरास क्षेत्र के तत्कालीन महाप्रबंधक जीतेंद्र मल्लिक ने इस सोच को पर्यावरण संरक्षण के लिए उचित समझा और सजाने-संवारने का बीड़ा उठाया। इससे बनाने में चार साल लगे। पांच जून 2016 को निर्माण पूरा हुआ। केंद्रीय गृहमंत्री अमित शाह व कोयला मंत्री प्रह्लाद जोशी ने 23 जुलाई 2020 को आनलाइन उद्घाटन किया था। यहां चंद्रशेखर आजाद व लोकमान्य बाल गंगाधर तिलक की प्रतिमा स्थापित की गई है। बच्चों के लिए झूले लगाए गए हैं। प्रवेश द्वार के समीप तालाब में मछलियां पाली गई हैं।

पांच बत्तख भी तैरते मिल जाएंगे। पास में दीवान बाबा का मंदिर है। बाग में पेवर्स ब्लाक बिछाए गए। गर्मी में फव्वारे का लोग भरपूर आनंद उठाते हैं। उद्यान के सुपरवाइजर मनोज कुमार कहते हैं कि 20 कर्मी प्रतिदिन सफाई, पेड़-पौधों की सिंचाई व सुरक्षा का ध्यान रखते हैं।

यहां दूर दराज से लोग पिकनिक मनाने व घूमने आते हैं। बीसीसीएल कतरास क्षेत्र के पर्यावरण विभाग के प्रबंधक रीतेश रंजन ने कहा कि पार्श्वनाथ उद्यान केशलपुर को और भी आकर्षक तरीके से सजाने की योजना है। सफाई की समुचित व्यवस्था की गई। सुरक्षा पर भी विशेष ध्यान है।

Bharat Coking Coal Limited

BHARAT COKING COAL LIMITED

COPRPORATE ENVIRONMENT POLICY 2025

Back Ground:

Bharat Coking Coal Limited (BCCL) subscribes to the view of Sustainable Development. Unless the environment can sustain all the developmental activities, any pursuit of development in isolation can cause irreparable damage to the ecosystem and associated environmental attributes.

The present policy is the revision of the Corporate Environment Policy 2019 and is complimentary to the National Environmental Policy, 2006.This modification in the present policy is the outcome of the experience gained since 2019 keeping in view the modifications / amendments made time to time in environmental policies and additional stipulations notified by MoEF&CC (Ministry of Environment, Forest& Climate Change) and other organizations concerning mine closure, reclamation of degraded land, environmental clearance etc. and also with the objective of revisiting the corporate policy. Government of India is signatory to few international conventions/agreements relevant to BCCL amongst others and activities associated with such conventions/agreements are embodied in the present policy

This Policy has a vision of Green Mining and mission of 100% compliance of environmental statutes applicable to coal mining industry.

Policy Statement: Bharat Coking Coal Limited(BCCL) is committed to promote low carbon, sustainable and socially inclusive coal mining 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. It also aims to bringing awareness amongst its stakeholders for continual improvement in environmental performances following good environmental practices.

Objectives:

BCCL shall endeavour to-

1. Plan & design projects with due consideration to environmental and social concerns for Sustainable Development and reduction in emission intensity of its operations.

2. Conduct mining and associated operation in an environmentally responsible manner to comply with applicable laws and other requirements related to environmental aspects.

3. Prevent pollution in surrounding habitation by continuous monitoring and adopting suitable measures for environment protection.

4. Ensure effective implementation of Environment Management Plans (EMPs) in all our mines / projects to mitigate pollution, conservation of natural resources and restoration of ecology & biodiversity.

5. *Ensure compliance of all statutory conditions prescribed by regulatory agencies.*
6. *Ensure waste management in each unit on the principle of REDUCE, REUSE, RECYCLE and SAFE DISPOSAL.*
7. *Put special thrusts on efficient energy utilization / renewable energy and other measures to reduce carbon foot-print.*
8. *Strive for continual improvement in our environmental performances by setting targets, measuring progress and taking corrective action.*
9. *Take measures to gainful repurposing of land and render productive post mining land use for ensuring environmentally sustainable closure of mine, keeping in view the social needs and requirement of the locals.*
10. *Take steps for dealing, prevention and control of coal mine fire and related subsidence.*
11. *Ensure implementation of activities applicable to BCCL arising out of International Conventions.*
12. *Create environmental awareness and ensure environmental education among the employees, local communities and other stakeholders through pro-active communication and training.*
13. *Promote R&D projects/innovations addressing various environmental concerns like minimization of carbon footprints of BCCL and environmental issues in mining & surrounding areas.*
14. *Establish eco-parks in the reclaimed mined areas and promote eco-mining tourism in the coalfield areas.*
15. *Ensure transparency in Environmental reporting / disclosure to stakeholders.*

Review of Environmental Policy:

In view of the present fast changing social, economic and environmental scenario, this policy shall be reviewed every 5 years to incorporate the changes in the legal, technical, environmental, economic and social inputs prevailing at that time. Whenever, there is change in National Environmental Policy or other National / State relevant policies, Acts etc, this Corporate Environmental Policy would be reviewed and suitably revised.

29/5/25

Chairman-cum-Managing Director,

BCCL

Place: Dhanbad

Major Environmental measures cost for the year 2024-25

Sl. No.	Activity (24-25)	Approx Cost Incurred (In Lakhs)
1	Environmental Monitoring (Air, water and noise)	9
2	Ecological Restoration/Block Plantation/Green Park	50.0
3	Water treatment plant	17.00
4	Top soil Management	2
5	Water Sprinkling	45.00

Annexure-30

भारत सरकार
जल शक्ति मंत्रालय
जल संसाधन, नदी विकास
और गंगा संरक्षण विभाग
केन्द्रीय भूमि जल प्राधिकरण
Government of India
Ministry of Jal Shakti
Department of Water Resources,
River Development & Ganga Rejuvenation
Central Ground Water Authority

(भूजल निकासी हेतु अनापत्ति प्रमाण पत्र)
NO OBJECTION CERTIFICATE (NOC) FOR GROUND WATER ABSTRACTION

Project Name:	Cluster Iv Mines Of Bccl		
Project Address:	Office Of The General Manager, Katras Area, M/s Bccl, Po- Sijua		
Town:	Malkera (ct)	Block:	Baghmara
District:	Dhanbad	State:	Jharkhand
Pin Code:			
Communication Address:	Office Of General Manager, Katras Area, M/s Bccl, Post Office- Sijua, Dhanbad, Dhanbad, Jharkhand - 828121		
Address of CGWB Regional Office :	Central Ground Water Board Mid Eastern Region, 6th & 7th Floor, Lok Nayak Jai Prakash Bhawan, Frazer Road Dak Banglow, Patna, Bihar - 800011		

1.	**NOC No.:**	CGWA/NOC/MIN/REN/1/2025/11517	2.	**Date of Issuence**	28/04/2025
3.	Application No.:	21-4/320/JH/MIN/2018	4.	Category: (GWRE 2024)	Semi Critical
5.	Project Status:	Existing With Additional Ground Water Requirment	6.	NOC Type:	Renewal
7.	**Valid from:**	27/12/2023	8.	**Valid up to:**	26/12/2025

9. Ground Water Abstraction Permitted:

Fresh Water		Saline Water		Dewatering		Total	
m³/day	m³/year	m³/day	m³/year	m³/day	m³/year	m³/day	m³/year
0.00	0.00			10212.00	3727380.00	10212.00	3727380.00

10. Details of ground water abstraction /Dewatering structures

	Total Existing No						Total Proposed No					
	DW	DCB	BW	TW	MP	MPu	DW	DCB	BW	TW	MP	MPu
Dewatering Structure*	0	0	0	0	4	0	0	0	0	0	2	0

*DW- Dug Well; DCB-Dug-cum-Bore Well; BW-Bore Well; TW-Tube Well; MP-Mine Pit;MPu-Mine Pumps

11.	Ground Water Abstraction/Restoration Charges paid (Rs.):	51161460.00
12.	Environment Compensation (if applicable) paid (Rs.):	0.00

13.	Number of Piezometers(Observation wells) to be constructed/ monitored & Monitoring mechanism.	No. of Piezometers	Monitoring Mechanism		
			Manual	DWLR**	DWLR With Telemetry
	**DWLR - Digital Water Level Recorder	2	0	1	1

CENTRAL GROUND WATER AUTHORITY

18/11, जामनगर हाउस, मानसिंह रोड, नई दिल्ली - 110011 / 18/11, Jamnagar House, Mansingh Road, New Delhi-110011
Phone: (011) 23383561 Fax: 23382051, 23386743
Website: cgwa-noc.gov.in

CENTRAL GROUND WATER AUTHORITY

18/11, जामनगर हाउस, मानसिंह रोड, नई दिल्ली - 110011 / 18/11, Jamnagar House, Mansingh Road, New Delhi-110011
Phone: (011) 23383561 Fax: 23382051, 23386743
Website: cgwa-noc.gov.in

(Compliance Conditions given overleaf)

This is an auto generated document & need not to be signed.

CENTRAL GROUND WATER AUTHORITY

18/11, जामनगर हाउस, मानसिंह रोड, नई दिल्ली - 110011 / 18/11, Jamnagar House, Mansingh Road, New Delhi-110011
Phone: (011) 23383561 Fax: 23382051, 23386743
Website: cgwa-noc.gov.in

Validity of this NOC shall be subject to compliance of the following conditions:

Mandatory conditions:

1) Installation of tamper proof digital water flow meter with telemetry on all the abstraction structure(s) shall be mandatory for all users seeking No Objection Certificate and intimation regarding their installation shall be communicated to the CGWA within 30 days of grant of No Objection Certificate.

2) Proponents shall mandatorily get water flow meter calibrated from an authorized agency once in a year.

3) Construction of purpose-built observation wells (piezometers) for ground water level monitoring shall be mandatory as per Section 14 of Guidelines. Water level data shall be made available to CGWA through web portal. Detailed guidelines for construction of piezometers are given in Annexure-II of the guidelines.

4) Proponents shall monitor quality of ground water from the abstraction structure(s) once in a year. Water samples from bore wells/ tube wells / dug wells shall be collected during April/May every year and analysed in NABL accredited laboratories for basic parameters (cations and anions), heavy metals, pesticides/ organic compounds etc. Water quality data shall be made available to CGWA through the web portal.

5) In case of mining projects, additional key wells shall be established in consultation with the Regional Director, CGWB for ground water level monitoring four (4) times a year (January, May, August and November) in core as well as buffer zones of the mine.

6) In case of mining project the firm shall submit water quality report of mine discharge/ seepage from Govt. approved/ NABL accredited lab.

7) The firm shall report compliance of the NOC conditions online in the website (www.cgwa-noc.gov.in) within one year from the date of issue of this NOC.

8) Industries abstracting ground water in excess of 100 m 3 /d shall undertake annual water audit through certified auditors and submit audit reports within three months of completion of the same to CGWA. All such industries shall be required to reduce their ground water use by at least 20% over the next three years through appropriate means.

9) Application for renewal can be submitted online from 90 days before the expiry of NOC. Ground water withdrawal, if any, after expiry of NOC shall be illegal & liable for legal action as per provisions of Environment (Protection) Act, 1986.

10) This NOC is subject to prevailing Central/State Government rules/laws/norms or Court orders related to construction of tube well/ground water abstraction structure / recharge or conservation structure/discharge of effluents or any such matter as applicable.

General conditions:

11) No additional ground water abstraction and/or de-watering structures shall be constructed for this purpose without prior approval of the Central Ground Water Authority (CGWA).

12) The proponent shall seek prior permission from CGWA for any increase in quantum of groundwater abstraction (more than that permitted in NOC for specific period).

13) Proponents shall install roof top rain water harvesting in the premise as per the existing building bye laws in the premise.

14) The project proponent shall take all necessary measures to prevent contamination of ground water in the premises failing which the firm shall be responsible for any consequences arising thereupon.

15) In case of industries that are likely to contaminate the ground water, no recharge measures shall be taken up by the firm inside the plant premises. The runoff generated from the rooftop shall be stored and put to beneficial use by the firm.

16) Wherever feasible, requirement of water for greenbelt (horticulture) shall be met from recycled / treated waste water.

17) Wherever the NOC is for abstraction of saline water and the existing wells (s) is /are yielding fresh water, the same shall be sealed and new tubewell(s) tapping saline water zone shall be constructed within 3 months of the issuance of NOC. The firm shall also ensure safe disposal of saline residue, if any.

18) Unexpected variations in inflow of ground water into the mine pit, if any, shall be reported to the concerned Regional Director, Central Ground Water Board.

19) In case of violation of any NOC conditions, the applicant shall be liable to pay the penalties as per Section 16 of Guidelines.

20) This NOC does not absolve the proponents of their obligation / requirement to obtain other statutory and administrative clearances from appropriate authorities.

21) The issue of this NOC does not imply that other statutory / administrative clearances shall be granted to the project by the concerned authorities. Such authorities would consider the project on merits and take decisions independently of the NOC.

22) In case of change of ownership, new owner of the industry will have to apply for incorporation of necessary changes in the No Objection Certificate with documentary proof within 60 days of taking over possession of the premises.

23) This NOC is being issued without any prejudice to the directions of the Hon'ble NGT/court orders in cases related to ground water or any other related matters.

24) Proponents, who have installed/constructed artificial recharge structures in compliance of the NOC granted to them previously and have availed rebate of upto 50% (fifty percent) in the ground water abstraction charges/ground water restoration charges, shall continue to regularly maintain artificial recharge structures.

25) Industries which are likely to cause ground water pollution e.g. Tanning, Slaughter Houses, Dye, Chemical/ Petrochemical, Coal washeries, pharmaceutical, other hazardous units etc. (as per CPCB list) need to undertake necessary well head protection measures to ensure prevention of ground water pollution as per Annexure III of the guidelines.

26) In case of new infrastructure projects having ground water abstraction of more than 20 m3/day, the firm/entity shall ensure implementation of dual water supply system in the projects.

27) In case of infrastructure projects, paved/parking area must be covered with interlocking/perforated tiles or other suitable measures to ensure groundwater infiltration/harvesting.

28) In case of coal and other base metal mining projects, the project proponent shall use the advance dewatering technology (by construction of series of dewatering abstraction structures) to avoid contamination of surface water.

29) The NOC issued is conditional subject to the conditions mentioned in the Public notice dated 27.01.2021 failing which penalty/EC/cancellation of NOC shall be imposed as the case may be.
30) This NOC is issued subject to the clearance of Expert Appraisal Committee (EAC) (if applicable).
31) In the self-compliance report, the PP shall submit details of Drilling Agency/ Agencies, which has/ have constructed BW(s)/ TW(s) along with undertaking to the effect that all necessary measures have been taken as per directions of Hon'ble Supreme Court provided in Annexure-VII of guidelines dated 24.09.2020 in respect of abandoned/ failed BW(s)/ TW(s)/Piezometer(s), if any. The PP is advised to engage registered drilling agency/ agencies. In the event of any mishap/ unfortunate incident due to negligence in taking measures for prevention of accident due to falling in Bore Well, both PP and concerned drilling agency shall jointly be held responsible and penal action as per extant Government rules shall be taken.

(Non-compliance of the conditions mentioned above is likely to result in the cancellation of NOC and legal action against the proponent.)

CENTRAL GROUND WATER AUTHORITY

Term and conditions:

i. All disputes are subject to Delhi Jurisdiction.
ii. Any complaint in regard to the rates will not be entertained.

Member-Secretary
CGWA, New Delhi

CENTRAL GROUND WATER AUTHORITY

(7)

Ph: 0326-2204933

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

Letter No. ...2659 Dated ....6/12/13....

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 refercnee 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,

6/12/13

(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

बिड संख्या/Bid Number: GEM/2025/B/6722136

दिनांक /Dated: 27-10-2025

बिड दस्तावेज़ / Bid Document

बिड विवरण/Bid Details	
बिड बंद होने की तारीख/समय /Bid End Date/Time	18-11-2025 11:00:00
बिड खुलने की तारीख/समय /Bid Opening Date/Time	18-11-2025 11:30:00
बिड पेशकश वैधता (बंद होने की तारीख से)/Bid Offer Validity (From End Date)	120 (Days)
मंत्रालय/राज्य का नाम/Ministry/State Name	Ministry Of Coal
विभाग का नाम/Department Name	Coal India Limited
संगठन का नाम/Organisation Name	Bharat Coking Coal Limited
कार्यालय का नाम/Office Name	Bccl Dhanbad Jharkhand
कुल मात्रा/Total Quantity	6
वस्तु श्रेणी /Item Category	CAAQMS (including PM10 Analyzer) , CAAQMS (without PM10 Analyzer)
GeMARPTS में खोजी गई स्ट्रिंग्स / Searched Strings used in GeMARPTS	CAAQMS (without PM10 Analyzer)
GeMARPTS में खोजा गया परिणाम / Searched Result generated in GeMARPTS	Online UPS (V2), Spectrum Analyzers and Vector Network Analyzers, Sterile Hypodermic Syringe (V3), Automatic Milk Collection Unit with Electronic Milk Analyzer and Adulteration testing, Prefab Shelters With PUF Panel of Size 7.620 M X 10.661 (As Per GeM Drawing), Solid Cushion Tyres (V3), Metal Oxide Surge Arresters Without Gaps For A.C. Systems (V2) Conforming to IS 15086 (Part 4), Prefab Hut / House of Size 6.10 M X 7.32 M (as per GeM Drawing), Prefab Hut / House of Size 6.10 M x 19.52 M (as per GeM Drawing)
अधिसूचना के लिए चयनित प्रासंगिक श्रेणियाँ / Relevant Categories selected for notification	• Continuous Ambient Air Quality Monitoring System (CAAQMS)
टर्नओवर के लिए एमएसई को छूट प्राप्त है / MSE Exemption for Turnover	Yes | Complete
टर्नओवर के लिए स्टार्टअप को छूट प्राप्त है / Startup Exemption for Turnover	Yes | Complete

बिड विवरण/Bid Details	
विक्रेता से मांगे गए दस्तावेज़/Document required from seller	Certificate (Requested in ATC),OEM Authorization Certificate,Additional Doc 1 (Requested in ATC),Additional Doc 2 (Requested in ATC),Additional Doc 3 (Requested in ATC),Additional Doc 4 (Requested in ATC) *In case any bidder is seeking exemption from Experience / Turnover Criteria, the supporting documents to prove his eligibility for exemption must be uploaded for evaluation by the buyer
क्या आप निविदाकारों द्वारा अपलोड किए गए दस्तावेज़ों को निविदा में भाग लेने वाले सभी निविदाकारों को दिखाना चाहते हैं? संदर्भ मेनू है/Do you want to show documents uploaded by bidders to all bidders participated in bid?	Yes (Documents submitted as part of a clarification or representation during the tender/bid process will also be displayed to other participated bidders after log in)
बिड लगाने की समय सीमा स्वतः नहीं बढ़ाने के लिए आवश्यक बिड की संख्या। / Minimum number of bids required to disable automatic bid extension	3
दिनों की संख्या, जिनके लिए बिड लगाने की समय-सीमा बढ़ाई जाएगी। / Number of days for which Bid would be auto-extended	7
ऑटो एक्सटेंशन अधिकतम कितनी बार किया जाना है। / Number of Auto Extension count	1
बिड से रिवर्स नीलामी सक्रिय किया/Bid to RA enabled	Yes
रिवर्स नीलामी योग्यता नियम/RA Qualification Rule	H1-Highest Priced Bid Elimination
व्यापक रखरखाव शुल्क आवश्यक / Comprehensive Maintenance Charges Required	Yes
बिड का प्रकार/Type of Bid	Two Packet Bid
प्राथमिक उत्पाद श्रेणी/Primary product category	CAAQMS (including PM10 Analyzer)
तकनीकी मूल्यांकन के दौरान तकनीकी स्पष्टीकरण हेतु अनुमत समय /Time allowed for Technical Clarifications during technical evaluation	7 Days
निरीक्षण आवश्यक (सूचीबद्ध निरीक्षण प्राधिकरण /जेम के साथ पूर्व पंजीकृत एजेंसियों द्वारा)/Inspection Required (By Empanelled Inspection Authority / Agencies pre-registered with GeM)	No
अनुमानित बिड मूल्य /Estimated Bid Value	51565090.89
Payment Timelines	Payments shall be made to the Seller within **21** days of issue of consignee receipt-cum-acceptance certificate (CRAC) and on-line submission of bills (This is in supersession of 10 days time as provided in clause 12 of GeM GTC)
मूल्यांकन पद्धति/Evaluation Method	Item wise evaluation/
मध्यस्थता खंड/Arbitration Clause	No
सुलह खंड/Mediation Clause	No

ईएमडी विवरण/EMD Detail

एडवाईजरी बैंक/Advisory Bank	State Bank of India
Schedule 1 ईएमडी राशि/EMD Amount (In INR)	555000
Schedule 2 ईएमडी राशि/EMD Amount (In INR)	476000

ईपीबीजी विवरण /ePBG Detail

एडवाइजरी बैंक/Advisory Bank	State Bank of India
ईपीबीजी प्रतिशत (%)/ePBG Percentage(%)	5.00
ईपीबीजी की आवश्यक अवधि (माह) /Duration of ePBG required (Months).	8

(a). जेम की शर्तों के अनुसार ईएमडी छूट के इच्छुक बिडर को संबंधित केटेगरी के लिए बिड के साथ वैध समर्थित दस्तावेज़ प्रस्तुत करने है। एमएसई केटेगरी के अंतर्गत केवल वस्तुओं के लिए विनिर्माता तथा सेवाओं के लिए सेवा प्रदाता ईएमडी से छूट के पात्र हैं। व्यापारियों को इस नीति के दायरे से बाहर रखा गया है।/EMD EXEMPTION: The bidder seeking EMD exemption, must submit the valid supporting document for the relevant category as per GeM GTC with the bid. Under MSE category, only manufacturers for goods and Service Providers for Services are eligible for exemption from EMD. Traders are excluded from the purview of this Policy.

(b). The EMD Amount will be applicable for each schedule/group selected during Bid creation.

(c).ईएमडी और संपादन जमानत राशि, जहां यह लागू होती है, लाभार्थी के पक्ष में होनी चाहिए। / EMD & Performance securityshould be in favour of Beneficiary, wherever it is applicable.

लाभार्थी /Beneficiary :

Public Sector Undertaking
BCCL Dhanbad Jharkhand, COAL INDIA LIMITED, Bharat Coking Coal Limited, Ministry of Coal, Dhanbad - 826005. (Bharat Coking Coal Limited)

बोली विभाजन लागू नहीं किया गया/ Bid splitting not applied.

एमआईआई खरीद वरीयता / MII Purchase Preference

एमआईआई खरीद वरीयता / MII Purchase Preference	Yes
मेक इन इंडिया विक्रेताओं को खरीद में प्राथमिकता, यदि उनका मूल्य L1+X% तक की सीमा में है / Purchase Preference to MII sellers availabele upto price within L1+X%	20
मेक इन इंडिया खरीद में प्राथमिकता के लिए बिड की मात्रा का अधिकतम प्रतिशत / Maximum Percentage of Bid quantity for MII purchase preference	50

सार्वजनिक खरीद (मेक-इन-इंडिया को प्राथमिकता) आदेश 2017 के अनुसार केवल क्लास 1/क्लास 2 के स्थानीय आपूर्तिकर्ताओं को ही भागीदारी की अनुमति है दिनांक 16.09.2020 (समय-समय पर संशोधित एवं लागू) / Allow participation only from Class 1/Class 2 local suppliers as per the Public procurement(Preference to Make-in-india) order 2017 date 16.09.2020(as amended and applicable time to time)	Yes, in compliance with the MII ORDER : DPIIT Order(as amended and applicable time to time)

एमएसई खरीद वरीयता/MSE Purchase Preference

एमएसई खरीद वरीयता/MSE Purchase Preference	Yes
सूक्ष्म और लघु उद्यम मूल उपकरण निर्माताओं को खरीद में प्राथमिकता, यदि उनका मूल्य L1+X% तक की सीमा में हो / Purchase Preference to MSE OEMs available upto price within L1+X%	15
सूक्ष्म और लघु उद्यम को खरीद में प्राथमिकता के लिए बिड की मात्रा का अधिकतम प्रतिशत / Maximum Percentage of Bid quantity for MSE purchase preference	25

1. If the bidder is a Micro or Small Enterprise (MSE) as per latest orders issued by Ministry of MSME, the bidder shall be exempted from the eligibility criteria of "Bidder Turnover" as defined above subject to meeting of quality and technical specifications. If the bidder itself is MSE OEM of the offered products, it would be exempted from the "OEM Average Turnover" criteria also subject to meeting of quality and technical specifications. The bidder seeking exemption from Turnover, shall upload the supporting documents to prove his eligibility for exemption.
2. If the bidder is a DPIIT registered Startup, the bidder shall be exempted from the the eligibility criteria of "Bidder Turnover" as defined above subject to their meeting of quality and technical specifications. If the bidder is DPIIT Registered OEM of the offered products, it would be exempted from the "OEM Average Turnover" criteria also subject to meeting of quality and technical specifications. The bidder seeking exemption from Turnover shall upload the supporting documents to prove his eligibility for exemption.
3. Preference to Make In India products (For bids < 200 Crore):Preference shall be given to Class 1 local supplier as defined in public procurement (Preference to Make in India), Order 2017 as amended from time to time and its subsequent Orders/Notifications issued by concerned Nodal Ministry for specific Goods/Products. The minimum local content to qualify as a Class 1 local supplier is denoted in the bid document. If the bidder wants to avail the Purchase preference, the bidder must upload a certificate from the OEM regarding the percentage of the local content and the details of locations at which the local value addition is made along with their bid, failing which no purchase preference shall be granted. In case the bid value is more than Rs 10 Crore, the declaration relating to percentage of local content shall be certified by the statutory auditor or cost auditor, if the OEM is a company and by a practicing cost accountant or a chartered accountant for OEMs other than companies as per the Public Procurement (preference to Make-in -India) order 2017 dated 04.06.2020. Only Class-I and Class-II Local suppliers as per MII order dated 4.6.2020 will be eligible to bid. Non - Local suppliers as per MII order dated 04.06.2020 are not eligible to participate. However, eligible micro and small enterprises will be allowed to participate .The buyers are advised to refer the OM No.F.1/4/2021-PPD dated 18.05.2023.
OM_No.1_4_2021_PPD_dated_18.05.2023 for compliance of Concurrent application of Public Procurement Policy for Micro and Small Enterprises Order, 2012 and Public Procurement (Preference to Make in India) Order, 2017.

4. Purchase preference will be given to MSEs having valid Udyam Registration and whose credentials are validated online through Udyam Registration portal as defined in Public Procurement Policy for Micro and Small Enterprises (MSEs) Order, 2012 dated 23.03.2012 issued by Ministry of Micro, Small and Medium Enterprises and its subsequent Orders/Notifications issued by concerned Ministry. If the bidder wants to avail themselves of the Purchase preference, the bidder must be the manufacturer / OEM of the offered product on GeM. Traders are excluded from the purview of Public Procurement Policy for Micro and Small Enterprises and hence resellers offering products manufactured by some other OEM are not eligible for any purchase preference. In respect of bid

for Services, the bidder must be the Service provider of the offered Service. Relevant documentary evidence in this regard shall be uploaded along with the bid in respect of the offered product or service and Buyer will decide eligibility for purchase preference based on documentary evidence submitted, while evaluating the bid. If L-1 is not an MSE and MSE Seller (s) has / have quoted price within L-1+ 15% (Selected by Buyer) of margin of purchase preference /price band defined in relevant policy, such MSE Seller shall be given opportunity to match L-1 price and contract will be awarded for 25% (selected by Buyer) percentage of total quantity. The buyers are advised to refer the OM No. F.1/4/2021-PPD dated 18.05.2023 OM_No.1_4_2021_PPD_dated_18.05.2023 for compliance of Concurrent application of Public Procurement Policy for Micro and Small Enterprises Order, 2012 and Public Procurement (Preference to Make in India) Order, 2017. Benefits of MSE will be allowed only if seller is validated on-line in GeM profile as well as validated and approved by Buyer after evaluation of documents submitted.
5. Estimated Bid Value indicated above is being declared solely for the purpose of guidance on EMD amount and for determining the Eligibility Criteria related to Turn Over, Past Performance and Project / Past Experience etc. This has no relevance or bearing on the price to be quoted by the bidders and is also not going to have any impact on bid participation. Also this is not going to be used as a criteria in determining reasonableness of quoted prices which would be determined by the buyer based on its own assessment of reasonableness and based on competitive prices received in Bid / RA process.

6. Reverse Auction would be conducted amongst all the technically qualified bidders except the Highest quoting bidder. The technically qualified Highest Quoting bidder will not be allowed to participate in RA. However, H-1 will also be allowed to participate in RA in following cases:

i. If number of technically qualified bidders are only 2 or 3.
ii. If Buyer has chosen to split the bid amongst N sellers, and H1 bid is coming within N.
iii. In case Primary product of only one OEM is left in contention for participation in RA on elimination of H-1.
iv. If L-1 is non-MSE and H-1 is eligible MSE and H-1 price is coming within price band of 15% of Non-MSE L-1
v. If L-1 is non-MII and H-1 is eligible MII and H-1 price is coming within price band of 20% of Non-MII L-1

मूल्यांकन विधि(मदवार मूल्यांकन विधि) / Evaluation Method (Item Wise Evaluation Method)

Contract will be awarded schedulewise and the determination of L1 will be done separately for each schedule. The details of item-consignee combination covered under each schedule are as under:

मूल्यांकन अनुसूचियां / **Evaluation Schedules**	अनुमानित मूल्य / **Estimated Value**	वस्तु/श्रेणी / **Item/Category**	मात्रा / **Quantity**
Schedule 1	27768150	Caaqms (including Pm10 Analyzer)	3
Schedule 2	23796940.89	Caaqms (without Pm10 Analyzer)	3

CAAQMS (including PM10 Analyzer) (3 set)

(क्रमशः श्रेणी 1 और श्रेणी 2 के स्थानीय आपूर्तिकर्ता के रूप में अर्हता प्राप्त करने के लिए आवश्यक/Minimum 50% and 20% Local Content required for qualifying as Class 1 and Class 2 Local Supplier respectively)

तकनीकी विशिष्टियाँ /Technical Specifications

क्रेता विशिष्टि दस्तावेज़ /Buyer Specification Document	Download

व्यापक रखरखाव / Comprehensive Maintenance	
Warranty of required product	3 Year
Comprehensive Maintenance Duration (Post Warranty)	5 Year

*Warranty displayed under the AMC/CMC Details section will supersede the warranty displayed under the catalog specfication

परेषिती/रिपोर्टिंग अधिकारी तथा मात्रा/Consignees/Reporting Officer and Quantity

क्र.सं./S.No.	परेषिती/रिपोर्टिंग अधिकारी /Consignee Reporting/Officer	पता/Address	मात्रा /Quantity	डिलीवरी के दिन/Delivery Days
1	Girish Kumar Prasad	828101,Depot Officer, Central Store, Ekra, BCCL, Post Office-BANSJORA, Dhanbad, Jharkhand-828101.	1	180
2	Shiv Prasad Rabidas	828202,Depot Officer, Regional Store, Laikdih, Post Chirkunda	1	180
3	Rajnish Ranjan Shukla	828113,Office of Depot Officer ,Regional Store, Katras Area, Katras Garh, Post Office-Angarpathra, DHANBAD, JHARKHAND- 828113	1	180

CAAQMS (without PM10 Analyzer) (3 set)

(क्रमशः श्रेणी 1 और श्रेणी 2 के स्थानीय आपूर्तिकर्ता के रूप में अर्हता प्राप्त करने के लिए आवश्यक/Minimum 50% and 20% Local Content required for qualifying as Class 1 and Class 2 Local Supplier respectively)

तकनीकी विशिष्टियाँ /Technical Specifications

क्रेता विशिष्टि दस्तावेज़ /Buyer Specification Document	Download

व्यापक रखरखाव / Comprehensive Maintenance	
Warranty of required product	3 Year
Comprehensive Maintenance Duration (Post Warranty)	5 Year

*Warranty displayed under the AMC/CMC Details section will supersede the warranty displayed under the catalog specfication

परेषिती/रिपोर्टिंग अधिकारी तथा मात्रा/Consignees/Reporting Officer and Quantity

क्र.सं./S.No.	परेषिती/रिपोर्टिंग अधिकारी /Consignee Reporting/Officer	पता/Address	मात्रा /Quantity	डिलीवरी के दिन/Delivery Days
1	Shiv Prasad Rabidas	828202,Depot Officer, Regional Store, Laikdih, Post Chirkunda	1	180
2	Vishal Dwivedi	828302,Regional Store, Bhowra, EJ Area, BCCL, Post. - Bhowra, Dist. - Dhanbad.	1	180
3	Rohit Kumar Sinha	828129,Office of General Manager, Western Jharia Area of BCCL, Moonidih Rd, Putkee, Jharkhand 828129	1	180

क्रेता द्वारा जोड़ी गई बिड की विशेष शर्तें/Buyer Added Bid Specific Terms and Conditions

1. **Scope of Supply**

   Scope of supply (Bid price to include all cost components) : Supply Installation Testing Commissioning of Goods and Training of operators and providing Statutory Clearances required (if any)

2. **Generic**

   Buyer Organization specific Integrity Pact shall have to be complied by all bidders. Bidders shall have to upload scanned copy of signed integrity pact as per Buyer organizations policy along with bid. Click here to view the file

3. **Certificates**

   The bidder is required to upload, along with the bid, all relevant certificates such as BIS licence, type test certificate, approval certificates and other certificates as prescribed in the Product Specification given in the bid document.

4. **Service & Support**

   Dedicated /toll Free Telephone No. for Service Support : BIDDER/OEM must have Dedicated/toll Free Telephone No. for Service Support.

5. **Forms of EMD and PBG**

   Bidders can also submit the EMD with Account Payee Demand Draft in favour of

   BHARAT COKING COAL LTD.
   payable at
   Dhanbad
   .
   Bidder has to upload scanned copy / proof of the DD along with bid and has to ensure delivery of hardcopy to the Buyer within 5 days of Bid End date / Bid Opening date.

6. **Forms of EMD and PBG**

   Bidders can also submit the EMD with Payment online through RTGS / internet banking in Beneficiary name

   Bharat Coking Coal Limited
   Account No.
   10976596836

IFSC Code
SBIN0000066
Bank Name
State Bank of India
Branch address
Bank More, Dhanbad
.
Bidder to indicate bid number and name of bidding entity in the transaction details field at the time of on-line transfer. Bidder has to upload scanned copy / proof of the Online Payment Transfer along with bid.

7. **Buyer Added Bid Specific ATC**

Buyer Added text based ATC clauses

A. Delivery

Delivery period 180 days includes Supply Installation Testing Commissioning of Goods and Training of operators and providing Statutory Clearances required (if any).

B. Optional Site Visit

Bidder may be visit the site as per their requirement before quoting the tender. Bidder is requested to contact on mail gmenv.bccl@coalindia.in.

C. Integrity Pact:-

The bidders will have to upload along with their offer, digitally signed Pre-Contract Integrity Pact as per attached format in Bid.

In terms of the Integrity Pact, the Independent External Monitor(s) (IEMs) nominated for this tender are as follows,

Sl	Name of IEM	Address	e-Mail ID
1	Shri Arvind Kumar Kadyan, IDAS(Retd.),	Add: B-2l1, Paschim Vihar, New Delhi – 110063.	arvindkadyan17@gmail.com
2	Shri Amrit Lugun, IFS(Retd.),	A2/122, Ground floor, Safdarjung enclave, New Delhi-110029.	a.lugan@ymail.com

In the event of any dispute between the management and the bidder relating to this Bid/thereafter contracts (where Integrity Pact is applicable), in case, both the parties are agreeable, they may try to settle dispute through mediation before the panel of IEMs in a time bound manner. If required, the organizations may adopt any mediation rules for this purpose. The fees/expenses on dispute resolution shall be equally shared by both the parties.

D. Security Deposit – ePBG mentioned in Bid document will work as Security Deposit.

a. The successful tenderers will have to submit Security Deposit for the 5% value of the total landed valu

e of the contract including all taxes, duties and other costs and charges. In case of Rate / Running Contra cts the Security Deposit shallbe for an amount of 5% of average annual offtake contractual value; and in case RC period is longer than 1 year, SD amount shall be 5% of average annual offtake. In case of Contr acts for procurement of Capital Goods along with WarrantySpares & Consumables (if applicable) and ad ditional Spares & Consumables / AMC / CMC for more than one year, the Security Deposit shall be for 5% of equipment landed value along with maximum annual landed value of Spares & Consumables.

b. The Security Deposit shall be deposited through RTGS / NEFT / IMPS /e-BG/ other digital modes or in t he form of a Bank Guarantee in the prescribed format from a RBI Scheduled Bank in purchaser's country (on a non-judicial stamp paper) within 15 days from date of notification of award or placement of order.

c. The Security Deposit shall be in the same currency(ies) in which contract is to be signed/ issued. In ca se of multi-currency contract, separate Security Deposit Bank Guarantee (SDBG) in respective currency for required value as above shall be submitted.

d. In case of equipment, SDBG shall not be individual equipment wise. However, multiple Bank Guarante es for Security Deposit shall be permissible provided value of all the SDBGs totals to 5% of the contract value, and all are submitted simultaneously within the specified time schedule and all of them are in the same prescribed format of SDBG without linking to any particular equipment.

e. The SDBG shall remain valid up to 2 months after completion of supplies and acceptance of materials by the consignee in case of supply contracts and in case of contracts for equipment involving installation and commissioning, 2 months after the supply and commissioning of all the equipment covered in the co ntract.

f. If the successful tenderer fails to deposit the security deposit within 15 (fifteen) days from date of notif ication of award/ placement of order, another opportunity may be given to them for submission of Securi ty Deposit within next 15days. If the successful tenderer still fails to deposit the security deposit within t he extended period but executes the supplies within scheduled delivery period, the submission of Securi ty Deposit may be waived, as the purpose of submission of SD is fulfilled.

g. In cases where the successful tenderer did not submit the security deposit even within the extended p eriod for SD submission but has supplied the materials either in full or in part after the extended period f or SD submission, a penalty equivalent to 0.5% (half percent) of SD amount for delay of each week or pa rt thereof (period of delay is to be calculated from the 31st day from the date of notification of award/pla cement of order to the date of receipt of full SD) shall be levied subject to a maximum of 5% of the contr act value.

h. Security Deposit will be released with the approval of HOD of MM Department / Area GM within 30 day s after completion of supplies and acceptance of material by the consignee in case of supply contract or after successful commissioning and on receipt of confirmation of Performance Bank Guarantee(s) for all the equipment covered in the contract in case of contracts for equipment and all those items/ goods inv olving installation and commissioning and PBG.

i. All Central/State Government Organization/PSUs shall be exempted from submission of Security Depos it. OEM/OES shall also be exempted from submission of Security Deposit in case of procurement of Spar e Parts for equipment against Single Tender Enquiry/Open/Limited Tenders.

f. The SDBG will be submitted Through Structured Financial Management System (SFMS).

E. Performance Bank Guarantee (PBG)

Apart from 5 % e-PBG as per GeM format (which is towards security Deposit), t he successful bidder shall be required to furnish a performance bank Guarante e as per following,

i. The successful tenderer shall be required to furnish a Performance Guara ntee equivalent to 10% value of the contract to cover the warranty/guaran tee period.
ii. The Performance Guarantee shall be in the form of a Bank Guarantee iss ued by a RBI scheduled bank in India as per given format attached in buye r added bid specific ATC document on a non-judicial stamp paper.
iii. The Performance Bank Guarantee (PBG) shall be in the same currency (ie s) in which contract has been signed/created. In case of multi-currency co ntract, separate PBG in respective currency for required value shall be sub mitted.
iv. The PBG (s) shall remain valid till 3 months after the completion of warra nty period of all the equipment/ items covered in the contract. The PBG is

of total 39 months duration from the date of successful installation, commissioning etc. as per GeM contract terms in present case.

v. The PBG shall be submitted, sufficiently in advance (say 3-4 weeks) to enable its verification before submission of the invoice for payment of the supplied material(s).

vi. The PBG issued by Issuing bank on behalf of the bidder in favour of “Bharat Coking Coal Limited” shall be in paper form (Stamp Paper) as well as issued under “Structured Financial Messaging System”. The details of beneficiary Bank for issue of BG through SFMS Platform shall be as under,
Issuing Bank should send the underlying confirmation to either of following banks:

Name of beneficiary & its details	Name	Bharat Coking Coal Limited
	Area	HQ,BCCL
	Bank Account no.	35160317947
	Deptt.	MM Department
Beneficiary Bank, Branch & Address	State Bank of India	
	Main Branch Dhanbad	
IFSC code	SBIN0000066	

Or

Name of beneficiary & its details	Name	Bharat Coking Coal Limited
	Area	HQ,BCCL
	Bank Account no.	019605001057
	Deptt.	MM Department
Beneficiary Bank, Branch & Address	ICICI Bank	
	ICICI Bank, Dhanbad	
IFSC code	ICIC0000196	

vii. Original copy of the Bank Guarantee issued by the Issuing Bank shall be sent by the issuing bank to MM department, BCCL.

viii. The release of the Performance Bank guarantee(s) after above indicated period, shall be subject to satisfactory performance of the equipment/items during the warranty period and fulfilment of contractual obligations failing which, action for further extension or encashment of PBG, as deemed suitable shall be taken. The Performance Bank Guarantee shall be released after expiry of validity period if no claim is pending, with the approval of the concerned HOD (MM) after expiry of validity period after obtaining the following:

1. ‘No Claim Certificate’ from the concerned HOD (User Dept.) indicating that there is no claim pending.
2. ‘No Claim Certificate’ from the contractor indicating that there is no claim pending and that there is no dispute pending as per attached annexure in buyer added bid specific ATC document.

ix. After completion of warranty period successful tenderer needs to submit ‘No Claim Certificate’ indicating that there is no claim pending and that there is no dispute pending as per attached annexure in buyer added bid specific ATC document.

x. In cases where the supplier does not submit the PBG in time or as per the prescribed format in line with the contract stipulations, the PBG amount may be deducted from the first bill or in case of insufficient amount, from subsequent bill(s) of the supplier till the full PBG amount is deducted. This amount shall be refunded to the supplier upon acceptance of PBG submitted by them.

F. DOCUMENTS TO BE SUBMITTED BY BIDDERS WHO HAVE SUBMITTED EMD IN FORM OF DD/RTGS / INTERNET BANKING

Bidders submitting EMD in the form of DD/RTGS / internet banking shall also submit the following documents along with their bid for Vendor Code Creation t o return the EMD amount post finalization of tender:

a. Copy of PAN Card.

b. Copy of GSTIN.

c. Copy of Cancelled Cheque.

d. Copy of EFT Mandate duly certified by Bank.

G. TReDS: Trade Receivables Discounting System (TReDS) is an initiative of Re serve bank of India (RBI) to facilitate MSME receivable payments from corporate s.

BCCL has on boarded on following four TReDS platforms

i. Receivables Exchange of India Limited (RXIL), websitewww.rxil.in
ii. A-treds Ltd (Invoicemart) , website- www.invoicemart.com11 / 14
iii. Mynd Solutions Pvt.Ltd. (M1 exchange) , website- www.m1exchange.co m
iv. C2FO Factoring Solutions Private Limited, website – www.c2treds.com

MSE bidders willing to get payment through this system may get registered on TReDS platform and confirm the respective member code of TReDS Portals in th eir offer. The bidder may contact respective portals for any queries /details.

H. The details of shipping documents to be furnished by the Supplier a re specified below:

Upon dispatch of the Goods to the consignee, the Supplier shall notify the Purch aser and Ultimate Consignee,

i. Supplier's invoice showing Contract Number, Goods description, quantity, unit price, total amount;

ii. Railway receipt/ Transporter’s consignment note /acknowledgement of receip t of Goods from the consignee(s);

iii. Manufacturer's/Supplier's warranty / guarantee certificate;

iv. Manufacturer’s Test & Inspection certificate (if any)

The above documents shall be provided by the supplier at the time of arrival of the Goods at the consignee’s end. In case of delay, the Supplier will be responsi ble for any consequent expenses.

I. Payment terms:

i. 100% payment including erection & commissioning charges shall be made aft er successful completion of erection, testing, commissioning and final acceptan ce of the equipment (along with the accessories) upon presentation of successf

ul commissioning certificate, signed by Staff Officer of the technical department of the area / Area General Manager of concerned area, to the effect that the equ ipment has been erected and commissioned to their entire satisfaction and perf ormance testing at the allocated location.

ii. For CAMC charges : 100% value of Quarterly CAMC charges shall be paid on q uarterly basis within 21 days of submission & acceptance of the bills as per clau se no. 13 of CAMC terms and Conditions of tech specs, after Completion of each quarter for the whole CAMC contract period of 5 years.

Paying authority : HOD(Pay), BCCL HQ, Dhanbad.

J. PBG for CAMC

Performance Bank Guarantee applicable for CAMC is to be submitted at the star t of the CAMC and shall be applicable at a rate of 5 % of the order value of equip ment only (landed cost of items ordered inclusive GST) which shall be given by supplier after completion of warranty period. The PBG submitted after award of contract shall be released only after new PBG for the CAMC period is submitted and accepted by buyer/consignee after due verification. Bank guarantee for CA MC is to remain valid till completion of CAMC period plus 3 months. The bank gu arantee for CAMC shall be submitted to buyer directly. In case, seller fails to sub mit the PBG or does not provide services for the CAMC contract after expiry of w arranty period then PBG of equipment shall be forfeited.

K. Clarification of Bids/ Shortfall/ Confirmatory Documents: After evaluation of t he uploaded documents, shortfall documents, if required, shall be sought from t he bidder. For this purpose, maximum 1 chance shall be given. The time period for the clarification will be 7x24hrs given to the bidders to upload these clarifica tions / shortfall documents. The bidder will upload the requested documents wit hin the specified period and no additional time will be allowed in this regard for on-line submission of documents after the maximum 1 chance, of 7x24 hours d uration. If the bidder does not comply or respond by the specified date & time, h is tender will be liable to be rejected. The shortfall information/documents shall be sought only in case of historical documents as per GeM provision/rules.

L. No new documents (except the documents submitted during the bid and in s hortfall window) submitted during the 48-hour challenge/representation period will be accepted.

M. Certificate of Local Content as per Public Procurement (Preference to Make in India) Order, 2017 (as amended from time to time) for tender value less than 10 Cr.

Ref. No: ..... Date: .....

Tender No.: ..... dated .....

We, M/s ....., having registered office at ....., being OEM of the offered product/servi ces do hereby confirm that the percentage of local content in the offered product / service is _____ % and meets the local content requirement for 'Class – I local supplier/ Class – II local supplier' (Strike off which is not applicable) as prescribed under Public Procurement (Preference to Make in India) Order, 2017 (as ame nded from time to time).

The complete address of the location(s) at which the local value addition is made, is / are as under:

1.

2.

(Signature of the authorised signatory)

Name:

Designation:

Email id:

Mobile No:

Place:

Date:

Note: Percentage of local content is to be mentioned as per the formula given in Annexure 28 (page no 285) of Manual for Procurement of Goods, Second Edition, 2024 issued by Department of Expenditure, MoF, GoI. (https://doe.gov.in/circulars/manual-procurement goods-second-edition-2024).

N. Primary Product Category:

Item Schedule no. 1: Caaqms (including Pm10 Analyzer)

Item Schedule no. 2: Caaqms (without Pm10 Analyzer)

Annexure-C

(Bidder Details)

Sl	Details required	Bidder Details
1	Offer no. and Date	
2	Name of the Tenderer	
3	Address of the Tenderer	
4	Phone no. of office	
5	Fax No of office	
6	E-mail id of office	
7	Contact person name & designation	
8	Contact person Mobile no.	
9	Contact person e-mail id	
10	If the tenderer is a Dealer	

11	Name of manufacturer (If the tenderer is not Manufacture)	
12	Address of the manufacturer	
13	Phone /fax/email id of manufacturer	
14	Nature of company (Govt/PSU/Pvt Ltd /Public Ltd/Other (please specify)	
15	Ownership (Proprietorship/partnership/other)	
16	Name of the Chief Executive of tenderer / Proprietor	
17	Email id of the Chief Executive of Tenderer / Proprietor	
18	Supply address (from which place and state the materials will be supplied) to be mentioned for equipment items .	
19	Billing address from where billing to be done for tender items.	
20	Type of local supplier (Class-I/Class-II)	
21	% of Local Content for each schedule as a whole as per auditor' certificate	
22	Place of value addition for each schedule as per auditor' certificate	

This annexure is to be filled by all bidders & to be uploaded in pdf form at in offer documents.

.

8. **Buyer Added Bid Specific ATC**

Buyer uploaded ATC document Click here to view the file.

अस्वीकरण/Disclaimer

The additional terms and conditions have been incorporated by the Buyer after approval of the Competent Authority in Buyer Organization, whereby Buyer organization is solely responsible for the impact of these clauses on the bidding process, its outcome, and consequences thereof including any eccentricity / restriction arising in the bidding process due to these ATCs and due to modification of technical specifications and / or terms and conditions governing the bid. If any clause(s) is / are incorporated by the Buyer regarding following, the bid and resultant contracts shall be treated as null and void and such bids may be cancelled by GeM at any stage of

bidding process without any notice:-

1. Definition of Class I and Class II suppliers in the bid not in line with the extant Order / Office Memorandum issued by DPIIT in this regard.
2. Seeking EMD submission from bidder(s), including via Additional Terms & Conditions, in contravention to exemption provided to such sellers under GeM GTC.
3. Publishing Custom / BOQ bids for items for which regular GeM categories are available without any Category item bunched with it.
4. Creating BoQ bid for single item.
5. Mentioning specific Brand or Make or Model or Manufacturer or Dealer name.
6. Mandating submission of documents in physical form as a pre-requisite to qualify bidders.
7. Floating / creation of work contracts as Custom Bids in Services.
8. Seeking sample with bid or approval of samples during bid evaluation process. (However, in bids for attached categories, trials are allowed as per approved procurement policy of the buyer nodal Ministries)
9. Mandating foreign / international certifications even in case of existence of Indian Standards without specifying equivalent Indian Certification / standards.
10. Seeking experience from specific organization / department / institute only or from foreign / export experience.
11. Creating bid for items from irrelevant categories.
12. Incorporating any clause against the MSME policy and Preference to Make in India Policy.
13. Reference of conditions published on any external site or reference to external documents/clauses.
14. Asking for any Tender fee / Bid Participation fee / Auction fee in case of Bids / Forward Auction, as the case may be.
15. Buyer added ATC Clauses which are in contravention of clauses defined by buyer in system generated bid template as indicated above in the Bid Details section, EMD Detail, ePBG Detail and MII and MSE Purchase Preference sections of the bid, unless otherwise allowed by GeM GTC.
16. In a category based bid, adding additional items, through buyer added additional scope of work/ additional terms and conditions/or any other document. If buyer needs more items along with the main item, the same must be added through bunching category based items or by bunching custom catalogs or bunching a BoQ with the main category based item, the same must not be done through ATC or Scope of Work.

Further, if any seller has any objection/grievance against these additional clauses or otherwise on any aspect of this bid, they can raise their representation against the same by using the Representation window provided in the bid details field in Seller dashboard after logging in as a seller within 4 days of bid publication on GeM. Buyer is duty bound to reply to all such representations and would not be allowed to open bids if he fails to reply to such representations.

Additional Clause For Comprehensive Maintenance Charges

1.CMC shall include preventive maintenance including calibration as per technical/ service /operational manual of the manufacturer, service charges and spares, after satisfactory completion of Warranty. During the CMC period commencing from date of the successful completion of warranty period, Service personnel shall visit each consignee site as recommended in the manufacturer’s technical/ service /operational manual, at least once in six months or as per user requirement. Cost of consumables shall not be included in CMC.Further there will be 98% uptime warranty during CMC period on 24 (hrs) X 7 (days) X 365 (days) basis, with penalty, to extend CMC period by double the downtime period.
2.CMC charges to be indicated as percentage of cost of equipment quoted for each year after the warranty period.
3.GST shall be included in the CMC Charges quoted.
4.Cost of CMC will be added for Ranking/Evaluation purpose with depreciation formula.A 10% discounting rate per year shall be applied on CMC Charges for price evaluation on Net Present Value.
5.The payment of CMC will be made on quarterly basis after satisfactory completion of said period, duly certified by end user.
6.While creating a bid or RA, buyers shall indicate whether CMC is required against Yes/No” options. If CMC Charges are included, an option for number of years for CMC required after the warranty period shall be available.Under this option up to 10 years can be chosen for CMC charges beyond warranty period.
7.In case the bid has a provision for CMC, the warranty of the product will also be deemed to have been

converted into Comprehensive warranty including preventive maintenance and calibration as per technical/ service /operational manual of the manufacturer, service charges and spares, during the Warranty Period also. Sellers are therefore advised to include the cost of Comprehensive Warranty including spares (excluding consumables) also in product Cost.
8.The CMC functionality shall be available in bid only and no direct RA shall be applicable.In case of bid to R/A decrement rules shall be applicable on total price inclusive of CMC charges. Bunching of products shall not be available while creating bids with CMC charges.

8.1.Buyer shall indicate number of years of warranty by selecting different options available in the field depending on warranty parameter applicable in category parameters for the equipment. No. of years of warranty indicated here shall supersede the warranty period indicated elsewhere in bid or product specifications. The Seller while participating in Bid/RA will get fields to indicate CMC charges as percentage depending on number of years of CMC selected by Buyer. The following shall be applicable, if 5 year CMC selected:

CMC charges for 1st year after warranty period– Percentage to be indicated- A1
CMC charges for 2nd year after warranty period– Percentage to be indicated- A2
CMC charges for 3rd year after warranty period – Percentage to be indicated- A3
CMC charges for 4th year after warranty period – Percentage to be indicated- A4
CMC charges for 5th year after warranty period – Percentage to be indicated- A5

Similarly, A6 to A10 are to be indicated for 6th to 10th year of CMC if applicable.
8.2.The calculation of CMC Charges shall take into account the number of years of warranty and duration of CMC as specified while creating bid.
8.3.In the price evaluation, the system shall provide function to calculate the cost of each equipment by formula indicated below includingCMC and then show the inter-se-ranking of the bidders. The following are the variables

(i) Number of years for which CMC required.
(ii) Number of years of product warranty

The formula for calculating total cost including CMC charges shall be as under:
Total Cost for evaluation=
C+C*{(A1/100)/(1.10^n)+(A2/100)/(1.10^n+1)+(A3/100)/(1.10^n+2)+(A4/100)/(1.10^n+3)+ (A5/100)/(1.10^n+4)} and so on
C – Cost for equipment quoted and n shall be number of years of product warranty specified.
If 2 year warranty specified, n shall be2 and if 5 year warranty specified, n shall be 5. A1,A2, A3, A4& A5shall depend on how many years CMC selected. For3 yearCMC, only A1,A2 and A3 factors are to be taken into account and A4 and A5 will not be applicable.
8.4.CMC charges offered for each subsequent year should be same or higher than preceding year.
8.5.The CMC charges shall be offered within range of 3 to 25% of cost of equipment.

9.Since CMC charges are to be paid only later for each year during CMC period,applicable performance guarantee amount after placement of contract shall be based on the cost of equipment excluding the cost of CMC Charges.
10.Performance bank guarantee applicable for CMC is to be submitted at start of the CMC and shall be applicable between 2.5% to 10% as specified in bid on total CMC Charges.The PBG submitted after award of contract shall be released only after new PBG for the CMC period is submitted and accepted by buyer/consignee after due verification.Bank guarantee for CMC is to remain valid till completion of CMC period plus one year. The bank guarantee for CMC shall be submitted to buyer directly. In case, seller fails to submit the PBG or does not provide services for the CMC contract after expiry of warranty period then PBG of equipment shall be forfeited.
11.In case of splitting of order quantity, equipment cost and CMC charges offered by L1 bidder shall be matched by higher quoting eligible bidders on one-to-one basis.The equipment cost and CMC charges (year to year) shall be matched individually.
12.The CMC Contract shall be an offline contract to be handled by buyer.The payment of CMC will be made on quarterly basis after satisfactory completion of said period, duly certified by end user and scope of CMC will be as per para 1 above.
13.CMC Charges are inclusive of all the charges for Transportation, Lodging, Boarding, all insurances including third party insurance and all other incidental charges. The same shall include GST. The prices also include cost of spares and damaged parts. Purchaser does not have any liability, whatsoever, over and above the cost of CMC. It also includes for arranging hand tools & tackles, special tools etc. required to carry out the work.

All GeM Sellers / Service Providers are mandated to ensure compliance with all the applicable laws / acts / rules including but not limited to all Labour Laws such as The Minimum Wages Act, 1948, The Payment of Wages Act, 1936, The Payment of Bonus Act, 1965, The Equal Remuneration Act, 1976, The Payment of Gratuity Act, 1972 etc. Any non-compliance will be treated as breach of contract and Buyer may take suitable actions as per GeM Contract.

यह बिड सामान्य शर्तों के अंतर्गत भी शासित है /This Bid is also governed by the General Terms and Conditions

जेम की सामान्य शर्तों के खंड 26 के संदर्भ में भारत के साथ भूमि सीमा साझा करने वाले देश के बिडर से खरीद पर प्रतिबंध के संबंध में भारत के साथ भूमि सीमा साझा करने वाले देश का कोई भी बिडर इस निविदा में बिड देने के लिए तभी पात्र होगा जब वह बिड देने वाला सक्षम प्राधिकारी के पास पंजीकृत हो।बिड में भाग लेते समय बिडर को इसका अनुपालन करना होगा और कोई भी गलत घोषणा किए जाने व इसका अनुपालन न करने पर अनुबंध को तत्काल समाप्त करने और कानून के अनुसार आगे की कानूनी कार्रवाई का आधार होगा।/In terms of GeM GTC clause 26 regarding Restrictions on procurement from a bidder of a country which shares a land border with India, any bidder from a country which shares a land border with India will be eligible to bid in this tender only if the bidder is registered with the Competent Authority. While participating in bid, Bidder has to undertake compliance of this and any false declaration and non-compliance of this would be a ground for immediate termination of the contract and further legal action in accordance with the laws.

---धन्यवाद/Thank You---

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 – IV

(FOR THE Q.E. JUNE, 2025)

E. C. no. J-11015/372/2010-IA.II (M) dated 23.10.2019

CMPDI
ISO 9001 Company
Regional Institute-II
Dhanbad, Jharkhand

CLUSTER - IV

(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 sump water, Ground water supply, well/ Hand pump water & 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. The Ground and Surface water samples were collected and analyzed for 25 and 17 parameters respectively, on quarterly basis. Thereafter the samples were preserved and analyzed at the Environmental Laboratory at CMPDI, RI-II, Dhanbad.

4.0 Results and interpretations

4.1 Water quality

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

CHAPTER - I

INTRODUCTION

1.0 Any industry and development activities including coal mining is bound to affect environmental attributes. There are positive as well as negative impacts of such operations. For controlling the adverse impacts a regular monitoring is essential. The environmental monitoring is being done as per the 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 MoEFCC 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.

The Cluster IV is in the Northern part of the Jharia coalfield.It includes Salanpur OCP, Katras Choitodih OC, Amalgamated Keshalpur – West Mudidih OCP & UG Mines, Amalgamated Ramkanali – Angarpathra OCP & UG mines, Gaslitand OC. The cluster–IV is situated about 25 - 30kms from Dhanbad Railway Station. The mines of this cluster-IV 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 KatriRiver and Kuaprili Jore.

The Project has Environmental Clearance from Ministry of Environment, Forest and Climate Change (MoEF&CC) for a rated capacity of 7.34Mtpa (normative) and 9.55 Mtpa peak capacity of coal production vide letter no. J-11015/372/2013-IA.II (M) dated 23rd October, 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 – III

WATER QUALITY MONITORING

3.1 Location of sampling sites

(Refer **Plate No. - I**)

i) Ground water quality at **Kankanee Village (GW4)**

ii) Surface water quality at **U/S of Katri River (SW8)**

iii) Surface water quality**) U/S of Kumari Jore (SW9)**

iv) Surface water quality at **D/S of Kumari Jore (SW10)**

v) Surface water quality at at **D/S of Katri River (SW11)**

vi) Mine Water Quality at Katras Chotudih Colliery **(MW4)**

vii) Drinking Water at Katras Choitudih Filter Plant **(DW 18)**

viii) Drinking Water at AKWMC Filter Plant **(DW 19)**

ix) Drinking Water at AARC Filter Plant **(DW 20)**

x) Drinking Water at Gaslitand Filter Plant **(DW 21)**

3.2 Methodology of sampling and analysis

Water samples were collected as per standard practice. Effluent samples were analyzed for 25 parameters on quarterly 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.

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 parmeters are within the permissible limits.

TC-14321

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	**QUARTER ENDING JUNE 2025**	**Name of Cluster**	**IV**	**ULR No.**	**TC1432125000002053P**
Customer	**Environment Department, Bharat Coking Coal Limited (BCCL), Koyla Bhawan, Dhanbad (E-mail: gmenv.bccl@coalindia.in)**			**Date of Issue**	**16.09.2025**
Project	**Kankanee Village**	**Sample Ref. No.**	**REM/BCCL/25-26/GW**	**Sampling Method**	**CMPDI/RI-II/LPM 13,(IS 3025:Part -1)**
Sampling Stations	**Kankanee Village**	**Date of Sampling**	**05.05.25**	**Sample Collected in 5 Ltr Jerricane , Color as observed is transparent**	
		Period of Analysis	**05.05.25**	**TO**	**20.07.2025**

Sl. No.	**Parameter**	**Method of Analysis**	**Observed Values**			**IS 10500: 2012**	
			GW4 G0174	**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	94	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	0.62	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	80	6.0-700	6	30	100
7	Nitrate , mg/l	APHA, 24th edition, UV-Spectrophotometric Method	3.98	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	8.05	1-14	0.1	6.5-8.5	No relaxation
10	Sulphate, mg/l	APHA –24th edition, 4500 S , Turbidity Method	57	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	205	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	565	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

(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

GROUND WATER 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 IV**		
Customer	**Environment Department, Bharat Coking Coal Limited (BCCL), Koyla Bhawan, Dhanbad (E-mail: gmenv.bccl@coalindia.in)**			**Date of Issue**	**16.09.2025**
Project	**Kankanee Village**	**Sample Ref. No.**	**REM/BCCL/24-25/GW**	**Sampling Method**	**CMPDI/RI-II/LPM 13,(IS 3025:Part -1)**
Sampling Stations	**Kankanee Village**	**Date of Sampling**	**05.05.25**	**Sample Collected in 5 Ltr Jerricane , Color as observed is transparent**	
			Period of Analysis	**05.05.25**	**TO** **20.07.2025**

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, 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	<0.02	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

(Gaurav Kant)
REVIEWED BY

(Kumar Vaibhav)
Authorised Signatory

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

TC-14321

CENTRAL MINE PLANNING AND DESIGN INSTITUTE LIMITED

Environment Laboratory, Regional Institute-II

SURFACE WATER ANALYSIS TEST REPORT

Month & Year	QUARTE ENDI NG JUNE2025	**Name of Cluster**	III&IV	ULR No.	TC1432125000002074P TC1432125000002075P
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 in Katri River(SW8)		Date of Sampling	04.06.2025	Period of Analysis
	(ii) Upstream in Kumar Jore(SW9)		Date of Sampling	04.06.2025	04.06.25 TO 20.08.25

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	45	41	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	6.0	6.5	4	1.0-10.0	0.1
6	Fluoride, mg/l	APHA, 24th edition, SPADNS Method	0.66	0.52	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	<0.2	0.2	50	0.2-10	0.2
9	Nitrate , mg/l	APHA, 24th edition, UV-Spectrophotometric Method	8.32	7.71	50	0.5-45.0	0.5
10	pH value	IS 3025, (Part 11) : 1983 R-2023 Electrometric (Ph Meter) method	7.43	7.66	6.5-8.5	1.0-14.0	2
11	Sulphate, mg/l	APHA –24th edition,4500- S, Turbidity Method	38	46	400	10.0-400.0	10
12	Total Dissolved Solids, mg/l	IS 3025, (Part 16): 1984 R-2023 Gravimetric method	476	442	1500	25.0-10000.0	25
13	Zinc, mg/l	IS 3025(Part 49) : 1994, R : 2019, AAS-Flame Method	<0.1	<0.1	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*

(Kumar Vaibhav)

Analysed by *REVIEWED BY* *Authorised Signatory*

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

CENTRAL MINE PLANNING AND DESIGN INSTITUTE LIMITED

Environment Laboratory, Regional Institute-II

SURFACE WATER ANALYSIS TEST REPORT

Month & Year	QUARTE ENDI NG JUNE 2024	**Name of Cluster**	III&IV	**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	Sample Ref. No.		REM/BCCL/24-25/SW /	Sampling Method	(IS 3025 , Part-1) CMPDI/RI-II/LPM 13
Sampling Stations	(i)	Upstream in Katri River(SW8)	Date of Sampling	04.06.2025	Period of Analysis
	(ii)	Upstream in Kumar Jore(SW9)	Date of Sampling	04.06.2025	04.06.25 TO 20.08.25

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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SURFACE WATER ANALYSIS TEST REPORT

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

Month & Year	QUARTE ENDI NG JUNE 2025	**Name of Cluster**	IV	ULR No.	TC1432125000002076P TC1432125000002077P
Customer	Environment Department, Bharat Coking Coal Limited (BCCL), Koyla Bhawan, Dhanbad (E-mail: gmenv.bccl@coalindia.in)			Date of Issue	16.09.25
Project	Sample Ref. No.		REM/BCCL/24-25/SW /	Sampling Method	(IS 3025 , Part-1) CMPDI/RI-II/LPM 13
Sampling Stations	(i) Downstream in Kumar Jore(SW10)		Date of Sampling	30.06.2025	Period of Analysis
	(ii) Downstream in Katri River(SW11)		Date of Sampling	30.06.2025	30.06.2025 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	2	10	1-500.0	1
3	Chlorides, mg/l	IS-3025(Part 32):1988, R-2019 Argentometric Method	50	57	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	5.9	5.7	4	1.0-10.0	0.1
6	Fluoride, mg/l	APHA, 24th edition, SPADNS Method	0.49	0.57	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	<0.2	<0.2	50	0.2-10	0.2
9	Nitrate , mg/l	APHA, 24th edition, UV-Spectrophotometric Method	8.45	6.89	50	0.5-45.0	0.5
10	pH value	IS 3025, (Part 11) : 1983 R-2023 Electrometric (Ph Meter) method	7.65	7.75	6.5-8.5	1.0-14.0	2
11	Sulphate, mg/l	APHA –24th edition,4500- S, Turbidity Method	55	59	400	10.0-400.0	10
12	Total Dissolved Solids, mg/l	IS 3025, (Part 16): 1984 R-2023 Gravimetric method	469	476	1500	25.0-10000.0	25
13	Zinc, mg/l	IS 3025(Part 49) : 1994, R : 2019, AAS-Flame Method	<0.1	<0.1	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*

Analysed by

(Gaurav Kant)
REVIEWED BY

(Kumar Vaibhav)
Authorised Signatory

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

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**	IV	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	Sample Ref. No.		REM/BCCL/24-25/SW /	Sampling Method	(IS 3025 , Part-1) CMPDI/RI-II/LPM 13
Sampling Stations	(i)	Downstream in Kumar Jore(SW10)	Date of Sampling	30.06.2025	Period of Analysis
	(ii)	Downstream in Katri River(SW11)	Date of Sampling	30.06.2025	30.06.2025 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
CMPDIL, RI-II
KOYLA BHAWAN COMPLEX
DHANBAD. -826005
Phone:0326-223-850
email: rdri2cmpdi@coalindia.in

MINE EFFLUENT ANALYSIS TEST REPORT

Month & Year	**QUARTER ENDING JUNE 2025**	**Name of Cluster**	**CLUSTER IV**	**ULR No.**	**TC14321250000 02112P**
Customer	**Environment Department, Bharat Coking Coal Limited (BCCL), Koyla Bhawan, Dhanbad (E-mail: gmenv.bccl@coalindia.in)**			**Date of Issue**	**16.09.2025**
Project	**Katras Chotudih Colliery**	**Sample Ref. No.**	**REM/BCCL/25-26/MW/**	**Sampling Method**	**CMPDI/RI-II/LPM 13,(IS 3025:Part -1)**
Sampling Stations	**MW4**	**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	MW4 M1585	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	40	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	0.078	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	1.56	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	7.59	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	46	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,*

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ANALYSED BY

(Gaurav Kant)
REVIEWED BY

(Kumar Vaibhav)
Authorised Signatory

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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**	**CLUSTERIV**	**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	**Katras Chotudih Colliery**	**Sample Ref. No.**	**REM/BCCL/24-25/MW/**	**Sampling Method**	**CMPDI/RI-II/LPM 13,(IS 3025:Part -1)**
Sampling Stations	**MW4**	**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**	**MW4**	**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

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DRINKING WATER 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**	**IV**	**ULR No.**	**TC1432125000002105P**
Customer	**Environment Department, Bharat Coking Coal Limited (BCCL), Koyla Bhawan, Dhanbad (E-mail: gmenv.bccl@coalindia.in)**			**Date of Issue**	**16.09.2025**
Project	**Katras Choutudih Filter Plant**	**Sample Ref. No.**	**REM/BCCL/25-26/DW**	**Sampling Method**	**CMPDI/RI-II/LPM 13,(IS 3025:Part -1)**
Sampling Stations	**Katras Choutudih Filter Plant**	**Date of Sampling**	**19.05.2025**	**Sample Collected in 5 Ltr Jerricane , Color as observed is transparent**	
			Period of Analysis	**19.05.2025 TO 20.07.2025**	

Sl. No.	**Parameter**	**Method of Analysis**	**Observed Values**			**IS 10500: 2012**	
			DW-1 D0065	**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	102	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,2023	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,2023	125	6.0-700	6	30	100
7	Nitrate , mg/l	APHA, 24th Edition, UV-Spectrophotometric Method,2023	5.27	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	278	10.0-400.0	10	200	400
11	Taste	APHA,24th Edition, 2160-C,2023	Acceptable	Qualitative	Qualitative	Acceptable	Agreeable
12	Total Alkalinity (c_aco_3), mg/l, Max	IS 3025, Part 23: 1986 R 2019 Titration Method	180	4.0-2000.0	4	200	600
13	Total Dissolved Solids, mg/l	IS 3025, Part 16: 1984 R 2023 Gravimetric method	905	25.0-10000.0	25	500	2000
14	Total Hardness, mg/l	IS 3025, (Part 21): 2019 EDTA Method	635	4.0-2000.0	4	200	600
15	Turbidity, NTU	IS 3025, (Part 10):1984, R-2023 Nephelometric/Turbiditimetric Method	1.7	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

*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,*

ANALYSED BY

(Gaurav Kant)
REVIEWED BY

(Kumar Vaibhav)
Authorised Signatory

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

CENTRAL MINE PLANNING AND DESIGN INSTITUTE LIMITED

Environment Laboratory, Regional Institute-II

DRINKING WATER ANALYSIS TEST REPORT

Month & Year	**QUARTER ENDING JUNE 2025**	**Name of Cluster**	**IV**	**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	**Katras Choutudih Filter Plant**	**Sample Ref. No.**	**REM/BCCL/24-25/DW**	**Sampling Method**	**CMPDI/RI-II/LPM 13,(IS 3025:Part -1)**
Sampling Stations	**Katras Choutudih Filter Plant**	**Date of Sampling**	**19.05.2025**	**Sample Collected in 5 Ltr Jerricane , Color as observed is transparent**	
			Period of Analysis	**19.05.2025**	**TO** **20.07.2025**

Sl. No.	**Parameter**	**Method of Analysis**	**Observed Values**			**IS 10500: 2012**	
			DW-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 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	0.01	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	0.01	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, AAS-GTA : 2003 AAS-GTA Method	0.41	0.02-10	0.02	0.1	0.3

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

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

ANALYSED BY

(Gaurav Kant)
REVIEWED BY

(Kumar Vaibhav)
Authorised Signatory

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

TC-14321

CENTRAL MINE PLANNING AND DESIGN INSTITUTE LIMITED

cmpdi A Mini Ratna Company

Environment Laboratory, Regional Institute-II

DRINKING WATER ANALYSIS TEST REPORT

Month & Year	**QUARTER ENDING JUNE 2025**	**Name of Cluster**	**IV**	**ULR No.**	**TC1432125000002106P**
Customer	**Environment Department, Bharat Coking Coal Limited (BCCL), Koyla Bhawan, Dhanbad (E-mail: gmenv.bccl@coalindia.in)**			**Date of Issue**	**16.09.2025**
Project	**AKWMC Filter Plant**	**Sample Ref. No.**	**REM/BCCL/25-26/DW**	**Sampling Method**	**CMPDI/RI-II/LPM 13,(IS 3025:Part -1)**
Sampling Stations	**AKWMC Filter Plant**	**Date of Sampling**	**19.05.2025**	**Sample Collected in 5 Ltr Jerricane , Color as observed is transparent**	
			Period of Analysis	**19.05.2025 TO 18.03.2025**	

Sl. No.	**Parameter**	**Method of Analysis**	**Observed Values**			**IS 10500: 2012**	
			DW2 D0063	**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	108	2.0-800.0	2	75	200
3	Chlorides, mg/l	IS-3025(Part 32):1988, R-2019 , Argentometric Method	91	2.0-1500.0	5	250	1000
4	Fluoride, mg/l	APHA, 24th Edition, SPADNS Method,2023	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,2023	89	6.0-700	6	30	100
7	Nitrate , mg/l	APHA, 24th Edition, UV-Spectrophotometric Method,2023	4.22	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	7.86	1-14	0.1	6.5-8.5	No relaxation
10	Sulphate, mg/l	APHA –24th Edition, 4500 S , Turbidity Method,2023	229	10.0-400.0	10	200	400
11	Taste	APHA,24th Edition, 2160-C,2023	Acceptable	Qualitative	Qualitative	Acceptable	Agreeable
12	Total Alkalinity ($c_ac_{O_3}$), mg/l, Max	IS 3025, Part 23: 1986 R 2019 Titration Method	205	4.0-2000.0	4	200	600
13	Total Dissolved Solids, mg/l	IS 3025, Part 16: 1984 R 2023 Gravimetric method	820	25.0-10000.0	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	2.6	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,*

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REVIEWED BY

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

CENTRAL MINE PLANNING AND DESIGN INSTITUTE LIMITED

Environment Laboratory, Regional Institute-II

DRINKING WATER ANALYSIS TEST REPORT

Month & Year	**QUARTER ENDING JUNE 2025**	**Name of Cluster**	**IV**			**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/DW**		**Sampling Method**	**CMPDI/RI-II/LPM 13,(IS 3025:Part -1)**	
Sampling Stations	**AKWMC Filter Plant**	**Date of Sampling**	**19.05.2025**	**Sample Collected in 5 Ltr Jerricane , Color as observed is transparent**			
			Period of Analysis	**19.05.2025**	**TO**	**20.07.2025**	

Sl. No.	**Parameter**	**Method of Analysis**	**Observed Values**			**IS 10500: 2012**	
			DW2	**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	0.01	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	0.01	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, AAS-GTA : 2003 AAS-GTA Method	0.22	0.02-10	0.02	0.1	0.3

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

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

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(Gaurav Kant)
REVIEWED BY

(Kumar Vaibhav)
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CENTRAL MINE PLANNING AND DESIGN INSTITUTE LIMITED
Environment Laboratory, Regional Institute-II
CMPDIL, RI-II
KOYLA BHAWAN COMPLEX
DHANBAD. -826005
Phone:0326-223-850
email: rdri2cmpdi@coalindia.in

DRINKING WATER ANALYSIS TEST REPORT

Month & Year	**QUARTER ENDING JUNE2025**	**Name of Cluster**	**IV**	**ULR No.**	**TC1432125000002107P**
Customer	**Environment Department, Bharat Coking Coal Limited (BCCL), Koyla Bhawan, Dhanbad (E-mail: gmenv.bccl@coalindia.in)**			**Date of Issue**	**16.09.2025**
Project	**AARC Filter Plant**	**Sample Ref. No.**	**REM/BCCL/25-26/DW**	**Sampling Method**	**CMPDI/RI-II/LPM 13,(IS 3025:Part -1)**
Sampling Stations	**AARC Filter Plant**	**Date of Sampling**	**19.05.2025**	**Sample Collected in 5 Ltr Jerricane , Color as observed is transparent**	
			Period of Analysis	**19.05.2025** **TO** **20.07.2025**	

Sl. No.	**Parameter**	**Method of Analysis**	**Observed Values**			**IS 10500: 2012**	
			DW3 D0064	**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	106	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	067	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	9.35	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	7.92	1-14	0.1	6.5-8.5	No relaxation
10	Sulphate, mg/l	APHA –24th Edition, 4500 S , Turbidity Method	265	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	195	4.0-2000.0	4	200	600
13	Total Dissolved Solids, mg/l	IS 3025, Part 16: 1984 R 2023 Gravimetric method	890	25.0-10000.0	25	500	2000
14	Total Hardness, mg/l	IS 3025, (Part 21): 2019 EDTA Method	770	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,*

ANALYSED BY

(Gaurav Kant)
REVIEWED BY

(Kumar Vaibhav)
Authorised Signatory

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

CENTRAL MINE PLANNING AND DESIGN INSTITUTE LIMITED

Environment Laboratory, Regional Institute-II

DRINKING WATER ANALYSIS TEST REPORT

Month & Year	**QUARTER ENDING JUNE 2025**	**Name of Cluster**	**IV**			**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	**AARC Filter Plant**	**Sample Ref. No.**	**REM/BCCL/23-24/DW**		**Sampling Method**	**CMPDI/RI-II/LPM 13,(IS 3025:Part -1)**	
Sampling Stations	**AARC Filter Plant**	**Date of Sampling**	**19.05.2025**	**Sample Collected in 5 Ltr Jerricane , Color as observed is transparent**			
			Period of Analysis	**19.05.2025**	**TO**	**20.07.2025**	

Sl. No.	**Parameter**	**Method of Analysis**	**Observed Values**			**IS 10500: 2012**	
			DW3	**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	0.01	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	0.01	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, AAS-GTA : 2003 AAS-GTA Method	<0.02	0.02-10	0.02	0.1	0.3

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

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

(Gaurav Kant)
REVIEWED BY

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Authorised Signatory

ANALYSED BY

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CENTRAL MINE PLANNING AND DESIGN INSTITUTE LIMITED
Environment Laboratory, Regional Institute-II
CMPDIL, RI-II
KOYLA BHAWAN COMPLEX
DHANBAD. -826005
Phone:0326-223-850
email: rdri2cmpdi@coalindia.in

DRINKING WATER ANALYSIS TEST REPORT

Month & Year	**QUARTER ENDING JUNE2025**	**Name of Cluster**	**IV**	**ULR No.**	**TC1432125000002108P**
Customer	**Environment Department, Bharat Coking Coal Limited (BCCL), Koyla Bhawan, Dhanbad (E-mail: gmenv.bccl@coalindia.in)**			**Date of Issue**	**16.09.2025**
Project	**Gaslitand Filter Plant**	**Sample Ref. No.**	**REM/BCCL/25-26/DW**	**Sampling Method**	**CMPDI/RI-II/LPM 13,(IS 3025:Part -1)**
Sampling Stations	**AARC Filter Plant**	**Date of Sampling**	**19.05.2025**	**Sample Collected in 5 Ltr Jerricane , Color as observed is transparent**	
			Period of Analysis	**19.05.2025** **TO** **20.07.2025**	

Sl. No.	**Parameter**	**Method of Analysis**	**Observed Values**			**IS 10500: 2012**	
			DW4 D0062	**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	106	2.0-800.0	2	75	200
3	Chlorides, mg/l	IS-3025(Part 32):1988, R-2019 , Argentometric Method	103	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	97	6.0-700	6	30	100
7	Nitrate , mg/l	APHA, 24th Edition, UV-Spectrophotometric Method	8.65	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	7.66	1-14	0.1	6.5-8.5	No relaxation
10	Sulphate, mg/l	APHA –24th Edition, 4500 S , Turbidity Method	249	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	210	4.0-2000.0	4	200	600
13	Total Dissolved Solids, mg/l	IS 3025, Part 16: 1984 R 2023 Gravimetric method	940	25.0-10000.0	25	500	2000
14	Total Hardness, mg/l	IS 3025, (Part 21): 2019 EDTA Method	600	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,*

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REVIEWED BY

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

CENTRAL MINE PLANNING AND DESIGN INSTITUTE LIMITED

Environment Laboratory, Regional Institute-II

DRINKING WATER ANALYSIS TEST REPORT

Month & Year	**QUARTER ENDING JUNE 2025**	**Name of Cluster**	**IV**			**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	**AARC Filter Plant**	**Sample Ref. No.**	**REM/BCCL/24-25/DW**		**Sampling Method**	**CMPDI/RI-II/LPM 13,(IS 3025:Part -1)**	
Sampling Stations	**Gaslitand Filter Plant**	**Date of Sampling**	**19.05.2025**	**Sample Collected in 5 Ltr Jerricane , Color as observed is transparent**			
			Period of Analysis	**19.05.2025**	**TO**	**20.07.2025**	

Sl. No.	**Parameter**	**Method of Analysis**	**Observed Values**			**IS 10500: 2012**	
			DW4	**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	0.01	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	0.01	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, AAS-GTA : 2003 AAS-GTA Method	<0.02	0.02-10	0.02	0.1	0.3

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(Gaurav Kant)
REVIEWED BY

(Kumar Vaibhav)
Authorised Signatory

ANALYSED BY

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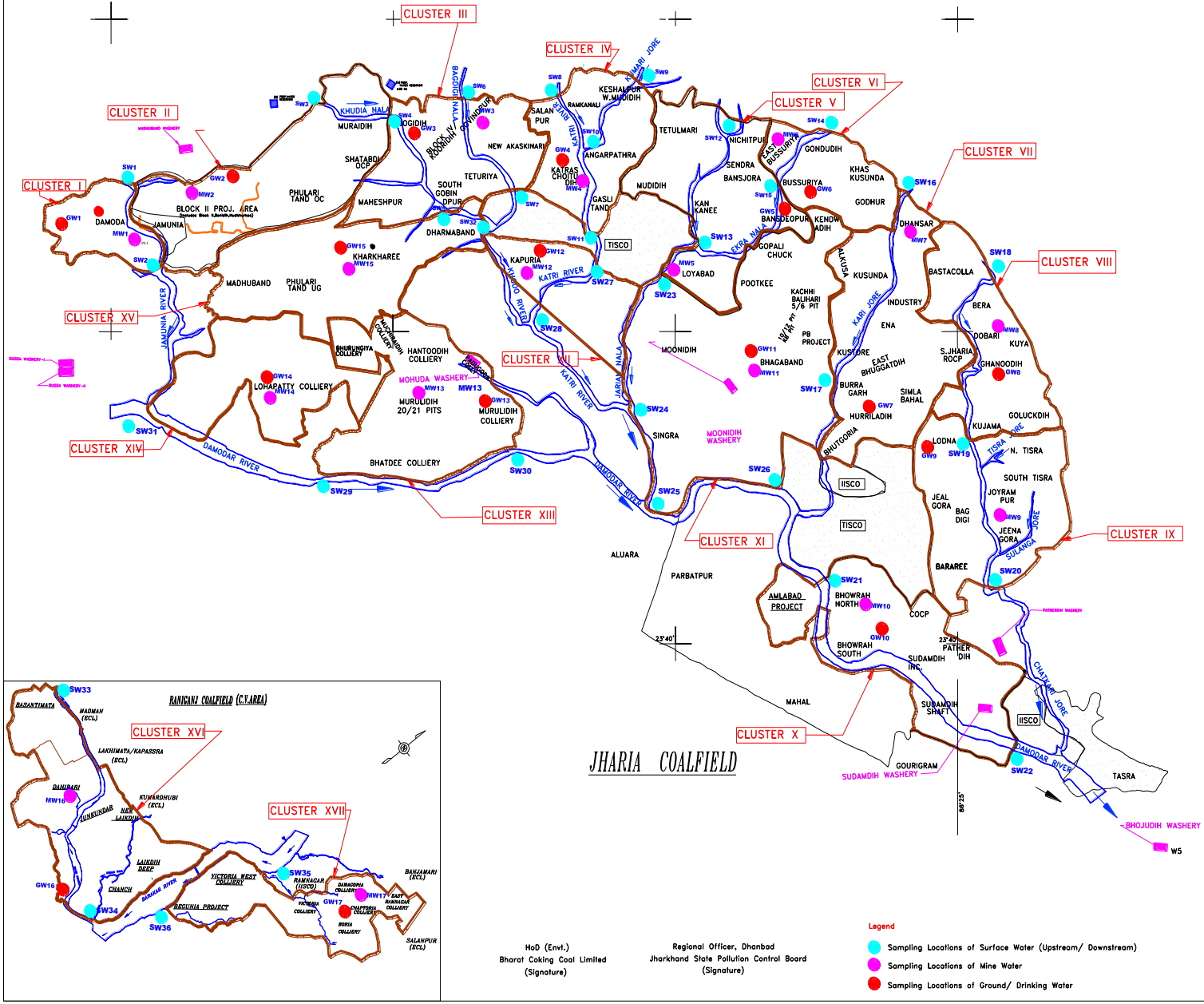
Water Sampling Locations in BCCL



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

Bharat Coking Coal Ltd.
(A Subsidiary of Coal India Limited)
Office of the General Manager, Katras Area
P.O. KATRAS, P.S.- Jogta, Dhanbad-828121
CIN: U1010JH1972GOI000918
Phone/Fax No.: 0326-2371213
Email ID: cgmkatras@bccl.gov.in

Ref- BCCK/KA/IV/GM/ 30.

Dated- 29/05/2025

To
The Director,
Ministry of environment, forest and climate charge
Regional office (ECZ)
Bungalow office no.42, Shyamali colony
Ranchi-834002

Sub:-Six monthly EC compliance report on implementation of environmental measures for the period from OCT 2024 to March 2025

Dear Sir,

Kindly find enclosed herewith the six monthly EC compliance report on implementation of environmental measures for the period from OCT 2024 to March 2025 in respect of cluster IV group of mines under Katras Area, BCCL.

Sir, this is for your kind information and necessary action please.
Hope you will find in order.

Enclosed:-As Above.

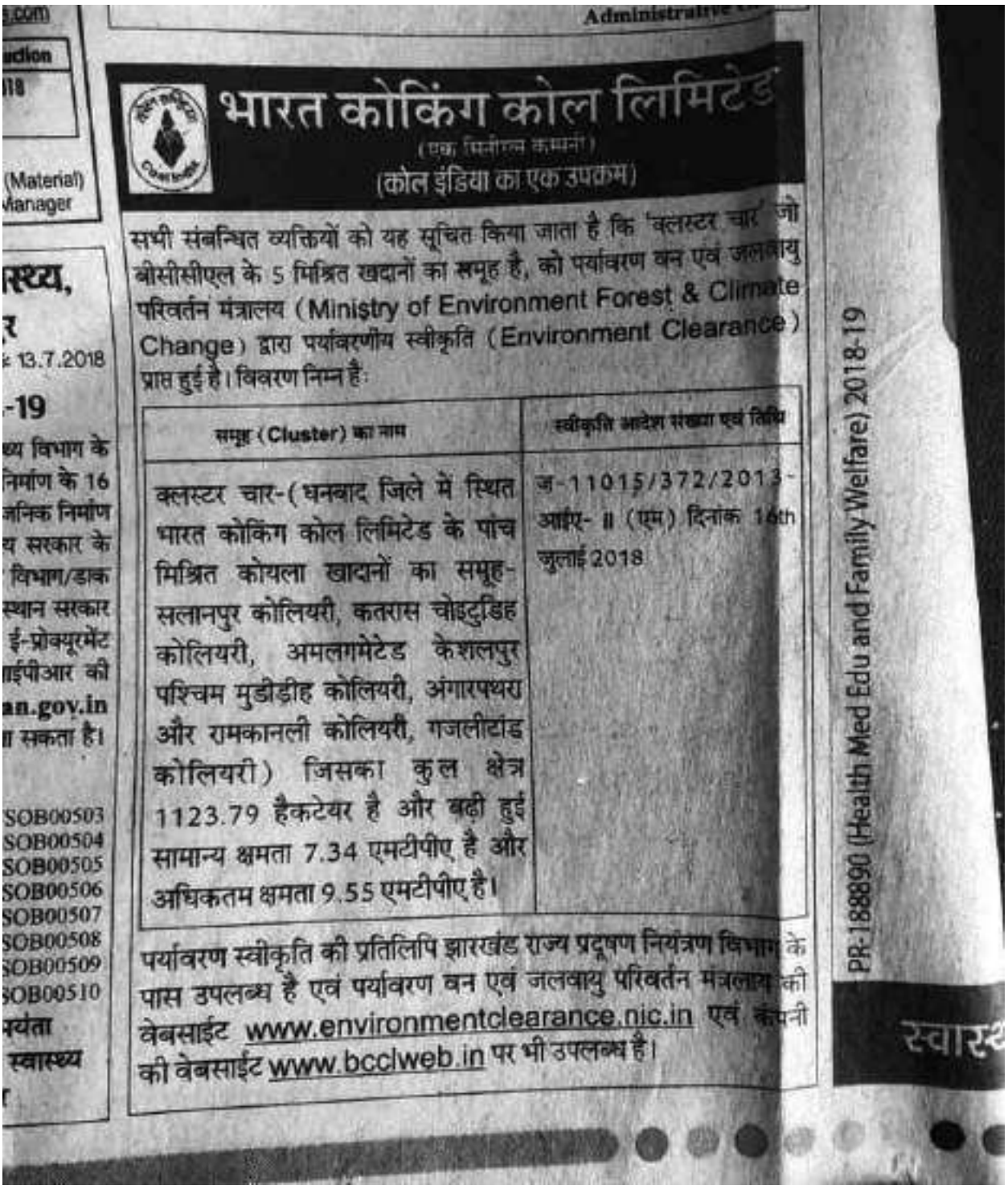
Yours Faithfully

Raj Kumar
29/5/25
General Manager
Cluster-IV, BCCL

Copy:-
1.The Director,IA Monitoring cell,Paryavaran Bhawan,CGO Complex, New Delhi-110003
2. Central Pollution Control Board, Parivesh Bhawan, CBD-cum-Office Complex East Arjun Nagar, DELHI - 110 032, INDIA
3. The Director,(S) Ministry of Environment & Forest,Govt.of India –Bhuneshwar751023
4.The Member Secretary, Jharkhand state Pollution Control Board,Ranchi-834004
5. The Regional Officer, Jharkhand state Pollution Board,Dhanabad-826001
6. GM(Min)/HOD(Env), BCCL,Koyla Bhawan,Dhanbad
6.Office Copy

CamScanner

Annexure-36



भारत कोकिंग कोल लिमिटेड

(एक मिनीरत्न कम्पनी)

(कोल इंडिया का एक उपक्रम)

सभी संबन्धित व्यक्तियों को यह सूचित किया जाता है कि 'क्लस्टर चार' जो बीसीसीएल के 5 मिश्रित खदानों का समूह है, को पर्यावरण वन एवं जलवायु परिवर्तन मंत्रालय (Ministry of Environment Forest & Climate Change) द्वारा पर्यावरणीय स्वीकृति (Environment Clearance) प्राप्त हुई है। विवरण निम्न है:

समूह (Cluster) का नाम	स्वीकृति आदेश संख्या एवं तिथि
क्लस्टर चार-(धनबाद जिले में स्थित भारत कोकिंग कोल लिमिटेड के पांच मिश्रित कोयला खादानों का समूह- सलानपुर कोलियरी, कतरास चोइटुडिह कोलियरी, अमलगमेटेड केशलपुर पश्चिम मुडीडीह कोलियरी, अंगारपथरा और रामकानली कोलियरी, गजलीटांड कोलियरी) जिसका कुल क्षेत्र 1123.79 हैकटेयर है और बढ़ी हुई सामान्य क्षमता 7.34 एमटीपीए है और अधिकतम क्षमता 9.55 एमटीपीए है।	ज-11015/372/2013-आईए- II (एम) दिनांक 16th जुलाई 2018

पर्यावरण स्वीकृति की प्रतिलिपि झारखंड राज्य प्रदूषण नियंत्रण विभाग के पास उपलब्ध है एवं पर्यावरण वन एवं जलवायु परिवर्तन मंत्रालय की वेबसाईट www.environmentclearance.nic.in एवं कंपनी की वेबसाईट www.bcclweb.in पर भी उपलब्ध है।

PR-188890 (Health Med Edu and Family Welfare) 2018-19