



## 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

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Ref No- BCCL/KA-IV/GM/08.

Date-29/11/2022

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 April 2022 to September 2022

Dear Sir,

Kindly find enclosed herewith the six monthly EC compliance report on implementation of environmental measures for the period from April 2022 to September 2022 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

  
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 - Bhuneshwar 751023
4. The Member Secretary, Jharkhand state Pollution Control Board, Ranchi-834004
5. The Regional Officer, Jharkhand state Pollution Board, Dhanabad-826001
6. Dy.GM(ENV), BCCL, Koyla Bhawan, Dhanbad
6. Office Copy

| SL | Mining                                                                                                                                                                                                                                                                                                        | Compliance                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             |
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| 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.<br><b>Annexure 1- EC order</b>                                                                                                                                                                                                                                                                     |
| 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.<br><b>Annexure 2- Pictures of Tarpaulin covered coal transportation in Cluster IV of Bharat Coking Coal Limited</b>                                                                                                                                                                                                                                                                                                                                                                              |
| 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. 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 1 no's of truck mounted fog cannon of capacity 12 KL has been deployed in cluster IV group of mines. Apart from that installation of 2 no's of fixed type fog cannon will be done shortly.<br><b>Annexure 3- Pic of Mobile water tanker with mist fitting, truck mounted fog cannon and fixed water sprinkler.</b> |
| 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/orig/2021/141.<br><b>Annexure-3(A)</b>                                                                                                                                                                                                                                                                                                                                           |
| 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.<br><b>Annexure 4-safety talk plc and distribution list of PPE.</b>                                                                                                                                                                                                                                                                                                                     |



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| 11                                             | The fire dealing operations by excavating out fire should be expedited.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 | It is being complied.<br>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 392 <sup>nd</sup> Board Meeting of M/s BCCL whereas Mine life of Katras choitudih colliery has been extended upto 24 years.<br>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.<br>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.                                                                                                                                                                                                                                                                                                                                  |
| <b>Land reclamation and water conservation</b> |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |                                                                                                                                                                                                                                                                                                                                                        |
| 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 and 2021.<br>Annexure 8- Last Time-series map of 2021                                                                             |
| 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/EIA/EMP 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.<br>Annexure- 9- surface drainage plan                                                                                    |

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| 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 top soil) and afforestation plan is being in conformity. Land use pattern has been submitted to ministry. Green belt over an area of 192.20 Ha (27.11 Ha over OB dumps, 165.09 Ha social forestry & Avenue Plantation) can be observed within IV as per CMPDIL land reclamation monitoring Report-2021.<br>In the FY 2022-23 greenery has been developed on 4.5 Ha area of OB dump.<br><b>Annexure 10- land reclamation monitoring Report</b>                                                               |
| 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.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.                                                                                                                                                                                                                               | 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.<br>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.<br>Green belt over an area of 192.20 Ha (27.11 Ha over OB dumps, 165.09 Ha social forestry & Avenue Plantation) can be observed within IV as per CMPDIL land reclamation monitoring Report-2021.<br><b>Annexure 10 A- Top soil storage plan</b><br><b>Annexure 10 B- Plantation details (2014-15 to till date)</b> |



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| 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.<br><b>Annexure 11- Approval copy of Mine closer plan.</b>                                                                                                                                                                                                                                                                                                                                                                 |
| 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.<br><b>Annexure 12- Certificate Regarding no subsidence due to mining operation.</b>                                                                                                                                                                                         |
| 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.                                                                                                                                                                                                                                                                                                          |
| <b>Emissions, effluents, and waste disposal</b> |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |                                                                                                                                                                                                                                                                                                                                                                                                                                                |
| 1                                               | 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 PM10/PM2.5) 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. | 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.                                                                                                                                                                                                                                                 | In the FY 2022-23 greenery has been developed on 4.5 Ha area of OB dump.<br>For meeting the green belt development target we have assigned the work order to the DFO, Dhanbad in FY 2019-2020 & FY 2020-2021 for plantation over an area of 11 Ha & 13 Ha over Ob dump respectively. Plantation is                                                                                                                                             |

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|   |                                                                                                                                                                                                                                                                                                                                                                                                                                     | <p>being carried out in available spaces for creation of thick green belt.</p> <p>It is being Complied. Green belt over an area of 192.20 Ha (27.11 Ha over OB dumps, 165.09 Ha social forestry &amp; Avenue Plantation) can be observed within IV as per CMPDIL land reclamation monitoring Report 2021. Apart of block plantation, 600 nos of avenue plantation in form of bamboo gabion plantation has been done in the FY 19-20 by DFO, Dhanbad. Two nos of Sneh Smriti upwan (Fruit orchid) site have been developed in around 1.5 Ha areas. Grass seed have been broadcasted In around 33 Ha over OB dump.</p> <p><b>Annexure 13 - plantation Pics.</b></p> |
| 3 | <p>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.</p> | <p>Presently, road transportation is being done by covering vehicle with tarpaulin.</p>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           |
| 4 | <p>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.</p>                                                                                                                                                                                        | <p>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.</p>                                                                                                                                                                                                                                                                                         |
| 5 | <p>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.</p>                                                                               | <p>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.</p> <p><b>Annexure 14- Dust suppression arrangement at coal loading point of CHP.</b></p>                                                                                                                                                                                                                                                                                                                  |
| 6 | <p>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.</p>                                                                                                                                                                                                           | <p>It is being complied. Dust suppression arrangement has been made at coal Handling plants. 3 mobile water sprinkler have been deployed for control to air pollution in CHP. Mobile water tanker is used for dust suppression. 1 no's of truck mounted fog cannon of capacity 12 KL has been deployed in cluster IV group of mines. Apart from that installation of 2 no's of fixed type fog cannon will be done shortly.</p>                                                                                                                                                                                                                                    |



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| 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.<br><b>Annexure 15- Ground water monitoring report</b><br><b>Annexure 16- Rain water harvesting arrangement.</b> |
| 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 desilted 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.<br><b>Annexure 17- Pic of toe wall made along OB dump.</b><br><b>Annexure 18- Pic of siltation pond.</b>                                                                                                                                                                                                                                                                                                                                                                                     |
| 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 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,                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    | 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                                                                                                                                                                                                                                             |



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|    | stabilized with plantation so as to withstand the peak water pressure preventing any chance of mine inundation.                                                                                                                                                                                                                                                                                                                                        | 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.<br><b>Annexure 19-Plc of embankment constructed.</b> |
| 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.)<br>Oil and grease trap has been installed at the workshops.<br><b>Annexure 20- Plc of Oil &amp; Grease trap</b>                                                                          |
|    | <b>Illumination, noise &amp; vibration</b>                                                                                                                                                                                                                                                                                                                                                                                                             |                                                                                                                                                                                                                                                                                     |
| 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.<br><b>Annexure 21- Illumination monitoring report.</b>                                                                                                                                                  |
| 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.<br><b>Annexure 22- Ground vibration report.</b>                                  |
| 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.<br><b>Annexure 23- Noise level Monitoring Report</b>                                                                                                                                                                |
|    | <b>Occupational health &amp; safety</b>                                                                                                                                                                                                                                                                                                                                                                                                                |                                                                                                                                                                                                                                                                                     |



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| 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.<br><br><b>Annexure 24- IME/PME report</b>                                                                                                              |
| 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. Total 1800 Nos of Dust masks have been provided to the personnel engaged in mining and working under cluster IV.<br><b>Annexure 25- training photograph</b>                                                                         |
| <b>Ecosystem and biodiversity conservation</b> |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |                                                                                                                                                                                                                                                                                                                                    |
| 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.                                                                                                                                                                       | Ecological restoration are being done in consultation with FRI, dehradun. Road Map of Ecological restoration has been made.<br><b>Annexure 26- Afforestation Programme of cluster-IV</b>                                                                                                                                           |
| 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.                                                                                                                                                         |
| <b>Public Hearing, R&amp;R and CSR</b>         |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |                                                                                                                                                                                                                                                                                                                                    |
| 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.<br><b>Annexure 27- List of activities undertaken in and around the mine in pursuance of CSR policy.</b> |

|                                             |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |
|---------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 3                                           | The project proponent shall follow the mitigation measures provided in this Ministry's OM NO.2-11013/5712014-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.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             |
| <b>Corporate environment responsibility</b> |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |
| 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.<br>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.<br><b>Annexure 28- CER policy</b>                      |
| 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.<br><b>Annexure 29- Environmental protection measure expenditure details</b> |
| 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.                                                                                                                                                                                                                                 |
|   | <b>Statutory Obligations</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                               |                                                                                                                                                                                                                                                       |
| 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.<br><b>Annexure 30- NOC for ground water abstraction</b>                                                                                                                                           |
| 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.                                                                                                                                                                                                                                 |

|                              |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |
|------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Monitoring of project</b> |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |
| 1                            | <p>Continuous ambient air quality monitoring stations as prescribed in the statute be established in the core zone as well as in the buffer zone for monitoring of pollutants, namely PM10, PM2.5, SO2 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.</p> <p>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) &amp; 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 &amp; 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.</p> <p><b>Annexure 31- Monitoring station location details and Coaaqms tender copy</b></p> |
| 2                            | <p>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.</p> <p>It is being complied. CMPDIL has been engaged for Air Quality monitoring as well as heavy metals.</p> <p><b>Annexure 32- Ambient Air quality monitoring report</b></p>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |
| 3                            | <p>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 25<sup>th</sup> September, 2000 and as amended from time to time by the Central Pollution Control Board.</p> <p>Monitoring of River water are being done by CMPDIL regularly in Upstream and Downstream.</p> <p><b>Annexure 33- Monitoring Report</b></p>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |



|                      |                                                                                                                                                                                                                                                                                                                                                                                                                                                         |                                                                                                                                                                                                                                                                                                                                                                |
|----------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 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.<br><b>Annexure 34- Water quality Monitoring Report enclosed as an Annexure 33</b> |
| 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.<br><b>Annexure 35 - Forwarding letter of last six monthly compliance report</b>                                                                                                                 |
| 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.                                                                                                                                                                                                                                                                                                                                          |
| <b>Miscellaneous</b> |                                                                                                                                                                                                                                                                                                                                                                                                                                                         |                                                                                                                                                                                                                                                                                                                                                                |
| 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)<br>Installation of Roof top solar system at cluster IV, head office is also in line, tender has been floated for the same.                                                                    |

Six Monthly Environmental clearance Compliance report of cluster IV group of mines for the period from April 2022 to September 2022, BCCL

|   |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |                                                                                                                                             |
|---|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------|
| 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 <a href="http://www.environmentclearance.nic.in">www.environmentclearance.nic.in</a> and a copy of the same shall be forwarded to the Regional Office. | Complied.<br><br><b>Annexure 36- Copy of newspaper advertisement.</b>                                                                       |
| 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 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.                                                                                                                                                                                                                                                                              | Agreed.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |
| 10 | 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, SO <sub>2</sub> and NO <sub>x</sub> . 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. | 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. |

General Manager  
Cluster IV, BCCL

*Ritesh*

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: 23<sup>rd</sup> October, 2019

To,

The General Manager (E&F)  
M/s Bharat Coking Coal Ltd,  
Koyala Bhawan,  
District **Dhanbad** (Jharkhand)  
Email: [envbcccl@gmail.com](mailto:envbcccl@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 28<sup>th</sup> June, 2019 on the above-mentioned subject.

2. The Ministry of Environment, Forest and Climate Change vide letter dated 20<sup>th</sup> 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 visit on 22<sup>nd</sup> August, 2016.*

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 22<sup>nd</sup> June, 2019.

4. The proposal was considered by the sectoral Expert Appraisal Committee (EAC) in its meeting held on 22<sup>nd</sup> August, 2019 and recommended for continuance of the project beyond 16<sup>th</sup> July, 2019 and validity of environmental clearance dated 16<sup>th</sup> 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 16<sup>th</sup> July, 2018 shall remain unchanged.

*Sharath*  
23/10/19  
(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*  
23/10/19  
(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: 16<sup>th</sup> July, 2018

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

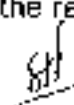
Sir,

This has reference to your letter No. BCCL/GM (Katras) /F EC/15 4709 dated 2<sup>nd</sup> December, 2015 along with online proposal No. IA/JH/CMIN/20227/2013 dated 8<sup>th</sup> 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 29<sup>th</sup> meeting held on 15-16 January, 2015, 49<sup>th</sup> meeting on 7-8 January, 2016, 17<sup>th</sup> meeting on 31<sup>st</sup> August, 2017, 26<sup>th</sup> meeting on 15-16 February, 2018 and 30<sup>th</sup> 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 6<sup>th</sup> 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, CIPS 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           |
|      | <b>Total</b>         | <b>1123.79</b>      | <b>0</b>            | <b>1123.79</b> |

**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         |
|      | <b>TOTAL</b>           | <b>665.72</b> | <b>10.76</b> | <b>106.52</b> | <b>340.79</b> | <b>1123.79</b> |

(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 Gasitand is 1:8, 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<sup>3</sup>/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 26<sup>th</sup> August, 2017.

(xii) The method of mining would be mixed i.e. with opencast and underground mining technologies.

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

(xiii) There are 8 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<br>Colliery | Katras<br>Choitudih<br>Colliery | Amalgamated<br>Keshalpur<br>West Mudidih<br>Colliery | Angarpathra<br>colliery &<br>Ramkanali<br>colliery | Gasitand<br>colliery |
|-----------------------|----------------------|---------------------------------|------------------------------------------------------|----------------------------------------------------|----------------------|
| Life of<br>mine (yrs) | 10 years             | 4 years                         | 20 years                                             | Over 30<br>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 305<sup>th</sup> meeting held on 12.03.2014 and of Katras choitudih in its 312<sup>th</sup> meeting held on 13<sup>th</sup> 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.

(xxii) Total afforestation plan shall be implemented covering an area of 865.72 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 21<sup>st</sup> 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 3<sup>rd</sup> August, 2017 and 2<sup>nd</sup> February, 2018 respectively. The Final Mine Closure plan will be submitted 5 years before final closure.

4. The Expert Appraisal Committee in its 26<sup>th</sup> 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 22<sup>nd</sup> 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/Govt 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 27<sup>th</sup> 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 (B) of fly ash notification issued



vide S.O 2804 (E) dated 3<sup>rd</sup> 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 27<sup>th</sup> 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<sub>10</sub>/PM<sub>2.5</sub>) 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 owners 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 29<sup>th</sup> 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 1<sup>st</sup> 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 statute 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 25<sup>th</sup> 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 27<sup>th</sup> 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](http://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 31<sup>st</sup> 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, SO<sub>2</sub> and NO<sub>x</sub>. 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

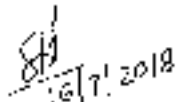
5. The proponent shall obtain all necessary clearances/approvals that may be required before the start of the project. The Ministry or any other competent authority may stipulate any further condition for environmental protection. The Ministry or any other competent authority may stipulate any further 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 2<sup>nd</sup> August, 2017 of Hon'ble Supreme Court in WP (Civil) No 114/2014 in the matter of 'Common Cause Vs Union of India & others'.

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.

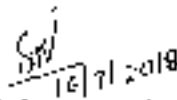
8. This environmental clearance shall not be operational till such time the project proponent complies with the above said judgment of Hon'ble Supreme Court, as applicable, and other statutory requirements.

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

  
(S K Srivastava)  
Scientist E

Copy to

1. The Secretary, Ministry of Coal, Shastri Bhawan, New Delhi
2. The Secretary, Deptt 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, 4<sup>th</sup> 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

  
(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:

**Table 1.1: Comparative representation of productions from mines in the cluster for which EC was granted and Proposed productions**

| Sl. No.     | Name of Mine                                 |             | Production Capacity (MTY)<br>As per EC granted in Feb 2013 |       | Production Capacity (MTY)<br>Proposed |      | Lease Hold Area (Ha) | Remarks                                      |
|-------------|----------------------------------------------|-------------|------------------------------------------------------------|-------|---------------------------------------|------|----------------------|----------------------------------------------|
|             |                                              |             | Normative                                                  | Peak  | Normative                             | Peak |                      |                                              |
| 1           | Satanpur 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           | Katras 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 Angerpathra - Ramkanali colliery | UG          | 0.291                                                      | 0.378 | 0.19                                  | 0.25 | 254.64               | -                                            |
| 5           | Gasikand 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                     |                   |

EWMP OF CLUSTER-IV (Revised) OF BCCL





**Water Sprinkling at Coal Dump**





Mist Sprinkler in Cluster-IV







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/ORIG/2021/14162 |        |    |         |                      |                          |                      |                     |            |        |    |         |  |
| 2.                                                                                           | Application No.:                                                                              |          | 21-4/320/JH/MIN/2018         |        |    |         | 3.                   | Category:<br>(GWRE 2020) |                      |                     | Safe       |        |    |         |  |
| 4.                                                                                           | Project Status:                                                                               |          | Existing Project             |        |    |         | 5.                   | NOC Type:                |                      |                     | New        |        |    |         |  |
| 6.                                                                                           | Valid from:                                                                                   |          | 27/12/2021                   |        |    |         | 7.                   | Valid up to:             |                      |                     | 26/12/2023 |        |    |         |  |
| 8.                                                                                           | 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 |  |
| 40.00                                                                                        |                                                                                               | 14600.00 |                              |        |    |         |                      | 5900.00                  |                      | 2153500.00          |            |        |    |         |  |
| 9.                                                                                           | Details of ground water abstraction /Dewatering structures                                    |          |                              |        |    |         |                      |                          |                      |                     |            |        |    |         |  |
| Total Existing No.:1                                                                         |                                                                                               |          |                              |        |    |         | Total Proposed No.:0 |                          |                      |                     |            |        |    |         |  |
|                                                                                              |                                                                                               |          | DW                           | DCB    | BW | TW      | MP                   | MPu                      | DW                   | DCB                 | BW         | TW     | MP | MPu     |  |
| Abstraction Structure*                                                                       |                                                                                               |          | 1                            | 0      | 0  | 0       | 0                    | 0                        | 0                    | 0                   | 0          | 0      | 0  | 0       |  |
| Dewatering Structure*                                                                        |                                                                                               |          | 0                            | 0      | 0  | 0       | 0                    | 1                        | 0                    | 0                   | 0          | 0      | 0  | 0       |  |
| *DW- Dug Well; DCB-Dug-cum-Bore Well; BW-Bore Well; TW-Tube Well; MP-Mine Pit;MPu-Mine Pumps |                                                                                               |          |                              |        |    |         |                      |                          |                      |                     |            |        |    |         |  |
| 10.                                                                                          | Ground Water Abstraction/Restoration Charges paid (Rs.):                                      |          |                              |        |    |         |                      |                          | 8672400.00           |                     |            |        |    |         |  |
| 11.                                                                                          | 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                   |            |        |    |         |  |

(Compliance Conditions given overleaf)

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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

पानी बचाये - जीवन बचाये  
SAVE WATER - SAVE LIFE

**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](http://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<sup>3</sup>/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 m<sup>3</sup>/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).

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



**PPE distribution details of FY 2022-23 in respect of Cluster IV group of mine**

| SI No. | ITEMS               | Total distribution in nos |
|--------|---------------------|---------------------------|
| 1      | Mining Shoes        | 453                       |
| 2      | GUMBOOT             | 106                       |
| 3      | HELMET              | 31                        |
| 4      | DUST MASK           | 900                       |
| 5      | Fluorescent Jackets | 198                       |

















**Annexure - I**

**NOTING SHEET**

Dept: Environment Dept. *77/14*

Ref: DyGM(Env)/F-IMP/15/2015 Dated 19-01-2015 *20*

Subj: 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, RII 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.

*G. M. (Env)*  
Dy GM(Env)

Director (T) Op *For spec. info*  
*20/1/15*

*RD, RI II*

*Copy - D.T. (T) - For information*  
*12/1*

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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           | 375.0 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          |
|       |         | Muradiah Colliery (Mixed)                                   | 5.5                | 7.15           | 536.41          |
|       |         | Phularitand OCP                                             | 3.0                | 3.90           | 401.00          |
| III   |         | Jogdih 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<br>Opencast Project<br>UG Mine        | 1.000<br>0.135     | 1.300<br>0.176 | 347.38          |
|       |         | Block-IV/Kooridih Mixed Mine<br>Opencast Project<br>UG Mine | 1.100<br>0.080     | 1.430<br>0.104 | 149.00          |
| IV    |         | Salanpur Colliery UG                                        | 0.13               | 0.17           | 228.00          |
|       |         | Salanpur Colliery OC                                        | 0.42               | 0.55           |                 |
|       |         | Katrae Choitudih Colliery OC                                | 0.5                | 0.65           |                 |
|       |         | a) Amalgamated Keshalpur & West Mududih<br>UG               | 0.60               | 0.78           | 325.00          |
|       |         | b) Amalgamated Keshalpur & West Mududih<br>OC               | 4.9                | 6.37           |                 |
|       |         | Amalgamated Angarpathra & Ramkanali<br>colliery UG          | 0.190              | 0.25           | 254.64          |
| V     |         | Nichatpur 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 Barsajore Colliery (Mixed)                           | 0.75               | 0.975          | 249.63          |
|       |         | Kankanee Colliery (Mixed)                                   | 0.48               | 0.624          | 258.12          |
|       |         | Barsdeopur Colliery (Mixed)                                 | 0.676              | 0.879          | 104.72          |
|       |         | Loyabed UG Mine<br>(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  |
|      | Pathardih (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   | Gopalchuk 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   |
|      | Bhagbandh UG Mine                                           | 0.08  | 0.104 | 581.17  |
|      | Moondih 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  |
|      | Moondih Washery                                             | 1.60  | 1.60  | 0.27*   |
| XIII | Muruldih 20/21 pits                                         | 0.18  | 0.234 | 571.32  |
|      | Bhurungyn colliery                                          | nil   | nil   | 170.44  |
|      | Muchradih colliery                                          | nil   | nil   | 83.23   |
|      | Hantoodih colliery                                          | nil   | nil   | 193.41  |
|      | Padugora colliery                                           | nil   | nil   | 17.6    |
|      | Muruldih colliery                                           | nil   | nil   | 547.0   |
|      | Bhatdes colliery                                            | nil   | nil   | 313.62  |
| XIV  | Lohapatty UG Mine                                           | 0.03  | 0.039 | 1577.22 |
|      | Lohapatty OC Mine                                           | 0.375 | 0.487 |         |
| XV   | Kharkhara 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 Kalayneshwari OCP                                  | 4     | 5.2   | 851.83  |
|      | Proposed Kalayneshwari 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                                   |
|      | Gondadih Khas kusunda Colliery     | 2.000 | 2.600 | 410                                      |
|      | Godhar Colliery                    | 2.000 | 2.6   | 162.72                                   |
| VII  | Dhanur UG                          | 0.372 | 0.484 | 174.12                                   |
|      | Dhanur 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                                   |
|      | Burrigh UG                         | 0.170 | 0.221 | 147.83                                   |
|      | Simlabahal UG                      | 0.250 | 0.325 | 178.13                                   |
|      | Hurildih UG                        | 0.090 | 0.117 | 127.17                                   |
|      | Bhutgoria UG (Re-opening Proposed) | 0.360 | 0.468 | 131.67                                   |
|      | Kustor UG (Closed)                 | -     | -     | 250.71                                   |
|      | East Bhugatdih UG (Closed)         | -     | -     | 242.62                                   |
|      | Vishwakarma OC (Proposed)          | 0.700 | 0.910 | 43.5 (Within<br>Dhanur &<br>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 |                                          |
|      | Dohari Colliery (UG)               | 0.24  | 0.312 | 146.90                                   |
|      | Kuya OCP                           | 0.60  | 0.780 |                                          |
|      | Kuya UG                            | 0.10  | 0.130 | 340.50                                   |
|      | 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   | Lodra (UG)                         | 0.115 | 0.150 | 391.64                                   |
|      | North Tara (UG)                    | 0.15  | 0.195 | 246.24                                   |
|      | NT/ST (OCP)                        | 1.65  | 2.145 | 256.13                                   |
|      | Jalgora (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                                   |
|      | Banuree (UG)                       | 0.17  | 0.221 | 475.00                                   |
|      | NT/ST EXPANSION (OCP)              | 6.0   | 7.8   | 755.15                                   |
|      |                                    |       |       |                                          |



**Annexure - II**

|                                                                                                                                                                                                           |                                                                                   |                                                                                                                                                                                                                                           |
|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>भारत कोकिंग कोल लिमिटेड</b><br>(एक मिनी रत्न कंपनी)<br>योजना एवं परियोजना विभाग<br>कोयला भवन कोयला नगर<br>धनबाद- 826005<br>दूरभाष-0326-2230276<br>ईमेल: gmpp@bccl.gov.in<br>CIN: U10101JH1972GO1000918 |  | <b>Bharat Coking Coal Limited</b><br>(A Mini Ratna Company)<br><b>Planning &amp; Project Division</b><br>Koyle Bhawan, Koyle Nagar<br>Dhanbad- 826 005<br>Telephone-0326-2230276<br>Email- gmpp@bccl.gov.in<br>CIN: U10101JH1972GO1000918 |
|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|

पत्रांक: बी.सी.सी.एल. मुठ महाप्रबंधक (पौ. उ. परि.)/फ-15/15/ 23)

Dated-17.06.2015

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



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.

संलग्नक यशोपरि

भवदीय

*[Signature]*  
 महाप्रबंधक (योजना एवं परियोजना)

प्रतिलिपि:

महाप्रबंधक, कतरास एरिया, बी सी सी एल, धनबाद



**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

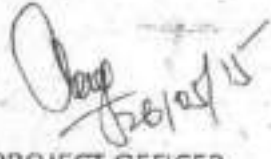
Subject:- Submission of draft Mining Plan of AKWM Colliery(Cluster-IV).

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

  
PROJECT OFFICER  
AKWMC

Annexure-III

|                                                                                                                                                                                                                                |                                                                                   |                                                                                                                                                                                                                                                         |
|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <p><b>भारत कोकिंग कोल लिमिटेड</b><br/>(एक मिनी रत्न कंपनी)<br/>योजना एवं परियोजना विभाग<br/>कोयला भवन कोयला नगर<br/>धनबाद- 826005<br/>दूरभाष-0326-2230276<br/>ईमेल: gmppl.bocl@coalindia.in<br/>CIN: U10101JH1972GO1000918</p> |  | <p><b>Bharat Coking Coal Limited</b><br/>(A Mini Ratna Company)<br/>Planning &amp; Project Division<br/>Koyla Bhawan, Koyla Nagar<br/>Dhanbad- 826 005<br/>Telephone-0326-2230276<br/>Email- gmppl.bocl@coalindia.in<br/>CIN: U10101JH1972GO1000918</p> |
|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|

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-III,  
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 - 826006  
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: भाकोलि/उप महाप्रबंधक(पर्या)/फाईल-Cluster-IV /2016/851- दिनांक: 16.01.2017  
254/M)

सेवा में,  
महाप्रबंधक - योजना एवं परियोजना  
भाकोलि/कोयला, 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 R.O. 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,

*[Signature]* 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. *77/11*  
 Ref: DyGM(Env)/T-DMC/15/ *1034* Dated 19-01-2015  
*30*

Subj: 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, R-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.

*[Signature]*  
Dy GM(Env)

Director (T)Op *20/1/15*

*RD, RT II*

*Copd - D.T. (T)Op - for information*

*1/2/15*

This Space is not for use.

BCCL Form 24/2011-14-308 Form-1 2011-14

**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           | 375.0 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          |
|       |         | Muradiah Colliery (Mixed)                                   | 5.5                | 7.15           | 536.41          |
|       |         | Phularitand OCP                                             | 3.0                | 3.90           | 401.00          |
| III   |         | Jogdih 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<br>Opencast Project<br>UG Mine        | 1.000<br>0.135     | 1.300<br>0.176 | 347.38          |
|       |         | Block-IV/Kooridih Mixed Mine<br>Opencast Project<br>UG Mine | 1.100<br>0.080     | 1.430<br>0.104 | 149.00          |
| IV    |         | Salanpur Colliery UG                                        | 0.13               | 0.17           | 228.00          |
|       |         | Salanpur Colliery OC                                        | 0.42               | 0.55           |                 |
|       |         | Katrae Choitudih Colliery OC                                | 0.5                | 0.65           |                 |
|       |         | a) Amalgamated Keshalpur & West Mududih<br>UG               | 0.60               | 0.78           | 325.00          |
|       |         | b) Amalgamated Keshalpur & West Mududih<br>OC               | 4.9                | 6.37           |                 |
|       |         | Amalgamated Angarpathra & Ramkanali<br>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 Barsajore Colliery (Mixed)                           | 0.75               | 0.975          | 249.63          |
|       |         | Kankanee Colliery (Mixed)                                   | 0.48               | 0.624          | 258.12          |
|       |         | Barsdeopur Colliery (Mixed)                                 | 0.676              | 0.879          | 104.72          |
|       |         | Loyabed UG Mine<br>(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  |
|      | Pathardih (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   | Gopalchak UG Project                                         | 0.11  | 0.143 | 241.94  |
|      | Kachi Bahari 10/12 Pit UG Mine                               | 0.09  | 0.117 | 60.00   |
|      | P3 Project (UG Mine)                                         | 0.80  | 1.040 | 89.00   |
|      | Bhagabandh UG Mine                                           | 0.08  | 0.104 | 581.17  |
|      | Moordih 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 Bahari 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  |
|      | Muchrasdih colliery                                          | nil   | nil   | 83.23   |
|      | Hantoodih colliery                                           | nil   | nil   | 193.41  |
|      | Padugora colliery                                            | nil   | nil   | 17.6    |
|      | Murulidih colliery                                           | nil   | nil   | 547.0   |
|      | Bhatdes colliery                                             | nil   | nil   | 315.62  |
| XIV  | Lohapatty UG Mine                                            | 0.03  | 0.039 | 1577.22 |
|      | Lohapatty OC Mine                                            | 0.375 | 0.487 |         |
| XV   | Kharikhar 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     | 377.50  |
| 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  |
|      | Danagora Colliery                                            | 0     | 0     | 620.0   |
|      | Proposed Kalayneshwari OCP                                   | 4     | 5.2   | 851.83  |
|      | Proposed Kalayneshwari 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  | Dhanisar UG                        | 0.372 | 0.484 | 174.12                                     |
|      | Dhanisar 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                                     |
|      | Burngarh UG                        | 0.170 | 0.221 | 147.83                                     |
|      | Sintlabahal UG                     | 0.250 | 0.325 | 178.13                                     |
|      | Humladih 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<br>Dhanisar &<br>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 |                                            |
|      | Dohari Colliery (UG)               | 0.24  | 0.312 | 146.90                                     |
|      | Kuya OCP                           | 0.60  | 0.780 |                                            |
|      | Kuya UG                            | 0.10  | 0.130 | 340.50                                     |
|      | 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   | Lodra (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                                     |
|      | Jailgora (UG) Closed               | NIL   | NIL   | 138.00                                     |
|      | Bagdigi (UG)                       | 0.11  | 0.143 | 61.00                                      |
|      | Joyrampur (UG)                     | 0.153 | 0.199 | 98.04                                      |
|      | Jetnagora (OC)                     | 0.7   | 0.91  | 276.05                                     |
|      | Baruree (UG)                       | 0.17  | 0.221 | 475.00                                     |
|      | NT/ST EXPANSION (OCP)              | 6.0   | 7.8   | 755.15                                     |



## Annexure-II

|                                                                                                                                                                                                                 |                                                                                   |                                                                                                                                                                                                                                          |
|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>भारत कोकिंग कोल लिमिटेड</b><br>(एक मिनी रतना कंपनी)<br><b>योजना एवं परियोजना विभाग</b><br>कोयला भवन कोयला नगर<br>धनबाद- 826005<br>दूरभाष-0326-2230276<br>ईमेल: gmpp@bcd.gov.in<br>CIN: U10101JH1972GO1000918 |  | <b>Bharat Coking Coal Limited</b><br>(A Mini Ratna Company)<br><b>Planning &amp; Project Division</b><br>Koyla Bhawan, Koyla Nagar<br>Dhanbad- 826 005<br>Telephone-0326-2230276<br>Email- gmpp@bcd.gov.in<br>CIN: U10101JH1972GO1000918 |
|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|

संश्लेषक: बी.सी.सी.एल/महाप्रबंधक (वी. ए. एच.)/क-76/16/ 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/2016/1289 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: सूचनायें  
महाप्रबंधक, कतरास, बी.सी.सी.एल.  
विभागाध्यक्षक (पर्यावरण), बी.सी.सी.एल.

D:\BCCL\Letter-16

77

Annexure-III

|                                                                                                                                                                                                                                |                                                                                   |                                                                                                                                                                                                                                                         |
|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <p><b>भारत कोकिंग कोल लिमिटेड</b><br/>(एक मिनी रत्न कंपनी)<br/>योजना एवं परियोजना विभाग<br/>कोयला भवन कोयला नगर<br/>धनबाद- 826005<br/>दूरभाष-0326-2230276<br/>ईमेल: gmppl.bcci@coalindia.in<br/>CIN: U10101JH1972GO1000918</p> |  | <p><b>Bharat Coking Coal Limited</b><br/>(A Mini Ratna Company)<br/>Planning &amp; Project Division<br/>Koyla Bhawan, Koyla Nagar<br/>Dhanbad- 826 005<br/>Telephone-0326-2230276<br/>Email- gmppl.bcci@coalindia.in<br/>CIN: U10101JH1972GO1000918</p> |
|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|

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-III,  
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 - 826006  
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: भाकोलि/उप महाप्रबंधक(पर्या)/फाईल-Cluster-IV /2016/851- दिनांक: 16.01.2017  
254/M)

सेवा में,  
महाप्रबंधक - योजना एवं परियोजना  
भाकोलि/कोयला, 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 R.O. 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,

*[Signature]* 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




**JOINTING SHEET**

Dept: Environment Dept.

Ref: DyCM/Env-VI-ENP/11/1496 Dated 29-01-2015

Subj: 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 18.01.2015 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. This 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, RJI for preparing Mine Plan for all the mines of Cluster 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.

By GM/Env

Director (DOP)

RD, RT II

Copd - D.T. (P&P) - For information

For spec. action

20/1/15

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BCCL Form No. 2/12-14-2014 Page 1 of 1



Annexure-II

18

**BCCL**



**भारत कोकिंग कोल लिमिटेड**  
( एक निजी रत्न कंपनी )  
( कोल इण्डिया लिमिटेड का एक उपक्रम )  
महाप्रबंधक का कार्यालय, कतरास क्षेत्र  
पोस्ट: सिजुआ, धनबाद पिन: 828121  
CIN U10101JH1972GOI000818  
[www.bccl.gov.in](http://www.bccl.gov.in)

सन्दर्भ : मा.को.को.लि.म.प्र.क.क्षो/15/A-2/1210 दिनांक : 11.04.2015

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

Cum P  
12/4/15

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 विश्वारी

महाप्रबंधक  
कतरास क्षेत्र

संलग्नक :

1. Draft Mining Plan

प्रतिलिपि :

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

## NOTING SHEET

Deptt: Environment Deptt.

Ref: DyGM(Env)/F-EMP/15/77/N

Dated 19-01-2015

20

Subj: 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.

*[Signature]*  
Dy GM(Env)

Director (Top)

RD, RI II

Copy - D.T. (P&amp;T) - For information

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BCCL Form 60/31/13-14-2009 (Rev. 1) 1001/15

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**Annexure - I**

**NOTING SHEET**

Dept: Environment Dept. *77/n*  
 Ref: DyGM(Env)/T-DM/15/ *103/n* Dated 19.01.2015  
*30*

Subj: 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 2-12-2009. It is proposed to obtain post facto approval of BCCL Board of Directors.

Competent authority is requested to direct RD CMPDI, R-II for preparing Mine Plan for all the mines of Clusters for which EC has been granted/spolied, 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.

*By GM(Env)*  
Dy GM(Env)

Director (T)Op *20/1/15*

*RD, RT II*

*Copy - D.T. (T)Op - for information*

*40/15*

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BCCL Form 22/2011-14 - 300 Pages, 400 Lines

**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           | 375.0 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          |
|       |         | Muradiah 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<br>Opencast Project<br>UG Mine        | 1.000<br>0.135     | 1.300<br>0.176 | 347.38          |
|       |         | Block-IV/Kooridih Mixed Mine<br>Opencast Project<br>UG Mine | 1.100<br>0.080     | 1.430<br>0.104 | 149.00          |
| IV    |         | Salanpur Colliery UG                                        | 0.13               | 0.17           | 228.00          |
|       |         | Salanpur Colliery OC                                        | 0.42               | 0.55           |                 |
|       |         | Katras Choitudih Colliery OC                                | 0.5                | 0.65           |                 |
|       |         | a) Amalgamated Keshalpur & West Mududih<br>UG               | 0.60               | 0.78           | 325.00          |
|       |         | b) Amalgamated Keshalpur & West Mududih<br>OC               | 4.9                | 6.37           |                 |
|       |         | Amalgamated Angarpathra & Ramkanali<br>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 Barajore Colliery (Mixed)                            | 0.75               | 0.975          | 249.63          |
|       |         | Kankanee Colliery (Mixed)                                   | 0.48               | 0.624          | 258.12          |
|       |         | Barsdeopur Colliery (Mixed)                                 | 0.676              | 0.879          | 104.72          |
|       |         | Loyabed UG Mine<br>(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   | Gopalchak UG Project                                         | 0.11  | 0.143 | 241.94  |
|      | Kachi Bahari 10/12 Pit UG Mine                               | 0.09  | 0.117 | 60.00   |
|      | P3 Project (UG Mine)                                         | 0.80  | 1.040 | 89.00   |
|      | Bhagabandh UG Mine                                           | 0.08  | 0.104 | 581.17  |
|      | Moondih 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 Bahari 5/6 Pit UG Mine (Closed for production)         | Nil   | Nil   | 120.71  |
|      | Moonidih Washery                                             | 1.60  | 1.60  | 0.27*   |
| XIII | Muruldih 20/21 pits                                          | 0.18  | 0.234 | 571.32  |
|      | Bhurungya colliery                                           | nil   | nil   | 170.44  |
|      | Muchrasdih colliery                                          | nil   | nil   | 83.23   |
|      | Hantoodih colliery                                           | nil   | nil   | 193.41  |
|      | Padugora colliery                                            | nil   | nil   | 17.6    |
|      | Muruldih colliery                                            | nil   | nil   | 547.0   |
|      | Bhatdes colliery                                             | nil   | nil   | 315.62  |
| XIV  | Lohapatty UG Mine                                            | 0.03  | 0.039 | 1577.22 |
|      | Lohapatty OC Mine                                            | 0.375 | 0.487 |         |
| XV   | Kharkhane 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 Kalayneshwari OCP                                   | 4     | 5.2   | 851.83  |
|      | Proposed Kalayneshwari 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  | Dhanisar UG                        | 0.372 | 0.484 | 174.12                                     |
|      | Dhanisar 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                                     |
|      | Burnagarh UG                       | 0.170 | 0.221 | 147.83                                     |
|      | Sintlabahal UG                     | 0.250 | 0.325 | 178.13                                     |
|      | Humladih 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<br>Dhanisar &<br>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 |                                            |
|      | Dohari Colliery (UG)               | 0.24  | 0.312 | 146.90                                     |
|      | Kuya OCP                           | 0.60  | 0.780 |                                            |
|      | Kuya UG                            | 0.10  | 0.130 | 340.50                                     |
|      | 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   | Lodra (UG)                         | 0.115 | 0.150 | 391.64                                     |
|      | North Tista (UG)                   | 0.15  | 0.195 | 246.24                                     |
|      | NT/ST (OCP)                        | 1.63  | 2.145 | 256.13                                     |
|      | Jesigora (UG) Closed               | NIL   | NIL   | 138.00                                     |
|      | Bagdigi (UG)                       | 0.11  | 0.143 | 61.00                                      |
|      | Joyrampur (UG)                     | 0.153 | 0.199 | 98.04                                      |
|      | Jetnagora (OC)                     | 0.7   | 0.91  | 276.05                                     |
|      | Baruree (UG)                       | 0.17  | 0.221 | 475.00                                     |
|      | NT/ST EXPANSION (OCP)              | 6.0   | 7.8   | 755.15                                     |

Annexure-II

|                                                                                                                                                                                                            |                                                                                   |                                                                                                                                                                                                                                           |
|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>भारत कोकिंग कोल लिमिटेड</b><br>(एक लिस्ती एरन कंपनी)<br>योजना एवं परियोजना विभाग<br>कोयला भवन कोयला नगर<br>धनबाद- 826005<br>दूरभाष-0326-2230276<br>ईमेल: gmpp@bccl.gov.in<br>CIN: U10101JH1972GO1000918 |  | <b>Bharat Coking Coal Limited</b><br>(A Mini Ratna Company)<br><b>Planning &amp; Project Division</b><br>Koyla Bhawan, Koyla Nagar<br>Dhanbad- 826 005<br>Telephone-0326-2230276<br>Email- gmpp@bccl.gov.in<br>CIN: U10101JH1972GO1000918 |
|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|

पत्रांक: बी.सी.सी.एल/ मु. महाप्रबंधक (यो. ए. परि.)/क-15/15/ 51

Dated-07.04.2015

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

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.

संलग्नक: यथोपरि

~kud(m)  
 Le  
 प्रतिलिपि

भवदीय  
 07/04/15  
 (आर एन प्रसाद)  
 मुख्य महाप्रबंधक (योजना एवं परियोजना)

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

Annexure-III

|                                                                                                                                                                                                                               |                                                                                   |                                                                                                                                                                                                                                                        |
|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <p><b>भारत कोकिंग कोल लिमिटेड</b><br/>(एक मिनी रत्न कंपनी)<br/>योजना एवं परियोजना विभाग<br/>कोयला भवन कोयला नगर<br/>धनबाद- 826005<br/>दूरभाष-0326-2230276<br/>ईमेल: gmpc.bccl@coalindia.in<br/>CIN: U10101JH1972GO1000918</p> |  | <p><b>Bharat Coking Coal Limited</b><br/>(A Mini Ratna Company)<br/>Planning &amp; Project Division<br/>Koyla Bhawan, Koyla Nagar<br/>Dhanbad- 826 005<br/>Telephone-0326-2230276<br/>Email- gmpc.bccl@coalindia.in<br/>CIN: U10101JH1972GO1000918</p> |
|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|

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-III,  
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: भाकोलि/उप महाप्रबंधक(पर्या)/फाईल-Cluster-IV /2016/851- दिनांक: 16.01.2017  
254/M)

सेवा में,  
महाप्रबंधक - योजना एवं परियोजना  
भाकोलि/कोयला, 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 R.O. 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,

*[Signature]* 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.bclweb.in)



पं.खा. :- कोयला भवन, कोयला नगर, धनबाद - 826005,  
Regd. Off: Koyla Bhawan, Koyla Nagar  
Dhanbad - 826005.  
CIN: U10101JH1972GOI000918  
दूरभाष: 0326-2230190  
ईमेल: cos.bcl@coalindia.in

बोर्ड सचिवालय / Board Secretariat

पत्रांक : बीसीसीएल/सीएस/एफ- 1(A)/2022/433(H)

दिनांक: 23.09.2022

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

विषय : **Certified copy of Minutes of 392<sup>nd</sup> 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 392<sup>nd</sup> Meeting of the Board of Directors of Bharat Coking Coal Limited held at Koyla Bhawan, 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.**

Encl: As above

भवदीय,

बी.के.पारुई  
कंपनी सचिव

GMLP887  
156212  
23/9/22  
24.9.22

GK  
23/9

Sri Behara

**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 7<sup>th</sup> 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 authorize 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 authorize 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 359<sup>th</sup> 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 Choitodih 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. 1<sup>st</sup> 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. Puroi  
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 Chaitudih 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. Puri**  
Company Secretary  
Bharat Coking Coal Limited  
Kovva 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. |
|---------|-------------------------------------------------------------|----------|
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| 2       | Exploration, Geology, Seam Sequence, Coal Quality & Reserve | 1-31     |
| 3       | Mining                                                      | 1-15     |
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| 7       | Environmental Management                                    | 1-17     |
| 8       | Progressive and final Mine Closure Plan                     | 1-10     |
|         | <b>PLANS</b>                                                |          |

## **LIST OF PLATES**

| <b>PLATES</b> |                                |
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| 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. 1<sup>st</sup> 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 VIIC 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          |
|       | <b>Total</b>                                   | <b>228.00</b> |

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<br>(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<br>(including GM and disputed) | 7.21         |
|         | <b>TOTAL</b>                          | <b>228</b>   |

## 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<br>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 VIIC 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 VIIC seam can be mined if adjacent mines are amalgamated in future |
| 1.5.11 | Gross Geological Reserve "Mt"                       |                       | 129.49 MT - Coking coal<br>149.68 MT- Non Coking coal                                                                                                                                                                                                                          |
| 1.5.12 | Net Geological Reserve "Mt"                         |                       | 117.72 MT - Coking coal<br>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 <sup>3</sup>                               | 17.186                | 178.43                                                                                                                                                                                                                                                                         |
| 1.5.21 | SR m <sup>3</sup> /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 from 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 (VIIB 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 |
| 25 | 429555.125520067 | 2630404.03965183 |
| 26 | 429554.162978721 | 2630397.37262295 |
| 27 | 429552.837764395 | 2630382.13649189 |
| 28 | 429551.886974927 | 2630372.82282448 |
| 29 | 429551.004697209 | 2630364.89983283 |
| 30 | 429550.751797019 | 2630362.61090616 |
| 31 | 429550.350606534 | 2630358.89666914 |
| 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          |



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|----|------------------|------------------|
| 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 |
| 58 | 429565.172535818 | 2630160          |
| 59 | 429563.512996618 | 2630149.71492152 |
| 60 | 429562.336098256 | 2630143.93930569 |
| 61 | 429562.185060082 | 2630142          |
| 62 | 429562.531528224 | 2630132.88923151 |
| 63 | 429562.700731279 | 2630127.33056646 |
| 64 | 429563.111698844 | 2630112.75789973 |
| 65 | 429563.520706854 | 2630105.08165427 |
| 66 | 429563.723950141 | 2630097          |
| 67 | 429563.907057346 | 2630094          |
| 68 | 429564.172422202 | 2630089.93592476 |
| 69 | 429564.432555491 | 2630083.76355705 |
| 70 | 429564.485775892 | 2630077.55827897 |
| 71 | 429565.163094793 | 2630060.47826044 |
| 72 | 429566.057591835 | 2630036          |
| 73 | 429566.759902138 | 2630025.32367967 |
| 74 | 429566.902910889 | 2630015.77344458 |
| 75 | 429566.628332872 | 2630006.30329912 |
| 76 | 429566.9         | 2629997.51799186 |
| 77 | 429567.301900333 | 2629987.26467322 |
| 78 | 429567.500293242 | 2629981.11782692 |
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| 79 | 429567.730625531 | 2629976.40154924 |
| 80 | 429567.819208687 | 2629971.96342087 |
| 81 | 429567.903461943 | 2629967.79431593 |
| 82 | 429568.111921622 | 2629962.11366531 |
| 83 | 429568.397244572 | 2629955.22281658 |
| 84 | 429568.491654446 | 2629948.30959325 |
| 85 | 429568.648285895 | 2629942.18078721 |
| 86 | 429568.807190288 | 2629938          |
| 87 | 429568.940483255 | 2629934.17791843 |
| 88 | 429568.796232957 | 2629930.89414401 |
| 89 | 429568.4         | 2629929.20229556 |
| 90 | 429568.317408237 | 2629927          |
| 91 | 429568.1         | 2629925.06675294 |
| 92 | 429567.895043303 | 2629921.56246333 |
| 93 | 429567.708044969 | 2629917.66160469 |

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| 94  | 429567.564945007 | 2629912.86072581 |
| 95  | 429566.986824485 | 2629904.94750122 |
| 96  | 429566.6         | 2629900.27298428 |
| 97  | 429566.488467552 | 2629899.99536836 |
| 98  | 429565.3         | 2629882.42331355 |
| 99  | 429564.9         | 2629875.32807107 |
| 100 | 429564.524861292 | 2629866.97363214 |
| 101 | 429563.973518521 | 2629856.68236118 |
| 102 | 429563.133843975 | 2629842          |
| 103 | 429562.102515084 | 2629826.12547413 |
| 104 | 429561.511442401 | 2629816.13362331 |
| 105 | 429560.805262272 | 2629810.09429172 |
| 106 | 429556.5         | 2629810.22372615 |
| 107 | 429540.082991474 | 2629819          |
| 108 | 429495.711657452 | 2629841          |
| 109 | 429440.558176182 | 2629869.17934746 |
| 110 | 429377.880139732 | 2629901.10451495 |
| 111 | 429348.010723819 | 2629915.85435972 |
| 112 | 429288.877527062 | 2629945.49409406 |
| 113 | 429263.709898038 | 2629958.28987456 |
| 114 | 429231.8         | 2629974.58691522 |
| 115 | 429191.7         | 2629998.56551006 |
| 116 | 429161.155768222 | 2630026.87998635 |
| 117 | 429143.985194339 | 2630046.59051043 |
| 118 | 429116.706182506 | 2630078.72300865 |
| 119 | 429117.309918547 | 2630101.33344629 |
| 120 | 429118.962666399 | 2630170.95337297 |
| 121 | 429094.025225662 | 2630170.53709191 |
| 122 | 429030.770374126 | 2630179.09840865 |
| 123 | 428949.595333533 | 2630190.50233366 |
| 124 | 428864.714558506 | 2630201.56113416 |
| 125 | 428808.951810725 | 2630223          |
| 126 | 428758.5         | 2630241.76683563 |
| 127 | 428695.005336939 | 2630265.26126672 |
| 128 | 428678.158334876 | 2630273.78307409 |
| 129 | 428616.513714539 | 2630304.83653985 |
| 130 | 428586.654401674 | 2630323.63207197 |
| 131 | 428537.913204812 | 2630355.89464513 |
| 132 | 428489.795797609 | 2630386.57322342 |
| 133 | 428424.2         | 2630428.44982603 |
| 134 | 428332           | 2630486.67207029 |
| 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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| 140 | 427997.807910756 | 2630963          |
| 141 | 428007.740380617 | 2630995.42236537 |
| 142 | 428028.129984771 | 2631062.27537364 |
| 143 | 428021.542573491 | 2631077.58327337 |
| 144 | 428041.178226937 | 2631138.62899207 |
| 145 | 428068.313710197 | 2631222.09934735 |
| 146 | 428077.094457251 | 2631249.84874982 |
| 147 | 428083.242582129 | 2631270.77497042 |
| 148 | 428097           | 2631302.31050114 |
| 149 | 428108.033841374 | 2631328.58228801 |
| 150 | 428114.888177411 | 2631344.93931092 |
| 151 | 428123.807262431 | 2631366.65344278 |
| 152 | 428131.322024643 | 2631384.76578268 |
| 153 | 428141.064912896 | 2631407.76426474 |
| 154 | 428149.480680119 | 2631428.39120468 |
| 155 | 428154.447858343 | 2631439.63699855 |
| 156 | 428174.887410042 | 2631476.35821998 |
| 157 | 428184.230667573 | 2631493          |
| 158 | 428187.904451733 | 2631506.43267297 |
| 159 | 428201.962007697 | 2631550.40183618 |
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| 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 |
| 170 | 428361.548352817 | 2631923.31979079 |
| 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 |
| 182 | 428626.315633428 | 2631959.53909671 |
| 183 | 428737.564013012 | 2631903.13176917 |
| 184 | 428757.611964585 | 2631893.52095533 |

|     |                  |                  |
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| 185 | 428832.675047844 | 2631785.97661887 |
| 186 | 428885.914469945 | 2631725.53145376 |
| 187 | 428956.004899205 | 2631711.50265638 |
| 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 |

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|----|------------------|------------------|
| 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<sup>2</sup>) 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<sup>2</sup> 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<sup>2</sup>). 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 |                                                                                                                         |
| ----- <b>Unconformity</b> ----- |                                 |                               |                                                                                                                         |
| <b>Lower Gondwana</b>           | 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. |
|                                 | ----- <b>Unconformity</b> ----- |                               |                                                                                                                         |
| 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<br>(KC009) | 19.33 (KC009) | 19.33  | 1  |
| P(V/VI-IV)      | 4.33             | 10.18         | 6.64   | 12 |
| IV              | 15.55<br>(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<br>1. Encountered in the working of IX, X & XI/XII, X, IX.<br>2. Encountered in workings of VIIC of East Katras Colliery.<br>3. Encountered in workings of VIIC of East Katras Colliery.<br>4. Encountered in quarry of VII & V/VI seams in Salanpur Colliery<br>5. III seam roof faulted in AP-73.<br>Seams in East Katras and adjoining Katras Choitudih Colliery. |
| 2       | F2-F2'    |                   | NE-SW with ESE dip. | 20m            | Dip Fault<br>1. Shifting of incrop of seams.<br>2. Omission of X seam in KC-14.<br>3. Omission of XIII Bot seam in KC-6<br>4. Encountered in the workings of IX/X, XI/XII, XIII & XIV.<br>5. Encountered in the workings of VIIC seam in East Katras and Katras-Choitudih collieries.<br>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.<br>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<br>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<br>1. Encountered in workings XVI(T), XVI(BOT) of Gaslitand Colliery.<br>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<br>1. Intersected in JSJ-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.<br>2. Omission of all the seam from XVII to XVIIIB/C in KC-4 |
| 9 | F20-F20' | 1.2  | E-W with northerly dip        | 40m | Curvilinear Fault<br>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<sup>2</sup>.

### 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&<br>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).

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

Where:

F = Fixed carbon %, VM = Volatile Matter %

A = Ash %, M = Moisture %

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

$$SG = 1.28 + (0.01A) \dots\dots\dots (ii)$$

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, VIIC, 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                        |                            |                                 |              |                  |                 |               |
| <b>TOTAL</b> |                             |                 | <b>253.8049</b>             | <b>13.35</b>               | <b>16.87</b>                    | <b>30.22</b> |                  | <b>14.82561</b> | <b>1.53</b>   |

### 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          | G12 | 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          |
| <b>TOTAL</b>                                                                    | <b>5.599</b> | <b>6.996</b> | <b>11.77</b> | <b>17.5</b> | <b>11.649</b> | <b>50.567</b> | <b>29.49</b> | <b>2.343</b> | <b>3.718</b> | <b>8.107</b> | <b>1.947</b> |     | <b>149.688</b> |

**Table No. - 2.8 (B)**

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

**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)**

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

**Table No.- 2.9 (B)**

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

### 2.2.19 Minalbe 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)**

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

### 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**

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

**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                                                                                                                                                                                                                                                                                                                                    |
|--------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>XVI Top</b>           | 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.                                                                                                         |
| <b>XVI Bottom</b>        | 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. |
| <b>XVA</b>               | The seam is partly quarried and rest is virgin.                                                                                                                                                                                                                                                                                           |
| <b>XV Top and Bottom</b> | 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.                                                                                                                        |

|                                       |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |
|---------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>XIV</b>                            | 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.                                                                                                                                                                                                                                                                                                                  |
| <b>XIII</b>                           | 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.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |
| <b>XII</b>                            | 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 Akashkinari colliery.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           |
| <b>XI</b>                             | 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.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |
| <b>X<br/>(Top and bottom section)</b> | 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.                  |
| <b>VIII C</b>            | Sseam is mostly developed and SOP and rest virgin.                                                                                            |
| <b>VIII B</b>            | Seam is developed in west-central portion and standing on pillars. Rest portion is virgin.                                                    |
| <b>VIII A</b>            | 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. |
| <b>Seam below VIII A</b> | Virgin                                                                                                                                        |

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

Thus, seam XVI T to VIIC 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° to 8° 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:

|     | <b>Coal<br/>(Mt)</b> | <b>OB<br/>(Mm3)</b> |
|-----|----------------------|---------------------|
| 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                |

|              | <b>Coal<br/>(Mt)</b> | <b>OB<br/>(Mm3)</b> |
|--------------|----------------------|---------------------|
| 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                |
| <b>Total</b> | <b>14.83</b>         | <b>178.43</b>       |

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  $37^{\circ}$ . 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  $70^{\circ}$  and  $80^{\circ}$  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 <sup>3</sup> |
| Loose OB to be handled       | 9.39 Mm <sup>3</sup>   |
| 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°                                |
| 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 VIIC 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  |

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

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

### 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<br>(Loose + In situ)              | Mm <sup>3</sup>    | 178.43 (in-situ)<br>9.39 (loose) |
| 3       | Av. Stripping Ratio<br>(considering only in situ) | m <sup>3</sup> /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° and 70° for coal and OB respectively, while for OB dump deck it is adopted as 37° ± 1°. 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:

| SI.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”:

|     | <b>Coal<br/>(Mt)</b> | <b>OB<br/>(Mm3)</b> |
|-----|----------------------|---------------------|
| 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                |



|              | <b>Coal<br/>(Mt)</b> | <b>OB<br/>(Mm3)</b> |
|--------------|----------------------|---------------------|
| Y24          | 0.59                 | 6.93                |
| <b>Total</b> | <b>14.83</b>         | <b>178.43</b>       |

**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

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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.

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## **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 Colliery, 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 Ramkanali 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 Submersible 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   |
|------------|---------------------------------------------------------------------------|----------------|---------|
| <b>1</b>   | <b>Water accumulation in the quarry:</b>                                  |                |         |
| <b>1.1</b> | <b>Maximum daily rainfall, h :</b>                                        | m              | 0.180   |
| <b>1.2</b> | <b>Catchment Areas :</b>                                                  |                |         |
| a)         | Maximum depth, d :                                                        | m              | 240     |
| b)         | Total Quarry Area to be Excavated, A                                      | m <sup>2</sup> | 1768000 |
| c)         | Maximum exposed area at any point of time = A1 (33% of total quarry area) | m <sup>2</sup> | 583440  |
| d)         | Area beyond Excavation = A2 (5% Of A)                                     | m <sup>2</sup> | 88400   |

|            |                                                                                                                                                                                  |                |        |
|------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------|--------|
| e)         | Internal Dump Area A3                                                                                                                                                            | m <sup>2</sup> | 859200 |
| <b>1.3</b> | <b>Assumed Run-off co-efficients:</b>                                                                                                                                            |                |        |
| a)         | For level terrain with thick soil cover                                                                                                                                          | n <sub>1</sub> | 0.70   |
| b)         | For area beyond Excavation                                                                                                                                                       | n <sub>2</sub> | 0.15   |
| c)         | For Internal dump area                                                                                                                                                           | n <sub>3</sub> | 0.10   |
| <b>1.4</b> | <b>Volume of Water accumulation in mine Q :</b>                                                                                                                                  |                |        |
| a)         | Volume of water likely to fall in Quarry, Q<br>= ( A <sub>1</sub> xn <sub>1</sub> xh + A <sub>2</sub> xn <sub>2</sub> xh + A <sub>3</sub> xn <sub>3</sub> xh)<br>Cum/day per day | Cum/day        | 91366  |
| b)         | Considering 10% seepage from surrounding strata, total water accumulation will be Q <sub>1</sub> = 1.1Q                                                                          | Cum/day        | 100502 |
| <b>2.1</b> | <b>Pumping capacity in Quarry :</b>                                                                                                                                              |                |        |
| 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- by 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<br>(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<br>(including GM and disputed) | 7.21         |
|         | <b>TOTAL</b>                          | <b>228</b>   |

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         |
|        | <b>Total</b>                                   | <b>228.00</b> |

### 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 Bungalow 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   |           |           |                    |                                       | <b>1117</b> | <b>632</b> | <b>267</b> |

**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 to be decided by Area/BCCL.

| 6.2   | DETAILS OF LEASE                                                                                  |                                                                         |
|-------|---------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------|
| 6.2.1 | Status of Lease                                                                                   | Renewed upto 7 <sup>th</sup> December 2030                              |
| 6.2.2 | Existing Lease Area "Ha"                                                                          | 228 Ha                                                                  |
| 6.2.3 | Period for which Mining Lease has been granted/ <del>is to be renewed/is to be applied for.</del> | 30 years from 8 <sup>th</sup> December 2000                             |
| 6.2.4 | Date of expiry of earlier Mining Lease, if any                                                    | 7 <sup>th</sup> 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 ( <del>applied</del> /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 | <b>Details of outside area:</b>                                                                   | 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                                                                                                                                                            |                                                                              |
|        | <ul style="list-style-type: none"> <li>▪ Purpose for which it is required, e.g. roads/ OB dumps/ service buildings/ colony/ safety zone/ others(specify)</li> </ul> | Not Applicable                                                               |
| 6.2.10 | <b>Whether some part(s) of the allotted block has not been applied for mining lease.</b>                                                                            | 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

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

|  |  |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             |
|--|--|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
|  |  | <p><b>Impact Assessment</b></p> <p>The ambient air quality is influenced due to the presence of PM10, PM2.5, SO<sub>2</sub>, NO<sub>2</sub>, etc., which are generated from above sources in operational and post operational stage.</p> <p>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.</p> <p>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:</p> <p><b>Core Zone:</b></p> <ul style="list-style-type: none"> <li>• Govindpur Village (A7): Industrial Area</li> <li>• Katras Chotudih (A37): Industrial Area</li> </ul> <p><b>Buffer Zone:</b></p> <ul style="list-style-type: none"> <li>• Block IV (A6) : industrial area</li> <li>• Nichitpur (A8): Industrial Area</li> <li>• Rudhi Basti(A18): Residential Area</li> </ul> <p>Air quality monitoring data at above stations for the period Jan 2022 to March 2022 is as given in the following tables.</p> |
|--|--|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|



# Mining Plan and Mine Closure Plan for Katras Choitudih Colliery

| 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  |

# Mining Plan and Mine Closure Plan for Katras Choitudih Colliery

| 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  |

# Mining Plan and Mine Closure Plan for Katras Choitudih Colliery

| 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.

# Mining Plan and Mine Closure Plan for Katras Choitudih Colliery

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: <b>Cluster -IV</b> |                        | Month: <b>Jan' 2022</b>       | Name of the Station: <b>Mine Discharge of Chotudih</b> |                                                      |
|-----------------------------------------|------------------------|-------------------------------|--------------------------------------------------------|------------------------------------------------------|
| <b>Sl. No.</b>                          | <b>Parameters</b>      | <b>MW4</b>                    | <b>MW4</b>                                             | <b>As per MOEF General Standards for schedule VI</b> |
|                                         |                        | First Fortnight<br>10.01.2022 | Second Fortnight<br>17.01.2022                         |                                                      |
| 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)                                            |

# Mining Plan and Mine Closure Plan for Katras Choitudih Colliery

| Name of the Cluster: <b>Cluster -IV</b> |                        | Month: <b>Feb' 2022</b>       | Name of the Station: <b>Mine Discharge of Chotudih</b> |                                               |
|-----------------------------------------|------------------------|-------------------------------|--------------------------------------------------------|-----------------------------------------------|
| Sl. No.                                 | Parameters             | MW4                           | MW4                                                    | As per MOEF General Standards for schedule VI |
|                                         |                        | First Fortnight<br>07.02.2022 | Second Fortnight<br>21.02.2022                         |                                               |
| 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: <b>Cluster -IV</b> |                        | Month: <b>March 2022</b>      | Name of the Station: <b>Mine Discharge of Chotudih</b> |                                               |
|-----------------------------------------|------------------------|-------------------------------|--------------------------------------------------------|-----------------------------------------------|
| Sl. No.                                 | Parameters             | MW4                           | MW4                                                    | As per MOEF General Standards for schedule VI |
|                                         |                        | First Fortnight<br>14.03.2022 | Second Fortnight<br>21.03.2022                         |                                               |
| 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:**

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

|  |  |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      |
|--|--|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
|  |  | <p>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.</p> <p>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.</p> <p><b>Water conservation measures</b></p> <ul style="list-style-type: none"> <li>• Provision of Rain water Harvesting system has been made for conservation of water.</li> <li>• Settling pond for surface run-off with drainage system shall be provided.</li> <li>• Closed water circuit will be provided.</li> </ul> <p><b>Impact on Noise level</b></p> <p>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:</p> <p><b>Core Zone:</b></p> <ul style="list-style-type: none"> <li>• Govindpur Village (A7): Industrial Area</li> <li>• Katras Chotudih (A37): Industrial Area</li> </ul> <p><b>Buffer Zone:</b></p> <ul style="list-style-type: none"> <li>• Block IV (A6) : industrial area</li> <li>• Nichitpur (A8): Industrial Area</li> <li>• Rudhi Basti(A18): Residential Area</li> </ul> <p>Noise level data at the aforementioned stations is as given below:</p> |
|--|--|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|



# Mining Plan and Mine Closure Plan for Katras Choitudih Colliery

| Name of the Project : <b>Cluster -IV</b> |                  |            | Station Name: <b>A7, Govindpur</b> |                                                           |
|------------------------------------------|------------------|------------|------------------------------------|-----------------------------------------------------------|
| Sl. No.                                  | Category of area | Date       | Noise level<br>dB(A)LEQ            | <i>*Permissible<br/>Limit of Noise<br/>level in dB(A)</i> |
| 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 : <b>Cluster -IV</b> |                  |            | Station Name: <b>A37, Katras<br/>Chotudih</b> |                                                           |
|------------------------------------------|------------------|------------|-----------------------------------------------|-----------------------------------------------------------|
| Sl. No.                                  | Category of area | Date       | Noise level<br>dB(A)LEQ                       | <i>*Permissible<br/>Limit of Noise<br/>level in dB(A)</i> |
| 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                                                        |

# Mining Plan and Mine Closure Plan for Katras Choitudih Colliery

| Name of the Project : <b>Cluster -IV</b> |                  |            | Station Name: <b>A6,Block IV</b> |                                                           |
|------------------------------------------|------------------|------------|----------------------------------|-----------------------------------------------------------|
| Sl. No.                                  | Category of area | Date       | Noise level<br>dB(A)LEQ          | <i>*Permissible Limit<br/>of Noise level in<br/>dB(A)</i> |
| 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 : <b>Cluster -IV</b> |                  |            | Station Name: <b>A8,Nichitpur</b> |                                                           |
|------------------------------------------|------------------|------------|-----------------------------------|-----------------------------------------------------------|
| Sl. No.                                  | Category of area | Date       | Noise level<br>dB(A)LEQ           | <i>*Permissible Limit<br/>of Noise level in<br/>dB(A)</i> |
| 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 : <b>Cluster -IV</b> |                  |            | Station Name: <b>A18,Rudhi Basti</b> |                                                           |
|------------------------------------------|------------------|------------|--------------------------------------|-----------------------------------------------------------|
| Sl. No.                                  | Category of area | Date       | Noise level<br>dB(A)LEQ              | <i>*Permissible Limit<br/>of Noise level in<br/>dB(A)</i> |
| 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 further 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             |

# Mining Plan and Mine Closure Plan for Katras Choitudih Colliery

|  |  |  |                      |       |       |       |       |  |
|--|--|--|----------------------|-------|-------|-------|-------|--|
|  |  |  |                      | 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<br>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 |      |  |  |  |  |  |
|  | <b>Post Closure</b> |  |  |     |      |  |  |  |  |  |
|  | 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                |        |                                   |      |                         |    |
|                                                                                                                              |                                        | 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                      |
|                     | <i>Plantation over virgin area including green belt</i>               | 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                      |
| <b>Dismantling of Infrastructure &amp; Disposal / rehabilitation of Mining Machinery</b> | 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                      |
| <b>Safety and Security</b>                                                               | 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         |          | -                            | -                              |
|                                                                                          | Filling of Void                                                                                                 |           |          | -                            | -                              |
| <b>Technical and Biological Reclamation of Mined Out of land and OB Dump</b>             | 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                      |
|                                                                                          | Power Cost                                                                                                      | LS        | 1        | 0.09                         | 0.0927125                      |
| <b>Post Closure management and supervision</b>                                           | 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.                                         |      |          |                              |                                |
| <b>Total</b> |                                                                                                     |      |          | <b>30.5801</b>               |                                |

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    | Amount to be deposited into escrow account annually |         |       |
| WPI as on base date                                          | Mar-22    | 148.9    |                                                     |         |       |
| Escalation rate of Closure cost                              |           | 1.229562 | Year                                                | OC      | Year  |
|                                                              | UG        | OC       |                                                     |         | UG    |
| Base Rate of Closure Cost "Rs. Crs/Ha"                       | 0.015     | 0.09000  |                                                     |         | Total |
| Closure Cost "Rs. Crs/Ha"                                    | 0.0184434 | 0.11066  | Y1                                                  | 0.50145 | Y-1   |
| Project Area                                                 | 39.83     | 176.800  | Y2                                                  | 0.52652 | Y-2   |
| Amount to be deposited into Escrow Account "Rs. in Crs."     | 0.734602  | 19.56480 | Y3                                                  | 0.55285 | Y-3   |
| Amount already deposited into Escrow Account "Rs. in Crs."   |           | 7.53000  | Y4                                                  | 0.58049 | Y-4   |
| Amount already released from Escrow Account "Rs. in Crs."    |           |          | Y5                                                  | 0.60952 | Y-5   |
| Net Amount to be deposited into Escrow Account "Rs. in Crs." | 0.734602  | 12.03480 | Y6                                                  | 0.63999 | Y-6   |
| Rate of compounding of Annual Closure Cost                   | 5.00%     |          | Y7                                                  | 0.67199 | Y-7   |
| Balance Life of the project "in yrs"                         | 24        |          | Y8                                                  | 0.70559 | Y-8   |
|                                                              |           |          | Y9                                                  | 0.74087 | Y-9   |
|                                                              |           |          | Y10                                                 | 0.77791 | Y-10  |
|                                                              |           |          | Y11                                                 | 0.81681 | Y-11  |
|                                                              |           |          | Y12                                                 | 0.85765 | Y-12  |
|                                                              |           |          | Y13                                                 | 0.90053 | Y-13  |
|                                                              |           |          | Y14                                                 | 0.94556 | Y-14  |

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

Mining and Mine Closure Plan of Katras Choitudih 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                 |                       | <b>753.0</b>    |
| Amount to be Deposited in the Escrow Account in the Future | <b>73.460</b>         | <b>2231.552</b> |
| <b>Total Amount available for Mine Closure Activities</b>  | <b>73.460</b>         | <b>2984.552</b> |
| <b>Grand Total</b>                                         | <b>3058.012</b>       |                 |

The amount deposited in Escrow Accounts is appended below:

| Name of Mine: Katras Chatudih OC Mine<br>Escrow account no: 00150100010086 |           |              |              |
|----------------------------------------------------------------------------|-----------|--------------|--------------|
| S.No<br>:                                                                  | 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 | -            | -            |
| <b>Total</b>                                                               |           | <b>753.0</b> | <b>753.0</b> |

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 | 312 <sup>th</sup> Board of BCCL | 13.12.2014<br>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 U10305JH1972GU100918

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

Date: 22.11.2017

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.

Encl. As above

General Manager  
Katras Area, BCCL

Yours faithfully,

Chief Manager (Env.)  
Katras Area  
BCCL

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

Annexure - I

गैरगजरा जंगल-श्राद्धी (Deemed Forest) भूमि की विवरणी (प्रपत्र III)

श्राद्धी का नाम - बाघभारा, जिला का नाम - धनबाद

| अर्बल का नाम - बाघभारा, जिला का नाम - धनबाद |           |          |          |      |                                                                                 |        |       |                               |     |      |                 |     |      |           |
|---------------------------------------------|-----------|----------|----------|------|---------------------------------------------------------------------------------|--------|-------|-------------------------------|-----|------|-----------------|-----|------|-----------|
| क्रमांक                                     | अर्बल     | मौजा     | शाना नं० | खेता | लॉट                                                                             | रकबा   | किस्म | बंदोबस्त / इस्तेमाल के विवरणी |     |      | की विवरणी (7-9) |     |      | अभिपुष्टि |
|                                             |           |          |          |      |                                                                                 |        |       | खेता                          | लॉट | रकबा | खेता            | लॉट | रकबा |           |
| 1                                           | 2         | 3        | 4        | 5    | 6                                                                               | 7      | 8     | 9                             |     |      | 10              |     |      | 11        |
| 1                                           | बाघभारा   | गोपालपुर | 62       | -    | 37,111,38,613,438<br>447,201,614,300,255,2                                      | 270.88 |       |                               |     |      |                 |     |      |           |
| 2                                           | सोहनडीह   |          | 63       |      | 15,34                                                                           | 23.84  |       |                               |     |      |                 |     |      |           |
| 3                                           | बोराही    |          | 65       |      | 1,158                                                                           | 21.4   |       |                               |     |      |                 |     |      |           |
| 4                                           | विलेवा    |          | 69       |      | 87,7,18,29,725,747,699,<br>863,701,702,603,602                                  | 19.52  |       |                               |     |      |                 |     |      |           |
| 5                                           | नारायणपुर | 7        | 70       |      | 2,53,191,184,202,<br>408,453,394,299,<br>309,314                                | 60.98  |       |                               |     |      |                 |     |      |           |
| 6                                           | दरवा      |          | 71       |      | 2,300,373,433,503,<br>521,500,452,31                                            | 283.5  |       |                               |     |      |                 |     |      |           |
| 7                                           | हुलाडीह   |          | 72       |      | 123,127,156,179                                                                 | 47.68  |       |                               |     |      |                 |     |      |           |
| 8                                           | जानूडीह   |          | 73       |      | 20,23,212,238,236<br>237,67,68,673,672<br>671,889,898,1064<br>1061,983,1062,239 | 336.32 |       |                               |     |      |                 |     |      |           |
| 9                                           | माटीगादा  |          | 74       |      | 5,6,113,114,115<br>.118,119,32,33,<br>116,120,112                               | 443.2  |       |                               |     |      |                 |     |      |           |
| 10                                          | शेखरपुर   |          | 75       |      | 48,52,37,38,55,51,1,46                                                          | 246.91 |       |                               |     |      |                 |     |      |           |
| 11                                          | मीरकानली  |          | 76       |      | 26,248,355,281,262,273                                                          | 195.03 |       |                               |     |      |                 |     |      |           |
| 12                                          | बक्सपुरा  |          | 80       |      | 3,11,219,28                                                                     | 80.7   |       |                               |     |      |                 |     |      |           |

| क्रमांक | अंचल       | मौजा | धाना नं० | खाना | प्लॉट                                                                      | रकबा   | किसम | बंदोबस्त/प्रस्तावित/लीज गृहि की विवरणी |       |      |    | अभियुक्ति |
|---------|------------|------|----------|------|----------------------------------------------------------------------------|--------|------|----------------------------------------|-------|------|----|-----------|
|         |            |      |          |      |                                                                            |        |      | (7-9)                                  |       | रकबा | 11 |           |
|         |            |      |          |      |                                                                            |        |      | खाना                                   | प्लॉट |      |    |           |
| 1       | 2          | 3    | 4        | 5    | 6                                                                          | 7      | 8    | 9                                      |       |      |    | 10        |
| 13      | लुदीपकाही  |      | 81       |      | 2,13,148,160,5,14                                                          | 73.44  |      |                                        |       |      |    |           |
| 14      | आमदीह      |      | 64       |      | 5,154                                                                      | 12.1   |      |                                        |       |      |    |           |
| 15      | टामकलाहीह  |      | 86       |      | 1,3,75,82,201,203,85,246,288,130,88                                        | 131.55 |      |                                        |       |      |    |           |
| 16      | नावाहीह    |      | 102      |      | 327,328,331,389                                                            | 61.2   |      |                                        |       |      |    |           |
| 17      | बैहराकुंदर |      | 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      | अरमुनई     |      | 181      |      | 1                                                                          | 4.8    |      |                                        |       |      |    |           |
| 22      | महेशपुर    |      | 185      |      | 118                                                                        | 1.72   |      |                                        |       |      |    |           |
| 23      | कर्मपुरा   |      | 186      |      | 1,71                                                                       | 5.75   |      |                                        |       |      |    |           |
| 24      | लालदाक     |      | 207      |      | 142,118,88,87,80,78,74,402                                                 | 14.47  |      |                                        |       |      |    |           |
| 25      | बागादाहा   |      | 217      |      | 2163,2840,2970,2988,2987,2868,2860,2971,2975,2980,2935,2083,2331,2324,3452 | 80.12  |      |                                        |       |      |    |           |
|         |            |      | 217      |      | 9434,3433,3421,3231,3230,3227,3218,3208                                    |        |      |                                        |       |      |    |           |

| क्रमांक | अंचल       | मौजा | थाना नं० | खाला | प्लॉट                                                                                             | एकम    | किस्म | बंदोबस्त/कलामास/जीव भूमि की विवरणी |       |     |                 | अभियुक्ति |
|---------|------------|------|----------|------|---------------------------------------------------------------------------------------------------|--------|-------|------------------------------------|-------|-----|-----------------|-----------|
|         |            |      |          |      |                                                                                                   |        |       | खाला                               | प्लॉट | एकम | को विवरणी (7-9) |           |
| 1       | 2          | 3    | 4        | 5    | 6                                                                                                 | 7      | 8     | 9                                  |       |     |                 | 11        |
|         |            |      |          |      |                                                                                                   |        |       |                                    |       |     |                 |           |
|         |            |      | 217      |      | 3203, 3438, 3215, 2972, 2046                                                                      |        |       |                                    |       |     |                 |           |
|         |            |      |          |      | 1482                                                                                              |        |       |                                    |       |     |                 |           |
| 26      | बीआकला     |      | 228      |      | 1, 11, 2326, 2715, 2400, 2420, 2711, 2712, 2794, 78,                                              | 85.34  |       |                                    |       |     |                 |           |
| 27      | महोदर      |      | 180      |      | 3.40                                                                                              | 18.8   |       |                                    |       |     |                 |           |
| 28      | शिलाह      |      | 213      |      | 388, 383, 385, 1387, 1, 2, 3, 4, 7, 65, 77, 78, 89, 80, 81, 82, 132, 138, 134, 135, 383, 384, 385 | 132.11 |       |                                    |       |     |                 |           |
| 29      | फाटमाहुल   |      | 222      |      | 137, 148, 626, 1833, 1864                                                                         | 78.67  |       |                                    |       |     |                 |           |
| 30      | गोविन्दगढ़ |      | 221      |      | 833, 1, 1382, 2094                                                                                | 200.57 |       |                                    |       |     |                 |           |
| 31      | वासोरी     |      | 225      |      | 1, 200, 2421, 2448, 2641                                                                          | 21.92  |       |                                    |       |     |                 |           |
| 32      | पंचरही     |      | 220      |      | 774                                                                                               | 50     |       |                                    |       |     |                 |           |
| 33      | नगरीकला    |      | 230      |      | 1, 3                                                                                              | 35.3   |       |                                    |       |     |                 |           |
| 34      | हरिणा      |      | 101      |      | 225, 228                                                                                          | 34     |       |                                    |       |     |                 |           |
| 35      | भुगोडा     |      | 214      |      | 454, 343                                                                                          | 54.25  |       |                                    |       |     |                 |           |
| 36      | चुगी       |      | 191      |      | 519, 1232                                                                                         | 8.81   |       |                                    |       |     |                 |           |
| 37      | लोहपेट्टी  |      | 318      |      | 17, 28, 32, 83, 1604, 2284, 2078, 3278                                                            | 69.96  |       |                                    |       |     |                 |           |



| क्रमांक | वर्ष    | गोळा | धाना नं० | आवा | वर्ष                                                                                               | वर्ष   | किस्म | मंदी नसत / वसांतवसित / |    |        | की विवरणी |      |      | अभियुक्ति |
|---------|---------|------|----------|-----|----------------------------------------------------------------------------------------------------|--------|-------|------------------------|----|--------|-----------|------|------|-----------|
|         |         |      |          |     |                                                                                                    |        |       | सीज नसि                | की | विवरणी | आवा       | वर्ष | रकमा |           |
| 1       | 2       | 3    | 4        | 5   | 6                                                                                                  | 7      | 8     | 9                      | 10 | 11     | 12        | 13   | 14   | 15        |
| 98      | तेलमवडी |      | 320      |     | 2782,2798,2755,2943,2982<br>2942,2754,2797,2807                                                    | 102.9  |       |                        |    |        |           |      |      |           |
| 39      | मुन्नी  |      | 321      |     | 1,3,25,764,28,435,131,135,<br>142,436,434,850,814,812,7<br>01<br>.800,801,751,695,794,255,<br>739. | 167.48 |       |                        |    |        |           |      |      |           |
| 40      | तारना   |      | 308      |     | 1352,1876,1411.                                                                                    | 68.96  |       |                        |    |        |           |      |      |           |
|         |         |      |          |     | 3678.35                                                                                            |        |       |                        |    |        |           |      |      |           |

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



**GEODYNAMICS AND GEOHAZARDS DIVISION  
GEOSCIENCES GROUP  
REMOTE SENSING APPLICATIONS AREA  
NATIONAL REMOTE SENSING CENTRE  
INDIAN SPACE RESEARCH ORGANISATION  
DEPT. OF SPACE, GOVT. OF INDIA  
HYDERABAD-500 037**

**AUGUST, 2021**

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

## 7.2 Conclusions

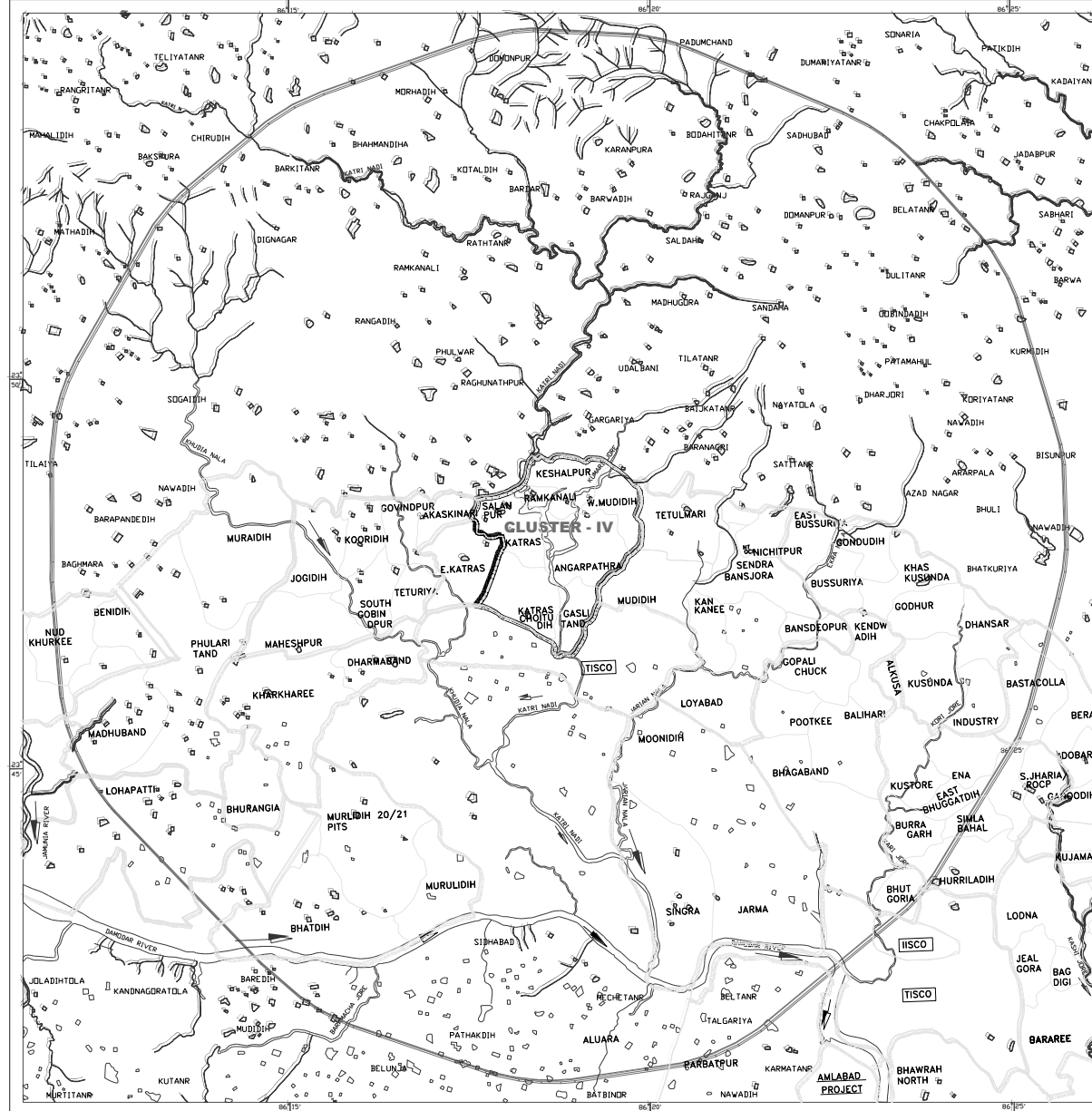
The following conclusions can be made:

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

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



# STUDY AREA MAP OF CLUSTER - IV SHOWING HYDROLOGICAL FEATURES



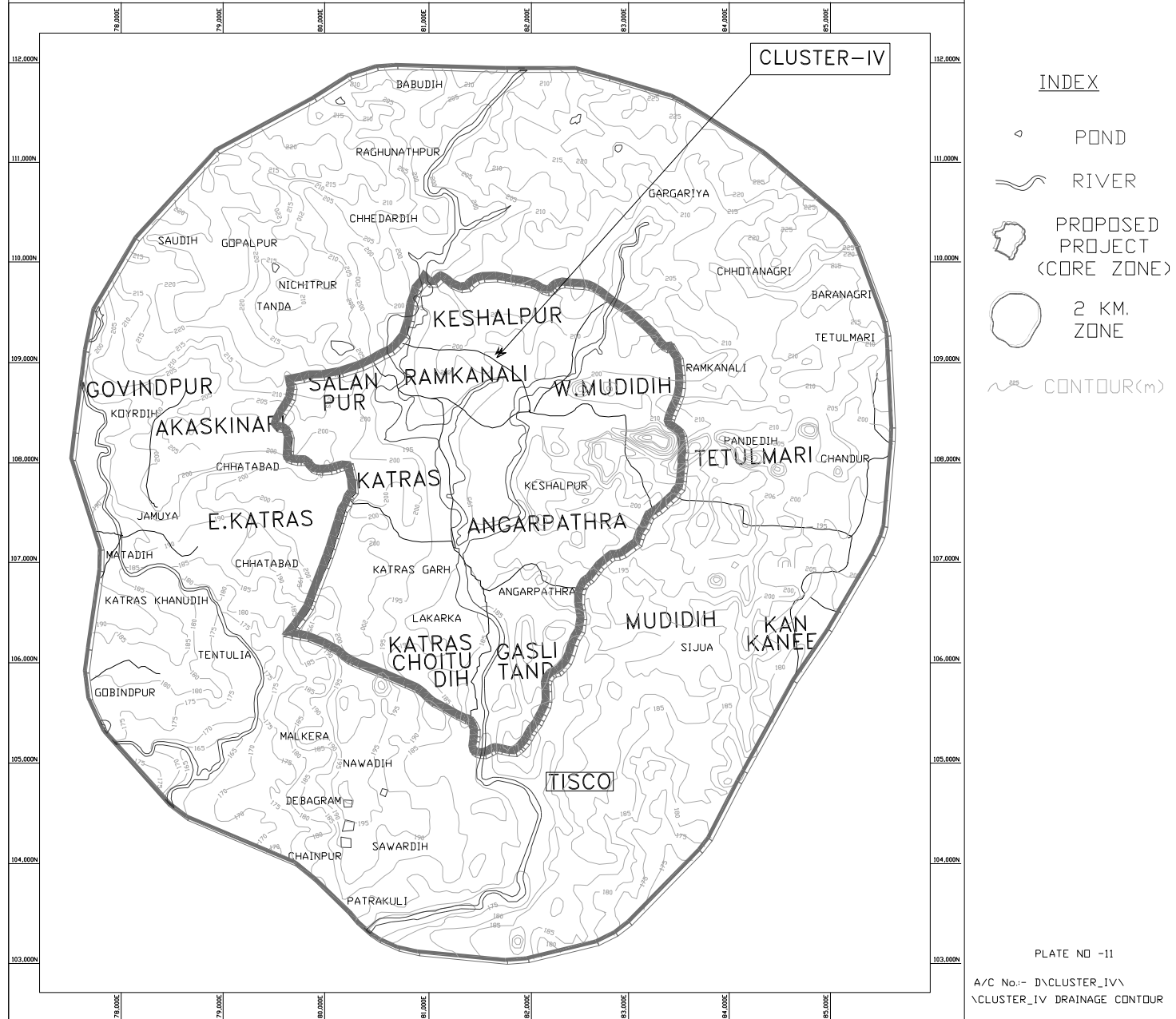
## INDEX

-  POND
-  RIVER
-  PROPOSED PROJECT (CORE ZONE)
-  BUFFER ZONE

PLATE NO-10

A/C NO. D\CLUSTER\_IV/  
HYDROLOGICAL PLAN

# STUDY AREA OF CLUSTER - IV SHOWING DRAINAGE CONTOUR



**INDEX**

- RIVER/NALA/JORE
- CMPDI OBSERVATION WELL
- CGWB OBSERVATION WELL
- WATER TABLE CONTOUR MAY - 2011
- EXISTING/ABANDONED OPENCAST MINES
- BUFFER ZONE
- CORE ZONE
- HILLS

WATER LEVEL IN METER (R.L.)  
FIGURE WITHIN PARENTHESIS IS WATER LEVEL BELOW GROUND LEVEL

PLATE NO.12

|                                                                 |                 |                    |                  |             |  |
|-----------------------------------------------------------------|-----------------|--------------------|------------------|-------------|--|
| <b>Customer:</b> BHARAT COKING COAL LIMITED                     |                 |                    |                  |             |  |
| <b>Job Title:</b> HYDROGEOLOGICAL STUDIES FOR EMP OF CLUSTER-IV |                 |                    |                  |             |  |
| <b>Subject:</b> WATER TABLE CONTOUR MAP OF CLUSTER-IV           |                 |                    |                  |             |  |
| <b>Activity</b>                                                 | <b>Name</b>     | <b>Designation</b> | <b>Signature</b> | <b>Date</b> |  |
| Prepared by                                                     | D.Bandyopadhyay |                    |                  | 05.2014     |  |
| Processed by                                                    | D.Bandyopadhyay |                    |                  |             |  |
| Checked by                                                      |                 |                    |                  |             |  |
| Approved by                                                     |                 |                    |                  |             |  |
| Scale 500 0 500 1500 M                                          |                 |                    | Sheet 1 OF 1     |             |  |

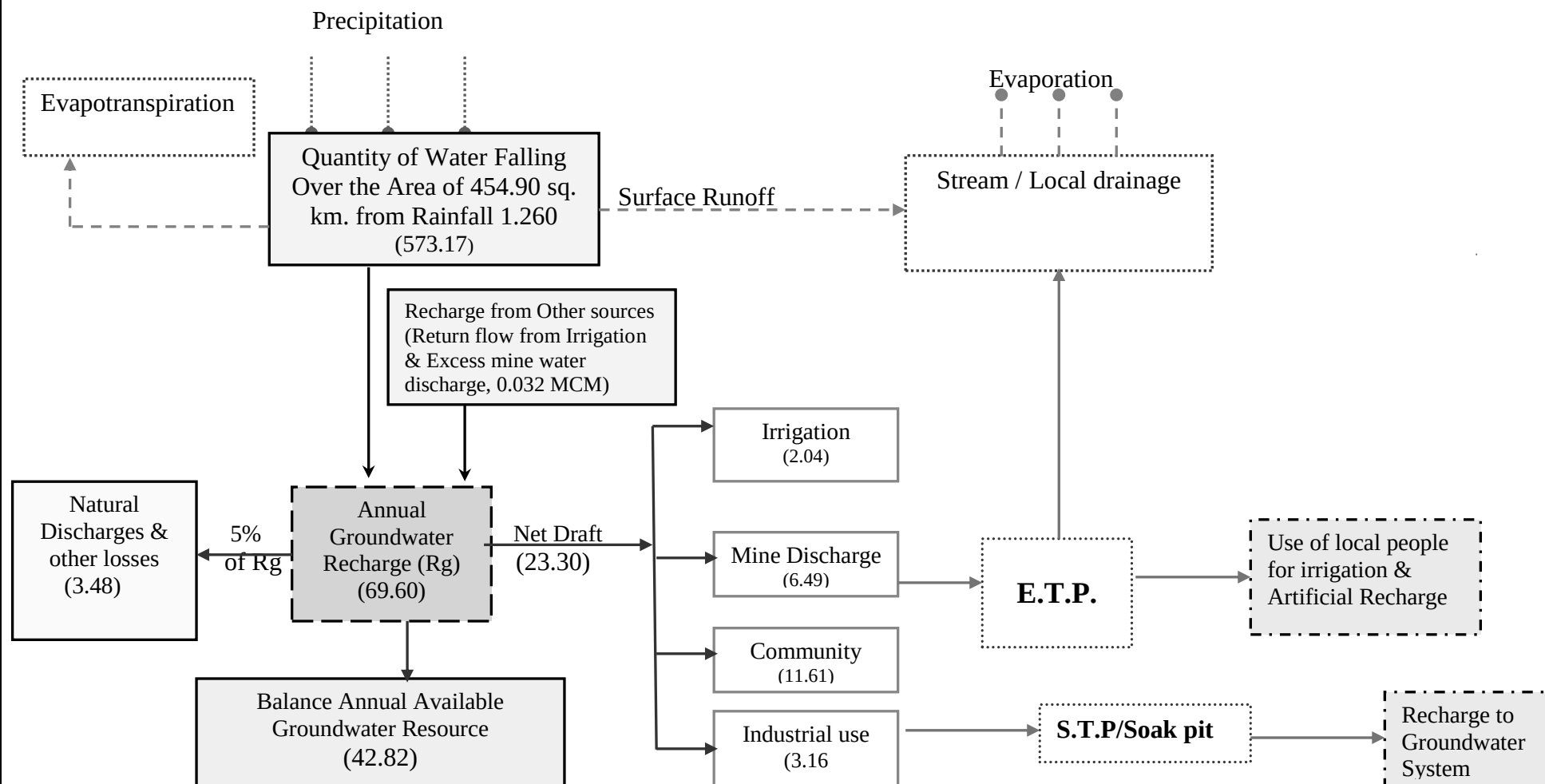
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|--------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------|----------------------------|-------------|-----------|------|-------------|-----------------|--|--|----------|--------------|-----------------|--|--|--|------------|--|--|--|--|-------------|--|--|--|--|--------------------------------------------------------|--|--|----------------------------|--|
| Customer <b>BHARAT COKING COAL LIMITED</b>                                                                                     |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |             |                            |             |           |      |             |                 |  |  |          |              |                 |  |  |  |            |  |  |  |  |             |  |  |  |  |                                                        |  |  |                            |  |
| Job Title<br><b>HYDROGEOLOGICAL STUDIES FOR EMP OF CLUSTER-IV</b>                                                              | Job No.<br><b>203006025</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |             |                            |             |           |      |             |                 |  |  |          |              |                 |  |  |  |            |  |  |  |  |             |  |  |  |  |                                                        |  |  |                            |  |
| Subject<br><b>WATER TABLE CONTOUR MAP<br/>         OF CLUSTER-IV</b>                                                           | <table border="1" style="width: 100%; border-collapse: collapse;"> <thead> <tr> <th style="width: 25%;">Activity</th> <th style="width: 25%;">Name</th> <th style="width: 25%;">Designation</th> <th style="width: 25%;">Signature</th> <th style="width: 20%;">Date</th> </tr> </thead> <tbody> <tr> <td>Prepared by</td> <td>D.Bandyopadhyay</td> <td></td> <td></td> <td>05.10.14</td> </tr> <tr> <td>Processed by</td> <td>D.Bandyopadhyay</td> <td></td> <td></td> <td></td> </tr> <tr> <td>Checked by</td> <td></td> <td></td> <td></td> <td></td> </tr> <tr> <td>Approved by</td> <td></td> <td></td> <td></td> <td></td> </tr> <tr> <td colspan="3">           Scale 500 0 500 1500 M<br/>           Drawn by <b>0 500 1500 M</b> </td> <td colspan="2">           Sheet <b>1</b> OF <b>1</b> </td> </tr> </tbody> </table> | Activity    | Name                       | Designation | Signature | Date | Prepared by | D.Bandyopadhyay |  |  | 05.10.14 | Processed by | D.Bandyopadhyay |  |  |  | Checked by |  |  |  |  | Approved by |  |  |  |  | Scale 500 0 500 1500 M<br>Drawn by <b>0 500 1500 M</b> |  |  | Sheet <b>1</b> OF <b>1</b> |  |
| Activity                                                                                                                       | Name                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                | Designation | Signature                  | Date        |           |      |             |                 |  |  |          |              |                 |  |  |  |            |  |  |  |  |             |  |  |  |  |                                                        |  |  |                            |  |
| Prepared by                                                                                                                    | D.Bandyopadhyay                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |             |                            | 05.10.14    |           |      |             |                 |  |  |          |              |                 |  |  |  |            |  |  |  |  |             |  |  |  |  |                                                        |  |  |                            |  |
| Processed by                                                                                                                   | D.Bandyopadhyay                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |             |                            |             |           |      |             |                 |  |  |          |              |                 |  |  |  |            |  |  |  |  |             |  |  |  |  |                                                        |  |  |                            |  |
| Checked by                                                                                                                     |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |             |                            |             |           |      |             |                 |  |  |          |              |                 |  |  |  |            |  |  |  |  |             |  |  |  |  |                                                        |  |  |                            |  |
| Approved by                                                                                                                    |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |             |                            |             |           |      |             |                 |  |  |          |              |                 |  |  |  |            |  |  |  |  |             |  |  |  |  |                                                        |  |  |                            |  |
| Scale 500 0 500 1500 M<br>Drawn by <b>0 500 1500 M</b>                                                                         |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |             | Sheet <b>1</b> OF <b>1</b> |             |           |      |             |                 |  |  |          |              |                 |  |  |  |            |  |  |  |  |             |  |  |  |  |                                                        |  |  |                            |  |
|  <b>CMPDI</b><br>An ISO 9001:2000 Company | Drg. No. <b>0 500 1500 M</b><br>REV. No. <b>1</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |             |                            |             |           |      |             |                 |  |  |          |              |                 |  |  |  |            |  |  |  |  |             |  |  |  |  |                                                        |  |  |                            |  |

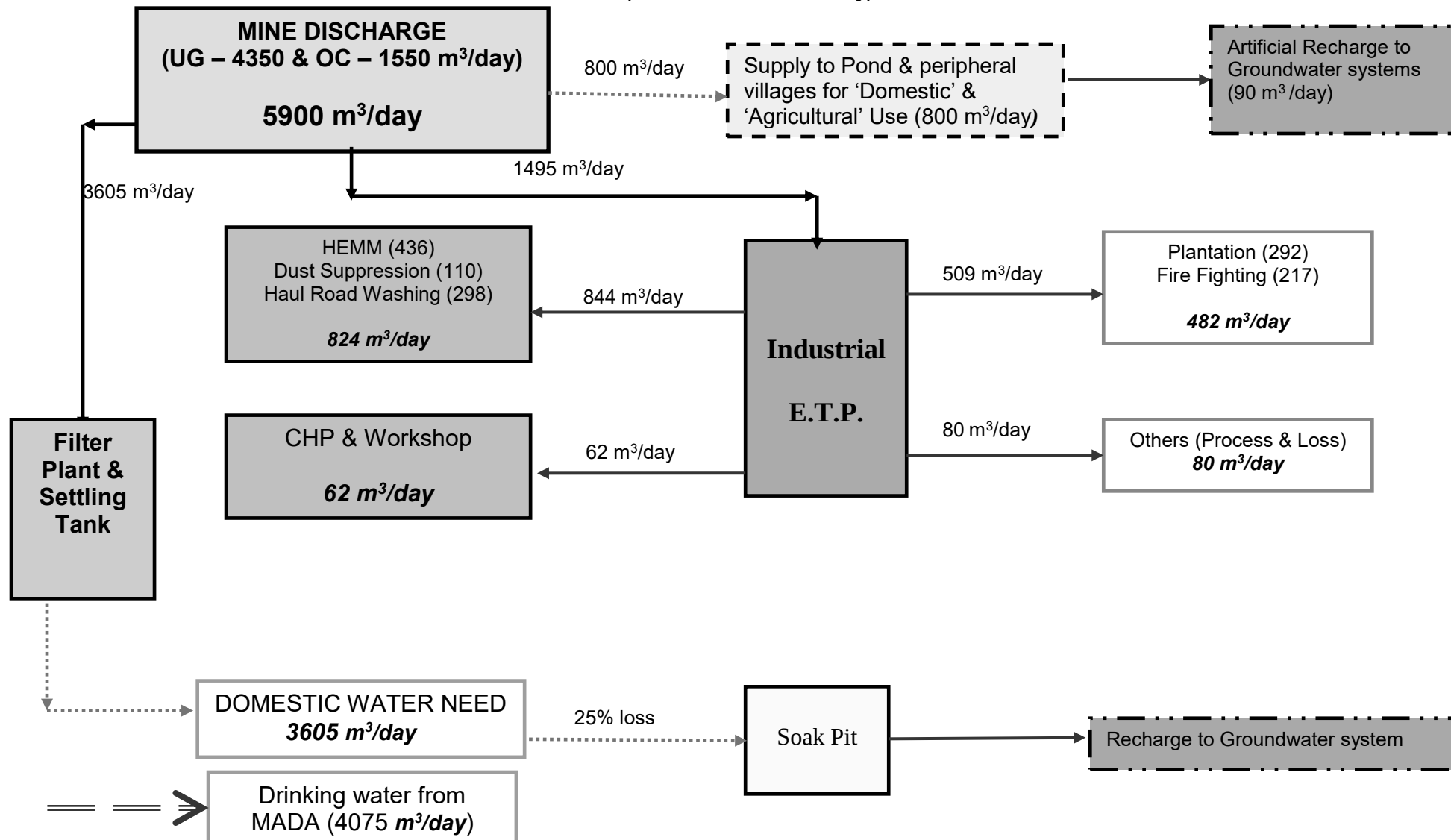
## GROUNDWATER BALANCE FLOW DIAGRAM, BUFFER ZONE OF CLUSTER-IV

(All Values are in M.Cu.m)



# WATER USAGE DIAGRAM OF CLUSTER-IV MINES

(All Values are in m<sup>3</sup> / day)



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

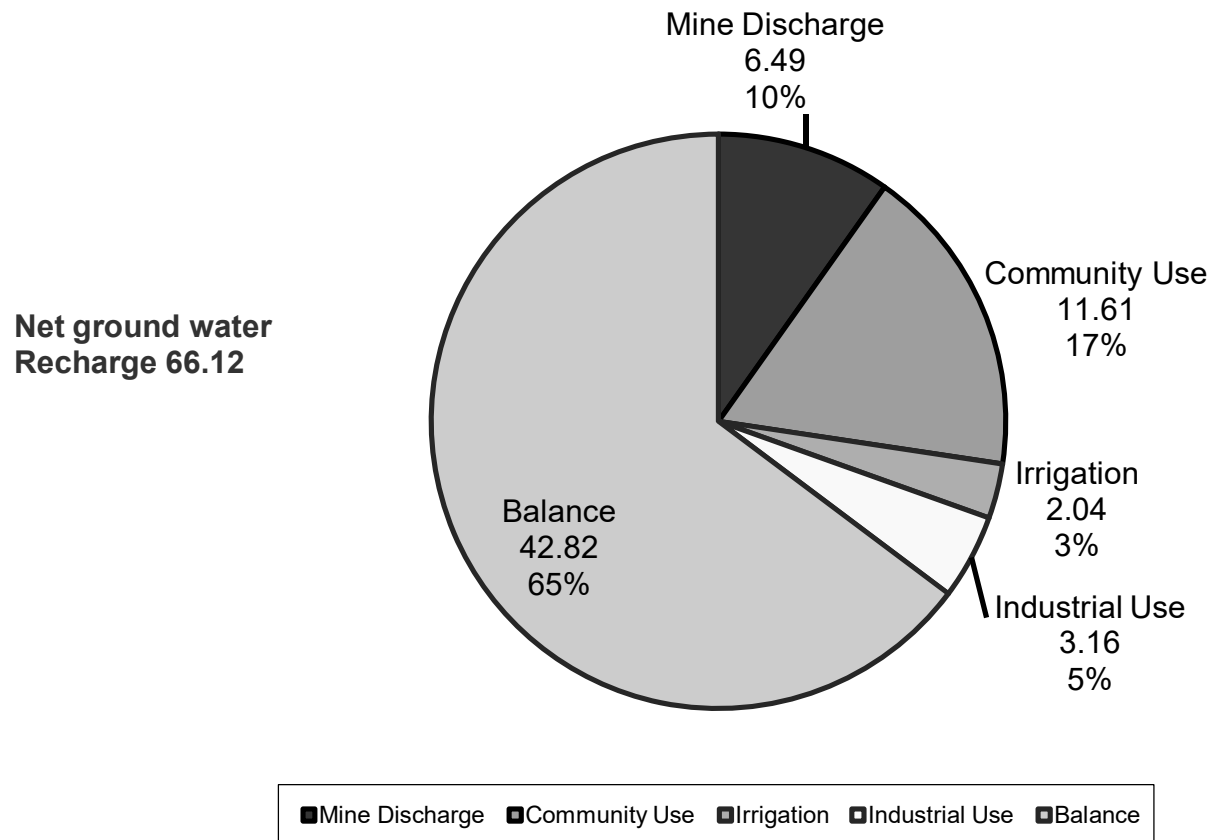
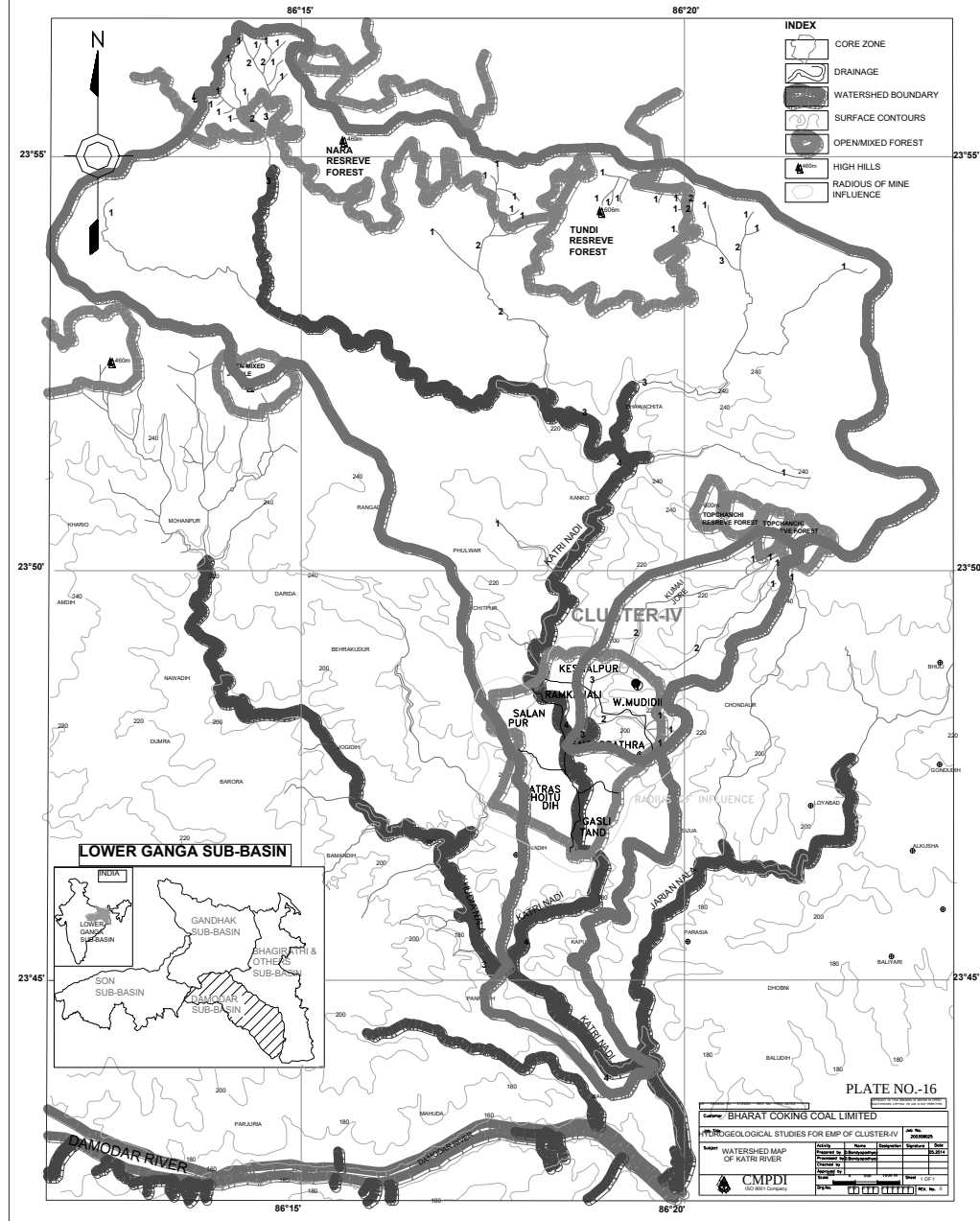
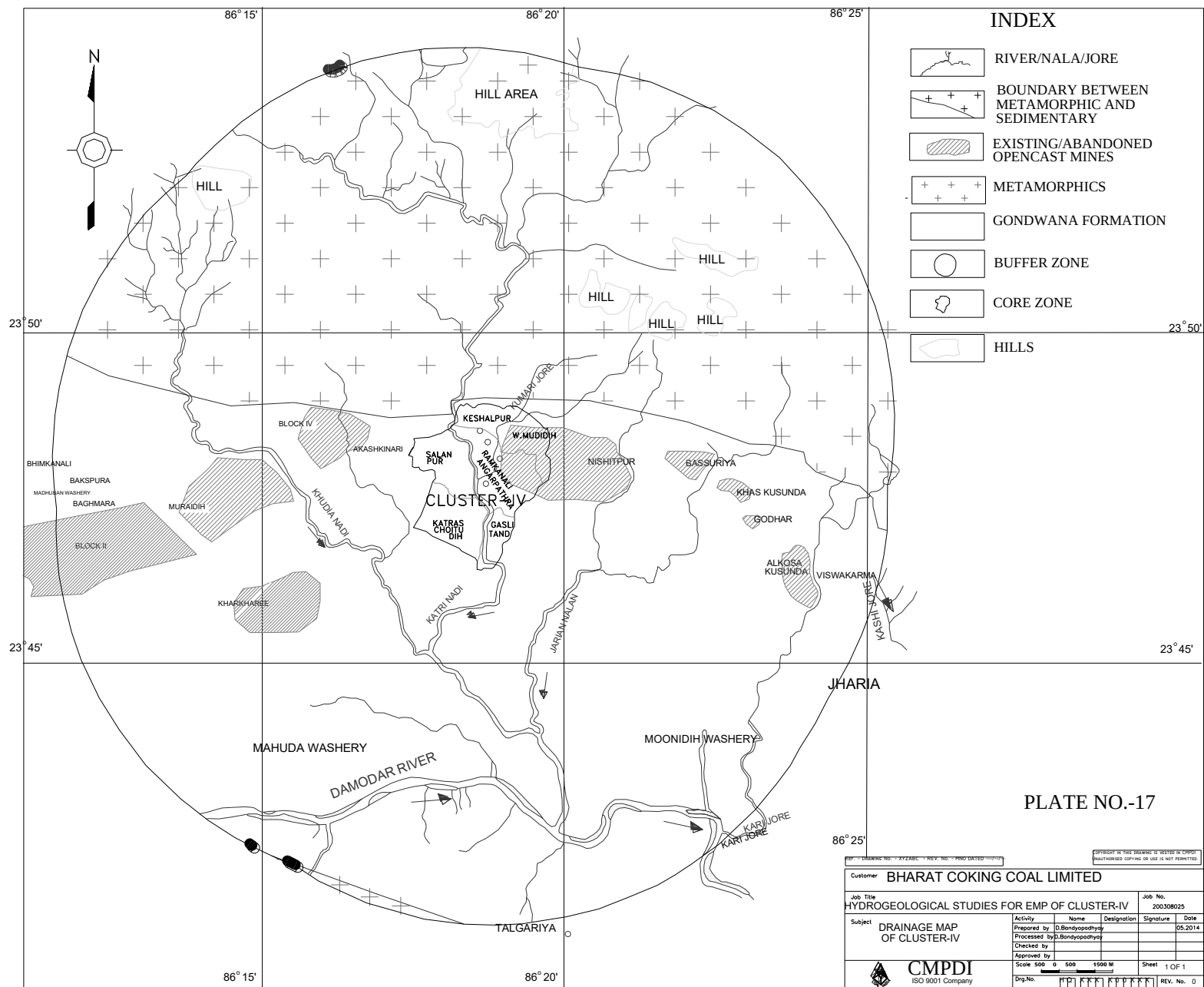


PLATE NO-15

# WATERSHED MAP OF CLUSTER IV

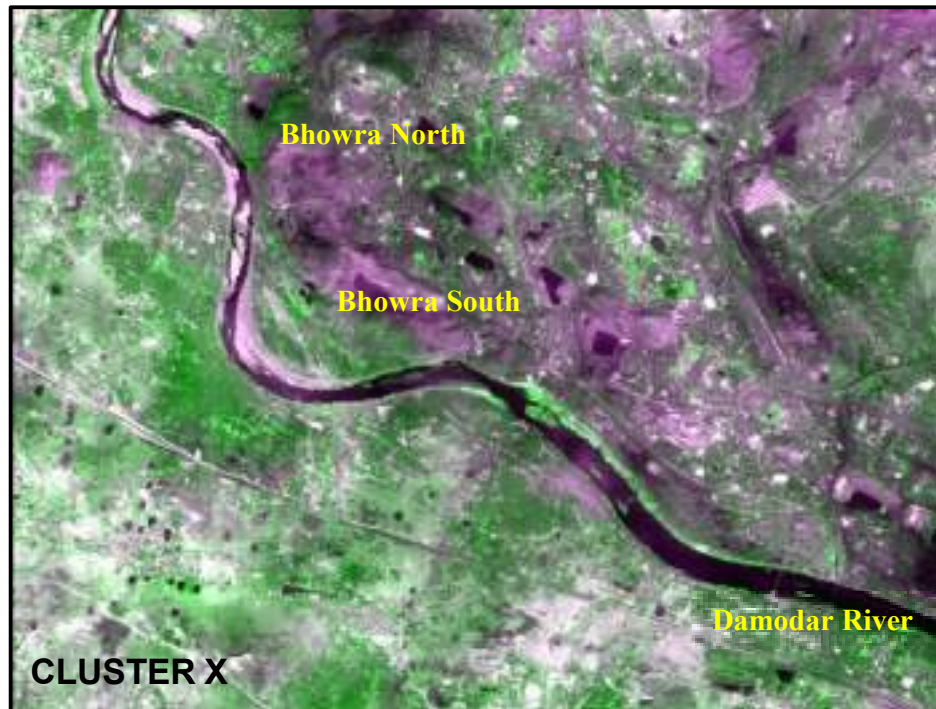


## DRAINAGE MAP OF THE CLUSTER-IV





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



*Submitted to*  
**Bharat Coking Coal Limited**



*cmpdi*  
*A Mini-Ratna Company*

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

March - 2022



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

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## Executive Summary

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

Table 1

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

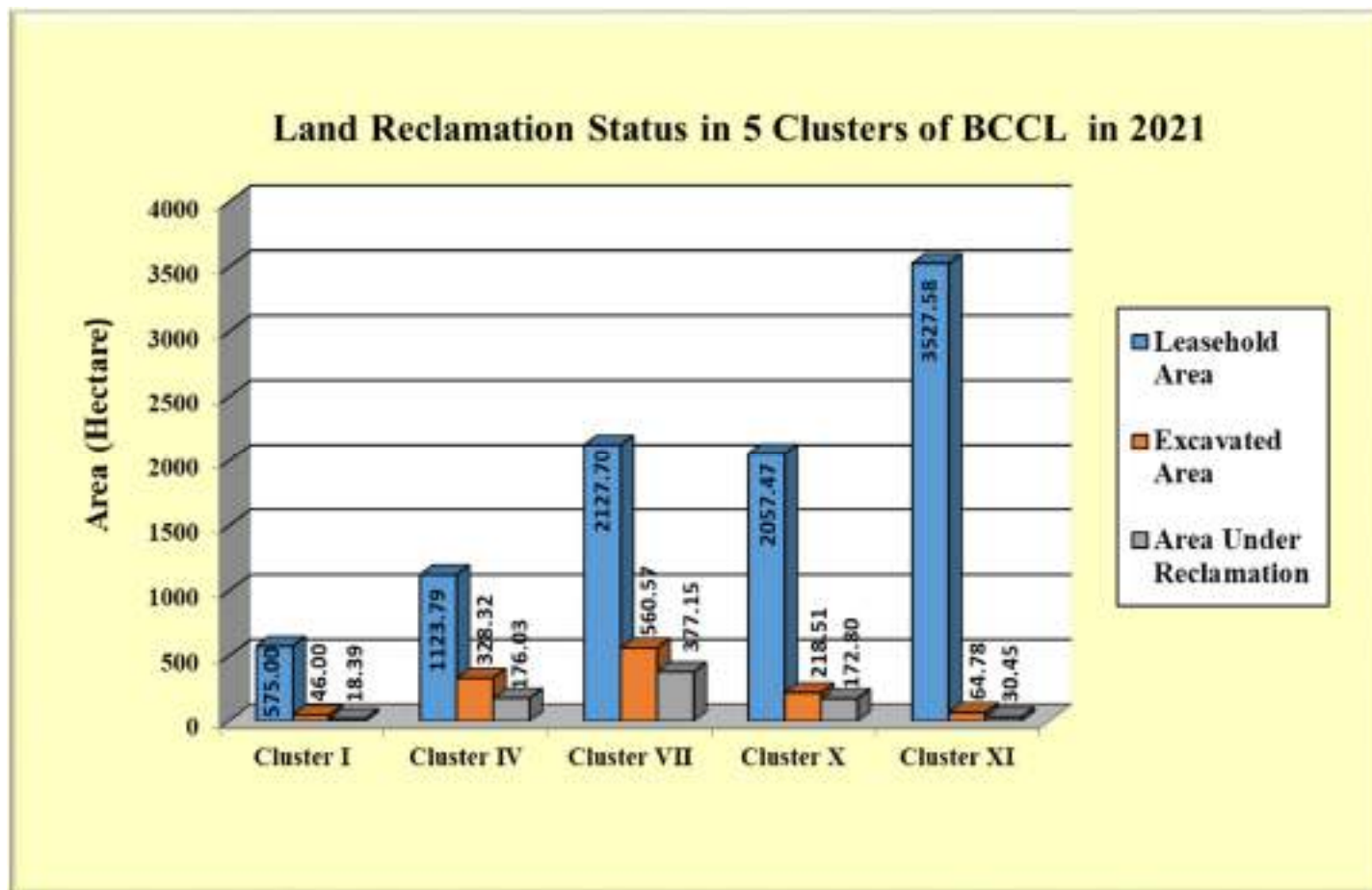
(Area in Hectare)

| Sl. No.                                                        | Cluster No. | Total Leasehold Area |         | Technical Reclamation  |        | Plantation                                |        |                                 |        |                                          |        | Area under Active Mining |        | Total Excavated Area |         | Total Area under Plantation (% Green Cover Generated in Leasehold) |        | Total Area under Reclamation |        |
|----------------------------------------------------------------|-------------|----------------------|---------|------------------------|--------|-------------------------------------------|--------|---------------------------------|--------|------------------------------------------|--------|--------------------------|--------|----------------------|---------|--------------------------------------------------------------------|--------|------------------------------|--------|
|                                                                |             |                      |         |                        |        | Biological Reclamation                    |        | Other Plantations               |        |                                          |        |                          |        |                      |         |                                                                    |        |                              |        |
|                                                                |             |                      |         | Area under Backfilling |        | Plantation on Excavated / Backfilled Area |        | Plantation on External OB Dumps |        | Social Forestry, Avaneue Plantation Etc. |        |                          |        |                      |         |                                                                    |        |                              |        |
| 1                                                              | 2           | 3                    |         | 4                      |        | 5                                         |        | 6                               |        | 7                                        |        | 8                        |        | 9 (=4+5+8)           |         | 10 (=5+6+7)                                                        |        | 11(=4+5)                     |        |
|                                                                |             | 2018                 | 2021    | 2018                   | 2021   | 2018                                      | 2021   | 2018                            | 2021   | 2018                                     | 2021   | 2018                     | 2021   | 2018                 | 2021    | 2018                                                               | 2021   | 2018                         | 2021   |
| 1                                                              | Cluster I   | 575.00               | 575.00  | 10.11                  | 11.10  | 7.29                                      | 7.29   | 47.99                           | 45.21  | 25.53                                    | 25.53  | 28.39                    | 27.61  | 45.79                | 46.00   | 80.81                                                              | 78.03  | 17.40                        | 18.39  |
|                                                                |             |                      |         | 22.08%                 | 24.13% | 15.92%                                    | 15.85% |                                 |        |                                          |        | 62.00%                   | 60.02% |                      |         | 14.05%                                                             | 13.57% | 38.00%                       | 39.98% |
| 2                                                              | Cluster IV  | 1123.79              | 1123.79 | 147.22                 | 176.03 | 0.00                                      | 0.00   | 27.11                           | 27.11  | 165.09                                   | 165.09 | 166.67                   | 152.29 | 313.89               | 328.32  | 192.20                                                             | 192.20 | 147.22                       | 176.03 |
|                                                                |             |                      |         | 46.90%                 | 53.62% | 0.00%                                     | 0.00%  |                                 |        |                                          |        | 53.10%                   | 46.38% |                      |         | 17.10%                                                             | 17.10% | 46.90%                       | 53.62% |
| 3                                                              | Cluster VII | 2127.70              | 2127.70 | 351.54                 | 351.68 | 37.47                                     | 25.47  | 15.52                           | 11.43  | 238.67                                   | 238.67 | 122.23                   | 183.42 | 511.24               | 560.57  | 291.66                                                             | 275.57 | 389.01                       | 377.15 |
|                                                                |             |                      |         | 68.76%                 | 62.74% | 7.33%                                     | 4.54%  |                                 |        |                                          |        | 23.91%                   | 32.72% |                      |         | 13.71%                                                             | 12.95% | 76.09%                       | 67.28% |
| 4                                                              | Cluster X   | 2057.47              | 2057.47 | 116.28                 | 143.64 | 29.16                                     | 29.16  | 66.09                           | 66.09  | 140.75                                   | 140.75 | 59.41                    | 45.71  | 204.85               | 218.51  | 236.00                                                             | 236.00 | 145.44                       | 172.80 |
|                                                                |             |                      |         | 56.76%                 | 65.74% | 14.23%                                    | 13.34% |                                 |        |                                          |        | 29.00%                   | 20.92% |                      |         | 11.47%                                                             | 11.47% | 71.00%                       | 79.08% |
| 5                                                              | Cluster XI  | -                    | 3527.58 | -                      | 30.45  | -                                         | 0.00   | -                               | 0.00   | -                                        | 187.14 | -                        | 34.33  | -                    | 64.78   | -                                                                  | 187.14 | -                            | 30.45  |
|                                                                |             |                      |         |                        | 47.01% |                                           | 0.00%  |                                 |        |                                          |        |                          | 52.99% |                      |         |                                                                    | 5.31%  |                              | 47.01% |
|                                                                | TOTAL       | 5883.96              | 9411.54 | 625.15                 | 712.90 | 73.92                                     | 61.92  | 156.71                          | 149.84 | 570.04                                   | 757.18 | 376.70                   | 443.36 | 1075.77              | 1218.18 | 800.67                                                             | 968.94 | 699.07                       | 774.82 |
|                                                                |             |                      |         | 58.11%                 | 58.52% | 6.87%                                     | 5.08%  |                                 |        |                                          |        | 35.02%                   | 36.40% |                      |         | 13.61%                                                             | 10.30% | 64.98%                       | 63.60% |
| (% is calculated with respect to Excavated Area as applicable) |             |                      |         |                        |        |                                           |        |                                 |        |                                          |        |                          |        |                      |         |                                                                    |        |                              |        |

( % is calculated with respect to Excavated Area as applicable)

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

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



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

## **1. Background**

- 1.1** Land is the most important natural resource which embodies soil, water, flora, fauna and total ecosystem. All human activities are based on the land which is the scarcest natural resource in our country. Mining is a site specific industry and it could not be shifted anywhere else from the location where mineral occurs. It is a fact that surface mining activities do affect the land environment due to ground breaking. Therefore, there is an urgent need to reclaim and restore the mined out land for its productive use for sustainable development of mining. This will not only mitigate environmental degradation, but would also help in creating a more congenial environment for land acquisition by coal companies in future.
- 1.2** Keeping above in view, Coal India Ltd. (CIL) issued a work order vide letter no. CIL/WBP/ENV/2017/DP/8391 dated 22.06.2017 to Central Mine Planning & Design Institute (CMPDI), Ranchi, for monitoring of clusters with coal mines (both underground and open cast projects) having less than 5 million m<sup>3</sup> per annum capacity (Coal +OB) at an interval of three years based on remote sensing satellite data for sustainable development of mining. Earlier, CMPDI used to carry out land reclamation monitoring for individual projects of less than 5 million capacity, but from 2017 the same was carried out cluster wise for mines of BCCL. For operational reasons and convenience, underground and opencast mines (often with multiple overlapping seams), have now been clustered together. The result of land reclamation status of all such mines are hosted on the website of CIL, ([www.coalindia.in](http://www.coalindia.in)), CMPDI ([www.cmpdi.co.in](http://www.cmpdi.co.in)) and the concerned coal companies in public domain. Detailed report is submitted to Coal India and respective subsidiaries.

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

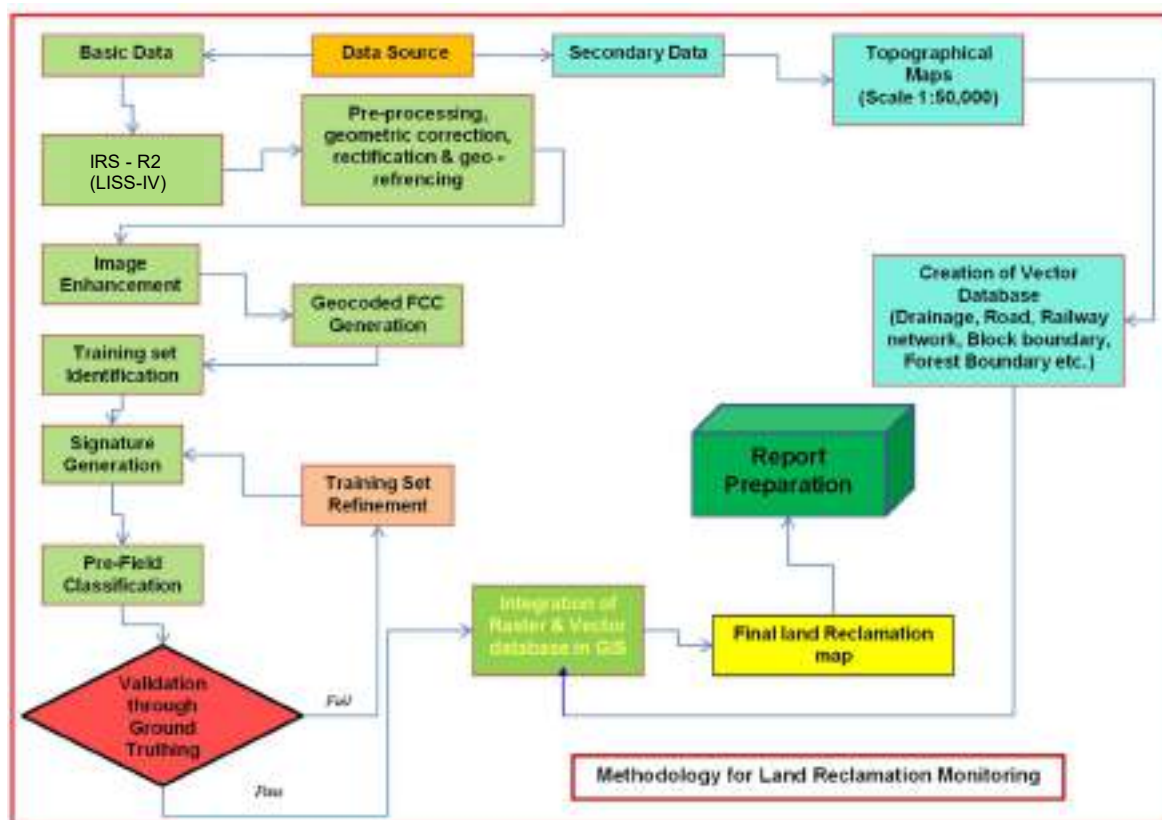
## **2. Objective**

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

## **3. Methodology**

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





**Fig. 2: Methodology of Land Reclamation Monitoring**

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

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

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

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

- **Image enhancement:**

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

- **Training set selection**

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

- **Classification and Accuracy assessment**

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

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

- **Area calculation**

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

- **Overlay of Vector data base**

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

- **Pre-field map preparation**

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

### **3.3 Ground Truthing:**

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

### **3.4 Land reclamation database on GIS:**

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

## 4. Land Reclamation Status in Bharat Coking Coal Ltd.

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

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

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

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

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

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

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

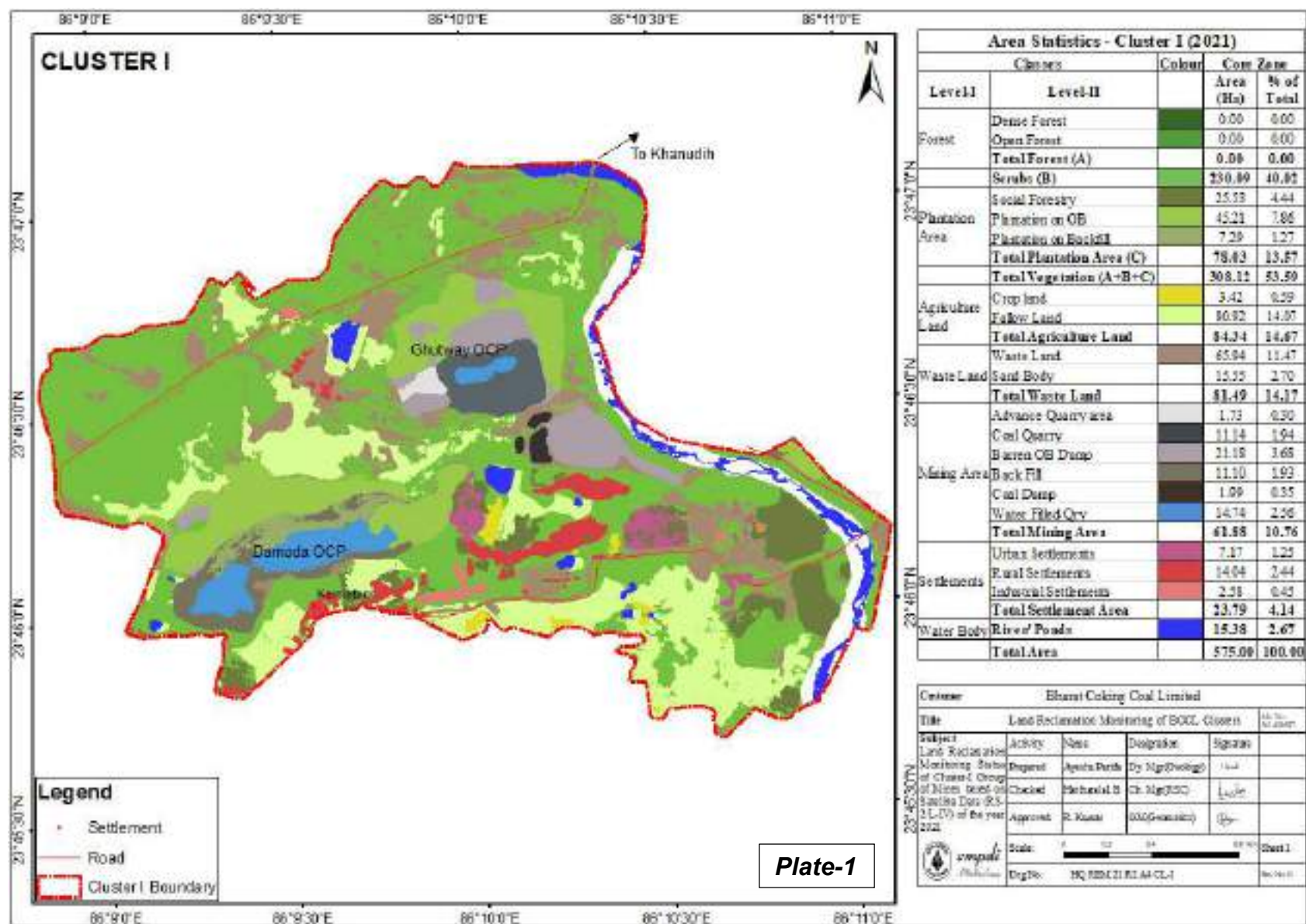
**4.10** The area under total plantation (Green Cover) is maximum in Cluster IV (17.10%) followed by Cluster I with (13.57%), Cluster VII with (12.95%), Cluster X with (11.47%) and Cluster XI with (5.31%).

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

Table 2

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

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





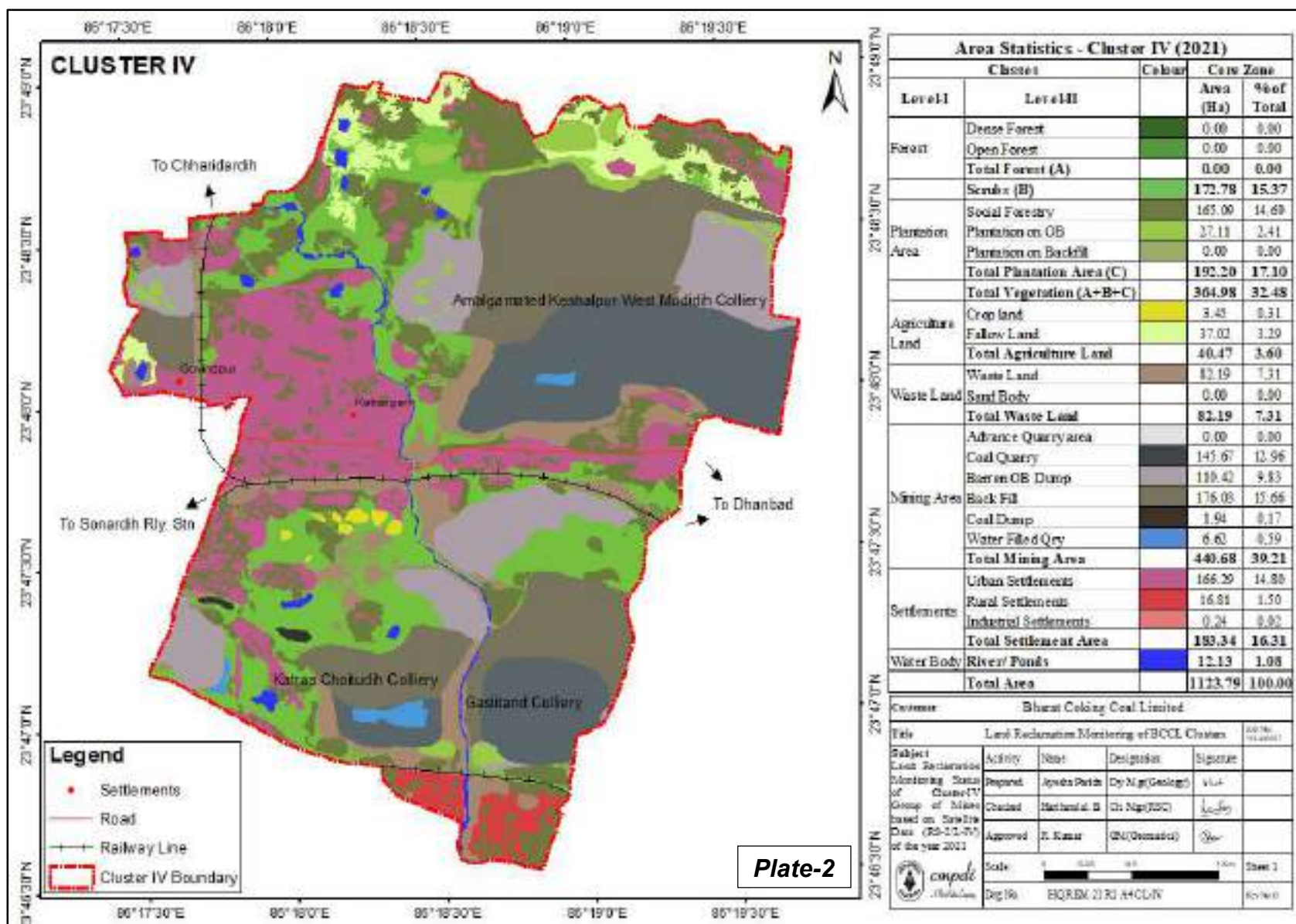
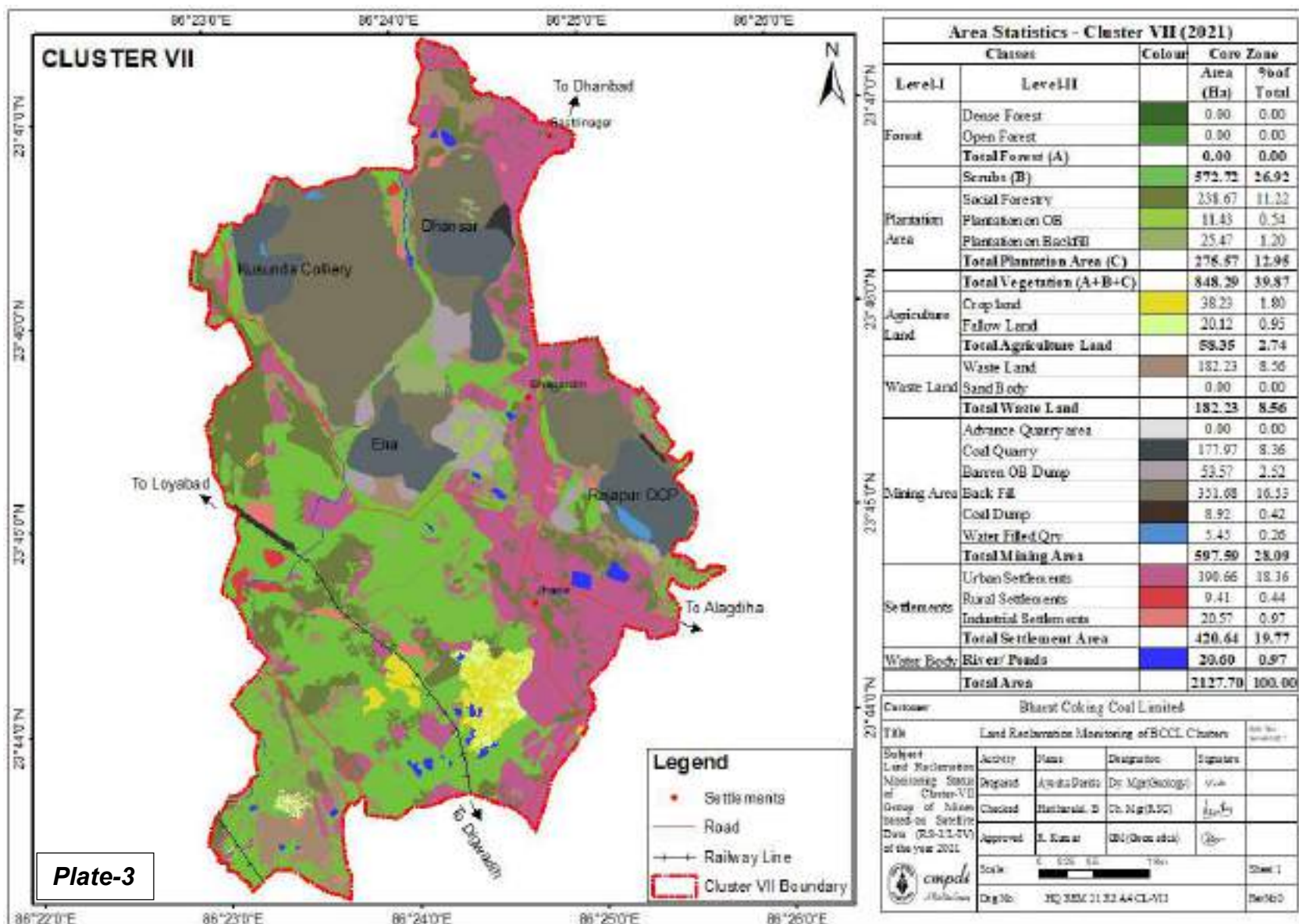
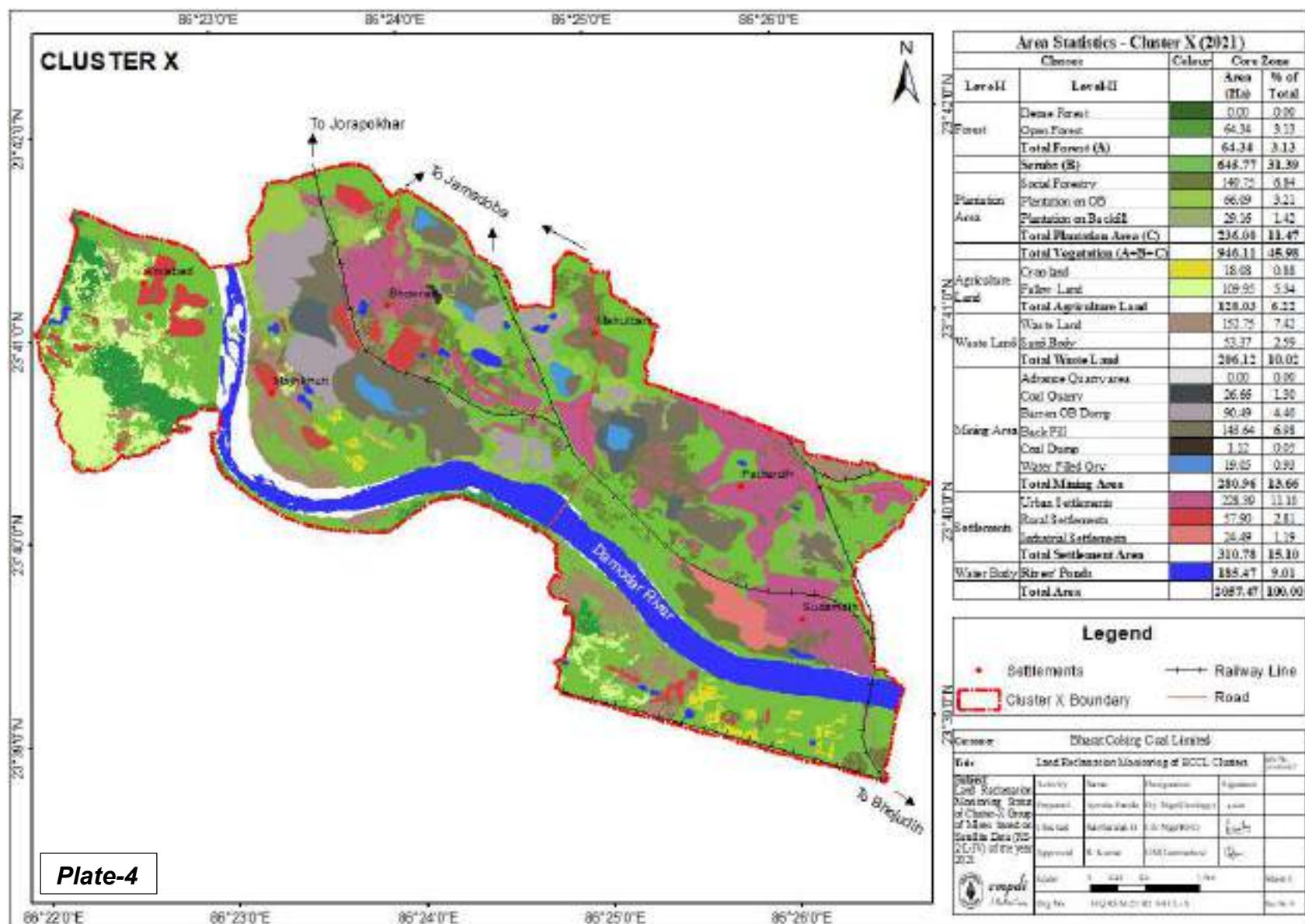
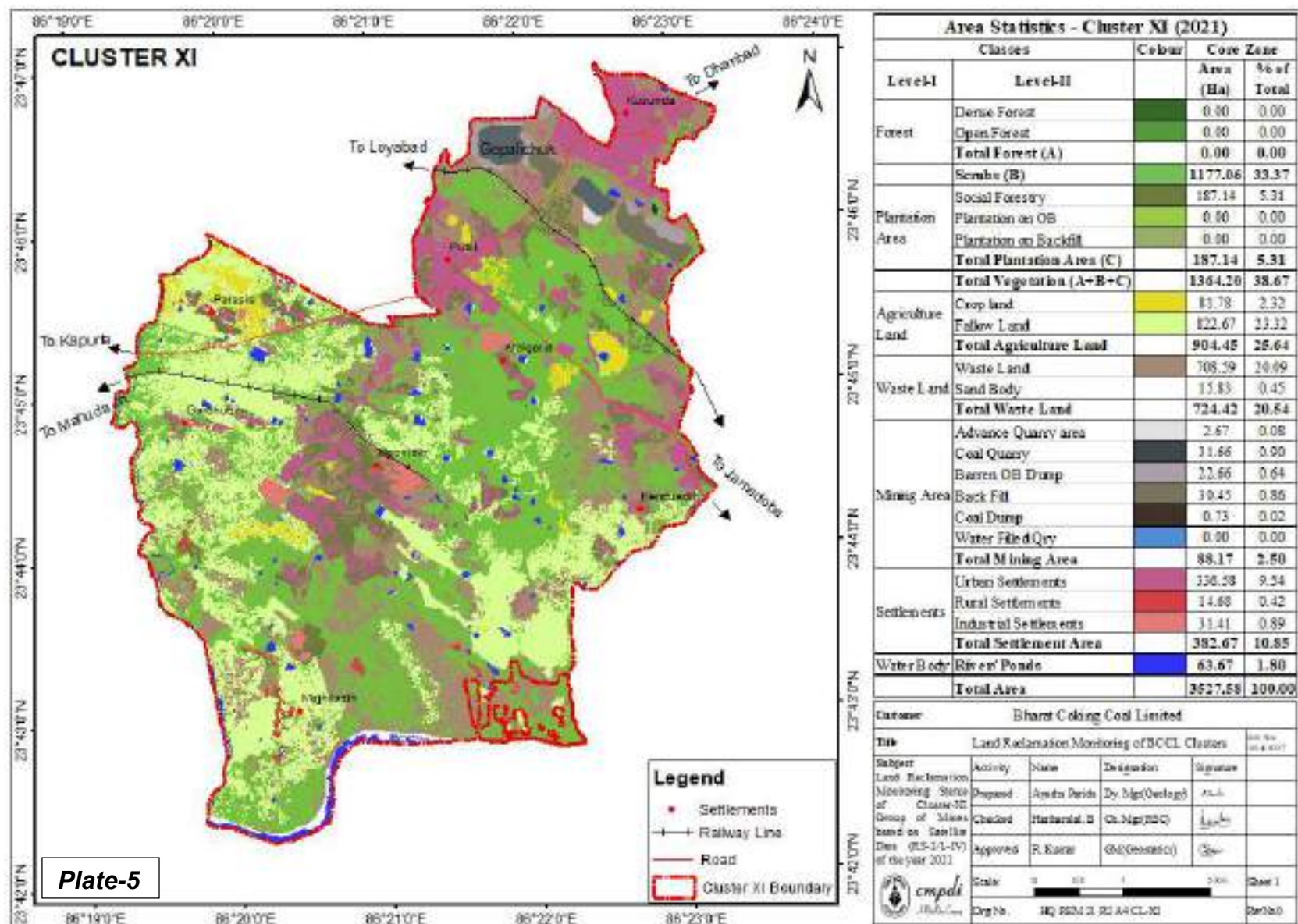


Plate-2









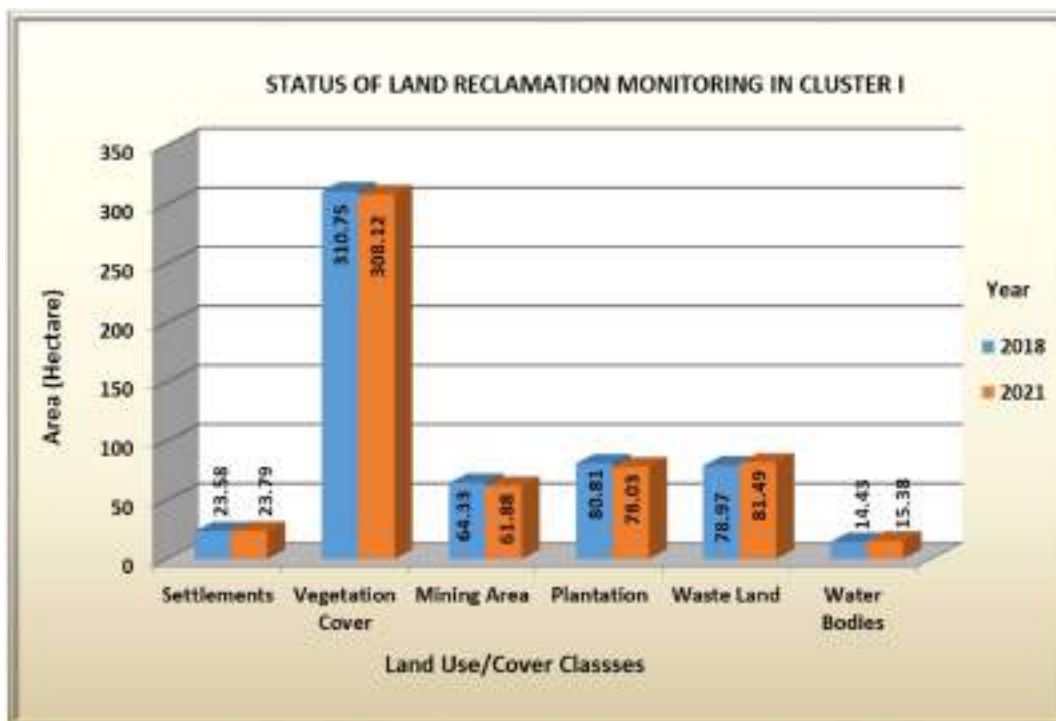


Fig. 3: Land Reclamation Status of Cluster I

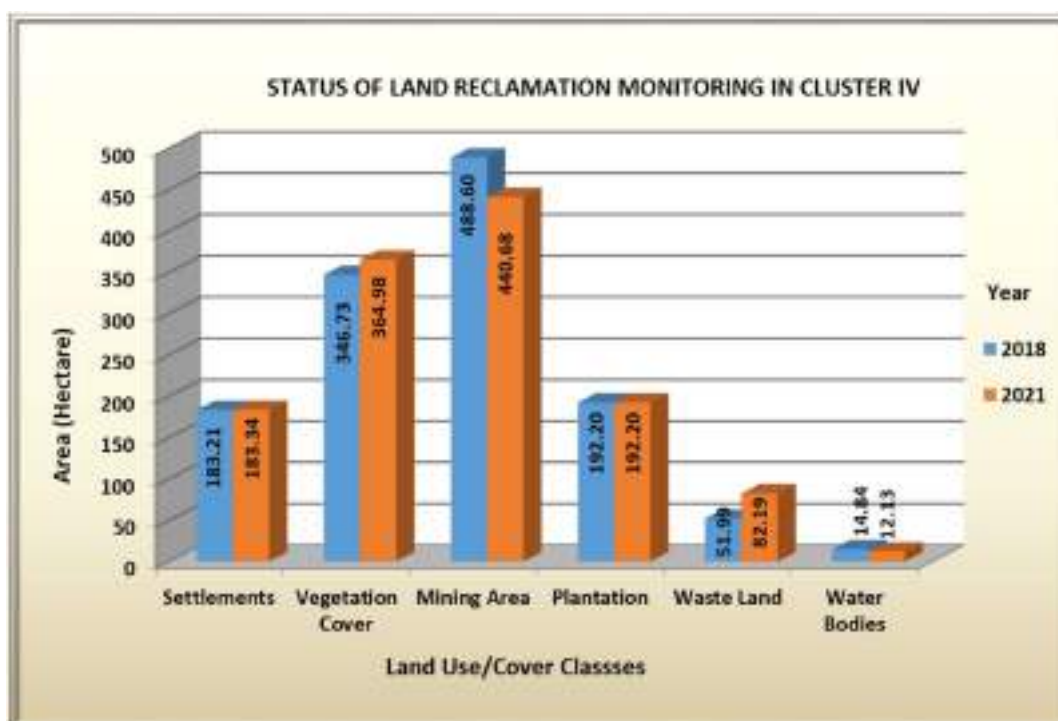


Fig. 4: Land Reclamation Status of Cluster IV



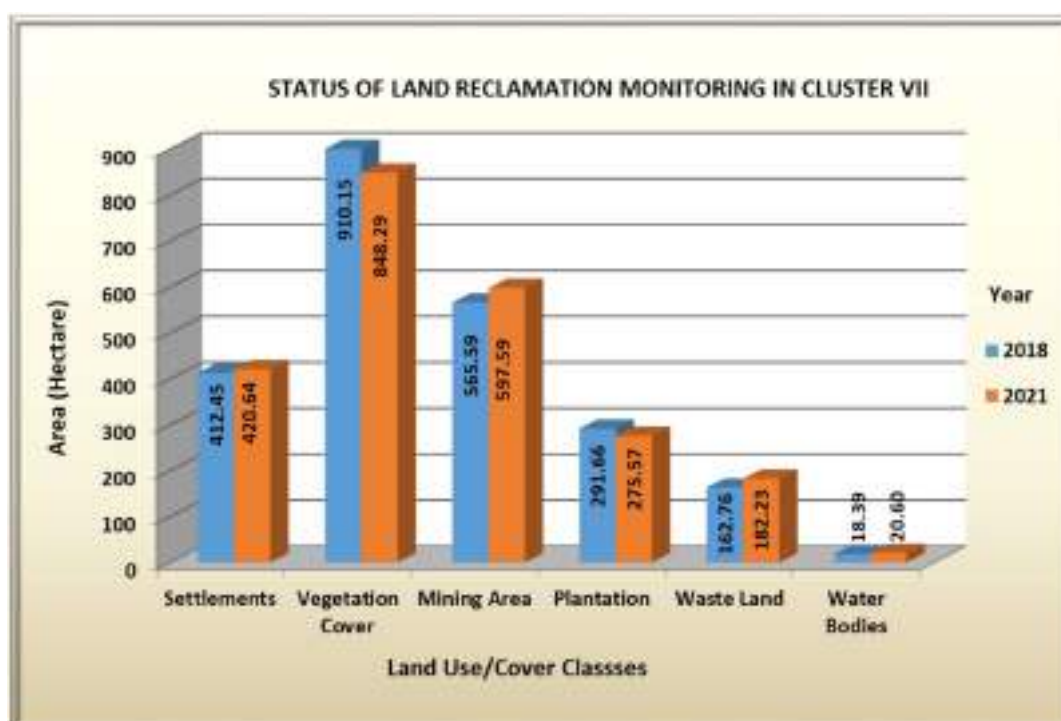


Fig. 5: Land Reclamation Status of Cluster VII

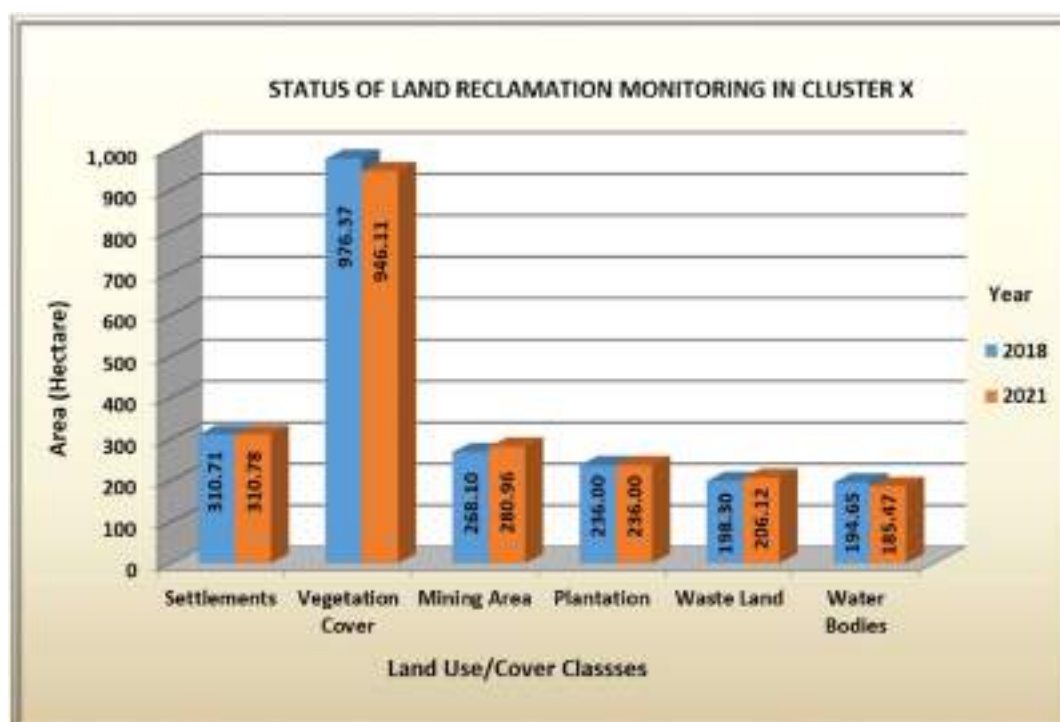


Fig. 6: Land Reclamation Status of Cluster X

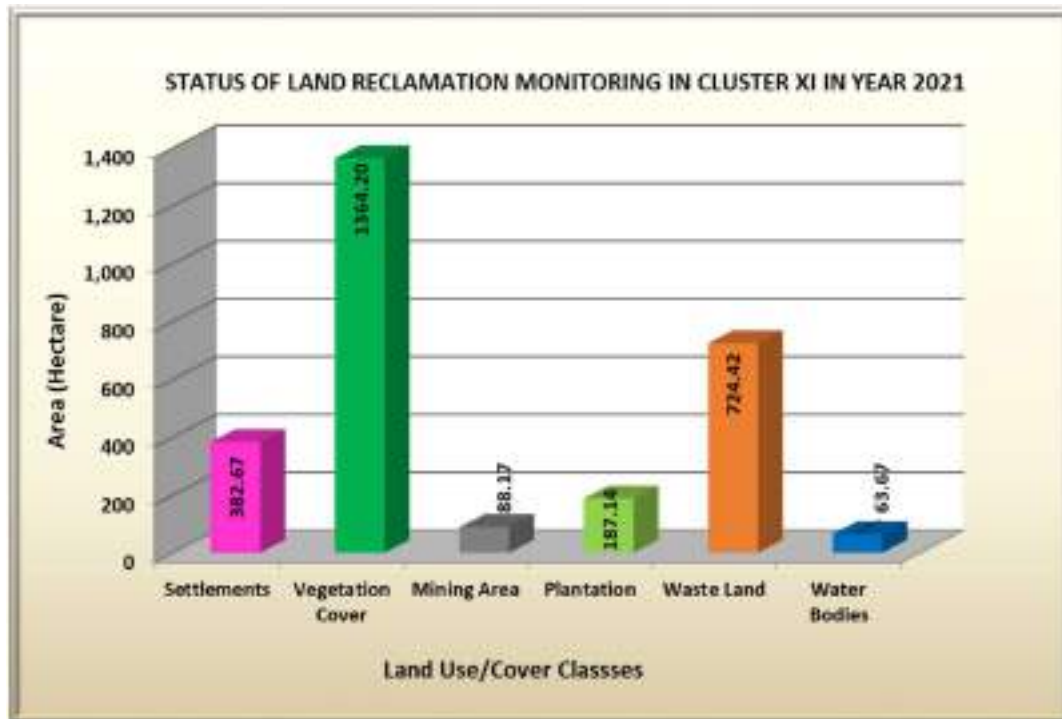


Fig. 7: Land Reclamation Status of Cluster XI



Photo 1: Social Forestry Plantation in Cluster XI



**Photo 2: Ecological Restoration Site in Cluster I**



**Photo 3: Plantation on OB Dump in Cluster I**





**Photo 4: Plantation on OB Dump in Cluster IV**



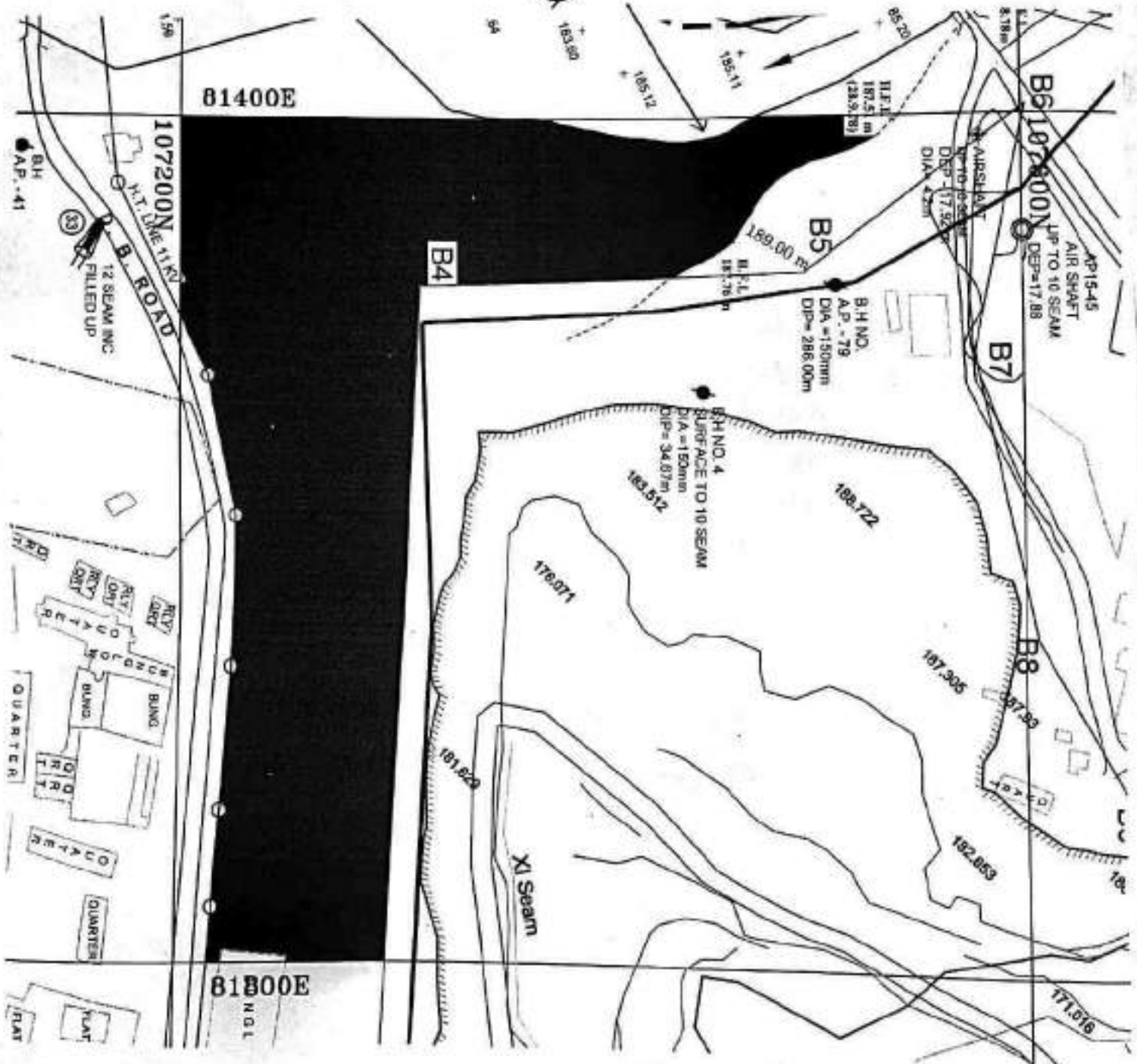
**Photo 5: Parasnath Udyaan in Cluster IV**



**Photo 6: Road side Plantation in Cluster VII**



**Photo 7: Plantation on OB Dump in Cluster X**



**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](mailto:cgmkatras@bccl.gov.in)**Yearwise (2014-15 to 2021-22) 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 mrityu 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                                               |                                                           |

Afforestation over an area of 41.69 Ha done from the period from 2014-15 to 2020-21 . Apart of that total 2285 nos of gabion plantation has also been done in the said period.

In the FY 22-23 plantation has been done over an OB dump area of 4.5 Ha.

## 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:

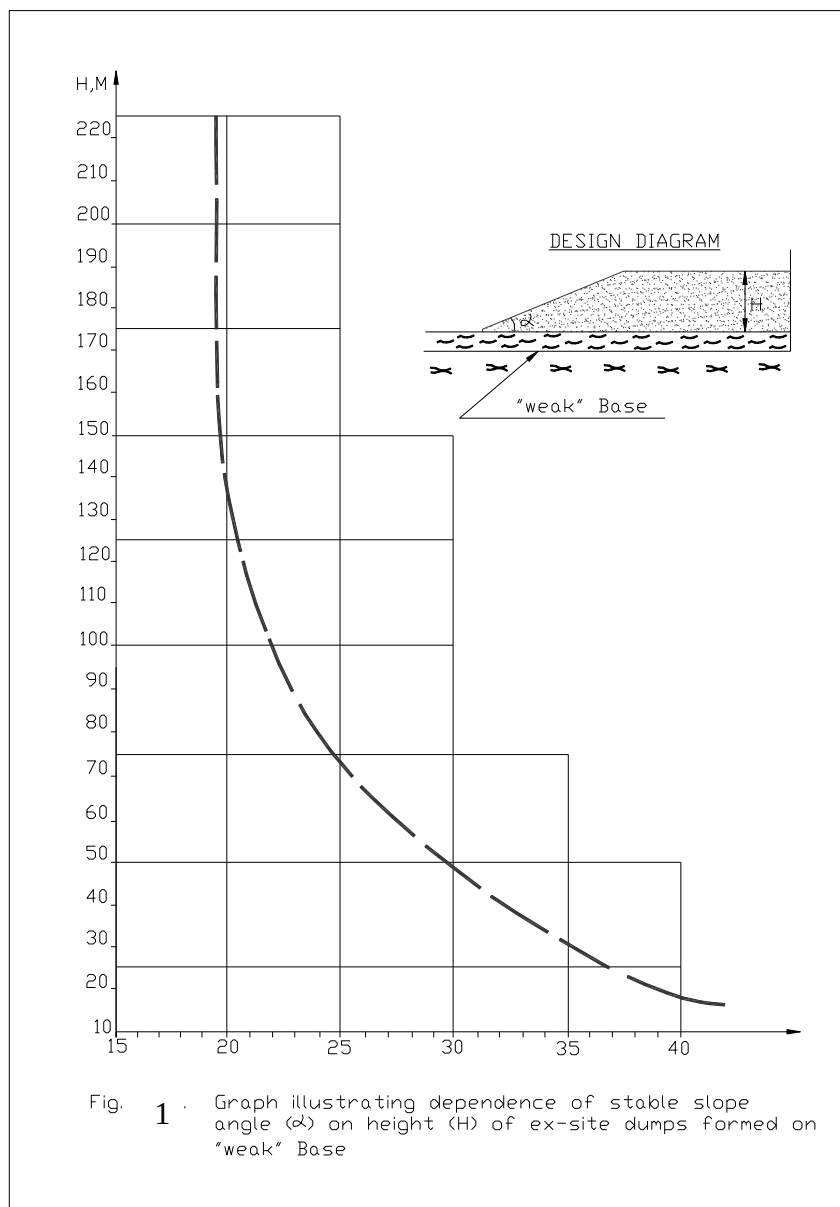
###### (a) **Technical aspects:**

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<sup>0</sup>-28<sup>0</sup>. 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 40m 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.



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 :

|                      |   |                                                                                                                                     |
|----------------------|---|-------------------------------------------------------------------------------------------------------------------------------------|
| <b>The Company</b>   | : | Employees, Management & Stakeholders                                                                                                |
| <b>The Community</b> | : | Local business and service providers, landholders, neighbours and nearby residents, local Government and NGOs and Community Groups. |
| <b>The State</b>     | : | 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 31<sup>st</sup> 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         |
| <b>Total</b> | <b>276.798</b> | <b>1228.382</b> | <b>1505.18</b> |

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 AKWMC Colliery**

|                                                            | 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        |
| <b>Total Amount available for Mine Closure Activities</b>  | <b>305.955</b>      | <b>2014.026</b> |

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<br>( ₹ in Lakhs) |
|----------|----------------------------------------------------------------------------------------------------------------------|------------------------------------|
| <b>A</b> | <b>Dismantling of Structures</b>                                                                                     |                                    |
|          | 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>B</b> | <b>Permanent Sealing of mine entries(incline mouth and air shaft)</b>                                                |                                    |
|          | Sealing of incline mouths and air shafts                                                                             | 16.277                             |
| <b>C</b> | <b>*Subsidence Management</b>                                                                                        | 14.533                             |
| <b>D</b> | <b>LANDSCAPING</b>                                                                                                   |                                    |
|          | Landscaping of the cleared land for improving its esthetic                                                           | 26.924                             |
| <b>E</b> | <b>*Plantation</b>                                                                                                   |                                    |
|          | Plantation over the cleared area obtained after dismantling and on other barren spaces                               | 39.774                             |
| <b>F</b> | <b>Monitoring/Testing of parameters for three years</b>                                                              |                                    |
|          | Air Quality                                                                                                          | 20.897                             |
|          | Water Quality                                                                                                        | 19.398                             |
| <b>G</b> | <b>*Enterpreneurship Development(Vocational/skill development training for sustainable income of affected people</b> | 23.406                             |
| <b>H</b> | <b>*Miscellaneous and other mitigative measures</b>                                                                  | 44.669                             |
| <b>I</b> | <b>Manpower Cost for Supervision</b>                                                                                 | 37.632                             |
|          | <b>TOTAL</b>                                                                                                         | <b>305.955</b>                     |

**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<br>( ₹ in Lakhs) |
|----------|---------------------------------------------------------------------------------------------------------------------|------------------------------------|
| <b>A</b> | <b>Dismantling of Structures</b>                                                                                    |                                    |
|          | Service Buildings                                                                                                   | 4.028                              |
|          | Residential Buildings                                                                                               | 53.774                             |
|          | Industrial Structures like CHP, Workshop, field sub-station, etc.                                                   | 6.042                              |
| <b>B</b> | <b>Permanent Fencing of Mine Void and other dangerous area</b>                                                      |                                    |
|          | Random Rubble masonry of height 1.2 metre including levelling up in cement concrete 1:6:12 in mud mortar            | 30.210                             |
| <b>C</b> | <b>Grading of Highwall slopes</b>                                                                                   |                                    |
|          | Levelling and grading of highwall slopes                                                                            | 35.648                             |
| <b>D</b> | <b>*OB Dump Reclamation</b>                                                                                         |                                    |
|          | Handling/Dozing of external OB Dump into mine void                                                                  | 1785.635                           |
|          | Bio-Reclamation including soil spreading, plantation and maintenance                                                | 8.056                              |
| <b>E</b> | <b>LANDSCAPING</b>                                                                                                  |                                    |
|          | Landscaping of the cleared land for improving its esthetic                                                          | 6.042                              |
| <b>F</b> | <b>*Plantation</b>                                                                                                  |                                    |
|          | Plantation over area obtained after dismantling                                                                     | 10.070                             |
|          | Plantation around fencing                                                                                           | 4.028                              |
|          | Plantation over the cleared external OB Dump                                                                        | 0.403                              |
| <b>G</b> | <b>Monitoring/Testing of parameters for three years</b>                                                             |                                    |
|          | Air Quality                                                                                                         | 4.431                              |
|          | Water Quality                                                                                                       | 4.028                              |
| <b>H</b> | <b>*Enterpreneuship Development(Vocational/skill development training for sustainable income of affected people</b> | 5.236                              |
| <b>I</b> | <b>*Miscellaneous and other mitigative measures</b>                                                                 | 40.281                             |
| <b>J</b> | <b>Manpower Cost for Supervision</b>                                                                                | 16.112                             |
|          | <b>TOTAL</b>                                                                                                        | <b>2014.026</b>                    |

**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           |                                  |                                  |
| <b>A</b> | <b>Dismantling of Structures</b>                                                                                    |                                |                |                 |                                  |                                  |
|          | Service Buildings                                                                                                   | 2.968                          | 15.730         | <b>18.698</b>   |                                  |                                  |
|          | Residential Buildings                                                                                               | 39.626                         | 47.549         | <b>87.175</b>   |                                  |                                  |
|          | Industrial Structures like CHP, Workshop, field sub-station, etc.                                                   | 4.452                          | 28.449         | <b>32.901</b>   |                                  |                                  |
| <b>B</b> | <b>Permanent Fencing of Mine Void and other dangerous area</b>                                                      |                                |                |                 |                                  |                                  |
|          | Random Ruble masonry of height 1.2 metre including levelling up in cement concrete 1:6:12 in mud mortar             | 22.262                         |                | <b>22.262</b>   |                                  |                                  |
| <b>C</b> | <b>Permanent Sealing of mine entries(incline mouth and air shaft)</b>                                               |                                |                |                 |                                  |                                  |
|          | Sealing of incline mouths and air shafts                                                                            |                                | 23.909         | <b>23.909</b>   |                                  |                                  |
| <b>D</b> | <b>Subsidence Management</b>                                                                                        |                                | 21.348         | <b>21.348</b>   |                                  |                                  |
| <b>E</b> | <b>Grading of Highwall slopes</b>                                                                                   |                                |                |                 |                                  |                                  |
|          | Levelling and grading of highwall slopes                                                                            | 26.269                         |                | <b>26.269</b>   |                                  |                                  |
| <b>F</b> | <b>OB Dump Reclamation</b>                                                                                          |                                |                | <b>0.000</b>    |                                  |                                  |
|          | Handling/Dozing of external OB Dump into mine void                                                                  | 1315.815                       |                | <b>1315.815</b> |                                  | 1524.638                         |
|          | Bio-Reclamation including soil spreading, plantation and maintenance                                                | 5.936                          |                | <b>5.936</b>    |                                  |                                  |
| <b>G</b> | <b>LANDSCAPING</b>                                                                                                  |                                |                |                 |                                  |                                  |
|          | Landscaping of the cleared land for improving its esthetic                                                          | 4.452                          | 39.550         | <b>44.002</b>   |                                  | 2.071                            |
| <b>H</b> | <b>Plantation</b>                                                                                                   |                                |                |                 |                                  |                                  |
|          | Plantation over area obtained after dismantling                                                                     | 7.421                          | 58.425         | <b>65.846</b>   |                                  |                                  |
|          | Plantation around fencing and around quarry area                                                                    | 2.968                          |                | <b>2.968</b>    | 67.94789                         |                                  |
|          | Plantation over the cleared external OB Dump                                                                        | 0.297                          |                | <b>0.297</b>    |                                  | 82.844                           |
| <b>I</b> | <b>Monitoring/Testing of parameters for three years</b>                                                             |                                |                |                 |                                  |                                  |
|          | Air Quality                                                                                                         | 3.265                          | 30.696         | <b>33.961</b>   |                                  |                                  |
|          | Water Quality                                                                                                       | 2.968                          | 28.494         | <b>31.462</b>   |                                  |                                  |
| <b>J</b> | <b>Enterpreneurship Development(Vocational/skill development training for sustainable income of affected people</b> | 3.859                          | 34.381         | <b>38.240</b>   | 16.62778                         | 8.285                            |
| <b>K</b> | <b>Miscellaneous and other mitigative measures</b>                                                                  | 29.682                         | 65.616         | <b>95.298</b>   |                                  |                                  |
| <b>L</b> | <b>Manpower Cost for Supervision</b>                                                                                | 11.873                         | 55.279         | <b>67.152</b>   |                                  |                                  |
|          | <b>TOTAL(%)</b>                                                                                                     | <b>1484.113</b>                | <b>449.426</b> | <b>1933.539</b> | <b>84.57567</b>                  | <b>1617.838</b>                  |

*\*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 305<sup>th</sup> 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 31<sup>st</sup> 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          |
|      | <b>64.830</b> | <b>911.464</b> | <b>976.294</b> |

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        |
| <b>Total Amount available for Mine Closure Activities</b>  | <b>144.788</b>      | <b>943.964</b> |



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) |
|----------|----------------------------------------------------------------------------------------------------------------------|---------------------------------|
| <b>A</b> | <b>Dismantling of Structures</b>                                                                                     |                                 |
|          | 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>B</b> | <b>Permanent Sealing of mine entries(incline mouth and air shaft)</b>                                                |                                 |
|          | Sealing of incline mouths and air shafts                                                                             | 7.703                           |
| <b>C</b> | <b>*Subsidence Management</b>                                                                                        | 6.877                           |
| <b>D</b> | <b>LANDSCAPING</b>                                                                                                   |                                 |
|          | Landscaping of the cleared land for improving its esthetic                                                           | 12.741                          |
| <b>E</b> | <b>*Plantation</b>                                                                                                   |                                 |
|          | Plantation over the cleared area obtained after dismantling and on other barren spaces                               | 18.822                          |
| <b>F</b> | <b>Monitoring/Testing of parameters for three years</b>                                                              |                                 |
|          | Air Quality                                                                                                          | 9.889                           |
|          | Water Quality                                                                                                        | 9.180                           |
| <b>G</b> | <b>*Entrepreneurship Development(Vocational/skill development training for sustainable income of affected people</b> | 11.076                          |
| <b>H</b> | <b>*Miscellaneous and other mitigative measures</b>                                                                  | 21.139                          |
| <b>I</b> | <b>Manpower Cost for Supervision</b>                                                                                 | 17.809                          |
|          | <b>TOTAL</b>                                                                                                         | <b>144.788</b>                  |

**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)**

| <b>Sl. No.</b> | <b>Activity</b>                                                                                                      | <b>Mine Closure Cost<br/>( ₹ in Lakhs)</b> |
|----------------|----------------------------------------------------------------------------------------------------------------------|--------------------------------------------|
| <b>A</b>       | <b>Dismantling of Structures</b>                                                                                     |                                            |
|                | Service Buildings                                                                                                    | 1.888                                      |
|                | Residential Buildings                                                                                                | 25.204                                     |
|                | Industrial Structures like CHP, Workshop, field sub-station, etc.                                                    | 2.832                                      |
| <b>B</b>       | <b>Permanent Fencing of Mine Void and other dangerous area</b>                                                       |                                            |
|                | Random Rubble masonry of height 1.2 metre including levelling up in cement concrete 1:6:12 in mud mortar             | 14.159                                     |
| <b>C</b>       | <b>Grading of Highwall slopes</b>                                                                                    |                                            |
|                | Levelling and grading of highwall slopes                                                                             | 16.708                                     |
| <b>D</b>       | <b>*OB Dump Reclamation</b>                                                                                          |                                            |
|                | Handling/Dozing of external OB Dump into mine void                                                                   | 836.918                                    |
|                | Bio-Reclamation including soil spreading, plantation and maintenance                                                 | 3.776                                      |
| <b>E</b>       | <b>LANDSCAPING</b>                                                                                                   |                                            |
|                | Landscaping of the cleared land for improving its esthetic                                                           | 2.832                                      |
| <b>F</b>       | <b>*Plantation</b>                                                                                                   |                                            |
|                | Plantation over area obtained after dismantling                                                                      | 4.720                                      |
|                | Plantation around fencing                                                                                            | 1.888                                      |
|                | Plantation over the cleared external OB Dump                                                                         | 0.189                                      |
| <b>G</b>       | <b>Monitoring/Testing of parameters for three years</b>                                                              |                                            |
|                | Air Quality                                                                                                          | 2.077                                      |
|                | Water Quality                                                                                                        | 1.888                                      |
| <b>H</b>       | <b>*Entrepreneurship Development(Vocational/skill development training for sustainable income of affected people</b> | 2.454                                      |
| <b>I</b>       | <b>*Miscellaneous and other mitigative measures</b>                                                                  | 18.879                                     |
| <b>J</b>       | <b>Manpower Cost for Supervision</b>                                                                                 | 7.552                                      |
|                | <b>TOTAL</b>                                                                                                         | <b>943.964</b>                             |

**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) |
|----------|--------------------------------------------------------------------------------------------------------------------|---------------------------------|----------------------------------|----------------------------------|
| <b>A</b> | <b>Dismantling of Structures</b>                                                                                   |                                 |                                  |                                  |
|          | 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>B</b> | <b>Permanent Sealing of mine entries(incline mouth and air shaft)</b>                                              |                                 |                                  |                                  |
|          | Sealing of incline mouths and air shafts                                                                           | 17.481                          |                                  |                                  |
| <b>C</b> | <b>Subsidence Management</b>                                                                                       | 15.608                          | 2.69877                          | 2.55357                          |
| <b>D</b> | <b>LANDSCAPING</b>                                                                                                 |                                 |                                  |                                  |
|          | Landscaping of the cleared land for improving its esthetic                                                         | 28.916                          |                                  | 66.08629                         |
| <b>E</b> | <b>Plantation</b>                                                                                                  |                                 |                                  |                                  |
|          | Plantation over the cleared area obtained after dismantling and on other barren spaces                             | 42.717                          |                                  |                                  |
| <b>F</b> | <b>Monitoring/Testing of parameters for three years</b>                                                            |                                 |                                  |                                  |
|          | Air Quality                                                                                                        | 22.443                          |                                  |                                  |
|          | Water Quality                                                                                                      | 20.833                          |                                  |                                  |
| <b>G</b> | <b>Enterpreneuship Development(Vocational/skill development training for sustainable income of affected people</b> | 25.137                          | 74.94412                         | 8.69345                          |
| <b>H</b> | <b>Miscellaneous and other mitigative measures</b>                                                                 | 47.975                          |                                  |                                  |
| <b>I</b> | <b>Manpower Cost for Supervision</b>                                                                               | 40.417                          |                                  |                                  |
| <b>J</b> | <b>Reclamation of Abandoned Quarry</b>                                                                             | 32.5                            |                                  |                                  |
|          | <b>TOTAL</b>                                                                                                       | <b>361.094</b>                  | <b>77.64289</b>                  | <b>81.53331</b>                  |

*\*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;

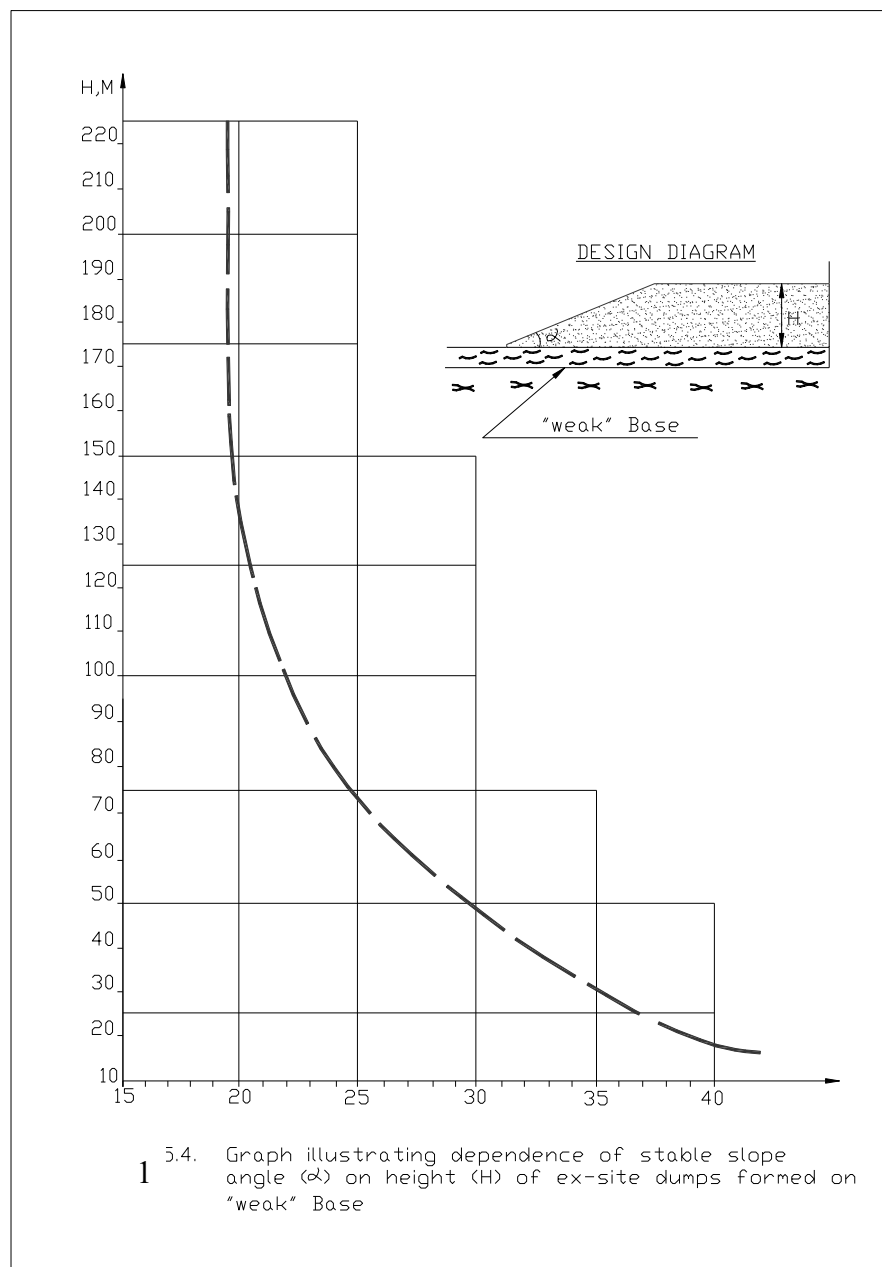
The following technical aspects would be reviewed in the final mine closure planning. Details can be worked in closure plans envisaged to be prepared.

**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<sup>0</sup>-28<sup>0</sup>. 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.



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 :

|                      |   |                                                                                                                                     |
|----------------------|---|-------------------------------------------------------------------------------------------------------------------------------------|
| <b>The Company</b>   | : | Employees, Management & Stakeholders                                                                                                |
| <b>The Community</b> | : | Local business and service providers, landholders, neighbours and nearby residents, local Government and NGOs and Community Groups. |
| <b>The State</b>     | : | 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 7<sup>th</sup> 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, Gol( 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) |
|----------|-----------------------------------------------------------------------------------------------------------------------|-------------------------------------|
| <b>A</b> | <b>Dismantling of Structures</b>                                                                                      |                                     |
|          | Service Buildings                                                                                                     | 1.349                               |
|          | Residential Buildings                                                                                                 | 18.010                              |
|          | Industrial Structures like CHP, Workshop, field sub-station, etc.                                                     | 2.024                               |
| <b>B</b> | <b>Permanent Fencing of Mine Void and other dangerous area</b>                                                        |                                     |
|          | Random Rubble masonry of height 1.2 metre including levelling up in cement concrete 1:6:12 in mud mortar              | 10.118                              |
| <b>C</b> | <b>Grading of Highwall slopes</b>                                                                                     |                                     |
|          | Levelling and grading of highwall slopes                                                                              | 11.939                              |
| <b>D</b> | <b>*OB Dump Reclamation</b>                                                                                           |                                     |
|          | Handling/Dozing of external OB Dump into mine void                                                                    | 598.032                             |
|          | Bio-Reclamation including soil spreading, plantation and maintenance                                                  | 2.698                               |
| <b>E</b> | <b>*LANDSCAPING</b>                                                                                                   |                                     |
|          | Landscaping of the cleared land for improving its esthetic                                                            | 2.024                               |
| <b>F</b> | <b>*Plantation</b>                                                                                                    |                                     |
|          | Plantation over area obtained after dismantling                                                                       | 3.373                               |
|          | Plantation around fencing                                                                                             | 1.349                               |
|          | Plantation over the cleared external OB Dump                                                                          | 0.135                               |
| <b>G</b> | <b>Monitoring/Testing of parameters for three years</b>                                                               |                                     |
|          | Air Quality                                                                                                           | 1.484                               |
|          | Water Quality                                                                                                         | 1.349                               |
| <b>H</b> | <b>*Entrepreneurship Development (Vocational/skill development training for sustainable income of affected people</b> | 1.754                               |
| <b>I</b> | <b>*Miscellaneous and other mitigative measures</b>                                                                   | 13.490                              |
| <b>J</b> | <b>Manpower Cost for Supervision</b>                                                                                  | 5.396                               |
|          | <b>TOTAL</b>                                                                                                          | <b>674.523</b>                      |

**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<br>(Extn+Top<br>Soil) | Infra/ot<br>hers* | Total                    | Backfill                   | Dump<br>(Extn+Top<br>Soil) | Infra/othe<br>rs                                       | Total |
|       | Up to Base<br>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<br>land<br>(Return) | Un<br>Distrubed/To<br>be left for<br>Public/com<br>Use | Total |
|       |                                                                    |  | Agriculture                 | Plantation                 | Water<br>Body     | Public<br>Company<br>Use | Total                      |                            |                                                        |       |
|       | Up to Base<br>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 |      |  |  |  |  |  |
|  | <b>Post Closure</b> |  |  |     |      |  |  |  |  |  |
|  | Y-25                |  |  | 1.8 | 32.4 |  |  |  |  |  |
|  | Y-26                |  |  | 1.1 |      |  |  |  |  |  |
|  | Y-27                |  |  | 0.6 |      |  |  |  |  |  |

| <b>8.2</b> | <b>Post Closure Water Quality management:</b> | Routine Environmental Monitoring will be carried out for water quality analysis of following samples:                                                                                                                                                                                                                  |        |        |           |   |            |             |  |             |    |               |           |    |
|------------|-----------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------|--------|-----------|---|------------|-------------|--|-------------|----|---------------|-----------|----|
|            |                                               | <table> <tr> <th>S. No.</th><th>Sample</th><th>Frequency</th></tr> <tr> <td>1</td><td rowspan="2">Mine Water</td><td>Fortnightly</td></tr> <tr> <td></td><td>Half Yearly</td></tr> <tr> <td>2.</td><td>Surface Water</td><td>Quarterly</td></tr> <tr> <td>3.</td><td>Ground Water</td><td>Quarterly</td></tr> </table> | S. No. | Sample | Frequency | 1 | Mine Water | Fortnightly |  | Half Yearly | 2. | Surface Water | Quarterly | 3. |
| S. No.     | Sample                                        | Frequency                                                                                                                                                                                                                                                                                                              |        |        |           |   |            |             |  |             |    |               |           |    |
| 1          | Mine Water                                    | Fortnightly                                                                                                                                                                                                                                                                                                            |        |        |           |   |            |             |  |             |    |               |           |    |
|            |                                               | 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.                                                                                                                                                                                           |        |        |           |   |            |             |  |             |    |               |           |    |
| <b>8.3</b> | <b>Post Closure Air Quality management:</b>   | 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                      |
|                     | <i>Plantation over virgin area including green belt</i>               | 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                      |
| <b>Dismantling of Infrastructure &amp; Disposal / rehabilitation of Mining Machinery</b> | 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                      |
| <b>Safety and Security</b>                                                               | 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    |          | -                            | -                              |
|                                                                                          | Filling of Void                                                                                                 |      |          | -                            | -                              |
| <b>Technical and Biological Reclamation of Mined Out of land and OB Dump</b>             | 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                      |
|                                                                                          | Power Cost                                                                                                      | LS   | 1        | 0.09                         | 0.0927125                      |
| <b>Post Closure management and supervision</b>                                           | 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                      |
|                                                                                          | 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.                                         |      |          |                              |                                |
| <b>Total</b> |                                                                                                     |      |          | <b>30.5801</b>               |                                |

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    | Amount to be deposited into escrow account annually |         |      |
|                                                              |           |          |                                                     |         |      |
| WPI as on base date                                          | Mar-22    | 148.9    | Year                                                | OC      | Year |
| Escalation rate of Closure cost                              |           | 1.229562 | Y1                                                  | 0.50145 | Y-1  |
|                                                              | UG        | OC       | Y2                                                  | 0.52652 | Y-2  |
| Base Rate of Closure Cost "Rs. Crs/Ha"                       | 0.015     | 0.09000  | Y3                                                  | 0.55285 | Y-3  |
| Closure Cost "Rs. Crs/Ha"                                    | 0.0184434 | 0.11066  | Y4                                                  | 0.58049 | Y-4  |
| Project Area                                                 | 39.83     | 176.800  | Y5                                                  | 0.60952 | Y-5  |
| Amount to be deposited into Escrow Account "Rs. in Crs."     | 0.734602  | 19.56480 | Y6                                                  | 0.63999 | Y-6  |
|                                                              |           |          | Y7                                                  | 0.67199 | Y-7  |
| Amount already deposited into Escrow Account "Rs. in Crs."   |           | 7.53000  | Y8                                                  | 0.70559 | Y-8  |
| Amount already released from Escrow Account "Rs. in Crs."    |           |          | Y9                                                  | 0.74087 | Y-9  |
| Net Amount to be deposited into Escrow Account "Rs. in Crs." | 0.734602  | 12.03480 | Y10                                                 | 0.77791 | Y-10 |
|                                                              |           |          | Y11                                                 | 0.81681 | Y-11 |
| Rate of compounding of Annual Closure Cost                   | 5.00%     |          | Y12                                                 | 0.85765 | Y-12 |
| Balance Life of the project "in yrs"                         | 24        |          | Y13                                                 | 0.90053 | Y-13 |
|                                                              |           |          | Y14                                                 | 0.94556 | Y-14 |

|                                                                                   |         |         |          |       |          |      |         |          |
|-----------------------------------------------------------------------------------|---------|---------|----------|-------|----------|------|---------|----------|
| Annual Closure Cost                                                               | 0.73460 | 0.50145 |          | 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 |
| Amount to be deposited into Escrow Account after compounding @ of 5% "Rs. in Crs" |         |         | 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                 |                       | <b>753.0</b>    |
| Amount to be Deposited in the Escrow Account in the Future | <b>73.460</b>         | <b>2231.552</b> |
| <b>Total Amount available for Mine Closure Activities</b>  | <b>73.460</b>         | <b>2984.552</b> |
| <b>Grand Total</b>                                         | <b>3058.012</b>       |                 |

The amount deposited in Escrow Accounts is appended below:

| Name of Mine: Katras Chatudih OC Mine<br>Escrow account no: 00150100010086 |           |              |              |
|----------------------------------------------------------------------------|-----------|--------------|--------------|
| S.No<br>:                                                                  | 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 | -            | -            |
| <b>Total</b>                                                               |           | <b>753.0</b> | <b>753.0</b> |

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 | 312 <sup>th</sup> Board of BCCL | 13.12.2014<br>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.

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**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.

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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) <b>Health &amp; Safety:</b> | i) Regulation Nos. 6, 61, 106, 112 of Coal Mines<br>ii) Regulations, 1957 and its related DGMS Circulars;                                                                                                               |
| (b) <b>Environment :</b>        | i) Water (Prevention & Control of Pollution) Act, 1974;<br>ii) Air (Prevention & Control of Pollution) Act, 1981;<br>iii) Environmental (Protection) Act, 1986<br>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 chronological 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:

|                      |   |                                                                                                                                      |
|----------------------|---|--------------------------------------------------------------------------------------------------------------------------------------|
| <b>The Company</b>   | : | Employees, Management & Stakeholders                                                                                                 |
| <b>The Community</b> | : | Local business and service providers, land holders, neighbours and nearby residents, local Government and NGOs and Community Groups. |
| <b>The State</b>     | : | 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 305<sup>th</sup> 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         |
|      | <b>198.309</b>                      | <b>176.585</b> | <b>374.895</b> |

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        |
| <b>Total Amount available for Mine Closure Activities</b>  | <b>258.605</b>      | <b>241.585</b> |

**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<br>( ₹ in Lakhs) |
|----------|---------------------------------------------------------------------------------------------------------------------|------------------------------------|
| <b>A</b> | <b>Dismantling of Structures</b>                                                                                    |                                    |
|          | 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>B</b> | <b>Permanent Sealing of mine entries(incline mouth and air shaft)</b>                                               |                                    |
|          | Sealing of incline mouths and air shafts                                                                            | 13.758                             |
| <b>C</b> | <b>*Subsidence Management</b>                                                                                       | 12.284                             |
| <b>D</b> | <b>LANDSCAPING</b>                                                                                                  |                                    |
|          | Landscaping of the cleared land for improving its esthetic                                                          | 22.757                             |
| <b>E</b> | <b>*Plantation</b>                                                                                                  |                                    |
|          | Plantation over the cleared area obtained after dismantling and on other barren spaces                              | 33.619                             |
| <b>F</b> | <b>Monitoring/Testing of parameters for three years</b>                                                             |                                    |
|          | Air Quality                                                                                                         | 17.663                             |
|          | Water Quality                                                                                                       | 16.396                             |
| <b>G</b> | <b>*Enterpreneuship Development(Vocational/skill development training for sustainable income of affected people</b> | 19.783                             |
| <b>H</b> | <b>*Miscellaneous and other mitigative measures</b>                                                                 | 37.756                             |
| <b>I</b> | <b>Manpower Cost for Supervision</b>                                                                                | 31.808                             |
|          | <b>TOTAL</b>                                                                                                        | <b>258.605</b>                     |

**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<br>( ₹ in Lakhs) |
|----------|----------------------------------------------------------------------------------------------------------------------|------------------------------------|
| <b>A</b> | <b>Dismantling of Structures</b>                                                                                     |                                    |
|          | Service Buildings                                                                                                    | 0.483                              |
|          | Residential Buildings                                                                                                | 6.450                              |
|          | Industrial Structures like CHP, Workshop, field sub-station, etc.                                                    | 0.725                              |
| <b>B</b> | <b>Permanent Fencing of Mine Void and other dangerous area</b>                                                       |                                    |
|          | Random Rubble masonry of height 1.2 metre including levelling up in cement concrete 1:6:12 in mud mortar             | 3.624                              |
| <b>C</b> | <b>Grading of Highwall slopes</b>                                                                                    |                                    |
|          | Levelling and grading of highwall slopes                                                                             | 4.276                              |
| <b>D</b> | <b>*OB Dump Reclamation</b>                                                                                          |                                    |
|          | Handling/Dozing of external OB Dump into mine void                                                                   | 214.189                            |
|          | Bio-Reclamation including soil spreading, plantation and maintenance                                                 | 0.966                              |
| <b>E</b> | <b>LANDSCAPING</b>                                                                                                   |                                    |
|          | Landscaping of the cleared land for improving its esthetic                                                           | 0.725                              |
| <b>F</b> | <b>*Plantation</b>                                                                                                   |                                    |
|          | Plantation over area obtained after dismantling                                                                      | 1.208                              |
|          | Plantation around fencing                                                                                            | 0.483                              |
|          | Plantation over the cleared external OB Dump                                                                         | 0.048                              |
| <b>G</b> | <b>Monitoring/Testing of parameters for three years</b>                                                              |                                    |
|          | Air Quality                                                                                                          | 0.531                              |
|          | Water Quality                                                                                                        | 0.483                              |
| <b>H</b> | <b>*Entrepreneurship Development(Vocational/skill development training for sustainable income of affected people</b> | 0.628                              |
| <b>I</b> | <b>*Miscellaneous and other mitigative measures</b>                                                                  | 4.832                              |
| <b>J</b> | <b>Manpower Cost for Supervision</b>                                                                                 | 1.933                              |
|          | <b>TOTAL</b>                                                                                                         | <b>241.585</b>                     |

**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) |
|----------|---------------------------------------------------------------------------------------------------------------------|--------------------------------|----------------------------------|----------------------------------|
| <b>A</b> | <b>Dismantling of Structures</b>                                                                                    |                                |                                  |                                  |
|          | Service Buildings                                                                                                   | 10.655                         |                                  |                                  |
|          | Residential Buildings                                                                                               | 32.21                          |                                  |                                  |
|          | Industrial Structures like CHP, Workshop, field sub-station, etc.                                                   | 19.271                         |                                  |                                  |
| <b>B</b> | <b>Permanent Sealing of mine entries(incline mouth and air shaft)</b>                                               |                                |                                  |                                  |
|          | Sealing of incline mouths and air shafts                                                                            | 16.196                         |                                  |                                  |
| <b>C</b> | <b>Subsidence Management</b>                                                                                        | 14.461                         |                                  | <b>2.56609</b>                   |
| <b>D</b> | <b>LANDSCAPING</b>                                                                                                  |                                |                                  |                                  |
|          | Landscaping of the cleared land for improving its esthetic                                                          | 26.791                         |                                  |                                  |
| <b>E</b> | <b>Plantation</b>                                                                                                   |                                |                                  |                                  |
|          | Plantation over area obtained after dismantling                                                                     | 39.577                         |                                  | <b>1.81038</b>                   |
| <b>F</b> | <b>Monitoring/Testing of parameters for three years</b>                                                             |                                |                                  |                                  |
|          | Air Quality                                                                                                         | 20.793                         |                                  |                                  |
|          | Water Quality                                                                                                       | 19.301                         |                                  |                                  |
| <b>G</b> | <b>Enterpreneurship Development(Vocational/skill development training for sustainable income of affected people</b> | 23.29                          | 41.80181                         |                                  |
| <b>H</b> | <b>Miscellaneous and other mitigative measures</b>                                                                  | 44.448                         |                                  | <b>173.29465</b>                 |
| <b>I</b> | <b>Manpower Cost for Supervision</b>                                                                                | 37.446                         |                                  |                                  |
|          | <b>Sub-Total(UG Part)</b>                                                                                           | <b>304.439</b>                 |                                  |                                  |
|          | <b>Abandoned Quarry Reclamation</b>                                                                                 |                                |                                  |                                  |
| <b>J</b> | <b>Reclamation of the abandoned quarry</b>                                                                          | 65.000                         |                                  |                                  |
|          | <b>Sub-Total(OC Part)</b>                                                                                           | <b>65.000</b>                  |                                  |                                  |
|          | <b>GRAND TOTAL</b>                                                                                                  | <b>369.439</b>                 | <b>41.802</b>                    | <b>177.671</b>                   |

*\*The estimate of total expenditure incurred upon the progressive closure activities are provided by BCCL.*



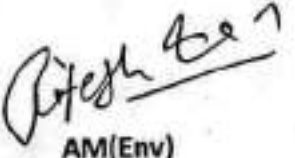


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Annexure-12

**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



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**



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

(Assessment year – 2021-22)

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

**JHARIA COALFIELD AND RANIGANJ COALFIELD (PART)**

For  
**(BHARAT COKING COAL LIMITED)**

(A Subsidiary of Coal India Limited)

KOYLA BHAWAN (DHANBAD)

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

**MARCH – 2022**



*cmpdi*  
*A Mini Ratna Company*

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

**(Assessment year – 2021-22)**

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

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**KOYLA BHAWAN (DHANBAD)**

**Prepared by  
Hydrogeology Department  
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**MARCH – 2022**

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**(Accredited as a GWCO by QCI-NABET)**

**(Accredited by NABL, CMPDI, RI-II, Lab)**



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**DETAILS OF THE REPORT**

| SI No. | ITEMS                                          | INFORMATIONS                                                                                                                                                                                                                                                                                                                                           |
|--------|------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 1      | Geographical Area                              | Jharia Coalfield (JCF): 453 sq. km.<br>Raniganj Coalfield (RCF part): 19.64 sq. km. (Cluster-XVI area only)                                                                                                                                                                                                                                            |
| 2      | Major Physiographic Units                      | Dissected Pediplain with surface Reduced Level (RL) varies from 160 m to 220 m above mean sea level (AMSL) in JCF and 100 m to 140 m AMSL in RCF.                                                                                                                                                                                                      |
| 3      | Drainage System                                | Damodar River is the master drainage flowing along western boundary of the JCF. Jamunia River, Khudia River, Katri River, Jarian Nala, Ekra Jore, Kari Jore, Kashi Jore, Chatkari Jore and their tributaries are flowing through the JCF area.<br>Damodar River, Barakar River is the master drainage of the part of RCF area (CV Area).               |
| 4      | Annual Rainfall (IMD-report)                   | Jharkhand State: 1264.10 mm<br>Rainfall data given in <b>Annexure-IV</b> .                                                                                                                                                                                                                                                                             |
| 5      | Geological Formations                          | Gondwana Formation<br>(Talchir Formation, Barakar Formation, Barren Measure Formation & Raniganj Formation)                                                                                                                                                                                                                                            |
| 6      | Aquifer System                                 | Unconfined/Phreatic Aquifer – thickness 25 m (Avg.)<br>Semi-confined to confined Aquifer – thickness from 25 m upto 650 m                                                                                                                                                                                                                              |
| 7      | Hydrogeological properties (Aquifer Pump Test) | Unconfined Aquifer (Damoda BJ Section & Block-II):<br>Hydraulic Conductivity – upto 0.50 m/day<br>Transmissivity – 10 - 42 m <sup>2</sup> /day<br>Semi-confined to confined Aquifer (Sitnala & Kumari Block):<br>Hydraulic Conductivity – 0.0006-1.44 & 0.05-0.0027 m/day<br>Transmissivity – 0.06 – 0.573 m <sup>2</sup> /day                         |
| 8      | Groundwater Level Monitoring Network           | Out of total 252 nos. of monitoring stations 64 nos located within core mining area and rest comes within Buffers zone.<br>60 Nos. of Groundwater monitoring well (Dug Wells) network established by CMPDI to record groundwater level data in and around the Core Zone of JCF and 4 Nos. of Groundwater monitoring well (Dug Wells) in RCF (CV Area). |
| 9      | Groundwater Levels Below Ground Level (bgl)    | JCF area:<br>Pre-monsoon – 0.62 to 11.26 m (Avg. 5.23 m bgl) in '2021-22<br>Post-monsoon – 0.05 to 7.62 m (Avg. 2.28 m bgl) in '2021-22<br>RCF area (part):<br>Pre-monsoon – 2.0 to 6.20 m (Avg. 3.34 m bgl) in '2021-22<br>Post-monsoon – 1.10 to 5.25 m (Avg. 2.44 m bgl) in '2021-22                                                                |
| 10     | Groundwater Quality                            | Potable as per GEC-2015 Norms ( <b>Annexure- VIII</b> )                                                                                                                                                                                                                                                                                                |
| 11     | Proposed Piezometers                           | Proposed piezometers (23 nos.) to monitor impact of coal mining on groundwater regime within the coalfield area (JCF & part of RCF) for maximum depth upto 290 m.                                                                                                                                                                                      |
| 12     | Stage of Groundwater Development (CGWB)        | Dhanbad District-76.30%<br>(GWRE-2017)                                                                                                                                                                                                                                                                                                                 |

## GROUNDWATER LEVEL & QUALITY REPORT FOR CLUSTER OF MINES OF BCCL

### 1.0 INTRODUCTION

#### 1.1 LOCATION DETAILS AND BRIEF ABOUT THE PROJECT

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

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

#### 1.2 OBJECTIVE OF THE STUDY:

The objective of the report is to conducting hydrogeological study by quarterly monitoring of groundwater level and quality of the Jharia coalfield and Raniganj coalfield (part) within BCCL command area for 15 nos. Cluster of mines of BCCL. The data collected shall submitted to the MoEF&CC, CPCB & SPCB within stipulated timeframe. The work being done yearly and require d 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 taken into account for hydro-geological investigation of the study area.

- i) The monitoring of the groundwater levels done four times/year during (May, August, Nov and Jan).
- ii) The monitoring of the groundwater quality done 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- दिनांक : 14.06.2018  
1088/14)

सेवा में,  
महाप्रबंधक  
व्यापार विकास

सीएमपीडीआई - कांके रोड रांची ८३४०३१-

**Sub: For work of Ground water level and quality monitoring**

महोदय,

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

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

This is for your kind information and further necessary action

भवदीय

14/6/18  
उप-महाप्रबंधक (पर्यावरण)

Copy To:

१ महाप्रबंधक (गवेषण), कांके रोड रांची ८३४०३१-

## 1.4 TOPOGRAPHY AND DRAINAGE

Northern part of the JCF area covered with hills and thin forest. In general, the altitude varies from 220 m AMSL in Barora area (Cluster-I) to 160 m above mean sea level (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) areas 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 southeast course and ultimately joins Damodar River, the master drainage. The drainage of the JCF is mainly controlled by Jamuniya River (5<sup>th</sup> order), Khudia nala (3<sup>rd</sup> order), Katri River (4<sup>th</sup>) and Chatkari nala (3<sup>rd</sup> 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 in Barakar River and Panchet dam in 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 flooded by water, either permanently or seasonally. The primary factor that distinguishes **wetlands** from other landform or water bodies is the characteristic vegetation of 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 given 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 upto 45° C and falls between 10° C to 5° C in winter. The maximum rainfall occurs during the period between June and September. Rainfall data of IMD Dhanbad and Mine Rescue Station Dhanbad given in **Annexure-IV**.

In Jharkhand state, Daily Rainfall data from 1989 to 2018 considered for analysis of trend variability and mean rainfall patterns. From the daily rainfall data, monthly rainfall series of each stations computed and then monthly district rainfall series has constructed by considering arithmetic average of all the station rainfall values within the district. The monthly rainfall series of the state has 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 utilized for identification of the mean spatial patterns and rainfall intensity trends. From mean and standard deviation (SD), the coefficient of variation (CV) calculated as follows: 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 see 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

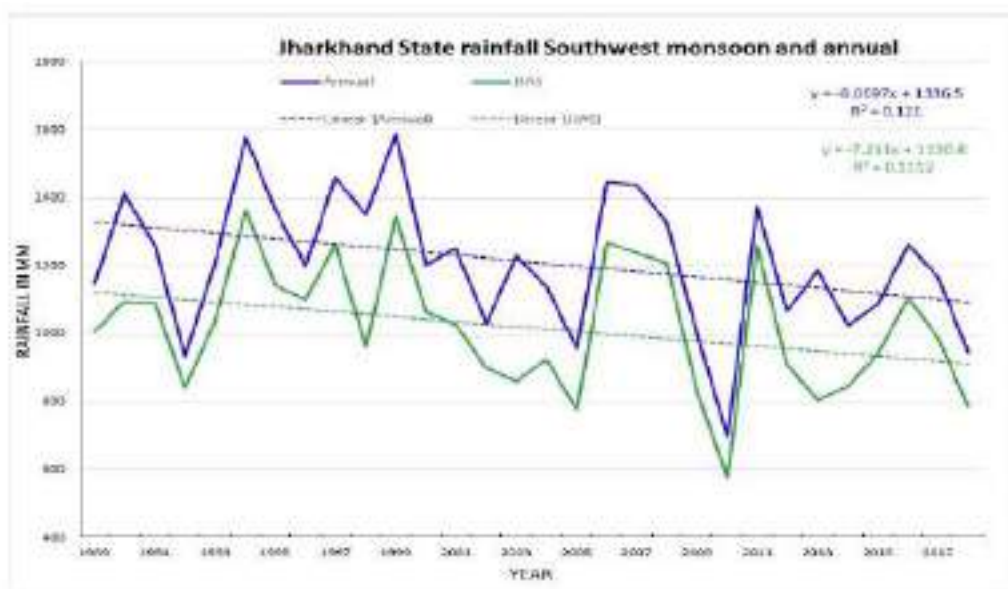
|      | June  | July  | August | September | Sub-total | Annual |
|------|-------|-------|--------|-----------|-----------|--------|
| Mean | 190.3 | 313.9 | 289.2  | 225.7     | 1019.1    | 1211.4 |
| CV   | 44.4  | 29.0  | 24.8   | 37.0      | 18.7      | 16.9   |

### Dhanbad District

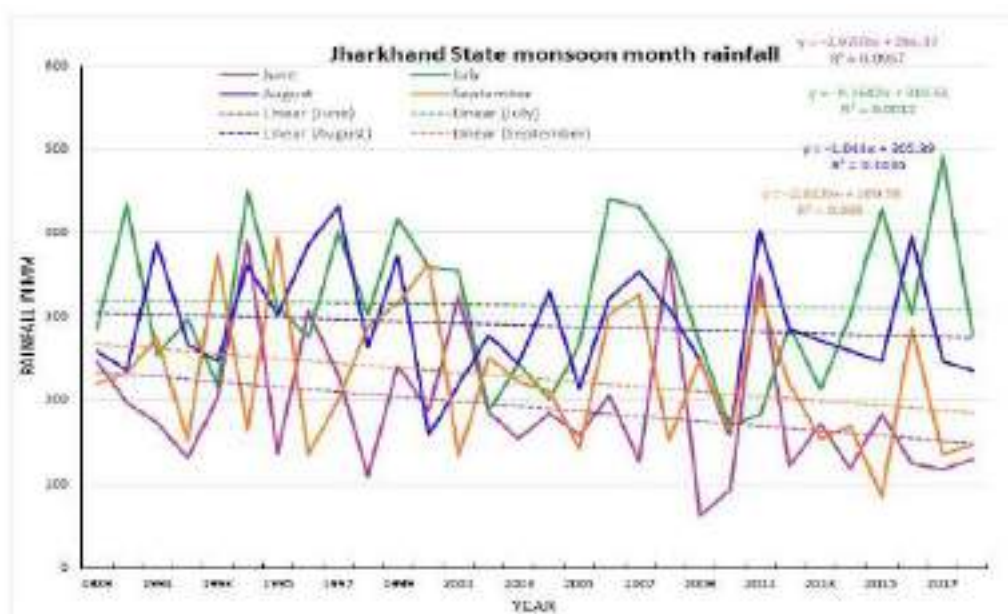
|      | June  | July  | August | September | Sub-total | Annual |
|------|-------|-------|--------|-----------|-----------|--------|
| Mean | 203.9 | 327.7 | 302.5  | 271.5     | 1105.6    | 1332.2 |
| CV   | 41.0  | 35.0  | 33.5   | 48.7      | 20.8      | 19.4   |



**Fig. 1 and 2** show the time series of rainfall in mm for the months of June, July, August, September and southwest monsoon season, annual respectively. The trend lines 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. In the monthly rainfall June, July, August, September and seasonal rainfall shows decreasing trend. During the last 30 years highest rainfall of 390.3 mm received in June in the year 1994, 492.1 mm received in June in the year 2017, 431.5 mm received in August in the year 1997, while highest rainfall of 395.2 in September received in the year 1995. Highest annual rainfall of 1587.9 mm received in the year 1999 and highest southwest monsoon rainfall of 1364.6 mm 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 covers an area of 453 sq. km. located in Dhanbad District, Jharkhand. The non-coal bearing Talchir Formation exposed in patches along the northern fringe of the Coalfield. The Barakar Formation overlies the Talchir is covering the most part of the Jharia Coalfield and having an area of 218 sq. km. This successively overlain by the non-coal bearing Barren Formation mainly exposed in the central part of the Coalfield. This, in turn, 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 in 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 which only 35 sq. km. comes under leasehold area of BCCL out of 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 in the area**

| 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 constituted of fine to coarse grain sandstone having primary porosity of intergranular void space. The secondary porosity formed due to presence of faults, fracture, joints, etc. Sandstone of Gondwana formations in JCF and RCF are very hard, compact and cemented sandstone and forming less potential aquifer, particularly the 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 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 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 potential than semi-confined to confined aquifer.

### **SEMI-CONFINED TO CONFINED AQUIFER**

The semi-confined to confined aquifer consisting of sandstone bed is sandwiched with coal seams/shale beds and multiple aquifer system developed due to presence of multiple numbers 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 potential.

**Table –2 Generalized Hydrogeological Units developed in the study Area**

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

## **2.4 GENERAL AQUIFER PARAMETERS**

### **PHREATIC/UN-CONFINED AQUIFER**

The wells tested by CMPDI for determination of aquifer parameters in Damuda (BJ Section) and Block-III area of JCF. The hydraulic conductivity of the un-confined aquifer is 0.50 m/day as computed from pumping tests on the wells. The transmissivity of the unconfined aquifer ranges from 10.68 m<sup>2</sup> /day to 41.48 m<sup>2</sup> /day.

### **SEMI-CONFINED TO CONFINED AQUIFER**

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

**Table – 3: Aquifer parameters considered for the study Area**

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

### **3.0 GROUND WATER LEVEL MONITORING**

To collect the representative groundwater levels in the study area, CMPDI has established a monitoring network of total 252 monitoring stations out of which 64 located within core zone and rest comes within Buffer zone. Total 60 nos. dug well within JCF and 04 nos. dug well within RCF (part) area (Details of the Hydrograph stations & water level given in **Annexure-V, VA & VB**) spread over the entire BCCL leasehold area, **Plate-I**. Water level monitoring in all hydrograph stations has been done in pre-monsoon as well as in post monsoon whereas in 64 stations monitoring done in quarterly (May'21, Aug'21, Nov'21 and Jan'22) basis.

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 in 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 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 given from 2005 to 2021 of CMPDI monitoring stations (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    |
| 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    |

### 3.2 GROUNDWATER LEVEL SCENARIO IN NON-MINING/MINING AREA

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

**Table – 5: Depth to water table**

| Formation                | Area                             |    | DTW (bgl, m) [Year-2021-22] |                        | Average GWL (m) |              |
|--------------------------|----------------------------------|----|-----------------------------|------------------------|-----------------|--------------|
|                          |                                  |    | Pre-monsoon (Apr/May)       | Post-monsoon (Nov/Dec) | Pre-monsoon     | Post-monsoon |
| Sedimentary (Gondwana)   | Non-mining                       |    | 1.45-8.20                   | 0.35-3.70              | 5.10            | 2.00         |
|                          | Mining                           | OC | 1.40-10.35                  | 0.84-5.65              | 4.66            | 2.15         |
|                          |                                  | UG | 1.09-10.13                  | 0.55-7.62              | 5.75            | 2.80         |
| Metamorphics (Hard rock) | Peripheral part of the Coalfield |    | 0.62-11.75                  | 0.50-7.45              | 6.80            | 3.60         |

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 the JCF and RCF (part) area. The average hydraulic gradient of the water table within mining and non-mining areas given in Table-6. There is no significant change in hydraulic gradient observed. Relatively steep gradient near active opencast mining areas w.r.t., Non-Mining, Underground mines and Metamorphics areas observed.

**Table – 6: Average hydraulic gradient**

| Sl. No | Formation                | Area                             |    | Average hydraulic gradient                    |
|--------|--------------------------|----------------------------------|----|-----------------------------------------------|
| 1      | Sedimentary (Gondwana)   | Non-Mining                       |    | $1.0 \times 10^{-3}$ to $3.25 \times 10^{-3}$ |
|        |                          | Mining                           | OC | $1.0 \times 10^{-2}$ to $4.0 \times 10^{-3}$  |
|        |                          |                                  | UG | $1.0 \times 10^{-2}$ to $3.0 \times 10^{-3}$  |
| 2      | Metamorphics (Hard rock) | Peripheral part of the Coalfield |    | $1.0 \times 10^{-3}$ to $3.5 \times 10^{-3}$  |

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

#### A GROUND WATER LEVEL OF CLUSTER-I

Cluster-I (Damuda Group of Mines) consisting of (Cluster-I consisting of Damoda 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 works out upto 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 Damoda block area marked by more or less flat and gently undulating topography. The RL varies from 179 m to 208 m AMSL and the general slope of topography is towards east. Jamuniya River, Kari Jore, Podo Jore and its tributaries are controlling the drainage system of the area. The area comes under the watershed of Jamuniya River.

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

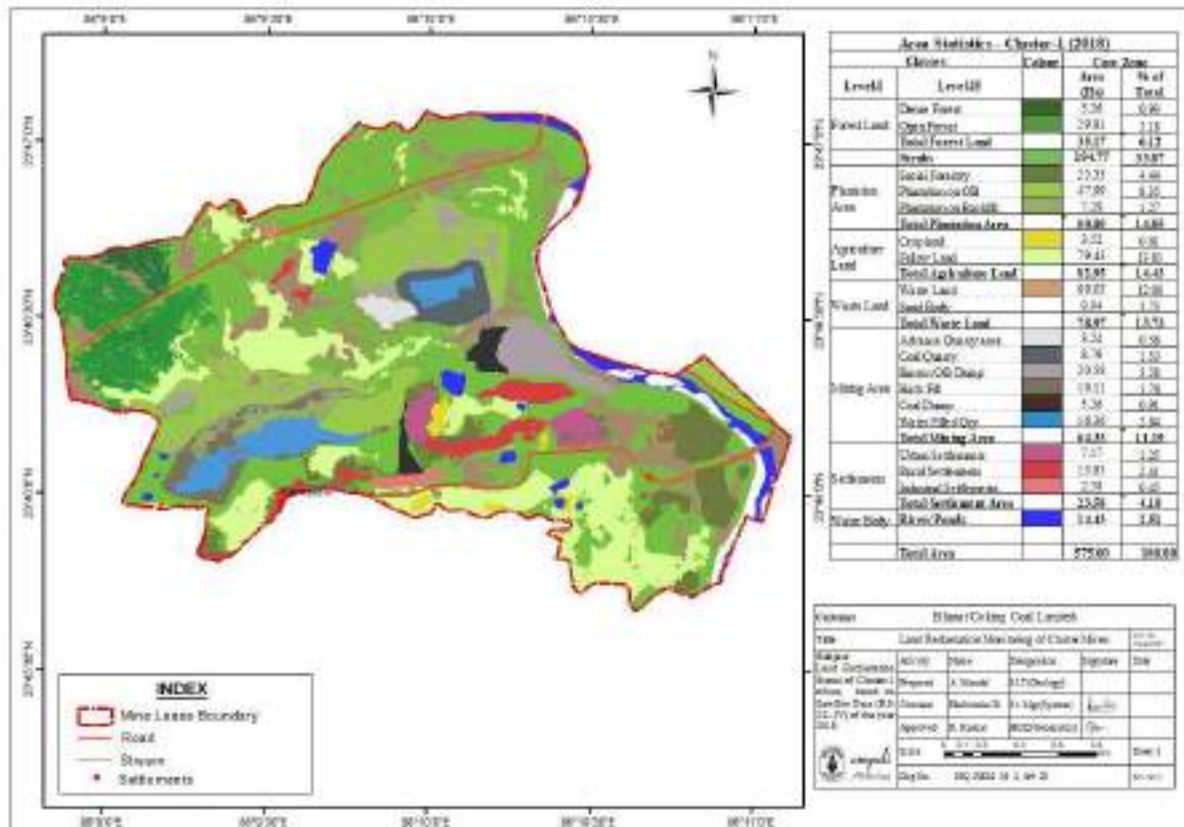
| Sl No.                  | Well No. | Location   | Water level (bgl in meters) |      |      |      |         |      |      |      |         |      |      |      |
|-------------------------|----------|------------|-----------------------------|------|------|------|---------|------|------|------|---------|------|------|------|
|                         |          |            | 2021-22                     |      |      |      | 2020-21 |      |      |      | 2019-20 |      |      |      |
|                         |          |            | May                         | Aug  | Nov  | Jan  | May     | Aug  | Nov  | Jan  | May     | Aug  | Nov  | Jan  |
| 1                       | B-15     | Bera Basti | 1.46                        | 0.25 | 0.35 | 1.01 | 3.70    | 0.15 | 1.47 | 1.70 | 1.90    | 0.45 | 1.65 | 2.65 |
| 2                       | B21A     | Dugdha     | 8.38                        | 2.5  |      |      | 10.00   | 4.15 | 5.80 | 6.70 | 9.45    | 1.90 | -    | -    |
| 3                       | B-51     | Taranga    | 5.70                        | 0.90 | 1.00 | 4.88 | 5.00    | 0.88 | 2.10 | 3.00 | 5.10    | 1.10 | 2.70 | 2.90 |
| 4                       | B-53     | Karmatanr  | 4.85                        | 1.52 | 1.87 | 2.87 | 3.12    | 1.07 | 1.40 | 1.92 | 3.22    | 0.97 | 1.42 | 2.12 |
| <b>Average WL (bgl)</b> |          |            | 5.10                        | 1.29 | 1.07 | 2.92 | 3.70    | 0.15 | 1.47 | 1.70 | 4.92    | 1.11 | 1.92 | 2.56 |

#### LAST THREE-YEAR ASSESSMENT:

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



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



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

## 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 works out upto 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 Damoda block area marked by more or less flat and gently undulating topography. The RL varies from 176 m to 235 m AMSL. Jamuniya River, Khudia River and its tributaries are controlling the drainage system of the area. The area comes under the watershed of Jamuniya River and Khudia River.

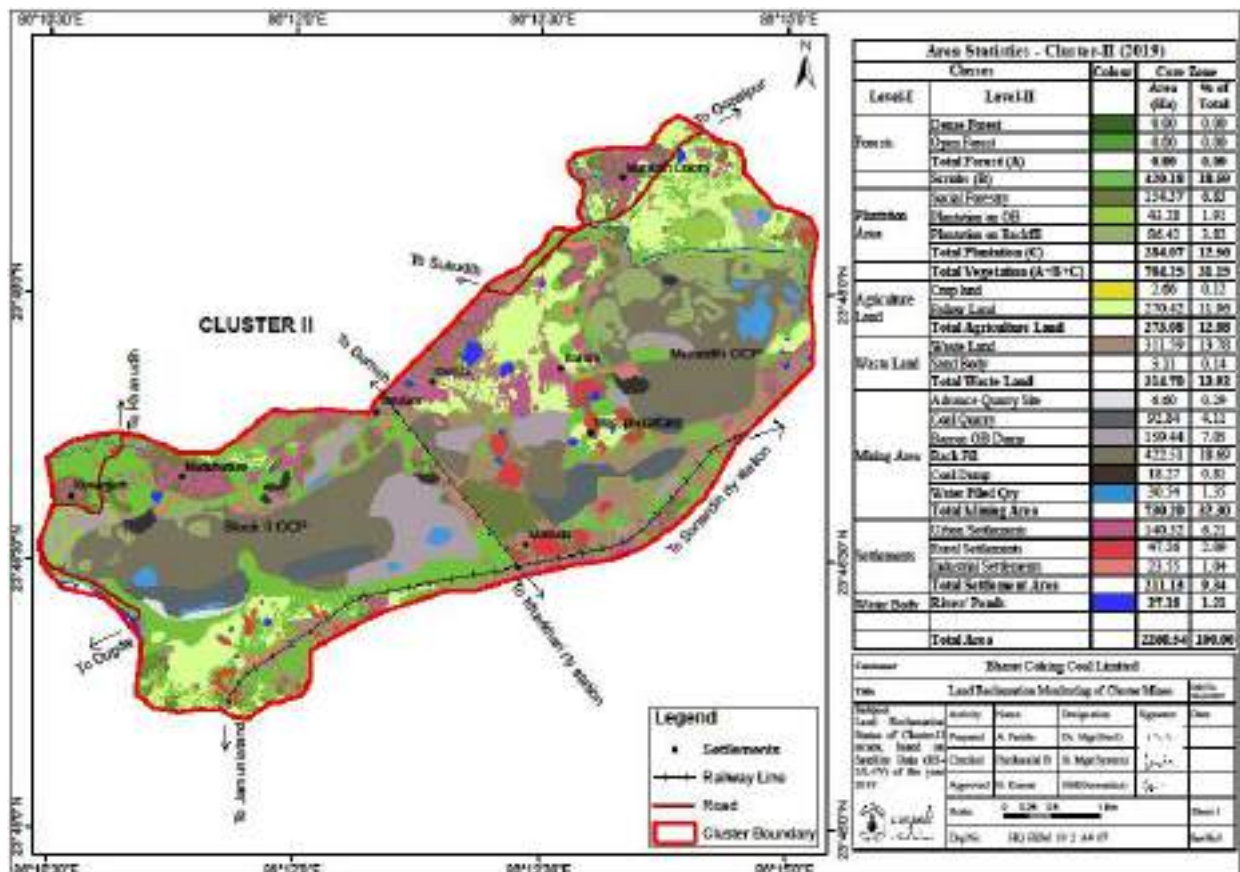
Monitoring stations (**B-1, B-59, B-60, B-61A and B-62A**) are located in the core zone of the mine area. Water level monitoring in these monitoring stations has done in the months of May'21, August'21, and Nov'21 and January'22, the Ground water level data enclosed in the table below:

| Sl No.                  | Well No. | Location   | Water level (bgl in meters) |      |      |      |         |      |      |      |         |      |      |      |
|-------------------------|----------|------------|-----------------------------|------|------|------|---------|------|------|------|---------|------|------|------|
|                         |          |            | 2021-22                     |      |      |      | 2020-21 |      |      |      | 2019-20 |      |      |      |
|                         |          |            | May                         | Aug  | Nov  | Jan  | May     | Aug  | Nov  | Jan  | May     | Aug  | Nov  | Jan  |
| 1                       | B-1      | Muraidih   | 2.58                        | 0.58 | 1.91 | 2.03 | 3.28    | 0.73 | 1.63 | 1.73 | 3.18    | 1.33 | 1.73 | 1.98 |
| 2                       | B-59     | Khodovaly  | 5.49                        | 0.30 | 0.90 | 0.95 | 5.25    | 0.67 | 1.40 | 2.10 | 6.20    | 0.80 | 0.90 | 1.20 |
| 3                       | B-60     | Bahiyardi  | 11.26                       | 1.33 | 2.23 | 6.53 | 10.33   | 0.91 | 3.21 | 6.13 | 8.13    | 1.23 | 3.23 | 4.93 |
| 4                       | B61A     | Kesargora  | 4.42                        | 0.47 | 0.97 | 0.97 | 3.32    | 0.85 | 1.60 | 2.07 | 3.32    | 1.39 | 0.52 | 1.12 |
| 5                       | B62A     | Sadiyardih | 6.87                        | 1.35 | 4.50 | 4.60 | 6.95    | 2.77 | 3.00 | 4.95 | 7.55    | 2.80 | 3.25 | 4.95 |
| <b>Average WL (bgl)</b> |          |            | 6.12                        | 0.81 | 2.10 | 3.02 | 5.83    | 1.19 | 2.17 | 3.40 | 5.68    | 1.51 | 1.93 | 2.84 |

### LAST THREE-YEAR ASSESSMENT:

Pre-monsoon GW Level (m): Min – 2.57 m      Max – 11.26 m  
Post-monsoon GW Level (m): Min – 0.52 m      Max – 4.50 m

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



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

### 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. It is located in the western most part of Jharia coalfield in Dhanbad district of Jharkhand. The life of the project works out upto 60 years considering annual target production 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 varies from 160 m to 208.80 m AMSL. The general slope of the area is towards south. Khudia River, Baghdihi Jore, Katri River and its tributaries are controlling the drainage system of the area. The area comes under the watershed of Khudia River.

Monitoring stations (**A-12, A-25, A-29, B-14 and B-60**) are located in the core zone of the mine area. Water level monitoring in these monitoring stations has done in the months of May'21, August'21, and Nov'21 and January'22, the Ground water level data enclosed in the table below:

| Sl No.                  | Well No. | Location   | Water level (bgl in meters) |      |      |      |         |      |      |      |         |      |      |      |
|-------------------------|----------|------------|-----------------------------|------|------|------|---------|------|------|------|---------|------|------|------|
|                         |          |            | 2021-22                     |      |      |      | 2020-21 |      |      |      | 2019-20 |      |      |      |
|                         |          |            | May                         | Aug  | Nov  | Jan  | May     | Aug  | Nov  | Jan  | May     | Aug  | Nov  | Jan  |
| 1                       | A12      | Jamua      | 1.92                        | 0.50 | 1.10 | 1.72 | 2.60    | 0.32 | 0.50 | 1.20 | 2.10    | 0.29 | 0.45 | 0.75 |
| 2                       | A25      | Sinidih    | 5.78                        | 1.73 | 2.43 | 2.53 | 2.98    | 1.30 | 1.83 | 2.53 | 6.08    | 1.43 | 1.93 | 2.48 |
| 3                       | A29      | Dharmaband | 6.49                        | 2.90 | 5.90 | 6.65 | 6.20    | 1.21 | 3.20 | 3.25 | 4.85    | 1.20 | 3.40 | 3.65 |
| 4                       | B14      | Mathadih   | 2.84                        | 0.24 | 2.04 | 2.10 | 2.44    | 0.32 | 1.04 | 1.69 | 2.24    | 0.54 | 0.94 | 2.04 |
| 5                       | B60      | Sonardih   | 11.26                       | 1.33 | 2.23 | 6.53 | 10.33   | 0.91 | 3.21 | 6.13 | 8.13    | 1.23 | 3.23 | 4.93 |
| <b>Average WL (bgl)</b> |          |            | 5.66                        | 1.34 | 2.74 | 3.91 | 4.91    | 0.81 | 1.96 | 2.96 | 4.68    | 0.94 | 1.99 | 2.77 |

#### LAST THREE-YEAR ASSESSMENT:

Pre-monsoon GW Level (m): Min – 1.92 m      Max – 11.26 m  
Post-monsoon GW Level (m): Min – 0.45 m      Max – 5.90 m

[illegible]

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

#### 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 works out 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 its tributaries are controlling the drainage pattern of the area. The area comes under the watershed of Katri River.

Monitoring stations (**A-26, A28A, B-64 and B-65A**) are located in the core zone of the mine area. Water level monitoring in these monitoring stations has done in the months of May'21, August'21, and Nov'21 and January'22, the Ground water level data enclosed in the table below:

| Sl No.                  | Well No. | Location     | Water level (bgl in meters) |      |      |      |         |      |      |      |         |      |      |      |
|-------------------------|----------|--------------|-----------------------------|------|------|------|---------|------|------|------|---------|------|------|------|
|                         |          |              | 2021-22                     |      |      |      | 2020-21 |      |      |      | 2019-20 |      |      |      |
|                         |          |              | May                         | Aug  | Nov  | Jan  | May     | Aug  | Nov  | Jan  | May     | Aug  | Nov  | Jan  |
| 1                       | A-26     | Malkhera     | 6.70                        | 2.10 | 2.73 | 3.63 | 6.98    | 2.69 | 3.18 | 4.78 | 6.58    | 2.23 | 3.33 | 3.83 |
| 2                       | A28A     | Lakarka      | 6.23                        | 0.53 | 3.75 | 4.47 | 4.00    | 1.33 | 3.03 | 3.35 | 2.45    | 1.25 | 3.15 | 3.60 |
| 3                       | B-64     | Keshalpur    | 2.35                        | 0.30 | 0.95 | 1.00 | 1.85    | 0.93 | 0.50 | 1.37 | 0.95    | 0.30 | 0.45 | 1.20 |
| 4                       | B65A     | Jhinjipahari | 9.03                        | 0.45 | 1.42 | 2.80 | 9.25    | 0.03 | 2.30 | 4.10 | 11.05   | 1.85 | 0.95 | 2.95 |
| <b>Average WL (bgl)</b> |          |              | 6.08                        | 0.85 | 2.21 | 2.98 | 5.52    | 1.25 | 2.25 | 3.40 | 5.26    | 1.41 | 1.97 | 2.90 |

#### LAST THREE-YEAR ASSESSMENT:

Pre-monsoon GW Level (m): Min – 0.95 m      Max – 11.05 m  
Post-monsoon GW Level (m): Min – 0.45 m      Max – 3.75 m



[illegible]

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

## 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 Bansjore 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 works out more than 30 years considering annual target production 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 its tributaries are controlling the drainage pattern of the area. The area comes under the watershed of Jarian Nala and Ekra Jore.

Monitoring stations (**A-3, A-16, A-27 and D-23**) are located in the core zone of the mine area. Water level monitoring in these monitoring stations has done in the months of May'21, August'21, and Nov'21 and January'22, the Ground water level data enclosed in the table below:

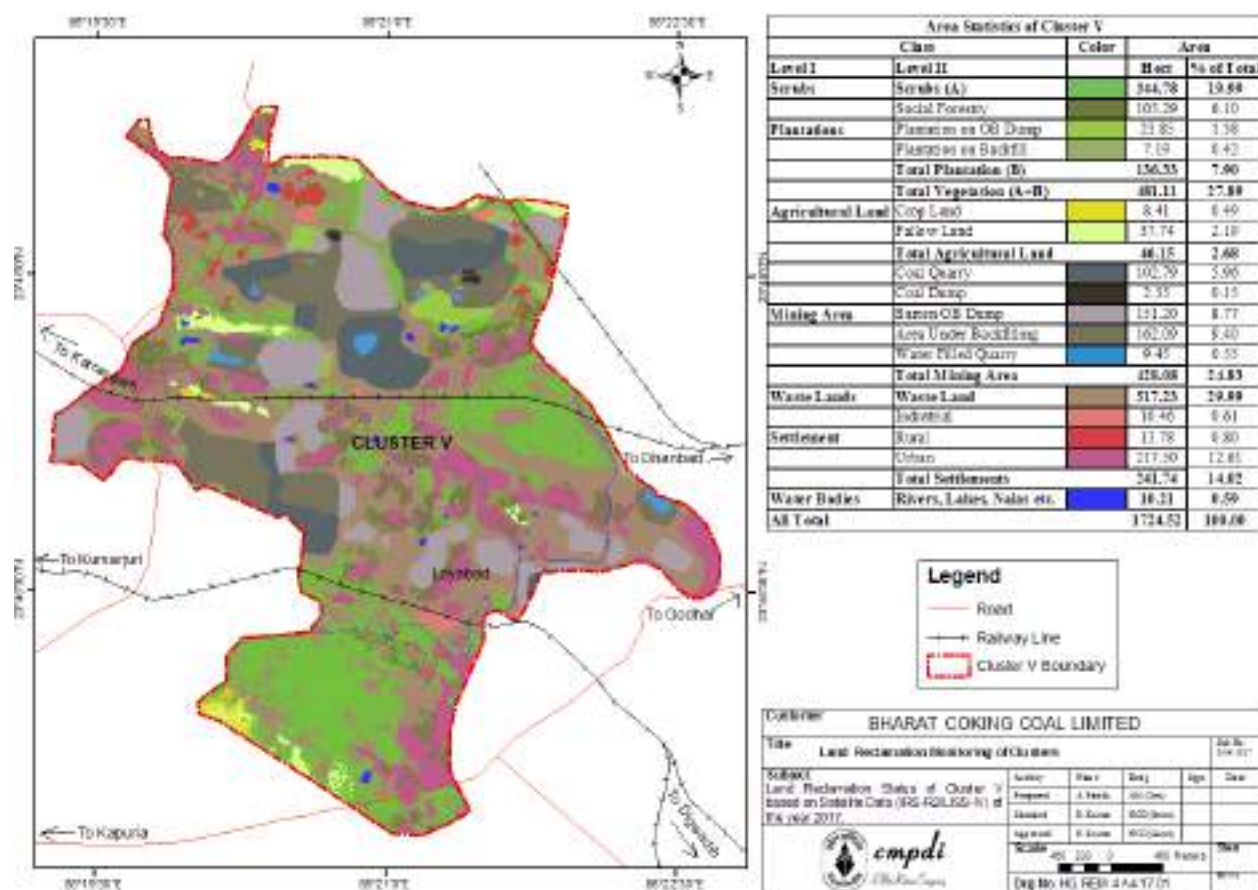
| Sl No.                  | Well No. | Location  | Water level (bgl in meters) |      |      |      |         |      |      |      |         |      |      |      |
|-------------------------|----------|-----------|-----------------------------|------|------|------|---------|------|------|------|---------|------|------|------|
|                         |          |           | 2021-22                     |      |      |      | 2020-21 |      |      |      | 2019-20 |      |      |      |
|                         |          |           | May                         | Aug  | Nov  | Jan  | May     | Aug  | Nov  | Jan  | May     | Aug  | Nov  | Jan  |
| 1                       | A-3      | Sijua     | 0.62                        | 0.07 | 0.05 | 0.07 | 1.57    | 0.02 | 0.47 | 0.77 | 3.47    | 0.32 | 0.47 | 0.62 |
| 2                       | A-16     | Ekra      | 3.45                        | 1.90 | 2.00 | 3.00 | 7.15    | 1.34 | 1.75 | 3.20 | 5.45    | 1.65 | 1.95 | 4.55 |
| 3                       | A-27     | Tetulmari | 1.67                        | 0.80 | 0.90 | 1.13 | 2.40    | 0.03 | 1.10 | 1.90 | 2.40    | 0.15 | 0.92 | 1.30 |
| 4                       | D-23     | Jogta     | 5.43                        | 1.87 | 1.60 | 1.65 | 5.60    | 1.69 | 3.35 | 3.70 | 4.70    | 1.65 | 1.40 | 1.50 |
| <b>Average WL (bgl)</b> |          |           | 2.79                        | 1.16 | 1.14 | 1.46 | 4.18    | 0.77 | 1.67 | 2.39 | 4.01    | 0.94 | 1.19 | 1.99 |

### LAST THREE-YEAR ASSESSMENT:

Pre-monsoon GW Level (m): Min – 0.62 m      Max – 5.60 m  
Post-monsoon GW Level (m): Min – 0.05 m      Max – 3.35 m



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



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

## F. GROUND WATER LEVEL OF CLUSTER-VI

Cluster-VI consists of four coalmines; 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 works out more than 30 years considering annual target production of 7.631 MTPA (Toposheet no – 73 I/6).

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

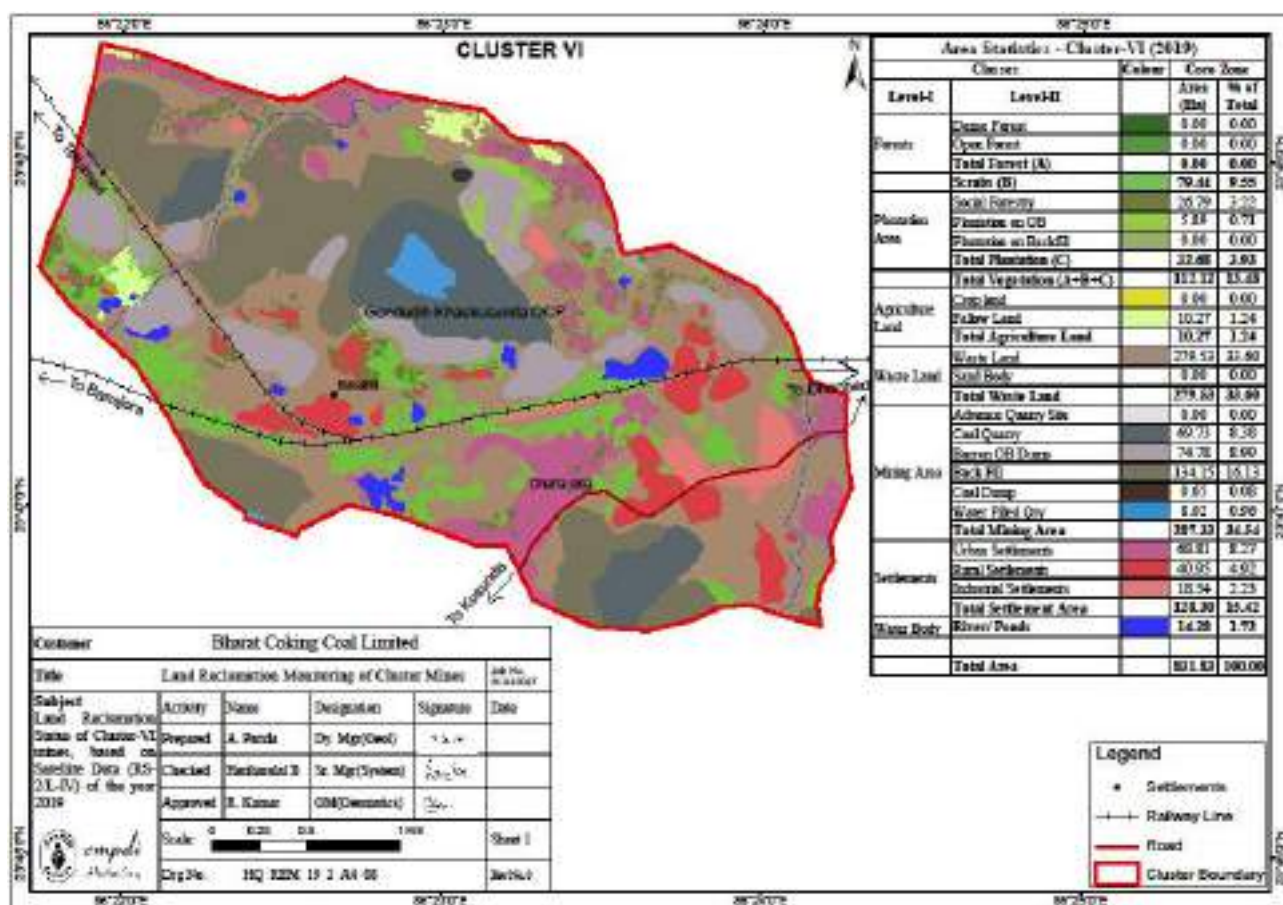
Monitoring stations (**D-25 and D-30**) are located in the core zone of the mine area. Water level monitoring in these monitoring stations has done in the months of May'21, August'21, and Nov'21 and January'22, the Ground water level data enclosed in the table below:

| Sl No.                  | Well No. | Location | Water level (bgl in meters) |      |      |      |         |      |      |      |             |             |             |             |
|-------------------------|----------|----------|-----------------------------|------|------|------|---------|------|------|------|-------------|-------------|-------------|-------------|
|                         |          |          | 2021-22                     |      |      |      | 2020-21 |      |      |      | 2019-20     |             |             |             |
|                         |          |          | May                         | Aug  | Nov  | Jan  | May     | Aug  | Nov  | Jan  | May         | Aug         | Nov         | Jan         |
| 1                       | D25      | Godhur   | 10.50                       | 2.90 | 3.80 | 4.40 | 10.50   | 2.28 | 5.62 | 6.40 | 9.90        | 4.35        | 5.38        | 5.50        |
| 2                       | D30      | Borkiboa | 4.23                        | 0.60 | 0.84 | 1.80 | 4.50    | 1.65 | 1.35 | 2.40 | 4.60        | 0.38        | 0.75        | 1.95        |
| <b>Average WL (bgl)</b> |          |          | 7.37                        | 1.75 | 2.32 | 3.10 | 7.50    | 1.97 | 3.49 | 4.40 | <b>7.25</b> | <b>2.37</b> | <b>3.07</b> | <b>3.73</b> |

### LAST THREE-YEAR ASSESSMENT:

Pre-monsoon GW Level (m): Min – 4.23 m      Max – 10.50 m  
Post-monsoon GW Level (m): Min – 0.75 m      Max – 5.62 m

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



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

## G. GROUND WATER LEVEL OF CLUSTER-VII

Cluster-VII consists of fourteen mines namely; Kusunda Area, Bastacolla Area and PB Area B.C.C.L (Jharia Coalfield) is located in Dhanbad district of Jharkhand. Cluster-VII consists of coal mines; Dhansar UG, Dhansar OCP, Kusunda OCP and Viswakarma OCP (proposed) are under the administrative control of Kusunda Area and Industry UG (closed), Alkusa UG, Ena OCP, S.Jharia/Rajapur OCP, Burragarh UG, Simlabahal UG, Huriladih UG, Bhutgoria UG (Re-opening), Kustore UG (closed) and E.Bhuggatdih UG (closed) are under Bastacolla and PB Area of BCCL. This Cluster of mines is located in east central part of Jharia Coalfield in Dhanbad district of Jharkhand. The life of the project works out more than 30 years considering annual target production 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 its tributaries are controlling the drainage pattern of the area. The area comes under the watershed of Kari Jore and Chatkari Jore.

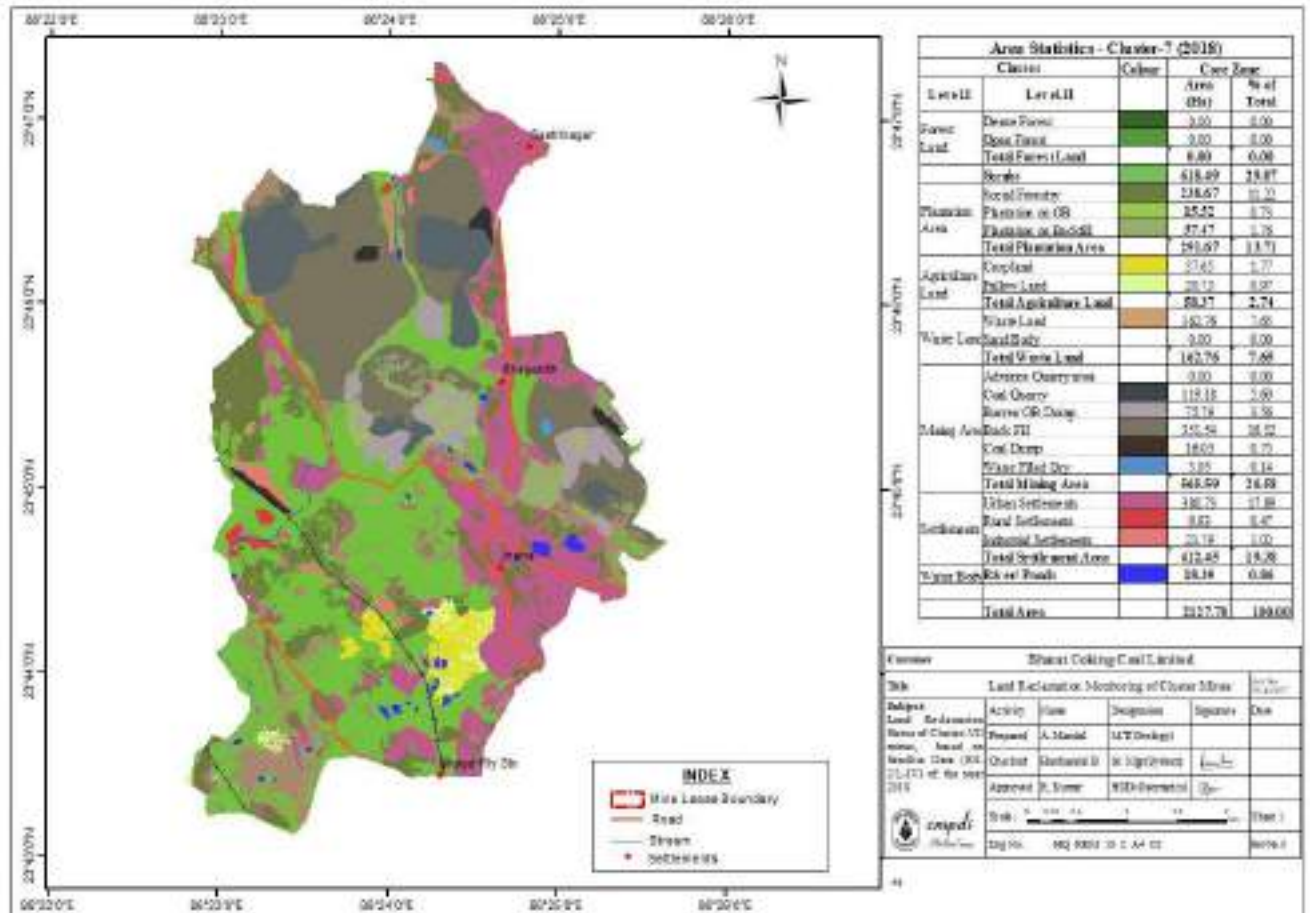
Monitoring stations (**D-3, D-4, D-33, D-34, D-47, D-55 and D-80**) are located in the core zone of the mine area. Water level monitoring in these monitoring stations has done in the months of May'21, August'21, and Nov'21 and January'22, the Ground water level data enclosed in the table below:

| Sl No.                  | Well No. | Location   | Water level (bgl in meters) |      |      |      |         |      |      |      |         |      |      |      |
|-------------------------|----------|------------|-----------------------------|------|------|------|---------|------|------|------|---------|------|------|------|
|                         |          |            | 2021-22                     |      |      |      | 2020-21 |      |      |      | 2019-20 |      |      |      |
|                         |          |            | May                         | Aug  | Nov  | Jan  | May     | Aug  | Nov  | Jan  | May     | Aug  | Nov  | Jan  |
| 1                       | D-3      | Dhansar    | 3.41                        | 0.80 | 0.85 | 1.30 | 5.40    | 0.56 | 1.38 | 1.90 | 1.75    | 1.05 | 1.30 | 1.45 |
| 2                       | D-4      | Jharia     | 3.01                        | 1.41 | 1.16 | 1.61 | 3.41    | 0.51 | 1.41 | 2.26 | 2.81    | 1.16 | 1.71 | 2.16 |
| 3                       | D33      | Kustore    | 1.75                        | 0.62 | 0.85 | 1.60 | 3.65    | 0.48 | 1.45 | 1.80 | 2.35    | 0.25 | 1.65 | 2.35 |
| 4                       | D34      | Kusunda    | 3.78                        | 2.05 | 2.90 | 2.95 | 3.30    | 2.00 | 2.80 | 2.95 | 4.75    | 2.10 | 2.40 | 2.55 |
| 5                       | D47      | Parastanr  | 4.05                        | 3.22 | 2.45 | 4.88 | 9.45    | 3.41 | 5.45 | 5.83 | 4.55    | 1.90 | 4.35 | 4.20 |
| 6                       | D55      | Hariladih  | 9.52                        | 5.62 | 7.62 | 9.02 | 9.42    | 3.88 | 8.60 | 8.62 | 8.42    | 2.97 | 5.47 | 8.62 |
| 7                       | D80      | Bastacolla | 7.10                        | 2.17 | 2.55 | 3.10 | 4.30    | 2.08 | 4.90 | 5.00 | 5.00    | 2.30 | 3.05 | 3.80 |
| <b>Average WL (bgl)</b> |          |            | 4.66                        | 2.27 | 2.63 | 3.49 | 5.56    | 1.85 | 3.71 | 4.05 | 4.23    | 1.68 | 2.85 | 3.59 |

### LAST THREE-YEAR ASSESSMENT:

Pre-monsoon GW Level (m): Min – 1.75 m      Max – 9.52 m  
Post-monsoon GW Level (m): Min – 0.85 m      Max – 8.60 m

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



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



## H. GROUND WATER LEVEL OF CLUSTER-VIII

Cluster - VIII of B.C.C.L mines under administrative control of Bastacolla Area of B.C.C.L (Jharia Coalfield) is located in Dhanbad district of Jharkhand. 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 are under Bastacolla Area of BCCL is located in the west part of Jharia Coalfield. All above the mines are contiguous in nature and the environmental impact is overlapping in ambient environment due to cumulative effect of the mining activities. The life of the project works out upto 25 years considering annual target production 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 its tributaries controlling the drainage pattern of the area. The area comes under the watershed of Chatkari Jore.

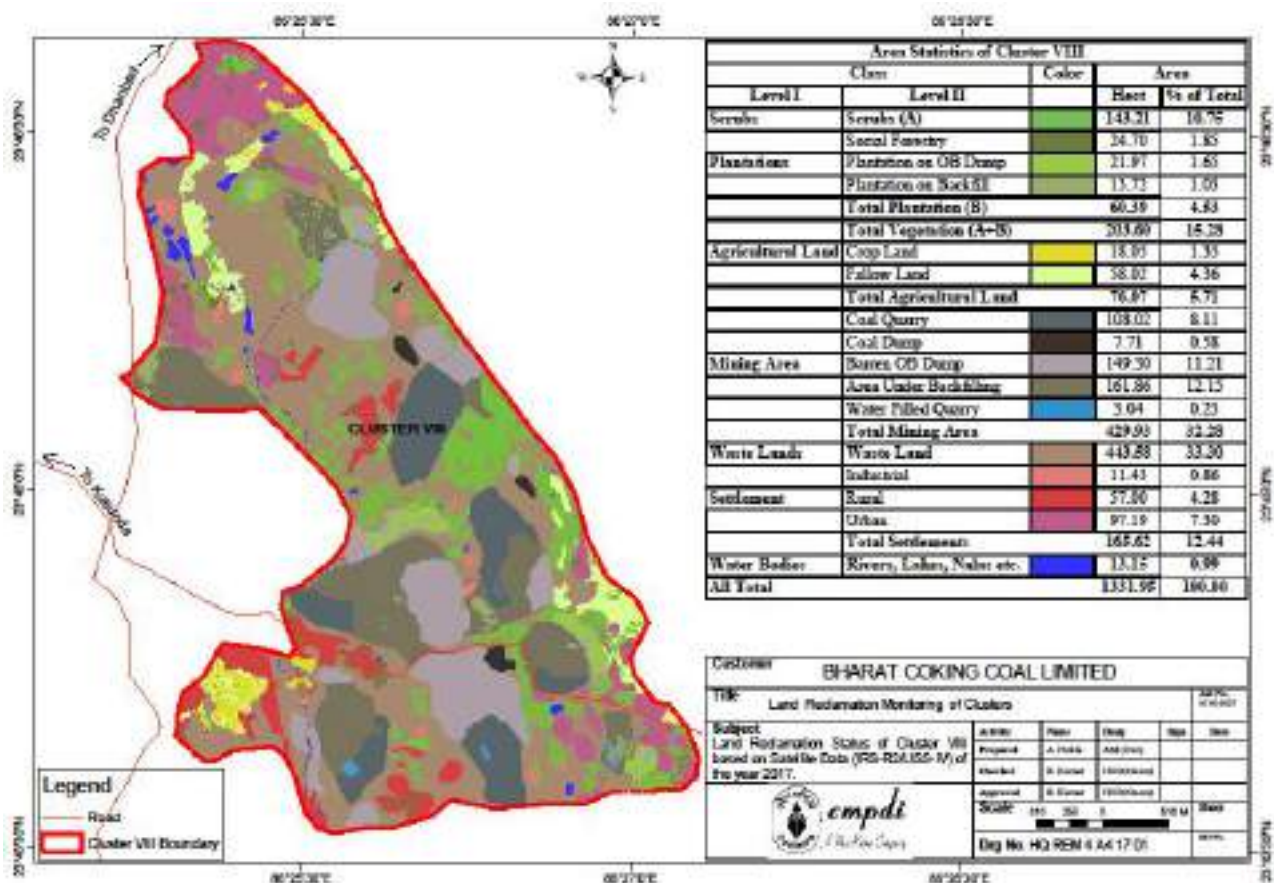
Monitoring stations (**D-8, D-43, D-49 and D-51**) are located in the core zone of the mine area. Water level monitoring in these monitoring stations has done in the months of May'21, August'21, and Nov'21 and January'22, the Ground water level data enclosed in the table below:

| Sl No.                  | Well No. | Location  | Water level (bgl in meters) |      |      |      |         |      |      |      |         |      |      |      |
|-------------------------|----------|-----------|-----------------------------|------|------|------|---------|------|------|------|---------|------|------|------|
|                         |          |           | 2021-22                     |      |      |      | 2020-21 |      |      |      | 2019-20 |      |      |      |
|                         |          |           | May                         | Aug  | Nov  | Jan  | May     | Aug  | Nov  | Jan  | May     | Aug  | Nov  | Jan  |
| 1                       | D-8      | Alokdiha  | 4.55                        | 1.85 | 2.27 | 3.20 | 5.83    | 1.70 | 2.75 | 3.20 | 4.80    | 1.95 | 2.85 | 4.25 |
| 2                       | D43      | Alagdih   | 4.65                        | 2.40 | 2.60 | 3.35 | 6.60    | 2.31 | 2.55 | 3.05 | 7.35    | 3.55 | 2.70 | 4.25 |
| 3                       | D49      | Galucdih  | 1.40                        | 0.73 | 0.85 | 1.00 | 3.25    | 1.41 | 1.65 | 1.98 | 1.75    | 0.60 | 1.50 | 1.25 |
| 4                       | D51      | Chankuiya | 9.43                        | 5.65 | 5.65 | 7.50 | 8.45    | 6.03 | 5.70 | 7.35 | 9.95    | 8.05 | 5.75 | 7.75 |
| <b>Average WL (bgl)</b> |          |           | 5.01                        | 2.66 | 2.84 | 3.76 | 6.03    | 2.86 | 3.16 | 3.90 | 5.96    | 3.54 | 3.20 | 4.38 |

### LAST THREE-YEAR ASSESSMENT:

Pre-monsoon GW Level (m): Min – 1.40 m                      Max – 9.95 m  
Post-monsoon GW Level (m): Min – 0.85 m                      Max – 5.75 m

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



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

## I. GROUND WATER LEVEL OF CLUSTER-IX

Cluster - IX of B.C.C.L mines under administrative control of Lodna Area of B.C.C.L (Jharia Coalfield) 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) are under the administrative control of Lodna Area of Bharat Coking Coal Limited (B.C.C.L - A Subsidiary of Coal India Limited). 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. North Tisra/South Tisra Expansion OCP, Lodna UG, Bagdigi UG, Bararee UG and Joyrampur UG are under Lodna Area of BCCL is located in the west part of Jharia Coalfield. All above the mines are contiguous in nature and the environmental impact is overlapping in ambient environment due to cumulative effect of the mining activities. The life of the project works out upto 30 years considering annual target production 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 its tributaries controlling the drainage pattern of the area. The area comes under the watershed of Chatkari Jore.

Monitoring stations (**D-5, D-7, D-39, D-40A, D-41 and D-74**) are located in the core zone of the mine area. Water level monitoring in these monitoring stations has done in the months of May'21, August'21, and Nov'21 and January'22, the Ground water level data enclosed in the table below:

| Sl No.                  | Well No. | Location      | Water level (bgl in meters) |      |      |      |         |      |      |      |         |      |      |       |
|-------------------------|----------|---------------|-----------------------------|------|------|------|---------|------|------|------|---------|------|------|-------|
|                         |          |               | 2021-22                     |      |      |      | 2020-21 |      |      |      | 2019-20 |      |      |       |
|                         |          |               | May                         | Aug  | Nov  | Jan  | May     | Aug  | Nov  | Jan  | May     | Aug  | Nov  | Jan   |
| 1                       | D-5      | Jiyalgora     | 7.28                        | 3.35 | 4.00 | 6.40 | 8.60    | 3.20 | 7.70 | 7.90 | 8.25    | 2.90 | 4.85 | 8.20  |
| 2                       | D-7      | Golden Pahari | 6.08                        | 2.38 | 2.63 | 3.88 | 7.33    | 2.56 | 5.13 | 5.35 | 8.23    | 1.88 | 3.28 | 4.86  |
| 3                       | D-39     | Tilaboni      | 10.70                       | 4.60 | 5.10 | 8.15 | 9.40    | 3.35 | 6.05 | 6.78 | 12.60   | 4.00 | 5.95 | 12.45 |
| 4                       | D40A     | Khapa Dhawra  | 1.95                        | 1.35 | 1.80 | 2.35 | 1.95    | 0.30 | 1.43 | 6.78 | 1.85    | 1.50 | 1.45 | 1.95  |
| 5                       | D-41     | Joyrampur     | 1.95                        | 1.34 | 1.38 | 1.45 | 3.30    | 1.43 | 1.45 | 1.60 | 2.30    | 0.70 | 1.25 | 1.40  |
| 6                       | D-74     | BhulanBararee | 6.93                        | 3.20 | 2.90 | 3.70 | 4.30    | 2.58 | 3.93 | 4.00 | 5.80    | 2.35 | 3.57 | 4.95  |
| <b>Average WL (bgl)</b> |          |               | 5.82                        | 2.70 | 2.97 | 4.32 | 5.81    | 2.24 | 4.28 | 4.54 | 6.51    | 2.22 | 3.39 | 5.64  |

### LAST THREE-YEAR ASSESSMENT:

Pre-monsoon GW Level (m): Min – 1.85 m      Max – 12.60 m  
Post-monsoon GW Level (m): Min – 1.25 m      Max – 7.70 m



**Area Statistics of Cluster IX**

| Level I                | Level II                   | Color | Area    | % of Total |
|------------------------|----------------------------|-------|---------|------------|
| Scrubs                 | Scrubs (A)                 |       | 179.94  | 17.25      |
|                        | Social Forestry            |       | 188.58  | 8.57       |
| Plantation             | Plantation on OB Dump      |       | 41.75   | 2.12       |
|                        | Plantation on Backfill     |       | 8.88    | 0.32       |
|                        | Total Plantation (B)       |       | 217.17  | 11.94      |
| Total Vegetation (A+B) |                            |       | 597.69  | 28.32      |
| Agricultural Land      | Fallow Land                |       | 44.49   | 2.26       |
|                        | Total Agricultural Land    |       | 44.49   | 2.26       |
| Mining Area            | Coal Quarry                |       | 178.55  | 8.08       |
|                        | Barren OB Dump             |       | 172.19  | 8.75       |
|                        | Area Under Reclamation     |       | 17.33   | 3.04       |
|                        | Coal Dump                  |       | 8.87    | 0.49       |
| Water Filled Quarry    |                            |       | 3.35    | 0.17       |
| Total Mining Area      |                            |       | 441.24  | 22.43      |
| Waste Lands            | Waste Land                 |       | 616.64  | 31.24      |
|                        | Industrial                 |       | 9.13    | 0.46       |
| Settlement             | Rural                      |       | 47.70   | 2.43       |
|                        | Urban                      |       | 232.31  | 11.81      |
|                        | Total Settlements          |       | 289.23  | 14.79      |
| Water Bodies           | Rivers, Lakes, Nallas etc. |       | 20.59   | 1.05       |
| All Total              |                            |       | 1967.22 | 100.00     |

**Legend**

- +—+— Railway Line
- Cluster IX Boundary

**Project Details:**

**Client:** BHARAT COKING COAL LIMITED

**Title:** Land Reclamation Monitoring of Clusters

**Subject:** Land Reclamation Status of Cluster IX based on Satellite Data (RS-43/L1/55-1/5) of the year 2017.

**Prepared by:** S. Kumar

**Checked by:** S. Kumar

**Approved by:** S. Kumar

**Scale:** 1:250,000

**Map No:** RS-43/L1/55-1/5

**Map Date:** 2017

**Map Scale:** 1:250,000

**Map No:** RS-43/L1/55-1/5

**Map Date:** 2017

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

## 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 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 works out is more than 30 years considering annual target production of 2.289 MTY.

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

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

Monitoring stations (**A-19, D-35, D-36 and D-77**) are located in the core zone of the mine area. Water level monitoring in these monitoring stations has done in the months of May'21, August'21, and Nov'21 and January'22, the Ground water level data enclosed in the table below:

| Sl No.                  | Well No. | Location  | Water level (bgl in meters) |      |      |      |         |      |      |      |         |      |      |      |
|-------------------------|----------|-----------|-----------------------------|------|------|------|---------|------|------|------|---------|------|------|------|
|                         |          |           | 2021-22                     |      |      |      | 2020-21 |      |      |      | 2019-20 |      |      |      |
|                         |          |           | May                         | Aug  | Nov  | Jan  | May     | Aug  | Nov  | Jan  | May     | Aug  | Nov  | Jan  |
| 1                       | A-19     | Bhowrah   | 3.30                        | 1.95 | 1.90 | 2.20 | 6.05    | 2.30 | 3.25 | 3.70 | 4.85    | 0.95 | 3.43 | 4.95 |
| 2                       | D-35     | Patherdih | 6.60                        | 2.70 | 2.90 | 4.30 | 8.20    | 2.98 | 5.40 | 5.62 | 8.00    | 3.15 | 3.80 | 5.90 |
| 3                       | D-36     | Sudamdih  | 2.02                        | 0.45 | 0.55 | 0.55 | 2.10    | 0.06 | 1.00 | 1.15 | 1.20    | 0.10 | 0.55 | 0.65 |
| 4                       | D-77     | Amlabad   | 5.98                        | 2.60 | 4.69 | 5.60 | 6.40    | 5.90 | 3.50 | 4.25 | 6.40    | 2.80 | 3.20 | 4.50 |
| <b>Average WL (bgl)</b> |          |           | 4.48                        | 1.93 | 2.51 | 3.16 | 5.69    | 2.81 | 3.29 | 3.68 | 5.11    | 1.75 | 2.75 | 4.00 |

### LAST THREE-YEAR ASSESSMENT:

Pre-monsoon GW Level (m): Min – 1.20 m      Max – 8.20 m  
Post-monsoon GW Level (m): Min – 0.55 m      Max – 4.69 m

[illegible]

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

## 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) 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 works out about upto 50 years considering annual target production 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 (**A-17, A-18, A-20 and A-32**) are located in the core zone of the mine area. Water level monitoring in these monitoring stations has done in the months of May'21, August'21, and Nov'21 and January'22, the Ground water level data enclosed in the table below:

| Sl No.                  | Well No. | Location       | Water level (bgl in meters) |      |      |      |         |      |      |      |         |      |      |      |
|-------------------------|----------|----------------|-----------------------------|------|------|------|---------|------|------|------|---------|------|------|------|
|                         |          |                | 2021-22                     |      |      |      | 2020-21 |      |      |      | 2019-20 |      |      |      |
|                         |          |                | May                         | Aug  | Nov  | Jan  | May     | Aug  | Nov  | Jan  | May     | Aug  | Nov  | Jan  |
| 1                       | A-17     | Kachi Balihari | 3.36                        | 1.62 | 2.37 | 2.54 | 2.14    | 0.64 | 1.69 | 1.79 | 2.94    | 0.34 | 2.24 | 2.42 |
| 2                       | A-18     | Baghaband      | 1.09                        | 0.54 | 0.57 | 0.74 | 1.09    | 0.39 | 0.34 | 0.89 | 2.29    | 1.09 | 0.69 | 1.09 |
| 3                       | A-20     | Gorbudih       | 5.47                        | 1.47 | 2.02 | 3.07 | 8.47    | 1.44 | 3.87 | 4.42 | 4.57    | 3.32 | 1.82 | 4.02 |
| 4                       | A-32     | Baludih        | 2.35                        | 0.73 | 0.96 | 1.50 | 1.90    | 0.36 | 1.75 | 1.80 | 2.75    | 0.62 | 0.95 | 1.65 |
| <b>Average WL (bgl)</b> |          |                | 3.07                        | 1.09 | 1.48 | 1.96 | 3.40    | 0.71 | 1.91 | 2.23 | 3.14    | 1.34 | 1.43 | 2.30 |

### LAST THREE-YEAR ASSESSMENT:

Pre-monsoon GW Level (m): Min – 1.09 m      Max – 8.47 m  
Post-monsoon GW Level (m): Min – 0.34 m      Max – 3.87 m



[illegible]

| Sl no | Land Use Details                | Existing (sq. meter)      | Proposed (sq. meter) | Grand Total (sq. meter)   |
|-------|---------------------------------|---------------------------|----------------------|---------------------------|
| 1     | Green Belt Area                 | 1060.61 x 10 <sup>4</sup> | 0.0                  | 1293.46 x 10 <sup>4</sup> |
| 2     | Open Land                       | 1518.33 x 10 <sup>4</sup> | 0.0                  | 1509.06 x 10 <sup>4</sup> |
| 3     | Road/ Paved Area                | 171.08 x 10 <sup>4</sup>  | 0.0                  | 171.08 x 10 <sup>4</sup>  |
| 4     | Rooftop area of building/ sheds | 777.56 x 10 <sup>4</sup>  | 0.0                  | 563.06 x 10 <sup>4</sup>  |
| 5     | Total                           | 3527.58 x 10 <sup>4</sup> | 0.0                  | 3527.58 x 10 <sup>4</sup> |

## 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 is located in the south-western part of Jharia coal field in Dhanbad district of Jharkhand. The area is covered by Survey of India toposheet no. 73 I/6. The life of the project works out about 15 years considering annual target production of 0.234 MTPA.

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

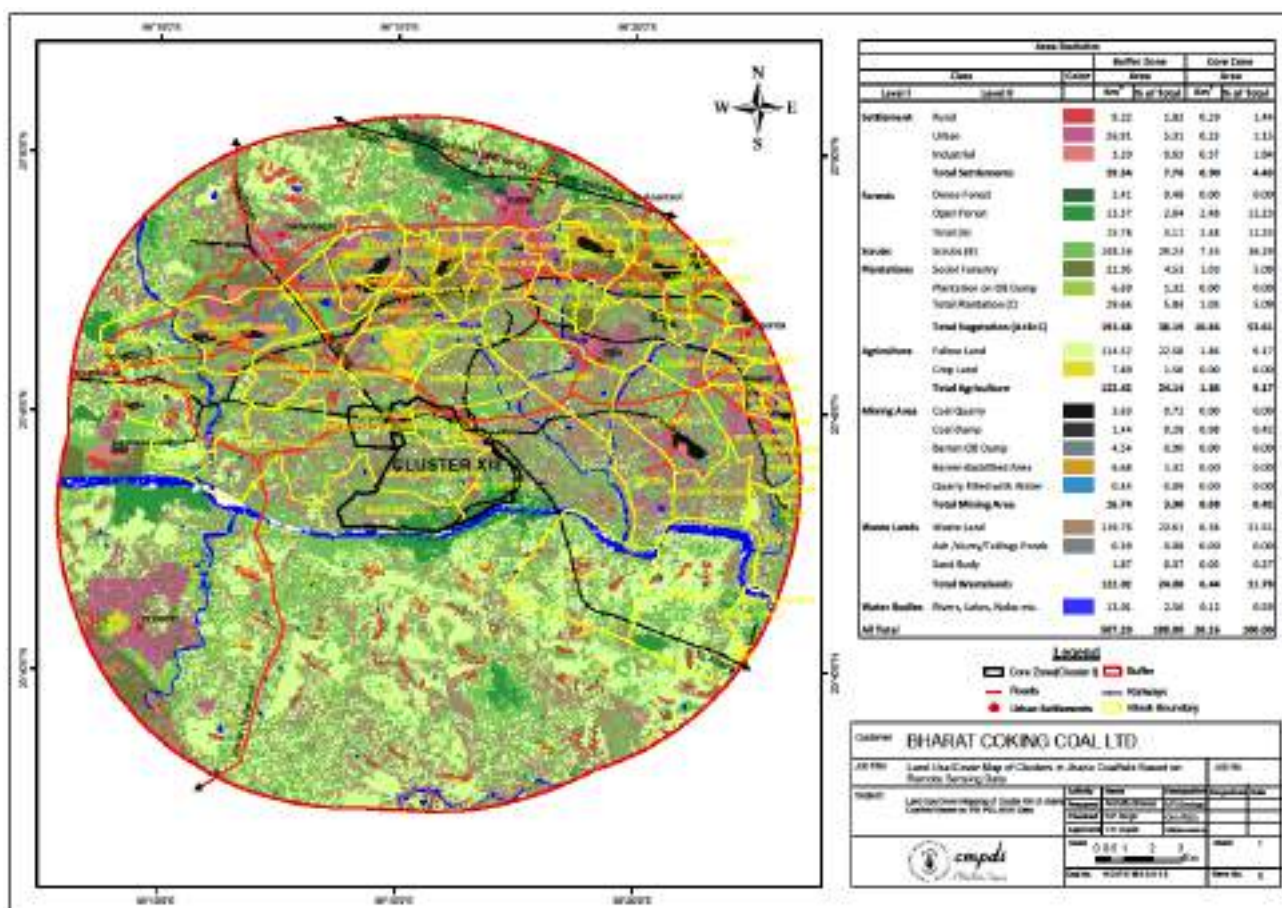
Monitoring stations (**A-22, A-23, A-33, A-34, B-25 and B-48**) are located in the core zone of the mine area. Water level monitoring in these monitoring stations has done in the months of May'21, August'21, Nov'21 and January'22, the Ground water level data enclosed in the table below:

| Sl No.                  | Well No. | Location    | Water level (bgl in meters) |      |      |      |         |      |      |      |         |      |      |      |
|-------------------------|----------|-------------|-----------------------------|------|------|------|---------|------|------|------|---------|------|------|------|
|                         |          |             | 2021-22                     |      |      |      | 2020-21 |      |      |      | 2019-20 |      |      |      |
|                         |          |             | May                         | Aug  | Nov  | Jan  | May     | Aug  | Nov  | Jan  | May     | Aug  | Nov  | Jan  |
| 1                       | A22A     | Nagdah      | 2.90                        | 0.40 | 1.10 | 1.50 | 2.90    | 0.20 | 1.98 | 2.00 | 2.60    | 1.75 | 2.00 | 2.85 |
| 2                       | A-23     | Machhayara  | 9.52                        | 1.87 | 2.82 | 4.82 | 8.92    | 1.12 | 5.62 | 7.12 | 11.97   | 5.37 | 3.77 | 6.57 |
| 3                       | A-33     | Mahuda Wa   | 2.85                        | 0.80 | 0.85 | 1.33 | 4.55    | 0.38 | 1.85 | 2.85 | 3.65    | 0.55 | 1.25 | 1.55 |
| 4                       | A-34     | Mahuda vil. | 5.20                        | 1.83 | 3.55 |      | 8.35    | 3.43 | 3.45 | 5.35 | 6.35    | 3.45 | 3.95 | 5.45 |
| 5                       | B-25     | Mahuda more | 5.10                        | 1.98 | 2.58 | 3.30 | 7.90    | 3.02 | 2.55 | 3.45 | 4.80    | 1.38 | 1.40 | 3.50 |
| 6                       | B-48     | Mahuda      | 7.23                        | 2.28 | 6.05 | 6.60 | 8.20    | 3.37 | 3.85 | 4.51 | 7.05    | 2.85 | 4.35 | 5.45 |
| <b>Average WL (bgl)</b> |          |             | 5.47                        | 1.53 | 2.83 | 3.51 | 6.80    | 1.92 | 3.22 | 4.21 | 6.07    | 2.56 | 2.79 | 4.23 |

### LAST THREE-YEAR ASSESSMENT:

Pre-monsoon GW Level (m): Min – 2.85 m      Max – 11.97 m  
Post-monsoon GW Level (m): Min – 0.85 m      Max – 6.05 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 x 10 <sup>4</sup> | 0.0                  | 1570.48 x 10 <sup>4</sup> |
| 2     | Open Land                       | 183.28 x 10 <sup>4</sup>  | 0.0                  | 97.22 x 10 <sup>4</sup>   |
| 3     | Road/ Paved Area                | 71.84 x 10 <sup>4</sup>   | 0.0                  | 71.83 x 10 <sup>4</sup>   |
| 4     | Rooftop area of building/ sheds | 159.09 x 10 <sup>4</sup>  | 0.0                  | 159.09 x 10 <sup>4</sup>  |
| 5     | Total                           | 1898.62 x 10 <sup>4</sup> | 0.0                  | 1898.62 x 10 <sup>4</sup> |

## M. GROUND WATER LEVEL OF CLUSTER-XIV

Cluster-XIV of B.C.C.L mines under administrative control of Western Jharia Area of B.C.C.L (Jharia Coalfield) is located in Dhanbad district of Jharkhand. Lohapatty UG and Lohapatty OC patch (proposed) 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- XIV is located in western part of Jharia Coalfield in Dhanbad district of Jharkhand. The life of the project works out upto 08 years considering annual target production of 0.526 MTPA. Cluster-XIV mine involves leasehold area of about 1418.25 Ha of land. It covered in Survey of India toposheet no. 73 I/2.

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

Monitoring stations (**B-23, B-24 and B-67**) are located in the core zone of the mine area. Water level monitoring in these monitoring stations has done in the months of May'21, August'21, and Nov'21 and January'22, the Ground water level data enclosed in the table below:

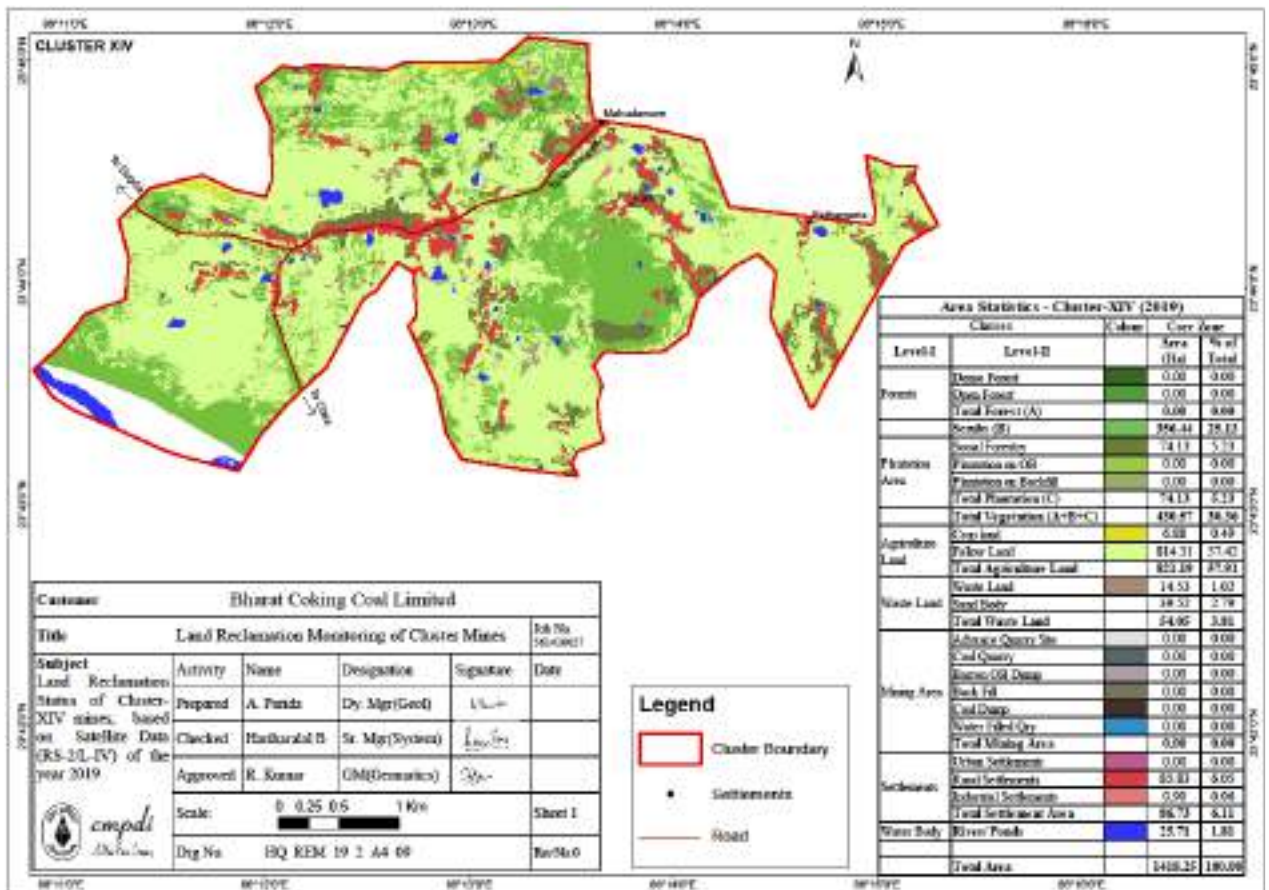
| Sl No.                  | Well No. | Location  | Water level (bgl in meters) |      |      |      |         |      |      |      |         |      |      |      |
|-------------------------|----------|-----------|-----------------------------|------|------|------|---------|------|------|------|---------|------|------|------|
|                         |          |           | 2021-22                     |      |      |      | 2020-21 |      |      |      | 2019-20 |      |      |      |
|                         |          |           | May                         | Aug  | Nov  | Jan  | May     | Aug  | Nov  | Jan  | May     | Aug  | Nov  | Jan  |
| 1                       | B-23     | Lohapatti | 4.12                        | 1.24 | 1.44 | 1.81 | 3.24    | 0.77 | 1.76 | 2.69 | 2.84    | 1.12 | 1.34 | 2.24 |
| 2                       | B-24     | Telmuchu  | 5.68                        | 1.55 | 2.08 | 3.07 | 5.48    | 1.13 | 3.53 | 4.38 | 4.58    | 1.23 | 2.33 | 3.63 |
| 3                       | B-67     | Simatanr  | 8.95                        | 2.45 | 2.95 | 3.65 | 7.55    | 1.83 | 3.95 | 5.90 | 8.57    | 3.37 | 4.35 | 4.65 |
| <b>Average WL (bgl)</b> |          |           | 6.25                        | 1.75 | 2.16 | 2.84 | 5.42    | 1.24 | 3.08 | 4.32 | 5.33    | 1.91 | 2.67 | 3.51 |

### LAST THREE-YEAR ASSESSMENT:

Pre-monsoon GW Level (m): Min – 2.84 m      Max – 8.95 m  
Post-monsoon GW Level (m): Min – 1.34 m      Max – 4.35 m



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



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

## N. GROUND WATER LEVEL OF CLUSTER-XV

Cluster - XV of B.C.C.L mines under administrative control of Govindpur Area and barora Area of B.C.C.L (Jharia Coalfield) is located in Dhanbad district of Jharkhand. Cluster-XV consists of four coal mines; Kharkharee UG (underground mine) and Dharmaband UG are under the administrative control of Govindpur Area and Madhuband UG & Phularitand UG are under the administrative control of Barora Area of Bharat Coking Coal Limited (B.C.C.L - A Subsidiary of Coal India Limited). The Cluster-XV is located in western part of Jharia Coalfield in Dhanbad district of Jharkhand. The life of the project works out upto 30 years considering annual target production of 0.423 MTPA. Cluster-XV mine involves leasehold area of about 1696.55 Ha of land. It covered in Survey of India toposheet no. 73 I/1 and 73 I/5.

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

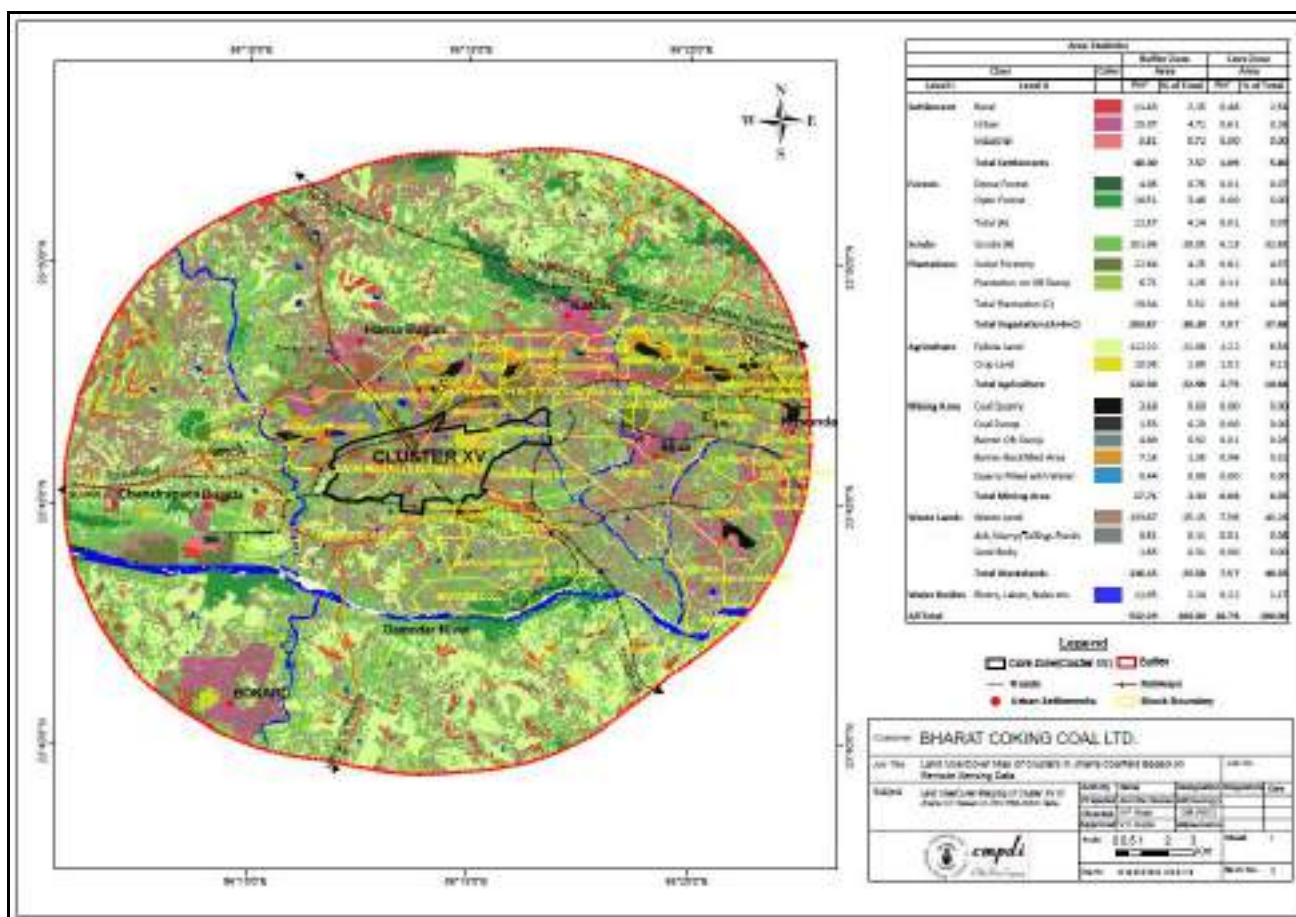
Monitoring stations (**A-24, B-32A and B-61A**) are located in the core zone of the mine area. Water level monitoring in these monitoring stations has done in the months of May'21, August'21, and Nov'21 and January'22, the Ground water level data enclosed in the table below:

| Sl No.                  | Well No. | Location  | Water level (bgl in meters) |      |      |      |         |      |      |      |         |      |      |      |
|-------------------------|----------|-----------|-----------------------------|------|------|------|---------|------|------|------|---------|------|------|------|
|                         |          |           | 2021-22                     |      |      |      | 2020-21 |      |      |      | 2019-20 |      |      |      |
|                         |          |           | May                         | Aug  | Nov  | Jan  | May     | Aug  | Nov  | Jan  | May     | Aug  | Nov  | Jan  |
| 1                       | A24      | Pipratn   | 10.13                       |      | 2.78 | 4.55 | 4.88    | -    | 4.28 | 4.68 | 15.88   | 1.73 | 2.48 | 4.08 |
| 2                       | B32A     | Madhuband | 5.60                        | 1.34 | 1.70 | 2.30 | 3.30    | 1.18 | 2.00 | 2.21 | 5.55    | 1.25 | 1.70 | 2.35 |
| 3                       | B61A     | Kesargora | 4.42                        | 0.47 | 0.97 | 0.97 | 3.32    | 0.85 | 1.60 | 2.07 | 3.35    | 1.39 | 0.52 | 1.12 |
| <b>Average WL (bgl)</b> |          |           | 6.72                        | 0.91 | 1.82 | 2.61 | 3.83    | 1.02 | 2.63 | 2.99 | 5.39    | 7.97 | 3.63 | 4.27 |

### LAST THREE-YEAR ASSESSMENT:

Pre-monsoon GW Level (m): Min – 3.32 m      Max – 15.88 m  
Post-monsoon GW Level (m): Min – 0.52 m      Max – 4.28 m

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



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

## O. GROUND WATER LEVEL OF CLUSTER-XVI

Cluster - XVI of B.C.C.L mines under administrative control of Chanch Victoria Area of B.C.C.L (Raniganj Coalfield) is located in Dhanbad district of Jharkhand. The Cluster-XVI (Dahibari-Basantimata Group of mines) is located on the western part of the Raniganj Coalfield and falls within Dhanbad district of Jharkhand. There are total five collieries within this Clusture- XVI (Dahibari-Basantimata OC, Basantimata UG, New Laikdih OC, Laikdih Deep UG and Chanch UG Colliery). All above the mines are contiguous in nature and the environmental impact is overlapping in ambient environment due to cumulative effect of the mining activities. The life of the project works out upto 24 years considering annual target production of 1.963 MTPA. Cluster-XVI mine involves leasehold area of about 2008.40 Ha of land. It covered in Survey of India toposheet no. 73 I/14.

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

Monitoring stations (**DB-22, DB-23, DB-24 & DB-25**) are located in the core zone of the mine area. Water level monitoring in these monitoring stations has done in the months of May'21, August'21, and Nov'21 and January'22, the Ground water level data enclosed in the table below:

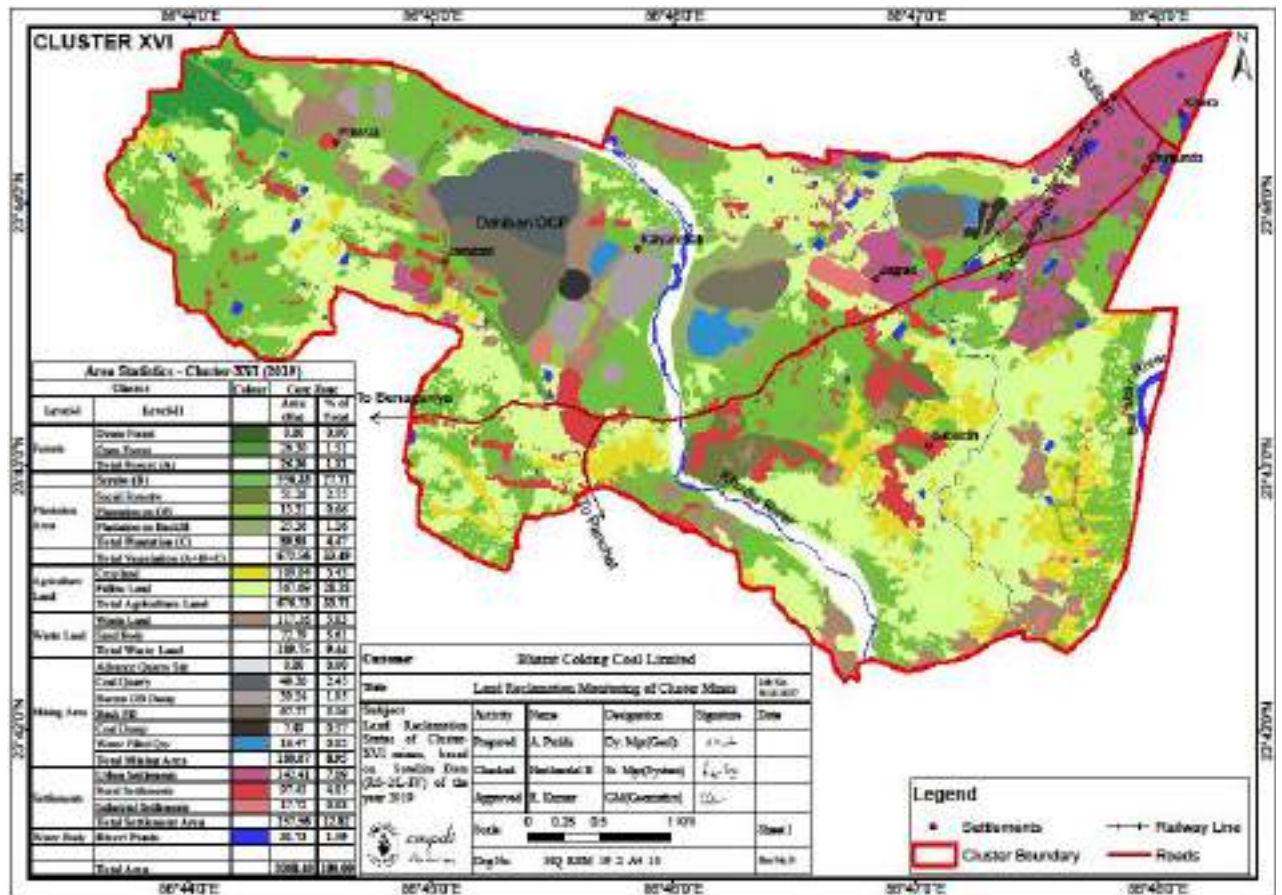
| Sl No.                  | Well No. | Location        | Water level (bgl in meters) |      |      |      |         |      |      |      |         |      |      |      |
|-------------------------|----------|-----------------|-----------------------------|------|------|------|---------|------|------|------|---------|------|------|------|
|                         |          |                 | 2021-22                     |      |      |      | 2020-21 |      |      |      | 2019-20 |      |      |      |
|                         |          |                 | May                         | Aug  | Nov  | Jan  | May     | Aug  | Nov  | Jan  | May     | Aug  | Nov  | Jan  |
| 1                       | DB22     | Dahibari, Basti | 2.31                        | 1.55 | 1.38 | 1.57 | 2.63    | 1.30 | 2.25 | 2.38 | 4.93    | 1.38 | 1.63 | 1.73 |
| 2                       | DB23     | Dahibari OC     | 2.00                        | 1.05 | 1.10 | 1.70 | 2.50    | 0.70 | 1.95 | 2.17 | 1.60    | 0.88 | 0.80 | 1.00 |
| 3                       | DB24     | Dahibari        | 6.20                        | 4.20 | 5.25 | 5.80 | 3.60    | 1.57 | 5.70 | 5.90 | 9.35    | 3.20 | 3.88 | 4.80 |
| 4                       | DB25     | Basantimata UG  | 2.83                        | 1.01 | 2.03 | 2.63 | 3.98    | 1.19 | 2.63 | 2.68 | -       | -    | -    | -    |
| <b>Average WL (bgl)</b> |          |                 | 3.34                        | 1.95 | 2.44 | 2.93 | 3.18    | 1.19 | 3.13 | 3.28 | 4.53    | 1.82 | 2.10 | 2.51 |

### LAST THREE-YEAR ASSESSMENT:

Pre-monsoon GW Level (m): Min – 1.60 m      Max – 9.35 m  
Post-monsoon GW Level (m): Min – 0.80 m      Max – 5.70 m



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



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

#### 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 fluctuation Below ground level (May, Aug, Nov'21 & Jan'22) | Avg. Fluctuation (in meters) during 2021-22 | Geological Formation     |
|---------|-----------------|-------------------------|------------------------------------------------------------------------|---------------------------------------------|--------------------------|
| 1       | I               | 4 nos.                  | 0.25 to 8.38 m                                                         | 2.93 m                                      | Barakar                  |
| 2       | II              | 5 nos.                  | 0.30 to 11.26 m                                                        | 4.02 m                                      | Barakar                  |
| 3       | III             | 5 nos.                  | 0.24 to 11.26 m                                                        | 2.92 m                                      | Barakar                  |
| 4       | IV              | 4 nos.                  | 0.30 to 9.03 m                                                         | 3.87 m                                      | Barakar                  |
| 5       | V               | 4 nos.                  | 0.07 to 5.43 m                                                         | 1.66 m                                      | Barakar                  |
| 6       | VI              | 2 nos.                  | 0.60 to 10.50 m                                                        | 5.05 m                                      | Barakar                  |
| 7       | VII             | 7 nos.                  | 0.62 to 9.52 m                                                         | 2.03 m                                      | Barakar                  |
| 8       | VIII            | 4 nos.                  | 0.73 to 9.43 m                                                         | 2.17 m                                      | Barakar                  |
| 9       | IX              | 6 nos.                  | 1.34 to 10.70 m                                                        | 2.85 m                                      | Barakar                  |
| 10      | X               | 4 nos.                  | 0.45 to 6.60 m                                                         | 1.97 m                                      | Barakar                  |
| 11      | XI              | 4 nos.                  | 0.54 to 5.47 m                                                         | 1.80 m                                      | Barakar & Barren Measure |
| 12      | XIII            | 6 nos.                  | 0.40 to 9.52 m                                                         | 2.64 m                                      | Raniganj                 |
| 13      | XIV             | 3 nos.                  | 1.24 to 8.95 m                                                         | 4.09 m                                      | Raniganj                 |
| 14      | XV              | 3 nos.                  | 0.47 to 10.13 m                                                        | 4.90 m                                      | Barakar & Barren Measure |
| 15      | XVI             | 3 nos.                  | 1.01 to 6.20 m                                                         | 0.90 m                                      | Barakar                  |

Depth to water level (in bgl) values described that water level goes down to maximum 11.26 m during pre-monsoon'2021 and maximum upto 7.62 m during post-monsoon'2021. Un-confined aquifer affected around 20 m to 30 m maximum 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 shown in **Annexure–VI**. Water Table contour map and Depth to water level map shown in **Plate-IV & V**.

Monitoring groundwater (quantity & quality) to assess the present condition and resource has done regularly in the coalfield areas. Well hydrographs (**Annexure–VI**) are prepared and studied to identify long-term trends. Hydrograph trend analysis of CGWB monitoring wells and observation well reveals increasing groundwater level trends in most of the Cluster of mines. However, decline trends in both Pre

and Post-monsoon GW level in Cluster-I, Cluster-V, Cluster-VI and Cluster-VII is recorded but no significant decline 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) given in **Annexure-V** and Quality is given in **Annexure-VII**.

## 5.0 GROUND WATER QUALITY

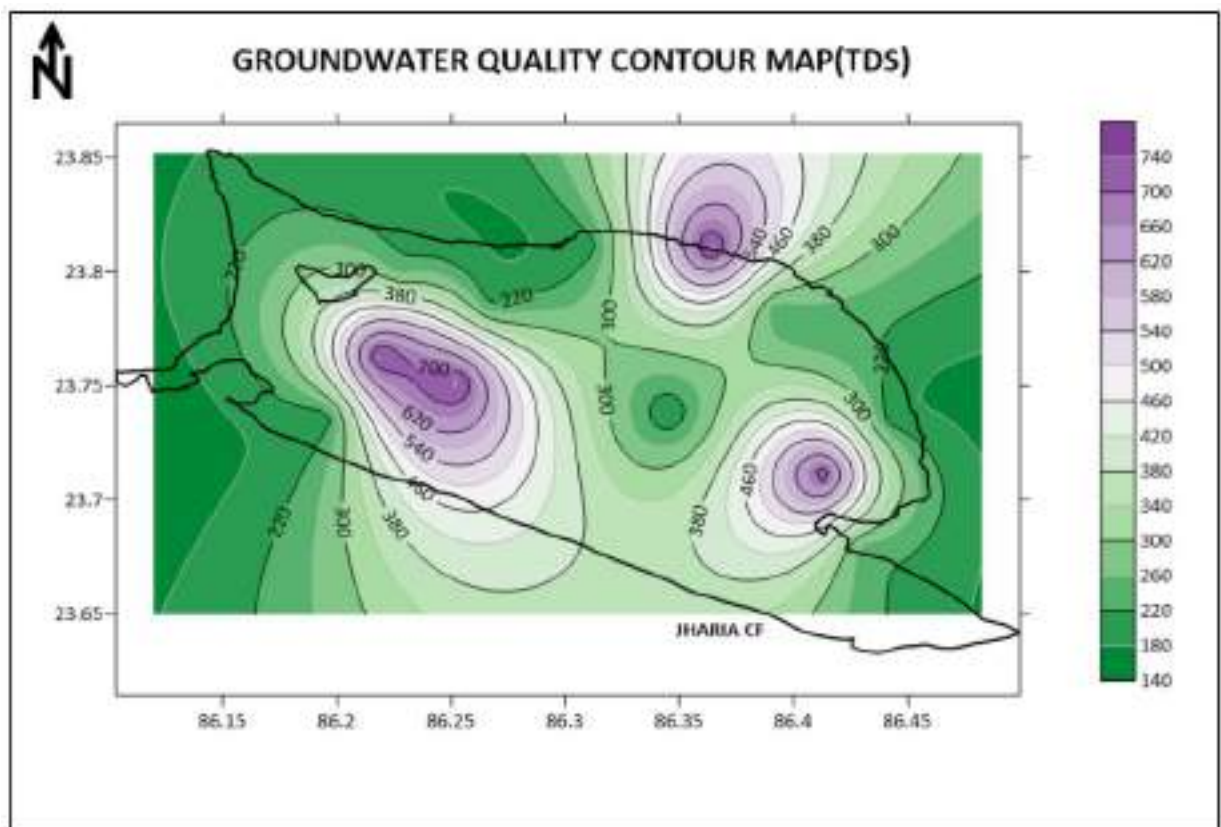
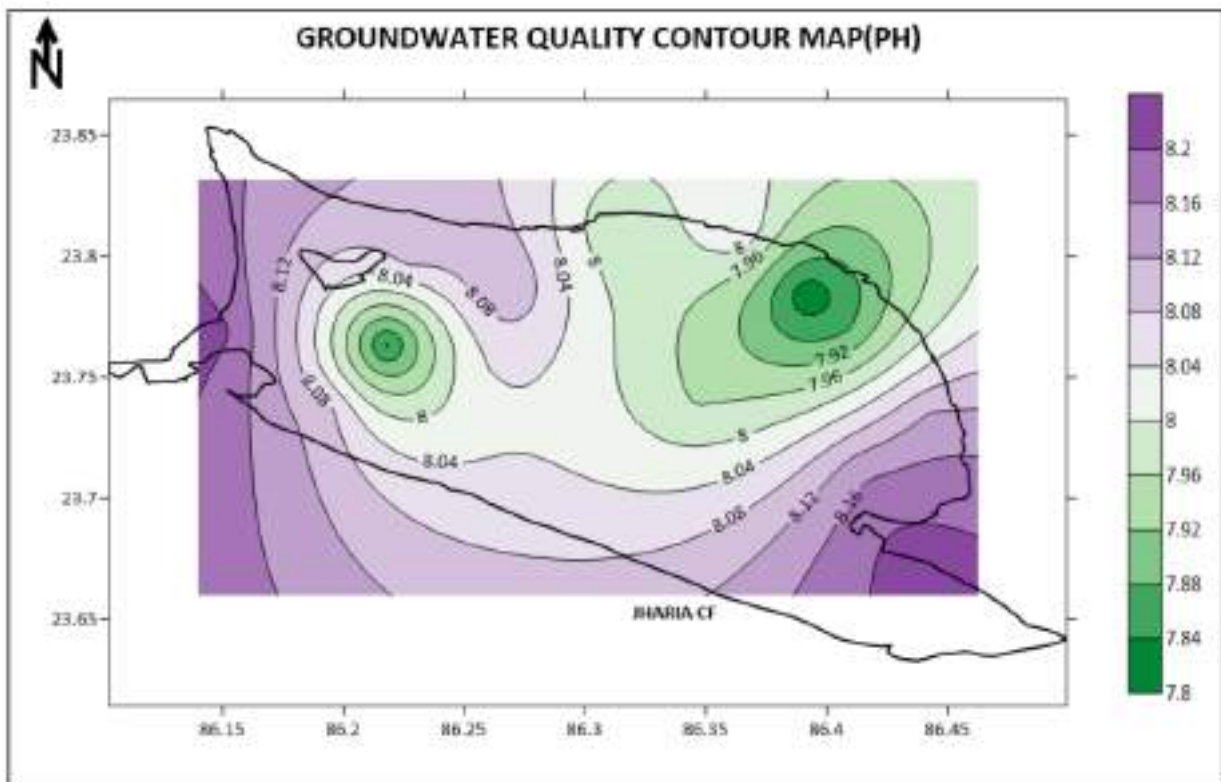
The ground water sample of the study area (15 nos. of Cluster of mines, BCCL) collected from dug wells and analyzed. Fifteen ground water samples (GW-1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 13, 14, 15 & 16) analyzed during the month of June'2021 at CMPDI, RI-II, Dhanbad. The water sampling details given in **Annexure-V** and Water sample locations shown in **Plate-II**. The water quality data enclosed in **Annexure-VII**.

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

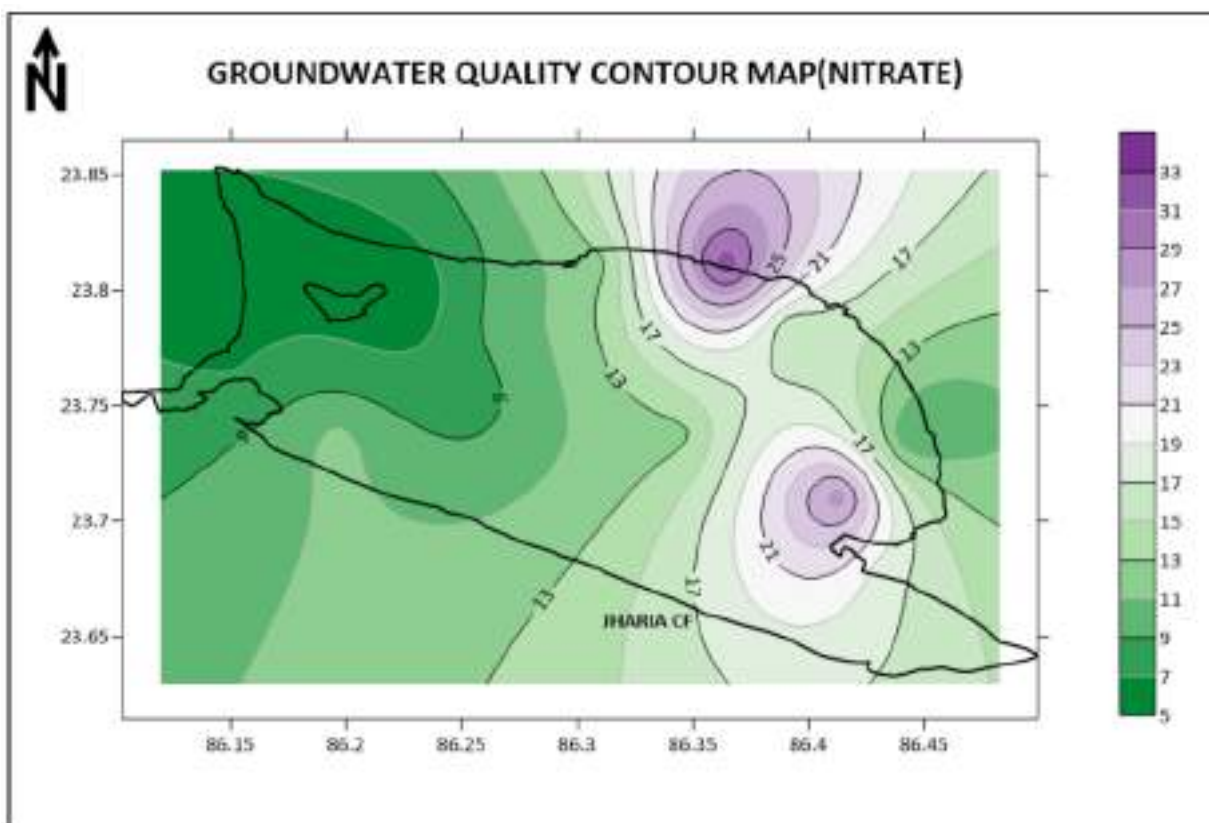
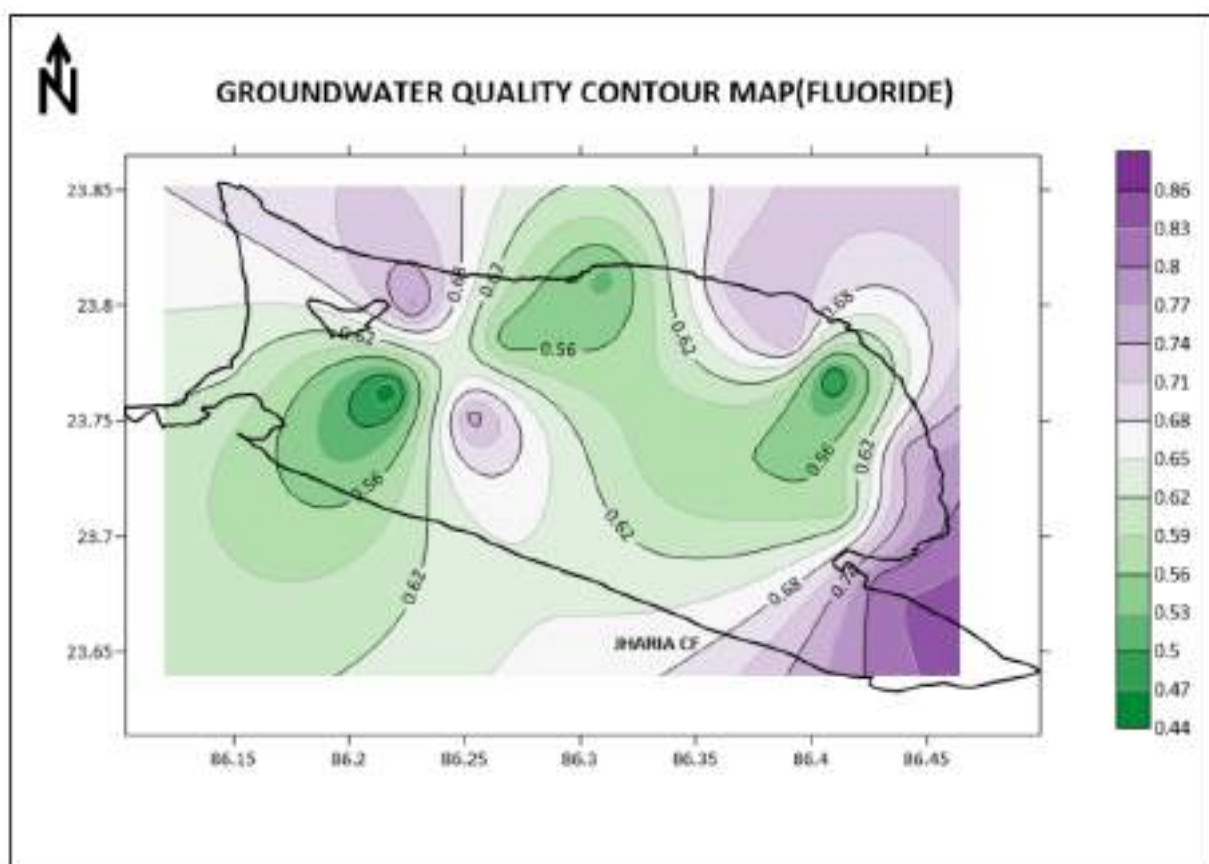
The pH of the groundwater samples varies between 7.65 (GW-5) to 8.15 (GW-11), the pH is within the IS 10500 limit of drinking water standard.

The mineral constituents dissolved in water constitute the dissolved solids. The total dissolve solids vary from 425 (GW-1) to 889 mg/l (GW-9), the TDS values ranges slightly above the IS 10500:2012 standards limits of drinking water.

The alkalinity of the water samples varies from 101 (GW-14) to 182 mg/l (GW-7) and are within the stipulated standard of (200 mg/l) drinking water. The concentrations of calcium in the water samples vary from 41 (GW-1) to 158 mg/l (GW-13) and are **slightly above** the permissible limit (75 mg/l) of drinking water standards. The total hardness ranges between 226 (GW-8) to 638 mg/l (GW-5) and the value of total hardness in water samples are **above** the permissible limit (200 mg/l). The sulphate ranges between 31 (GW-1) to 187 mg/l (GW-16) and the value of sulphate in water sample are within the permissible limit (200 mg/l). The Iron, Copper, Manganese, Lead, Zinc and Chromium concentration in the water samples found to be below the upper ISI limits for drinking water.







## 6.0 STAGE OF GROUNDWATER EXTRACTION

The groundwater mainly utilized for domestic needs and for irrigation purposes. The groundwater abstraction is mainly through dug wells and bore wells. The stage of groundwater development in Dhanbad District is 76.30% (as per 2017 GWRE). The highest stage of development is in Jharia Block (127.0%) & Dhanbad Block (107.50%) and lowest stage of development is in Baliapur Block (78.24%) as per GWRE-2013. The Gondwana sandstones in general, known to constitute good aquifers at many places. However, the yield potential of the area adjoining to active mines in the coal belt is poor. The active mines often act as groundwater “sinks”. In contrast, the water logged abandoned mines and pits act as potential sources of groundwater. As per the assessment by Central Ground Water Board (CGWB), Patna in 2017, Block wise data of Dhanbad District given below:

**Table–8A: Block wise Stage of Groundwater development**

| SI No. | Administrative Unit |           | Stage of GW Development | Category (GWRE-2013) | Category (GWRE-2017) |
|--------|---------------------|-----------|-------------------------|----------------------|----------------------|
|        | District            | Block     |                         |                      |                      |
| 1      | Bokaro              | Bermo     | 156.30%                 | Over- exploited      | Over- exploited      |
| 2      | Dhanbad             | Baghmara  | 91.74%                  | Critical             | Critical             |
| 3      | Dhanbad             | Baliapur  | 78.24%                  | Semi- Critical       | Semi- Critical       |
| 4      | Dhanbad             | Dhanbad   | 107.50%                 | Over- exploited      | Over- exploited      |
| 5      | Dhanbad             | Jharia    | 127.0%                  | Over- exploited      | Over- exploited      |
| 6      | Dhanbad             | Topchachi | 98.45%                  | Critical             | Critical             |

- **Dynamic Groundwater Resource Assessment, CGWB as per 2013 & 2017.**

**Table-8B: Cluster wise Groundwater development scenario**

| Cluster/<br>Area | Adminis-<br>trative<br>Blocks/Stage<br>Of GW<br>Extraction | Total Water demand (cum/day)         |                            |                                            |                              | Avg. GW level<br>(bgl in m)<br>2021-22 |                  | GW level declining<br>trend<br>2005-2021 |                  | Remarks                                                         |
|------------------|------------------------------------------------------------|--------------------------------------|----------------------------|--------------------------------------------|------------------------------|----------------------------------------|------------------|------------------------------------------|------------------|-----------------------------------------------------------------|
|                  |                                                            | Mine<br>Discharge<br>+ BH<br>pumping | Surface<br>Water<br>Source | Total<br>Use<br>(Domestic<br>+ Industrial) | Excess<br>Or<br>other<br>use | Pre-<br>monsoon                        | Post-<br>monsoon | Pre-<br>monsoon                          | Post-<br>monsoon |                                                                 |
|                  |                                                            |                                      |                            |                                            |                              |                                        |                  |                                          |                  |                                                                 |
| Cluster-I        | Bermo<br>(SOD: Over-<br>exploited)                         | 2173<br>(2065+108)                   | NIL                        | 2112<br>(1698+414)                         | 61                           | 5.10                                   | 1.07             | YES                                      | YES              | Recharge<br>structure<br>needed                                 |
| Cluster-II       | Baghmara<br><br>(SOD:<br>Critical)                         | 8350                                 | Jamunia<br>river           | 6737<br>(2755+3982)                        | 1613                         | 6.12                                   | 2.10             | NO                                       | NO               | Excess<br>mine<br>water<br>needed<br>to be<br>utilized          |
| Cluster-III      |                                                            | 12760<br>(10960+1800)                | NIL                        | 8946<br>(7849+1097)                        | 3814                         | 5.66                                   | 2.74             | NO                                       | NO               |                                                                 |
| Cluster-IV       |                                                            | 5900                                 | MADA                       | 5100<br>(3605+1495)                        | 800                          | 6.08                                   | 2.21             | NO                                       | NO               |                                                                 |
| Cluster-V        |                                                            | 12690<br>(11025+1665)                | MADA                       | 11063<br>(5710+5353)                       | 1897                         | 2.80                                   | 1.15             | YES                                      | YES              |                                                                 |
| Cluster-VI       | Dhanbad                                                    | 4150                                 | MADA                       | 4150<br>(1664+2486)                        | 0.0                          | 7.37                                   | 2.32             | YES                                      | NO               | --                                                              |
| Cluster-VII      | (SOD: Over-<br>exploited)                                  | 21565                                | MADA                       | 20826<br>(17596+3230)                      | 739                          | 4.66                                   | 2.63             | YES                                      | YES              | Excess<br>mine<br>water<br>needed<br>to be<br>utilized<br>water |
| Cluster-VIII     | Jharia<br><br>(SOD: Over-<br>exploited)                    | 9320                                 | MADA                       | 5294<br>(3730+1564)                        | 4026                         | 5.01                                   | 2.84             | NO                                       | NO               |                                                                 |
| Cluster-IX       |                                                            | 12980                                | MADA                       | 9358<br>(4549+4809)                        | 3622                         | 5.82                                   | 2.97             | NO                                       | NO               |                                                                 |
| Cluster-X        |                                                            | 11825                                | Damodar<br>river           | 6201<br>(4255+1946)                        | 5624                         | 4.48                                   | 2.51             | YES                                      | NO               |                                                                 |
| Cluster-XI       | Dhanbad<br>(SOD: Over-<br>exploited)                       | 24960                                | MADA &<br>DVC              | 19425<br>(14015+5410)                      | 5535                         | 2.82                                   | 1.48             | NO                                       | NO               |                                                                 |
| Cluster-XIII     | Baghmara                                                   | 750                                  | Damodar<br>river           | 692                                        | 58.0                         | 5.47                                   | 2.83             | NO                                       | NO               | --                                                              |
| Cluster-XIV      | (SOD:<br>Critical)                                         | 943                                  | NA                         | 668                                        | 275                          | 6.25                                   | 2.16             | NO                                       | NO               | --                                                              |
| Cluster-XV       |                                                            | 6200                                 | NA                         | 5941<br>(4600+1341)                        | 259                          | 6.72                                   | 1.82             | NO                                       | NO               | --                                                              |
| Cluster-XVI      | Nirsa<br>(SOD:Safe)                                        | 1910                                 | DVC<br>(Barakar<br>river)  | 1730<br>(1380+350)                         | 180                          | 3.34                                   | 2.44             | NO                                       | NO               | --                                                              |

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

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

## **7.0 IMPACT OF MINING ON GROUND WATER REGIME**

### **7.1 GENERAL CONSEQUENCES OF COAL MINES ON AMBIENT HYDROGEOLOGICAL REGIME**

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

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

The general need in mine planning from the hydrogeological point of view is the estimation of make of water (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 the groundwater regime be determined in advance. However, the mine pumping in most of the cases are passive dewatering for the safety of the mine pit, active mine dewatering is done in few cases for very high potential aquifers.

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

Generally, in the opencast and underground mines of Jharia Coalfield, alluvium and overlying weathered mantle are the first to excavate 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, the depression in the water table created. The initial discharges due to this depression is large in amount due to concentration of flow to that region. In the top zones, water table condition prevails and away from the opening in the stratified section, semi-confined conditions exist. With progress of mine operations, there is an increase in the depth of incision as a result; the semi-confined aquifers are also punctured.

During mining the hydraulic gradients generally, steepens down near mine i.e. within the mine influence area. In the up-dip region, only un-confined aquifer punctured through the mining process and thus only it

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 not punctured as it lies below the working coal seams and hence normally there is no noticeable effect in the aquifer related to this formation.

### 7.3 ESTIMATION OF RADIUS OF MINE INFLUENCE ZONE

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

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

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

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

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

Here, K has been used for Barakar Formations i.e. 0.05 m/d or  $5.7 \times 10^{-7}$  m/sec.

It may be appropriate to mention here that the presence of prominent boundaries/water bodies, faults or interfringing of sandstone and shale beds may restrict propagation of the 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 not directly affected. During the working of board and pillar method, subsidence takes place during the extraction of total coal (depillaring), both the phreatic and semi-confined aquifers get affected. Surface vigilance and filling up subsided zone, if any, has to be constantly in view. 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 upto 500 m and becomes milder/negligible thereafter.

### 8.0 CONSERVATION MEASURES & FUTURE STRATEGY

- BCCL has installed 25 Pressure Filter Plant of total capacity of 4.16 MGD to meet drinking water requirement nearby the 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 with the capacity of 5.84 MGD are in progress.

- BCCL 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 plant has proposed at other sites of BCCL.
- A scheme entitled '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 through pipe line by mine discharge at mines of Barora, Block-II and Govindpur Area.
- Rooftop rainwater harvesting (RWH) will took 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 and around 13150 cum/annum of water is going to be recharged the nearby groundwater system through RWH structures. 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.
- After cessation of mining, with plenty rainfall and abundant ground water recharge, the water levels will recoup and attain normalcy. Thus, the impact of mining on groundwater system may 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 through connecting pipeline to abandoned dug wells. Utilization of mine water for irrigation use 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.
- Creation of awareness among workers and local peoples about Rainwater harvesting and artificial recharge will have priority. This aspect usually covered during the Environmental Week celebrated every year (5 to 12 June).
- 23 nos. of Piezometer proposed to install within JCF and RCF to monitor GW level (**Plate-III**).

Monitoring of water quality of mine water discharge, local River/nala and domestic water source (dug well/hand pump wells) will continued under routine monitoring (May, August, November & Jan).



## 9.0 EXISTING/PROPOSED RAINWATER HARVESTING STRUCTURES IN BCCL COAL MINES

Fig-3 to 4.



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



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

Fig-5 to 6.



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



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



Fig-7 to 8.



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

## RECHARGE POND / ABANDONDED IN THE JCF MINE AREA

Fig-9 to 10.



## RECHARGE POND / ABANDONDED IN THE JCF MINE AREA



## RECHARGE POND / ABANDONDED IN THE JCF 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



## FILTER PLANT IN THE MINE AREA

Fig-15.



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

**List of Ramsar Sites in India**

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

## Annexure – IV

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

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

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

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



## Location of Hydrograph Stations (Dug Wells)

| Well No | Latitude       | Longitude      | Well No | Latitude       | Longitude      |
|---------|----------------|----------------|---------|----------------|----------------|
| A-3     | 23°47'53.35" N | 86°19'55.14" E | B-64    | 23°48'43.14" N | 86°18'44.25" E |
| A-12    | 23°48'20.31" N | 86°16'51.64" E | B-65A   | 23°48'53.65" N | 86°18'11.82" E |
| A-16    | 23°46'57.00" N | 86°21'38.57" E | B-67    | 23°43'30.70" N | 86°14'01.45" E |
| A-17    | 23°45'09.44" N | 86°22'16.35" E | D-3     | 23°46'46.31" N | 86°24'49.30" E |
| A-18    | 23°44'37.65" N | 86°22'58.90" E | D-4     | 23°44'29.37" N | 86°24'42.88" E |
| A-19    | 23°41'12.86" N | 86°23'55.27" E | D-5     | 23°42'20.05" N | 86°24'86.06" E |
| A-20    | 23°44'56.64" N | 86°19'55.35" E | D-7     | 23°43'12.08" N | 86°27'11.89" E |
| A-22    | 23°43'06.65" N | 86°14'48.53" E | D-8     | 23°44'06.13" N | 86°27'20.72" E |
| A-23    | 23°45'06.38" N | 86°15'12.69" E | D-23    | 23°47'20.89" N | 86°20'09.96" E |
| A-24    | 23°45'20.44" N | 86°13'45.12" E | D-25    | 23°47'03.28" N | 86°23'29.56" E |
| A-25    | 23°47'06.20" N | 86°15'27.79" E | D-30    | 23°48'36.10" N | 86°21'50.07" E |
| A-26    | 23°46'49.24" N | 86°18'12.12" E | D-33    | 23°45'34.62" N | 86°23'18.50" E |
| A-27    | 23°48'42.55" N | 86°20'21.80" E | D-34    | 23°45'36.50" N | 86°23'02.45" E |
| A-28A   | 23°47'34.74" N | 86°18'04.18" E | D-35    | 23°40'46.54" N | 86°25'46.33" E |
| A-29    | 23°47'08.02" N | 86°16'02.72" E | D-36    | 23°40'19.26" N | 86°25'18.98" E |
| A-32    | 23°44'15.56" N | 86°20'43.80" E | D-39    | 23°43'28.50" N | 86°26'0.10" E  |
| A-33    | 23°44'32.58" N | 86°16'58.28" E | D-40A   | 23°43'20.18" N | 86°25'45.70" E |
| A-34    | 23°42'58.63" N | 86°15'19.31" E | D-41    | 23°42'40.00" N | 86°26'17.20" E |
| B-1     | 23°48'48.06" N | 86°14'16.87" E | D-43*   | NA             | NA             |
| B-14    | 23°48'00.81" N | 86°16'25.88" E | D-47    | 23°45'20.59" N | 86°24'34.86" E |
| B-15    | 23°46'06.92" N | 86°08'59.30" E | D-49    | 23°44'08.96" N | 86°26'32.71" E |
| B-21A   | 23°45'10.50" N | 86°09'36.38" E | D-51    | 23°44'20.86" N | 86°27'11.37" E |
| B-23    | 23°44'13.05" N | 86°11'46.56" E | D-55    | 23°43'58.37" N | 86°24'07.45" E |
| B-24    | 23°44'26.80" N | 86°13'09.38" E | D-74    | 23°41'33.66" N | 86°25'06.10" E |
| B-25    | 23°44'44.98" N | 86°13'57.80" E | D-77    | 23°41'00.74" N | 86°22'25.55" E |
| B-32A   | 23°45'49.18" N | 86°13'03.64" E | D-80    | 23°46'09.46" N | 86°24'33.08" E |
| B-48    | 23°44'35.09" N | 86°16'38.30" E | DB-22   | 23°43'38.81" N | 86°45'09.00" E |
| B-51    | 23°47'40.20" N | 86°09'11.90" E | DB-23   | 23°43'44.24" N | 86°45'06.39" E |
| B-53    | 23°45'55.25" N | 86°09'35.44" E | DB-24   | 23°43'53.00" N | 86°45'03.88" E |
| B-59    | 23°47'59.87" N | 86°13'37.97" E | DB-25   | 23°44'10.75" N | 86°44'35.84" E |
| B-60    | 23°48'7.87" N  | 86°15'37.12" E |         |                |                |
| B-61A   | 23°45'59.85" N | 86°11'40.80" E |         |                |                |
| B-62A   | 23°45'44.15" N | 86°11'27.80" E |         |                |                |

## Details of Hydrograph Stations (Dug Wells)

| Well No | Location       | M.P. (agl) in m | Well Dia in m | Well Depth (m bmp) | R.L. (G.L) (m) | Formation    | Owner     | Utility    |
|---------|----------------|-----------------|---------------|--------------------|----------------|--------------|-----------|------------|
| A-3     | Sijua          | 0.53            | 3.00          | 5.20               | 203            | Barakar      | Govt.     | Domestic   |
| A-12    | Jamua          | 0.80            | 1.90          | 3.30               | 202            | Barakar      | Govt.     | Domestic   |
| A-16    | Ekra, Kalali   | 0.45            | 3.10          | 6.50               | 205            | Barakar      | Govt.     | Domestic   |
| A-17    | Kachi Balihari | 0.56            | 1.60          | 5.30               | 182            | Barakar      | Govt.     | Domestic   |
| A-18    | Bhagabandh     | 0.61            | 1.45          | 3.37               | 182            | Barakar      | Govt.     | Domestic   |
| A-19    | Bhaura         | 0.54            | 3.15          | 11.65              | 162            | Barakar      | Govt.     | Domestic   |
| A-20    | Gorbhudih      | 0.43            | 3.30          | 8.30               | 181            | BM           | Govt.     | Domestic   |
| A-22    | Nagdah, Niche  | 0.00            | 1.40          | 9.50               | 171            | Raniganj     | Govt      | Irrigation |
| A-23    | Machhyara      | 0.43            | 1.85          | 12.40              | 203            | Raniganj     | Govt      | Domestic   |
| A-24    | Pipra Tanr     | 0.22            | 1.80          | 19.55              | 208            | Raniganj     | Govt      | Domestic   |
| A-25    | Sinidih        | 0.22            | 2.00          | 11.30              | 203            | Barakar      | Govt      | Domestic   |
| A-26    | Pasitanr       | 0.32            | 1.80          | 9.65               | 198            | Barakar      | Govt      | Domestic   |
| A-27    | Chandor        | 0.60            | 2.50          | 5.50               | 221            | Barakar      | Govt      | Domestic   |
| A-28A   | Lakarka 6 no.  | 0.65            | 1.30          | 5.25               | 199            | Barakar      | BCCL      | Domestic   |
| A-29    | Aambagan       | 0.10            | 2.60          | 9.15               | 186            | Barakar      | Govt      | Domestic   |
| A-32    | Baludih        | 0.55            | 2.30          | 6.85               | 182            | BM           | Govt      | Domestic   |
| A-33    | Mahuda         | 0.75            | 2.00          | 10.80              | 195            | BM           | BCCL      | Domestic   |
| A-34    | Bhatdih        | 0.55            | 3.50          | 24.50              | 162            | Raniganj     | BCCL      | Domestic   |
| B-1     | Muraidih       | 0.47            | 1.80          | 5.35               | 212            | Talchir      | Govt      | Domestic   |
| B-14    | Mathadih       | 0.76            | 2.15          | 3.75               | 201            | Barakar      | Govt      | Domestic   |
| B-15    | Bera Basti     | 0.55            | 1.60          | 2.50               | 221            | Talchir      | Dhanu Roy | Domestic   |
| B-21A   | Dugdha         | 0.55            | 2.10          | 10.35              | 220            | Metamorphics | Govt      | Domestic   |
| B-23    | Lohapati       | 0.26            | 3.60          | 10.85              | 204            | Raniganj     | Govt      | Domestic   |
| B-24    | Telmuchu       | 0.67            | 4.35          | 10.83              | 207            | Raniganj     | Govt      | Domestic   |
| B-25    | Mahuda More    | 0.10            | 2.45          | 8.45               | 205            | Raniganj     | Govt      | Domestic   |
| B-32A   | Madhuband      | 0.80            | 4.30          | 8.60               | 205            | Barakar      | BCCL      | Domestic   |
| B-48    | Mahuda         | 0.65            | 2.10          | 11.50              | 181            | Raniganj     | Mosque    | Domestic   |
| B-51    | Taranga        | 0.00            | 2.50          | 5.75               | 215            | Metamorphics | Bisun     | Irrigation |
| B-53    | Karmatanr      | 0.58            | 2.70          | 13.25              | 195            | Barakar      | Govt      | Domestic   |
| B-59    | Khodovaly      | 0.60            | 2.40          | 9.30               | 202            | Barakar      | BCCL      | Domestic   |
| B-60    | Bahiyardih     | 0.77            | 3.00          | 15.60              | 196            | Barakar      | BCCL      | Domestic   |
| B-61A   | Kesargora      | 0.48            | 2.00          | 11.20              | 201            | Barakar      | BCCL      | Domestic   |
| B-62A   | Sadariyadih    | 0.15            | 3.10          | 9.50               | 188            | Barakar      | Govt      | Domestic   |

## Details of Hydrograph Stations (Dug Wells)

| Well No | Location       | M.P. (agl) in m | Well Dia in m | Well Depth (m bmp) | R.L. (G.L) (m) | Formation    | Owner       | Utility  |
|---------|----------------|-----------------|---------------|--------------------|----------------|--------------|-------------|----------|
| B-64    | Keshalpur      | 0.65            | 1.10          | 3.40               | 195            | Barakar      | BCCL        | Domestic |
| B-65A   | Jhinjipahari   | 0.95            | 2.20          | 12.40              | 196            | Barakar      | Shiv Temple | Domestic |
| B-67    | Simatanr       | 0.55            | 2.20          | 11.80              | 198            | Raniganj     | Govt        | Domestic |
| D-3     | Dhansar        | 0.60            | 1.70          | 8.70               | 217            | Barakar      | Govt        | Domestic |
| D-4     | Jharia         | 0.59            | 1.90          | 5.73               | 218            | Barakar      | Govt        | Domestic |
| D-5     | Jiyalgora      | 0.70            | 2.80          | 10.55              | 183            | Barakar      | Govt        | Domestic |
| D-7     | Golden Pahari  | 0.67            | 2.85          | 10.05              | 201            | Barakar      | BCCL        | Domestic |
| D-8     | Alokdiha       | 0.35            | 1.75          | 7.57               | 201            | Metamorphics | BCCL        | Domestic |
| D-23    | Jogta (Sindra) | 0.40            | 3.10          | 7.25               | 205            | Barakar      | BCCL        | Domestic |
| D-25    | Godhar More    | 0.60            | 2.75          | 5.60               | 219            | Barakar      | Govt        | Domestic |
| D-30    | Borkiboa       | 0.70            | 2.00          | 5.60               | 221            | Talchir      | H.Kumbhakar | Domestic |
| D-33    | Kustore-4      | 0.55            | 1.85          | 3.45               | 196            | Barakar      | BCCL        | Domestic |
| D-34    | Kusunda-7      | 0.60            | 1.50          | 3.45               | 201            | Barakar      | BCCL        | Domestic |
| D-35    | Patherdih      | 0.40            | 2.00          | 11.20              | 160            | Barakar      | BCCL        | Domestic |
| D-36    | Sudamdih       | 0.90            | 2.00          | 6.20               | 141            | Barakar      | BCCL        | Domestic |
| D-39    | Tilabani       | 0.85            | 2.00          | 5.90               | 178            | Barakar      | BCCL        | Domestic |
| D-40A   | Khapra Dhaora  | 0.55            | 1.95          | 3.70               | 180            | Barakar      | Panchayat   | Domestic |
| D-41    | Joyrampur      | 0.50            | 1.80          | 4.00               | 180            | Barakar      | BCCL        | Domestic |
| D-43    | Alagdih        | 0.45            | 2.20          | 8.90               | 200            | Metamorphics | Govt        | Domestic |
| D-47    | Parastanr      | 0.45            | 3.20          | 23.80              | 206            | Barakar      | BCCL        | Domestic |
| D-49    | Goluckdih      | 0.55            | 1.80          | 6.15               | 192            | Barakar      | BCCL        | Domestic |
| D-51    | Chankuiya      | 0.55            | 3.70          | 11.90              | 197            | Barakar      | BCCL        | Domestic |
| D-55    | Hariladih      | 0.48            | 2.80          | 11.80              | 184            | Barakar      | Govt        | Domestic |
| D-74    | Bhulan Barari  | 0.10            | 1.60          | 12.80              | 173            | Barakar      | Govt        | Domestic |
| D-77    | Rohoniatanr    | 0.40            | 3.15          | 6.70               | 156            | Barakar      | Govt        | Domestic |
| D-80    | Bastacolla     | 0.70            | 2.50          | 24.95              | 219            | Barakar      | Govt        | Domestic |
| DB-22   | Nichebasti     | 0.67            | 2.40          | 10.65              | 121            | Barakar      | Govt        | Domestic |
| DB-23   | Dahibari OC    | 0.70            | 2.30          | 8.00               | -              | Barakar      | BCCL        | Domestic |
| DB-24   | Dahibari       | 0.60            | 3.60          | 13.70              | 125            | Barakar      | BCCL        | Domestic |
| DB-25   | Palasya        | 0.37            | 1.55          | 5.25               | 127            | Barakar      | Govt        | Domestic |

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

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

## Historical Water Level data of Hydrograph Stations

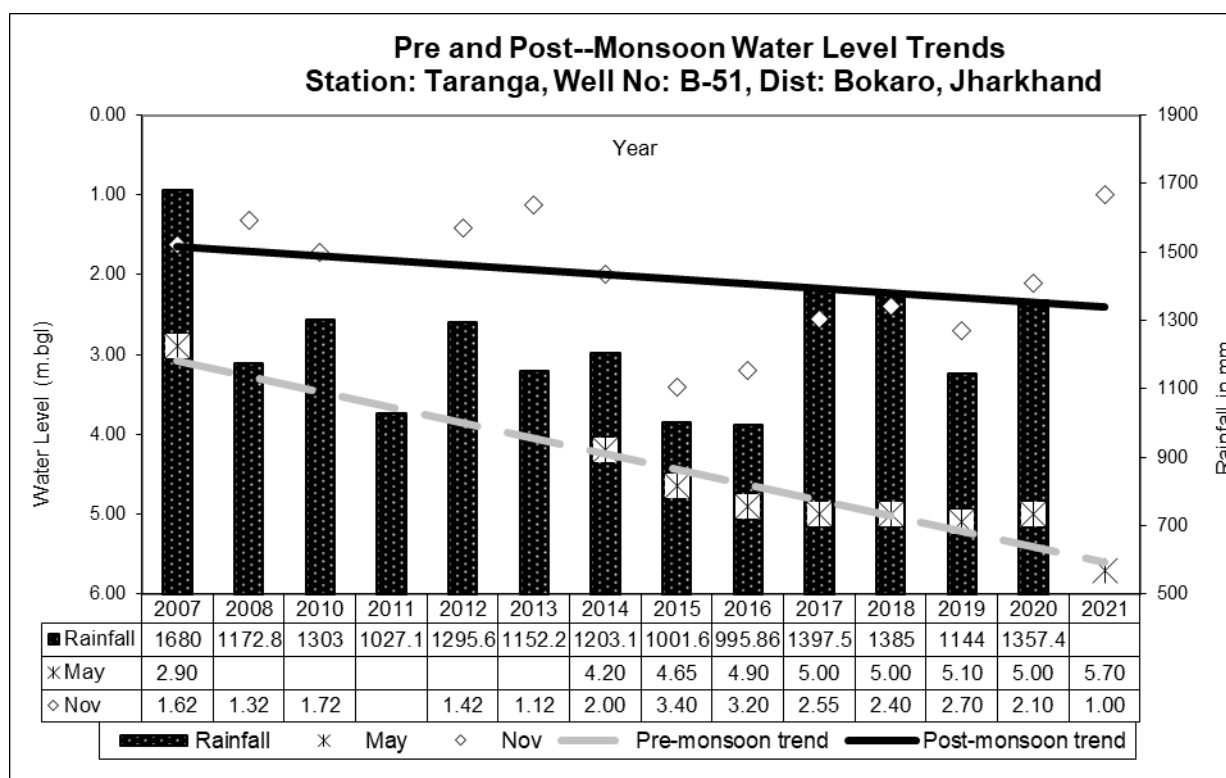
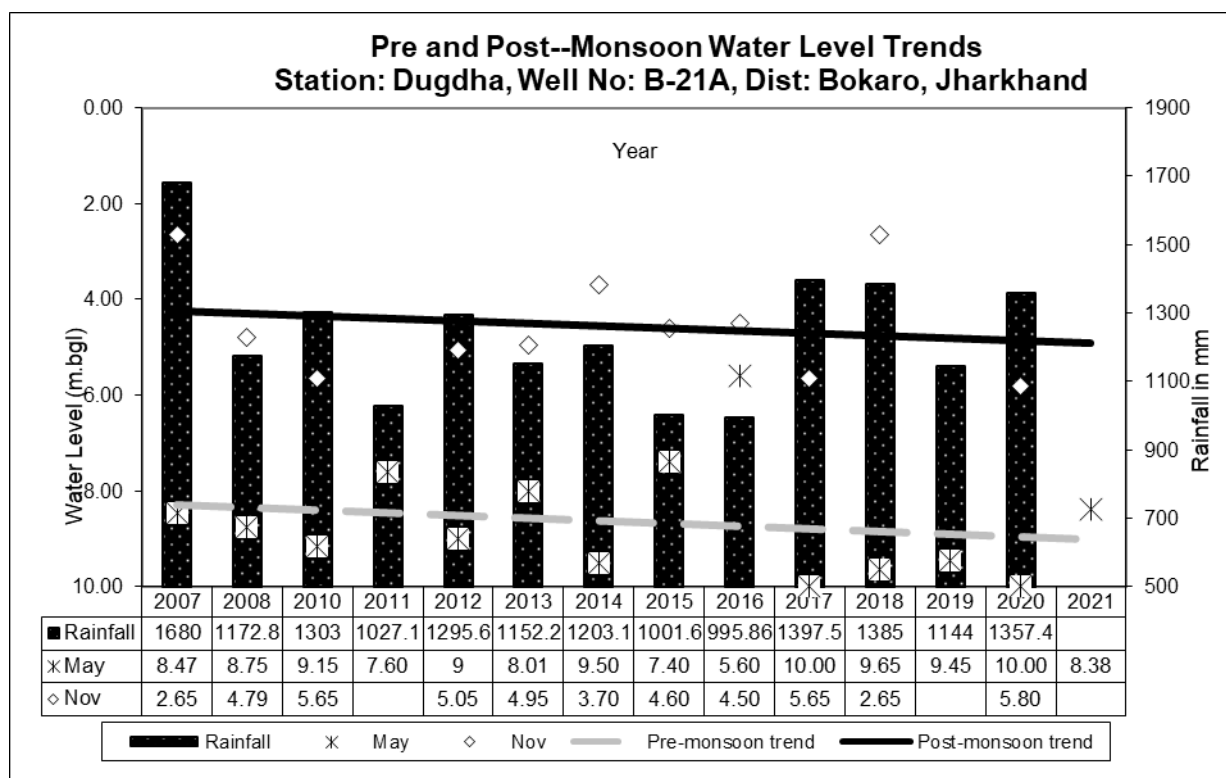
| Well No | Water level below ground level (bgl) in meters |        |        |        |        |        |        |        |        |        |        |        |        |        |        |        |
|---------|------------------------------------------------|--------|--------|--------|--------|--------|--------|--------|--------|--------|--------|--------|--------|--------|--------|--------|
|         | May 14                                         | Nov 14 | 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 |
| A-3     | 4.67                                           | 2.37   | 3.70   | 3.42   | 4.87   | 0.47   | 0.67   | 0.77   | 1.27   | 0.47   | 3.47   | 0.47   | 1.57   | 0.47   | 0.62   | 0.05   |
| A-12    | 2.45                                           | 1.4    | 3.00   | 2.68   | 2.50   | 0.70   | 2.55   | 0.85   | 2.80   | 1.0    | 2.10   | 0.45   | 2.60   | 0.50   | 1.92   | 1.10   |
| A-16    | 5.5                                            | 2.9    | 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   |
| A-17    | 2.19                                           | 1.91   | 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   |
| A-18    | 1.76                                           | 1.19   | 2.84   | 1.29   | 1.14   | 0.89   | 1.29   | 0.99   | 1.24   | 0.99   | 2.29   | 0.69   | 1.09   | 0.34   | 1.09   | 0.57   |
| A-19    | 3.00                                           | 2.75   | 3.05   | 2.75   | 7.81   | 4.11   | 6.37   | 2.45   | 5.55   | 2.45   | 4.85   | 3.43   | 6.05   | 3.25   | 3.30   | 1.90   |
| A-20    | 3.97                                           | 2.55   | 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   |
| A22A    | 1.50                                           | 2.0    | 3.20   | 1.96   | 3.25   | 1.75   | 4.27   | 1.77   | 3.35   | 1.30   | 2.60   | 2.00   | 2.90   | 1.98   | 2.90   | 1.10   |
| A-23    | 8.76                                           | 6.82   | 11.3   | 9.37   | 11.87  | 8.13   | 6.40   | 1.50   | 11.15  | 7.17   | 11.97  | 3.77   | 8.92   | 5.62   | 9.52   | 2.82   |
| A-24    | 16.28                                          | 14.98  | 17.2   | 14.5   | 16.62  | 12.43  | 11.87  | 6.97   | 14.58  | 6.88   | 15.88  | 2.48   | *4.88  | 4.28   | 10.13  | 2.78   |
| A-25    | 7.03                                           | 5.28   | 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   |
| A-26    | 7.71                                           | 4.58   | 7.73   | 3.18   | 8.93   | 4.48   | 5.28   | 2.53   | 6.23   | 3.88   | 6.58   | 3.33   | 6.98   | 3.18   | 6.70   | 2.73   |
| A-27    | 1.63                                           | 1.55   | 4.40   | 3.95   | 4.85   | 1.80   | 2.90   | 1.25   | 2.90   | 1.0    | 2.40   | 0.92   | 2.40   | 1.10   | 1.67   | 0.90   |
| A28A    | 3.29                                           | 1.91   | 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   |
| A-29    | 3.3                                            | 2.35   | 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   |
| A-32    | 3.15                                           | 2.45   | 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   |
| A-33    | 4.08                                           | 1.57   | 4.91   | 1.97   | 5.75   | 2.60   | 6.45   | 1.55   | 4.07   | 2.35   | 3.65   | 1.25   | 4.55   | 1.85   | 2.85   | 0.85   |
| A-34    | 4.45                                           | 4.45   | 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   |
| B-1     | 2.43                                           | 1.81   | 3.28   | 2.75   | 3.58   | 1.93   | 2.33   | 0.85   | 2.88   | 2.08   | 3.18   | 1.73   | 3.28   | 1.63   | 2.58   | 1.91   |
| B-14    | 3.24                                           | 4.44   | 2.94   | 2.29   | 2.44   | 0.47   | 2.94   | 1.84   | 3.64   | 2.84   | 2.24   | 0.94   | 2.44   | 1.04   | 2.84   | 2.04   |
| B-15    | 0.95                                           | 1.45   | 1.50   | 0.45   | 1.85   | 0.55   | 4.85   | 0.15   | 1.85   | 0.85   | 1.90   | 1.65   | 3.70   | 1.47   | 1.46   | 0.35   |
| B21A    | 9.54                                           | 3.7    | 7.37   | 4.65   | 5.55   | 4.50   | 8.85   | 5.65   | 9.65   | 2.65   | 9.45   | -      | 10.00  | 5.80   | 8.38   | -      |
| B-23    | 6.57                                           | 2.74   | 7.86   | 4.29   | 6.81   | 2.41   | 7.74   | 2.14   | 6.64   | 2.14   | 2.84   | 1.34   | 3.24   | 1.76   | 4.12   | 1.44   |
| B-24    | 9.40                                           | 2.21   | 10.0   | 5.78   | 10.63  | 4.28   | 10.03  | 4.03   | 9.28   | 4.33   | 4.58   | 2.33   | 5.48   | 3.53   | 5.68   | 2.08   |
| B-25    | 5.82                                           | 5.15   | 6.88   | -      | 7.05   | 1.70   | 6.70   | 1.40   | 5.90   | 3.70   | 4.80   | 1.40   | 7.90   | 2.55   | 5.10   | 2.58   |
| B32A    | 8.33                                           | 2.05   | 7.55   | 3.32   | 6.95   | 3.07   | 6.95   | 2.80   | 6.75   | 3.90   | 5.55   | 1.70   | 3.30   | 2.00   | 7.23   | 6.05   |
| B-48    | 6.38                                           | 4.35   | 7.90   | 5.42   | 9.35   | 4.60   | 7.70   | 4.15   | 7.33   | 3.97   | 7.05   | 4.35   | 8.20   | 3.85   | 7.23   | 6.05   |
| B-51    | 2.09                                           | 1.98   | 4.65   | 3.40   | 4.90   | 3.18   | 4.98   | 2.55   | 5.02   | 2.42   | 5.10   | 2.70   | 5.00   | 2.10   | 5.70   | 1.0    |
| B-53    | 3.39                                           | -      | 5.58   | 2.82   | 4.70   | 1.45   | 4.02   | 1.92   | 3.92   | 1.42   | 3.22   | 1.42   | 3.12   | 1.40   | 4.85   | 1.87   |
| B-59    | 2.65                                           | 1.0    | 4.12   | 1.60   | 4.40   | 0.50   | 5.40   | 0.60   | 5.47   | 1.10   | 6.20   | 0.90   | 5.25   | 1.40   | 5.49   | 0.90   |
| B-60    | 9.82                                           | 4.59   | 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   |
| B61A    | 6.93                                           | 3.57   | 6.15   | 4.52   | 6.58   | 3.87   | 2.57   | 0.82   | 2.57   | 2.02   | 3.32   | 0.52   | 3.32   | 1.60   | 4.42   | 0.97   |
| B62A    | 8.83                                           | 5.85   | 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   |

## Historical Water Level data of Hydrograph Stations

| Well No    | Water level below ground level (bgl) in meters |               |               |               |               |               |               |               |               |               |               |               |               |               |               |               |
|------------|------------------------------------------------|---------------|---------------|---------------|---------------|---------------|---------------|---------------|---------------|---------------|---------------|---------------|---------------|---------------|---------------|---------------|
|            | May 14                                         | Nov 14        | 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        |
| B-64       | 0.7                                            | 1.15          | 1.38          | 0.95          | 2.35          | 0.55          | 1.25          | 0.85          | 2.15          | 1.85          | 0.95          | 0.45          | 1.85          | 0.50          | 2.35          | 0.95          |
| B65A       | 10.45                                          | 2.4           | 7.82          | 5.87          | 7.15          | 2.68          | 9.05          | 1.25          | 10.03         | 2.40          | 11.05         | 0.95          | 9.25          | 2.30          | 9.03          | 1.42          |
| B-67       | 9.80                                           | 3.72          | 9.23          | 5.53          | 9.53          | 4.30          | 10.00         | 2.15          | 9.55          | 4.0           | 8.57          | 4.35          | 7.55          | 3.95          | 8.95          | 2.95          |
| D-3        | 2.54                                           | 2.11          | 4.25          | 2.25          | 2.35          | 1.90          | 2.15          | 2.30          | 3.43          | 2.45          | 1.75          | 1.30          | 5.40          | 1.38          | 3.41          | 0.85          |
| D-4        | 1.23                                           | 0.91          | 2.41          | 1.27          | 1.21          | 1.36          | 1.21          | 1.46          | 1.91          | 1.56          | 2.81          | 1.71          | 3.41          | 1.41          | 3.01          | 1.16          |
| D-5        | 9.0                                            | 7.8           | 9.37          | 8.33          | 9.40          | 6.40          | 7.90          | 5.20          | 7.80          | 5.30          | 8.25          | 4.85          | 8.60          | 7.70          | 7.28          | 4.00          |
| D-7        | 5.28                                           | 5.53          | 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          |
| D-8        | 7.73                                           | -             | 6.24          | 4.38          | 8.00          | 3.43          | 5.15          | 1.85          | 5.65          | 1.85          | 4.80          | 2.85          | 5.83          | 2.75          | 4.55          | 2.27          |
| D-23       | 6.38                                           | 2.4           | 6.55          | 3.48          | 5.70          | 1.63          | 2.80          | 2.98          | 4.40          | 3.40          | 4.70          | 1.40          | 5.60          | 3.35          | 5.43          | 1.60          |
| D-25       | 4.42                                           | 2.9           | 4.48          | 2.45          | 2.40          | 1.90          | 2.40          | 1.20          | 2.60          | 2.40          | *9.90         | *5.38         | 10.50         | 5.62          | 10.50         | 3.80          |
| D-30       | 4.17                                           | 3.3           | 4.55          | 3.15          | 4.45          | 3.20          | 4.40          | 1.25          | 4.58          | 1.10          | 4.60          | 0.75          | 4.50          | 1.35          | 4.23          | 0.84          |
| D-33       | 1.72                                           | 0.35          | 2.25          | 1.10          | 2.50          | 1.95          | 0.75          | 0.75          | 2.85          | 0.95          | 2.35          | 1.65          | 3.65          | 1.45          | 1.75          | 0.85          |
| D-34       | 2.80                                           | 0.30          | 2.55          | 1.45          | 2.30          | 0.30          | 0.80          | 0.55          | 2.80          | 0.45          | 4.75          | 2.40          | 3.30          | 2.80          | 3.78          | 2.90          |
| D-35       | 6.94                                           | 6.15          | 9.80          | 7.90          | 9.52          | 6.45          | 8.80          | 3.60          | 8.40          | 4.45          | 8.00          | 3.80          | 8.20          | 5.40          | 6.60          | 2.90          |
| D-36       | 1.82                                           | 0.75          | 1.66          | 1.13          | 0.78          | 0.95          | 1.30          | 0.70          | 1.20          | 0.60          | 1.20          | 0.55          | 2.10          | 1.00          | 2.02          | 0.55          |
| D-39       | 5.03                                           | 2.25          | 5.00          | 2.61          | 2.18          | 2.65          | 6.17          | 4.75          | 4.95          | 4.35          | *12.60        | *5.95         | 9.40          | 6.05          | 10.70         | 5.10          |
| D40A       | 2.35                                           | 2.45          | 3.07          | 2.45          | 1.40          | 0.85          | 1.45          | 1.35          | 2.10          | 1.40          | 1.85          | 1.45          | 1.95          | 1.43          | 1.95          | 1.80          |
| D-41       | 3.20                                           | 1.35          | 2.65          | 2.32          | 1.30          | 1.52          | 1.40          | 1.20          | 1.59          | 1.32          | 2.30          | 1.25          | 3.30          | 1.45          | 1.95          | 1.38          |
| D-43       | 6.0                                            | 4.75          | 6.61          | 5.05          | 8.20          | 3.35          | 7.50          | 3.60          | 7.15          | 3.45          | 7.35          | 2.70          | 6.60          | 2.55          | 4.65          | 2.60          |
| D-47       | 8.0                                            | 2.37          | 9.60          | 3.60          | 3.18          | 2.95          | 3.15          | 2.85          | 5.33          | 2.55          | 4.55          | 4.35          | 9.45          | 5.45          | 4.05          | 2.45          |
| D-49       | 2.51                                           | 1.65          | 3.55          | 2.35          | 2.45          | 1.72          | 2.70          | 2.05          | 3.45          | 2.45          | 1.75          | 1.50          | 3.25          | 1.65          | 1.40          | 0.85          |
| D-51       | 9.60                                           | 9.05          | 10.48         | 9.15          | 11.15         | 6.45          | 10.45         | 5.43          | 10.93         | 7.10          | 9.95          | 5.75          | 8.45          | 5.70          | 9.43          | 5.65          |
| D-55       | 1.95                                           | 2.07          | 6.15          | 1.57          | 2.52          | 3.62          | 6.42          | 2.37          | 8.42          | 1.57          | 8.42          | 5.47          | 9.42          | 8.60          | 9.52          | 7.62          |
| D-74       | 5.0                                            | 4.0           | 10.05         | 7.20          | 7.73          | 5.00          | 9.25          | 3.85          | 8.60          | 4.80          | 5.80          | 3.57          | 4.30          | 3.93          | 6.93          | 2.90          |
| D-77       | 6.23                                           | 6.0           | 6.44          | 5.60          | 4.60          | 2.90          | 6.50          | 4.90          | 6.30          | 5.20          | 6.40          | 3.20          | 6.40          | 3.50          | 5.98          | 4.69          |
| D-80       | 13.3                                           | 3.15          | 10.97         | 3.35          | 6.55          | 4.15          | 8.65          | 3.70          | 9.35          | 4.20          | 5.00          | 3.05          | 4.30          | 4.90          | 7.10          | 2.55          |
| RCF (part) | <b>May 14</b>                                  | <b>Nov 14</b> | <b>May 15</b> | <b>Nov 15</b> | <b>May 16</b> | <b>Nov 16</b> | <b>May 17</b> | <b>Nov 17</b> | <b>May 18</b> | <b>Nov 18</b> | <b>May 19</b> | <b>Nov 19</b> | <b>May 20</b> | <b>Nov 20</b> | <b>May 21</b> | <b>Nov 21</b> |
| DB22       | 6.48                                           | 3.03          | 4.59          | 3.53          | 5.38          | 3.33          | 1.93          | 1.63          | 2.34          | 1.93          | 4.93          | 1.63          | 2.63          | 2.25          | 2.31          | 1.38          |
| DB23       | 3.95                                           | 2.13          | 3.38          | 6.04          | 5.30          | 0.90          | 2.05          | 1.90          | 2.85          | 1.75          | 1.60          | 0.80          | 2.50          | 1.95          | 2.00          | 1.10          |
| DB24       | -                                              | 8.45          | 9.52          | 8.20          | 10.65         | 6.50          | 5.80          | 3.78          | 8.25          | 5.70          | 9.35          | 3.88          | 5.70          | 3.60          | 6.20          | 5.25          |
| DB25       | 3.27                                           | 2.73          | 3.83          | 2.68          | 3.61          | 1.98          | 3.23          | 2.58          | 3.93          | 1.63          | -             | -             | 3.98          | 2.63          | 2.83          | 2.03          |

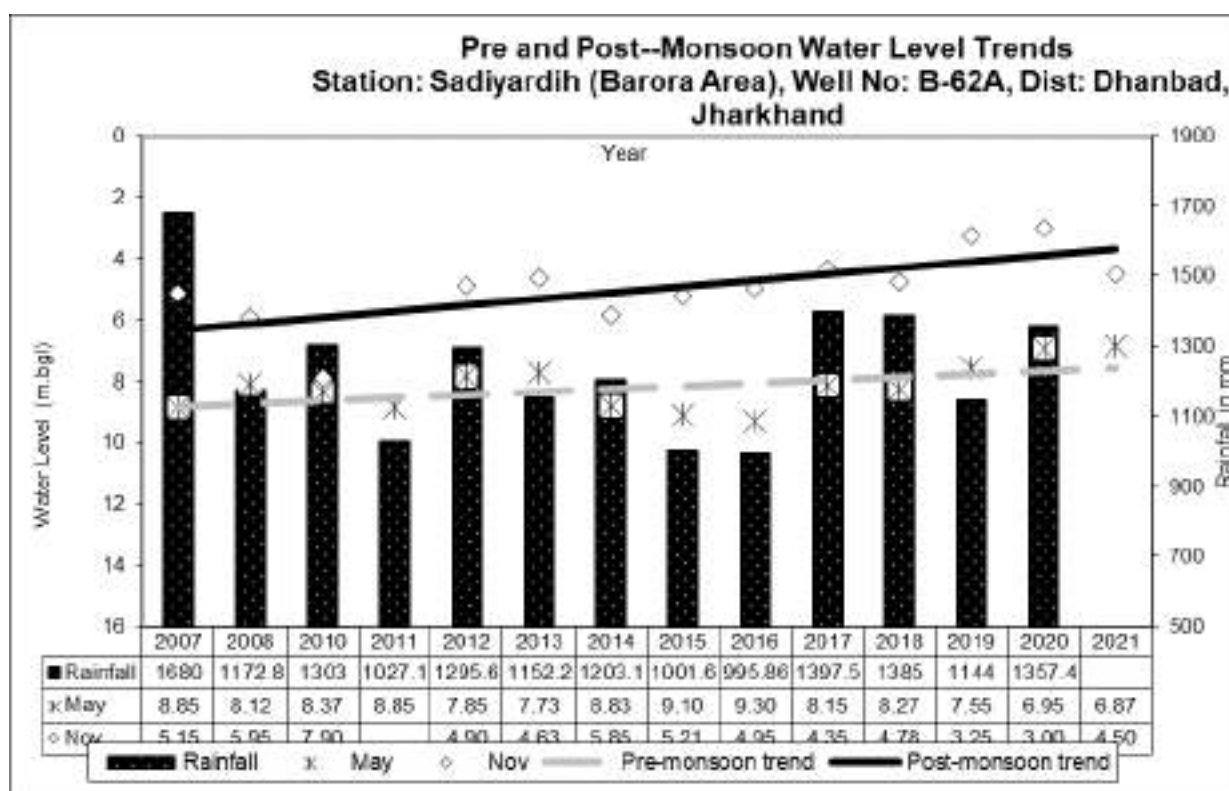
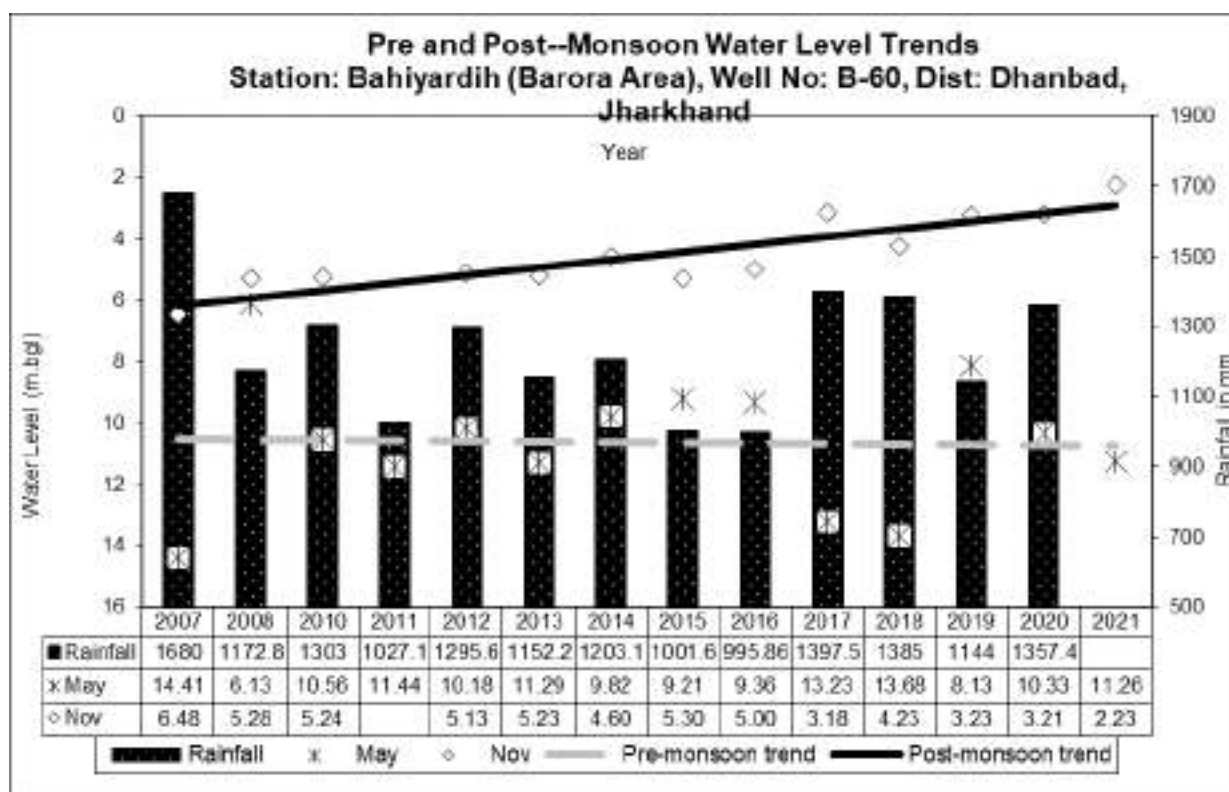
\*New well

## HYDROGRAPHS OF CLUSTER-I

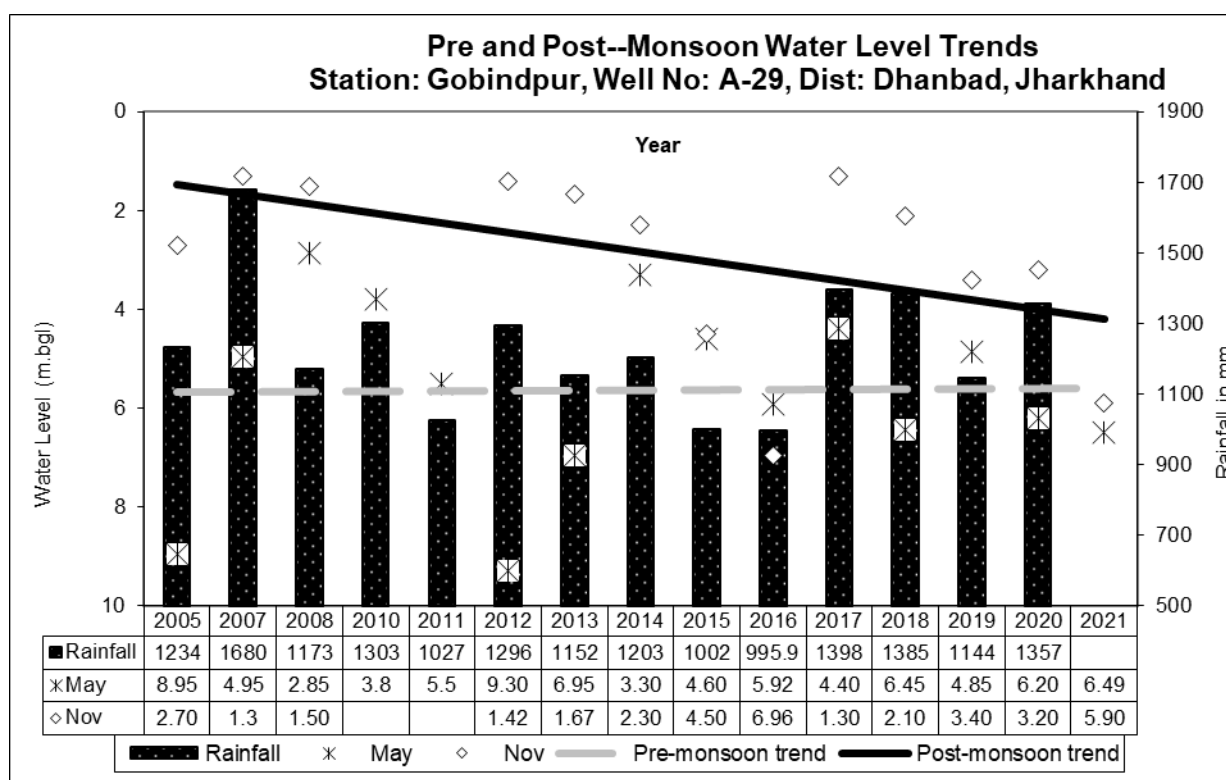
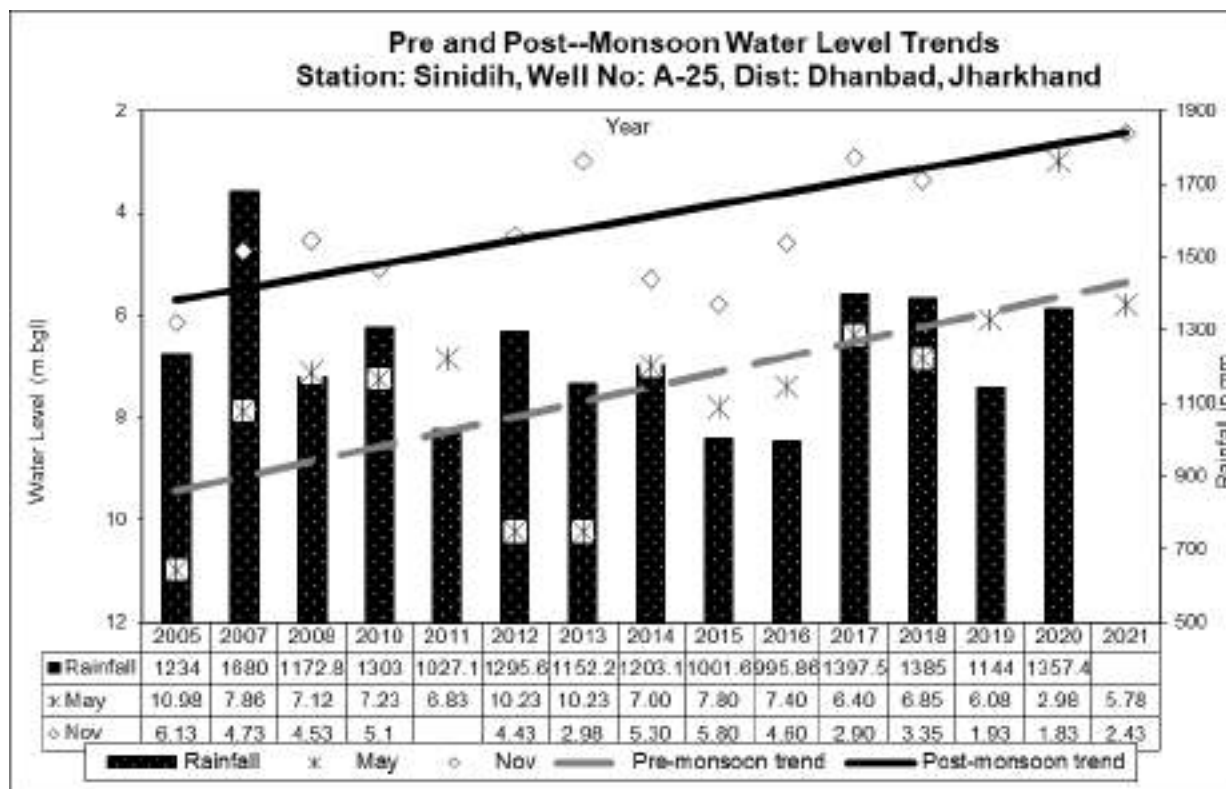




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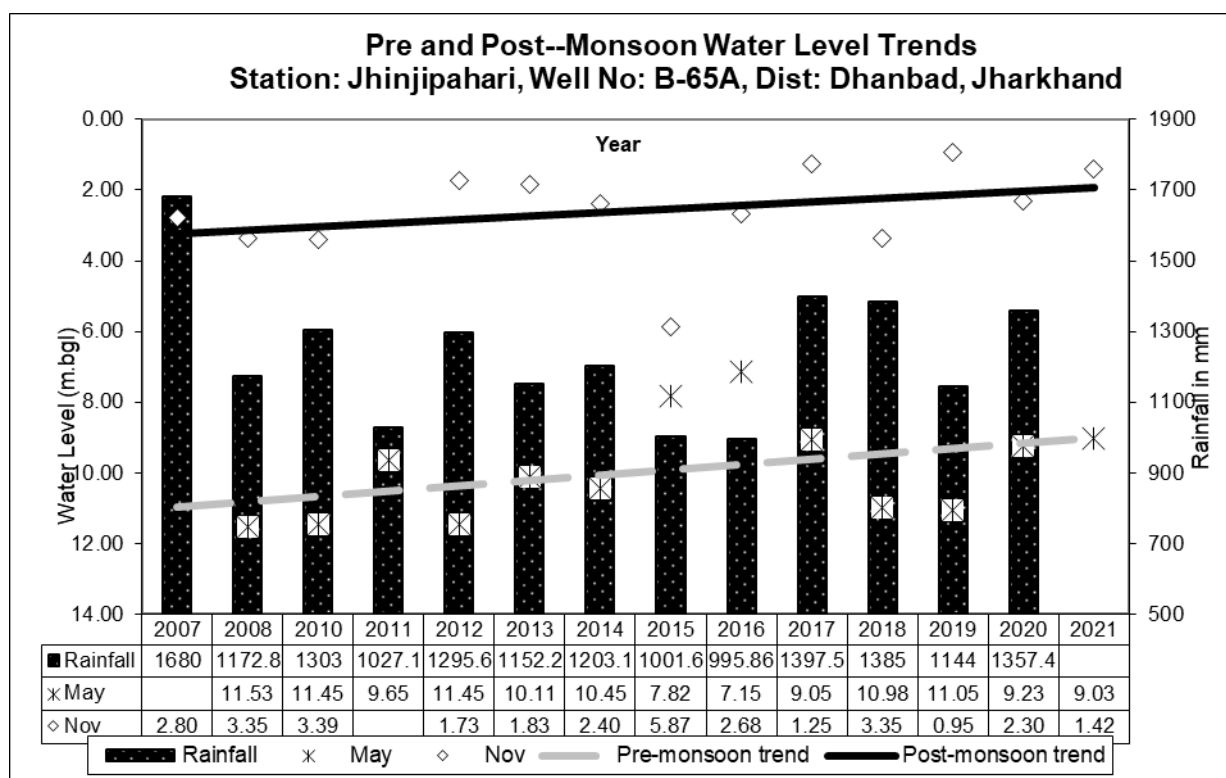
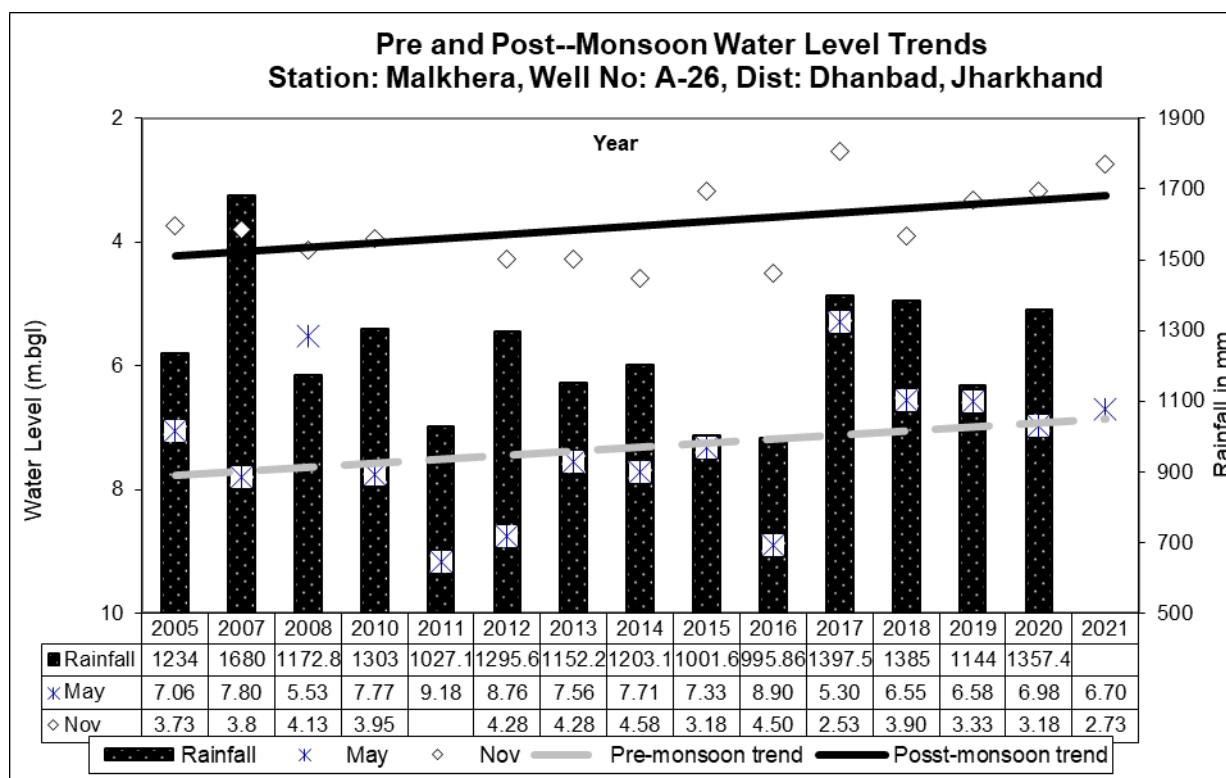


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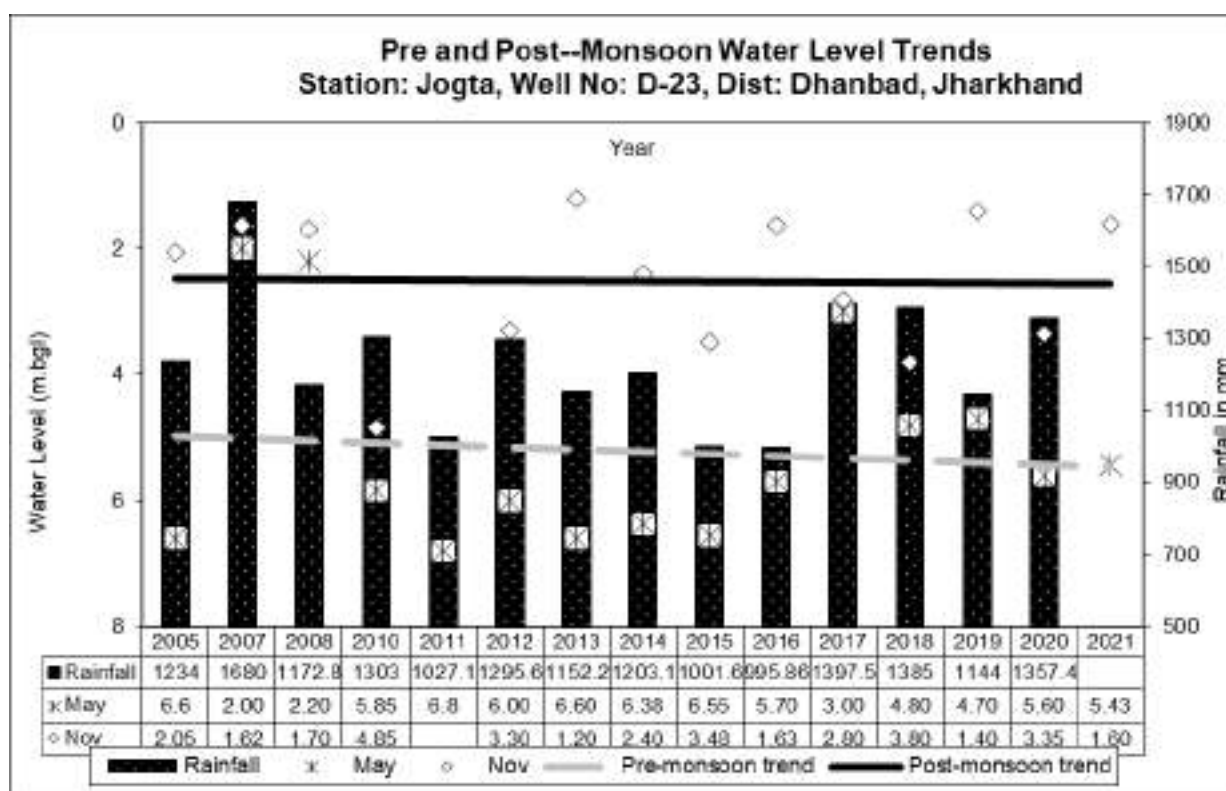
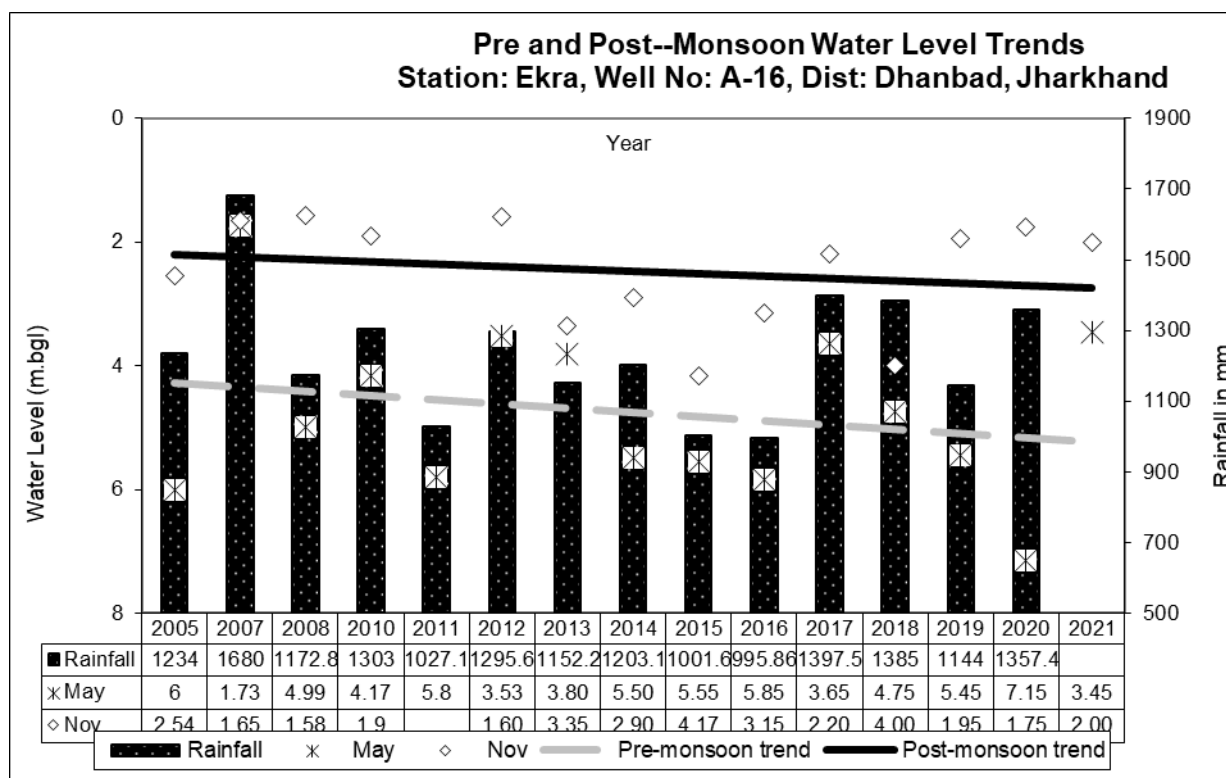




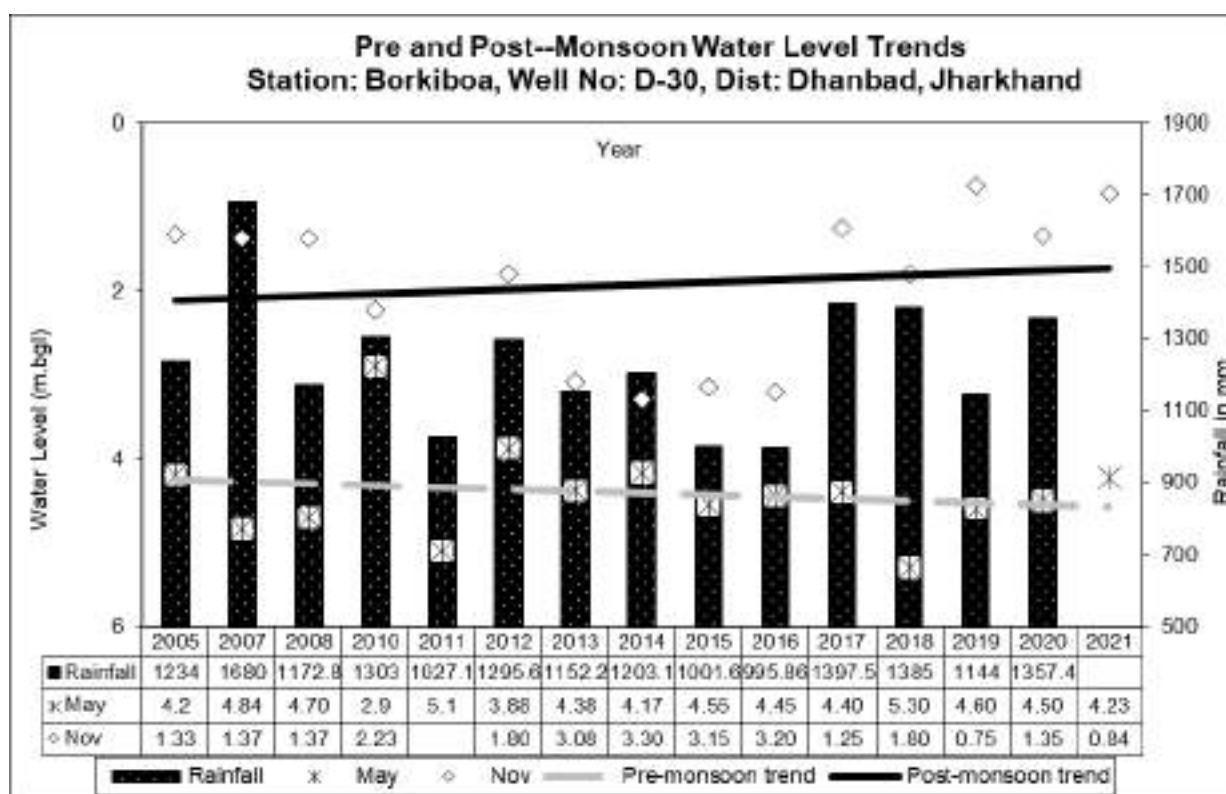
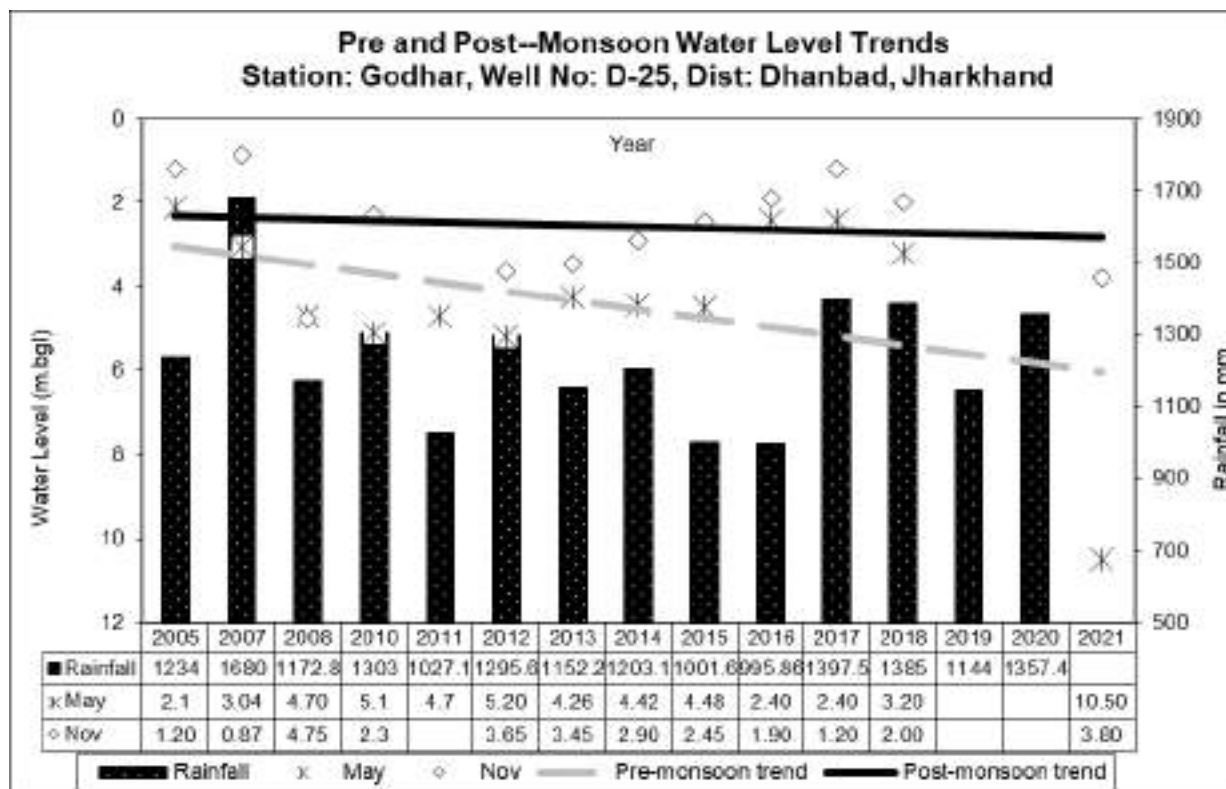
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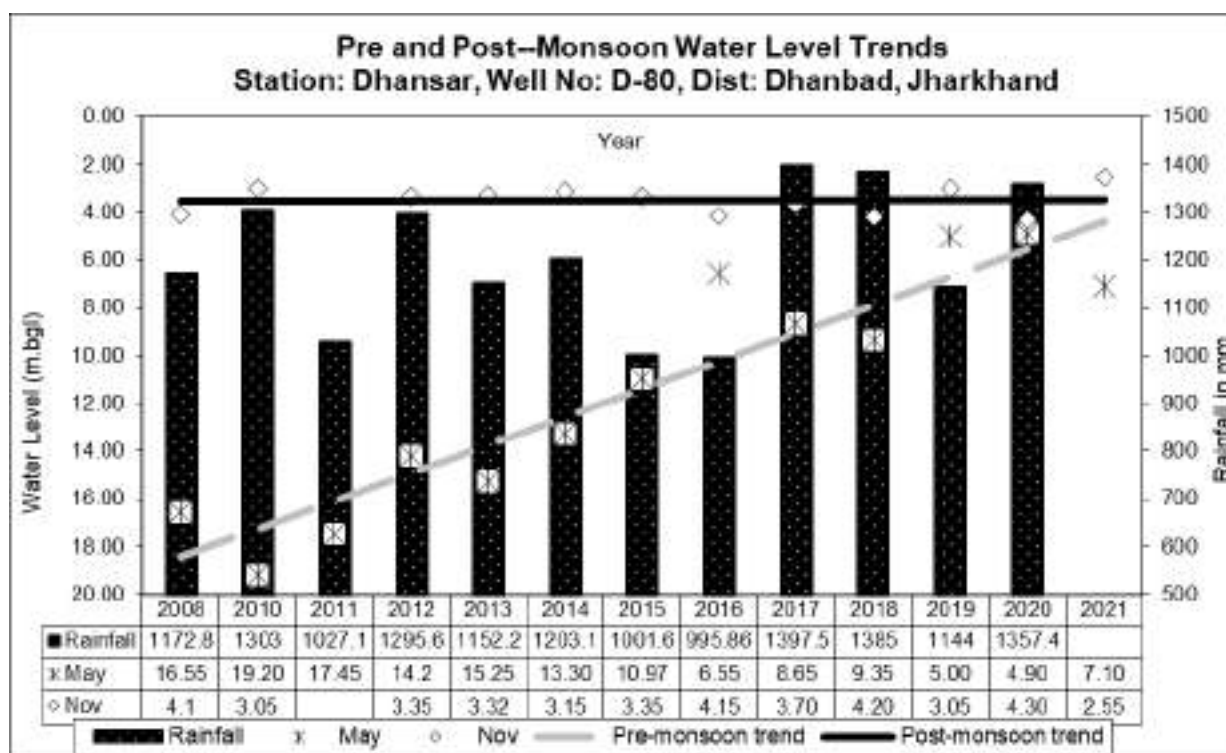
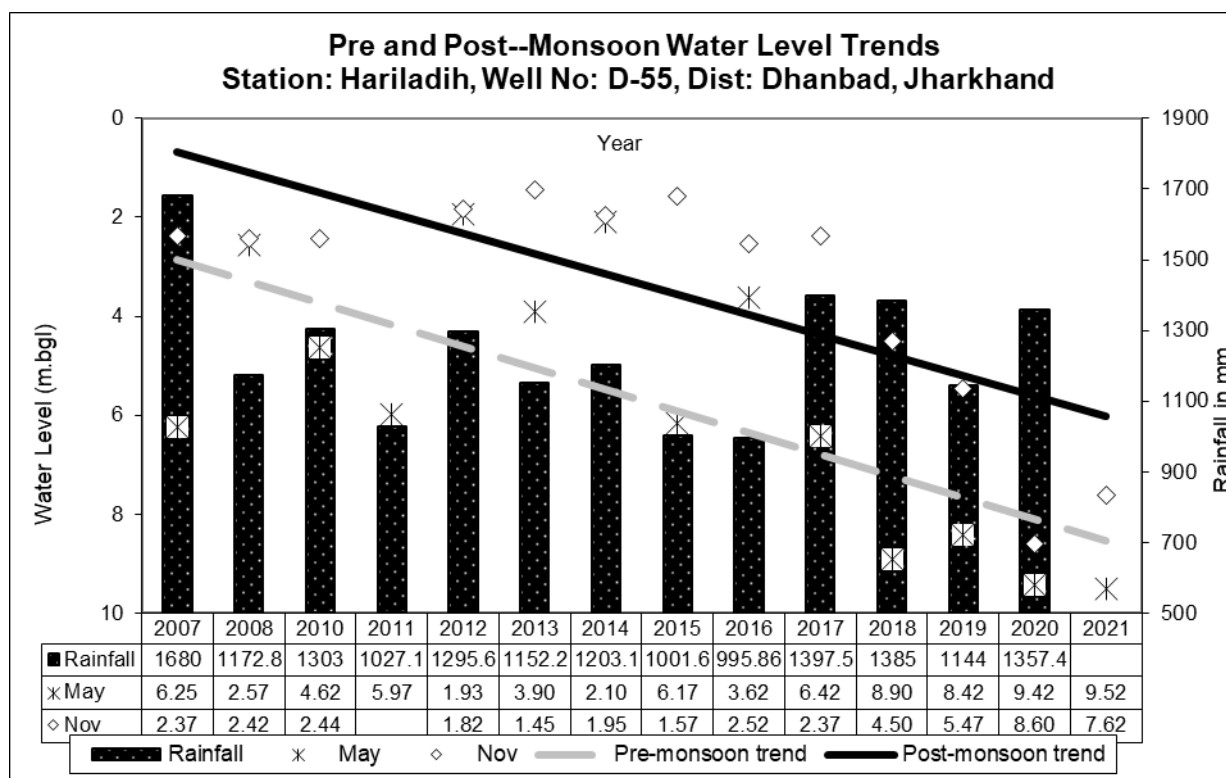
## HYDROGRAPHS OF CLUSTER-V



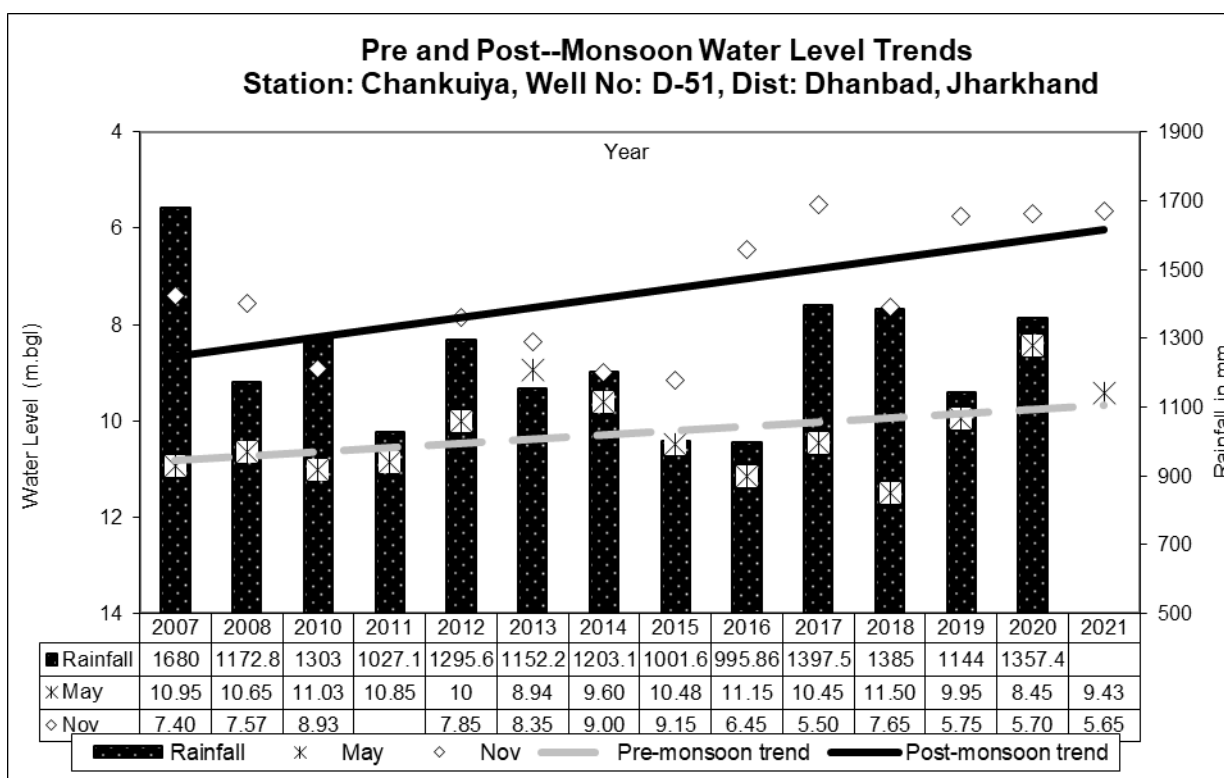
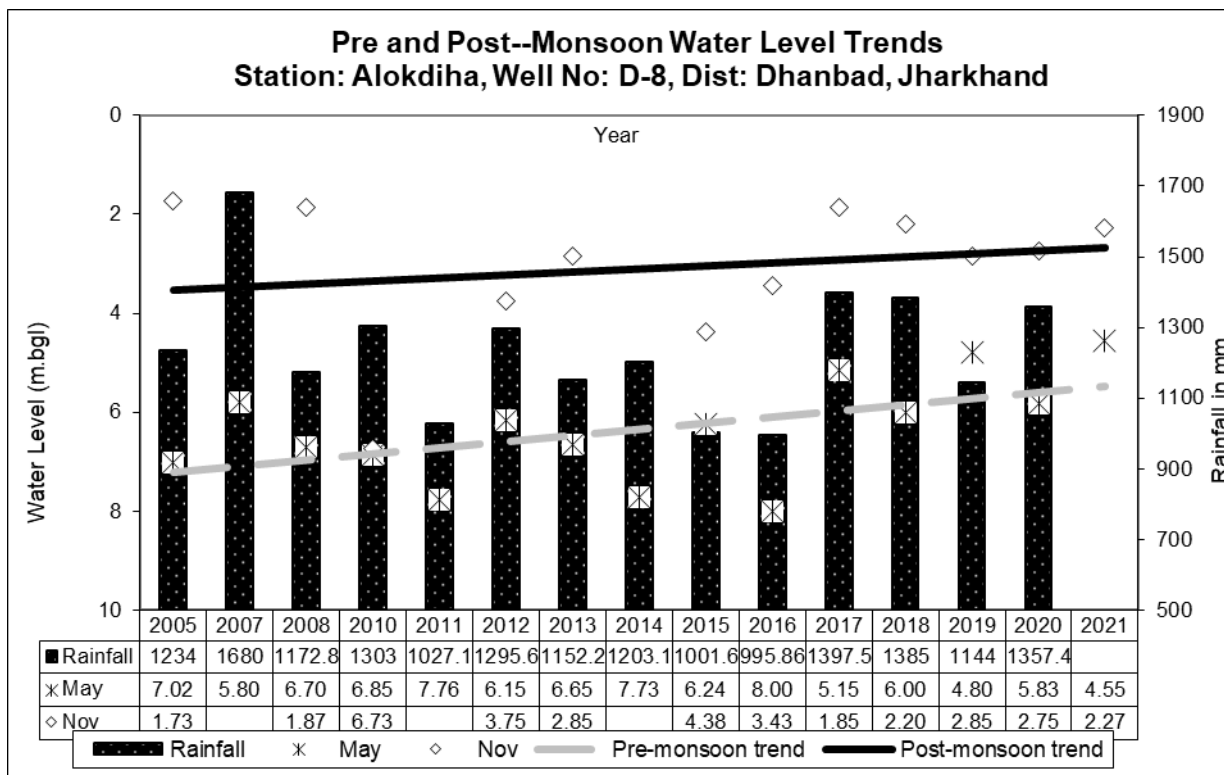
## HYDROGRAPHS OF CLUSTER-VI



## HYDROGRAPHS OF CLUSTER-VII

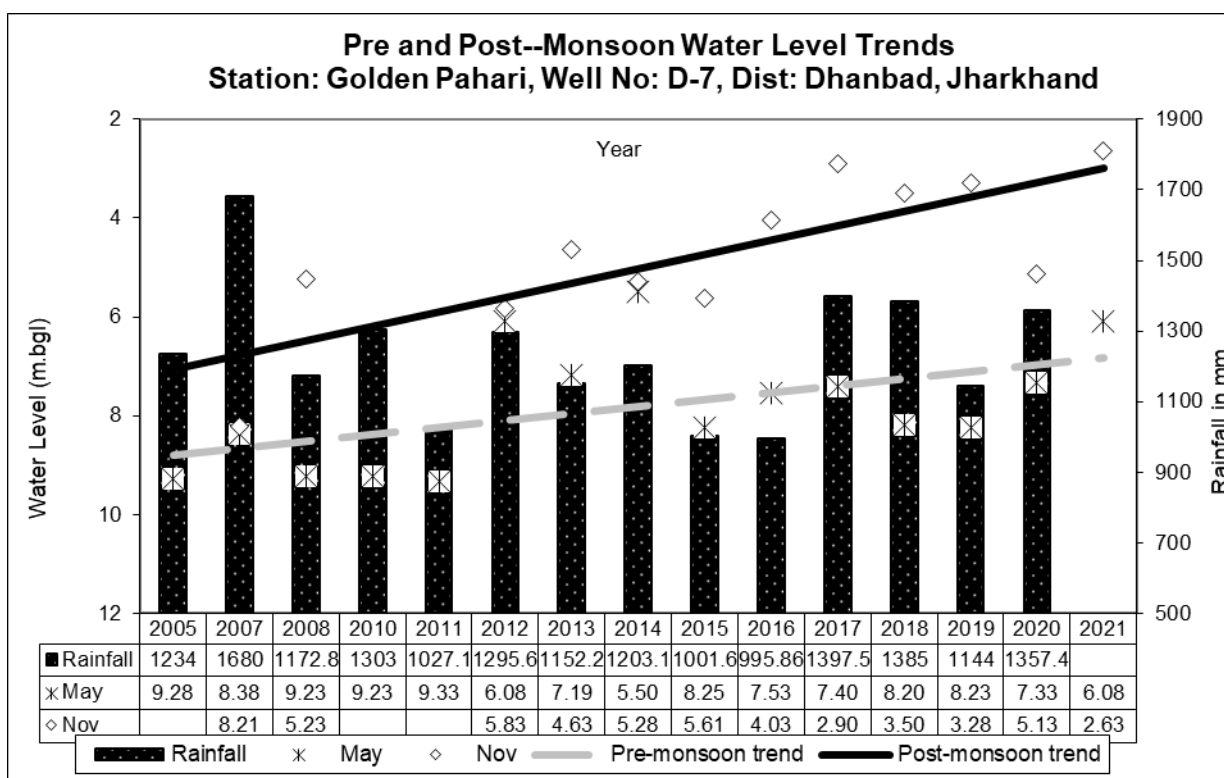
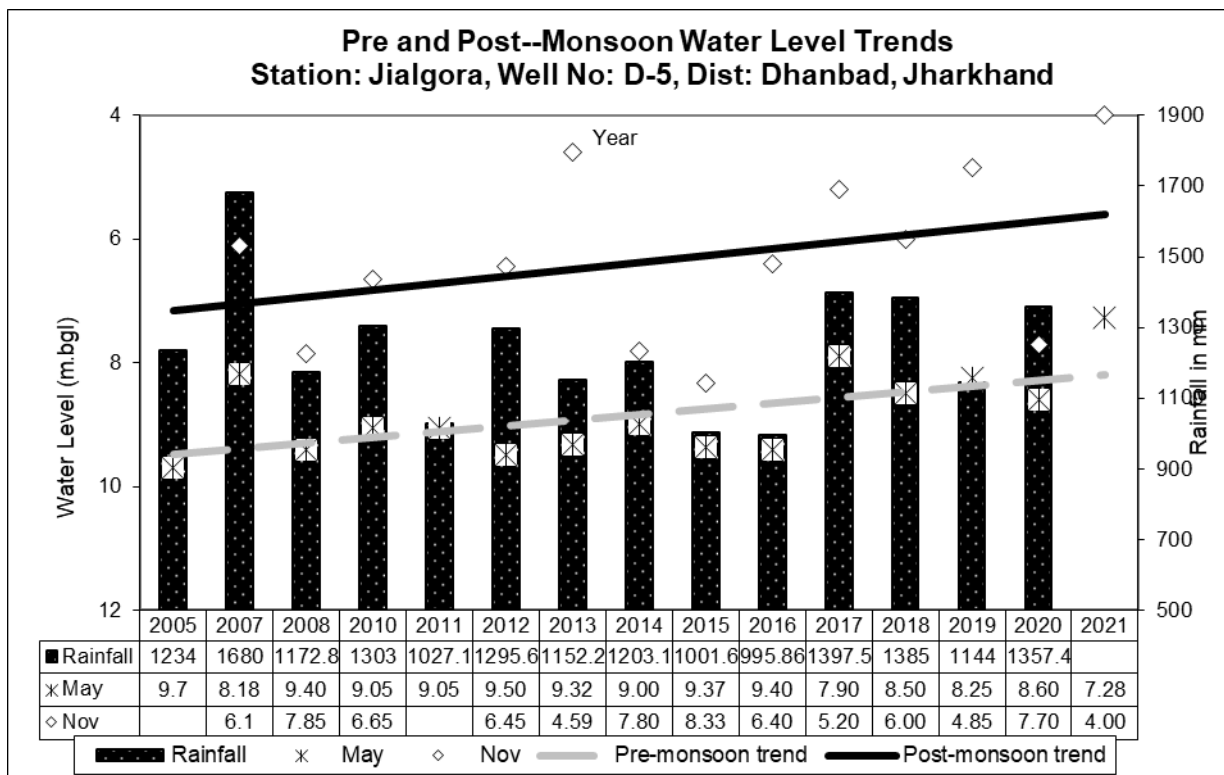


## HYDROGRAPHS OF CLUSTER-VIII

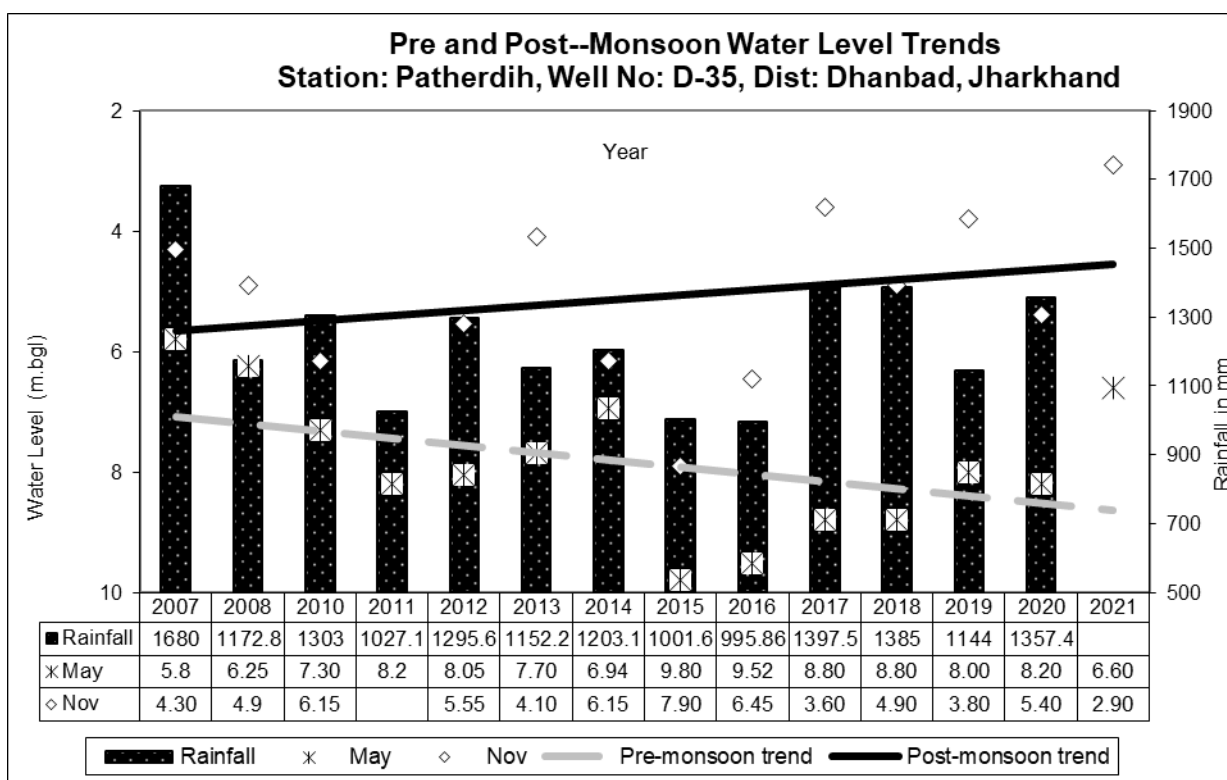
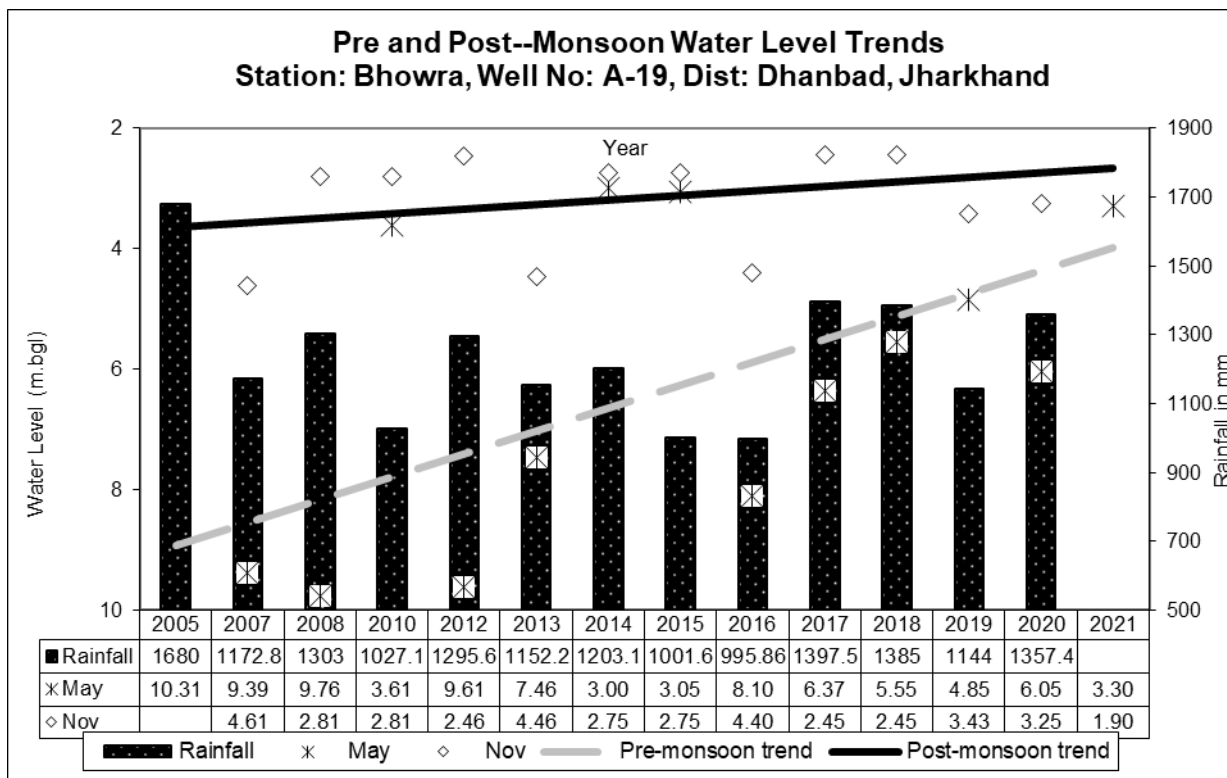




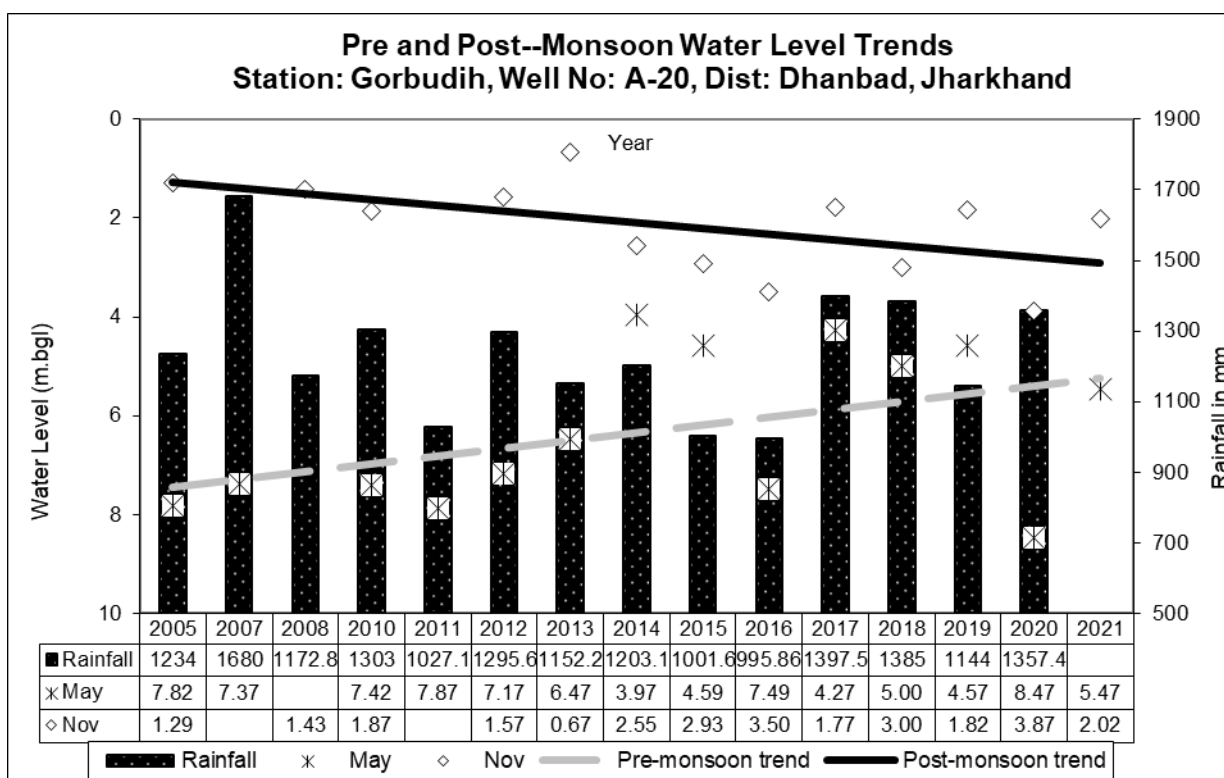
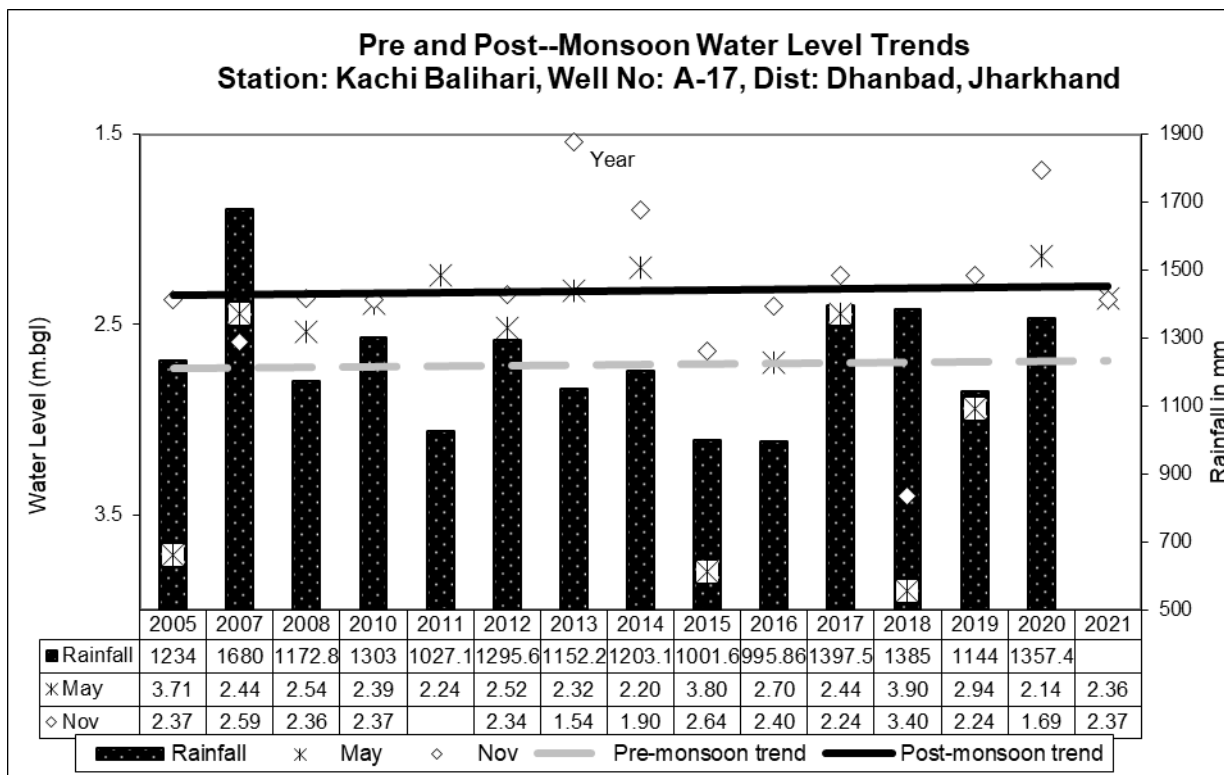
## HYDROGRAPHS OF CLUSTER-IX



## HYDROGRAPHS OF CLUSTER-X

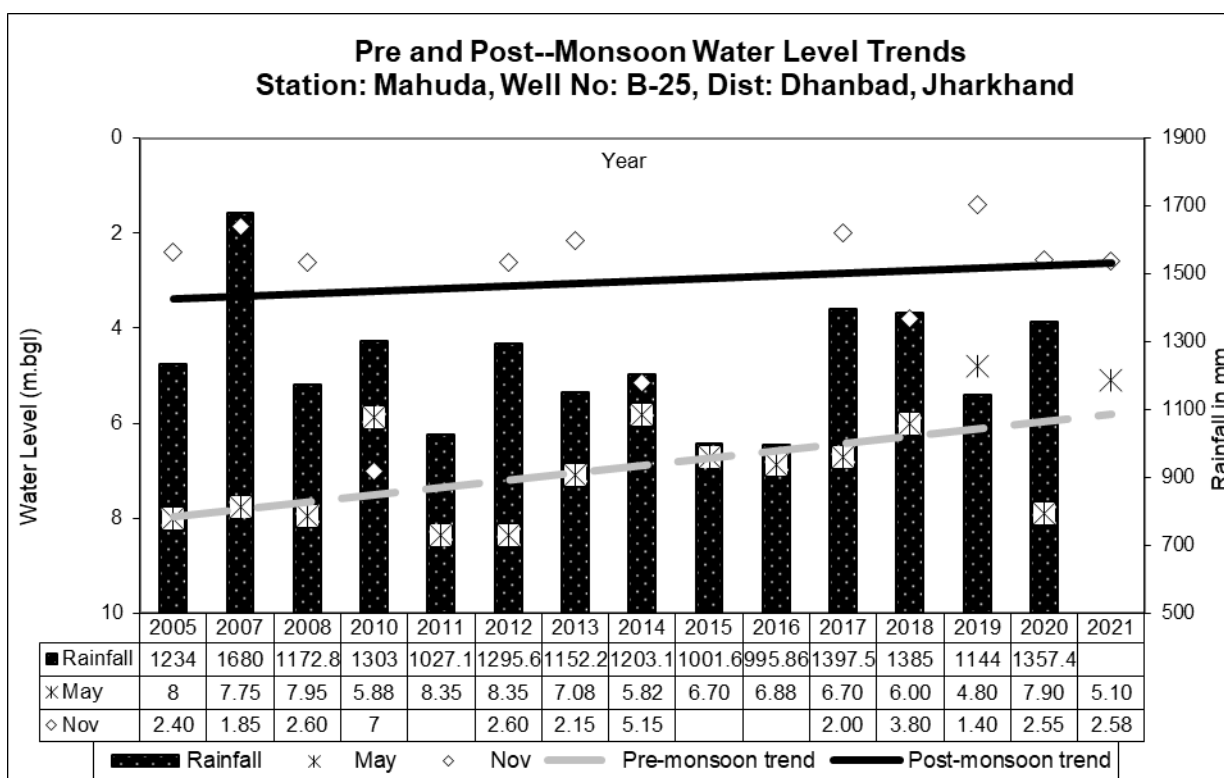
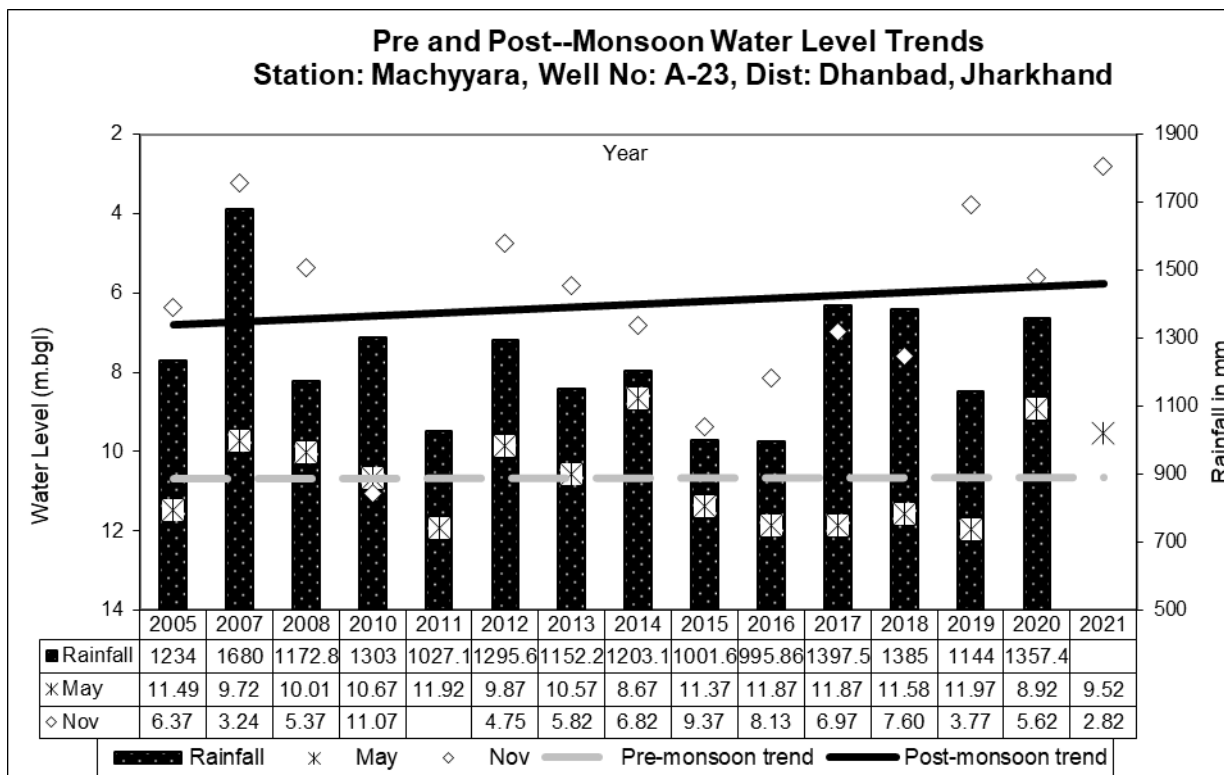


## HYDROGRAPHS OF CLUSTER-XI

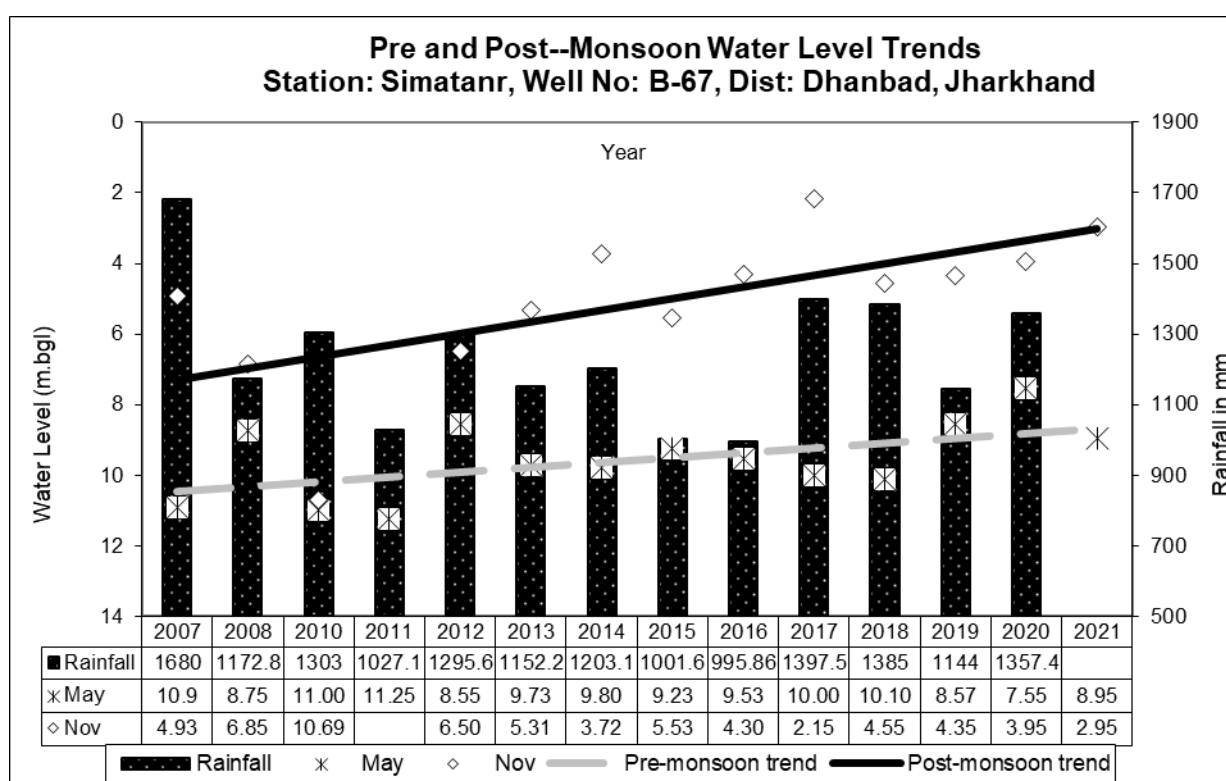
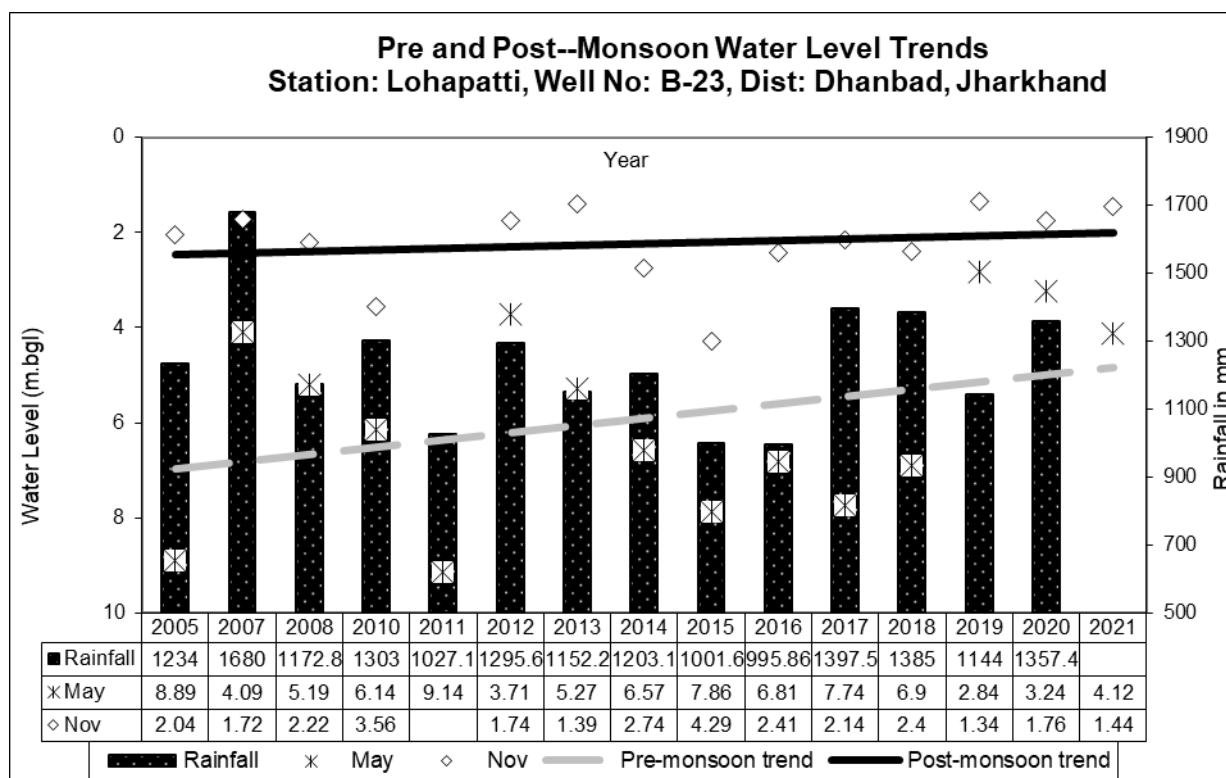




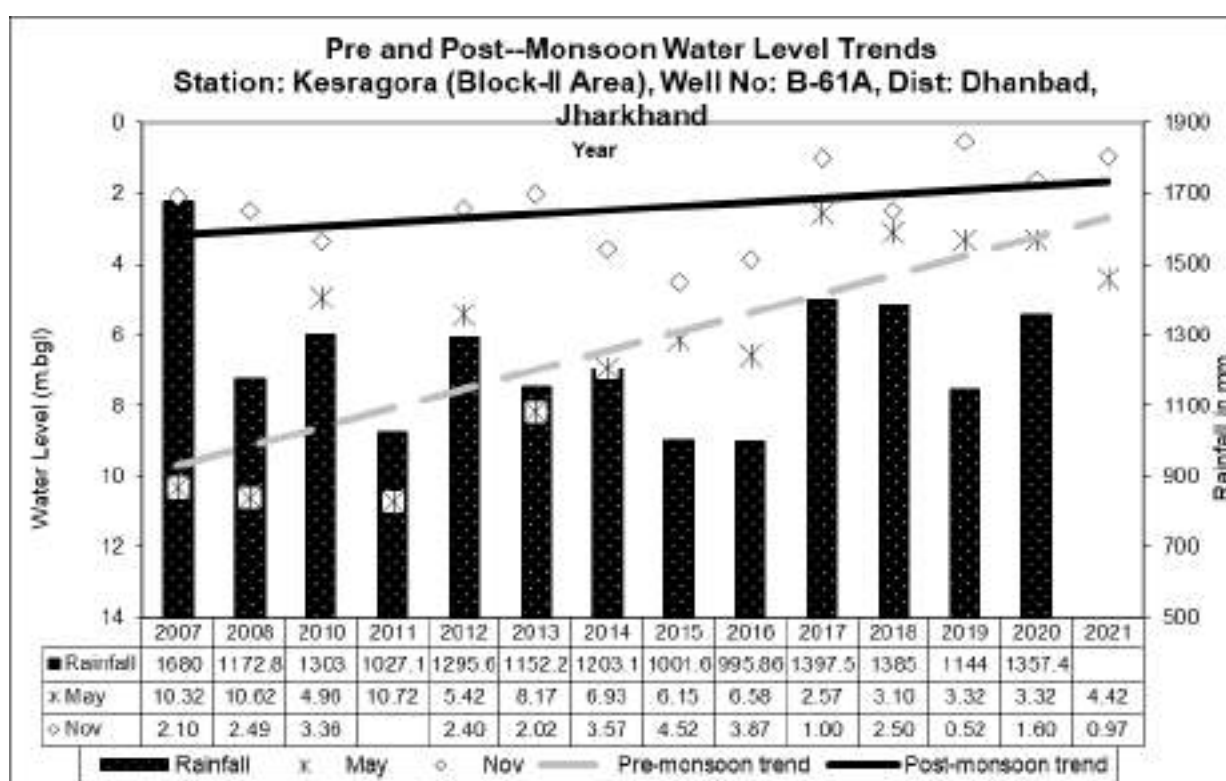
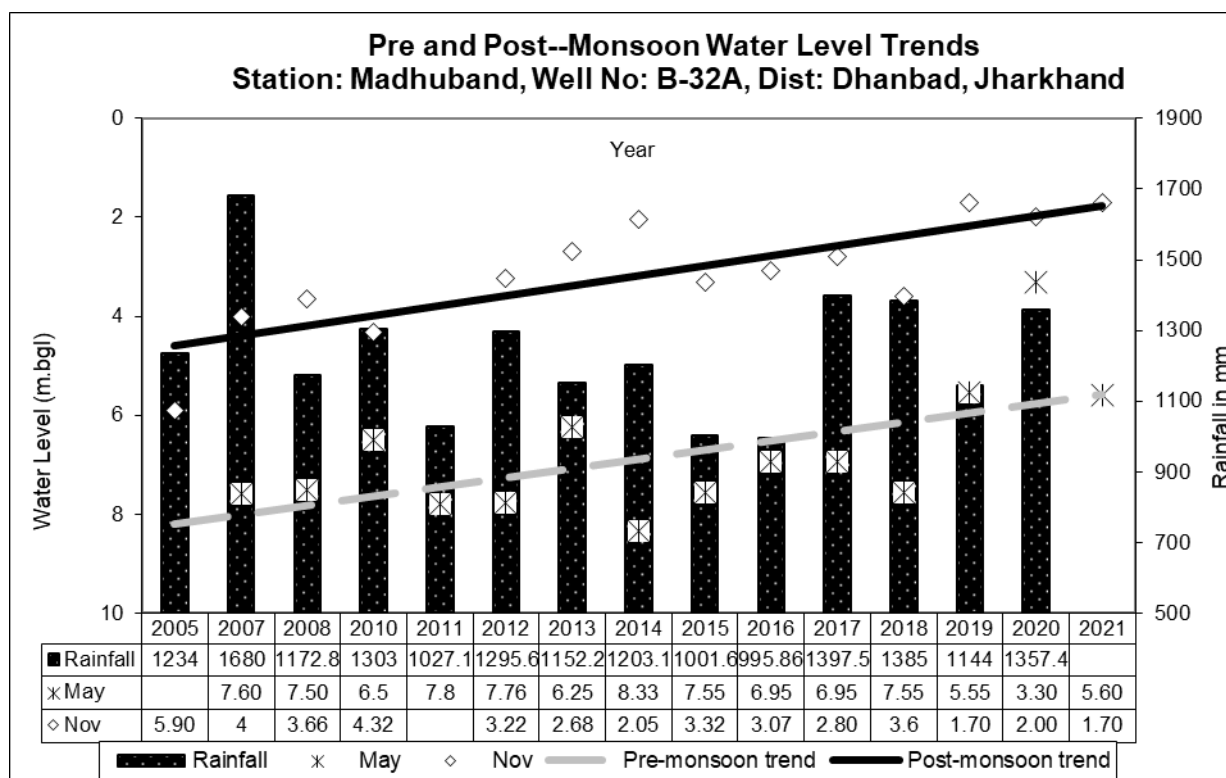
## HYDROGRAPHS OF CLUSTER-XIII



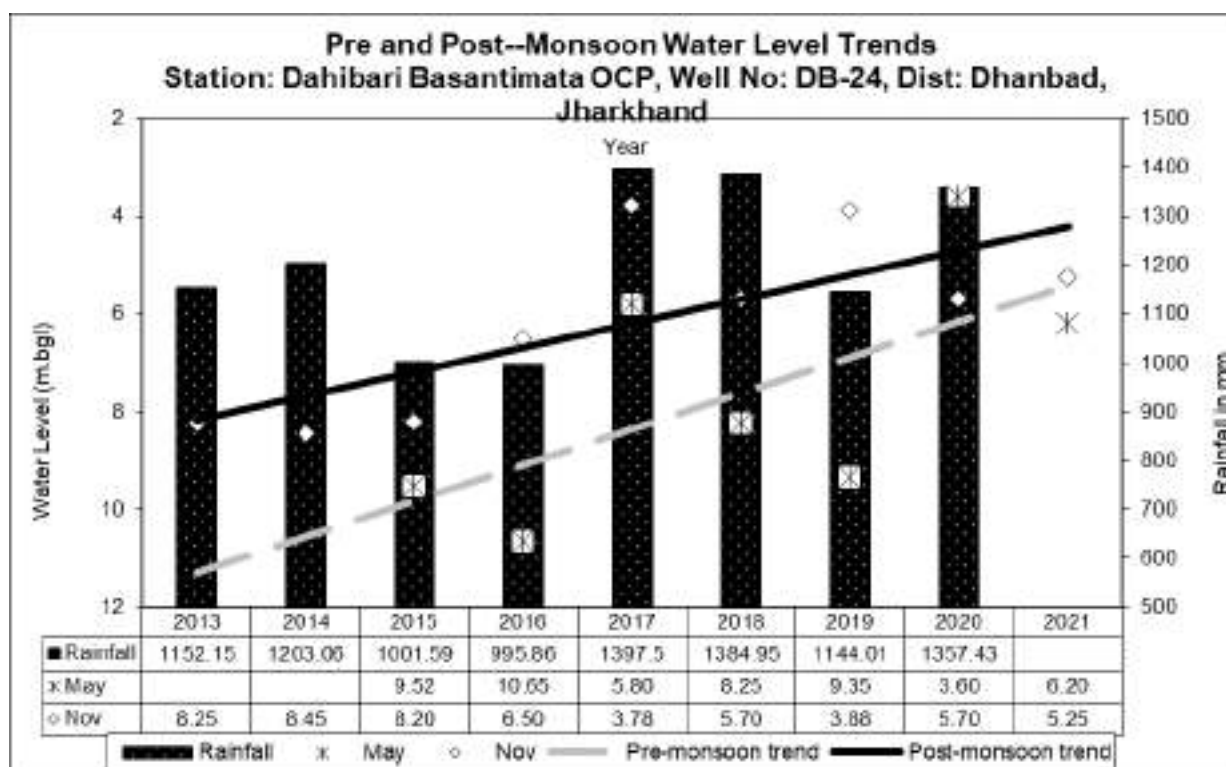
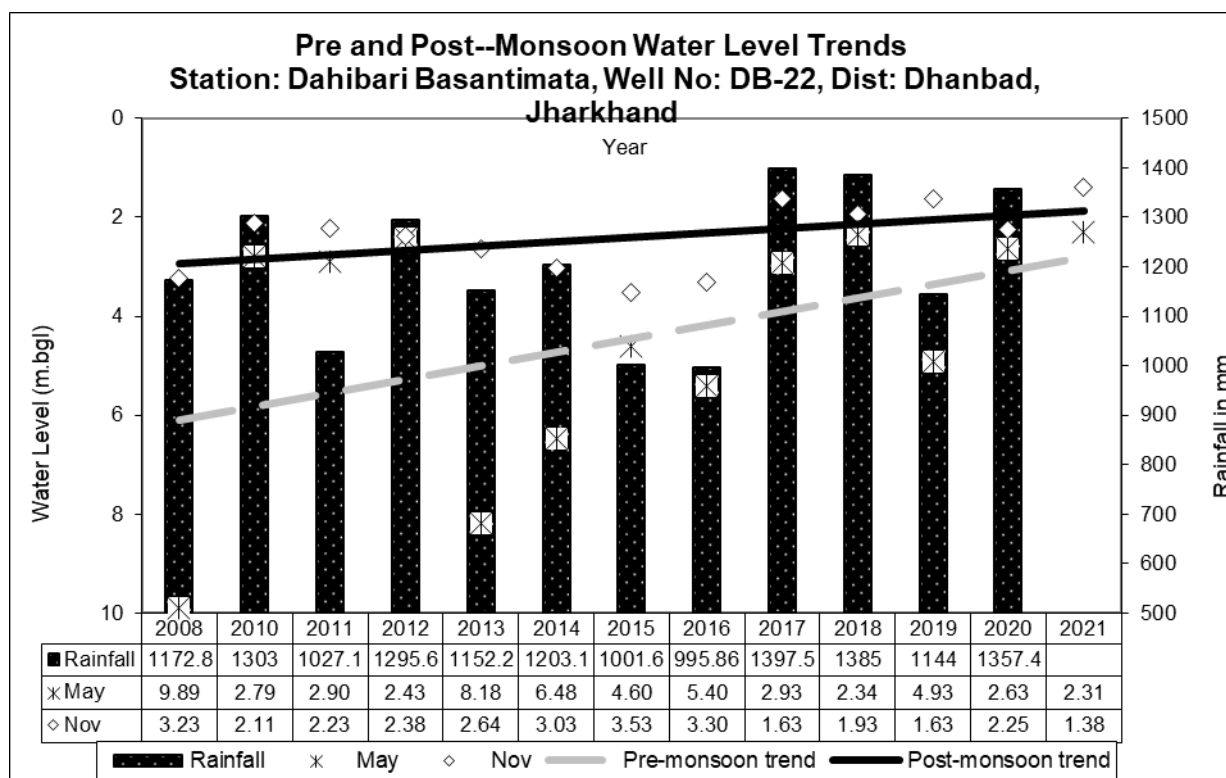
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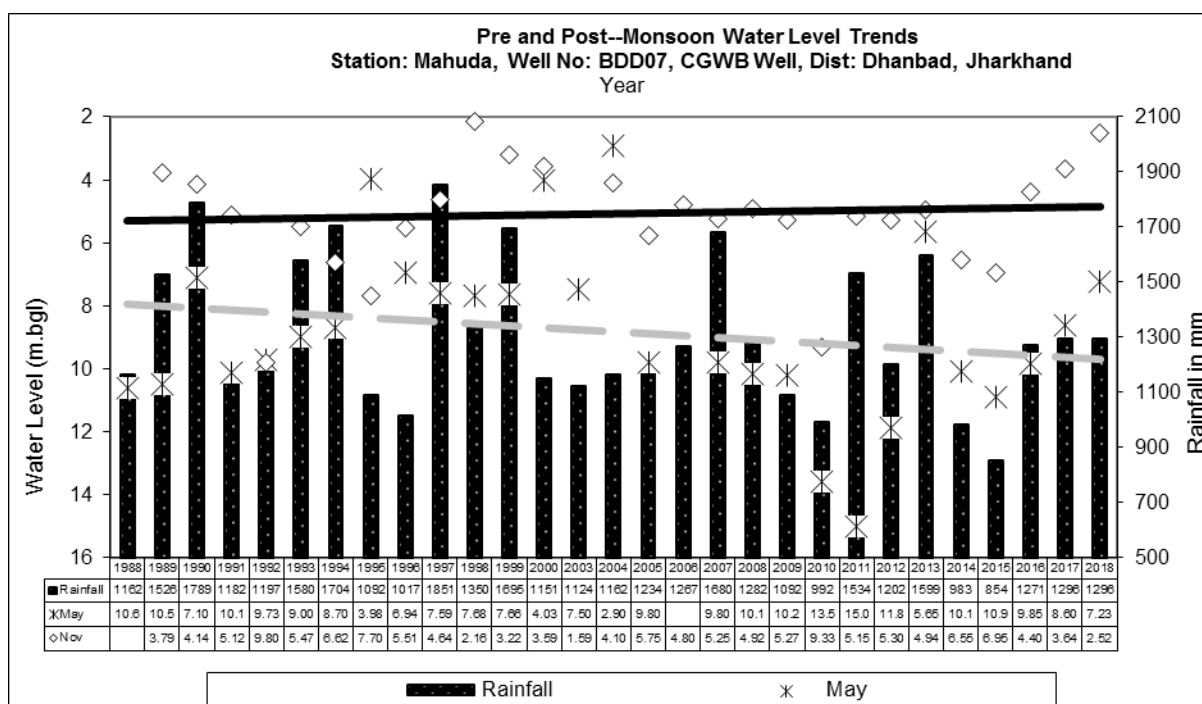
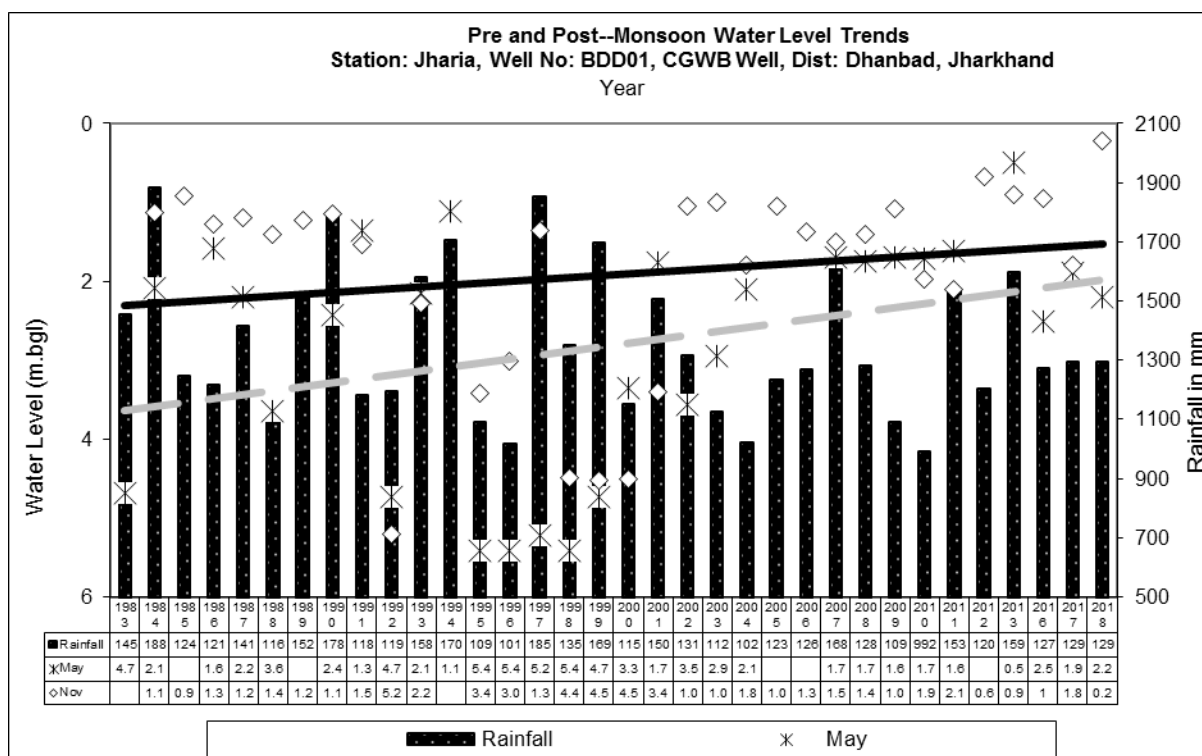
## HYDROGRAPHS OF CLUSTER-XV



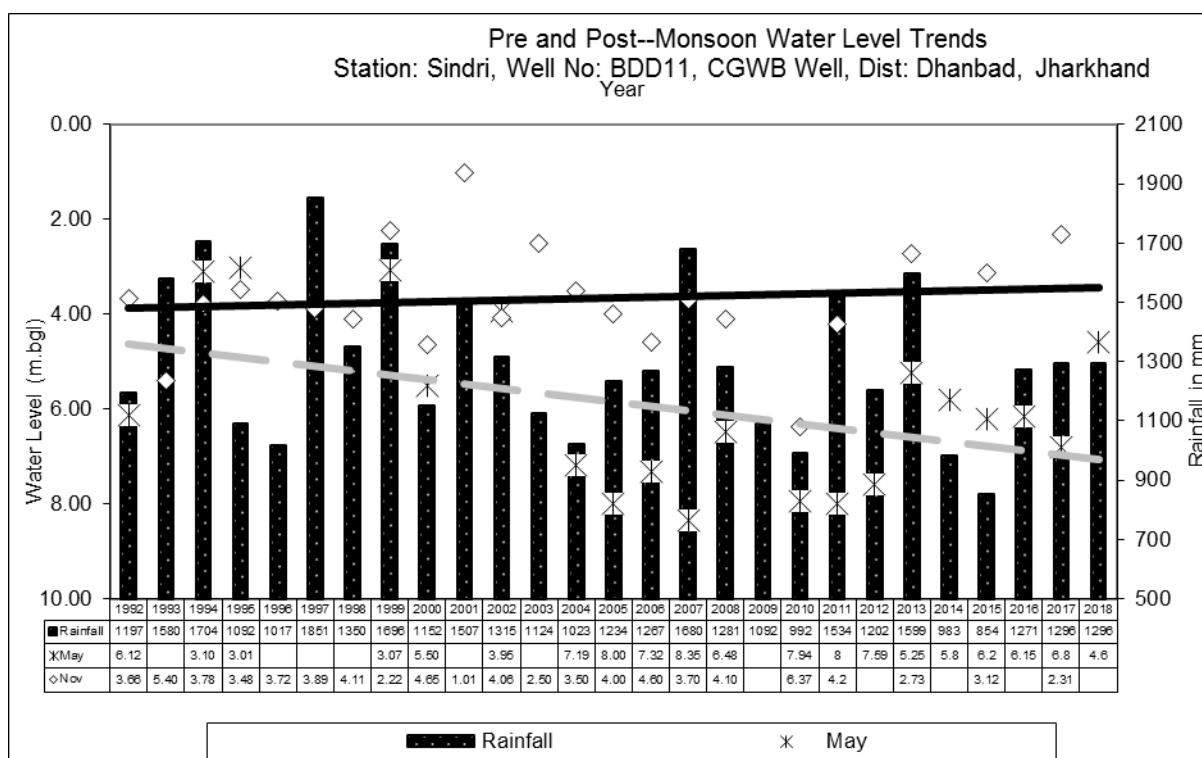
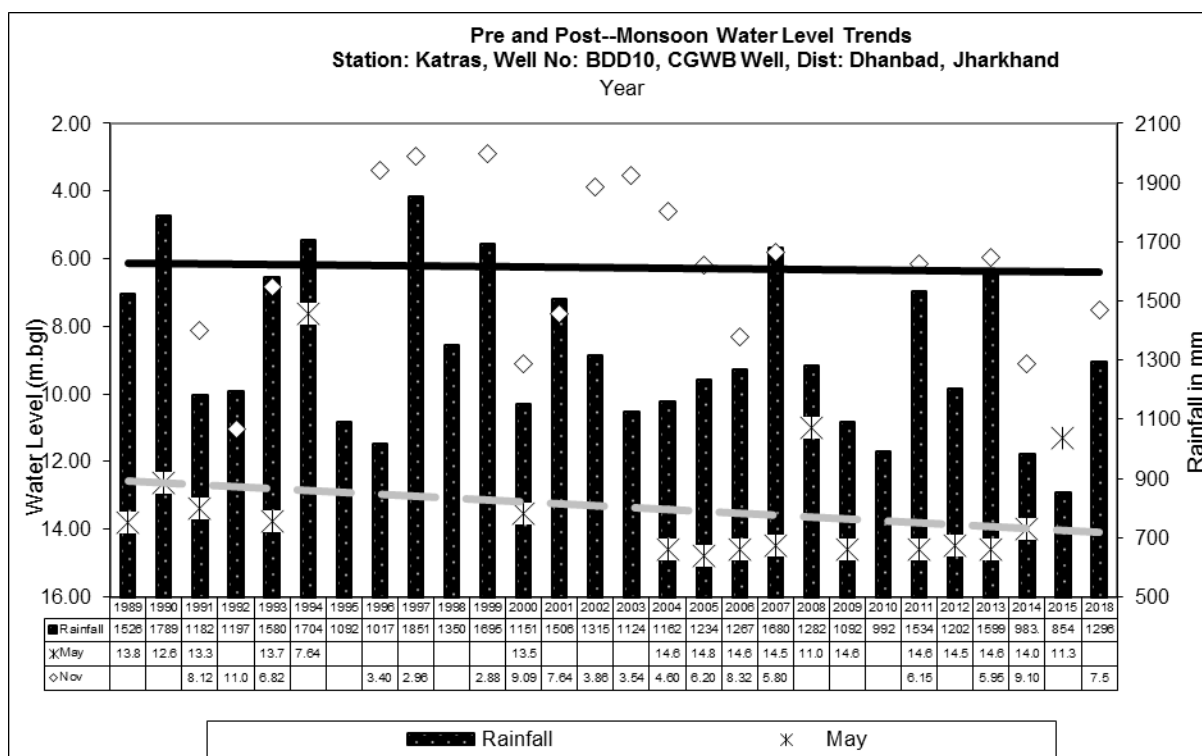
## HYDROGRAPHS OF CLUSTER-XVI



## HYDROGRAPHS OF CGWB PERMANENT OBSERVATION STATIONS



## HYDROGRAPHS OF CGWB PERMANENT OBSERVATION STATIONS





## GROUNDWATER SAMPLE LOCATION DETAILS

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

| SI No | Name of Cluster | Ground Water Sample | Dug well (CMPDI) | Location                  | Sampling Date |
|-------|-----------------|---------------------|------------------|---------------------------|---------------|
|       |                 |                     |                  |                           | June'2021     |
| 1     | CLUSTER-I       | GW-1                | B-15             | BERA VILLAGE              | 16.06.2021    |
| 2     | CLUSTER-II      | GW-2                | B-59             | KHODOVALY VILLAGE         | 16.06.2021    |
| 3     | CLUSTER-III     | GW-3                | A-29             | GOVINDPUR,AMBAGAN VILLAGE | 16.06.2021    |
| 4     | CLUSTER-IV      | GW-4                | B-64             | KESHALPUR, BATIGHAR       | 16.06.2021    |
| 5     | CLUSTER-V       | GW-5                | D-30             | BORKIBOA VILLAGE          | 16.06.2021    |
| 6     | CLUSTER-VI      | GW-6                | D-25             | GODHUR MORE               | 16.06.2021    |
| 7     | CLUSTER-VII     | GW-7                | D-80             | DHANSAR MINE RESCUE STN.  | 16.06.2021    |
| 8     | CLUSTER-VIII    | GW-8                | D-49             | NEAR GHANOODIH OC         | 15.06.2021    |
| 9     | CLUSTER-IX      | GW-9                | D-5              | JEALGORA, NEAR P.O.       | 15.06.2021    |
| 10    | CLUSTER-X       | GW-10               | D-35             | PATHERDIH RLY. COLONY     | 15.06.2021    |
| 11    | CLUSTER-XI      | GW-11               | A-32             | MONNIDIH BAZAR            | 16.06.2021    |
| 12    | CLUSTER-XIII    | GW-13               | A-23             | MACHHAYARA                | 16.06.2021    |
| 13    | CLUSTER-XIV     | GW-14               | B-23             | LOHAPATTI VILLAGE         | 16.06.2021    |
| 14    | CLUSTER-XV      | GW-15               | B-32A            | MADHUBAND VILLAGE         | 16.06.2021    |
| 15    | CLUSTER-XVI     | GW-16               | DB-22            | DAHIBARI,NICHE BASTI      | 15.06.2021    |

# WATER QUALITY

## (GROUND WATER- ALL PARAMETERS)

Year: 2020-21

| Sl. No | Parameter                                                           | Sampling Stations |                   |                   | Detection Limit | IS:10500 Drinking Water Standards | Standard / Test Method                                                                                                  |
|--------|---------------------------------------------------------------------|-------------------|-------------------|-------------------|-----------------|-----------------------------------|-------------------------------------------------------------------------------------------------------------------------|
|        |                                                                     | GW1<br>16.06.2021 | GW2<br>16.06.2021 | GW3<br>16.06.2021 |                 |                                   |                                                                                                                         |
| 1      | Boron (as B), mg/l, Max                                             | <0.2              | <0.2              | <0.2              | 0.2             | 0.5                               | APHA, 23 <sup>rd</sup> Edition ,Carmin                                                                                  |
| 2      | Colour,in Hazen Units                                               | 1                 | 2                 | 2                 | 1               | 5                                 | APHA, 23 <sup>rd</sup> Edition ,Pt.-Co. Method                                                                          |
| 3      | Calcium (as Ca), mg/l, Max                                          | 41                | 84                | 127               | 1.6             | 75                                | IS 3025, Part 40: 1991 R 2019 EDTA Method                                                                               |
| 4      | Chloride (as Cl), mg/l, Max                                         | 47                | 78                | 124               | 2               | 250                               | IS-3025/32:1988, R-2019 Argentometric                                                                                   |
| 5      | Copper (as Cu), mg/l, Max                                           | <0.03             | <0.03             | <0.03             | 0.03            | 0.05                              | IS 3025 Part 42 : 1992 R : 2019, AAS-Flame APHA, 23 <sup>rd</sup> Edition, AAS-GTA                                      |
| 6      | Fluoride (as F) mg/l, Max                                           | 0.77              | 0.71              | 0.59              | 0.2             | 1.0                               | APHA, 23 <sup>rd</sup> Edition, Page 4-90 to , 4500 -F- D (SPADNS Method)                                               |
| 7      | Free Residual Chlorine, mg/l, Min                                   | <0.004            | <0.004            | <0.004            | 0.04            | 0.2                               | APHA, 23 <sup>rd</sup> Edition , 4500-Cl <sup>-</sup> B. (Iodometric Method-I)                                          |
| 8      | Iron (as Fe), mg/l, Max                                             | 0.28              | 0.2               | 0.2               | 0.2             | 1.0                               | IS 3025 Part 53 : 2003, R : 2019 , AAS-Flame Method                                                                     |
| 9      | Lead (as Pb), mg/l, Max                                             | <0.005            | <0.005            | <0.005            | 0.005           | 0.01                              | IS:3025(Part 47):1994 (Reaffirmed 2019) APHA, 23 <sup>rd</sup> Edition, AAS-GTA                                         |
| 10     | Manganese (as Mn), mg/l, Max                                        | 0.24              | <0.02             | <0.02             | 0.02            | 0.1                               | APHA, 23 <sup>rd</sup> Edition, 3111B, Direct Air Acetylene Flame AAS-Flame                                             |
| 11     | Nitrate (as NO <sub>3</sub> ), mg/l, Max                            | 9.62              | 7.03              | 14.76             | 0.5             | 45                                | APHA, 23 <sup>rd</sup> Edition, P-4-127, 4500 - NO <sub>3</sub> <sup>-</sup> B , UV-Spectrophotometric Screening Method |
| 12     | Odour                                                               | Aggreable         | Aggreable         | Aggreable         | Qualitative     | Agreeable                         | APHA, 23 <sup>rd</sup> Edition , 2150-C                                                                                 |
| 13     | pH value                                                            | 7.72              | 7.85              | 7.91              | 0.2             | 6.5-8.5                           | IS 3025, Part 11 : 1983 R 2017 Electrometric method                                                                     |
| 14     | Phenolic compounds (as C <sub>6</sub> H <sub>5</sub> OH), mg/l, Max | <0.001            | <0.001            | <0.001            | 0.001           | 0.002                             | APHA, 22 <sup>nd</sup> Edition, 4-Amino Autipyrine                                                                      |
| 15     | Selenium, mg/l, Max                                                 | <0.007            | <0.007            | <0.007            | 0.007           | 0.01                              | IS -3025,part 56:2003,R-2019/APHA 23 <sup>rd</sup> Edition, AAS-VGA                                                     |
| 16     | Sulphate (as SO <sub>4</sub> ) mg/l, Max                            | 31                | 64                | 42                | 10              | 200                               | APHA -23 <sup>rd</sup> Edition. P-4-199, 4500 SO <sub>4</sub> <sup>2-</sup> E                                           |
| 17     | Taste                                                               | Acceptable        | Acceptable        | Acceptable        | Qualitative     | Acceptable                        | APHA, 23 <sup>rd</sup> Edition, 2160-C Flavour Rating Assesment                                                         |
| 18     | Total Alkalinity (CaCO <sub>3</sub> ), mg/l, Max                    | 105               | 121               | 137               | 4               | 200                               | IS 3025, Part 23: 1986 R 2019 Titration Method                                                                          |
| 19     | Total Arsenic (as As), mg/l,Max                                     | <0.006            | <0.006            | <0.006            | 0.006           | 0.01                              | IS-3025, part 37:1988,R-2019/APHA23 <sup>rd</sup> Edition AAS-VGA                                                       |
| 20     | Total Chromium (as Cr), mg/l, Max                                   | <0.004            | <0.004            | <0.004            | 0.04            | 0.05                              | IS-3025 Part 52:2003, R:2019,AAS-Flame APHA, 23 <sup>rd</sup> Edition, AAS-GTA                                          |
| 21     | Total Dissolved Solids, mg/l, Max                                   | 425               | 510               | 622               | 25              | 500                               | IS 3025, Part 16: 1984 R 2017 Gravimetric method                                                                        |
| 22     | Total Hardness (CaCO <sub>3</sub> ), mg/l, Max                      | 226               | 384               | 487               | 4               | 200                               | IS 3025, Part 21, 2009 R 2019 EDTA Method                                                                               |
| 23     | Turbidity, NTU, Max                                                 | 2                 | 2                 | 3                 | 1               | 5                                 | IS 3025, Part 10 : 1984 R 2017 Nephelometric Method                                                                     |
| 24     | Zinc (as Zn), mg/l, Max                                             | <0.1              | <0.1              | <0.1              | 0.1             | 5                                 | IS 3025 Part 49 : 1994,R : 2019, AAS-Flame                                                                              |
| 25     | Nickel as Ni, mg/l Max                                              | <0.01             | <0.01             | <0.01             | 0.01            | 0.02                              | IS 3025 Pat 54 : 2003,R : 2019, AAS-Flame APHA 23 <sup>rd</sup> Edition, AAS-GTA                                        |



# WATER QUALITY

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

Year: 2021-22

| Sl. No | Parameter                                                           | Sampling Stations |                   |                   | Detection Limit | IS:10500 Drinking Water Standards | Standard / Test Method                                                                                       |
|--------|---------------------------------------------------------------------|-------------------|-------------------|-------------------|-----------------|-----------------------------------|--------------------------------------------------------------------------------------------------------------|
|        |                                                                     | GW4<br>16.06.2021 | GW5<br>16.06.2021 | GW6<br>16.06.2021 |                 |                                   |                                                                                                              |
| 1      | Boron (as B), mg/l, Max                                             | <0.2              | <0.2              | <0.2              | 0.2             | 0.5                               | APHA, 23 <sup>rd</sup> Edition ,Carmine                                                                      |
| 2      | Colour,in Hazen Units                                               | 1                 | 3                 | 3                 | 1               | 5                                 | APHA, 23 <sup>rd</sup> Edition ,Pt.-Co. Method                                                               |
| 3      | Calcium (as Ca), mg/l, Max                                          | 49                | 122               | 78                | 1.6             | 75                                | IS 3025, Part 40: 1991 R 2019 EDTA Method                                                                    |
| 4      | Chloride (as Cl), mg/l, Max                                         | 74                | 132               | 60                | 2               | 250                               | IS-3025/32:1988, R-2019 Argentometric                                                                        |
| 5      | Copper (as Cu), mg/l, Max                                           | <0.03             | <0.03             | <0.03             | 0.03            | 0.05                              | IS 3025 Part 42 : 1992 R : 2019, AAS-Flame APHA, 23 <sup>rd</sup> Edition, AAS-GTA                           |
| 6      | Fluoride (as F) mg/l, Max                                           | 0.50              | 0.83              | 0.80              | 0.2             | 1.0                               | APHA, 23 <sup>rd</sup> Edition, Page 4-90 to , 4500 -F- D (SPADNS Method)                                    |
| 7      | Free Residual Chlorine, mg/l, Min                                   | <0.04             | <0.04             | <0.04             | 0.04            | 0.2                               | APHA, 23 <sup>rd</sup> Edition, , 4500-Cl <sup>-</sup> B. (Iodometric Method-I)                              |
| 8      | Iron (as Fe), mg/l, Max                                             | 0.41              | <0.2              | 0.32              | 0.2             | 1.0                               | IS 3025 Part 53 : 2003, R : 2019 , AAS-Flame Method                                                          |
| 9      | Lead (as Pb), mg/l, Max                                             | <0.005            | <0.005            | <0.005            | 0.005           | 0.01                              | IS:3025(Part 47):1994 (Reaffirmed 2019) APHA, 23 <sup>rd</sup> Edition, AAS-GTA                              |
| 10     | Manganese (as Mn), mg/l, Max                                        | <0.02             | <0.02             | 0.16              | 0.02            | 0.1                               | APHA, 23 <sup>rd</sup> Edition, 3111B, Direct Air Acetylene Flame AAS-GTA                                    |
| 11     | Nitrate (as NO <sub>3</sub> ), mg/l, Max                            | 11.32             | 29.01             | 14.21             | 0.5             | 45                                | APHA, 23 <sup>rd</sup> Edition, P-4-127, 4500 - NO <sub>3</sub> - B , UV-Spectrophotometric Screening Method |
| 12     | Odour                                                               | Agreeable         | Agreeable         | Agreeable         | Qualitative     | Agreeable                         | APHA, 23 <sup>rd</sup> Edition, , 2150-C                                                                     |
| 13     | pH value                                                            | 8.03              | 7.65              | 7.77              | 0.2             | 6.5-8.5                           | IS 3025, Part 11 : 1983 R 2017 Electrometric method                                                          |
| 14     | Phenolic compounds (as C <sub>6</sub> H <sub>5</sub> OH), mg/l, Max | <0.001            | <0.001            | <0.001            | 0.001           | 0.002                             | APHA, 22 <sup>nd</sup> Edition, 4-Amino Autipyrine                                                           |
| 15     | Selenium, mg/l, Max                                                 | <0.007            | <0.007            | <0.007            | 0.007           | 0.01                              | IS -3025,part 56:2003,R-2019/APHA 23 <sup>rd</sup> Edition, AAS-VGA                                          |
| 16     | Sulphate (as SO <sub>4</sub> ) mg/l, Max                            | 54                | 148               | 58                | 2               | 200                               | APHA –23 <sup>rd</sup> Edition. P-4-199, 4500 SO <sub>4</sub> <sup>2-</sup> E                                |
| 17     | Taste                                                               | Acceptable        | Acceptable        | Acceptable        | Qualitative     | Acceptable                        | APHA,23 <sup>rd</sup> Edition, 2160-C Flavour Rating Assesment                                               |
| 18     | Total Alkalinity (CaCO <sub>3</sub> ), mg/l, Max                    | 103               | 119               | 139               | 4               | 200                               | IS 3025, Part 23: 1986 R 2019 Titration Method                                                               |
| 19     | Total Arsenic (as As), mg/l,Max                                     | <0.006            | <0.006            | <0.006            | 0.006           | 0.01                              | IS-3025, part 37:1988,R-2019/APHA23 <sup>rd</sup> Edition AAS-VGA                                            |
| 20     | Total Chromium (as Cr), mg/l, Max                                   | <0.04             | <0.04             | <0.04             | 0.04            | 0.05                              | IS-3025 Part 52:2003, R:2019,AAS-Flame APHA, 23 <sup>rd</sup> Edition, AAS-GTA                               |
| 21     | Total Dissolved Solids, mg/l, Max                                   | 455               | 659               | 522               | 25              | 500                               | IS 3025, Part 16: 1984 R 2017 Gravimetric method                                                             |
| 22     | Total Hardness (CaCO <sub>3</sub> ), mg/l, Max                      | 281               | 531               | 329               | 4               | 200                               | IS 3025, Part 21, 2009 R 2019 EDTA Method                                                                    |
| 23     | Turbidity, NTU, Max                                                 | 4                 | 2                 | 2                 | 1               | 5                                 | IS 3025, Part 10 : 1984 R 2017 Nephelometric Method                                                          |
| 24     | Zinc (as Zn), mg/l, Max                                             | <0.1              | <0.1              | 0.18              | 0.1             | 5                                 | IS 3025 Part 49 : 1994,R : 2019, AAS-Flame                                                                   |
| 25     | Nickel as Ni, mg/l Max                                              | <0.01             | <0.01             | <0.01             | 0.01            | 0.02                              | IS 3025 Pat 54 : 2003,R : 2019, AAS-Flame APHA 23 <sup>rd</sup> Edition, AAS-GTA                             |

# **WATER QUALITY**

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

**Year: 2021-22**

| Sl. No | Parameter                                                           | Sampling Stations |                   |                   | Detection Limit | IS:10500 Drinking Water Standards | Standard / Test Method                                                                                      |
|--------|---------------------------------------------------------------------|-------------------|-------------------|-------------------|-----------------|-----------------------------------|-------------------------------------------------------------------------------------------------------------|
|        |                                                                     | GW7<br>16.06.2021 | GW8<br>15.06.2021 | GW9<br>15.06.2021 |                 |                                   |                                                                                                             |
| 1      | Boron (as B), mg/l, Max                                             | <0.2              | <0.2              | <0.2              | 0.2             | 0.5                               | APHA, 23 <sup>rd</sup> Edition ,Carmine                                                                     |
| 2      | Colour,in Hazen Units                                               | 2                 | 2                 | 3                 | 1               | 5                                 | APHA, 23 <sup>rd</sup> Edition ,Pt.-Co. Method                                                              |
| 3      | Calcium (as Ca), mg/l, Max                                          | 117               | 65                | 139               | 1.6             | 75                                | IS 3025, Part 40: 1991 R 2019 EDTA Method                                                                   |
| 4      | Chloride (as Cl), mg/l, Max                                         | 97                | 85                | 124               | 2               | 250                               | IS-3025/32:1988, R-2019 Argentometric                                                                       |
| 5      | Copper (as Cu), mg/l, Max                                           | <0.03             | <0.03             | <0.03             | 0.03            | 0.05                              | IS 3025 Part 42 : 1992 R : 2019, AAS-Flame APHA,23 <sup>rd</sup> Edition, AAS-GTA                           |
| 6      | Fluoride (as F) mg/l, Max                                           | 0.44              | 0.68              | 0.75              | 0.2             | 1.0                               | APHA, 23RD Edition, Page 4-90 to , 4500 -F- D (SPADNS Method)                                               |
| 7      | Free Residual Chlorine, mg/l, Min                                   | <0.04             | <0.04             | <0.04             | 0.04            | 0.2                               | APHA, 23rd Edition, , 4500-Cl <sup>-</sup> B. (Iodometric Method-I)                                         |
| 8      | Iron (as Fe), mg/l, Max                                             | <0.2              | 0.2               | <0.2              | 0.2             | 1.0                               | IS 3025 Part 53 : 2003, R : 2019 , AAS-Flame Method                                                         |
| 9      | Lead (as Pb), mg/l, Max                                             | <0.005            | <0.005            | <0.005            | 0.005           | 0.01                              | IS:3025(Part 47):1994 (Reaffirmed 2019) APHA, 23 <sup>rd</sup> Edition, AAS-GTA                             |
| 10     | Manganese (as Mn), mg/l, Max                                        | <0.02             | <0.02             | <0.02             | 0.02            | 0.1                               | APHA, 23 <sup>rd</sup> Edition, 3111B, Direct Air Acetylene Flame AAS-GTA                                   |
| 11     | Nitrate (as NO <sub>3</sub> ), mg/l, Max                            | 16.27             | 11.81             | 25.78             | 0.5             | 45                                | APHA, 23rd Edition, P-4-127, 4500 - NO <sub>3</sub> <sup>-</sup> B , UV-Spectrophotometric Screening Method |
| 12     | Odour                                                               | Agreeable         | Agreeable         | Agreeable         | Qualitative     | Agreeable                         | APHA, 23rd Edition, , 2150-C                                                                                |
| 13     | pH value                                                            | 7.71              | 7.35              | 7.86              | 0.2             | 6.5-8.5                           | IS 3025, Part 11 : 1983 R 2017 Electrometric method                                                         |
| 14     | Phenolic compounds (as C <sub>6</sub> H <sub>5</sub> OH), mg/l, Max | <0.001            | <0.001            | <0.001            | 0.001           | 0.002                             | APHA, 22 <sup>nd</sup> Edition,4-Amino Autipyrine                                                           |
| 15     | Selenium, mg/l, Max                                                 | <0.007            | <0.007            | <0.007            | 0.007           | 0.01                              | IS -3025,part 56:2003,R-2019/APHA 23 <sup>rd</sup> Edition, AAS-VGA                                         |
| 16     | Sulphate (as SO <sub>4</sub> ) mg/l, Max                            | 75                | 35                | 159               | 2               | 200                               | APHA –23rd Edition. P-4-199, 4500 SO <sub>4</sub> <sup>2-</sup> E                                           |
| 17     | Taste                                                               | Acceptable        | Acceptable        | Acceptable        | Qualitative     | Acceptable                        | APHA,23rd Edition, 2160-C Flavour Rating Assesment                                                          |
| 18     | Total Alkalinity (CaCO <sub>3</sub> ),, mg/l, Max                   | 182               | 115               | 135               | 4               | 200                               | IS 3025, Part 23: 1986 R 2019 Titration Method                                                              |
| 19     | Total Arsenic (as As), mg/l,Max                                     | <0.006            | <0.006            | <0.006            | 0.006           | 0.01                              | IS-3025, part 37:1988,R-2019/APHA23rd Edition AAS-VGA                                                       |
| 20     | Total Chromium (as Cr), mg/l, Max                                   | <0.04             | <0.04             | <0.04             | 0.04            | 0.05                              | IS-3025 Part 52:2003, R:2019,AAS-Flame APHA, 23 <sup>rd</sup> Edition, AAS-GTA                              |
| 21     | Total Dissolved Solids, mg/l, Max                                   | 783               | 724               | 889               | 25              | 500                               | IS 3025, Part 16: 1984 R 2017 Gravimetric method                                                            |
| 22     | Total Hardness (CaCO <sub>3</sub> ), mg/l, Max                      | 440               | 309               | 554               | 4               | 200                               | IS 3025, Part 21, 2009 R 2019 EDTA Method                                                                   |
| 23     | Turbidity, NTU, Max                                                 | 1                 | 5                 | 2                 | 1               | 5                                 | IS 3025, Part 10 : 1984 R 2017 Nephelometric Method                                                         |
| 24     | Zinc (as Zn), mg/l, Max                                             | <0.1              | <0.1              | 0.1               | 0.1             | 5                                 | IS 3025 Part 49 : 1994,R : 2019, AAS-Flame                                                                  |
| 25     | Nickel as Ni, mg/l Max                                              | <0.01             | <0.01             | <0.01             | 0.01            | 0.02                              | IS 3025 Pat 54 : 2003,R : 2019, AAS-Flame APHA 23 <sup>rd</sup> Edition, AAS-GTA                            |

# **WATER QUALITY**

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

**Year: 2021-22**

| Sl. No | Parameter                                                           | Sampling Stations  |                    |                    | Detection Limit | IS:10500 Drinking Water Standards | Standard / Test Method                                                                                                  |
|--------|---------------------------------------------------------------------|--------------------|--------------------|--------------------|-----------------|-----------------------------------|-------------------------------------------------------------------------------------------------------------------------|
|        |                                                                     | GW10<br>15.06.2021 | GW11<br>16.06.2021 | GW13<br>16.06.2021 |                 |                                   |                                                                                                                         |
| 1      | Boron (as B), mg/l, Max                                             | <0.2               | <0.2               | <0.2               | 0.2             | 0.5                               | APHA, 23 <sup>rd</sup> Edition ,Carmine                                                                                 |
| 2      | Colour,in Hazen Units                                               | 3                  | 2                  | 3                  | 1               | 5                                 | APHA, 23 <sup>rd</sup> Edition ,Pt.-Co. Method                                                                          |
| 3      | Calcium (as Ca), mg/l, Max                                          | 82                 | 54                 | 158                | 1.6             | 75                                | IS 3025, Part 40: 1991 R 2019 EDTA Method                                                                               |
| 4      | Chloride (as Cl), mg/l, Max                                         | 80                 | 39                 | 103                | 2               | 250                               | IS-3025/32:1988, R-2019 Argentometric                                                                                   |
| 5      | Copper (as Cu), mg/l, Max                                           | <0.03              | <0.03              | <0.03              | 0.03            | 0.05                              | IS 3025 Part 42 : 1992 R : 2019, AAS-Flame APHA,23 <sup>rd</sup> Edition, AAS-GTA                                       |
| 6      | Fluoride (as F) mg/l, Max                                           | 0.54               | 0.60               | 0.43               | 0.2             | 1.0                               | APHA, 23 <sup>rd</sup> Edition, Page 4-90 to , 4500 -F- D (SPADNS Method)                                               |
| 7      | Free Residual Chlorine, mg/l, Min                                   | <0.04              | <0.04              | <0.04              | 0.04            | 0.2                               | APHA, 23 <sup>rd</sup> Edition, , 4500-Cl <sup>-</sup> B. (Iodometric Method-I)                                         |
| 8      | Iron (as Fe), mg/l, Max                                             | <0.2               | <0.2               | 0.2                | 0.2             | 1.0                               | IS 3025 Part 53 : 2003, R : 2019 , AAS-Flame Method                                                                     |
| 9      | Lead (as Pb), mg/l, Max                                             | <0.005             | <0.005             | <0.005             | 0.005           | 0.01                              | IS:3025(Part 47):1994 (Reaffirmed 2019) APHA, 23 <sup>rd</sup> Edition, AAS-GTA                                         |
| 10     | Manganese (as Mn), mg/l, Max                                        | <0.02              | <0.02              | 0.18               | 0.02            | 0.1                               | APHA, 23 <sup>rd</sup> Edition, 3111B, Direct Air Acetylene Flame AAS-GTA                                               |
| 11     | Nitrate (as NO <sub>3</sub> ), mg/l, Max                            | 17.24              | 11.47              | 9.23               | 0.5             | 45                                | APHA, 23 <sup>rd</sup> Edition, P-4-127, 4500 - NO <sub>3</sub> <sup>-</sup> B , UV-Spectrophotometric Screening Method |
| 12     | Odour                                                               | Agreeable          | Agreeable          | Agreeable          | Qualitative     | Agreeable                         | APHA, 23 <sup>rd</sup> Edition, , 2150-C                                                                                |
| 13     | pH value                                                            | 7.75               | 8.15               | 8.05               | 0.2             | 6.5-8.5                           | IS 3025, Part 11 : 1983 R 2017 Electrometric method                                                                     |
| 14     | Phenolic compounds (as C <sub>6</sub> H <sub>5</sub> OH), mg/l, Max | <0.001             | <0.001             | <0.001             | 0.001           | 0.002                             | APHA, 22 <sup>nd</sup> Edition,4-Amino Autipyrine                                                                       |
| 15     | Selenium, mg/l, Max                                                 | <0.007             | <0.007             | <0.007             | 0.007           | 0.01                              | IS -3025,part 56:2003,R-2019/APHA 23 <sup>rd</sup> Edition, AAS-VGA                                                     |
| 16     | Sulphate (as SO <sub>4</sub> ) mg/l, Max                            | 99                 | 44                 | 183                | 2               | 200                               | APHA -23 <sup>rd</sup> Edition. P-4-199, 4500 SO <sub>4</sub> <sup>2-</sup> E                                           |
| 17     | Taste                                                               | Acceptable         | Acceptable         | Acceptable         | Qualitative     | Acceptable                        | APHA,23 <sup>rd</sup> Edition, 2160-C Flavour Rating Assesment                                                          |
| 18     | Total Alkalinity (CaCO <sub>3</sub> ),, mg/l, Max                   | 119                | 178                | 115                | 4               | 200                               | IS 3025, Part 23: 1986 R 2019 Titration Method                                                                          |
| 19     | Total Arsenic (as As), mg/l,Max                                     | <0.006             | <0.006             | <0.006             | 0.006           | 0.01                              | IS-3025, part 37:1988,R-2019/APHA23 <sup>rd</sup> Edition AAS-VGA                                                       |
| 20     | Total Chromium (as Cr), mg/l, Max                                   | <0.04              | <0.04              | <0.04              | 0.04            | 0.05                              | IS-3025 Part 52:2003, R:2019,AAS-Flame APHA, 23 <sup>rd</sup> Edition, AAS-GTA                                          |
| 21     | Total Dissolved Solids, mg/l, Max                                   | 666                | 578                | 782                | 25              | 500                               | IS 3025, Part 16: 1984 R 2017 Gravimetric method                                                                        |
| 22     | Total Hardness (CaCO <sub>3</sub> ), mg/l, Max                      | 356                | 246                | 566                | 4               | 200                               | IS 3025, Part 21, 2009 R 2019 EDTA Method                                                                               |
| 23     | Turbidity, NTU, Max                                                 | 3                  | 1                  | 1                  | 1               | 5                                 | IS 3025, Part 10 : 1984 R 2017 Nephelometric Method                                                                     |
| 24     | Zinc (as Zn), mg/l, Max                                             | 0.1                | <0.1               | <0.1               | 0.1             | 5                                 | IS 3025 Part 49 : 1994,R : 2019, AAS-Flame                                                                              |
| 25     | Nickel as Ni, mg/l Max                                              | <0.01              | <0.01              | <0.01              | 0.01            | 0.02                              | IS 3025 Pat 54 : 2003,R : 2019, AAS-Flame APHA 23 <sup>rd</sup> Edition, AAS-GTA                                        |

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

Year: 2021-22

| Sl. No | Parameter                                                           | Sampling Stations  |                    |                    | Detection Limit | IS:10500 Drinking Water Standards | Standard / Test Method                                                                                                  |
|--------|---------------------------------------------------------------------|--------------------|--------------------|--------------------|-----------------|-----------------------------------|-------------------------------------------------------------------------------------------------------------------------|
|        |                                                                     | GW14<br>16.06.2021 | GW15<br>16.06.2021 | GW16<br>15.06.2021 |                 |                                   |                                                                                                                         |
| 1      | Boron (as B), mg/l, Max                                             | <0.2               | <0.2               | <0.2               | 0.2             | 0.5                               | APHA, 23 <sup>rd</sup> Edition ,Carminc                                                                                 |
| 2      | Colour,in Hazen Units                                               | 3                  | 2                  | 2                  | 1               | 5                                 | APHA, 23 <sup>rd</sup> Edition ,Pt-Co. Method                                                                           |
| 3      | Calcium (as Ca), mg/l, Max                                          | 52                 | 101                | 154                | 1.6             | 75                                | IS 3025, Part 40: 1991 R 2019 EDTA Method                                                                               |
| 4      | Chloride (as Cl), mg/l, Max                                         | 54                 | 136                | 119                | 2               | 250                               | IS-3025/32:1988, R-2019 Argentometric                                                                                   |
| 5      | Copper (as Cu), mg/l, Max                                           | <0.03              | <0.03              | <0.03              | 0.03            | 0.05                              | IS 3025 Part 42 : 1992 R : 2019, AAS-Flame APHA,23 <sup>rd</sup> Edition, AAS-GTA                                       |
| 6      | Fluoride (as F) mg/l, Max                                           | 0.61               | 0.78               | 0.55               | 0.2             | 1.0                               | APHA, 23 <sup>rd</sup> Edition, Page 4-90 to , 4500 -F- D (SPADNS Method)                                               |
| 7      | Free Residual Chlorine, mg/l, Min                                   | <0.04              | <0.04              | <0.04              | 0.04            | 0.2                               | APHA, 23 <sup>rd</sup> Edition, , 4500-Cl <sup>-</sup> B. (Iodometric Method-I)                                         |
| 8      | Iron (as Fe), mg/l, Max                                             | <0.2               | <0.2               | 0.2                | 0.2             | 1.0                               | IS 3025 Part 53 : 2003, R : 2019 , AAS-Flame Method                                                                     |
| 9      | Lead (as Pb), mg/l, Max                                             | <0.005             | <0.005             | <0.005             | 0.005           | 0.01                              | IS:3025(Part 47):1994 (Reaffirmed 2019) APHA, 23 <sup>rd</sup> Edition, AAS-GTA                                         |
| 10     | Manganese (as Mn), mg/l, Max                                        | <0.02              | 0.10               | <0.02              | 0.02            | 0.1                               | APHA, 23 <sup>rd</sup> Edition, 3111B, Direct Air Acetylene Flame AAS-GTA                                               |
| 11     | Nitrate (as NO <sub>3</sub> ), mg/l, Max                            | 14.83              | 9.44               | 15.73              | 0.5             | 45                                | APHA, 23 <sup>rd</sup> Edition, P-4-127, 4500 - NO <sub>3</sub> <sup>-</sup> B , UV-Spectrophotometric Screening Method |
| 12     | Odour                                                               | Agreeable          | Agreeable          | Agreeable          | Qualitative     | Agreeable                         | APHA, 23 <sup>rd</sup> Edition, , 2150-C                                                                                |
| 13     | pH value                                                            | 8.06               | 7.95               | 7.86               | 0.2             | 6.5-8.5                           | IS 3025, Part 11 : 1983 R 2017 Electrometric method                                                                     |
| 14     | Phenolic compounds (as C <sub>6</sub> H <sub>5</sub> OH), mg/l, Max | <0.001             | <0.001             | <0.001             | 0.001           | 0.002                             | APHA, 22 <sup>nd</sup> Edition,4-Amino Autipyrine                                                                       |
| 15     | Selenium, mg/l, Max                                                 | <0.007             | <0.007             | <0.007             | 0.007           | 0.01                              | IS -3025,part 56:2003,R-2019/APHA 23 <sup>rd</sup> Edition, AAS-VGA                                                     |
| 16     | Sulphate (as SO <sub>4</sub> ) mg/l, Max                            | 58                 | 142                | 187                | 2               | 200                               | APHA -23 <sup>rd</sup> Edition. P-4-199, 4500 SO <sub>4</sub> <sup>2-</sup> E                                           |
| 17     | Taste                                                               | Acceptable         | Acceptable         | Acceptable         | Qualitative     | Acceptable                        | APHA,23 <sup>rd</sup> Edition, 2160-C Flavour Rating Assesment                                                          |
| 18     | Total Alkalinity (CaCO <sub>3</sub> ), mg/l, Max                    | 101                | 127                | 155                | 4               | 200                               | IS 3025, Part 23: 1986 R 2019 Titration Method                                                                          |
| 19     | Total Arsenic (as As), mg/l,Max                                     | <0.006             | <0.006             | <0.006             | 0.006           | 0.01                              | IS-3025, part 37:1988,R-2019/APHA23 <sup>rd</sup> Edition AAS-VGA                                                       |
| 20     | Total Chromium (as Cr), mg/l, Max                                   | <0.04              | <0.04              | <0.04              | 0.04            | 0.05                              | IS-3025 Part 52:2003, R:2019,AAS-Flame APHA, 23 <sup>rd</sup> Edition, AAS-GTA                                          |
| 21     | Total Dissolved Solids, mg/l, Max                                   | 569                | 766                | 807                | 25              | 500                               | IS 3025, Part 16: 1984 R 2017 Gravimetric method                                                                        |
| 22     | Total Hardness (CaCO <sub>3</sub> ), mg/l, Max                      | 309                | 539                | 638                | 4               | 200                               | IS 3025, Part 21, 2009 R 2019 EDTA Method                                                                               |
| 23     | Turbidity, NTU, Max                                                 | 2                  | 3                  | 3                  | 1               | 5                                 | IS 3025, Part 10 : 1984 R 2017 Nephelometric Method                                                                     |
| 24     | Zinc (as Zn), mg/l, Max                                             | <0.1               | 0.1                | 0.84               | 0.1             | 5                                 | IS 3025 Part 49 : 1994,R : 2019, AAS-Flame                                                                              |
| 25     | Nickel as Ni, mg/l Max                                              | <0.01              | <0.01              | <0.01              | 0.01            | 0.02                              | IS 3025 Pat 54 : 2003,R : 2019, AAS-Flame APHA 23 <sup>rd</sup> Edition, AAS-GTA                                        |

## **Abbreviations**

AMSL: Above mean sea level

Avg.: Average

APT: Aquifer Pumping Test

BCCL: Bharat Coking Coal Ltd.

bgl: Below Ground Level

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

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

CMPDI: Central Mine Plan & Design Institute

DVC: Damodar Valley Corporation

DTW: Depth to water level

GW: Groundwater

IMD: Indian Meteorological Division

JCF: Jharia Coalfield

RCF: Raniganj Coalfield

MADA: Mineral Area Development Authority

MCM: Million Cubic Meter

MGD: Million Gallon per day

NTU: Nephelometric Turbidity unit

OC / UG: Opencast / Underground

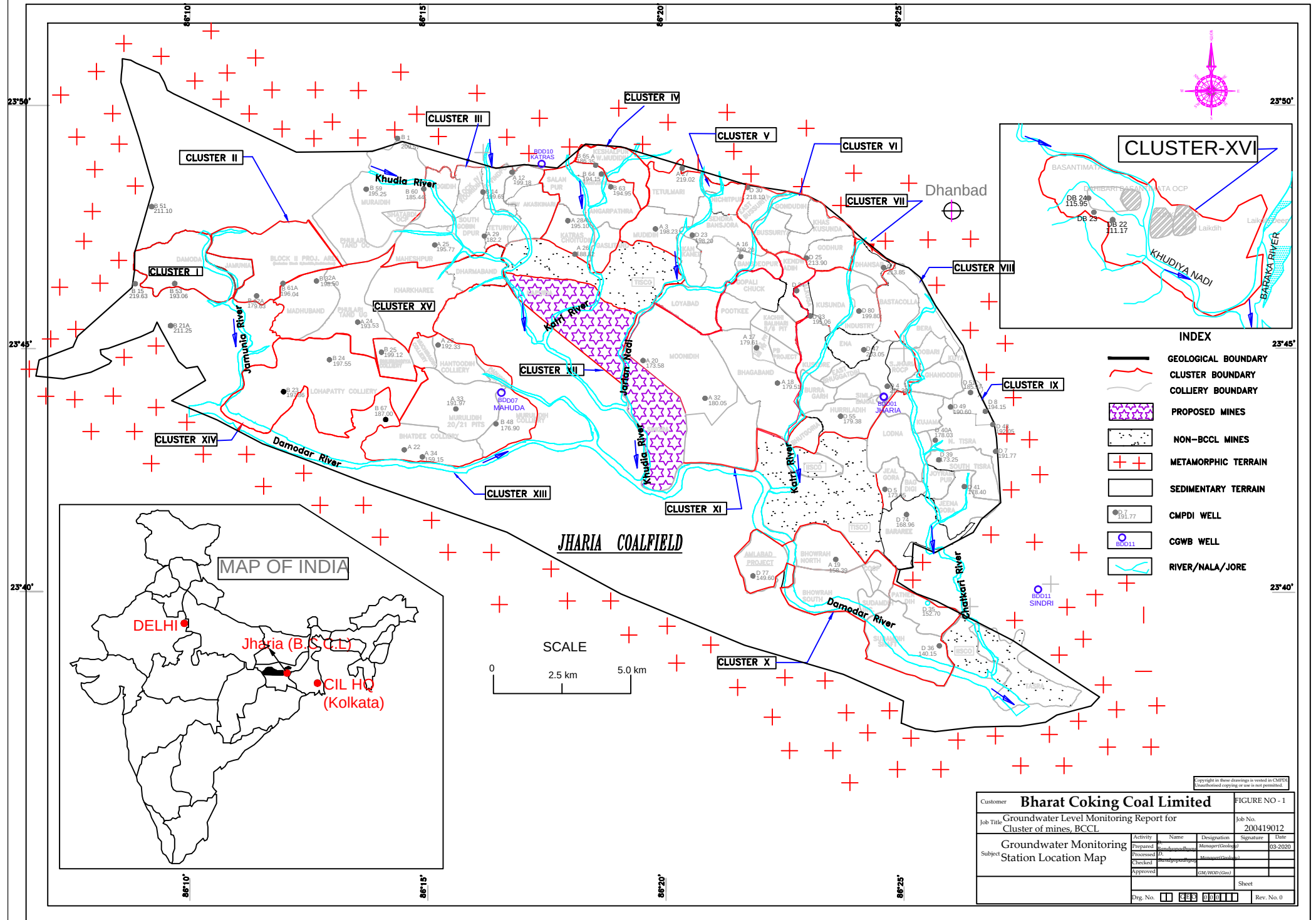
OCP / UGP: Opencast Project / Underground Project

RL: Reduced Level

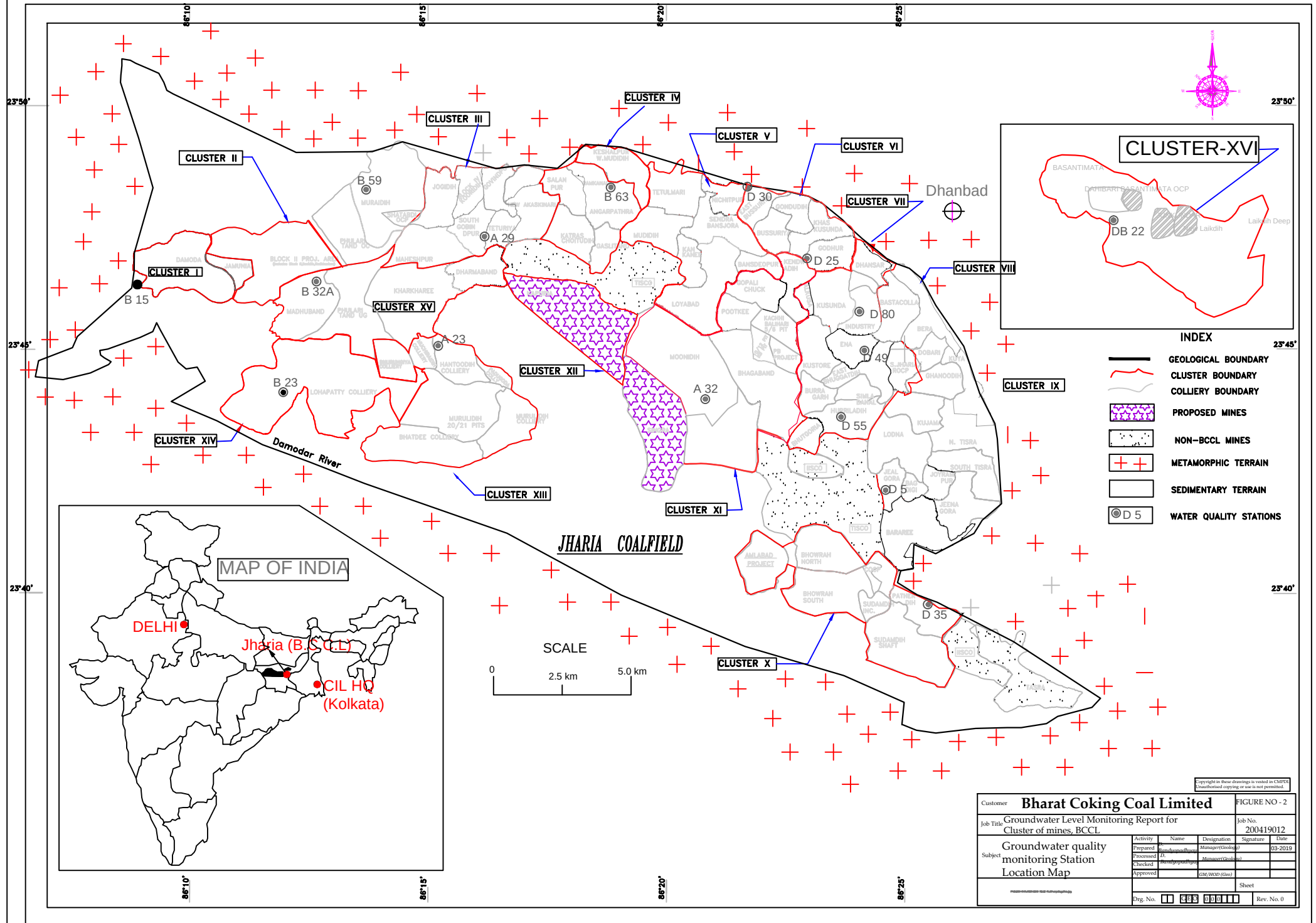
RWH: Rainwater Harvesting

FF: Fire Fighting

# GROUNDWATER MONITORING STATION LOCATION MAP

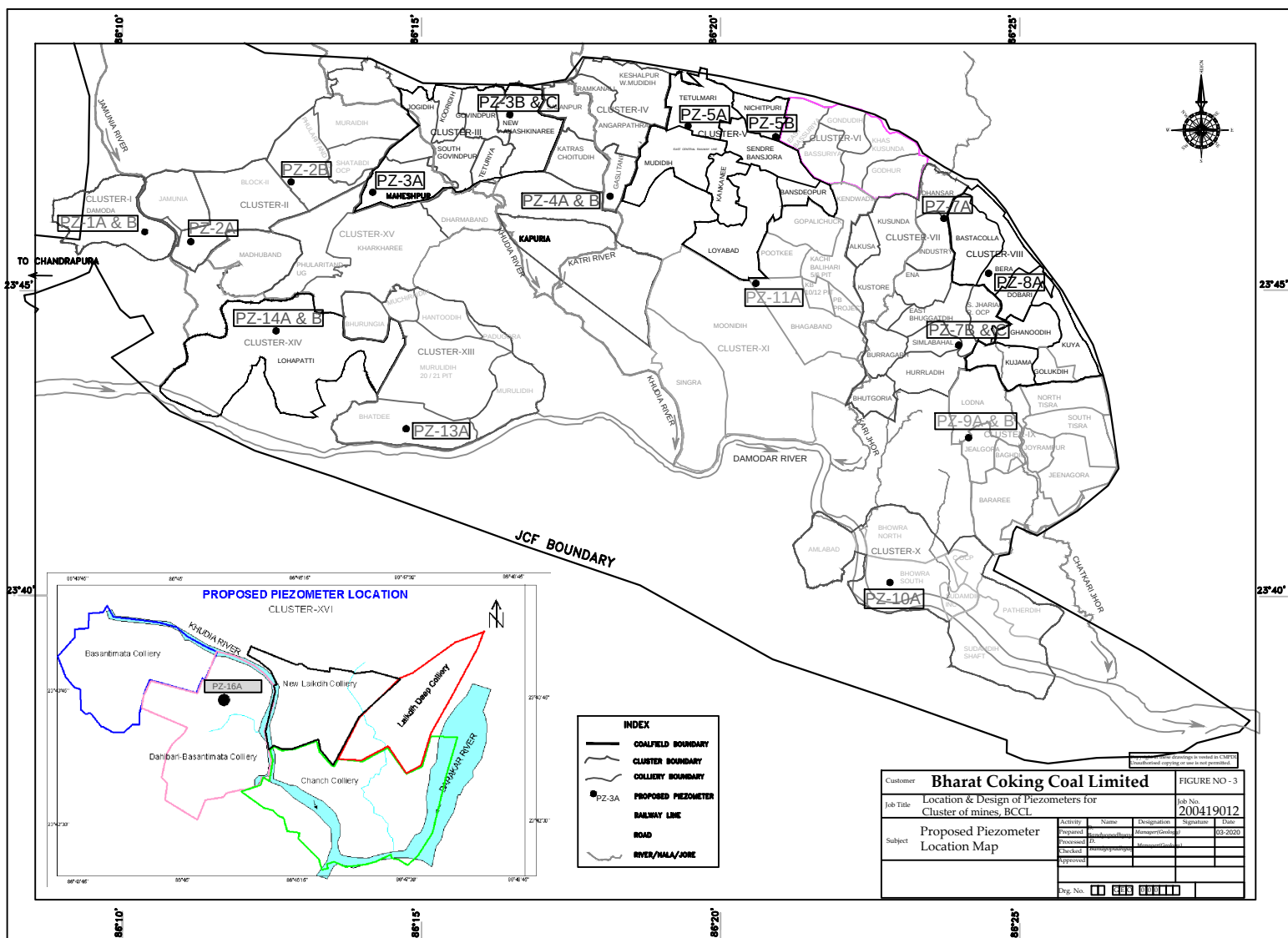


# GROUNDWATER QUALITY MONITORING STATION LOCATION MAP





PROPOSED PIEZOMETER LOCATION MAP, JCF & RCF (part)





**WATER TABLE CONTOUR MAP OF RCF (PART)**

**Legend:**

- 160: WATER TABLE CONTOUR (m)
- D 90 159.17: CMPDI OBSERVATION WELL
- : EXISTING/ABANDONED MINES
- : GW FLOW DIRECTION

**Figure NO-4**

**Customer:** BHARAT COKING COAL LIMITED

**Job Title:** QUARTERLY GW LEVEL & QUALITY MONITORING

**Job No.:** 200421008

**Subject:** WATER TABLE CONTOUR MAP

**Activity:**

| Activity    | Name           | Designation      | Signature | Date |
|-------------|----------------|------------------|-----------|------|
| Prepared by | D.BANDOPADHYAY | MNG (GD)         |           |      |
| Checked by  | D.BANDOPADHYAY | MNG (GD)         |           |      |
| Approved by | V.K.SRIVASTAVA | GM (EXPLORATION) |           |      |

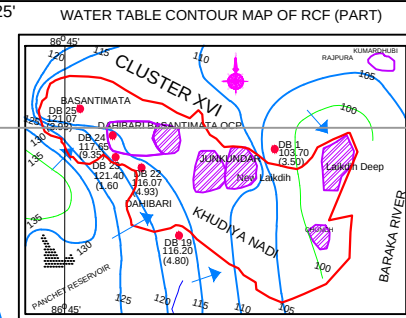
**Scale:** 500 0 500 1500 M

**Sheet:**

**Drp.No.:** H C X X X X X X X X

**REV. No.:** 0

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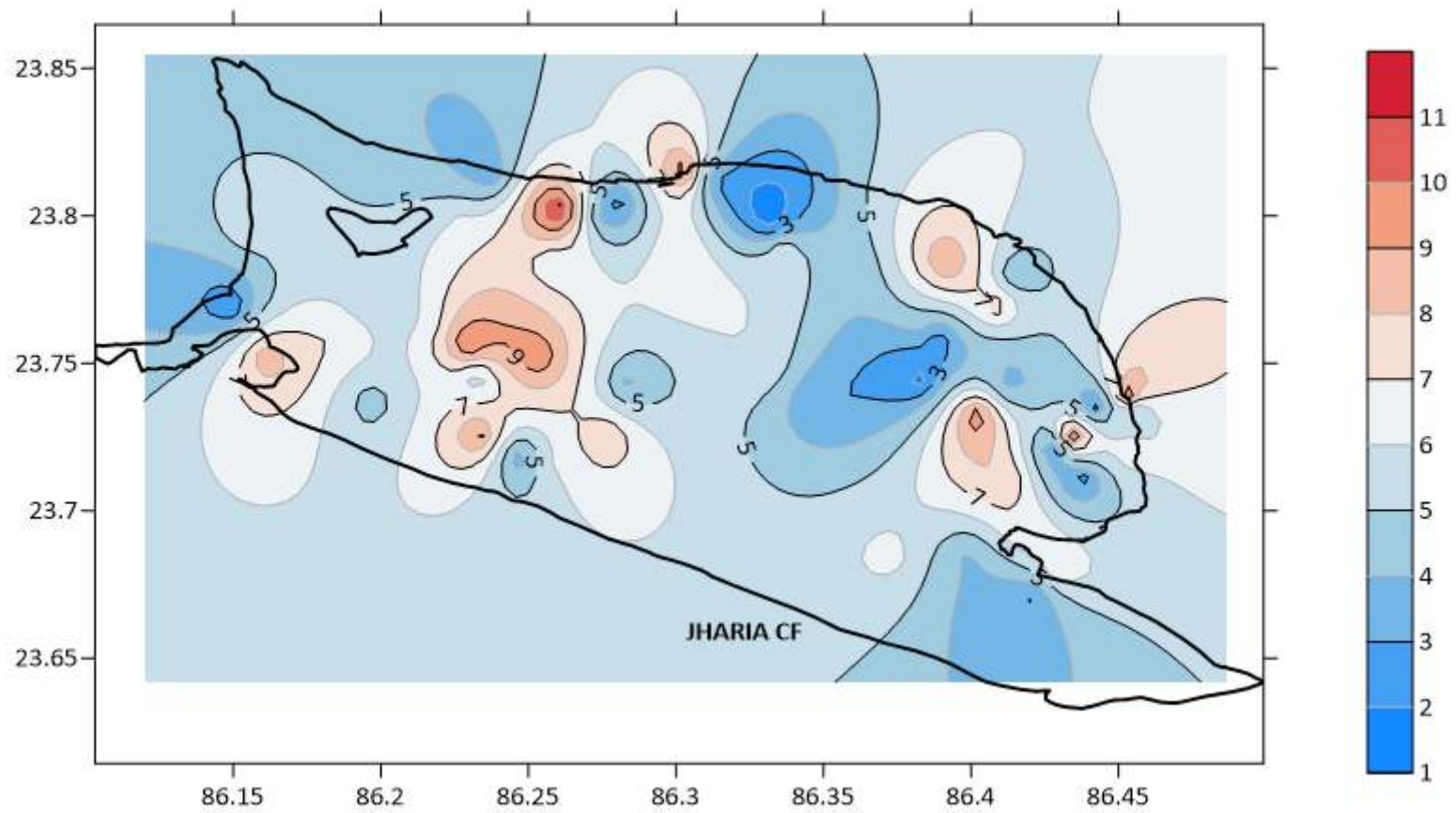
REF. - DRAWING NO. XYZABC - ( ) - NO. - MNO DATED - ( ) -

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| <div style="font-weight: bold; font-size: 1.2em; margin-bottom: 5px;">Customer</div> <div style="font-size: 1.5em; margin: 0;">BHARAT COKING COAL LIMITED</div>                                                                                   |                                                                                          |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |       |                                                                                                                                        |                                                                                          |             |      |             |              |           |  |              |              |           |  |            |  |  |  |             |                |                   |  |       |     |       |       |
|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------|----------------------------------------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------|-------------|------|-------------|--------------|-----------|--|--------------|--------------|-----------|--|------------|--|--|--|-------------|----------------|-------------------|--|-------|-----|-------|-------|
| <b>Job Title</b><br>QUARTERLY GW LEVEL & QUALITY MONITORING                                                                                                                                                                                       |                                                                                          | <b>Job No.</b><br>200421008                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           |       |                                                                                                                                        |                                                                                          |             |      |             |              |           |  |              |              |           |  |            |  |  |  |             |                |                   |  |       |     |       |       |
| <b>Subject</b><br>WATER TABLE CONTOUR MAP                                                                                                                                                                                                         |                                                                                          | <table border="1" style="width: 100%; border-collapse: collapse; text-align: center;"> <thead> <tr> <th style="width: 30%;">Activity</th> <th style="width: 30%;">Name</th> <th style="width: 30%;">Designation</th> <th style="width: 10%;">Date</th> </tr> </thead> <tbody> <tr> <td>Prepared by</td> <td>D.BANOPADHAY</td> <td>MNG (GEO)</td> <td></td> </tr> <tr> <td>Processed by</td> <td>D.BANOPADHAY</td> <td>MNG (GEO)</td> <td></td> </tr> <tr> <td>Checked by</td> <td></td> <td></td> <td></td> </tr> <tr> <td>Approved by</td> <td>V.K.SRIVASTAVA</td> <td>GM (EXPLOURATION)</td> <td></td> </tr> <tr> <td>Scale</td> <td>500</td> <td>1:500</td> <td>Sheet</td> </tr> </tbody> </table> |       | Activity                                                                                                                               | Name                                                                                     | Designation | Date | Prepared by | D.BANOPADHAY | MNG (GEO) |  | Processed by | D.BANOPADHAY | MNG (GEO) |  | Checked by |  |  |  | Approved by | V.K.SRIVASTAVA | GM (EXPLOURATION) |  | Scale | 500 | 1:500 | Sheet |
| Activity                                                                                                                                                                                                                                          | Name                                                                                     | Designation                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           | Date  |                                                                                                                                        |                                                                                          |             |      |             |              |           |  |              |              |           |  |            |  |  |  |             |                |                   |  |       |     |       |       |
| Prepared by                                                                                                                                                                                                                                       | D.BANOPADHAY                                                                             | MNG (GEO)                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             |       |                                                                                                                                        |                                                                                          |             |      |             |              |           |  |              |              |           |  |            |  |  |  |             |                |                   |  |       |     |       |       |
| Processed by                                                                                                                                                                                                                                      | D.BANOPADHAY                                                                             | MNG (GEO)                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             |       |                                                                                                                                        |                                                                                          |             |      |             |              |           |  |              |              |           |  |            |  |  |  |             |                |                   |  |       |     |       |       |
| Checked by                                                                                                                                                                                                                                        |                                                                                          |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |       |                                                                                                                                        |                                                                                          |             |      |             |              |           |  |              |              |           |  |            |  |  |  |             |                |                   |  |       |     |       |       |
| Approved by                                                                                                                                                                                                                                       | V.K.SRIVASTAVA                                                                           | GM (EXPLOURATION)                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |       |                                                                                                                                        |                                                                                          |             |      |             |              |           |  |              |              |           |  |            |  |  |  |             |                |                   |  |       |     |       |       |
| Scale                                                                                                                                                                                                                                             | 500                                                                                      | 1:500                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 | Sheet |                                                                                                                                        |                                                                                          |             |      |             |              |           |  |              |              |           |  |            |  |  |  |             |                |                   |  |       |     |       |       |
|  <div style="margin-top: 10px;"> <b style="font-size: 1.5em;">CMPDI</b><br/>                     ISO 9001 Company                 </div> |                                                                                          | <table style="width: 100%; border-collapse: collapse;"> <tr> <td style="width: 50%; padding: 5px;">                     Dwg. No. <span style="font-family: monospace; font-size: 1.2em; border: 1px solid black; padding: 2px;">H C X X X X X X X X X X</span> </td> <td style="width: 50%; padding: 5px;">                     REV. NO. <span style="font-size: 1.5em; border: 1px solid black; padding: 2px;">0</span> </td> </tr> </table>                                                                                                                                                                                                                                                         |       | Dwg. No. <span style="font-family: monospace; font-size: 1.2em; border: 1px solid black; padding: 2px;">H C X X X X X X X X X X</span> | REV. NO. <span style="font-size: 1.5em; border: 1px solid black; padding: 2px;">0</span> |             |      |             |              |           |  |              |              |           |  |            |  |  |  |             |                |                   |  |       |     |       |       |
| Dwg. No. <span style="font-family: monospace; font-size: 1.2em; border: 1px solid black; padding: 2px;">H C X X X X X X X X X X</span>                                                                                                            | REV. NO. <span style="font-size: 1.5em; border: 1px solid black; padding: 2px;">0</span> |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |       |                                                                                                                                        |                                                                                          |             |      |             |              |           |  |              |              |           |  |            |  |  |  |             |                |                   |  |       |     |       |       |

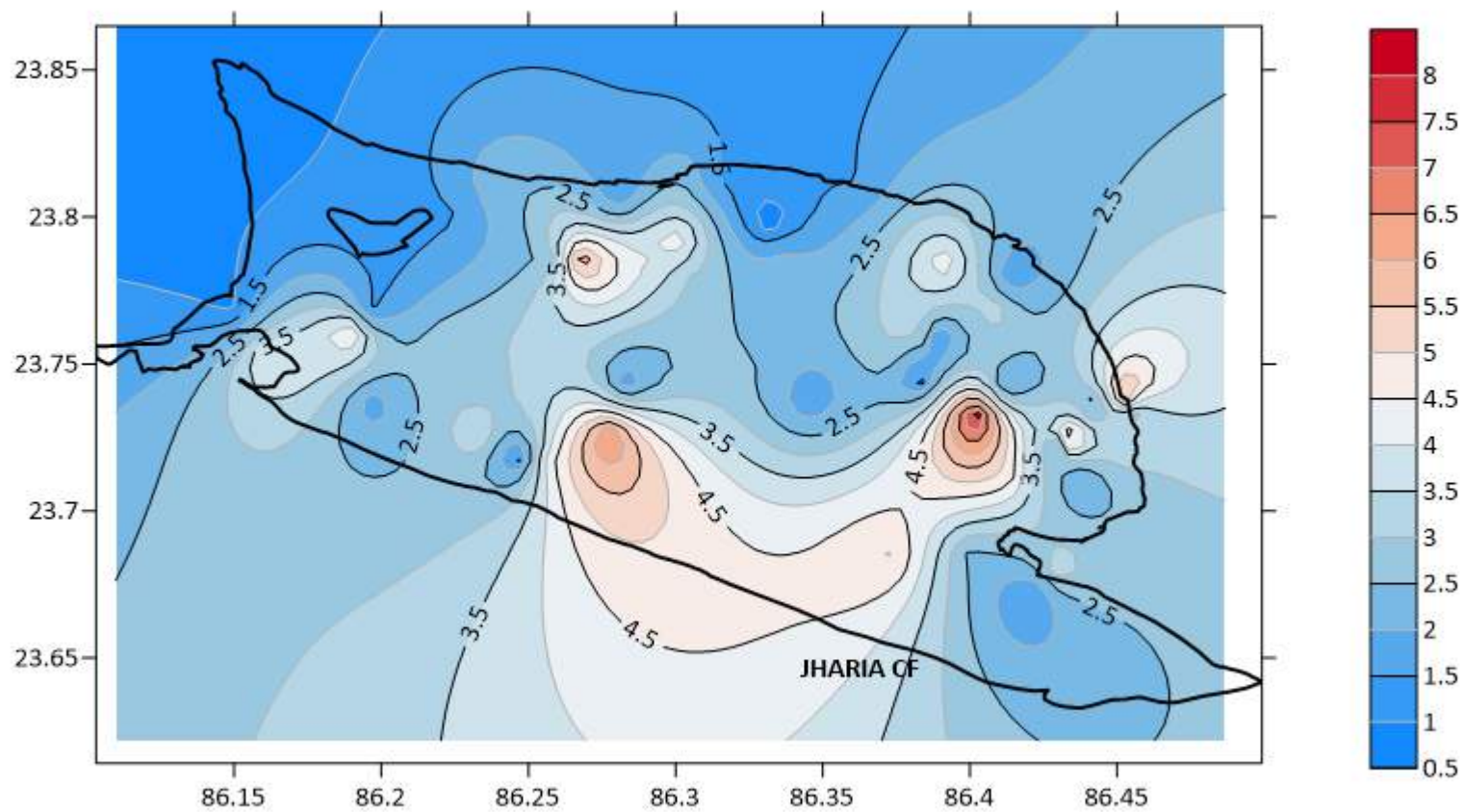


# DEPTH TO WATER LEVEL MAP (PRE-MONSOON)





## DEPTH TO WATER LEVEL MAP(POST-MONSOON)





# Accreditation Board of CGWA

## Certificate of Accreditation

*M/s. Central Mine Planning and Design Institute Ltd. (CMPDIL)  
Ranchi, Jharkhand*

*Has been accredited as a Ground Water Professionals to prepare reports in the  
Functional Areas of*

- Hydrogeological conditions in mining projects.*

*Valid from : 15.02.2021*

*Certificate No. : CGWA/RGI/013*

*Valid thru : 14.02.2026*

*Dated : 07.07.2021*

क्षेत्रीय निदेशक  
Regional Director  
आरजीएनजीडब्ल्यूटीआरआई  
RGNGWT&RI

सदस्य  
Member  
आरजीएनजीडब्ल्यूटीआरआई  
RGNGWT&RI





भारत सरकार  
Government of India  
जल शक्ति मंत्रालय  
Ministry of Jal Shakti

E-877816  
15.11.21



जल ससाधन, नदी विकास और गंगा संरक्षण विभाग  
Department of Water Resources, River Development & Ganga Rejuvenation

केन्द्रीय भूमि जल बोर्ड / Central Ground Water Board

राजीव गांधी राष्ट्रीय भूमि जल प्रशिक्षण एवं अनुसंधान संस्थान

Rajiv Gandhi National Ground Water Training & Research Institute

फोन / Phone No. 07712220701

ई-मेल / E-mail: rgi-cgwb@nic.in

वेबसाइट / Website: cgwb.gov.in / ngwtri.org

सेक्टर 23, तुता, अटल नगर, नया रायपुर 492016 (छ.ग.)

Sector - 23, Tuta, Atal Nagar, Naya Raipur 492016 (C.G.)

File No. 29/TS/RGI/Accreditation/20-21 - 295

Date 02.08.2021

To,

**The CMPDIL**

Gondwana Place, Kanke Road

**Ranchi, (Jharkhand)**

PIN- 834031

Sub: - Accreditation Certificate – Reg.

Sir,

Please find enclosed the Certificate of Accreditation in respect of The CMPDIL for the period 2021-2026.

Please acknowledge the receipt of the Certificate

Encl : As Above

Yours Faithfully

(Satish Kumar)

Regional Director  
RGNGWTRI, Raipur



**Quality Council of India**  
National Accreditation Board for Education and Training  
ITPI Building, 6th Floor, 4 - A, Ring Road, I P Estate, New Delhi - 110002



**Under the QCI-NABET Scheme  
for  
Ground Water Consultant Organisation**



**CENTRAL MINE PLANNING AND DESIGN INSTITUTE LIMITED**

**CMPDI, GONDWANA PLACE, KANKE ROAD, RANCHI, JHARKHAND -834031**

| S.No. | SCOPE COVERAGE                                                                  |                 |                         |
|-------|---------------------------------------------------------------------------------|-----------------|-------------------------|
|       | Industrial Use                                                                  | Mining Projects | Infrastructure Projects |
| 1     | Hydrogeological report: Comprehensive report on groundwater condition/situation |                 |                         |
| 2     | Impact Assessment Reports without modelling studies                             |                 |                         |

**Note: Names of approved Project Coordinators and Technical Area Experts are mentioned in IA AC Minutes dated Oct 14, 2021 on QCI-NABET website.**

*The Accreditation shall remain in force subject to continued compliance to the terms and conditions mentioned in NABET's letter of accreditation bearing no. QCI/NABET/ENV/GWCO/21/57 dated Oct 27, 2021. The accreditation needs to be renewed before the expiry date by Oct 13, 2026 following due process of assessment.*

**Sr. Director, NABET**  
**Issue Date : Oct 27, 2021**



**Certificate No.**  
**NABET/GWCO/IA/GW021**

**Valid Upto**  
**Oct 13, 2026**



Ref. No. - QCI/NABET/ENV/GWCO/ACO/21/57

October 27, 2021

To,

M/s Central Mine Planning and Design Institute Limited  
Gondwana Place, Kanke Road,  
Ranchi, Jharkhand- 834031

Sub: Accreditation under NABET Scheme of Ground Water Consultant Organization (GWCO)

Ref.: With reference to your application No. QCI/NABET/GWCO/0011/IA dated October 22, 2020.

Dear Sir

QCI-NABET is hereby pleased to accredit 'Central Mine Planning and Design Institute Limited' for the scope coverage as mentioned in the Certificate of Accreditation.

The validity of accreditation is subject to continued compliance to the Scheme and the terms & conditions mentioned in **Annexure I to IV**.

NABET always look forward for your association and continued support.

With best regards,

  
A K Jha  
Senior Director  
QCI- NABET

**Annexure-I****Ref. No.:** QCI/NABET/ENV/GWCO/ACO/21/57**Date** October 27, 2021**Name of organization:** Central Mine Planning and Design Institute Limited**Accreditation of Ground Water Consultant Organization (GWCO) under NABET Scheme****Marks obtained in various aspect of Initial Assessment**

| Sl. No. | Aspect                                   | Marks Scored       | Out of |
|---------|------------------------------------------|--------------------|--------|
| 1.      | Quality and performance of personnel     |                    |        |
|         | i. Project Coordinator/s                 | 18.29<br>(Average) | 25     |
|         | ii. Technical Area Expert/s              | 13.29<br>(Average) | 20     |
| 2.      | Infrastructure and software and hardware | 13.20              | 15     |
| 3.      | Field Invest. & Laboratory system        | 13.80              | 20     |
| 4.      | Quality Management System                | 10.88              | 15     |
| 5.      | Organizational Commitment                | 4.20               | 5      |
|         | Total                                    | 73.66              | 100    |
|         | Overall Score                            | 73.66%             |        |

The organization has scored 73.66% overall and awarded 3-Star (★★★)

**Criteria for Star Rating:**

| S. No | Overall Score | Star Rating |
|-------|---------------|-------------|
| 1     | 40% to 60%    | ★           |
| 2     | 61% to 70%    | ★★          |
| 3     | 71% and Above | ★★★         |





National Accreditation Board for  
Testing and Calibration Laboratories

**CERTIFICATE OF ACCREDITATION**

**ENVIRONMENT LABORATORY, REGIONAL INSTITUTE -II,  
CMPDI DHANBAD**

has been assessed and accredited in accordance with the standard

**ISO/IEC 17025:2017**

**"General Requirements for the Competence of Testing &  
Calibration Laboratories"**

for its facilities at

CMPDIL, RI-2, KOYLABHAWAN, KOYLANAGAR, DHANBAD, JHARKHAND, INDIA

in the field of

**TESTING**

Certificate Number: TC-10122

Issue Date: 07/12/2021

Valid Until: 06/12/2023

This certificate remains valid for the Scope of Accreditation as specified in the annexure subject to continued satisfactory compliance to the above standard & the relevant requirements of NABL.  
(To see the scope of accreditation of this laboratory, you may also visit NABL website [www.nabl-india.org](http://www.nabl-india.org))

Name of Legal Identity : CENTRAL MINE PLANNING AND DESIGN INSTITUTE LTD.

Signed for and on behalf of NABL



N. Venkateswaran  
Chief Executive Officer

## REGISTERED OFFICE

Gondwana Place, Kanke Road  
Ranchi - 834 031  
(Jharkhand)

## REGIONAL INSTITUTES

### क्षेत्रीय संस्थान - I

वेस्ट एंड, जी.टी.रोड  
असोल - 713 301  
(पश्चिम बंगाल)

### क्षेत्रीय संस्थान - II

कोयला भवन, कोयला नगर  
धनबाद - 826 005  
(झारखंड)

### क्षेत्रीय संस्थान - III

गोंदवाना प्लेस, कान्के रोड  
राँची - 834 031  
(झारखंड)

### क्षेत्रीय संस्थान - IV

जरीपटका, कास्तूरबा नगर  
नागपुर - 440 014  
(महाराष्ट्र)

### क्षेत्रीय संस्थान - V

सीपाट रोड  
बिलासपुर - 495 001  
(छत्तीसगढ़)

### क्षेत्रीय संस्थान - VI

पोस्ट जयंत कोलिरी,  
जिला : सिंगरौली  
पिन नं० - 486 890  
(मध्य प्रदेश)

### क्षेत्रीय संस्थान - VII

गृह निर्माण भवन  
सचिवालय मार्ग  
भुवनेश्वर - 751001  
(उड़ीसा)

### Regional Institute - I

West End, G.T Road  
Asansol - 713 301  
(West Bengal)

### Regional Institute - II

Koila Bhawan, Koila Nagar  
Dhanbad - 826 005  
(Jharkhand)

### Regional Institute - III

Gondwana Place, Kanke Road  
Ranchi - 834 031  
(Jharkhand)

### Regional Institute - IV

Jaripathka, Kasturba Nagar  
Nagpur - 440 014  
(Maharashtra)

### Regional Institute - V

Seepat Road  
Bilaspur - 495 001  
(Chattisgarh)

### Regional Institute - VI

P.O Jayant Colliery  
Dist. - Singrauli  
PIN - 486 890  
Madhya Pradesh

### Regional Institute - VII

Grih Nirman Bhawan  
Sachivalaya Marg  
Bhubneswar - 751 001  
(Orissa)

# सेन्ट्रल माईन प्लानिंग एंड डिजाइन इन्स्टीच्यूट लिमिटेड

(कोल इंडिया की अनुबंधी कंपनी)

एक मिनी रत्न कंपनी

## Central Mine Planning & Design Institute Limited

(A Subsidiary of Coal India Limited)

A Mini Ratna Company

गोंदवाना प्लेस, कान्के रोड, राँची - 834 031, भारत

दूरभाष : (91-0651) 2230002, 2230483

फैक्स : (91-0651) 2231447

वेबसाइट : [www.cmpdi.co.in](http://www.cmpdi.co.in)



Gondwana Place, Kanke Road, Ranchi - 834 031, INDIA

Phone : (91 - 0651) 2230002, 2230483

Fax : (91 - 0651) 2231447

website : [www.cmpdi.co.in](http://www.cmpdi.co.in)

## REGISTERED OFFICE

Gondwana Place, Kanke Road  
Ranchi - 834 031  
(Jharkhand)

## REGIONAL INSTITUTES

### क्षेत्रीय संस्थान - I

वेस्ट एंड, जी.टी. रोड  
आसनसोल - 713 301  
(पश्चिम बंगाल)

### क्षेत्रीय संस्थान - II

कोयला भवन, कोयला नगर  
धनबाद - 826 005  
(झारखंड)

### क्षेत्रीय संस्थान - III

गोंदवाना प्लेस, कान्के रोड  
राँची - 834 031  
(झारखंड)

### क्षेत्रीय संस्थान - IV

जरीपटका, कस्तूरबा नगर  
नागपुर - 440 014  
(महाराष्ट्र)

### क्षेत्रीय संस्थान - V

सीपत रोड  
बिलासपुर - 495 001  
(छत्तीसगढ़)

### क्षेत्रीय संस्थान - VI

पोस्ट : जयंत कॉलरी,  
जिला : सिंगरौली  
पिन नं० - 486 890  
(मध्य प्रदेश)

### क्षेत्रीय संस्थान - VII

गृह निर्माण भवन  
सचिवालय मार्ग  
भुवनेश्वर - 751 001  
(उड़ीसा)

### Regional Institute - I

West End, G.T Road  
Asansol - 713 301  
(West Bengal)

### Regional Institute - II

Koyla Bhawan, Koyla Nagar  
Dhanbad - 826 005  
(Jharkhand)

### Regional Institute - III

Gondwana Place, Kanke Road  
Ranchi - 834 031  
(Jharkhand)

### Regional Institute - IV

Jaripathka, Kasturba Nagar  
Nagpur - 440 014  
(Maharashtra)

### Regional Institute - V

Seepat Road  
Bilaspur - 495 001  
(Chattisgarh)

### Regional Institute - VI

P.O. Jayant Colliery  
Dist. - Singrauli  
PIN - 486 890  
Madhya Pradesh

### Regional Institute - VII

Grih Nirman Bhawan  
Sachivalaya Marg  
Bhubaneswar - 751 001  
(Oris. )

# सेन्ट्रल माईन प्लानिंग एंड डिजाइन इन्स्टीच्यूट लिमिटेड

(कोल इंडिया की अनुषंगी कंपनी)

एक मिनी रत्न कंपनी

# Central Mine Planning & Design Institute Limited

(A Subsidiary of Coal India Limited)

A Mini Ratna Company

गोंदवाना प्लेस, कान्के रोड, राँची - 834 031, भारत

दूरभाष : (91-0651) 2230002, 2230483

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वेबसाइट : [www.cmpdi.co.in](http://www.cmpdi.co.in)



Gondwana Place, Kanke Road, Ranchi - 834 031, INDIA

Phone : (91 - 0651) 2230002, 2230483

Fax : (91 - 0651) 2231447

website : [www.cmpdi.co.in](http://www.cmpdi.co.in)

### 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. |                        |           |              |

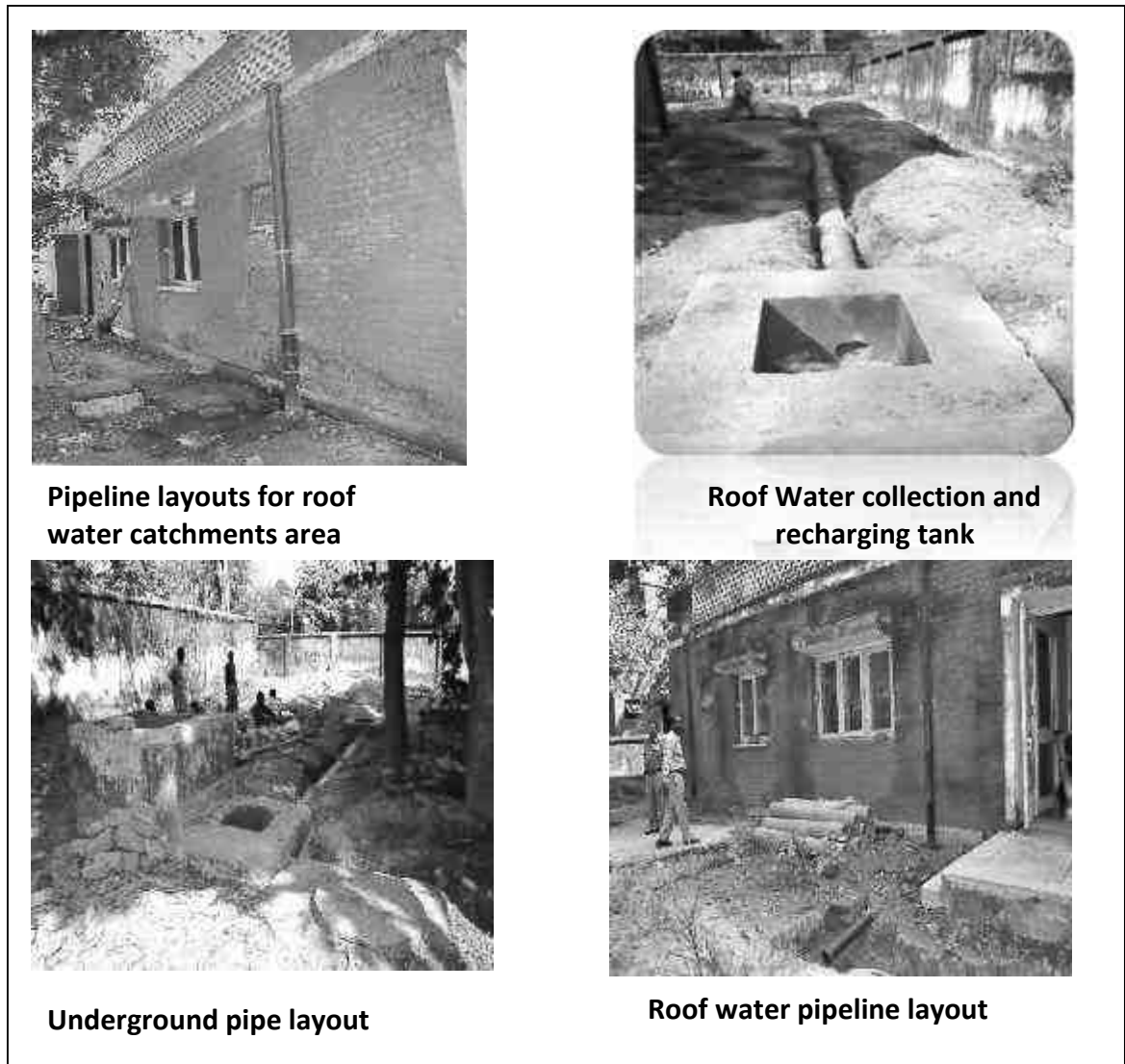
After mine closure, void of opencast will be filled up with rainwater and will maintaining the water table in the surrounding areas and may become a source of water supply to the community.

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.



**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**





**Water Harvesting at Cluster IV**



Toe wall and Embankment at Cluster IV

**Oil and Grease Trap (48 KL)**

**AKWMC WORKSHOP, Katras Area**





Illumination Survey at DECO - AMPL - BKB(JV) Hired patch on 09/04/2022

| Sl.No | Place of illumination Obtained                   | Height of light source in (m) | Distance of light source in (m) | Standard of illumination | Illumination Obtained | Types of light provided | Remarks |
|-------|--------------------------------------------------|-------------------------------|---------------------------------|--------------------------|-----------------------|-------------------------|---------|
| 1.    | OB dumping place beside haul road                | 12                            | 30                              | H = 15<br>V = 15         | H = 135<br>V = 75     | 8 X 600W (MH)           |         |
|       | — " —                                            | "                             | 50                              | "                        | H = 72, V = 45        | — " —                   |         |
|       | — " —                                            | "                             | 100                             | "                        | H = 11, V = 22        | — " —                   |         |
| 2.    | At haul road (V seam)                            | 30                            | 50                              | H = 10                   | H = 01                | 3 X 400W (MH)           |         |
| 3.    | At pumping station                               | 12                            | 30                              | H = 40                   | H = 550               | 2 X 1000W (LED)         |         |
|       | — " —                                            | "                             | 100                             | "                        | H = 120               | — " —                   |         |
| 04.   | Near rest shelter at V seam near pumping station | 10                            | 50                              | H = 50                   | H = 44                | — " —                   |         |
| 05.   | At haul road way to V seam parking               | 30                            | 50                              | H = 10                   | H = 05                | 4 X 400W (MH)           |         |
| 06.   | Near tower light at V seam parking               | 08                            | 50                              | H = 10                   | H = 35                | — " —                   |         |

Manager  
AKWMC

Colliery Engineer  
AKWMC

Safety Officer  
AKWMC  
09/04/2022



# Illumination Survey at "AMUL-BKA (SV)

Wind. patch on 09/04/2022

| Sr. No. | Place of illumination obtained                      | Height of light source (m) | Distance of light source (m) | Standard at Illumination | Illumination obtained     | Type of light provided        | Remarks              |
|---------|-----------------------------------------------------|----------------------------|------------------------------|--------------------------|---------------------------|-------------------------------|----------------------|
| 07.     | Near haul road turning at X-loom                    | 10                         | 30                           | H = 10                   | H = 11                    | 1 x 4000 (MH)                 |                      |
| 08.     | At old dump brick haul road                         | 12                         | 25                           | H = 15<br>V = 15         | H = 22<br>V = 27          | 2 x 4000 (MH)                 |                      |
| 09.     | At haul road near VII loom                          | 40                         | 50                           | H = 10                   | H = 2                     | 1 x 4000 (MH)                 |                      |
| 10.     | Near shore no. valve - 353 (At bucket seat)         | Machine height             | 2m from front of machine.    | H = 15<br>V = 25         | H = 51<br>V = 43          | 6 x LED light (Machine light) |                      |
|         |                                                     |                            | 1m from back of machine      | H = 12<br>V = 07         | 2 light (reflexive light) |                               |                      |
| 11.     | East at view point (Near old dumping is being done) | 12                         | 50                           | H = 15<br>V = 15         | H = 1<br>V = 0            | 1 x 4000 (MH)                 | More light required. |
| 12.     | In machine cabin of machine no. Volo-353            | Machine cabin light        | In machine cabin.            | H = 50                   | H = 23                    | 2 x Machine cabin light       | More light required. |

Manager  
ARULM

Safety Officer  
ARULM

Illumination survey at BSMCL - BEPL (TV)

(Tetelmari) hind patch on 11/04/2022

| Sl. No. | Place of illumination obtained                            | Height of light source in (m) | Distance of light source in (m)  | Standard of illumination | Illumination obtained | Types of light provided                  | Remarks         |
|---------|-----------------------------------------------------------|-------------------------------|----------------------------------|--------------------------|-----------------------|------------------------------------------|-----------------|
| 01.     | Near weight bridge (Type curve)                           | 08                            | 20m west from light source       | H = 10                   | H = 32                | 4 x LED light                            | DN act provided |
|         |                                                           |                               | 50m north-east from light source | H = 10                   | H = 12                | ---                                      |                 |
| 02.     | At haul road - way to VII room                            | 12                            | 10m from light source            | H = 10                   | H = 14                | 1 x 250w (MH)                            |                 |
| 03.     | Near shovel no. - Hyundai 500 LC-7 at V/I room coal bench | Machine height                | 20m front from machine           | H = 15<br>V = 25         | H = 15<br>V = 10      | 4 x front light to machine               |                 |
|         |                                                           |                               | 10m back from machine            | ---                      | H = 04<br>V = 02      | 1 x back light to machine                |                 |
| 04.     | In machine cabin at machine no. Hyundai 500 LC-7          | Machine cabin                 | In machine cabin                 | H = 50                   | H = 15                | 2 x Machine cabin light                  |                 |
| 05.     | Way to IX room working face -                             |                               |                                  |                          |                       |                                          |                 |
|         | At haul road                                              | 08                            | 10                               | H = 10                   | H = 46                | DN act provided with 4 x 60w (LED light) |                 |

Manager  
AKWMC

Colliery Engineer  
AKWMC

Safety Officer  
AKWMC



# Illumination Survey at BSMCL- BPL (TV)

(Tetubansi hired ocp) on 11/09/2022

| Sl. No. | Place at Illumination Obtained                         | Height at light provided in (m) | Distance at light provided in (m) | Standard at illumination | Illumination Obtained | Types at light provided                 | Remarks |
|---------|--------------------------------------------------------|---------------------------------|-----------------------------------|--------------------------|-----------------------|-----------------------------------------|---------|
| 06.     | Near type corner - Tetubansi hired ocp Coal dump       | 08                              | 20m north from light source       | H = 15<br>V = 15         | H = 35<br>V = 29      | On set provided with 4x400W (LED light) |         |
|         |                                                        |                                 | 50m west from light source        | -                        | H = 17<br>V = 13      | -                                       |         |
| 07.     | Near shovel no. later hitachi - 470(1) at X beam bench | 08                              | 20m front from machine            | H = 15<br>V = 25         | H = 09<br>V = 04      | Machine light                           |         |
| 08.     | At Parking                                             | 08                              | 20m from light source             | H = 50                   | H = 61                | On set provided with 4x400W (LED light) |         |
|         |                                                        |                                 | 50m from light source             | -                        | H = 39                | -                                       |         |
| 09.     | At haul road way to X beam                             | 12                              | 10m from light source             | H = 10                   | H = 13                | 1x200W (MH)                             |         |

Manager  
ARWMC

Colony Engineer  
ARWMC

Safety Officer  
ARWMC

# Illumination Survey at departmental OCP at AKWMC

on 17/05/2022

| Sl. No. | Place of illumination obtained                        | Height of light provided in (m) | Distance of light provided in (m)                               | Standard of Illumination | Illumination obtained | Types of light provided | Remarks |
|---------|-------------------------------------------------------|---------------------------------|-----------------------------------------------------------------|--------------------------|-----------------------|-------------------------|---------|
| 01.     | At tyre cover -                                       | 15m approx                      | 10m west from lighting source<br>10m north from lighting source | H = 10                   | H = 15                | 1 x LED light           |         |
| 02.     | At haul road way to VII A seam - 1                    | 12m approx                      | 10m from lighting source                                        | H = 10                   | H = 12                | 1 x LED light           |         |
| 03.     | At haul road way to VII A seam - 2                    | 10m approx                      | 10m from lighting source                                        | H = 10                   | H = 09                | 1 x LED light           |         |
| 04.     | Near shovel no. Tata hitachi - 1200 at IV seam        | Machine height                  | 10m front of the machine                                        | H = 35, V = 25           | H = 15, V = 23        | 4 x LED Machine light   |         |
| 05.     | In machine cabin at machine No. - Tata hitachi - 1200 | Machine cabin light             | In machine cabin                                                | H = 50                   | H = 69                | 3 x LED light           |         |
| 06.     | At IV seam coal bench                                 | Light coming from upper bench   | Tower light at IV seam bench                                    | H = 10                   | H = 08                | LED tower light         |         |

Manager  
AKWMC

Colliery Engineer  
AKWMC

Safety officer  
AKWMC



# Illumination Survey at departmental O.C.P at

A.K.U.M.C. on 22/06/2022

| S.No | Place of Illumination obtained   | Height of light provided (in m) | Distance of light provided (in m)                                 | Standard of illumination     | Illumination Obtained                       | Type of light provided                       | Remarks                 |
|------|----------------------------------|---------------------------------|-------------------------------------------------------------------|------------------------------|---------------------------------------------|----------------------------------------------|-------------------------|
| 1.   | CISF chake view point            | 15 m approx.                    | 10 m from lighting source                                         | H = 10                       | H = 14                                      | Tower LED light                              |                         |
| 2.   | Near Shovel no 522<br>Vill & Sam | Machine Height                  | 10 m front side<br>and 10 m back side<br>of machine               | H = 15<br>V = 25             | H = 27, V = 54<br>H = 18, V = 32            | Two LED front<br>One LED Back                | front side<br>Back side |
| 3.   | Near Shovel no 523<br>DIT Sam    | Machine Height                  | 10 m front side<br>& 10 m back side<br>of machine<br>(B) At cabin | H = 15<br>V = 25<br>H = 50 H | H = 28, V = 63<br>H = 19, V = 42<br>H = 133 | Metal highlight<br>Machine cabin<br>light    |                         |
| 4.   | Depth. OB dump                   | 25 m approx.                    | 50 m approx.                                                      | H = 15<br>V = 15             | H = 16<br>V = 14                            | Metal highlight                              |                         |
| 5.   | Type Curve                       | 12 m approx.                    | 20 m approx.                                                      | H = 10                       | H = 12                                      | Two different pole<br>having Metal highlight |                         |

Manager  
AKWMC

Colony Engineer  
AKWMC

Supv officer  
AKWMC

# Illumination Survey at AMPL Hired DEP.

of AKWMC on 25/07/22

| Sl. No. | Place of illumination obtained                    | Height of light provided (in m) | Distance of light provided (in m) | Standard of illumination | Illumination obtained | Types of light provided | Remarks |
|---------|---------------------------------------------------|---------------------------------|-----------------------------------|--------------------------|-----------------------|-------------------------|---------|
| 1.      | OB dumping place beside haul road                 | 12 m approx                     | 30 m approx                       | $H=15, V=15$             | $H=108, V=83$         | Metal highlight         |         |
|         | - do -                                            | - do -                          | 50 m approx                       | $H=15, V=15$             | $H=33, V=51$          | - do -                  |         |
|         | - do -                                            | - do -                          | 100 m approx                      | $H=15, V=15$             | $H=24, V=16$          | - do                    |         |
| 2.      | At Haul road (22 km)                              | 30 m approx                     | 50 m approx                       | $H=10$                   | $H=19$                | Metal highlight         |         |
| 3.      | At pumping Station                                | 12 m approx                     | 30 m approx                       | $H=40$                   | $H=330$               | LED                     |         |
|         | - do -                                            | - do -                          | 100 m approx                      |                          | $H=120$               |                         |         |
| 4.      | Near rest shelter at IV beam Near pumping station | 10 m approx                     | 50 m approx                       | $H=30$                   | $H=64$                | LED                     |         |
| 5.      | At Haul road way to V beam parking                | 30 m approx                     | 50 m approx                       | $H=10$                   | $H=12$                | Metal highlight         |         |
| 6.      | Near Townlight at V beam parking                  | 08 m approx                     | 50 m approx                       | $H=10$                   | $H=31$                | Metal highlight         |         |

Manager  
AKWMC

Colony Engineer  
AKWMC

Manager  
AKWMC

Safety officer  
AKWMC



# Illumination Survey at Departmental OEP of

AKWMC on 24/08/22

| Sr | Place of illumination obtained                 | Height of light source (in m) | Distance of light source (in m) | Standard of illumination | Illumination obtained | Type of light provided               | Remarks |
|----|------------------------------------------------|-------------------------------|---------------------------------|--------------------------|-----------------------|--------------------------------------|---------|
| 1. | At Departmental Parking - At Centre of parking | 15 m approx                   | 10 m West from lighting source  | H = 30                   | H = 32                | 2 x LED LIGHT (Tower light provided) |         |
|    |                                                |                               | 15 m East from lighting source  | H = 50                   | H = 59                | 4 x MH light (Tower light provided)  |         |
| 2. | East side of parking                           | 12 m approx                   | 10 m North from lighting source | H = 50                   | H = 51                | 2 x HPSV light                       |         |
| 3. | One lighting pole at South side of parking     | 12 m approx                   | 10 m North from lighting source | H = 50                   | H = 53                | 2 x HPSV light                       |         |
| 4. | AT Type Curve (Junction point)                 | 15 m approx                   | 10 m West from lighting source  | H = 10                   | H = 12                | 1 x LED light                        |         |
|    |                                                |                               | 15 m North from lighting source | H = 10                   | H = 10                | 1 x LED light                        |         |

Manager  
AKWMC

Colliery Engineer  
AKWMC

Safety officer  
AKWMC



Illumination Survey at Departmental OCP of AKWML

on 24/09/20

| S.No. | Place of illumination obtained      | Height of light source | Distance of light source |
|-------|-------------------------------------|------------------------|--------------------------|
| 1.    | Type Curve                          | 12m                    | 20 m                     |
| 2.    | Dept. O.B. Dump                     | 25m                    | 50 m                     |
| 3.    | From Type Curve to VII Seam (Depth) |                        |                          |
|       | pole 1.                             | 12 m                   | 15 m                     |
|       | pole 2.                             | - do -                 | - do -                   |
|       | pole 3.                             | - do -                 | - do -                   |
|       | pole 4.                             | - do -                 | - do -                   |
|       | pole 5.                             | - do -                 | - do -                   |
|       | pole 6.                             | - do -                 | - do -                   |
| 4.    | Type Curve to Ghani Dump            | 12 m                   | 15 m                     |
|       | pole 1                              | - do -                 | - do -                   |
|       | pole 2                              | - do -                 | - do -                   |
|       | pole 3                              | - do -                 | - do -                   |
|       | pole 4                              | - do -                 | - do -                   |
|       | pole 5                              | - do -                 | - do -                   |

| Standard of illumination | Illumination obtained | Type of light provided                    | Remarks |
|--------------------------|-----------------------|-------------------------------------------|---------|
| H = 10                   | H = 11                | Two different pole having metal highlight |         |
| H = 15<br>V = 15         | H = 16<br>V = 17      | Metal highlight                           |         |
| H = 10                   | H = 12                | LED light                                 |         |
|                          | H = 13                | - do -                                    |         |
|                          | H = 14                | - do -                                    |         |
|                          | H = 15                | - do -                                    |         |
|                          | H = 16                | - do -                                    |         |
| H = 10                   | H = 12                | LED light                                 |         |
|                          | H = 13                | - do -                                    |         |
|                          | H = 14                | - do -                                    |         |
|                          | H = 15                | - do -                                    |         |
|                          | H = 16                | - do -                                    |         |

Manager  
AKWML

Colliery Engineer  
AKWML

Safety Officer  
AKWML

Illustration during at Departmental exp. of

24/10/22

| Sl. No. | Place of illumination obtained        | Height of light source (in m) | Distance of light source (in m) |
|---------|---------------------------------------|-------------------------------|---------------------------------|
| 1       | At Departmental building              | 15m                           | 15m west                        |
| 2       | East side of parking                  | 12m                           | 10m North                       |
| 3       | Lighting pole at East side of parking | 12m                           | 10m North                       |
| 4       | AT type Curve (Simulation pole)       | 15m                           | 10m west                        |
| 5       | Type Curve as AT, type 2 & 3          |                               |                                 |
|         | road pole 1                           | 12m                           | 10m South                       |
|         | pole 2                                | 12m                           | 12m South                       |
|         | pole 3                                | 10m                           | 15m South                       |

| Height of illumination | illumination obtained | Types of light provided          | Remarks |
|------------------------|-----------------------|----------------------------------|---------|
| H=15                   | H=69                  | LED 1 mnd highlight (Twin light) |         |
| H=12                   | H=51                  | 2x HSPV light                    |         |
| H=12                   | H=54                  | 2x HSPV light                    |         |
| H=15                   | H=10                  | LED light                        |         |
| H=12                   | H=13                  | LED light                        |         |
|                        | H=13                  | "                                |         |
|                        | H=10                  | "                                |         |

Cableing Engineer  
A. K. J.

Safety Officer  
A. K. J.

illumination survey at AMOL Hand dip on 12/1/22

| Sl. No. | Place of illumination observed | Height of light source | Distance of light source                  | Standard of illumination | Illumination obtained | Types of light provided | Remarks |
|---------|--------------------------------|------------------------|-------------------------------------------|--------------------------|-----------------------|-------------------------|---------|
| 1.      | IT Room Top Kantha 300         | Machine Height         | 20m front side<br>20m back side           | $H = 15$<br>$V = 25$     | $H = 18$<br>$V = 27$  | Machine light           |         |
| 2.      | IT Room OP Kantha 480          | Machine Height         | 20m from front side<br>20m from back side | $H = 15$<br>$V = 25$     | $H = 19$<br>$V = 26$  | Machine light           |         |
| 3.      | IT Room parking solar 1174     | Machine Height         | 20m from front side<br>20m from back side | $H = 15$ $V = 25$        | $H = 17$<br>$V = 26$  | Machine light           |         |

Signature  
Celling Engineer  
A. K. S. M. S.

Signature  
Safety Officer  
A. K. S. M. S.



# Illumination Survey at AMPL Haul Stop

| Sl. No. | Place of Illumination obtained   | Height of Light Source | Distance of Light Source |
|---------|----------------------------------|------------------------|--------------------------|
| 4.      | At parking station               | 20m                    | 30 m                     |
|         |                                  |                        | 100 m                    |
| 5.      | Near Haul road turning at X Stem | 20m                    | 25m                      |
| 6.      | At Haul road - 0 stem parking    | 30m                    | 50m                      |
|         |                                  |                        | 100m                     |

Manager

Celling Engineer

| Standard of Illumination | Illumination obtained | Types of Light provided | Remarks |
|--------------------------|-----------------------|-------------------------|---------|
| H=40                     | H=71                  | Metal highlight         |         |
|                          | H=42                  |                         |         |
| H=10                     | H=13                  | Metal highlight         |         |
| H=10                     | H=14                  | Metal highlight         |         |
| H=10                     | H=11                  | "                       |         |

Safety Officer

# Illumination Survey at Roadside 2. Sean 07

10/11/22

| Sl. No. | Place of illumination obtained | Height of light source | Distance of light source |
|---------|--------------------------------|------------------------|--------------------------|
| 1.      | 31 L 1 Dip (Semi-traffic)      | 1.2 m                  | 3 m                      |
| 2.      | 30 L 2 Dip                     | 1.4 m                  | 2 m                      |
| 3.      | 30 L 1 Dip                     | 1.2 m                  | 2 m                      |
| 4.      | 30 L 2 Dip                     | 1.2 m                  | 2 m                      |
| 5.      | 30 L 3 Dip                     | 1.2 m                  | 2 m                      |
| 6.      | 30 L 0 Dip                     | 1.2 m                  | 3 m                      |
| 7.      | 30 L 0 Dip                     | 1.2 m                  | 2 m                      |
| 8.      | 30 L 0 Dip                     | 1.2 m                  | 3 m                      |
| 9.      | 31 L 3 Dip<br>parking station  | 1.5 m                  | 3 m                      |

| Standard of illumination | Illumination obtained | Type of light provided | Remarks |
|--------------------------|-----------------------|------------------------|---------|
| H = 10 V = 10            | H = 11 V = 12         | C + L                  |         |
| H = 10 V = 10            | H = 12 V = 11         | "                      |         |
| H = 10 V = 10            | H = 13 V = 14         | "                      |         |
| H = 10 V = 10            | H = 11 V = 13         | "                      |         |
| H = 10 V = 10            | H = 12 V = 12         | "                      |         |
| H = 10 V = 10            | H = 12 V = 12         | "                      |         |
| H = 10 V = 10            | H = 11 V = 11         | "                      |         |
| H = 10 V = 10            | H = 12 V = 13         | "                      |         |
| H = 30                   | H = 33                | "                      |         |

Dr  
M. S. G. S.  
A. S. G. S.

Dr. S. S.  
College Engineer  
A. S. G. S.

Dr. S. S.  
Safety Officer  
A. S. G. S.

# Illumination Survey at DECO - RmPL - BKB(JV) Hired patch on 09/04/2022

| Sl.No. | Place of illumination Obtained                    | Height at light source in(m) | Distance at light source in(m) | Standard at illumination | Illumination Obtained | Types at light provided | Remarks. |
|--------|---------------------------------------------------|------------------------------|--------------------------------|--------------------------|-----------------------|-------------------------|----------|
| 1.     | OB dumping place beside haul road                 | 12                           | 30                             | H = 15<br>V = 15         | H = 135<br>V = 75     | 8 X 6000W (MH)          |          |
|        | " "                                               | "                            | 50                             | "                        | H = 72, V = 45        | " "                     |          |
|        | " "                                               | "                            | 100                            | "                        | H = 11, V = 22        | " "                     |          |
| 2.     | At haul road (S side)                             | 30                           | 50                             | H = 10                   | H = 01                | 3 X 4000W (MH)          |          |
| 3.     | At pumping station                                | 12                           | 30                             | H = 40                   | H = 550               | 2 X 1000W (LED)         |          |
|        | " "                                               | "                            | 100                            | "                        | H = 120               | " "                     |          |
| 04.    | Near rest shelter at IV seam near pumping station | 10                           | 50                             | H = 50                   | H = 44                | " "                     |          |
| 05.    | At haul road way to I seam parking                | 30                           | 50                             | H = 10                   | H = 05                | 4 X 4000W (MH)          |          |
| 06.    | Near tower light at V seam parking                | 08                           | 50                             | H = 10                   | H = 35                | " "                     |          |

Manager  
AKWMC

Colliery Engineer  
AKWMC

Safety Officer  
AKWMC  
09/04/2022



| Sl. No. | Place at illumination obtained                     | Height at light source in cm | Distance at light source in m | Standard at illumination | Illumination obtained | Types at light provided       | Remarks              |
|---------|----------------------------------------------------|------------------------------|-------------------------------|--------------------------|-----------------------|-------------------------------|----------------------|
| 07.     | Near haul road turning at X-seam                   | 10                           | 30                            | H = 10                   | H = 11                | 1 x 400w (MH)                 |                      |
| 08.     | At OB dump beside haul road                        | 12                           | 25                            | H = 15<br>V = 15         | H = 22<br>V = 27      | 2 x 400w (MH)                 |                      |
| 09.     | At haul road near VII seam                         | 40                           | 50                            | H = 10                   | H = 2                 | 1 x 400w (MH)                 |                      |
| 10.     | Near shovel no. valvo - 353 (At bucket rest)       | Machine height               | 20m from front at machine     | H = 15<br>V = 25         | H = 51<br>V = 43      | 6 x LED light (Machine light) |                      |
|         |                                                    |                              | 10m from back at machine      | - " -                    | H = 12<br>V = 07      | 2 light (Machine light)       |                      |
| 11.     | East of view point (Near OB dumping is being done) | 12                           | 50                            | H = 15<br>V = 15         | H = 1<br>V = 0        | 1 x 400w (MH)                 | More light required. |
| 12.     | In machine cabin of machine no. Valvo - 353        | Machine cabin light          | In machine cabin              | H = 50                   | H = 23                | 2 x Machine cabin light       | More light required. |

Manager  
ARWMC

Cellery Engineer  
ARWMC

Safety Officer  
ARWMC



# Illumination survey at BSMCPL - BEPL (JV)

(Telukmari) hired Patch on 11/04/2022

| SL. No. | Place at illumination obtained                             | Height at light source in (m) | Distance at light source in (m)  | Standard at illumination | Illumination obtained | Types at light provided                  | Remarks |
|---------|------------------------------------------------------------|-------------------------------|----------------------------------|--------------------------|-----------------------|------------------------------------------|---------|
| 01.     | Near weight bridge (Type curve)                            | 08                            | 20m west from light source       | H = 10                   | H = 32                | 4x LED light<br>06 set provided          |         |
|         |                                                            |                               | 50m north-east from light source | H = 10                   | H = 12                | —                                        |         |
| 02.     | At haul road - way to VIII seam                            | 12                            | 10m from light source            | H = 10                   | H = 14                | 1x 250w (MH)                             |         |
| 03.     | Near shovel no. - Hyundai 500 LC-7 at S/VI seam coal bench | Machine height                | 20m front from machine           | H = 15<br>V = 25         | H = 15<br>V = 10      | 4x front light at machine                |         |
|         |                                                            |                               | 10m Back from machine            | —                        | H = 04<br>V = 02      | 1x back light at machine                 |         |
| 04.     | In machine cabin at machine no. Hyundai 500 LC-7           | Machine cabin                 | In machine cabin                 | H = 50                   | H = 15                | 2x Machine cabin light                   |         |
| 05.     | Way to IX seam working face -                              |                               |                                  |                          |                       |                                          |         |
|         | At haul road                                               | 08                            | 20                               | H = 10                   | H = 46                | 06 set provided with 4x 400w (LED light) |         |

Manager  
AKWMC

Colliery Engineer  
AKWMC

Safety Officer  
AKWMC

Illumination Survey at BSMCEP - BEPL (TV) (Tetukmari hired ocp) on 11/09/2022

| Sl. No. | Place at Illumination Obtained                  | Height at light provided in (m) | Distance at light provided in (m) | Standard at illumination | Illumination Obtained | Types at light provided                 | Remarks |
|---------|-------------------------------------------------|---------------------------------|-----------------------------------|--------------------------|-----------------------|-----------------------------------------|---------|
| 06.     | Near tyre curve - Tetukmari hired ocp Coal dump | 08                              | 20m north from light source       | $H = 15$<br>$V = 15$     | $H = 35$<br>$V = 29$  | On set provided with 4x400w (LED light) |         |
|         |                                                 |                                 | 50m west from light source        | - - -                    | $H = 17$<br>$V = 13$  | - - -                                   |         |
| 07.     | Near shovel no. 470 (1) at V beam bench         | 08                              | 20m front from machine            | $H = 15$<br>$V = 25$     | $H = 09$<br>$V = 04$  | Machine light                           |         |
| 08.     | At Parking                                      | 08                              | 20m from light source             | $H = 50$                 | $H = 61$              | On set provided with 4x400w (LED light) |         |
|         |                                                 |                                 | 50m from light source             | - - -                    | $H = 39$              | - - -                                   |         |
| 09.     | At haul road way to V beam                      | 12                              | 10m from light source             | $H = 10$                 | $H = 13$              | 1x200w (MH)                             |         |

By  
Manager  
ARWMC

By  
Colliery Engineer  
ARWMC

By  
Safety Officer  
ARWMC



Date/Time: Vert at 13:52:23 July 2, 2022  
 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

Serial Number: UM10858 V 10-77 Micromate ISEE  
 Battery Level: 3.8 Volts  
 Unit Calibration: November 18, 2021 by CIMFR Dhanbad  
 File Name: UM10858\_20220702135223 IDFW

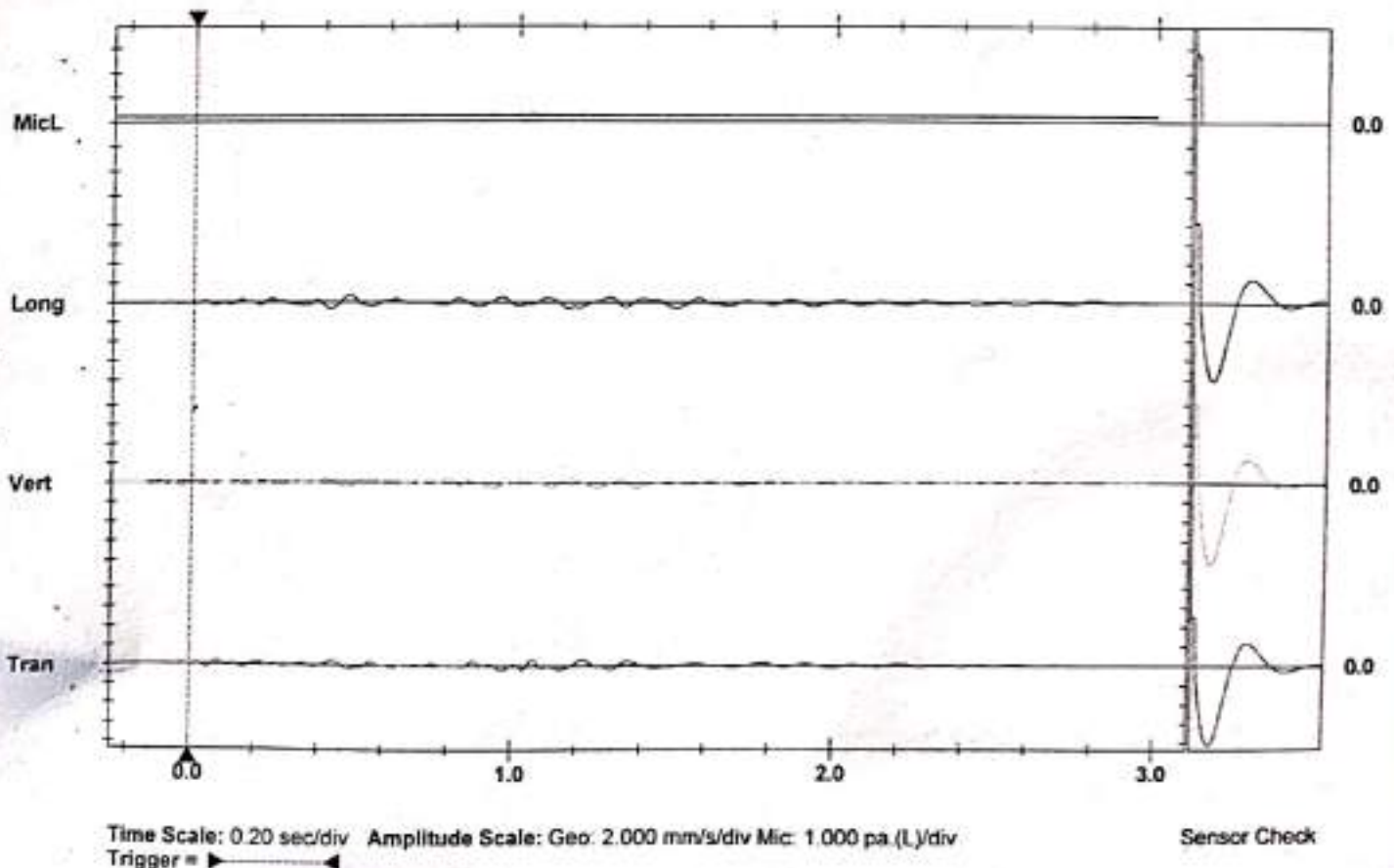
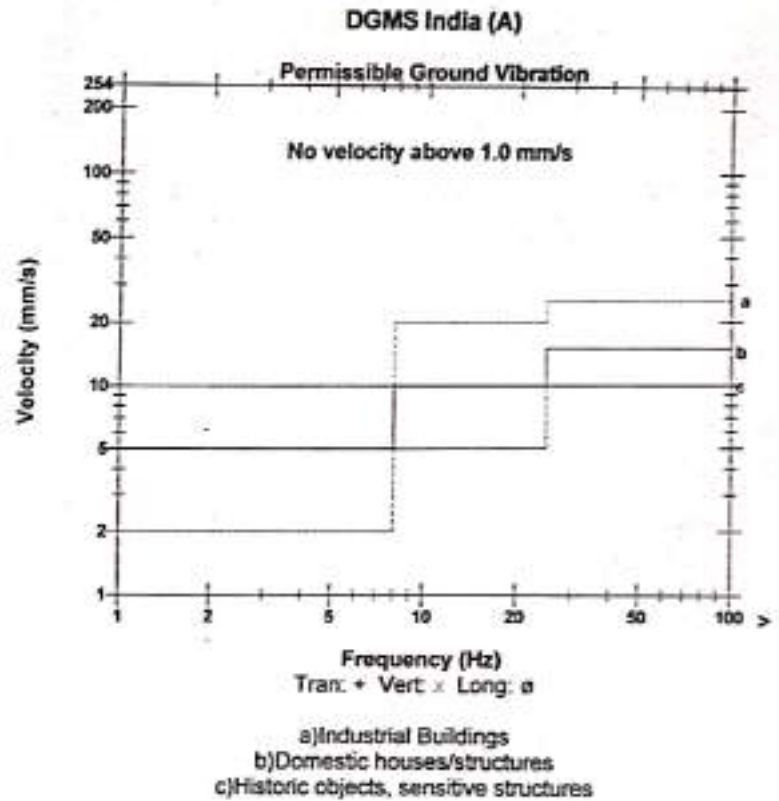
Notes:  
 Location:  
 Client:  
 User Name:  
 General:

Post Event Notes  
 A K W M C  
 Distance from blasting-200mtr

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                 | 0.631  | 0.741  | 0.694  | mm/s |
| ZC Freq             | 13.5   | 15.1   | 8.9    | Hz   |
| Time (Rel. to Trig) | 1.065  | 0.002  | 0.483  | sec  |
| Peak Acceleration   | 0.010  | 0.012  | 0.012  | g    |
| Peak Displacement   | 0.013  | 0.012  | 0.020  | mm   |
| Sensor Check        | Passed | Passed | Passed |      |
| Frequency           | 7.5    | 7.7    | 7.5    | Hz   |
| Overswing Ratio     | 3.5    | 3.4    | 3.3    |      |

Peak Vector Sum: 0.931 mm/s at 0.487 sec  
 N/A: Not Applicable



Time: Vert at 14:26:09 July 9, 2022  
 User 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

Serial Number: UM16971 V 10-89 Micromate ISEE  
 Battery Level: 3.8 Volts  
 Unit Calibration: November 18, 2021 by CIMFR Dhanabd  
 File Name: UM16971\_20220709142609.IDFW

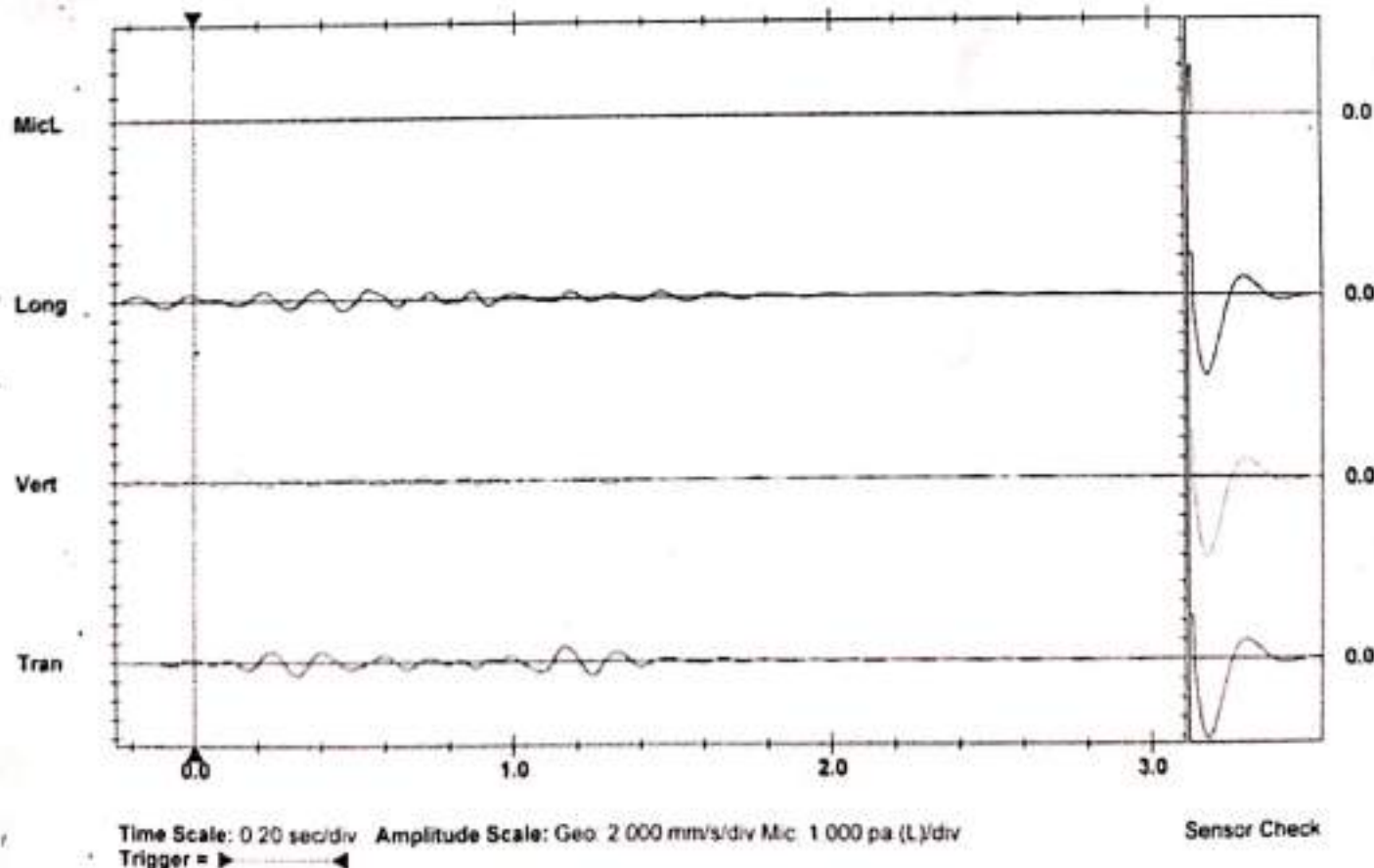
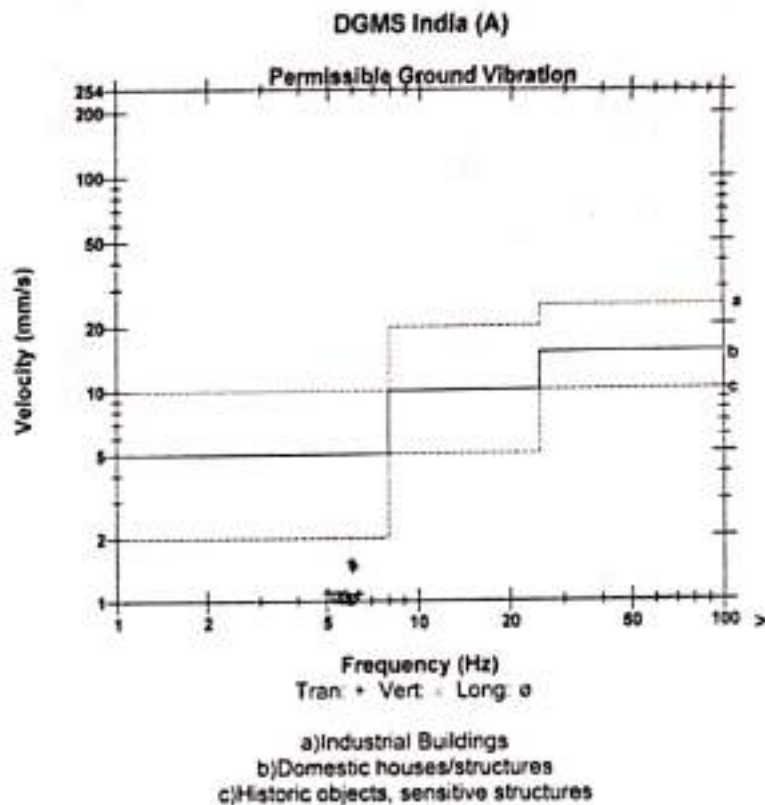
Post Event Notes  
 A K W M C  
 Distance from blasting-190mtr

Notes  
 Location:  
 Client:  
 User Name:  
 General:

Microphone: Linear Weighting  
 PSPL: <0.500 pa (L)  
 ZC Freq: 45 Hz  
 Channel Test: Check (Freq = 0.0 Hz Amp = 0 mv)

|                     | Tran   | Vert   | Long   |      |
|---------------------|--------|--------|--------|------|
| PPV                 | 1.529  | 0.930  | 1.064  | mm/s |
| ZC Freq             | 6.0    | 6.1    | 5.4    | Hz   |
| Time (Rel. to Trig) | 1.161  | 0.155  | 0.546  | sec  |
| Peak Acceleration   | 0.015  | 0.010  | 0.012  | g    |
| Peak Displacement   | 0.041  | 0.023  | 0.031  | mm   |
| Sensor Check        | Passed | Passed | Passed |      |
| Frequency           | 7.3    | 7.3    | 7.5    | Hz   |
| Overswing Ratio     | 4.3    | 4.6    | 4.6    |      |

Peak Vector Sum: 1.634 mm/s at 1.171 sec  
 N/A: Not Applicable



# Event Report

Vert at 12:56:51 July 11, 2022

Source Geo: 0.700 mm/s, Mic: 68.95 pa (L)

Geo: 254.0 mm/s

Record Time 3.0 sec at 2048 sps

Operator/Setup: Operator/factory.MMB

## Notes

Location:

Client:

User Name:

General:

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                 | 0.244  | 0.701  | 0.473  | mm/s |
| ZC Freq             | 12.5   | 14.4   | 18.6   | Hz   |
| Time (Rel. to Trig) | 2.188  | 0.000  | -0.001 | sec  |
| Peak Acceleration   | 0.012  | 0.013  | 0.010  | g    |
| Peak Displacement   | 0.004  | 0.008  | 0.006  | mm   |
| Sensor Check        | Passed | Passed | Check  |      |
| Frequency           | 7.5    | 7.7    | 8.5    | Hz   |
| Overswing Ratio     | 3.4    | 3.3    | 3.4    |      |

Peak Vector Sum 0.827 mm/s at 0.000 sec

N/A: Not Applicable

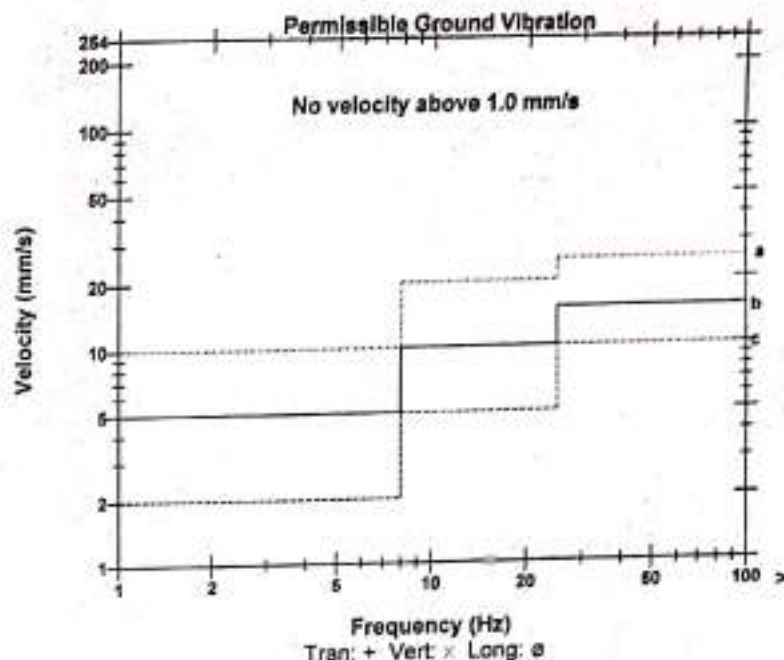
Serial Number UM10858 V 10-77 Micromate ISEE  
Battery Level 3.8 Volts  
Unit Calibration November 18, 2021 by CIMFR Dhanbad  
File Name UM10858\_20220711125651.IDFW

## Post Event Notes

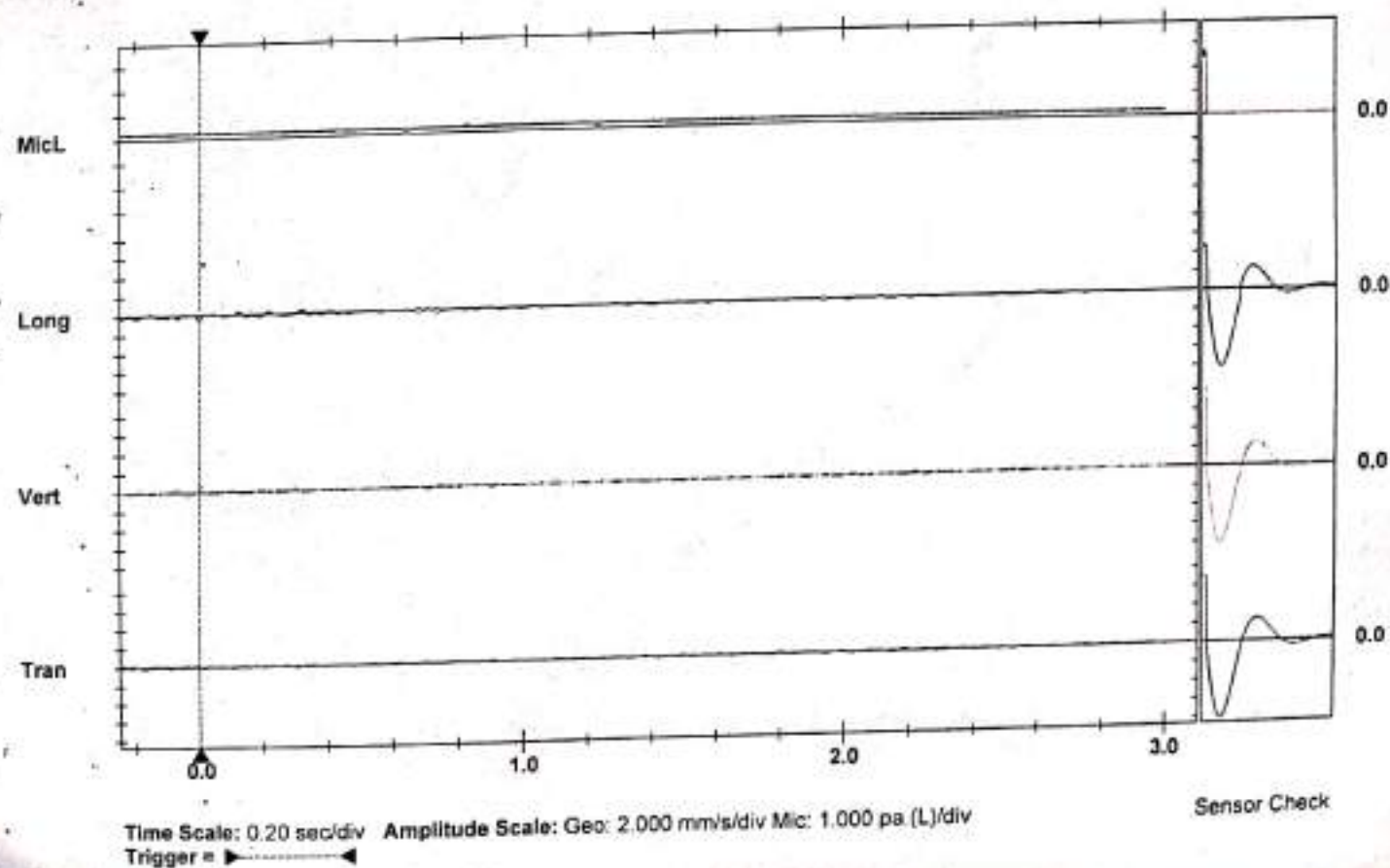
A K W M C

Distance from blasting-150mtr

## DGMS India (A)



- a) Industrial Buildings
- b) Domestic houses/structures
- c) Historic objects, sensitive structures





# Event Report

Source: Vert at 14:51:12 July 20, 2022  
 Geo: 0.700 mm/s, Mic: 68.95 pa.(L)  
 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: 3.5 Volts  
 Unit Calibration: November 18, 2021 by CIMFR Dhanbad  
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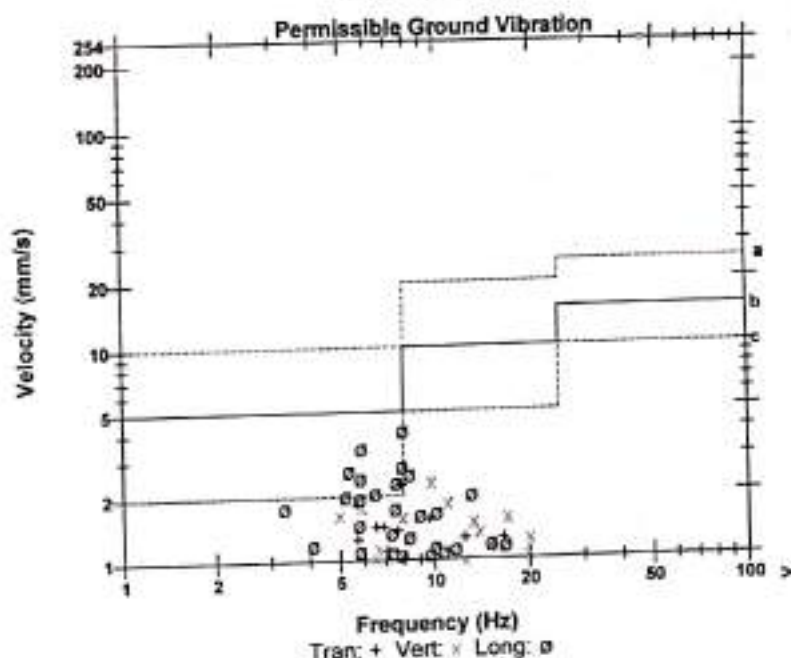
Post Event Notes  
 A K W M C  
 Distance from blasting-120mtr

Microphone: Linear Weighting  
 PSPL: <0.500 pa.(L)  
 ZC Freq: N/A  
 Channel Test: Check (Freq = 0.0 Hz Amp = 0 mv)

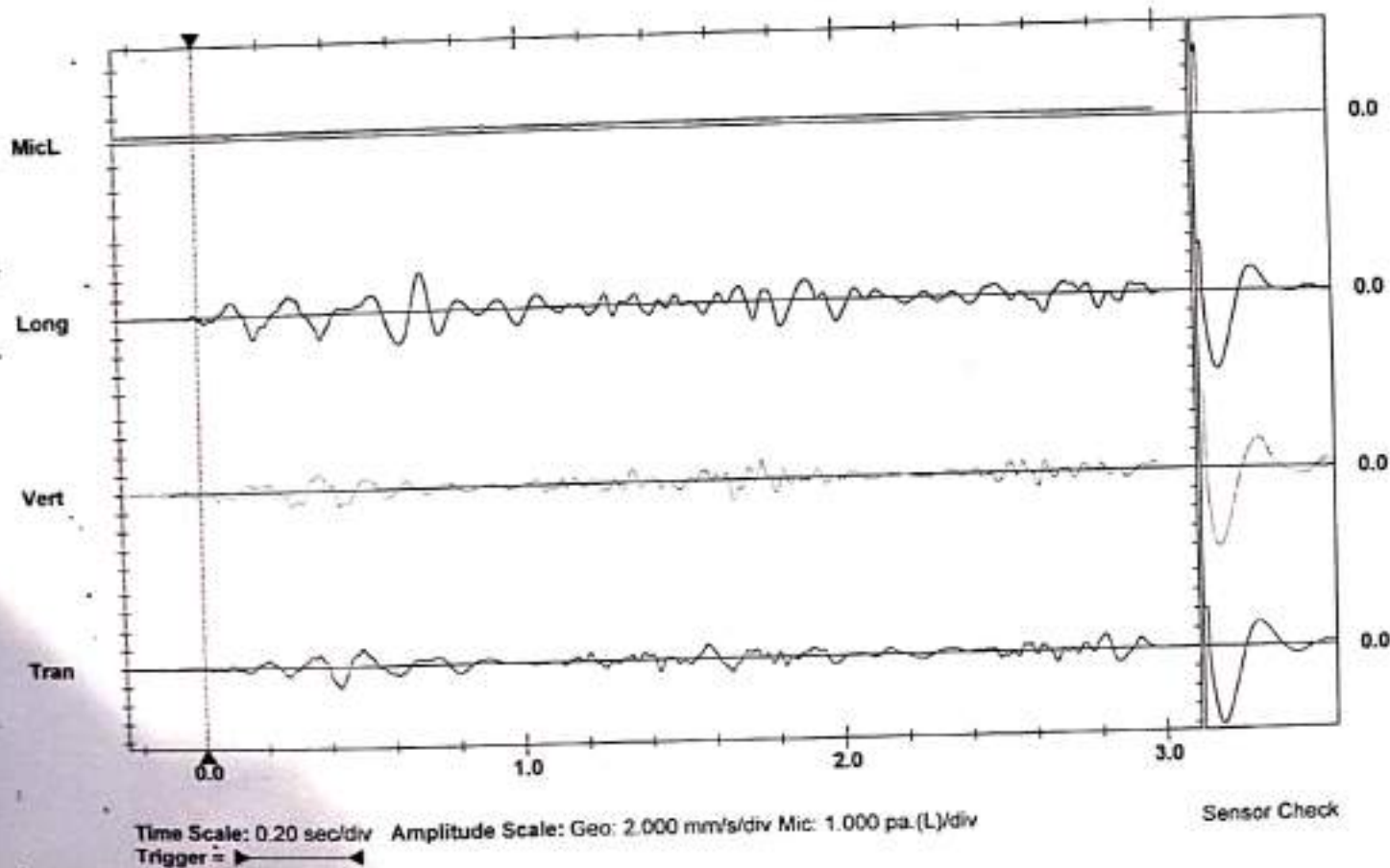
|                     | Tran   | Vert   | Long   |      |
|---------------------|--------|--------|--------|------|
| PPV                 | 2.246  | 2.317  | 4.035  | mm/s |
| ZC Freq             | 7.9    | 9.8    | 7.9    | Hz   |
| Time (Rel. to Trig) | 0.427  | 1.663  | 0.692  | sec  |
| Peak Acceleration   | 0.018  | 0.036  | 0.026  | g    |
| Peak Displacement   | 0.046  | 0.043  | 0.094  | mm   |
| Sensor Check        | Passed | Passed | Passed |      |
| Frequency           | 7.5    | 7.5    | 7.5    | Hz   |
| Overswing Ratio     | 3.3    | 2.7    | 3.3    |      |

Peak Vector Sum: 4.092 mm/s at 0.693 sec  
 N/A: Not Applicable

## DGMS India (A)



a) Industrial Buildings  
 b) Domestic houses/structures  
 c) Historic objects, sensitive structures



Date/Time: Tran at 15:24 10 July 9, 2022  
 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

Serial Number: UM10858 V 10-77 Micromate ISEE  
 Battery Level: 3.8 Volts  
 Unit Calibration: November 18, 2021 by CIMFR Dhanbad  
 File Name: UM10858\_20220709152410.IDFW

Notes

Location:  
 Client:  
 User Name:  
 General:

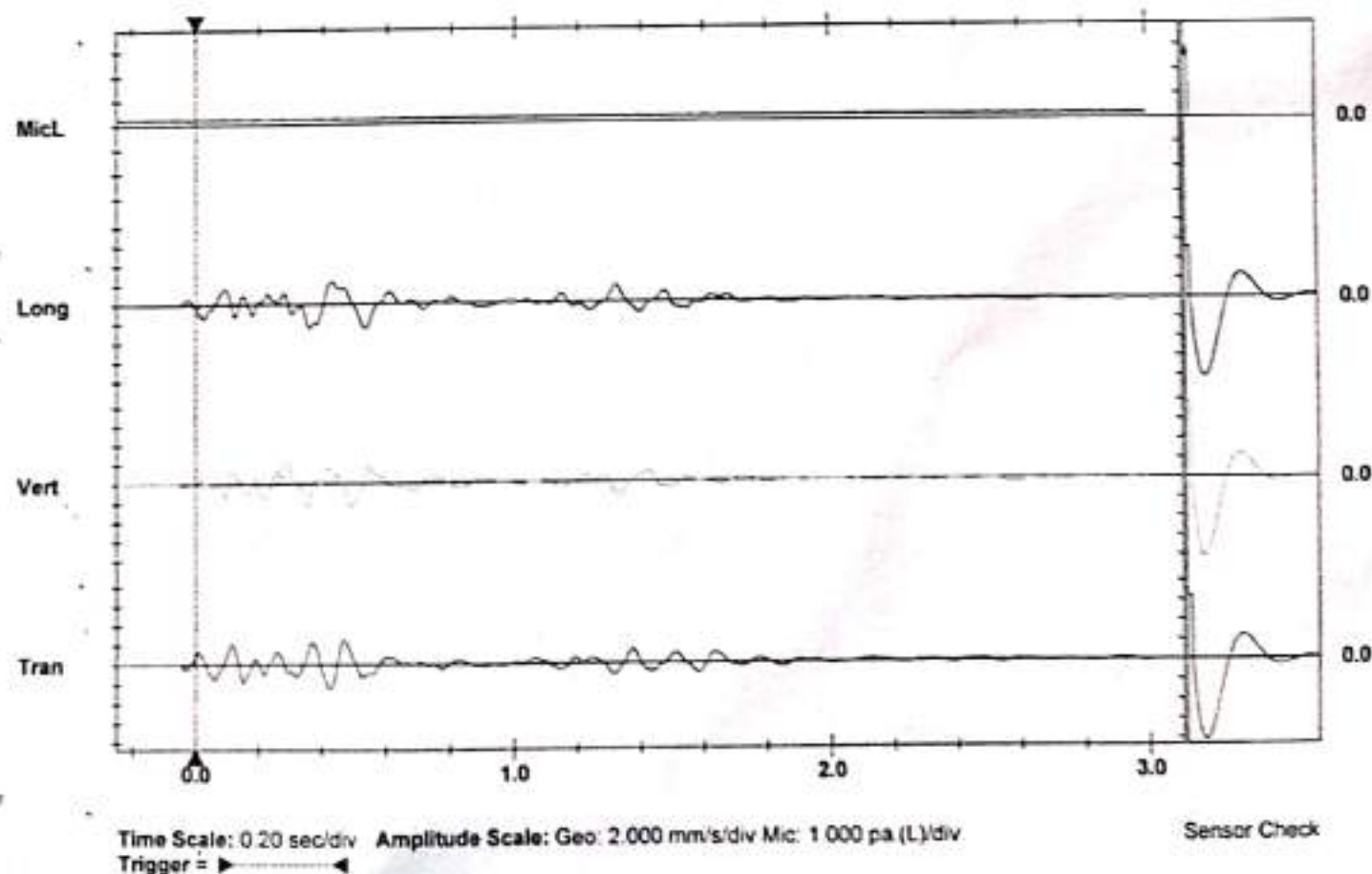
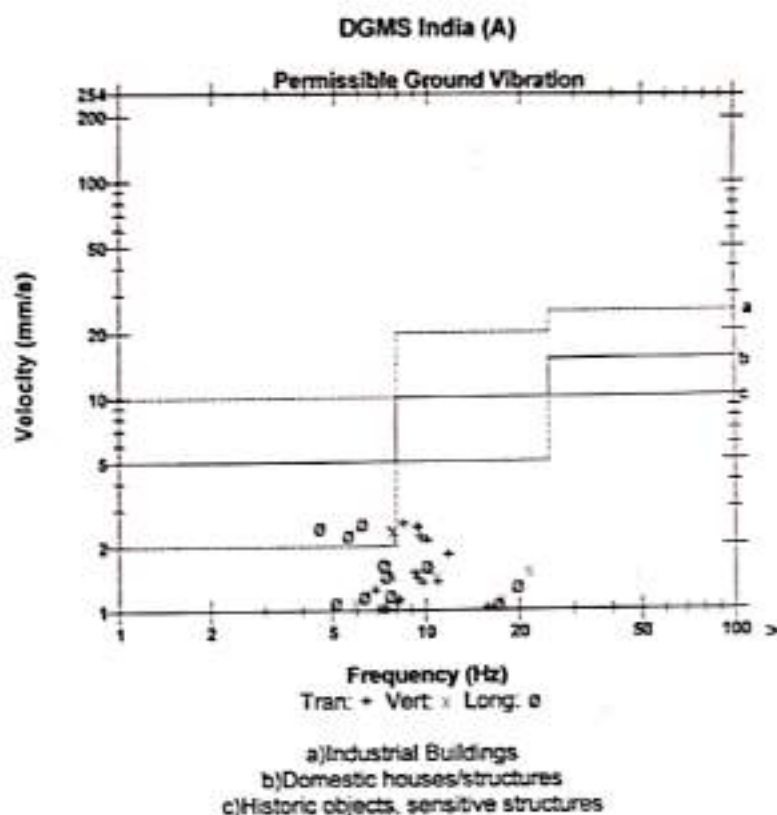
Post Event Notes

Tetulmani hired  
 Distance from blasting-150mtr

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                 | 2.569  | 2.396  | 2.569  | mm/s |
| ZC Freq             | 8.5    | 7.8    | 6.2    | Hz   |
| Time (Rel. to Trig) | 0.467  | 0.490  | 0.533  | sec  |
| Peak Acceleration   | 0.025  | 0.025  | 0.021  | g    |
| Peak Displacement   | 0.043  | 0.042  | 0.066  | mm   |
| Sensor Check        | Passed | Passed | Passed |      |
| Frequency           | 7.5    | 7.9    | 7.5    | Hz   |
| Overswing Ratio     | 3.4    | 3.4    | 3.4    |      |

Peak Vector Sum: 3.707 mm/s at 0.425 sec  
 N/A: Not Applicable





Time Tran at 12:54:15 July 11, 2022  
 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

Serial Number UM10858 V 10-77 Micromate ISEE  
 Battery Level 3.8 Volts  
 Unit Calibration November 18, 2021 by CIMFR Dhanbad  
 File Name UM10858\_20220711125415.IDFW

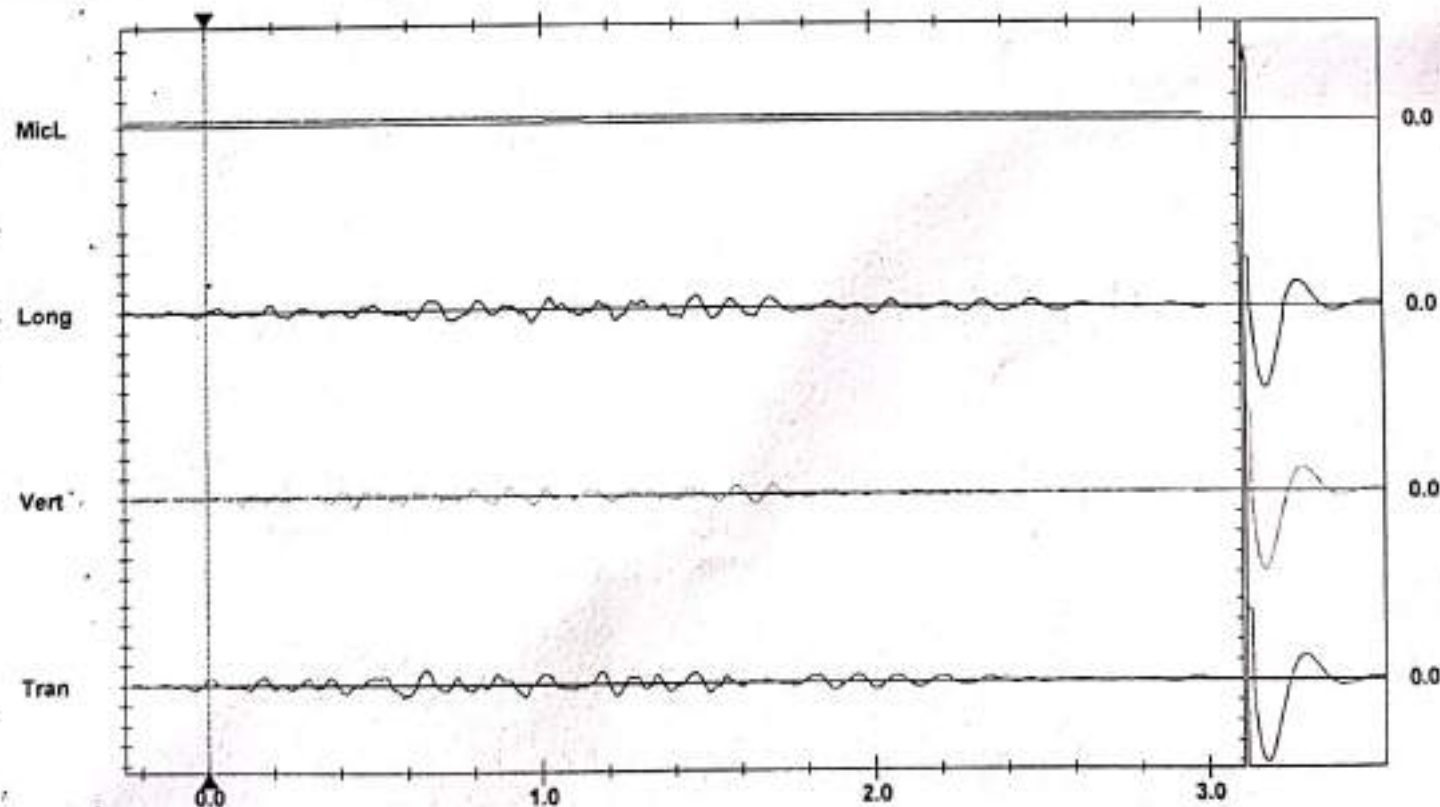
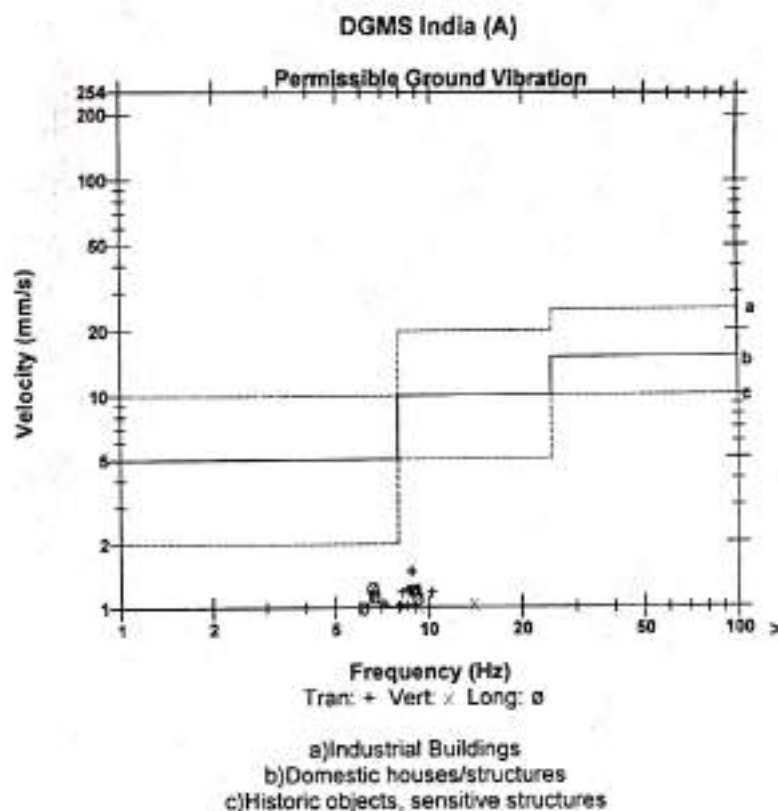
Notes  
 Location:  
 Client:  
 User Name:  
 General:

Post Event Notes  
 Trilumari hired  
 Distance from blasting-200mtr

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                 | 1.482  | 1.040  | 1.253  | mm/s |
| ZC Freq             | 8.8    | 14.0   | 6.6    | Hz   |
| Time (Rel. to Trig) | 0.655  | 0.441  | 0.968  | sec  |
| Peak Acceleration   | 0.013  | 0.021  | 0.016  | g    |
| Peak Displacement   | 0.027  | 0.016  | 0.025  | mm   |
| Sensor Check        | Passed | Passed | Passed |      |
| Frequency           | 7.5    | 7.7    | 8.2    | Hz   |
| Overswing Ratio     | 3.4    | 3.4    | 3.4    |      |

Peak Vector Sum 1.732 mm/s at 1.224 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  
 Trigger =

Sensor Check

Time Vert at 13:24:11 July 20, 2022  
 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:

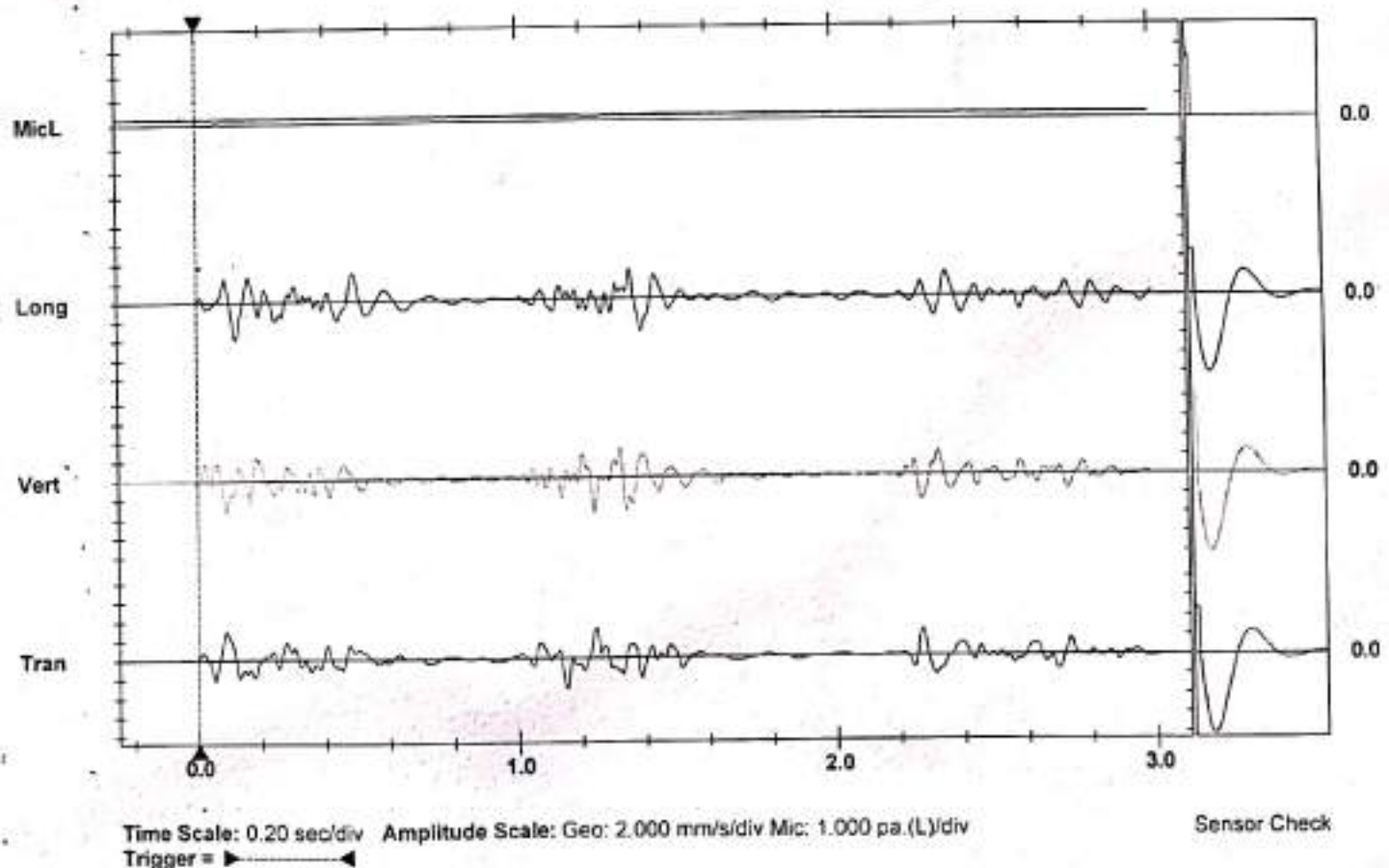
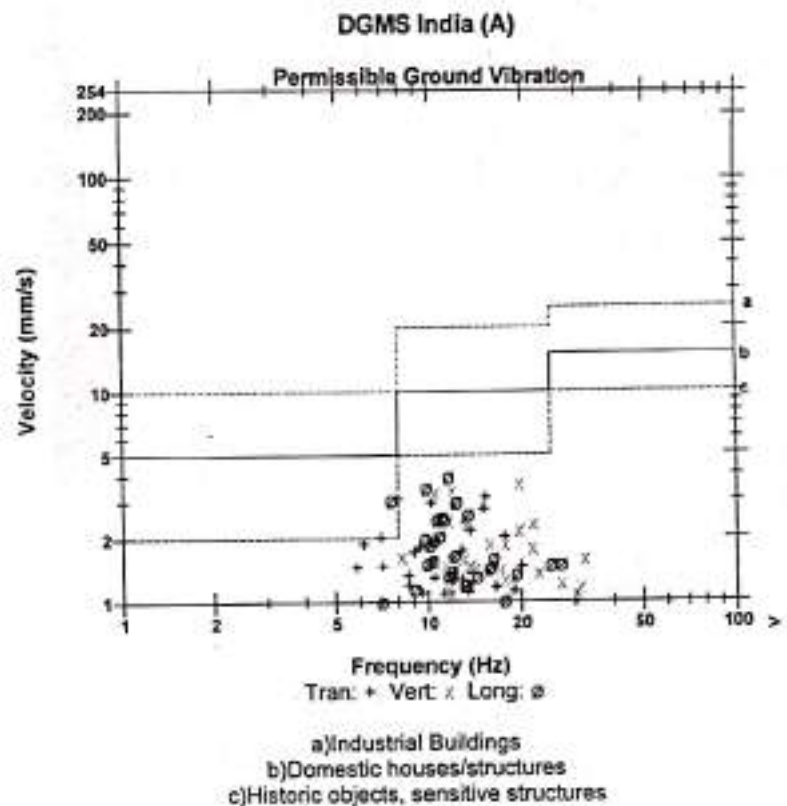
Serial Number UM10858 V 10-77 Micromate ISEE  
 Battery Level 3.5 Volts  
 Unit Calibration November 18, 2021 by CIMFR Dhanbad  
 File Name UM10858\_20220720132411.IDFW

Post Event Notes  
 Tetulmari hired  
 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                 | 3.137  | 3.618  | 3.917  | mm/s |
| ZC Freq             | 15.3   | 19.7   | 11.6   | Hz   |
| Time (Rel. to Trig) | 1.149  | 1.238  | 0.123  | sec  |
| Peak Acceleration   | 0.031  | 0.061  | 0.036  | g    |
| Peak Displacement   | 0.047  | 0.048  | 0.050  | mm   |
| Sensor Check        | Passed | Passed | Passed |      |
| Frequency           | 7.5    | 7.9    | 7.7    | Hz   |
| Overswing Ratio     | 3.5    | 3.3    | 3.3    |      |

Peak Vector Sum 4.991 mm/s at 0.090 sec  
 N/A: Not Applicable



Time Vert at 13:23:32 July 22, 2022  
 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

Serial Number UM16971 V 10-89 Micromate ISEE  
 Battery Level 3.6 Volts  
 Unit Calibration November 18, 2021 by CIMFR Dhanabd  
 File Name UM16971\_20220722132332.IDFW

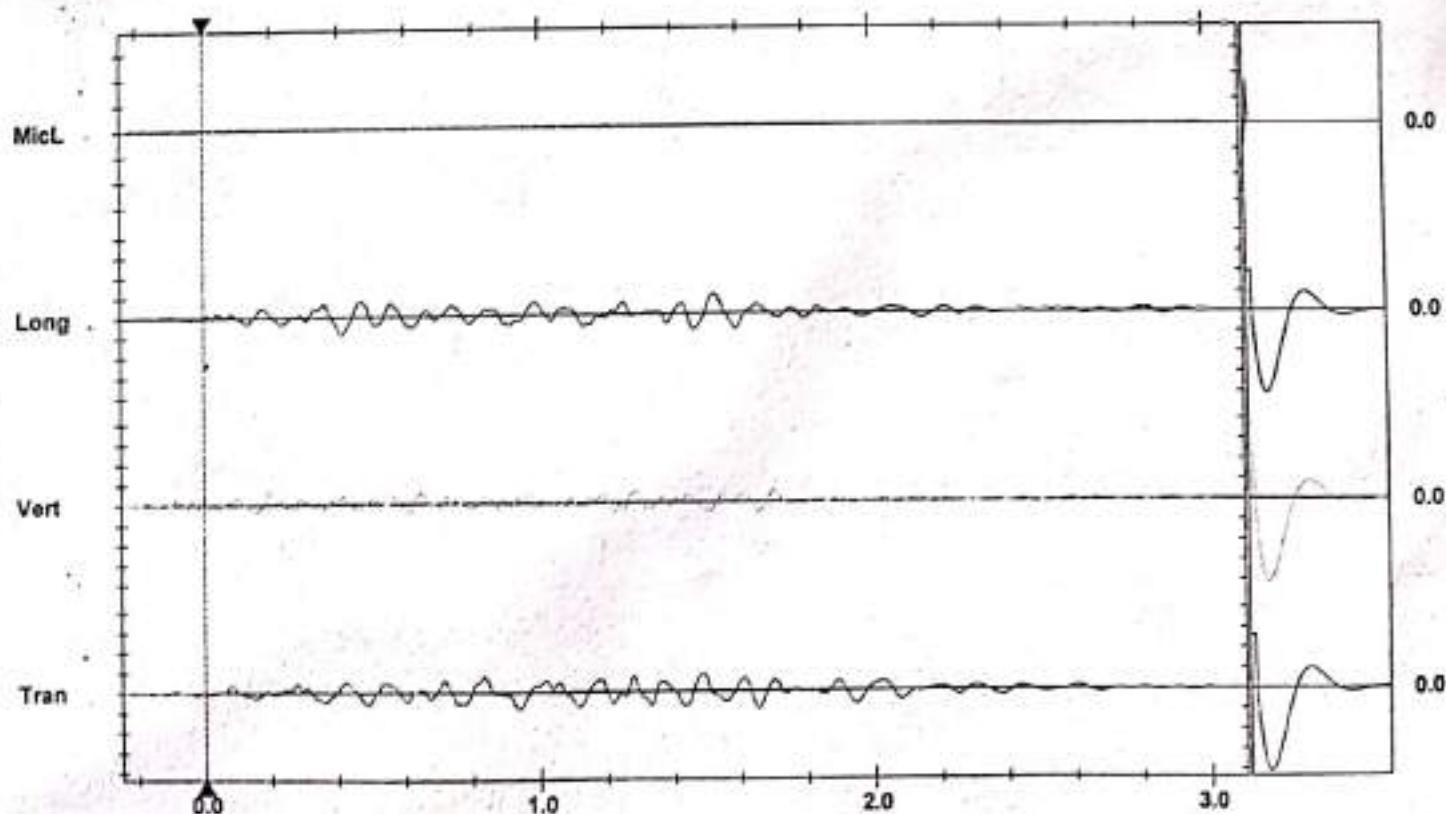
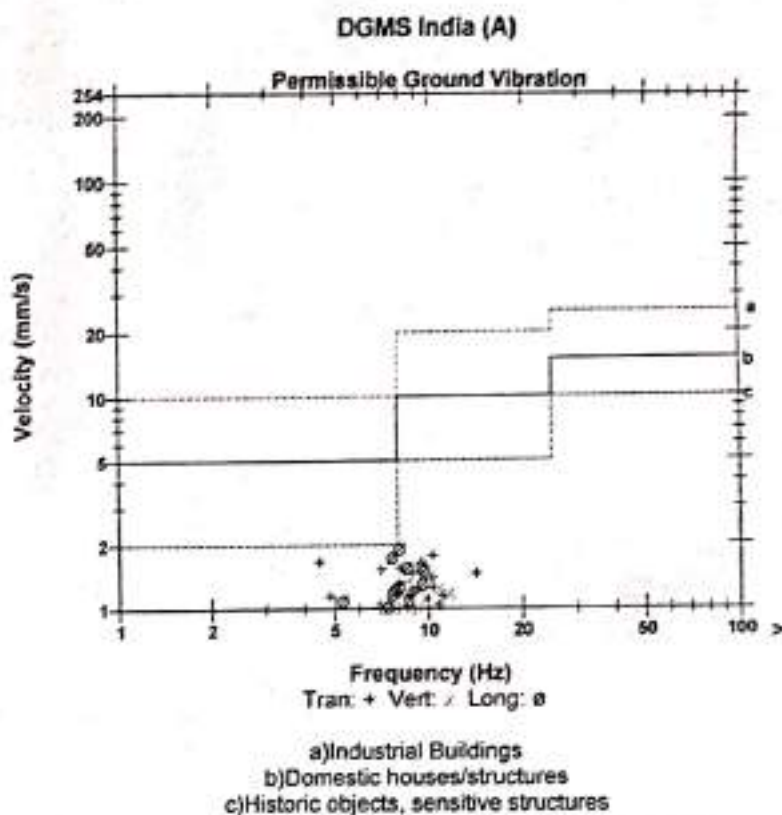
Notes  
 Location:  
 Client:  
 User Name:  
 General

Post Event Notes  
 Tetulmari hired  
 Distance from blasting-180mtr

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                 | 1.781  | 1.427  | 1.939  | mm/s |
| ZC Freq             | 10.3   | 8.8    | 8.1    | Hz   |
| Time (Rel. to Trig) | 1.650  | 0.197  | 1.526  | sec  |
| Peak Acceleration   | 0.018  | 0.025  | 0.021  | g    |
| Peak Displacement   | 0.036  | 0.020  | 0.036  | mm   |
| Sensor Check        | Passed | Passed | Passed |      |
| Frequency           | 7.3    | 7.3    | 7.5    | Hz   |
| Overwing Ratio      | 4.2    | 4.7    | 4.6    |      |

Peak Vector Sum 2.154 mm/s at 1.652 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  
 Trigger =

Sensor Check



Date/Time Long at 13 05 52 July 11, 2022  
 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

Serial Number UM10858 V 10-77 Micromate ISEE  
 Battery Level 3.8 Volts  
 Unit Calibration November 18, 2021 by CIMFR Dhanbad  
 File Name UM10858\_20220711130552.IDFW

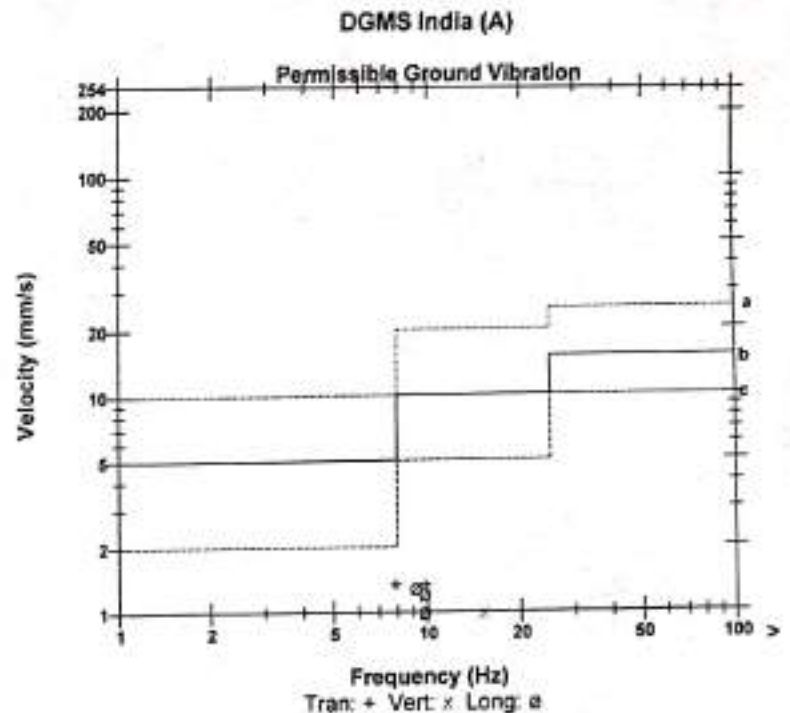
Post Event Notes  
 Kantapahari hired  
 Distance from blasting-160mtr

Notes  
 Location:  
 Client:  
 User Name:  
 General:

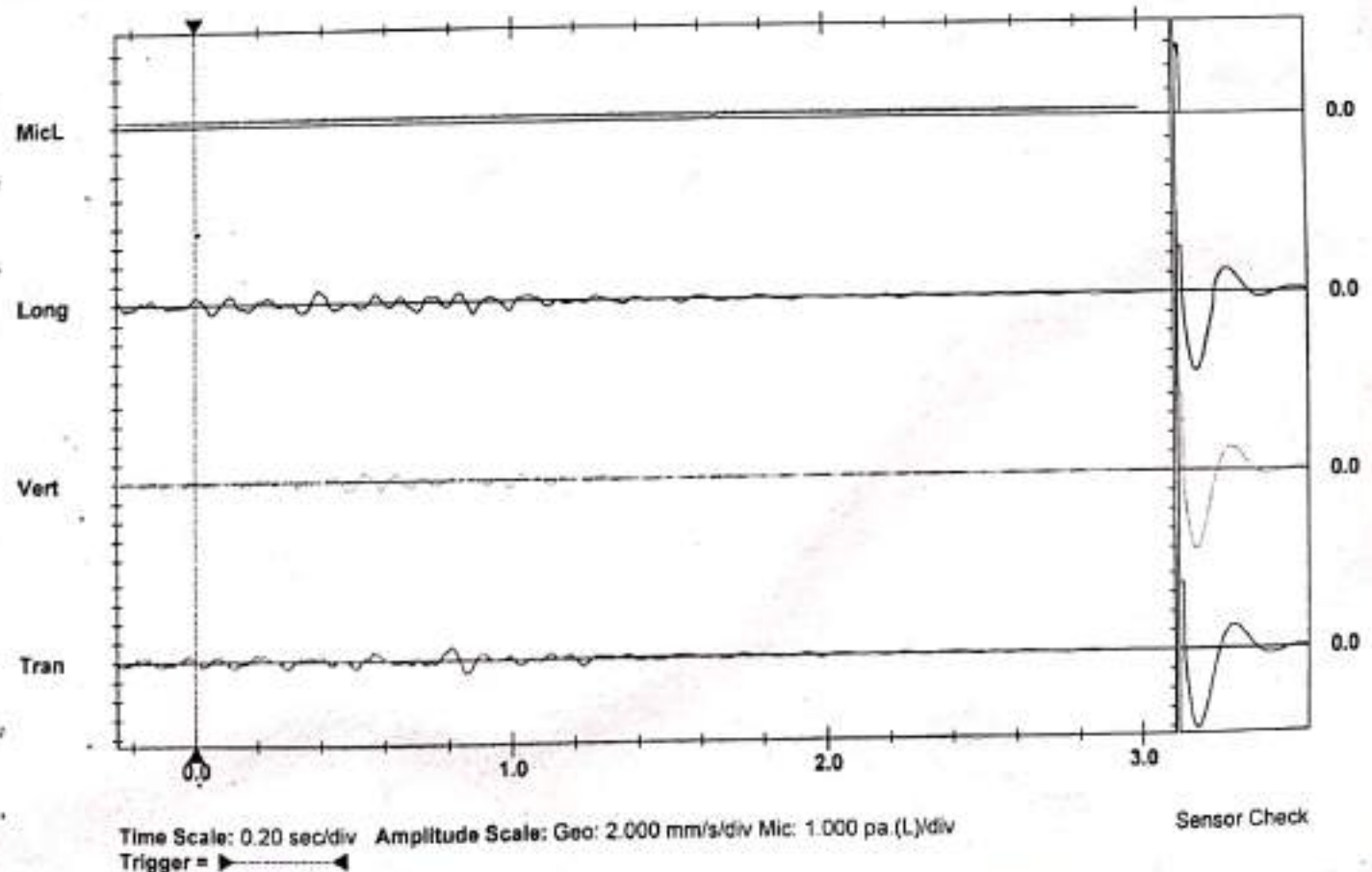
Microphone Linear Weighting  
 PSPL <0.500 pa (L)  
 ZC Freq N/A  
 Channel Test Check (Freq = 0.0 Hz Amp = 0 mv)

|                     | Tran   | Vert   | Long  |      |
|---------------------|--------|--------|-------|------|
| PPV                 | 1.340  | 1.001  | 1.293 | mm/s |
| ZC Freq             | 7.9    | 15.1   | 9.1   | Hz   |
| Time (Rel. to Trig) | 0.809  | 0.584  | 0.390 | sec  |
| Peak Acceleration   | 0.015  | 0.018  | 0.015 | g    |
| Peak Displacement   | 0.024  | 0.018  | 0.023 | mm   |
| Sensor Check        | Passed | Passed | Check |      |
| Frequency           | 7.7    | 7.9    | 8.5   | Hz   |
| Overswing Ratio     | 3.3    | 3.4    | 3.4   |      |

Peak Vector Sum 1.445 mm/s at 0.871 sec  
 N/A: Not Applicable



a) Industrial Buildings  
 b) Domestic houses/structures  
 c) Historic objects, sensitive structures



Source Vert at 14.43.11 July 14, 2022  
 Geo: 0.700 mm/s, Mic: 68.95 pa (L)  
 Geo: 254.0 mm/s  
 3rd Time 3.0 sec at 2048 sps  
 Operator/Setup: Operator/factory MMB

Notes  
 Location:  
 Client:  
 User Name:  
 General:

Microphone Linear Weighting  
 PSPL <0.500 pa (L)  
 ZC Freq N/A  
 Channel Test Check (Freq = 0.0 Hz Amp = 0 mv)

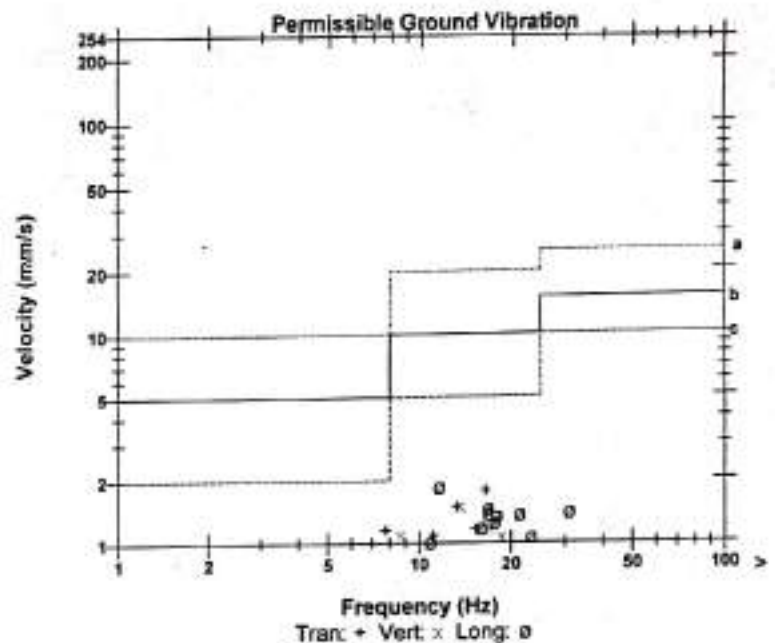
|                     | Tran   | Vert   | Long   |      |
|---------------------|--------|--------|--------|------|
| PPV                 | 1.781  | 1.505  | 1.868  | mm/s |
| ZC Freq             | 16.5   | 13.7   | 11.6   | Hz   |
| Time (Rel. to Trig) | 0.385  | 0.126  | 0.503  | sec  |
| Peak Acceleration   | 0.026  | 0.023  | 0.035  | g    |
| Peak Displacement   | 0.022  | 0.019  | 0.017  | mm   |
| Sensor Check        | Passed | Passed | Passed |      |
| Frequency           | 7.5    | 7.9    | 7.5    | Hz   |
| Overswing Ratio     | 3.5    | 3.3    | 3.4    |      |

Peak Vector Sum 2.422 mm/s at 0.382 sec  
 N/A: Not Applicable

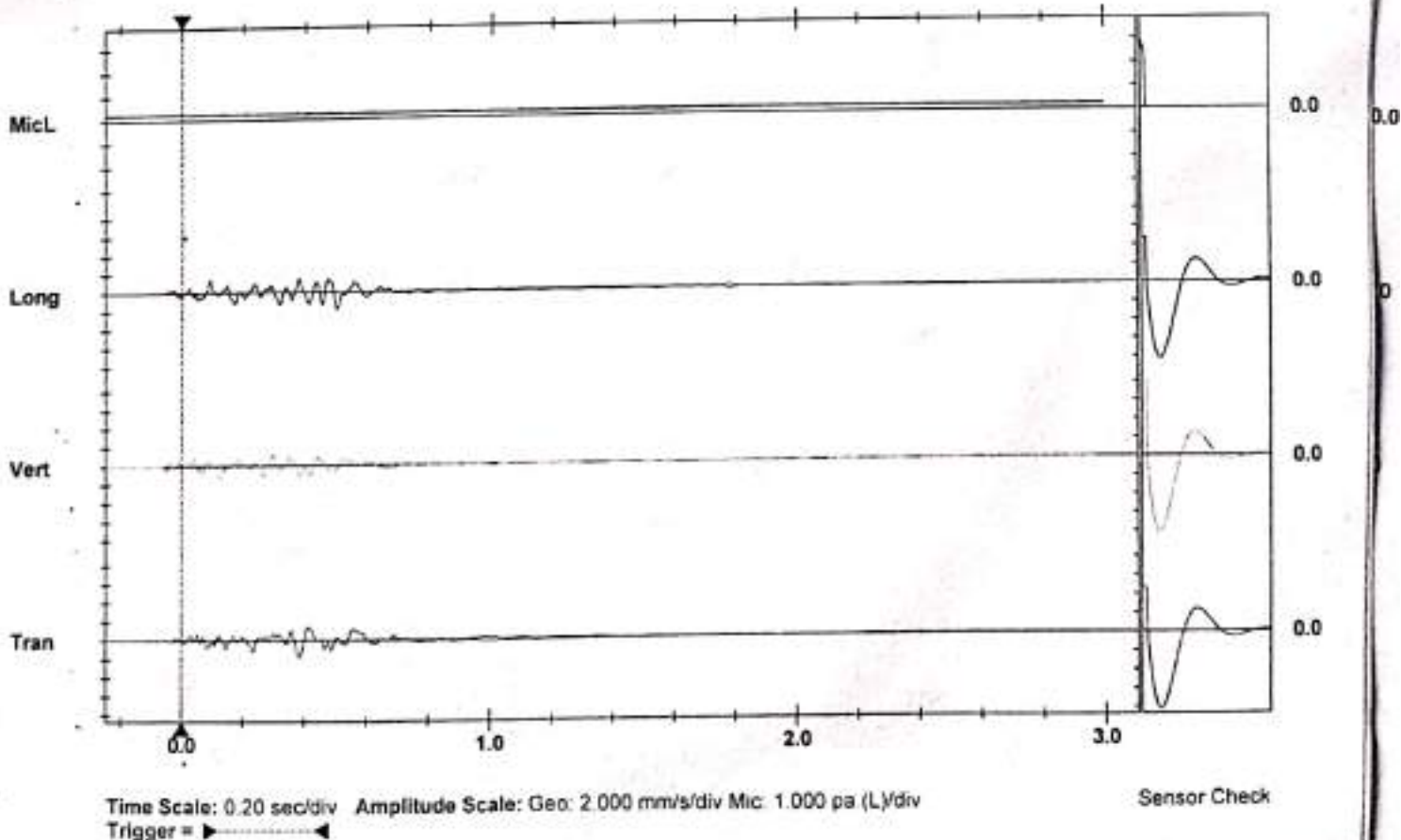
Serial Number UM10858 V 10-77 Micromate ISEE  
 Battery Level 3.7 Volts  
 Unit Calibration November 18, 2021 by CIMFR Dhanbad  
 File Name UM10858\_20220714144311.IDFW

Post Event Notes  
 Kantapahari hired  
 Distance from blasting-180mtr

## DGMS India (A)



a) Industrial Buildings  
 b) Domestic houses/structures  
 c) Historic objects, sensitive structures



Source Vert at 13:49:07 July 27, 2022  
 Geo: 0.700 mm/s, Mic: 68.95 pa.(L)  
 Geo: 254.0 mm/s  
 End Time 3.0 sec at 2048 sps  
 Operator/Setup: Operator/factory MMB

Notes  
 Location:  
 Client:  
 User Name:  
 General:

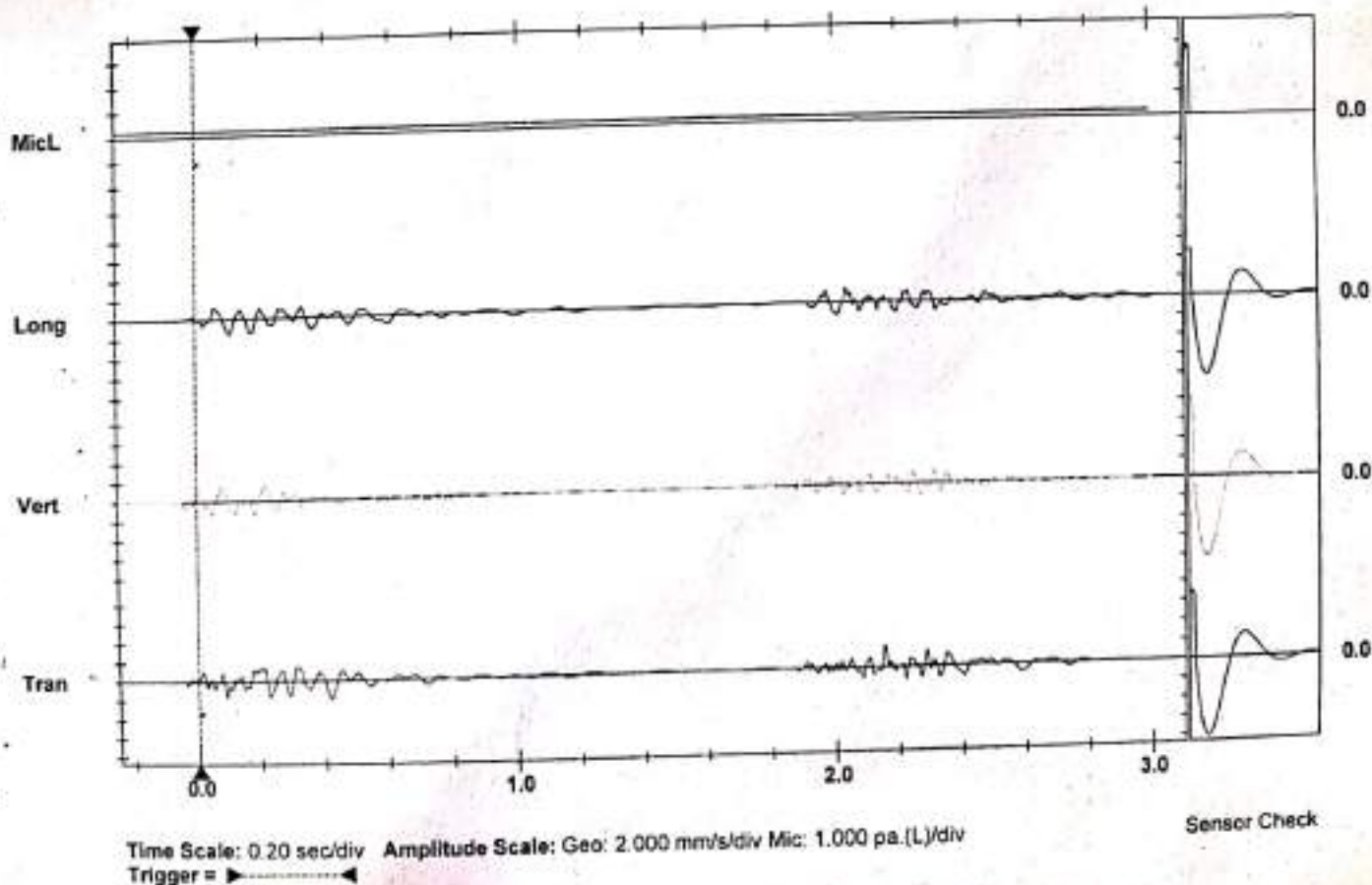
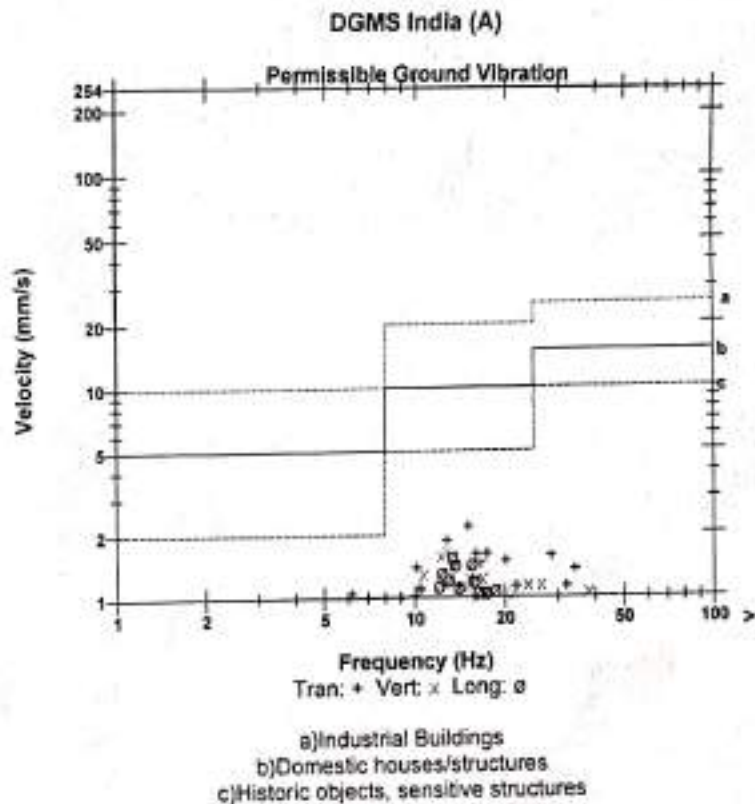
Serial Number UM10858 V 10-77 Micromate ISEE  
 Battery Level 3.7 Volts  
 Unit Calibration November 18, 2021 by CIMFR Dhanbad  
 File Name UM10858\_20220727134907.IDFW

Post Event Notes  
 Kantapahari hired  
 Distance from blasting-210mtr

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                 | 2.191  | 1.671  | 1.568  | mm/s |
| ZC Freq             | 15.1   | 12.8   | 13.3   | Hz   |
| Time (Rel. to Trig) | 2.152  | 0.081  | 0.109  | sec  |
| Peak Acceleration   | 0.043  | 0.049  | 0.039  | g    |
| Peak Displacement   | 0.026  | 0.019  | 0.018  | mm   |
| Sensor Check        | Passed | Passed | Passed |      |
| Frequency           | 7.5    | 7.9    | 7.5    | Hz   |
| Overswing Ratio     | 3.4    | 3.4    | 3.4    |      |

Peak Vector Sum 2.204 mm/s at 2.152 sec  
 N/A: Not Applicable





Date/Time: Tran at 14:11:49 August 4, 2022  
 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

Serial Number: UM10958 V 10-77 Micromate ISEE  
 Battery Level: 3.7 Volts  
 Unit Calibration: November 18, 2021 by CIMFR Dharwad  
 File Name: \_\_TEMP.EVT

**Notes**

Location:  
 Client:  
 User Name:  
 General:

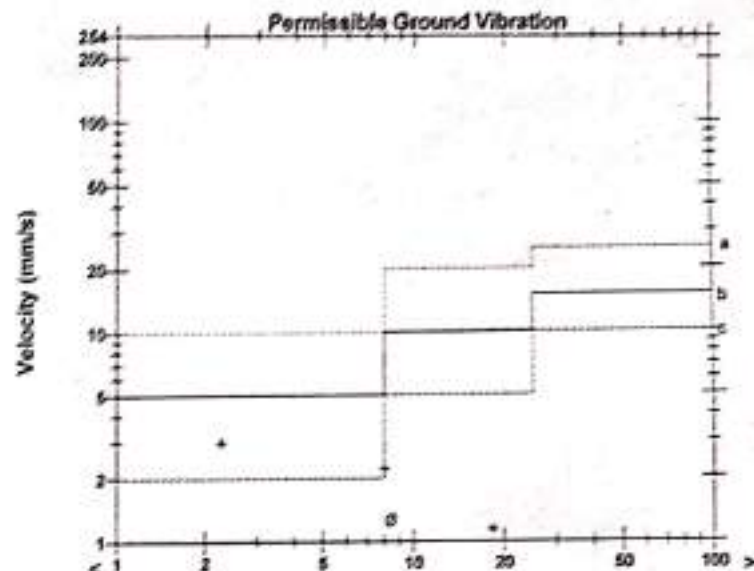
Post Event Notes  
 Tetulmari hired  
 Distance from blasting-150mtr

Microphone: Linear Weighting  
 PSPL: <0.500 pa (L)  
 ZC Freq: N/A  
 Channel Test: Check (Freq = 0.0 Hz Amp = 0 mv)

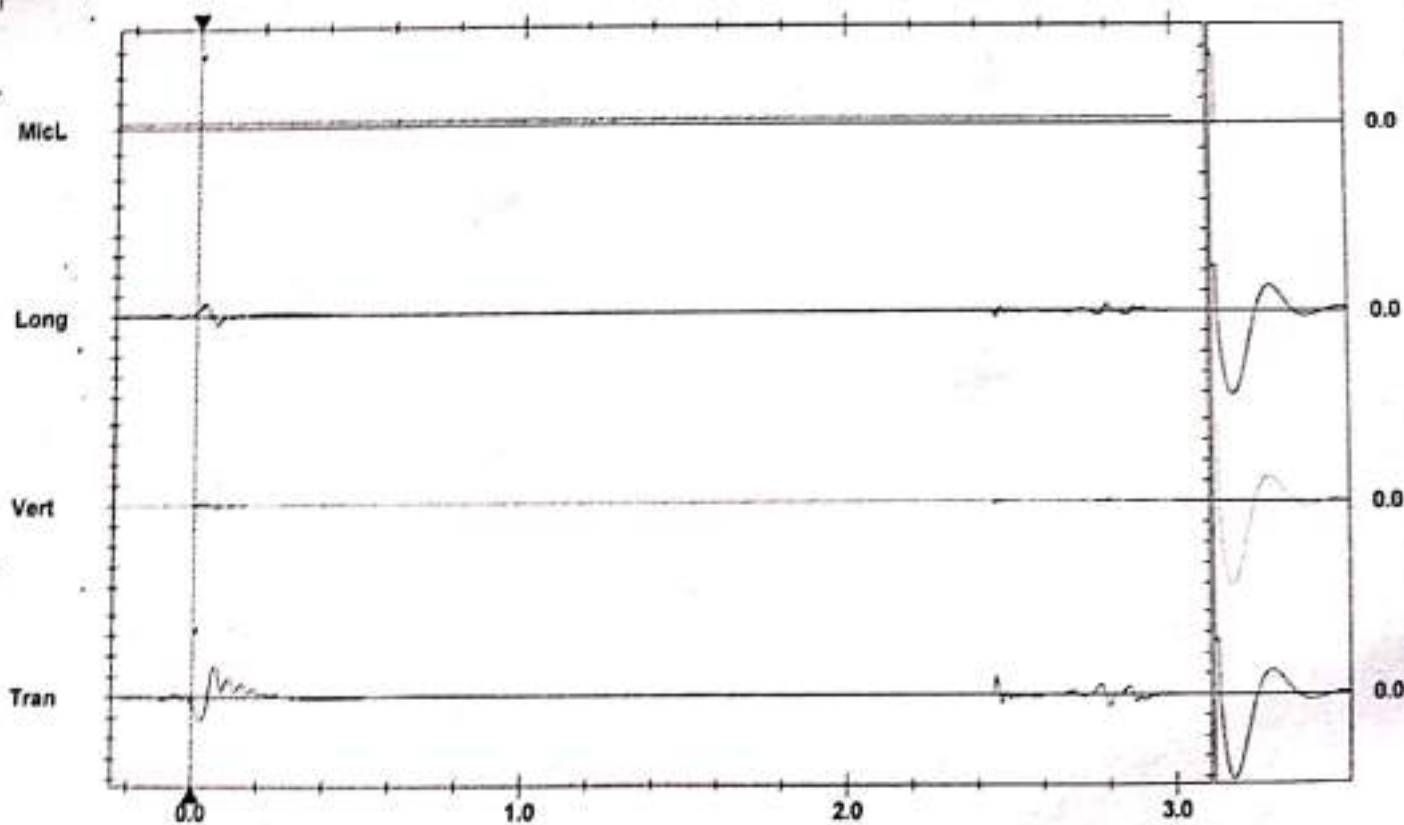
|                     | Tran   | Vert   | Long   |      |
|---------------------|--------|--------|--------|------|
| PPV                 | 2.979  | 0.473  | 1.285  | mm/s |
| ZC Freq             | 2.3    | 6.4    | 8.4    | Hz   |
| Time (Rel. to Trig) | 0.069  | 0.066  | 0.019  | sec  |
| Peak Acceleration   | 0.030  | 0.012  | 0.023  | g    |
| Peak Displacement   | 0.101  | 0.008  | 0.019  | mm   |
| Sensor Check        | Passed | Passed | Passed |      |
| Frequency           | 7.5    | 7.7    | 7.3    | Hz   |
| Overwing Ratio      | 3.6    | 3.4    | 3.3    |      |

Peak Vector Sum: 3.113 mm/s at 0.067 sec  
 N/A: Not Applicable

**DGM3 India (A)**



a) Industrial Buildings  
 b) Domestic houses/structures  
 c) Historic objects, sensitive structures



Sensor Check



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

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

**(FOR THE MONTH AUGUST, 2022)**

**E. C. no. J-11015/372/2010-IA.II (M) dated 23.10.2019**



**CMPDI**

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

## **NOISE LEVEL QUALITY MONITORING**

### **4.1 Location of sampling sites**

- i) **Govindpur (N7)**
- ii) **Katras Chotudih (N37)**
- iii) **Block IV(N6)**
- iv) **Nichitpur(N8)**
- v) **RudhiBasti (N18)**

### **4.2 Methodology of sampling and analysis**

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

### **4.3 Results & Interpretations**

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

|    |                                                                                                                    | <b>CENTRAL MINE PLANNING AND DESIGN INSTITUTE LIMITED</b><br><b>Environment Laboratory, Regional Institute-II</b><br><b>Ambient Noise Level Test Report</b> |                                                        |                                                         |                                                                   | <b>CMPDIL, RI-II</b><br><b>KOYLA BHAWAN COMPLEX</b><br><b>DHANBAD. -826005</b><br><b>Phone:0326-223-850</b><br><b>email: rdri2cmpdi@coalindia.in</b> |                           |                                                                                      |                      |
|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------|---------------------------------------------------------|-------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------|--------------------------------------------------------------------------------------|----------------------|
| Month & Year                                                                                                                                                                                                                                         | 08/2022                                                                                                            | Cluster                                                                                                                                                     | Cluster IV                                             |                                                         |                                                                   | Report No.                                                                                                                                           | RI-II/NOISE/2022-23/05    |                                                                                      |                      |
| Customer                                                                                                                                                                                                                                             | Environment Department, Bharat Coking Coal Limited (BCCL), Koyla Bhawan, Dhanbad (E-mail: gmenv.bccl@coalindia.in) |                                                                                                                                                             |                                                        |                                                         |                                                                   | Date of Issue                                                                                                                                        | 26.10.2022                |                                                                                      |                      |
| Project                                                                                                                                                                                                                                              |                                                                                                                    | Sample Ref. No.                                                                                                                                             | REM/BCCL/2022/08                                       |                                                         | Sampling Method                                                   | CMPDI/RI-II/LPM 13                                                                                                                                   |                           |                                                                                      |                      |
| Sampling Stations                                                                                                                                                                                                                                    | i                                                                                                                  | Govindpur                                                                                                                                                   |                                                        | Date of Sampling                                        | 01.08.22                                                          | 17.08.22                                                                                                                                             | Zone Category of Station: | Core Zone                                                                            |                      |
| Sl. No.                                                                                                                                                                                                                                              | Parameter                                                                                                          | Hour / Time of day                                                                                                                                          | Observed Values<br>( in Leq dB(A) )<br>First Fortnight | Observed Values<br>( in Leq dB(A) )<br>Second Fortnight | Method of Analysis                                                | Range Of Testing                                                                                                                                     | LDL                       | NOISE POLLUTION (REGULATION AND CONTROL) RULES, 2000 Standards<br>Zones Limits in dB |                      |
| 1                                                                                                                                                                                                                                                    | Noise Level dB(A)Leq<br>- Day                                                                                      | 06:00 - 07:00                                                                                                                                               | 52.2                                                   | 51.5                                                    | CPCB, Protocol for<br>Ambient Level<br>Noise Monitoring -<br>2015 | 35 dB-135 dB                                                                                                                                         | 35<br>dB(A)               | Industrial<br>Commercial<br>Residential<br>Silence                                   | 75<br>65<br>55<br>50 |
| 2                                                                                                                                                                                                                                                    |                                                                                                                    | 07:00 - 08:00                                                                                                                                               | 55.0                                                   | 54.2                                                    |                                                                   |                                                                                                                                                      |                           |                                                                                      |                      |
| 3                                                                                                                                                                                                                                                    |                                                                                                                    | 08:00 - 09:00                                                                                                                                               | 57.6                                                   | 57.2                                                    |                                                                   |                                                                                                                                                      |                           |                                                                                      |                      |
| 4                                                                                                                                                                                                                                                    |                                                                                                                    | 09:00 - 10:00                                                                                                                                               | 64.0                                                   | 63.0                                                    |                                                                   |                                                                                                                                                      |                           |                                                                                      |                      |
| 5                                                                                                                                                                                                                                                    |                                                                                                                    | 10:00 - 11:00                                                                                                                                               | 65.5                                                   | 64.5                                                    |                                                                   |                                                                                                                                                      |                           |                                                                                      |                      |
| 6                                                                                                                                                                                                                                                    |                                                                                                                    | 11:00 - 12:00                                                                                                                                               | 64.0                                                   | 63.0                                                    |                                                                   |                                                                                                                                                      |                           |                                                                                      |                      |
| 7                                                                                                                                                                                                                                                    |                                                                                                                    | 12:00 - 13:00                                                                                                                                               | 67.1                                                   | 68.4                                                    |                                                                   |                                                                                                                                                      |                           |                                                                                      |                      |
| 8                                                                                                                                                                                                                                                    |                                                                                                                    | 13:00 - 14:00                                                                                                                                               | 68.5                                                   | 67.5                                                    |                                                                   |                                                                                                                                                      |                           |                                                                                      |                      |
| 9                                                                                                                                                                                                                                                    |                                                                                                                    | 14:00 - 15:00                                                                                                                                               | 62.4                                                   | 61.5                                                    |                                                                   |                                                                                                                                                      |                           |                                                                                      |                      |
| 10                                                                                                                                                                                                                                                   |                                                                                                                    | 15:00 - 16:00                                                                                                                                               | 61.5                                                   | 60.5                                                    |                                                                   |                                                                                                                                                      |                           |                                                                                      |                      |
| 11                                                                                                                                                                                                                                                   |                                                                                                                    | 16:00 - 17:00                                                                                                                                               | 60.9                                                   | 60.0                                                    |                                                                   |                                                                                                                                                      |                           |                                                                                      |                      |
| 12                                                                                                                                                                                                                                                   |                                                                                                                    | 17:00 - 18:00                                                                                                                                               | 60.4                                                   | 59.5                                                    |                                                                   |                                                                                                                                                      |                           |                                                                                      |                      |
| 13                                                                                                                                                                                                                                                   |                                                                                                                    | 18:00 - 19:00                                                                                                                                               | 59.5                                                   | 58.6                                                    |                                                                   |                                                                                                                                                      |                           |                                                                                      |                      |
| 14                                                                                                                                                                                                                                                   |                                                                                                                    | 19:00 - 20:00                                                                                                                                               | 58.4                                                   | 57.5                                                    |                                                                   |                                                                                                                                                      |                           |                                                                                      |                      |
| 15                                                                                                                                                                                                                                                   |                                                                                                                    | 20:00 - 21:00                                                                                                                                               | 58.4                                                   | 53.5                                                    |                                                                   |                                                                                                                                                      |                           |                                                                                      |                      |
| 16                                                                                                                                                                                                                                                   |                                                                                                                    | 21:00 - 22:00                                                                                                                                               | 54.2                                                   | 52.4                                                    |                                                                   |                                                                                                                                                      |                           |                                                                                      |                      |
|                                                                                                                                                                                                                                                      |                                                                                                                    | <b>Leq DAY</b>                                                                                                                                              | <b>62.7</b>                                            | <b>62.2</b>                                             |                                                                   |                                                                                                                                                      |                           |                                                                                      |                      |
| 1                                                                                                                                                                                                                                                    | Noise Level dB(A)Leq<br>-Night                                                                                     | 22:00-23:00                                                                                                                                                 | 44.8                                                   | 44.2                                                    | CPCB, Protocol for<br>Ambient Level<br>Noise Monitoring -<br>2015 | 35 dB-135 dB                                                                                                                                         | 35<br>dB(A)               | Industrial<br>Commercial<br>Residential<br>Silence                                   | 70<br>55<br>45<br>50 |
| 2                                                                                                                                                                                                                                                    |                                                                                                                    | 23:00- 00:00                                                                                                                                                | 43.5                                                   | 44.2                                                    |                                                                   |                                                                                                                                                      |                           |                                                                                      |                      |
| 3                                                                                                                                                                                                                                                    |                                                                                                                    | 00:00- 01:00                                                                                                                                                | 41.9                                                   | 44.0                                                    |                                                                   |                                                                                                                                                      |                           |                                                                                      |                      |
| 4                                                                                                                                                                                                                                                    |                                                                                                                    | 01:00-02:00                                                                                                                                                 | 41.8                                                   | 41.7                                                    |                                                                   |                                                                                                                                                      |                           |                                                                                      |                      |
| 5                                                                                                                                                                                                                                                    |                                                                                                                    | 02:00-03:00                                                                                                                                                 | 40.2                                                   | 39.8                                                    |                                                                   |                                                                                                                                                      |                           |                                                                                      |                      |
| 6                                                                                                                                                                                                                                                    |                                                                                                                    | 03:00-04:00                                                                                                                                                 | 39.9                                                   | 39.6                                                    |                                                                   |                                                                                                                                                      |                           |                                                                                      |                      |
| 7                                                                                                                                                                                                                                                    |                                                                                                                    | 04:00-05:00                                                                                                                                                 | 39.0                                                   | 38.6                                                    |                                                                   |                                                                                                                                                      |                           |                                                                                      |                      |
| 8                                                                                                                                                                                                                                                    |                                                                                                                    | 05:00-06:00                                                                                                                                                 | 38.9                                                   | 38.4                                                    |                                                                   |                                                                                                                                                      |                           |                                                                                      |                      |
|                                                                                                                                                                                                                                                      |                                                                                                                    | <b>Leq NIGHT</b>                                                                                                                                            | <b>41.7</b>                                            | <b>41.9</b>                                             |                                                                   |                                                                                                                                                      |                           |                                                                                      |                      |

\*LDL indicates Lower Detection Limit

\*\*All noise measurements are integrated for a 01 hour period, All units in dB(A)

|                                           |                                                                                                                             |                                                                                                                                      |
|-------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------|
| Sampling Assistants<br><b>ANALYSED BY</b> | <br>(Gaurav Kant)<br><b>CHECKED BY</b> | <br>(Amit Raj Mishra)<br><b>HOD's Signature</b> |
|-------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------|

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

| <div style="display: flex; justify-content: space-between; align-items: center;"> <div>   <div> <b>cmpdi</b><br/> <i>A Bharat Coking Coal Company</i> </div> </div> <div style="text-align: center;"> <b>CENTRAL MINE PLANNING AND DESIGN INSTITUTE LIMITED</b><br/> <b>Environment Laboratory, Regional Institute-II</b><br/> <b>Ambient Noise Level Test Report</b> </div> <div style="text-align: right;"> <b>CMPDIL, RI-II</b><br/> <b>KOYLA BHAWAN COMPLEX</b><br/> <b>DHANBAD. -826005</b><br/> <b>Phone:0326-223-850</b><br/> <b>email: rdri2cmpdi@coalindia.in</b> </div> </div> |                                                                                                                    |                    |                                                   |                                                    |                                                          |                           |               |                                                                         |                      |
|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------|--------------------|---------------------------------------------------|----------------------------------------------------|----------------------------------------------------------|---------------------------|---------------|-------------------------------------------------------------------------|----------------------|
| Month & Year                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             | 08/2022                                                                                                            | Cluster            | Cluster IV                                        |                                                    |                                                          |                           | Report No.    | RI-II/NOISE/2022-23/05                                                  |                      |
| Customer                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 | Environment Department, Bharat Coking Coal Limited (BCCL), Koyla Bhawan, Dhanbad (E-mail: gmenv.bccl@coalindia.in) |                    |                                                   |                                                    |                                                          |                           | Date of Issue | 26.10.2022                                                              |                      |
| Project                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |                                                                                                                    | Sample Ref. No.    | REM/BCCL/2022/08                                  |                                                    | Sampling Method                                          | CMPDI/RI-II/LPM 13        |               |                                                                         |                      |
| Sampling Stations                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        | i                                                                                                                  | Katrash Chotudih   | Date of Sampling                                  | 01.08.22                                           | 17.08.22                                                 | Zone Category of Station: | Core Zone     |                                                                         |                      |
| Sl. No.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  | Parameter                                                                                                          | Hour / Time of day | Observed Values (in Leq dB(A))<br>First Fortnight | Observed Values (in Leq dB(A))<br>Second Fortnight | Method of Analysis                                       | Range Of Testing          | LDL           | NOISE POLLUTION (REGULATION AND CONTROL) RULES, 2000 Standards<br>Zones | Limits in dB         |
| 1                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        | Noise Level dB(A)Leq - Day                                                                                         | 06:00 - 07:00      | 50.3                                              | 51.0                                               | CPCB, Protocol for Ambient Level Noise Monitoring - 2015 | 35 dB-135 dB              | 35 dB(A)      | Industrial<br>Commercial<br>Residential<br>Silence                      | 75<br>65<br>55<br>50 |
| 2                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |                                                                                                                    | 07:00 - 08:00      | 53.0                                              | 53.6                                               |                                                          |                           |               |                                                                         |                      |
| 3                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |                                                                                                                    | 08:00 - 09:00      | 55.5                                              | 54.5                                               |                                                          |                           |               |                                                                         |                      |
| 4                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |                                                                                                                    | 09:00 - 10:00      | 61.7                                              | 63.8                                               |                                                          |                           |               |                                                                         |                      |
| 5                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |                                                                                                                    | 10:00 - 11:00      | 63.1                                              | 63.9                                               |                                                          |                           |               |                                                                         |                      |
| 6                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |                                                                                                                    | 11:00 - 12:00      | 61.7                                              | 63.5                                               |                                                          |                           |               |                                                                         |                      |
| 7                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |                                                                                                                    | 12:00 - 13:00      | 64.6                                              | 65.1                                               |                                                          |                           |               |                                                                         |                      |
| 8                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |                                                                                                                    | 13:00 - 14:00      | 65.2                                              | 65.6                                               |                                                          |                           |               |                                                                         |                      |
| 9                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |                                                                                                                    | 14:00 - 15:00      | 60.2                                              | 60.1                                               |                                                          |                           |               |                                                                         |                      |
| 10                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |                                                                                                                    | 15:00 - 16:00      | 59.2                                              | 61.3                                               |                                                          |                           |               |                                                                         |                      |
| 11                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |                                                                                                                    | 16:00 - 17:00      | 67.2                                              | 60.7                                               |                                                          |                           |               |                                                                         |                      |
| 12                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |                                                                                                                    | 17:00 - 18:00      | 58.2                                              | 64.2                                               |                                                          |                           |               |                                                                         |                      |
| 13                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |                                                                                                                    | 18:00 - 19:00      | 57.3                                              | 59.3                                               |                                                          |                           |               |                                                                         |                      |
| 14                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |                                                                                                                    | 19:00 - 20:00      | 56.3                                              | 58.2                                               |                                                          |                           |               |                                                                         |                      |
| 15                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |                                                                                                                    | 20:00 - 21:00      | 55.6                                              | 57.6                                               |                                                          |                           |               |                                                                         |                      |
| 16                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |                                                                                                                    | 21:00 - 22:00      | 55.7                                              | 57.6                                               |                                                          |                           |               |                                                                         |                      |
|                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |                                                                                                                    | <b>Leq DAY</b>     | <b>61.3</b>                                       | <b>61.7</b>                                        |                                                          |                           |               |                                                                         |                      |
| 1                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        | Noise Level dB(A)Leq -Night                                                                                        | 22:00-23:00        | 45.1                                              | 44.1                                               | CPCB, Protocol for Ambient Level Noise Monitoring - 2015 | 35 dB-135 dB              | 35 dB(A)      | Industrial<br>Commercial<br>Residential<br>Silence                      | 70<br>55<br>45<br>50 |
| 2                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |                                                                                                                    | 23:00- 00:00       | 44.8                                              | 44.8                                               |                                                          |                           |               |                                                                         |                      |
| 3                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |                                                                                                                    | 00:00- 01:00       | 40.1                                              | 40.7                                               |                                                          |                           |               |                                                                         |                      |
| 4                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |                                                                                                                    | 01:00-02:00        | 39.4                                              | 39.9                                               |                                                          |                           |               |                                                                         |                      |
| 5                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |                                                                                                                    | 02:00-03:00        | 41.0                                              | 41.0                                               |                                                          |                           |               |                                                                         |                      |
| 6                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |                                                                                                                    | 03:00-04:00        | 40.9                                              | 40.5                                               |                                                          |                           |               |                                                                         |                      |
| 7                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |                                                                                                                    | 04:00-05:00        | 41.1                                              | 40.9                                               |                                                          |                           |               |                                                                         |                      |
| 8                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |                                                                                                                    | 05:00-06:00        | 40.2                                              | 41.0                                               |                                                          |                           |               |                                                                         |                      |
|                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |                                                                                                                    | <b>Leq NIGHT</b>   | <b>42.1</b>                                       | <b>42.0</b>                                        |                                                          |                           |               |                                                                         |                      |

*\*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)**  
**CHECKED BY**

  
**(Amit Raj Mishra)**  
**HOD's Signature**

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

--- End of Report ---  
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| <div style="display: flex; justify-content: space-between; align-items: center;"> <div>   <div> <b>cmpdi</b><br/> <i>A Bharat Coking Company</i> </div> </div> <div style="text-align: center;"> <b>CENTRAL MINE PLANNING AND DESIGN INSTITUTE LIMITED</b><br/> <b>Environment Laboratory, Regional Institute-II</b><br/> <b>Ambient Noise Level Test Report</b> </div> <div style="text-align: right;"> <b>CMPDIL, RI-II</b><br/> <b>KOYLA BHAWAN COMPLEX</b><br/> <b>DHANBAD. -826005</b><br/> <b>Phone:0326-223-850</b><br/> <b>email: rdri2cmpdi@coalindia.in</b> </div> </div> |                                                                                                                    |                    |                                                   |                                                    |                                                          |                  |                           |                                                                                      |                        |
|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------|--------------------|---------------------------------------------------|----------------------------------------------------|----------------------------------------------------------|------------------|---------------------------|--------------------------------------------------------------------------------------|------------------------|
| Month & Year                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        | 08/2022                                                                                                            | Cluster            | Cluster IV                                        |                                                    |                                                          |                  |                           | Report No.                                                                           | RI-II/NOISE/2022-23/05 |
| Customer                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            | Environment Department, Bharat Coking Coal Limited (BCCL), Koyla Bhawan, Dhanbad (E-mail: gmenv.bccl@coalindia.in) |                    |                                                   |                                                    |                                                          |                  |                           | Date of Issue                                                                        | 26.10.2022             |
| Project                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             |                                                                                                                    | Sample Ref. No.    | REM/BCCL/2022/08                                  |                                                    |                                                          | Sampling Method  | CMPDI/RI-II/LPM 13        |                                                                                      |                        |
| Sampling Stations                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   | i                                                                                                                  | Block IV           | Date of Sampling                                  |                                                    | 02.08.22                                                 | 18.08.22         | Zone Category of Station: | Buffer Zone                                                                          |                        |
| Sl. No.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             | Parameter                                                                                                          | Hour / Time of day | Observed Values (in Leq dB(A))<br>First Fortnight | Observed Values (in Leq dB(A))<br>Second Fortnight | Method of Analysis                                       | Range Of Testing | LDL                       | NOISE POLLUTION (REGULATION AND CONTROL) RULES, 2000 Standards<br>Zones Limits in dB |                        |
| 1                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   | Noise Level dB(A)Leq - Day                                                                                         | 06:00 - 07:00      | 50.4                                              | 50.3                                               | CPCB, Protocol for Ambient Level Noise Monitoring - 2015 | 35 dB-135 dB     | 35 dB(A)                  | Industrial<br>Commercial<br>Residential<br>Silence                                   | 75<br>65<br>55<br>50   |
| 2                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |                                                                                                                    | 07:00 - 08:00      | 53.6                                              | 53.0                                               |                                                          |                  |                           |                                                                                      |                        |
| 3                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |                                                                                                                    | 08:00 - 09:00      | 55.2                                              | 55.5                                               |                                                          |                  |                           |                                                                                      |                        |
| 4                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |                                                                                                                    | 09:00 - 10:00      | 62.0                                              | 61.7                                               |                                                          |                  |                           |                                                                                      |                        |
| 5                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |                                                                                                                    | 10:00 - 11:00      | 62.9                                              | 63.1                                               |                                                          |                  |                           |                                                                                      |                        |
| 6                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |                                                                                                                    | 11:00 - 12:00      | 60.7                                              | 61.7                                               |                                                          |                  |                           |                                                                                      |                        |
| 7                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |                                                                                                                    | 12:00 - 13:00      | 62.8                                              | 64.6                                               |                                                          |                  |                           |                                                                                      |                        |
| 8                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |                                                                                                                    | 13:00 - 14:00      | 64.1                                              | 65.2                                               |                                                          |                  |                           |                                                                                      |                        |
| 9                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |                                                                                                                    | 14:00 - 15:00      | 60.1                                              | 60.2                                               |                                                          |                  |                           |                                                                                      |                        |
| 10                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |                                                                                                                    | 15:00 - 16:00      | 60.7                                              | 59.2                                               |                                                          |                  |                           |                                                                                      |                        |
| 11                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |                                                                                                                    | 16:00 - 17:00      | 65.8                                              | 67.2                                               |                                                          |                  |                           |                                                                                      |                        |
| 12                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |                                                                                                                    | 17:00 - 18:00      | 59.1                                              | 58.2                                               |                                                          |                  |                           |                                                                                      |                        |
| 13                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |                                                                                                                    | 18:00 - 19:00      | 57.4                                              | 57.3                                               |                                                          |                  |                           |                                                                                      |                        |
| 14                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |                                                                                                                    | 19:00 - 20:00      | 56.3                                              | 56.3                                               |                                                          |                  |                           |                                                                                      |                        |
| 15                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |                                                                                                                    | 20:00 - 21:00      | 55.9                                              | 55.6                                               |                                                          |                  |                           |                                                                                      |                        |
| 16                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |                                                                                                                    | 21:00 - 22:00      | 54.1                                              | 55.7                                               |                                                          |                  |                           |                                                                                      |                        |
|                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |                                                                                                                    | <b>Leq DAY</b>     | <b>60.6</b>                                       | <b>61.3</b>                                        |                                                          |                  |                           |                                                                                      |                        |
| 1                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   | Noise Level dB(A)Leq -Night                                                                                        | 22:00-23:00        | 45.5                                              | 45.8                                               | CPCB, Protocol for Ambient Level Noise Monitoring - 2015 | 35 dB-135 dB     | 35 dB(A)                  | Industrial<br>Commercial<br>Residential<br>Silence                                   | 70<br>55<br>45<br>50   |
| 2                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |                                                                                                                    | 23:00- 00:00       | 44.5                                              | 44.9                                               |                                                          |                  |                           |                                                                                      |                        |
| 3                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |                                                                                                                    | 00:00- 01:00       | 44.5                                              | 44.2                                               |                                                          |                  |                           |                                                                                      |                        |
| 4                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |                                                                                                                    | 01:00-02:00        | 43.0                                              | 43.2                                               |                                                          |                  |                           |                                                                                      |                        |
| 5                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |                                                                                                                    | 02:00-03:00        | 41.8                                              | 42.7                                               |                                                          |                  |                           |                                                                                      |                        |
| 6                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |                                                                                                                    | 03:00-04:00        | 41.9                                              | 41.2                                               |                                                          |                  |                           |                                                                                      |                        |
| 7                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |                                                                                                                    | 04:00-05:00        | 40.5                                              | 39.5                                               |                                                          |                  |                           |                                                                                      |                        |
| 8                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |                                                                                                                    | 05:00-06:00        | 40.2                                              | 39.4                                               |                                                          |                  |                           |                                                                                      |                        |
|                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |                                                                                                                    | <b>Leq NIGHT</b>   | <b>43.1</b>                                       | <b>43.2</b>                                        |                                                          |                  |                           |                                                                                      |                        |

*\*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)  
**CHECKED BY**

  
 (Amit Raj Mishra)  
**HOD's Signature**

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

---- End of Report ----  
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| <div style="display: flex; justify-content: space-between; align-items: center;"> <div>   <div> <b>cmpdi</b><br/> <i>A Bharat Coking Coal Company</i> </div> </div> <div style="text-align: center;"> <b>CENTRAL MINE PLANNING AND DESIGN INSTITUTE LIMITED</b><br/> <b>Environment Laboratory, Regional Institute-II</b><br/> <b>Ambient Noise Level Test Report</b> </div> <div style="text-align: right;"> <b>CMPDIL, RI-II</b><br/> <b>KOYLA BHAWAN COMPLEX</b><br/> <b>DHANBAD. -826005</b><br/> <b>Phone:0326-223-850</b><br/> <b>email: rdri2cmpdi@coalindia.in</b> </div> </div> |                                                                                                                    |                    |                                                   |                                                    |                                                          |                  |                           |                                                                |                      |            |
|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------|--------------------|---------------------------------------------------|----------------------------------------------------|----------------------------------------------------------|------------------|---------------------------|----------------------------------------------------------------|----------------------|------------|
| Month & Year                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             | 08/2022                                                                                                            | Cluster            | Cluster IV                                        |                                                    |                                                          |                  | Report No.                | RI-II/NOISE/2022-23/05                                         |                      |            |
| Customer                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 | Environment Department, Bharat Coking Coal Limited (BCCL), Koyla Bhawan, Dhanbad (E-mail: gmenv.bccl@coalindia.in) |                    |                                                   |                                                    |                                                          |                  |                           |                                                                | Date of Issue        | 26.10.2022 |
| Project                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |                                                                                                                    | Sample Ref. No.    | REM/BCCL/2022/08                                  |                                                    |                                                          | Sampling Method  | CMPDI/RI-II/LPM 13        |                                                                |                      |            |
| Sampling Stations                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        | i                                                                                                                  | Nichtipur          |                                                   | Date of Sampling                                   | 11.08.22                                                 | 22.08.22         | Zone Category of Station: | Buffer Zone                                                    |                      |            |
| Sl. No.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  | Parameter                                                                                                          | Hour / Time of day | Observed Values (in Leq dB(A))<br>First Fortnight | Observed Values (in Leq dB(A))<br>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      | 47.8                                              | 46.7                                               | CPCB, Protocol for Ambient Level Noise Monitoring - 2015 | 35 dB-135 dB     | 35 dB(A)                  | Industrial<br>Commercial<br>Residential<br>Silence             | 75<br>65<br>55<br>50 |            |
| 2                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |                                                                                                                    | 07:00 - 08:00      | 50.3                                              | 49.2                                               |                                                          |                  |                           |                                                                |                      |            |
| 3                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |                                                                                                                    | 08:00 - 09:00      | 55.2                                              | 51.6                                               |                                                          |                  |                           |                                                                |                      |            |
| 4                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |                                                                                                                    | 09:00 - 10:00      | 58.5                                              | 57.2                                               |                                                          |                  |                           |                                                                |                      |            |
| 5                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |                                                                                                                    | 10:00 - 11:00      | 59.9                                              | 58.6                                               |                                                          |                  |                           |                                                                |                      |            |
| 6                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |                                                                                                                    | 11:00 - 12:00      | 58.5                                              | 57.2                                               |                                                          |                  |                           |                                                                |                      |            |
| 7                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |                                                                                                                    | 12:00 - 13:00      | 63.6                                              | 60.0                                               |                                                          |                  |                           |                                                                |                      |            |
| 8                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |                                                                                                                    | 13:00 - 14:00      | 62.6                                              | 61.3                                               |                                                          |                  |                           |                                                                |                      |            |
| 9                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |                                                                                                                    | 14:00 - 15:00      | 57.1                                              | 55.9                                               |                                                          |                  |                           |                                                                |                      |            |
| 10                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |                                                                                                                    | 15:00 - 16:00      | 56.4                                              | 55.0                                               |                                                          |                  |                           |                                                                |                      |            |
| 11                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |                                                                                                                    | 16:00 - 17:00      | 55.7                                              | 54.5                                               |                                                          |                  |                           |                                                                |                      |            |
| 12                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |                                                                                                                    | 17:00 - 18:00      | 55.2                                              | 54.0                                               |                                                          |                  |                           |                                                                |                      |            |
| 13                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |                                                                                                                    | 18:00 - 19:00      | 54.4                                              | 53.2                                               |                                                          |                  |                           |                                                                |                      |            |
| 14                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |                                                                                                                    | 19:00 - 20:00      | 53.4                                              | 52.2                                               |                                                          |                  |                           |                                                                |                      |            |
| 15                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |                                                                                                                    | 20:00 - 21:00      | 53.1                                              | 52.2                                               |                                                          |                  |                           |                                                                |                      |            |
| 16                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |                                                                                                                    | 21:00 - 22:00      | 52.9                                              | 51.7                                               |                                                          |                  |                           |                                                                |                      |            |
|                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |                                                                                                                    | <b>Leq DAY</b>     | <b>57.8</b>                                       | <b>56.0</b>                                        |                                                          |                  |                           |                                                                |                      |            |
| 1                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        | Noise Level dB(A)Leq -Night                                                                                        | 22:00-23:00        | 43.5                                              | 44.9                                               | CPCB, Protocol for Ambient Level Noise Monitoring - 2015 | 35 dB-135 dB     | 35 dB(A)                  | Industrial<br>Commercial<br>Residential<br>Silence             | 70<br>55<br>45<br>50 |            |
| 2                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |                                                                                                                    | 23:00- 00:00       | 43.1                                              | 44.2                                               |                                                          |                  |                           |                                                                |                      |            |
| 3                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |                                                                                                                    | 00:00- 01:00       | 42.8                                              | 43.5                                               |                                                          |                  |                           |                                                                |                      |            |
| 4                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |                                                                                                                    | 01:00-02:00        | 41.5                                              | 42.0                                               |                                                          |                  |                           |                                                                |                      |            |
| 5                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |                                                                                                                    | 02:00-03:00        | 39.4                                              | 39.1                                               |                                                          |                  |                           |                                                                |                      |            |
| 6                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |                                                                                                                    | 03:00-04:00        | 39.2                                              | 38.9                                               |                                                          |                  |                           |                                                                |                      |            |
| 7                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |                                                                                                                    | 04:00-05:00        | 38.1                                              | 37.6                                               |                                                          |                  |                           |                                                                |                      |            |
| 8                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |                                                                                                                    | 05:00-06:00        | 37.9                                              | 37.4                                               |                                                          |                  |                           |                                                                |                      |            |
|                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |                                                                                                                    | <b>Leq NIGHT</b>   | <b>41.3</b>                                       | <b>41.9</b>                                        |                                                          |                  |                           |                                                                |                      |            |
| *LDL indicates Lower Detection Limit                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |                                                                                                                    |                    |                                                   |                                                    |                                                          |                  |                           |                                                                |                      |            |
| **All noise measurements are integrated for a 01 hour period, All units in dB(A)                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |                                                                                                                    |                    |                                                   |                                                    |                                                          |                  |                           |                                                                |                      |            |
| Sampling Assistants                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      |                                                                                                                    | (Gaurav Kant)      |                                                   |                                                    | (Amit Raj Mishra)                                        |                  |                           |                                                                |                      |            |
| ANALYSED BY                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |                                                                                                                    | CHECKED BY         |                                                   |                                                    | HOD's Signature                                          |                  |                           |                                                                |                      |            |
| Note: The results above relate to the samples tested as received. This report can not be reproduced in part or full without the written permission of the HOD(Env) , CMPDI, RI-II.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |                                                                                                                    |                    |                                                   |                                                    |                                                          |                  |                           |                                                                |                      |            |
| ---- End of Report ----                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |                                                                                                                    |                    |                                                   |                                                    |                                                          |                  |                           |                                                                |                      |            |
| Page -1 of 1                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             |                                                                                                                    |                    |                                                   |                                                    |                                                          |                  |                           |                                                                |                      |            |

| <div style="display: flex; justify-content: space-between; align-items: center;"> <div>   <div> <b>cmpdi</b><br/> <i>A Mine Rules Company</i> </div> </div> <div style="text-align: center;"> <b>CENTRAL MINE PLANNING AND DESIGN INSTITUTE LIMITED</b><br/> <b>Environment Laboratory, Regional Institute-II</b><br/> <b>Ambient Noise Level Test Report</b> </div> <div style="text-align: right;"> <b>CMPDIL, RI-II</b><br/> <b>KOYLA BHAWAN COMPLEX</b><br/> <b>DHANBAD. -826005</b><br/> <b>Phone:0326-223-850</b><br/> <b>email: rdri2cmpdi@coalindia.in</b> </div> </div> |                                                                                                                    |                    |                                                    |                                                     |                                                                   |                  |                           |                                                                |                        |
|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------|--------------------|----------------------------------------------------|-----------------------------------------------------|-------------------------------------------------------------------|------------------|---------------------------|----------------------------------------------------------------|------------------------|
| Month & Year                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     | 08/2022                                                                                                            | Cluster            | Cluster IV                                         |                                                     |                                                                   |                  |                           | Report No.                                                     | RI-II/NOISE/2022-23/05 |
| Customer                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         | Environment Department, Bharat Coking Coal Limited (BCCL), Koyla Bhawan, Dhanbad (E-mail: gmenv.bccl@coalindia.in) |                    |                                                    |                                                     |                                                                   |                  |                           | Date of Issue                                                  | 26.10.2022             |
| Project                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |                                                                                                                    | Sample Ref. No.    | REM/BCCL/2022/08                                   |                                                     |                                                                   | Sampling Method  | CMPDI/RI-II/LPM 13        |                                                                |                        |
| Sampling Stations                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                | i                                                                                                                  | Rudhi Basti        |                                                    | Date of Sampling                                    | 08.08.22                                                          | 30.08.22         | Zone Category of Station: | Buffer Zone                                                    |                        |
| Sl. No.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          | Parameter                                                                                                          | Hour / Time of day | Observed Values (in Leq dB(A) )<br>First Fortnight | Observed Values (in Leq dB(A) )<br>Second Fortnight | Method of Analysis                                                | Range Of Testing | LDL                       | NOISE POLLUTION (REGULATION AND CONTROL) RULES, 2000 Standards |                        |
|                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |                                                                                                                    |                    |                                                    |                                                     |                                                                   |                  |                           | Zones                                                          | Limits in dB           |
| 1                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                | Noise Level<br>dB(A)Leq - Day                                                                                      | 06:00 - 07:00      | 45.8                                               | 46.7                                                | CPCB, Protocol for<br>Ambient Level<br>Noise Monitoring -<br>2015 | 35 dB-135 dB     | 35 dB(A)                  | Industrial<br>Commercial<br>Residential<br>Silence             | 75<br>65<br>55<br>50   |
| 2                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |                                                                                                                    | 07:00 - 08:00      | 48.2                                               | 49.2                                                |                                                                   |                  |                           |                                                                |                        |
| 3                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |                                                                                                                    | 08:00 - 09:00      | 53.4                                               | 51.6                                                |                                                                   |                  |                           |                                                                |                        |
| 4                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |                                                                                                                    | 09:00 - 10:00      | 56.1                                               | 57.2                                                |                                                                   |                  |                           |                                                                |                        |
| 5                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |                                                                                                                    | 10:00 - 11:00      | 57.4                                               | 58.6                                                |                                                                   |                  |                           |                                                                |                        |
| 6                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |                                                                                                                    | 11:00 - 12:00      | 62.3                                               | 57.2                                                |                                                                   |                  |                           |                                                                |                        |
| 7                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |                                                                                                                    | 12:00 - 13:00      | 58.8                                               | 60.0                                                |                                                                   |                  |                           |                                                                |                        |
| 8                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |                                                                                                                    | 13:00 - 14:00      | 60.0                                               | 61.3                                                |                                                                   |                  |                           |                                                                |                        |
| 9                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |                                                                                                                    | 14:00 - 15:00      | 55.6                                               | 55.9                                                |                                                                   |                  |                           |                                                                |                        |
| 10                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |                                                                                                                    | 15:00 - 16:00      | 53.9                                               | 55.0                                                |                                                                   |                  |                           |                                                                |                        |
| 11                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |                                                                                                                    | 16:00 - 17:00      | 53.4                                               | 54.5                                                |                                                                   |                  |                           |                                                                |                        |
| 12                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |                                                                                                                    | 17:00 - 18:00      | 52.9                                               | 54.0                                                |                                                                   |                  |                           |                                                                |                        |
| 13                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |                                                                                                                    | 18:00 - 19:00      | 52.1                                               | 53.2                                                |                                                                   |                  |                           |                                                                |                        |
| 14                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |                                                                                                                    | 19:00 - 20:00      | 51.2                                               | 52.2                                                |                                                                   |                  |                           |                                                                |                        |
| 15                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |                                                                                                                    | 20:00 - 21:00      | 50.6                                               | 52.2                                                |                                                                   |                  |                           |                                                                |                        |
| 16                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |                                                                                                                    | 21:00 - 22:00      | 50.4                                               | 51.7                                                |                                                                   |                  |                           |                                                                |                        |
|                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |                                                                                                                    | <b>Leq DAY</b>     | <b>55.9</b>                                        | <b>56.0</b>                                         |                                                                   |                  |                           |                                                                |                        |
| 1                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                | Noise Level<br>dB(A)Leq -Night                                                                                     | 22:00-23:00        | 44.3                                               | 44.9                                                | CPCB, Protocol for<br>Ambient Level<br>Noise Monitoring -<br>2015 | 35 dB-135 dB     | 35 dB(A)                  | Industrial<br>Commercial<br>Residential<br>Silence             | 70<br>55<br>45<br>50   |
| 2                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |                                                                                                                    | 23:00- 00:00       | 43.9                                               | 43.2                                                |                                                                   |                  |                           |                                                                |                        |
| 3                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |                                                                                                                    | 00:00- 01:00       | 41.9                                               | 42.7                                                |                                                                   |                  |                           |                                                                |                        |
| 4                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |                                                                                                                    | 01:00-02:00        | 42.5                                               | 42.9                                                |                                                                   |                  |                           |                                                                |                        |
| 5                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |                                                                                                                    | 02:00-03:00        | 43.0                                               | 42.0                                                |                                                                   |                  |                           |                                                                |                        |
| 6                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |                                                                                                                    | 03:00-04:00        | 40.9                                               | 41.6                                                |                                                                   |                  |                           |                                                                |                        |
| 7                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |                                                                                                                    | 04:00-05:00        | 40.1                                               | 41.2                                                |                                                                   |                  |                           |                                                                |                        |
| 8                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |                                                                                                                    | 05:00-06:00        | 40.2                                               | 41.0                                                |                                                                   |                  |                           |                                                                |                        |
|                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |                                                                                                                    | <b>Leq NIGHT</b>   | <b>42.4</b>                                        | <b>42.6</b>                                         |                                                                   |                  |                           |                                                                |                        |

\*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)  
**CHECKED BY**

(Amit Raj Mishra)  
**HOD's Signature**

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

---- End of Report ----  
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**IME & PME****(a) IME**

| Type of Man Power | In the month | Cumulative |
|-------------------|--------------|------------|
| Departmental      | 00           | 02         |
| Contractual       | 00           | 10         |

**(b) PME**

| Type of Man Power | In the month |             | Cumulative |             |
|-------------------|--------------|-------------|------------|-------------|
|                   | Target       | Achievement | Target     | Achievement |
| Departmental      | 70           | 50          | 700        | 711         |
| Contractual       | 00           | 00          | 33         | 33          |



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                                             |
|                          | <b>Total (A)</b> | <b>69.75</b>            | <b>174375</b>  | <b>104.9</b>       | <b>262250</b>  | <b>16</b>                      | <b>40000</b>   | <b>0</b>                                          | <b>0</b>       | <b>75</b>             | <b>187500</b>  | <b>90</b>     | <b>225000</b>  | <b>889125</b>    | <b>355.65</b>                               | <b>195.96671</b>                                  |
| 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                                             |
|                          | <b>Total (B)</b> | <b>30</b>               | <b>75000</b>   | <b>90</b>          | <b>225000</b>  | <b>12.89</b>                   | <b>32225</b>   | <b>92.25</b>                                      | <b>230625</b>  | <b>30.55</b>          | <b>76375</b>   | <b>54.38</b>  | <b>135950</b>  | <b>775175</b>    | <b>310.07</b>                               | <b>170.85167</b>                                  |
| <b>Grand (A+B)</b>       |                  | <b>99.75</b>            | <b>249375</b>  | <b>194.9</b>       | <b>487250</b>  | <b>28.89</b>                   | <b>72225</b>   | <b>92.25</b>                                      | <b>230625</b>  | <b>105.55</b>         | <b>263875</b>  | <b>144.38</b> | <b>360950</b>  | <b>1664300</b>   | <b>665.72</b>                               | <b>366.81838</b>                                  |

| CSR Works & Expenditure FY 2020-21* |                                                                                                                                                                                            |                               |           |                      |           |                                                                           |
|-------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------|-----------|----------------------|-----------|---------------------------------------------------------------------------|
| (CSR Budget - ₹ 5.54 Crore)         |                                                                                                                                                                                            |                               |           |                      |           |                                                                           |
| SI 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)         |                                                                                                                                                                                            |                               |           |                      |           |                                                                           |
| SI 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*





Few CSR works done by BCCL during Covid 19 Pandemic





## BHARAT COKING COAL LIMITED Corporate Environment Policy



### ENVIRONMENTAL POLICY STATEMENT:

Bharat Coking Coal Limited (BCCL) is committed to promote sustainable development by protecting the environment through integrated project planning & design, prevention / mitigation of pollution, conservation of natural resources, restoration of ecology & biodiversity, recycling/ proper disposal of wastes, addressing climate change and inclusive growth. It also aims to bringing awareness amongst its stakeholders for continual improvement in environmental performances following best practices.

### OBJECTIVES:

Bharat Coking Coal Limited shall endeavour to:

1. Plan & design projects with due consideration to environmental concerns for Sustainable Development.
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 of surrounding habitation by continuous monitoring and adopting suitable measures for environment protection.
4. Implement Environment Management Plans in all our mines /projects/Clusters effectively to mitigate pollution, conservation of natural resources and restoration of ecology & biodiversity.
5. Ensure compliance of all applicable Environmental Clearance& Forestry Clearance conditions and other statutory conditions issued by regulatory agencies.
6. Recycling of wastes on the principle of REDUCE, REUSE and RECYCLE.
7. Put special thrusts on efficient energy utilization / renewable energy as a measure to reduce carbon foot-print.
8. Strive for continual improvement in our environmental performances by setting targets, measuring progress and taking corrective action.
9. Taking measures to render productive post mining land use.
10. Implementation of activities applicable to BCCL arising out of International Conventions.
11. Create environmental awareness among the employees and the local communities through pro-active communication and training

### STRATEGIES FOR IMPLEMENTATION OF ENVIRONMENTAL POLICY:

#### BackGround:

Bharat Coking Coal Limited 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. Keeping this view in mind, Bharat Coking Coal Limited attaches top priority towards sustainable development and approved its 'Corporate Environmental Policy'. Based on CIL Environment Policy 2012, incorporating the Jharia Master Plan ,CEP of BCCL was approved by 285th BCCL board on 21.04.2012 and is complimentary to the National Environmental Policy, 2006. The Revised BCCL Policy, 2019 is the outcome of the experience gained since 2012, keeping in view the modifications / amendments made time to time in environmental policies and additional stipulation notified by MoEF&CC (Ministry of Environment, Forest& Climate Change), and other organisations concerning mine closure, reclamation of degraded land, environmental clearance etc. and also with the objective of revisiting the corporate policy. The Policy has a vision of Green Mining and mission of 100%

compliance of environmental statutes applicable to coal mining industry. This policy is prepared in line with that of CIL's policy with incorporation of prevailing local conditions.

**STRATEGIES: Bharat Coking Coal Limited adopts the strategies appended below for effective implementation:**

**1. MINE/ PROJECT PLANNING & DESIGN FOR SUSTAINABLE DEVELOPMENT:**

- a) Coal being a non-renewal energy source, extraction shall be planned prudently to meet national requirement in a planned way. The projects shall be designed on the principle of Sustainable Development with due consideration to environment, mine closure, safety and aspirations of the stakeholders at the planning & design stage itself with due regard to mine closure plan.
- b) While preparing the Mining plan/project reports, the effort shall be to incorporate latest mining technologies and equipment's with optimal capacity, which are more environment friendly
- c) All Mining Plan/ project reports will be provided with detailed provisions for ensuring environmental compliances

**2. ENVIRONMENTAL IMPACT ASSESSMENT (EIA) & ENVIRONMENT MANAGEMENT PLAN (EMP)**

- a. All mine planning and design shall be environmentally acceptable and operation shall be carried out in such a way as to facilitate the compliance of stipulated environmental standards.
- b. EIA& EMP for all projects/Clusters shall be formulated as per the approved ToR (Terms of Reference) and public consultations for obtaining Environmental Clearance (EC) from MoEF&CC. Similarly, in the existing projects needing enhancement of production capacities with or without increase in land, change of technology, renewal of lease and change in land use etc. fresh EC is required to be sought as per norms. The projects shall be operated after obtaining Consent to Establish (CTE)/ Consent to Operate (CTO) from State Pollution Control Boards (SPCB).
- c. Detailed Mine Closure Plans shall be prepared for all existing and new mines as per the MoC (Ministry of Coal) guidelines.

**3. COMPLIANCE OF THE STATUTORY REQUIREMENTS:**

The implementation of EMP and fulfilment of all other statutory requirements like conditions of EC, FC and consents to establish & operate, including timely submission of returns to statutory bodies and various agencies, are to be ensured at all levels.

**4. MEASURES TO MITIGATE POLLUTION:**

**a) Air Pollution:**

- i) Generation of dust is to be controlled at the source to the possible extent with necessary control measures during drilling, blasting, loading, unloading, CHP transfer points etc.
- ii) Deployment of eco-friendly mining technologies.
- iii) Dust generation is to be minimized along coal/ waste transportation routes.
- iv) Mechanized transportation of coal to be encouraged.
- v) Green belt is to be created around the source of dust

**b) Water pollution:**

- i) The mine water and other effluent shall be treated to ensure the discharge norms as per statute. The treated effluent shall be utilized to the extent possible with a view to achieve maximum water conservation.
- ii) Oil & grease from the effluent shall be removed by Oil & Grease Traps for proper disposal.

**c) Noise / ground vibration:**

- i) All measures to minimize noise pollution will be taken including maintenance of HEMM, equipment and provision of PPE where required.
- ii) Suitable blasting techniques shall be followed to reduce ground vibration as well as noise pollution.

**d) Land reclamation:**

- i) Progressive and concurrent reclamation of mined out areas will be carried out as per approved EIA/EMP and Mine Closure Plan (MCP).
- ii) Slopes of external dumps are the important area to be suitably graded / terraced for effective reclamation and plantation.
- iii) Preservation of top soil is required for future use. Old as well as existing nonactive dumps are to be technically and biologically reclaimed.
- iv) Monitoring of reclamation work of all opencast mines will be done through Satellite Surveillance. The outcome shall be put in the websites.

**e) Mine closure plans:**

Mine Closure Plan (MCP) shall be prepared for each mine on which Mine closure guidelines are applicable. MCP are being delineated in two phases viz. progressive and final mine closure. Appropriate funds are set aside and deposited under a special Escrow fund every year as per MoC guidelines, to be utilized for proper and final mine closure. For mines closed prior to issuance of MoC guidelines (i.e. 27th August, 2009) suitable action to be taken as per provisions of Mines Act 1952.

**f) Mine fire & subsidence**

BCCL shall endeavour to reduce occurrence of mine fire and subsidence due to mining activity for safety and conservation purpose and, shall take steps for prevention and control of coal mine fire. Monthly report shall be submitted to top management of the subsidiary and CIL and Quarterly to company board. Action Plan for mine fire control shall be implemented. Monitoring will be done through Satellite Surveillance/other suitable technology. Rehabilitation under Master Plan will be expedited to facilitate faster liquidation of fire. During the execution of the Master Plan since 2009, changes have occurred in the fire dealing methodology, the number of affected families and the infrastructure facilities to be provided to them. However, these modifications were executed in cognizance of HPCC committee for JMP.

BCCL is committed for implementation of the GOI approved Master Plan for Dealing with Fire, Subsidence and Rehabilitation in leasehold of BCCL (Jharia Master Plan) which is also required to be dovetailed with the implementation of EC conditions of various clusters of BCCL. Necessary steps shall be taken for implementation of Jharia master plan to deal with the problem of fire and subsidence in JCF along with R&R of affected people.

**g) Monitoring:**

All receptors in and around the mining projects/clusters shall be monitored regularly to assess the efficacy of the pollution control / mitigation measures within stipulated standards.

II. Effect of mining on the hydrology of the area will be monitored through measurement of water level and quality of nearby wells and bore holes provided for this purpose. Conservation of water through rainwater harvesting shall be taken up.

III. Area and Unit environmental cells shall have regular interaction with the people in and around the coal mines and other allied units on matters related to environment to take necessary and timely corrective actions.

V. Environmental initiatives and monitoring through self and third party environment audit shall be conducted for generating useful data for taking corrective actions and mitigation measures as per guidelines.

**h) Other measures:**

- I. Special emphasis shall be given to undertake R&D related to various facets of coal mine environmental management in collaboration with Central Mine Planning and Design Institute (CMPDI) and other competent institutions.
- II. Besides ensuring statutory compliance, the BCCL desires to set high standards and continual improvement.
- III. Mines & establishments shall be ISO 14001 certified in phased manner.
- IV. CSR and R&R policies of CIL are to be incorporated by BCCL for better planning and implementation of the socio-economic issues of coal mining areas.
- V. The coal mining environmental issues are complex and require multi-disciplinary approach to address the same. BCCL will endeavour to enter into MoUs with expert agencies of repute to assist in environment issues and also help in capacity building of BCCL executives.
- VI. BCCL conduct periodical medical examination (PME) of its work force on routine basis in compliance of the requirement mining rules and regulation, additional test will be done as and when required.

**5. PRESERVATION OF BIO-DIVERSITY:**

BCCL has made the ecological restoration a flagship programme for restoration of degraded mined areas and adopting 3- tier plantation consisting of native species grasses, bushes and trees under the technical expertise of Forest research institute, Dehradun, a renowned institute in the field of forests and ecology. Ecological restoration has been widely accepted as one of the most effective means to restore the ecology and biodiversity.

BCCL is committed towards the conservation and restoration of the natural biodiversity of the region on the degraded mined out areas and restore back to forest like areas. BCCL will strive to restore the habitats for the native fauna of the region by restoring the areas through ecological restoration.

BCCL is committed towards the wellbeing and betterment of the living standards for the local community through establishment of the eco-parks in the reclaimed mined areas in the coalfield and promoting the eco-mining tourism in the coalfield areas and exploring the new opportunities to the local communities. This will start from mine planning including technically and biologically reclamation of mined out areas in collaboration with State Forest Departments, Wild Life Divisions, NGOs, FRI Dehradun etc. working in the fields of biodiversity conservation.

**6. COAL BENEFICIATION / COAL WASHERIES:**

- a) For beneficiation of Runoff Mines (ROM) coal, washeries are being set up in a phased manner as per requirement and statutes.
- b) Slurry Management System (SMS) in all washeries shall be organized to ensure collection of fines, gainful utilization of rejects viz. power generation in Fluidized Bed Combustion (FBC) plants, selling to brick manufacturers or adopting other environmental friendly disposal options as feasible.
- c) The reject dumps and tailings shall be suitably handled to avoid any contamination.
- d) The effluent from washeries including tailings pond shall be suitably treated and reused to minimize water consumption with zero discharge concept.

**7. CONSERVATION AND CLEAN TECHNOLOGY:**

- a) R&D projects shall be taken up to promote clean coal technology and improve the existing technologies.
- b) Energy saved is energy produced. Voluntary energy audit to be done for corrective action to reduce carbon footprint.
- c) Clean Development Mechanisms will be explored for reducing emission of Green House Gases by exploration, identification, preparation of projects reports for extraction of methane from Coal Bed, Coal Mine, Abandoned Mine, Ventilation Air, UG Coal Gasification, generation and utilization of renewable energy etc.

## **8. AWARENESS PROGRAMME:**

- a) Publicity to generate awareness through exchange & communication of information, newsletters and periodicals on environment, seminars, workshops, celebration of World Environment Day etc, at BCCL HQ, Areas & units to be undertaken. Regular training programs to be organized at various levels to inculcate awareness among employees.
- b) Courses on environmental and forestry laws and Environmental Protection Measures and the Corporate Policy to be organized for project executives for improving knowledge.
- c) BCCL will felicitate its workers for best practices in eco-restoration, land reclamation, conservation, compliance of statutes and innovative ways of sustaining environment.

## **9. WASTE MANAGEMENT:**

BCCL will undertake appropriate action for safe handling, storage and disposal of solid waste and hazardous waste generated from its industrial set up and colonies as per relevant rules. The biomedical waste generated from hospitals and dispensaries will be collected and disposed in appropriate facilities created as per statutes. E-waste management and handling of various types of e-waste generated in its operations will be done as per rule.

## **10. CORPORATE ENVIRONMENT RESPONSIBILITY:**

Corporate Environment Responsibility (CER) is mandatory for issuing environmental clearance for all the Greenfield and Brownfield projects as per directives of MoEFCC with effect from 1st May, 2018 (O.M.No.22-65/2017- I/III dt. 19.06.2018). Budgetary provisions should be kept for implementation of provisions of CER for all the projects which will be submitted to MoEFCC for grant of environmental clearance.

## **11. INCORPORATION OF VIEWS OF STAKEHOLDERS:**

BCCL will critically examine and incorporate the viewpoints of various stakeholders like PAPs/PAFs, Parliamentary Committees, Standing Sub-Committees, NGOs etc.

## **12. IMPLEMENTATION OF POLICY:**

**i) Manpower:** BCCL shall have environmental divisions at decision making & operational levels in its structure. The environment department shall be set up and strengthened at:

i) BCCL HQ

ii) Areas / Units / Collieries / Workshops / Washeries

**ii) Roles and Responsibilities:** The environmental department, set up at company HQs, Areas and Unit levels with appropriate manpower and resources, shall be responsible for implementation of policy, obtaining EC, FC, consent to establish & operate, statutes requirements and undertaking mitigation measures besides preparation of action plan every year and also to intimate the status of implementation to the management regularly.

**iii) Annual Environment Budget (Revenue & Capital):** The Annual Environment Budget (revenue & capital) shall be prepared based on the action plan including monitoring of various bench marks and the budget utilization. The year wise funds earmarked for environmental protection measures shall be kept in separate accounts with Environmental cost code.

## **REVIEW OF ENVIRONMENTAL POLICY:**

In view of the present fast changing social, economic and environmental scenario, the CIL 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, the CIL Corporate Environmental Policy would be reviewed and suitably revised. It will be followed by revision of this policy accordingly.

Place: Dhanbad  
Date:

*P. B. D.*  
Chairman-cum-Managing Director  
21/02/2023

**Major Environmental measures cost for the year 2020-21**

| <b>Sl. No.</b>             | <b>Activity (20-21)</b>                            | <b>Approx Cost Incurred<br/>(In Lakhs)</b> |
|----------------------------|----------------------------------------------------|--------------------------------------------|
| 1                          | Environmental Monitoring (Air, water and noise)    | 18.71                                      |
| 2                          | Procurement of 28 KL Water Tanker (3 Nos)          | 500.00                                     |
| 3                          | Ecological Restoration/Block Plantation/Green Park | 143.0                                      |
| 4                          | Fire covering/blanketing/fighting                  | 80.00                                      |
| 5                          | Water Sprinkling                                   | 75.00                                      |
| 6                          | Water treatment plant                              | 35.00                                      |
| 7                          | Top soil Management                                | 2.5                                        |
|                            | Plantation by DFO                                  | 29.48                                      |
|                            | Avenue Plantation (Gabion plantation)              | 2.58                                       |
| <b>Total Cost Incurred</b> |                                                    | <b>886.27</b>                              |

Note:- Amount deposited in Escrow account for implementation of progressive mine closure Activity in the mines under cluster IV 5.66 Crores in the FY20-21.



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/ORIG/2021/14162 |     |        |    |                    |                      |                          |                     |         |            |        |     |         |  |
| 2.                                                                                           | Application No.:                                                                              | 21-4/320/JH/MIN/2018         |     |        |    |                    | 3.                   | Category:<br>(GWRE 2020) |                     |         | Safe       |        |     |         |  |
| 4.                                                                                           | Project Status:                                                                               | Existing Project             |     |        |    |                    | 5.                   | NOC Type:                |                     |         | New        |        |     |         |  |
| 6.                                                                                           | Valid from:                                                                                   | 27/12/2021                   |     |        |    |                    | 7.                   | Valid up to:             |                     |         | 26/12/2023 |        |     |         |  |
| 8.                                                                                           | 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 |  |
| 40.00                                                                                        |                                                                                               | 14600.00                     |     |        |    | 5900.00            |                      | 2153500.00               |                     |         |            |        |     |         |  |
| 9.                                                                                           | Details of ground water abstraction /Dewatering structures                                    |                              |     |        |    |                    |                      |                          |                     |         |            |        |     |         |  |
| Total Existing No.:1                                                                         |                                                                                               |                              |     |        |    |                    | Total Proposed No.:0 |                          |                     |         |            |        |     |         |  |
|                                                                                              |                                                                                               | DW                           | DCB | BW     | TW | MP                 | MPu                  | DW                       | DCB                 | BW      | TW         | MP     | MPu |         |  |
| Abstraction Structure*                                                                       |                                                                                               | 1                            | 0   | 0      | 0  | 0                  | 0                    | 0                        | 0                   | 0       | 0          | 0      | 0   |         |  |
| Dewatering Structure*                                                                        |                                                                                               | 0                            | 0   | 0      | 0  | 0                  | 1                    | 0                        | 0                   | 0       | 0          | 0      | 0   |         |  |
| *DW- Dug Well; DCB-Dug-cum-Bore Well; BW-Bore Well; TW-Tube Well; MP-Mine Pit;MPu-Mine Pumps |                                                                                               |                              |     |        |    |                    |                      |                          |                     |         |            |        |     |         |  |
| 10.                                                                                          | Ground Water Abstraction/Restoration Charges paid (Rs.):                                      |                              |     |        |    |                    |                      | 8672400.00               |                     |         |            |        |     |         |  |
| 11.                                                                                          | 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                   |         |            |        |     |         |  |

(Compliance Conditions given overleaf)

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

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

पानी बचाये - जीवन बचाये  
SAVE WATER - SAVE LIFE



**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](http://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<sup>3</sup>/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 m<sup>3</sup>/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).

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



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

Ph: 0326-2204933

7

Letter No. .... 2658

Dated .... 6/2/13

From,

Regional Officer,  
Dhanbad

To,

HOD (Envt.),  
M/s. B.C.C.L.,  
Koyla Bhawan, Koyla Nagar,  
Dhanbad.Sub: **Fixing up monitoring station/Sampling location of Air, Water & Noise.**

Sir,

With reference to you letter no. GM(Envt)/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,

6/2/13  
(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.

## Bid Document

| Bid Details                                                                                        |                                                                                                                                                                                                                                                                                                                                                                            |
|----------------------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Bid End Date/Time</b>                                                                           | 30-11-2022 14:00:00                                                                                                                                                                                                                                                                                                                                                        |
| <b>Bid Opening Date/Time</b>                                                                       | 30-11-2022 14:30:00                                                                                                                                                                                                                                                                                                                                                        |
| <b>Bid Offer Validity (From End Date)</b>                                                          | 90 (Days)                                                                                                                                                                                                                                                                                                                                                                  |
| <b>Ministry/State Name</b>                                                                         | Ministry Of Coal                                                                                                                                                                                                                                                                                                                                                           |
| <b>Department Name</b>                                                                             | Materials Management                                                                                                                                                                                                                                                                                                                                                       |
| <b>Organisation Name</b>                                                                           | Bharat Coking Coal Limited                                                                                                                                                                                                                                                                                                                                                 |
| <b>Office Name</b>                                                                                 | Bccl Dhanbad                                                                                                                                                                                                                                                                                                                                                               |
| <b>Total Quantity</b>                                                                              | 11                                                                                                                                                                                                                                                                                                                                                                         |
| <b>Item Category</b>                                                                               | COAAQMS (Q3) , COAAQMS (without pm10) (Q3)                                                                                                                                                                                                                                                                                                                                 |
| <b>MSE Exemption for Years Of Experience</b>                                                       | Yes                                                                                                                                                                                                                                                                                                                                                                        |
| <b>Startup Exemption for Years Of Experience</b>                                                   | Yes                                                                                                                                                                                                                                                                                                                                                                        |
| <b>Document required from seller</b>                                                               | Experience Criteria,Certificate (Requested in ATC),OEM Authorization Certificate,Additional Doc 1 (Requested in ATC),Compliance of BoQ specification and supporting document<br>*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 |
| <b>Bid to RA enabled</b>                                                                           | Yes                                                                                                                                                                                                                                                                                                                                                                        |
| <b>RA Qualification Rule</b>                                                                       | H1-Highest Priced Bid Elimination                                                                                                                                                                                                                                                                                                                                          |
| <b>Comprehensive Maintenance Charges Required</b>                                                  | Yes                                                                                                                                                                                                                                                                                                                                                                        |
| <b>Primary product category</b>                                                                    | COAAQMS (without pm10)                                                                                                                                                                                                                                                                                                                                                     |
| <b>Time allowed for Technical Clarifications during technical evaluation</b>                       | 7 Days                                                                                                                                                                                                                                                                                                                                                                     |
| <b>Inspection Required (By Empanelled Inspection Authority / Agencies pre-registered with GeM)</b> | No                                                                                                                                                                                                                                                                                                                                                                         |
| <b>Estimated Bid Value</b>                                                                         | 96243945                                                                                                                                                                                                                                                                                                                                                                   |
| <b>Payment Timelines</b>                                                                           | Payments shall be made to the Seller within <b>21</b> 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)                                                                                                                                   |
| <b>Evaluation Method</b>                                                                           | Item wise evaluation                                                                                                                                                                                                                                                                                                                                                       |

### EMD Detail

|                                |               |
|--------------------------------|---------------|
| Advisory Bank                  | AXIS BANK LTD |
| Schedule 1 EMD Amount (In INR) | 942045        |
| Schedule 2 EMD Amount (In INR) | 982834        |

#### ePBG Detail

|                                     |               |
|-------------------------------------|---------------|
| Advisory Bank                       | AXIS BANK LTD |
| ePBG Percentage(%)                  | 10.00         |
| Duration of ePBG required (Months). | 26            |

(a). 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). EMD & Performance security should be in favour of Beneficiary, wherever it is applicable.

#### Beneficiary:

BCCL

Bccl Dhanbad, Materials Management, Bharat Coking Coal Limited, Ministry of Coal

(Bccl)

#### Splitting

Bid splitting not applied.

#### MII Purchase Preference

|                         |     |
|-------------------------|-----|
| MII Purchase Preference | Yes |
|-------------------------|-----|

#### MSE Purchase Preference

|                         |     |
|-------------------------|-----|
| MSE Purchase Preference | Yes |
|-------------------------|-----|

1. If the bidder is a Micro or Small Enterprise as per latest definitions under MSME rules, the bidder shall be exempted from the requirement of "Bidder Turnover" criteria and "Experience Criteria" subject to meeting of quality and technical specifications. If the bidder is OEM of the offered products, it would be exempted from the "OEM Average Turnover" criteria also subject to meeting of quality and technical specifications. In case any bidder is seeking exemption from Turnover / Experience Criteria, the supporting documents to prove his eligibility for exemption must be uploaded for evaluation by the buyer.

2. If the bidder is a Startup, the bidder shall be exempted from the requirement of "Bidder Turnover" criteria and "Experience Criteria" subject to their meeting of quality and technical specifications. If the bidder is OEM of the offered products, it would be exempted from the "OEM Average Turnover" criteria also subject to meeting of quality and technical specifications. In case any bidder is seeking exemption from Turnover / Experience Criteria, the supporting documents to prove his eligibility for exemption must be uploaded for evaluation by the buyer.

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 .In case Buyer has selected Purchase preference to Micro and Small Enterprises clause in the bid, the same will get precedence over this clause.

4. Purchase preference to Micro and Small Enterprises (MSEs): Purchase preference will be given to MSEs 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 the Purchase preference, the bidder must be the manufacturer of the offered product in case of bid for supply of goods. Traders are excluded from the purview of Public Procurement Policy for Micro and Small Enterprises. 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. 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 Seller shall be given opportunity to match L-1 price and contract will be awarded for 25%(selected by Buyer) percentage of total QUANTITY.

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

#### **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:

| <b>Evaluation Schedules</b> | <b>Estimated Value</b> | <b>Item/Category</b>   | <b>Quantity</b> |
|-----------------------------|------------------------|------------------------|-----------------|
| Schedule 1                  | 47102265               | Coaaqms                | 5               |
| Schedule 2                  | 49141680               | Coaaqms (without Pm10) | 6               |

#### **COAAQMS ( 5 set )**

**(Minimum 50% and 20% Local Content required for qualifying as Class 1 and Class 2 Local Supplier respectively)**

|            |           |
|------------|-----------|
| Brand Type | Unbranded |
|------------|-----------|

#### **Technical Specifications**

|                              |                          |
|------------------------------|--------------------------|
| Buyer Specification Document | <a href="#">Download</a> |
|------------------------------|--------------------------|

| Comprehensive Maintenance                          |        |
|----------------------------------------------------|--------|
| Warranty of required product                       | 2 Year |
| Comprehensive Maintenance Duration (Post Warranty) | 5 Year |

\*Warranty displayed under the AMC/CMC Details section will supersede the warranty displayed under the catalog specification

#### Consignees/Reporting Officer and Quantity

| S.No. | Consignee/Reporting Officer | Address                                                                                                                         | Quantity | Delivery Days |
|-------|-----------------------------|---------------------------------------------------------------------------------------------------------------------------------|----------|---------------|
| 1     | Rohit Kumar                 | 828101, Depot Officer, Central Store, Ekra, BCCL, Post Office- BANSJORA, Dhanbad, Jharkhand-828101.                             | 1        | 90            |
| 2     | Tripurari Kumar             | 828116, BCCL, Kusunda Area, Post: Kusunda                                                                                       | 1        | 90            |
| 3     | Shiv Prasad Rabidas         | 828202, Depot Officer, Regional Store, Laikdih, Post Chirkunda                                                                  | 1        | 90            |
| 4     | Satish Kumar Mishra         | 828106, Depot Officer, Bera Regional Store, Near Dowari colliera, Bastacolla Area, P.O. Dhansar, Dhanbad.                       | 1        | 90            |
| 5     | Rajnish Ranjan Shukla       | 828113, Office of Depot Officer ,Regional Store, Katras Area, Katras Garh, Post Office- Angarpathra, DHANBAD, JHARKHAND- 828113 | 1        | 90            |

#### COAAQMS (without Pm10) ( 6 set )

(Minimum 50% and 20% Local Content required for qualifying as Class 1 and Class 2 Local Supplier respectively)

|            |           |
|------------|-----------|
| Brand Type | Unbranded |
|------------|-----------|

#### Technical Specifications

|                              |                          |
|------------------------------|--------------------------|
| Buyer Specification Document | <a href="#">Download</a> |
|------------------------------|--------------------------|

| Comprehensive Maintenance                          |        |
|----------------------------------------------------|--------|
| Warranty of required product                       | 2 Year |
| Comprehensive Maintenance Duration (Post Warranty) | 5 Year |

\*Warranty displayed under the AMC/CMC Details section will supersede the warranty displayed under the catalog specification

#### Consignees/Reporting Officer and Quantity

| S.No. | Consignee/Reporting Officer | Address                                                                                                     | Quantity | Delivery Days |
|-------|-----------------------------|-------------------------------------------------------------------------------------------------------------|----------|---------------|
| 1     | Ajay Kumar Rajbhar          | 828306,Office of General Manager, Barora Area (Area-I), BCCL, P.O. Nawagarh, Dhanbad, Pin code-828306.      | 1        | 90            |
| 2     | Shiv Prasad Rabidas         | 828202,Depot Officer, Regional Store, Laikdih, Post Chirkunda                                               | 1        | 90            |
| 3     | Rahul Babu                  | 828131,Office of Depot Officer , Post Office Lodna, DHANBAD, JHARKHAND.                                     | 1        | 90            |
| 4     | Prashant Kumar              | 828128,Regional Store, Sinidih, Govindpur, Area-3, BCCL, Post-Tundu, Dhanbad, Pincode-828128.               | 1        | 90            |
| 5     | Surya Kant Sinha            | 828307,Depot Officer, Regional Store, Block-II, P.O.-Nudkhurkee, Dist.-Dhanbad, Jharkhand, Pin code-828307. | 1        | 90            |
| 6     | Nagendra Kumar Chaudhary    | 828129,Office of General Manager, Western Jharia Area of BCCL, Moonidih Rd, Putkee, Jharkhand 828129        | 1        | 90            |

#### Buyer added Bid Specific Additional Scope of Work

| S.No. | Document Title                            | Description                                         | Applicable i.r.o. Items |
|-------|-------------------------------------------|-----------------------------------------------------|-------------------------|
| 1     | List of locations<br><a href="#">View</a> | List of locations where COAAQMS are to be installed | COAAQMS(5)              |
| 2     | CAMC Terms<br><a href="#">View</a>        | CAMC terms to be agreed by the bidder               | COAAQMS(5)              |



| S.No. | Document Title                        | Description                                                | Applicable i.r.o. Items |
|-------|---------------------------------------|------------------------------------------------------------|-------------------------|
| 3     | Scope of Work<br><a href="#">View</a> | Scope of Work- acceptance needs to be submitted with offer | COAAQMS(5)              |

**The uploaded document only contains Buyer specific Additional Scope of Work and / or Drawings for the bid items added with due approval of Buyer's competent authority. Buyer has certified that these additional scope and drawings are generalized and would not lead to any restrictive bidding.**

## 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

Bidders shall quote only those products in the bid which are not obsolete in the market and has at least 7 years residual market life i.e. the offered product shall not be declared end-of-life by the OEM before this period.

### 3. Generic

Bidder shall submit the following documents along with their bid for Vendor Code Creation:

- Copy of PAN Card.
- Copy of GSTIN.
- Copy of Cancelled Cheque.
- Copy of EFT Mandate duly certified by Bank.

### 4. 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](#)

### 5. Generic

Data Sheet of the product(s) offered in the bid, are to be uploaded along with the bid documents. Buyers can match and verify the Data Sheet with the product specifications offered. In case of any unexplained mismatch of technical parameters, the bid is liable for rejection.

### 6. Generic

The seller is required to print logo as per buyer's requirement.

### 7. Generic

Without prejudice to Buyer's right to price adjustment by way of discount or any other right or remedy available to Buyer, Buyer may terminate the Contract or any part thereof by a written notice to the Seller, if:

- The Seller fails to comply with any material term of the Contract.
- The Seller informs Buyer of its inability to deliver the Material(s) or any part thereof within the stipulated Delivery Period or such inability otherwise becomes apparent.
- The Seller fails to deliver the Material(s) or any part thereof within the stipulated Delivery Period and/or to replace/rectify any rejected or defective Material(s) promptly.

- iv) The Seller becomes bankrupt or goes into liquidation.
- v) The Seller makes a general assignment for the benefit of creditors.
- vi) A receiver is appointed for any substantial property owned by the Seller.
- vii) The Seller has misrepresented to Buyer, acting on which misrepresentation Buyer has placed the Purchase Order on the Seller.

#### 8. **Generic**

**Upload Manufacturer authorization:** Wherever Authorised Distributors are submitting the bid, Manufacturers Authorisation Form (MAF)/Certificate with OEM details such as name, designation, address, e-mail Id and Phone No. required to be furnished along with the bid.

#### 9. **OEM**

**IMPORTED PRODUCTS:** In case of imported products, OEM or Authorized Seller of OEM should have a registered office in India to provide after sales service support in India. The certificate to this effect should be submitted.

#### 10. **Service & Support**

Escalation Matrix For Service Support : Bidder/OEM must provide Escalation Matrix of Telephone Numbers for Service Support.

#### 11. **Service & Support**

Dedicated /toll Free Telephone No. for Service Support : BIDDER/OEM must have Dedicated/toll Free Telephone No. for Service Support.

#### 12. **Inspection**

**Nominated Inspection Agency:** On behalf of the Buyer organization, any one of the following Inspection Agency would be conducting inspection of stores before acceptance:  
Pre-dispatch Inspection at Seller Premises (applicable only if pre-dispatch inspection clause has been selected in ATC): NA  
Post Receipt Inspection at consignee site before acceptance of stores: HOD Envt or his authorized representative

#### 13. **Certificates**

Bidder's offer is liable to be rejected if they don't upload any of the certificates / documents sought in the Bid document, ATC and Corrigendum if any.

#### 14. **Warranty**

Warranty period of the supplied products shall be 2 years from the date of final acceptance of goods or after completion of installation, commissioning & testing of goods (if included in the scope of supply), at consignee location. OEM Warranty certificates must be submitted by Successful Bidder at the time of delivery of Goods. The seller should guarantee the rectification of goods in case of any break down during the guarantee period. Seller should have well established Installation, Commissioning, Training, Troubleshooting and Maintenance Service group in INDIA for attending the after sales service. Details of Service Centres near consignee destinations are to be uploaded along with the bid.

#### 15. **Warranty**

Over and above the normal Warranty terms as per GeM GTC, the successful bidder / OEM shall have to provide Comprehensive Warranty during the entire Standard warranty period as per contract. : The comprehensive warranty shall be covering the following scope 5 (Upload an undertaking with the bid confirming compliance by the bidder if Bidder is taking onus of this compliance. In case OEM is taking onus of this compliance, OEM undertaking is to be uploaded along with Bidder undertaking)

#### 16. **Warranty**

Timely Servicing / rectification of defects during warranty period: After having been notified of the defects

/ service requirement during warranty period, Seller has to complete the required Service / Rectification within 3 days time limit. If the Seller fails to complete service / rectification with defined time limit, a penalty of 0.5% of Unit Price of the product shall be charged as penalty for each week of delay from the seller. Seller can deposit the penalty with the Buyer directly else the Buyer shall have a right to recover all such penalty amount from the Performance Security (PBG). Cumulative Penalty cannot exceed more than 10% of the total contract value after which the Buyer shall have the right to get the service / rectification done from alternate sources at the risk and cost of the Seller besides forfeiture of PBG. Seller shall be liable to re-imburse the cost of such service / rectification to the Buyer.

#### 17. **Generic**

1. The Seller shall not assign the Contract in whole or part without obtaining the prior written consent of buyer.
2. The Seller shall not sub-contract the Contract in whole or part to any entity without obtaining the prior written consent of buyer.
3. The Seller shall, notwithstanding the consent and assignment/sub-contract, remain jointly and severally liable and responsible to buyer together with the assignee/ sub-contractor, for and in respect of the due performance of the Contract and the Sellers obligations there under.

#### 18. **Generic**

The successful bidder has to supply all essential accessories required for the successful installation and commissioning of the goods supplied. Besides standard accessories as per normal industry practice, following accessories must be part of supply and cost should be included in bid price: SCOPE OF WORK.

#### 19. **Generic**

##### **OPTIONAL SITE VISIT:**

1. The Bidder is advised to visit and examine the installation site and its surroundings and obtain for itself on its own responsibility all information that may be necessary for preparing the Bid. The costs of visiting the site shall be borne by the Bidder. YES
2. The Bidder representative shall be allowed entry upon consignee premises for such visits, only upon the express conditions that the Bidder will release and indemnify the Buyer and Consignee against all liabilities arising out of such visit including death or injury, loss or damage to property, and any other loss, damage, costs, and expenses incurred as a result of such visit.
3. The Bidder shall not be entitled to hold any claim against Buyer for noncompliance due to lack of any kind of pre-requisite information as it is the sole responsibility of the Bidder to obtain all the necessary information with regard to site, surrounding, working conditions, weather etc. on its own before submission of the bid.

#### 20. **Buyer Added Bid Specific ATC**

Buyer Added text based ATC clauses

##### **1)TERMS FOR COMPREHENSIVE WARRANTY**

A)Warranty period of the supplied products shall be 5 years from the date of final acceptance of goods or after completion of installation, commissioning & testing of goods (if included in the scope of supply), at consignee location.

OEM Warranty certificates must be submitted by Successful Bidder at the time of delivery of Goods. The seller should guarantee the rectification of goods in case of any break down during the guarantee period. Seller should have well established Installation, Commissioning, Training, Troubleshooting and Maintenance Service group in INDIA for attending the after sales service. Details of Service Centres near consignee destinations are to be uploaded along with the bid.

B) Replacement under warranty clause shall be made by the Seller free of all charges at site including freight, insurance and other incidental charges. During the warranty period, the Seller shall remain responsible to arrange replacement in next Business day (NBD) and for setting right at his own cost any equipment installed by him which is of defective manufacture or design or becomes unworkable due to any cause whatsoever. The decision of the Buyers representative in this regard to direct the contractor to attend to any damage or defect in work shall be final and binding on the Seller.

C) The Bidder shall be responsible for any defects that may develop under the conditions provided by the contract and under proper USE, arising FROM faulty materials, design OR workmanship such AS corrosion, inadequate quantity of material TO meet equipment requirements, inadequate contact protection, deficiencies in design AND/ OR otherwise and shall remedy such defects at his own cost when called upon to do so by the Purchaser who shall state in writing in what respect the stores are faulty.

Warranty shall include COST OF SPARES, CONSUMABLES, PERIODIC SITE VISIT ETC

**2) Proven ness Criteria:** The equipment offered by the tenderer shall be considered proven provided the offered model/item with same or higher specification, must have been supplied by the bidder in India to mining industry and/or to the other Industries (Private or Government/ Public Sector Undertaking) and performed satisfactorily for a minimum period of one year from the date of commissioning (window period). The performance of only those equipment would be considered for assessing proven-ness which have been commissioned 1 year prior to the date of opening of tender but not prior to 5 years from the date of opening of tender.

Relevant PO copies, commissioning certificate issued by User Organization need to be submitted along with offer for compliance of above achieved the guaranteed annual availability and satisfactory performance, if any, as per the performance guarantee clause of the supply orders/contracts for a minimum period of one year from the date of commissioning.

Considering the practical difficulties in obtaining the Performance Reports in cases where provenness of the offered product is being ascertained on the basis of supply made in other subsidiaries of CIL or other PSUs/Govt Department/Private Organizations, the bidder shall submit a self-certificate in the following format along with proof of payment against the Purchase Order/ Rate Contract and commissioning certificates (in case of equipment, P&M etc where erection & commissioning is required):

"The items covered in the purchase order/ rate contract(s) copies enclosed with our offer have been fully executed and have performed satisfactorily as per the provisions of the respective purchase order/ rate contract(s) and all the complaints lodged by the purchaser, if any, have been attended to and no complaints/ claims are pending."

Relaxation from above Provenness criteria (for Prior Experience /Turnover) for Startup and Micro & Small Enterprises (MSEs):

As per Provision of Policy Circular No.1 (2) (1)/2016-MA dated 10th March 2016 issued by Ministry of Micro, Small and Medium Enterprises, Government of India, prior experience and turnover criteria is not applicable for MSEs bidders and no further documents regarding provenness will be required to be submitted by these category of bidders.

Documents for claiming exemption from provenness criteria:

i) Certificate towards quality assurance & capability from some authority like MSME, NSIC etc. for the quoted items.

OR

ii) Any favourable technical capability reports given earlier to bidder for supply of the tendered item(s) as per the required specification is available, these may be considered, provided the date of such reports are not more than one year from the date of opening of bids.

OR

iii) If bidders have submitted documents to prove Startup/MSE status for the tendered items and whose products are ISI marked / DGMS approved / Current holding Rate Contract with CIL or its subsidiaries for supply of tendered items/supplied and proven in CIL or Subsidiary companies /proven product of the ancillary unit of a subsidiary company of CIL

Note: For claiming MSE exemption , the bidder must be manufacturer of the offered item i.e. COAAQMS and its analyzers.

**3)The specific CAMC terms uploaded with the Bid document will supersede the general Additional Clause For Comprehensive Maintenance Charges where conflicting.**

**4)The ePBG against CAMC may be considered as 5%**

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## 21. Buyer Added Bid Specific ATC

Buyer uploaded ATC document [Click here to view the file.](#)

## 22. Generic

Installation, Commissioning, Testing, Configuration, Training (if any - which ever is applicable as per scope of supply) is to be carried out by OEM / OEM Certified resource or OEM authorised Reseller.

## Disclaimer

The additional terms and conditions have been incorporated by the Buyer after approval of the Competent Authority in Buyer Organization. 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. Any clause incorporated by the Buyer such as demanding Tender Sample, incorporating any clause against the MSME policy and Preference to make in India Policy, mandating any Brand names or Foreign Certification, changing the default time period for Acceptance of material or payment timeline governed by OM of Department of Expenditure shall be null and void and would not be considered part of bid. Further any reference of conditions published on any external site or reference to external documents/clauses shall also be null and void. 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. Also, GeM does not permit collection of Tender fee / Auction fee in case of Bids / Forward Auction as the case may be. Any stipulation by the Buyer seeking payment of Tender Fee / Auction fee through ATC clauses would be treated as null and void.

## 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 including CMC 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=

$C + C \times \{ (A1/100)/(1.10^n) + (A2/100)/(1.10^{n+1}) + (A3/100)/(1.10^{n+2}) + (A4/100)/(1.10^{n+3}) + (A5/100)/(1.10^{n+4}) \}$  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 be 2 and if 5 year warranty specified, n shall be 5. A1, A2, A3, A4 & A5 shall depend on how many years CMC selected. For 3 year CMC, 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 10% 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 5% 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.

[This Bid is also governed by the General Terms and Conditions](#)

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.

**---Thank You---**

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

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

**(FOR THE MONTH AUGUST, 2022)**

**E. C. no. J-11015/372/2010-IA.II (M) dated 23.10.2019**



**CMPDI**

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



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## **EXECUTIVE SUMMARY**

### **1.0 Introduction**

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

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

### **2.0 Sampling location and rationale**

#### **2.1 Ambient air sampling locations**

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

#### **2.2 Water sampling stations**

The Water sampling stations were selected for mine sump water.

#### **2.3 Noise level monitoring locations**

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

### **3.0 Methodology of sampling and analysis**

#### **3.1 Ambient air quality**

Parameters chosen for assessment of ambient air quality were Particulate Matter (PM<sub>10</sub>), Fine Particulate Matter (PM<sub>2.5</sub>), Sulphur Di-oxide (SO<sub>2</sub>) and Nitrogen Oxides (NO<sub>x</sub>). Respirable Dust Samplers (RDS) and Fine Dust Sampler (PM<sub>2.5</sub>

sampler) were used for sampling of PM<sub>10</sub>, SO<sub>2</sub>, & NO<sub>x</sub> and Fine Dust Sampler (PM<sub>2.5</sub> sampler) were used for sampling of PM<sub>2.5</sub> 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<sub>EQ</sub>' 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<sub>10</sub>, PM<sub>2.5</sub>, SO<sub>2</sub> and NO<sub>x</sub> 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<sub>10</sub>& PM<sub>2.5</sub> 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<sub>10</sub>, PM<sub>2.5</sub>, SO<sub>2</sub>, NO<sub>x</sub> 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° 48'34" N, 86° 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° 47.916' N 86° 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° 48'20" N 86° 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



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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  
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### Test Report for Ambient Air Samples

| Month & Year      |                   | 08/2022                                                                                                            | Cluster           | Cluster IV                     |                  |                       | Report No.                      | RI-II/AIR/2022-23/05                                               |             |
|-------------------|-------------------|--------------------------------------------------------------------------------------------------------------------|-------------------|--------------------------------|------------------|-----------------------|---------------------------------|--------------------------------------------------------------------|-------------|
| Customer          |                   | Environment Department, Bharat Coking Coal Limited (BCCL), Koyla Bhawan, Dhanbad (E-mail: gmenv.bccl@coalindia.in) |                   |                                |                  |                       |                                 | Date of Issue                                                      | 26.10.2022  |
| Project           |                   |                                                                                                                    |                   | Sample Ref. No.                | REM/BCCL/2022/08 | Sampling Method       | CMPDI/RI-II/LPM 13 , ( IS 5182) |                                                                    |             |
| Sampling Stations |                   | i                                                                                                                  | Govindpur Village |                                | Date of Sampling | 01.08.22              | 17.08.22                        | Zone of Station:                                                   | Core Zone   |
| Sl. No.           | Parameter         | Method Analysis                                                                                                    | of                | Observed Values<br>( in µg/m³) |                  | Range Of Testing      | LDL                             | MoEF Standards Notification dated 25th September,2000 (GSR 742 E ) | NAAQS, 2009 |
|                   |                   |                                                                                                                    |                   | 1st FN                         | 2nd FN           |                       |                                 |                                                                    |             |
| 1                 | PM <sub>10</sub>  | IS -5182(Part 23):2006, R-2017                                                                                     |                   | 70                             | 72               | 10 µg/m³ - 1000 µg/m³ | 10 µg/m³                        | 300                                                                | 100         |
| 2                 | PM <sub>2.5</sub> | IS -5182(Part 24):2019                                                                                             |                   | 36                             | 37               | 10 µg/m³ - 400 µg/m³  | 10 µg/m³                        | Not Specified                                                      | 60          |
| 3                 | SO <sub>2</sub>   | IS-5182(Part-2): 2001 , R-2017                                                                                     |                   | <10                            | <10              | 10 µg/m³ - 1050 µg/m³ | 10 µg/m³                        | 120                                                                | 80          |
| 4                 | NO <sub>2</sub>   | IS-5182 (Part-6): 2006 , R-2017                                                                                    |                   | 31                             | 30               | 06 µg/m³ - 420 µg/m³  | 06 µg/m³                        | 120                                                                | 80          |

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

**ANALYSED BY**

(Gaurav Kant)

**CHECKED BY**

(Amit Raj Mishra)

**HOD's Signature**

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

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**Environment Laboratory, Regional Institute-II**  
**Ambient Air Quality Test Report**

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**Test Report for Ambient Air Samples**

| Month & Year      |                   | 08/2022                                                                                                            | Cluster         | Cluster IV                     |                  |                       | Report No.                      | RI-II/AIR/2022-23/05                                               |             |
|-------------------|-------------------|--------------------------------------------------------------------------------------------------------------------|-----------------|--------------------------------|------------------|-----------------------|---------------------------------|--------------------------------------------------------------------|-------------|
| Customer          |                   | Environment Department, Bharat Coking Coal Limited (BCCL), Koyla Bhawan, Dhanbad (E-mail: gmenv.bccl@coalindia.in) |                 |                                |                  |                       | Date of Issue                   | 26.10.2022                                                         |             |
| Project           |                   |                                                                                                                    |                 | Sample Ref. No.                | REM/BCCL/2022/08 | Sampling Method       | CMPDI/RI-II/LPM 13 , ( IS 5182) |                                                                    |             |
| Sampling Stations |                   | i                                                                                                                  | Katras Chotudih |                                | Date of Sampling | 01.08.22              | 17.08.22                        | Zone of Station:                                                   | Core Zone   |
| Sl. No.           | Parameter         | Method Analysis                                                                                                    | of              | Observed Values<br>( in µg/m³) |                  | Range Of Testing      | LDL                             | MoEF Standards Notification dated 25th September,2000 (GSR 742 E ) | NAAQS, 2009 |
|                   |                   |                                                                                                                    |                 | 1st FN                         | 2nd FN           |                       |                                 |                                                                    |             |
| 1                 | PM <sub>10</sub>  | IS -5182(Part 23):2006, R-2017                                                                                     |                 | 127                            | 89               | 10 µg/m³ - 1000 µg/m³ | 10 µg/m³                        | 300                                                                | 100         |
| 2                 | PM <sub>2.5</sub> | IS -5182(Part 24):2019                                                                                             |                 | 25                             | 50               | 10 µg/m³ - 400 µg/m³  | 10 µg/m³                        | Not Specified                                                      | 60          |
| 3                 | SO <sub>2</sub>   | IS-5182(Part-2): 2001 , R-2017                                                                                     |                 | 11                             | 12               | 10 µg/m³ - 1050 µg/m³ | 10 µg/m³                        | 120                                                                | 80          |
| 4                 | NO <sub>2</sub>   | IS-5182 (Part-6): 2006 , R-2017                                                                                    |                 | 16                             | 20               | 06 µg/m³ - 420 µg/m³  | 06 µg/m³                        | 120                                                                | 80          |

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

**ANALYSED BY**

**CHECKED BY**

**HOD's Signature**

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**Environment Laboratory, Regional Institute-II**  
**Ambient Air Quality Test Report**

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**email: rdri2cmpdi@coalindia.in**

**Test Report for Ambient Air Samples**

| Month & Year      |                   | 08/2022                                                                                                            | Cluster         | Cluster IV                     |                  |                       | Report No.                      | RI-II/AIR/2022-23/05                                               |             |
|-------------------|-------------------|--------------------------------------------------------------------------------------------------------------------|-----------------|--------------------------------|------------------|-----------------------|---------------------------------|--------------------------------------------------------------------|-------------|
| Customer          |                   | Environment Department, Bharat Coking Coal Limited (BCCL), Koyla Bhawan, Dhanbad (E-mail: gmenv.bccl@coalindia.in) |                 |                                |                  |                       | Date of Issue                   | 26.10.2022                                                         |             |
| Project           |                   |                                                                                                                    | Sample Ref. No. | REM/BCCL/2022/08               | Sampling Method  |                       | CMPDI/RI-II/LPM 13 , ( IS 5182) |                                                                    |             |
| Sampling Stations |                   | i                                                                                                                  | Block IV        |                                | Date of Sampling | 02.08.22              | 18.08.22                        | Zone of Station:                                                   | Buffer Zone |
| Sl. No.           | Parameter         | Method Analysis                                                                                                    | of              | Observed Values<br>( in µg/m³) |                  | Range Of Testing      | LDL                             | MoEF Standards Notification dated 25th September,2000 (GSR 742 E ) | NAAQS, 2009 |
|                   |                   |                                                                                                                    |                 | 1st FN                         | 2nd FN           |                       |                                 |                                                                    |             |
| 1                 | PM <sub>10</sub>  | IS -5182(Part 23):2006, R-2017                                                                                     |                 | 82                             | 108              | 10 µg/m³ - 1000 µg/m³ | 10 µg/m³                        | 300                                                                | 100         |
| 2                 | PM <sub>2.5</sub> | IS -5182(Part 24):2019                                                                                             |                 | 41                             | 62               | 10 µg/m³ - 400 µg/m³  | 10 µg/m³                        | Not Specified                                                      | 60          |
| 3                 | SO <sub>2</sub>   | IS-5182(Part-2): 2001 , R-2017                                                                                     |                 | <10                            | 13               | 10 µg/m³ - 1050 µg/m³ | 10 µg/m³                        | 120                                                                | 80          |
| 4                 | NO <sub>2</sub>   | IS-5182 (Part-6): 2006 , R-2017                                                                                    |                 | 19                             | 20               | 06 µg/m³ - 420 µg/m³  | 06 µg/m³                        | 120                                                                | 80          |

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

  
**ANALYSED BY**

  
(Gaurav Kant)  
**CHECKED BY**

  
(Amit Raj Mishra)  
**HOD's Signature**

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

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|                                                                                                                                                                                                                                                       |                   |                                                                                                                                                             |           |                                                                  |               |                                                                                                                                                     |                             |                                                                           |                    |                                 |  |
|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------|------------------------------------------------------------------|---------------|-----------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------|---------------------------------------------------------------------------|--------------------|---------------------------------|--|
|    |                   | <b>CENTRAL MINE PLANNING AND DESIGN INSTITUTE LIMITED</b><br><b>Environment Laboratory, Regional Institute-II</b><br><b>Ambient Air Quality Test Report</b> |           |                                                                  |               | <b>CMPDI, RI-II</b><br><b>KOYLA BHAWAN COMPLEX</b><br><b>DHANBAD. -826005</b><br><b>Phone:0326-223-850</b><br><b>email: rdri2cmpdi@coalindia.in</b> |                             |                                                                           |                    |                                 |  |
| <b>Test Report for Ambient Air Samples</b>                                                                                                                                                                                                            |                   |                                                                                                                                                             |           |                                                                  |               |                                                                                                                                                     |                             |                                                                           |                    |                                 |  |
| <b>Month &amp; Year</b>                                                                                                                                                                                                                               |                   | 08/2022                                                                                                                                                     |           | <b>Cluster</b>                                                   |               | Cluster IV                                                                                                                                          |                             | <b>Report No.</b>                                                         |                    | RI-II/AIR/2022-23/05            |  |
| <b>Customer</b>                                                                                                                                                                                                                                       |                   | Environment Department, Bharat Coking Coal Limited (BCCL), Koyla Bhawan, Dhanbad (E-mail: gmenv.bccl@coalindia.in)                                          |           |                                                                  |               |                                                                                                                                                     |                             | <b>Date of Issue</b>                                                      |                    | 26.10.2022                      |  |
| <b>Project</b>                                                                                                                                                                                                                                        |                   |                                                                                                                                                             |           | <b>Sample Ref. No.</b>                                           |               | REM/BCCL/2022/08                                                                                                                                    |                             | <b>Sampling Method</b>                                                    |                    | CMPDI/RI-II/LPM 13 , ( IS 5182) |  |
| <b>Sampling Stations</b>                                                                                                                                                                                                                              |                   | i                                                                                                                                                           |           | Nitchpur                                                         |               | <b>Date of Sampling</b>                                                                                                                             |                             | 11.08.22                                                                  |                    | 22.08.22                        |  |
|                                                                                                                                                                                                                                                       |                   |                                                                                                                                                             |           |                                                                  |               |                                                                                                                                                     |                             | <b>Zone of Station:</b>                                                   |                    | Buffer Zone                     |  |
| <b>Sl. No.</b>                                                                                                                                                                                                                                        | <b>Parameter</b>  | <b>Method Analysis</b>                                                                                                                                      | <b>of</b> | <b>Observed Values ( in <math>\mu\text{g}/\text{m}^3</math>)</b> |               | <b>Range Of Testing</b>                                                                                                                             | <b>LDL</b>                  | <b>MoEF Standards Notification dated 25th September,2000 (GSR 742 E )</b> | <b>NAAQS, 2009</b> |                                 |  |
|                                                                                                                                                                                                                                                       |                   |                                                                                                                                                             |           | <b>1st FN</b>                                                    | <b>2nd FN</b> |                                                                                                                                                     |                             |                                                                           |                    |                                 |  |
| 1                                                                                                                                                                                                                                                     | PM <sub>10</sub>  | IS -5182(Part 23):2006, R-2017                                                                                                                              |           | 62                                                               | 72            | 10 $\mu\text{g}/\text{m}^3$ - 1000 $\mu\text{g}/\text{m}^3$                                                                                         | 10 $\mu\text{g}/\text{m}^3$ | 300                                                                       | 100                |                                 |  |
| 2                                                                                                                                                                                                                                                     | PM <sub>2.5</sub> | IS -5182(Part 24):2019                                                                                                                                      |           | 34                                                               | 36            | 10 $\mu\text{g}/\text{m}^3$ - 400 $\mu\text{g}/\text{m}^3$                                                                                          | 10 $\mu\text{g}/\text{m}^3$ | Not Specified                                                             | 60                 |                                 |  |
| 3                                                                                                                                                                                                                                                     | SO <sub>2</sub>   | IS-5182(Part-2): 2001 , R-2017                                                                                                                              |           | 10                                                               | 14            | 10 $\mu\text{g}/\text{m}^3$ - 1050 $\mu\text{g}/\text{m}^3$                                                                                         | 10 $\mu\text{g}/\text{m}^3$ | 120                                                                       | 80                 |                                 |  |
| 4                                                                                                                                                                                                                                                     | NO <sub>2</sub>   | IS-5182 (Part-6): 2006 , R-2017                                                                                                                             |           | 17                                                               | 20            | 06 $\mu\text{g}/\text{m}^3$ - 420 $\mu\text{g}/\text{m}^3$                                                                                          | 06 $\mu\text{g}/\text{m}^3$ | 120                                                                       | 80                 |                                 |  |
| * LDL indicates Lower Detection Limit,                                                                                                                                                                                                                |                   |                                                                                                                                                             |           |                                                                  |               |                                                                                                                                                     |                             |                                                                           |                    |                                 |  |
| **All units are in $\mu\text{g}/\text{m}^3$ , 24 hourly Average,                                                                                                                                                                                      |                   |                                                                                                                                                             |           |                                                                  |               |                                                                                                                                                     |                             |                                                                           |                    |                                 |  |
| <br><b>ANALYSED BY</b>                                                                                                                                             |                   | <br><b>(Gaurav Kant)</b><br><b>CHECKED BY</b>                            |           |                                                                  |               | <br><b>(Amit Raj Mishra)</b><br><b>HOD's Signature</b>         |                             |                                                                           |                    |                                 |  |
| <b>Note:</b> The results above relate to the samples tested as received. This report can not be reproduced in part or full without the written permission of the HOD(Env) , CMPDI, RI-II.                                                             |                   |                                                                                                                                                             |           |                                                                  |               |                                                                                                                                                     |                             |                                                                           |                    |                                 |  |
| ---- End of Report ----                                                                                                                                                                                                                               |                   |                                                                                                                                                             |           |                                                                  |               |                                                                                                                                                     |                             |                                                                           |                    |                                 |  |
| Page -1 of 1                                                                                                                                                                                                                                          |                   |                                                                                                                                                             |           |                                                                  |               |                                                                                                                                                     |                             |                                                                           |                    |                                 |  |



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

**CMPDIL, RI-II**  
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**email: rdri2cmpdi@coalindia.in**

**Test Report for Ambient Air Samples**

| Month & Year      |                   | 08/2022                                                                                                            | Cluster     | Cluster IV                     |                  |                       | Report No.                      | RI-II/AIR/2022-23/05                                               |             |
|-------------------|-------------------|--------------------------------------------------------------------------------------------------------------------|-------------|--------------------------------|------------------|-----------------------|---------------------------------|--------------------------------------------------------------------|-------------|
| Customer          |                   | Environment Department, Bharat Coking Coal Limited (BCCL), Koyla Bhawan, Dhanbad (E-mail: gmenv.bccl@coalindia.in) |             |                                |                  |                       | Date of Issue                   | 26.10.2022                                                         |             |
| Project           |                   |                                                                                                                    |             | Sample Ref. No.                | REM/BCCL/2022/08 | Sampling Method       | CMPDI/RI-II/LPM 13 , ( IS 5182) |                                                                    |             |
| Sampling Stations |                   | i                                                                                                                  | Rudhi Basti |                                | Date of Sampling | 03.08.22              | 30.08.22                        | Zone of Station:                                                   | Buffer Zone |
| Sl. No.           | Parameter         | Method Analysis                                                                                                    | of          | Observed Values<br>( in µg/m³) |                  | Range Of Testing      | LDL                             | MoEF Standards Notification dated 25th September,2000 (GSR 742 E ) | NAAQS, 2009 |
|                   |                   |                                                                                                                    |             | 1st FN                         | 2nd FN           |                       |                                 |                                                                    |             |
| 1                 | PM <sub>10</sub>  | IS -5182(Part 23):2006, R-2017                                                                                     |             | 73                             | 73               | 10 µg/m³ - 1000 µg/m³ | 10 µg/m³                        | 300                                                                | 100         |
| 2                 | PM <sub>2.5</sub> | IS -5182(Part 24):2019                                                                                             |             | 35                             | 40               | 10 µg/m³ - 400 µg/m³  | 10 µg/m³                        | Not Specified                                                      | 60          |
| 3                 | SO <sub>2</sub>   | IS-5182(Part-2): 2001 , R-2017                                                                                     |             | 13                             | 12               | 10 µg/m³ - 1050 µg/m³ | 10 µg/m³                        | 120                                                                | 80          |
| 4                 | NO <sub>2</sub>   | IS-5182 (Part-6): 2006 , R-2017                                                                                    |             | 17                             | 16               | 06 µg/m³ - 420 µg/m³  | 06 µg/m³                        | 120                                                                | 80          |

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

*[Signature]*

**ANALYSED BY**

*[Signature]*

**CHECKED BY**

*[Signature]*

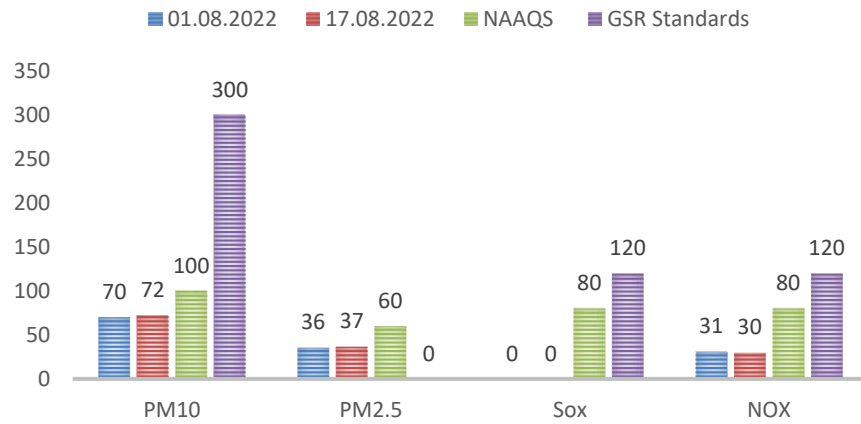
**HOD's Signature**

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

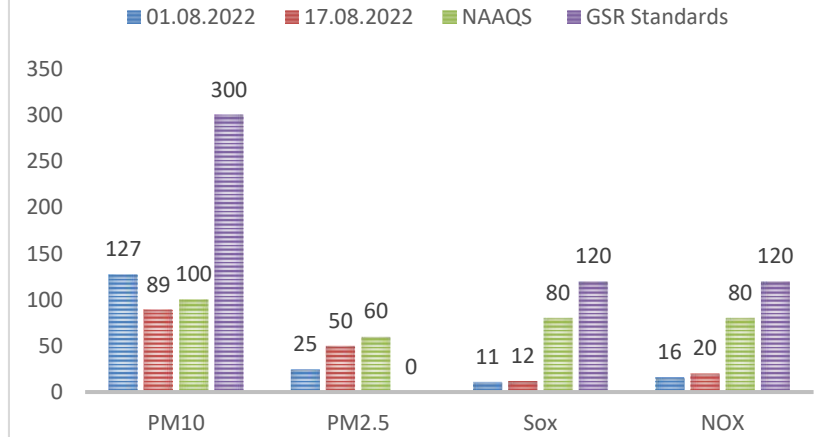
---- End of Report ----

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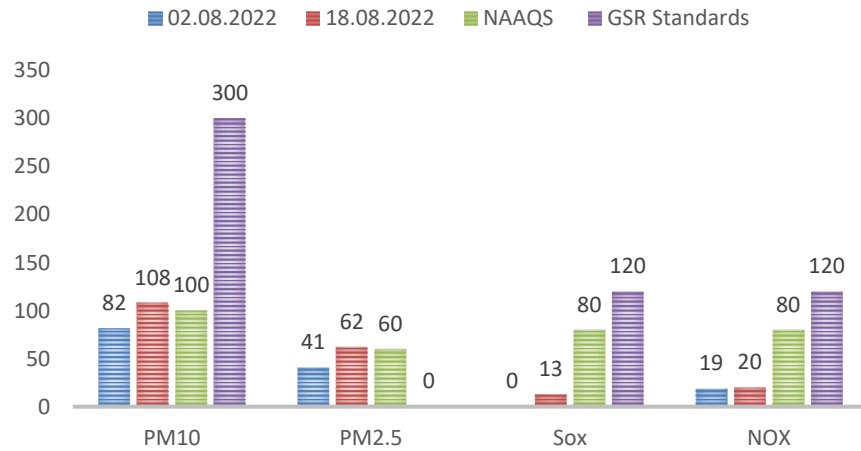
## AMBIENT AIR QUALITY AT GOVINDPUR VILLAGE



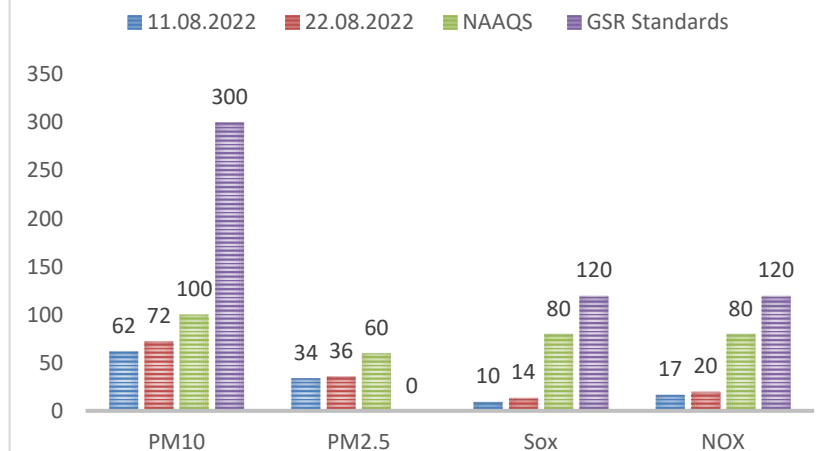
## AMBIENT AIR QUALITY AT KATRAS CHOTUDIH

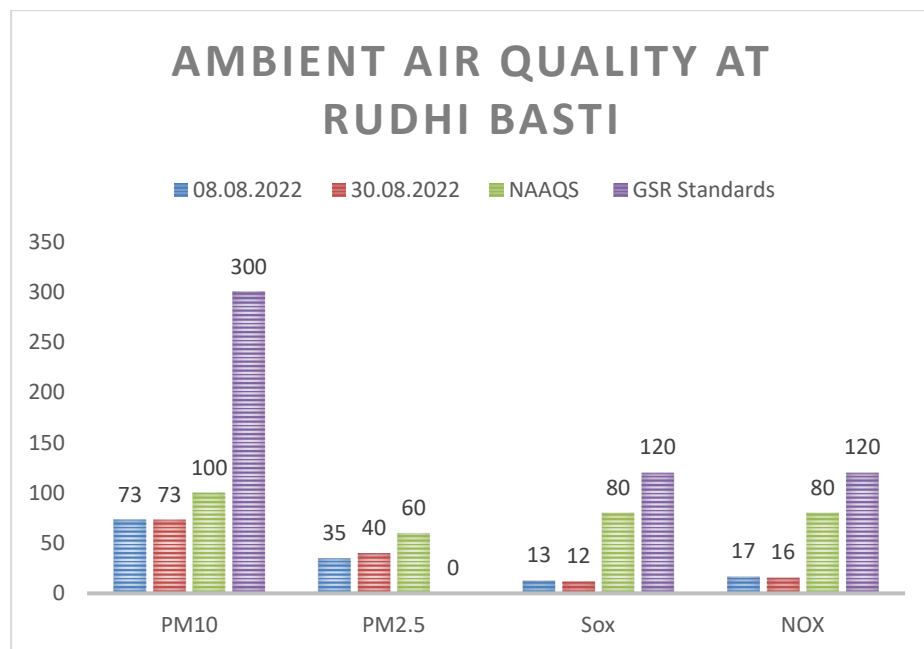


## AMBIENT AIR QUALITY AT BLOCK IV



## AMBIENT AIR QUALITY AT NICHITPUR





## **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 parameters are within the permissible limits.





**CENTRAL MINE PLANNING AND DESIGN INSTITUTE LIMITED**  
**Environment Laboratory, Regional Institute-II**  
**MINE EFFLUENT TEST REPORT**

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

**Test Report for Mine Effluent samples**

| Month & Year       | 08/2022                                                                                                            | Cluster                                          | Cluster IV                                                               |                  | Report No.                                                                                                                               |                                     | RI-II/WATER/2022-23/05 |  |
|--------------------|--------------------------------------------------------------------------------------------------------------------|--------------------------------------------------|--------------------------------------------------------------------------|------------------|------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------|------------------------|--|
| Customer           | Environment Department, Bharat Coking Coal Limited (BCCL), Koyla Bhawan, Dhanbad (E-mail: gmenv.bccl@coalindia.in) |                                                  |                                                                          |                  |                                                                                                                                          | Date of Issue                       | 26.10.2022             |  |
| Project            |                                                                                                                    | Sampling Ref. No.                                | REM/BCCL/2022/08                                                         |                  | 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                  | June 2022              |  |
|                    |                                                                                                                    |                                                  | Date of Sampling                                                         |                  | 1.08.22                                                                                                                                  |                                     |                        |  |
| Sl. No.            | Parameter                                                                                                          | Method of Analysis                               | Observed Values                                                          |                  | STANDARDS FOR COAL MINES<br>(Stipulated by Ministry of Environment and Forests (MoEF), Vide Notification No. GSR 742(E), Dt: 25.09.2000) | LDL                                 |                        |  |
|                    |                                                                                                                    |                                                  | First Fortnight                                                          | Second Fortnight |                                                                                                                                          |                                     |                        |  |
| 1                  | Total Suspended Solids                                                                                             | IS 3025/17:1984, R :2017, Gravimetric            | 37                                                                       | 46               | 100 (Max)                                                                                                                                | 10                                  |                        |  |
| 2                  | pH                                                                                                                 | IS-3025/11:1983, R-2017, Electrometric           | 7.64                                                                     | 7.8              | 5.5 - 9.0                                                                                                                                | 0.2                                 |                        |  |
| 3                  | Oil & Grease                                                                                                       | IS 3025/39:1991, R : 2019, Partition Gravimetric | <2.0                                                                     | <2.0             | 10 (Max)                                                                                                                                 | 2                                   |                        |  |
| 4                  | COD                                                                                                                | APHA 23rd Edition 5220 C Titrimetric Method      | 28                                                                       | 24               | 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,*

3014

**ANALYSED BY**

(Kumar Vaibhav)

**CHECKED BY**

(Amit Raj Mishra)

**HOD's Signature**

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

---- End of Report ----

## **NOISE LEVEL QUALITY MONITORING**

### **4.1 Location of sampling sites**

- i) **Govindpur (N7)**
- ii) **Katras Chotudih (N37)**
- iii) **Block IV(N6)**
- iv) **Nichitpur(N8)**
- v) **RudhiBasti (N18)**

### **4.2 Methodology of sampling and analysis**

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

### **4.3 Results & Interpretations**

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

|    |                                                                                                                    |                    |                                                   |                                                    |                                                          |                  |                           |                                                                |                        | <b>CENTRAL MINE PLANNING AND DESIGN INSTITUTE LIMITED</b><br><b>Environment Laboratory, Regional Institute-II</b><br><b>Ambient Noise Level Test Report</b> |  |  |  | <b>CMPDIL, RI-II</b><br><b>KOYLA BHAWAN COMPLEX</b><br><b>DHANBAD. -826005</b><br><b>Phone:0326-223-850</b><br><b>email: rdri2cmpdi@coalindia.in</b> |  |
|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------|--------------------|---------------------------------------------------|----------------------------------------------------|----------------------------------------------------------|------------------|---------------------------|----------------------------------------------------------------|------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------|--|--|--|------------------------------------------------------------------------------------------------------------------------------------------------------|--|
| Month & Year                                                                                                                                                                                                                                         | 08/2022                                                                                                            | Cluster            | Cluster IV                                        |                                                    |                                                          |                  |                           | Report No.                                                     | RI-II/NOISE/2022-23/05 |                                                                                                                                                             |  |  |  |                                                                                                                                                      |  |
| Customer                                                                                                                                                                                                                                             | Environment Department, Bharat Coking Coal Limited (BCCL), Koyla Bhawan, Dhanbad (E-mail: gmenv.bccl@coalindia.in) |                    |                                                   |                                                    |                                                          |                  |                           | Date of Issue                                                  | 26.10.2022             |                                                                                                                                                             |  |  |  |                                                                                                                                                      |  |
| Project                                                                                                                                                                                                                                              |                                                                                                                    | Sample Ref. No.    | REM/BCCL/2022/08                                  |                                                    |                                                          | Sampling Method  | CMPDI/RI-II/LPM 13        |                                                                |                        |                                                                                                                                                             |  |  |  |                                                                                                                                                      |  |
| Sampling Stations                                                                                                                                                                                                                                    | i                                                                                                                  | Govindpur          |                                                   | Date of Sampling                                   | 01.08.22                                                 | 17.08.22         | Zone Category of Station: | Core Zone                                                      |                        |                                                                                                                                                             |  |  |  |                                                                                                                                                      |  |
| Sl. No.                                                                                                                                                                                                                                              | Parameter                                                                                                          | Hour / Time of day | Observed Values (in Leq dB(A))<br>First Fortnight | Observed Values (in Leq dB(A))<br>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      | 52.2                                              | 51.5                                               | CPCB, Protocol for Ambient Level Noise Monitoring - 2015 | 35 dB-135 dB     | 35 dB(A)                  | Industrial<br>Commercial<br>Residential<br>Silence             | 75<br>65<br>55<br>50   |                                                                                                                                                             |  |  |  |                                                                                                                                                      |  |
| 2                                                                                                                                                                                                                                                    |                                                                                                                    | 07:00 - 08:00      | 55.0                                              | 54.2                                               |                                                          |                  |                           |                                                                |                        |                                                                                                                                                             |  |  |  |                                                                                                                                                      |  |
| 3                                                                                                                                                                                                                                                    |                                                                                                                    | 08:00 - 09:00      | 57.6                                              | 57.2                                               |                                                          |                  |                           |                                                                |                        |                                                                                                                                                             |  |  |  |                                                                                                                                                      |  |
| 4                                                                                                                                                                                                                                                    |                                                                                                                    | 09:00 - 10:00      | 64.0                                              | 63.0                                               |                                                          |                  |                           |                                                                |                        |                                                                                                                                                             |  |  |  |                                                                                                                                                      |  |
| 5                                                                                                                                                                                                                                                    |                                                                                                                    | 10:00 - 11:00      | 65.5                                              | 64.5                                               |                                                          |                  |                           |                                                                |                        |                                                                                                                                                             |  |  |  |                                                                                                                                                      |  |
| 6                                                                                                                                                                                                                                                    |                                                                                                                    | 11:00 - 12:00      | 64.0                                              | 63.0                                               |                                                          |                  |                           |                                                                |                        |                                                                                                                                                             |  |  |  |                                                                                                                                                      |  |
| 7                                                                                                                                                                                                                                                    |                                                                                                                    | 12:00 - 13:00      | 67.1                                              | 68.4                                               |                                                          |                  |                           |                                                                |                        |                                                                                                                                                             |  |  |  |                                                                                                                                                      |  |
| 8                                                                                                                                                                                                                                                    |                                                                                                                    | 13:00 - 14:00      | 68.5                                              | 67.5                                               |                                                          |                  |                           |                                                                |                        |                                                                                                                                                             |  |  |  |                                                                                                                                                      |  |
| 9                                                                                                                                                                                                                                                    |                                                                                                                    | 14:00 - 15:00      | 62.4                                              | 61.5                                               |                                                          |                  |                           |                                                                |                        |                                                                                                                                                             |  |  |  |                                                                                                                                                      |  |
| 10                                                                                                                                                                                                                                                   |                                                                                                                    | 15:00 - 16:00      | 61.5                                              | 60.5                                               |                                                          |                  |                           |                                                                |                        |                                                                                                                                                             |  |  |  |                                                                                                                                                      |  |
| 11                                                                                                                                                                                                                                                   |                                                                                                                    | 16:00 - 17:00      | 60.9                                              | 60.0                                               |                                                          |                  |                           |                                                                |                        |                                                                                                                                                             |  |  |  |                                                                                                                                                      |  |
| 12                                                                                                                                                                                                                                                   |                                                                                                                    | 17:00 - 18:00      | 60.4                                              | 59.5                                               |                                                          |                  |                           |                                                                |                        |                                                                                                                                                             |  |  |  |                                                                                                                                                      |  |
| 13                                                                                                                                                                                                                                                   |                                                                                                                    | 18:00 - 19:00      | 59.5                                              | 58.6                                               |                                                          |                  |                           |                                                                |                        |                                                                                                                                                             |  |  |  |                                                                                                                                                      |  |
| 14                                                                                                                                                                                                                                                   |                                                                                                                    | 19:00 - 20:00      | 58.4                                              | 57.5                                               |                                                          |                  |                           |                                                                |                        |                                                                                                                                                             |  |  |  |                                                                                                                                                      |  |
| 15                                                                                                                                                                                                                                                   |                                                                                                                    | 20:00 - 21:00      | 58.4                                              | 53.5                                               |                                                          |                  |                           |                                                                |                        |                                                                                                                                                             |  |  |  |                                                                                                                                                      |  |
| 16                                                                                                                                                                                                                                                   |                                                                                                                    | 21:00 - 22:00      | 54.2                                              | 52.4                                               |                                                          |                  |                           |                                                                |                        |                                                                                                                                                             |  |  |  |                                                                                                                                                      |  |
|                                                                                                                                                                                                                                                      |                                                                                                                    | <b>Leq DAY</b>     | <b>62.7</b>                                       | <b>62.2</b>                                        |                                                          |                  |                           |                                                                |                        |                                                                                                                                                             |  |  |  |                                                                                                                                                      |  |
| 1                                                                                                                                                                                                                                                    | Noise Level dB(A)Leq -Night                                                                                        | 22:00-23:00        | 44.8                                              | 44.2                                               | CPCB, Protocol for Ambient Level Noise Monitoring - 2015 | 35 dB-135 dB     | 35 dB(A)                  | Industrial<br>Commercial<br>Residential<br>Silence             | 70<br>55<br>45<br>50   |                                                                                                                                                             |  |  |  |                                                                                                                                                      |  |
| 2                                                                                                                                                                                                                                                    |                                                                                                                    | 23:00- 00:00       | 43.5                                              | 44.2                                               |                                                          |                  |                           |                                                                |                        |                                                                                                                                                             |  |  |  |                                                                                                                                                      |  |
| 3                                                                                                                                                                                                                                                    |                                                                                                                    | 00:00- 01:00       | 41.9                                              | 44.0                                               |                                                          |                  |                           |                                                                |                        |                                                                                                                                                             |  |  |  |                                                                                                                                                      |  |
| 4                                                                                                                                                                                                                                                    |                                                                                                                    | 01:00-02:00        | 41.8                                              | 41.7                                               |                                                          |                  |                           |                                                                |                        |                                                                                                                                                             |  |  |  |                                                                                                                                                      |  |
| 5                                                                                                                                                                                                                                                    |                                                                                                                    | 02:00-03:00        | 40.2                                              | 39.8                                               |                                                          |                  |                           |                                                                |                        |                                                                                                                                                             |  |  |  |                                                                                                                                                      |  |
| 6                                                                                                                                                                                                                                                    |                                                                                                                    | 03:00-04:00        | 39.9                                              | 39.6                                               |                                                          |                  |                           |                                                                |                        |                                                                                                                                                             |  |  |  |                                                                                                                                                      |  |
| 7                                                                                                                                                                                                                                                    |                                                                                                                    | 04:00-05:00        | 39.0                                              | 38.6                                               |                                                          |                  |                           |                                                                |                        |                                                                                                                                                             |  |  |  |                                                                                                                                                      |  |
| 8                                                                                                                                                                                                                                                    |                                                                                                                    | 05:00-06:00        | 38.9                                              | 38.4                                               |                                                          |                  |                           |                                                                |                        |                                                                                                                                                             |  |  |  |                                                                                                                                                      |  |
|                                                                                                                                                                                                                                                      |                                                                                                                    | <b>Leq NIGHT</b>   | <b>41.7</b>                                       | <b>41.9</b>                                        |                                                          |                  |                           |                                                                |                        |                                                                                                                                                             |  |  |  |                                                                                                                                                      |  |

\*LDL indicates Lower Detection Limit

\*\*All noise measurements are integrated for a 01 hour period, All units in dB(A)

|                                           |                                                                                                                             |                                                                                                                                      |
|-------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------|
| Sampling Assistants<br><b>ANALYSED BY</b> | <br>(Gaurav Kant)<br><b>CHECKED BY</b> | <br>(Amit Raj Mishra)<br><b>HOD's Signature</b> |
|-------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------|

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---- End of Report ----  
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|   <b>cmpdi</b><br><i>A Bharat Coking Coal Company</i> |                                                                                                                    |                    |                                                   |                                                    |                                                          |                           |                    |                                                                |                        | <b>CENTRAL MINE PLANNING AND DESIGN INSTITUTE LIMITED</b><br><b>Environment Laboratory, Regional Institute-II</b><br><b>Ambient Noise Level Test Report</b> |  |  |  | <b>CMPDIL, RI-II</b><br><b>KOYLA BHAWAN COMPLEX</b><br><b>DHANBAD. -826005</b><br><b>Phone:0326-223-850</b><br><b>email: rdri2cmpdi@coalindia.in</b> |  |
|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------|--------------------|---------------------------------------------------|----------------------------------------------------|----------------------------------------------------------|---------------------------|--------------------|----------------------------------------------------------------|------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------|--|--|--|------------------------------------------------------------------------------------------------------------------------------------------------------|--|
| Month & Year                                                                                                                                                                                                          | 08/2022                                                                                                            | Cluster            | Cluster IV                                        |                                                    |                                                          |                           |                    | Report No.                                                     | RI-II/NOISE/2022-23/05 |                                                                                                                                                             |  |  |  |                                                                                                                                                      |  |
| Customer                                                                                                                                                                                                              | Environment Department, Bharat Coking Coal Limited (BCCL), Koyla Bhawan, Dhanbad (E-mail: gmenv.bccl@coalindia.in) |                    |                                                   |                                                    |                                                          |                           |                    | Date of Issue                                                  | 26.10.2022             |                                                                                                                                                             |  |  |  |                                                                                                                                                      |  |
| Project                                                                                                                                                                                                               |                                                                                                                    | Sample Ref. No.    | REM/BCCL/2022/08                                  |                                                    |                                                          | Sampling Method           | CMPDI/RI-II/LPM 13 |                                                                |                        |                                                                                                                                                             |  |  |  |                                                                                                                                                      |  |
| Sampling Stations                                                                                                                                                                                                     | i                                                                                                                  | Katrash Chotudih   | Date of Sampling                                  | 01.08.22                                           | 17.08.22                                                 | Zone Category of Station: | Core Zone          |                                                                |                        |                                                                                                                                                             |  |  |  |                                                                                                                                                      |  |
| Sl. No.                                                                                                                                                                                                               | Parameter                                                                                                          | Hour / Time of day | Observed Values (in Leq dB(A))<br>First Fortnight | Observed Values (in Leq dB(A))<br>Second Fortnight | Method of Analysis                                       | Range Of Testing          | LDL                | NOISE POLLUTION (REGULATION AND CONTROL) RULES, 2000 Standards |                        |                                                                                                                                                             |  |  |  |                                                                                                                                                      |  |
|                                                                                                                                                                                                                       |                                                                                                                    |                    |                                                   |                                                    |                                                          |                           |                    | Zones                                                          | Limits in dB           |                                                                                                                                                             |  |  |  |                                                                                                                                                      |  |
| 1                                                                                                                                                                                                                     | Noise Level dB(A)Leq - Day                                                                                         | 06:00 - 07:00      | 50.3                                              | 51.0                                               | CPCB, Protocol for Ambient Level Noise Monitoring - 2015 | 35 dB-135 dB              | 35 dB(A)           | Industrial<br>Commercial<br>Residential<br>Silence             | 75<br>65<br>55<br>50   |                                                                                                                                                             |  |  |  |                                                                                                                                                      |  |
| 2                                                                                                                                                                                                                     |                                                                                                                    | 07:00 - 08:00      | 53.0                                              | 53.6                                               |                                                          |                           |                    |                                                                |                        |                                                                                                                                                             |  |  |  |                                                                                                                                                      |  |
| 3                                                                                                                                                                                                                     |                                                                                                                    | 08:00 - 09:00      | 55.5                                              | 54.5                                               |                                                          |                           |                    |                                                                |                        |                                                                                                                                                             |  |  |  |                                                                                                                                                      |  |
| 4                                                                                                                                                                                                                     |                                                                                                                    | 09:00 - 10:00      | 61.7                                              | 63.8                                               |                                                          |                           |                    |                                                                |                        |                                                                                                                                                             |  |  |  |                                                                                                                                                      |  |
| 5                                                                                                                                                                                                                     |                                                                                                                    | 10:00 - 11:00      | 63.1                                              | 63.9                                               |                                                          |                           |                    |                                                                |                        |                                                                                                                                                             |  |  |  |                                                                                                                                                      |  |
| 6                                                                                                                                                                                                                     |                                                                                                                    | 11:00 - 12:00      | 61.7                                              | 63.5                                               |                                                          |                           |                    |                                                                |                        |                                                                                                                                                             |  |  |  |                                                                                                                                                      |  |
| 7                                                                                                                                                                                                                     |                                                                                                                    | 12:00 - 13:00      | 64.6                                              | 65.1                                               |                                                          |                           |                    |                                                                |                        |                                                                                                                                                             |  |  |  |                                                                                                                                                      |  |
| 8                                                                                                                                                                                                                     |                                                                                                                    | 13:00 - 14:00      | 65.2                                              | 65.6                                               |                                                          |                           |                    |                                                                |                        |                                                                                                                                                             |  |  |  |                                                                                                                                                      |  |
| 9                                                                                                                                                                                                                     |                                                                                                                    | 14:00 - 15:00      | 60.2                                              | 60.1                                               |                                                          |                           |                    |                                                                |                        |                                                                                                                                                             |  |  |  |                                                                                                                                                      |  |
| 10                                                                                                                                                                                                                    |                                                                                                                    | 15:00 - 16:00      | 59.2                                              | 61.3                                               |                                                          |                           |                    |                                                                |                        |                                                                                                                                                             |  |  |  |                                                                                                                                                      |  |
| 11                                                                                                                                                                                                                    |                                                                                                                    | 16:00 - 17:00      | 67.2                                              | 60.7                                               |                                                          |                           |                    |                                                                |                        |                                                                                                                                                             |  |  |  |                                                                                                                                                      |  |
| 12                                                                                                                                                                                                                    |                                                                                                                    | 17:00 - 18:00      | 58.2                                              | 64.2                                               |                                                          |                           |                    |                                                                |                        |                                                                                                                                                             |  |  |  |                                                                                                                                                      |  |
| 13                                                                                                                                                                                                                    |                                                                                                                    | 18:00 - 19:00      | 57.3                                              | 59.3                                               |                                                          |                           |                    |                                                                |                        |                                                                                                                                                             |  |  |  |                                                                                                                                                      |  |
| 14                                                                                                                                                                                                                    |                                                                                                                    | 19:00 - 20:00      | 56.3                                              | 58.2                                               |                                                          |                           |                    |                                                                |                        |                                                                                                                                                             |  |  |  |                                                                                                                                                      |  |
| 15                                                                                                                                                                                                                    |                                                                                                                    | 20:00 - 21:00      | 55.6                                              | 57.6                                               |                                                          |                           |                    |                                                                |                        |                                                                                                                                                             |  |  |  |                                                                                                                                                      |  |
| 16                                                                                                                                                                                                                    |                                                                                                                    | 21:00 - 22:00      | 55.7                                              | 57.6                                               |                                                          |                           |                    |                                                                |                        |                                                                                                                                                             |  |  |  |                                                                                                                                                      |  |
|                                                                                                                                                                                                                       |                                                                                                                    | <b>Leq DAY</b>     | <b>61.3</b>                                       | <b>61.7</b>                                        |                                                          |                           |                    |                                                                |                        |                                                                                                                                                             |  |  |  |                                                                                                                                                      |  |
| 1                                                                                                                                                                                                                     | Noise Level dB(A)Leq -Night                                                                                        | 22:00-23:00        | 45.1                                              | 44.1                                               | CPCB, Protocol for Ambient Level Noise Monitoring - 2015 | 35 dB-135 dB              | 35 dB(A)           | Industrial<br>Commercial<br>Residential<br>Silence             | 70<br>55<br>45<br>50   |                                                                                                                                                             |  |  |  |                                                                                                                                                      |  |
| 2                                                                                                                                                                                                                     |                                                                                                                    | 23:00- 00:00       | 44.8                                              | 44.8                                               |                                                          |                           |                    |                                                                |                        |                                                                                                                                                             |  |  |  |                                                                                                                                                      |  |
| 3                                                                                                                                                                                                                     |                                                                                                                    | 00:00- 01:00       | 40.1                                              | 40.7                                               |                                                          |                           |                    |                                                                |                        |                                                                                                                                                             |  |  |  |                                                                                                                                                      |  |
| 4                                                                                                                                                                                                                     |                                                                                                                    | 01:00-02:00        | 39.4                                              | 39.9                                               |                                                          |                           |                    |                                                                |                        |                                                                                                                                                             |  |  |  |                                                                                                                                                      |  |
| 5                                                                                                                                                                                                                     |                                                                                                                    | 02:00-03:00        | 41.0                                              | 41.0                                               |                                                          |                           |                    |                                                                |                        |                                                                                                                                                             |  |  |  |                                                                                                                                                      |  |
| 6                                                                                                                                                                                                                     |                                                                                                                    | 03:00-04:00        | 40.9                                              | 40.5                                               |                                                          |                           |                    |                                                                |                        |                                                                                                                                                             |  |  |  |                                                                                                                                                      |  |
| 7                                                                                                                                                                                                                     |                                                                                                                    | 04:00-05:00        | 41.1                                              | 40.9                                               |                                                          |                           |                    |                                                                |                        |                                                                                                                                                             |  |  |  |                                                                                                                                                      |  |
| 8                                                                                                                                                                                                                     |                                                                                                                    | 05:00-06:00        | 40.2                                              | 41.0                                               |                                                          |                           |                    |                                                                |                        |                                                                                                                                                             |  |  |  |                                                                                                                                                      |  |
|                                                                                                                                                                                                                       |                                                                                                                    | <b>Leq NIGHT</b>   | <b>42.1</b>                                       | <b>42.0</b>                                        |                                                          |                           |                    |                                                                |                        |                                                                                                                                                             |  |  |  |                                                                                                                                                      |  |

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

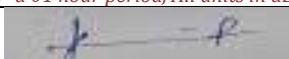
|                                           |                                                                                                                             |                                                                                                                                      |
|-------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------|
| Sampling Assistants<br><b>ANALYSED BY</b> | <br>(Gaurav Kant)<br><b>CHECKED BY</b> | <br>(Amit Raj Mishra)<br><b>HOD's Signature</b> |
|-------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------|

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---- End of Report ----  
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|    |                                                                                                                    | <b>CENTRAL MINE PLANNING AND DESIGN INSTITUTE LIMITED</b><br><b>Environment Laboratory, Regional Institute-II</b><br><b>Ambient Noise Level Test Report</b> |                                                   |                                                    |                                                          | <b>CMPDIL, RI-II</b><br><b>KOYLA BHAWAN COMPLEX</b><br><b>DHANBAD. -826005</b><br><b>Phone:0326-223-850</b><br><b>email: rdri2cmpdi@coalindia.in</b> |                           |                                                                |                      |
|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------------------------------|----------------------------------------------------|----------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------|----------------------------------------------------------------|----------------------|
| Month & Year                                                                                                                                                                                                                                       | 08/2022                                                                                                            | Cluster                                                                                                                                                     | Cluster IV                                        |                                                    |                                                          | Report No.                                                                                                                                           | RI-II/NOISE/2022-23/05    |                                                                |                      |
| Customer                                                                                                                                                                                                                                           | Environment Department, Bharat Coking Coal Limited (BCCL), Koyla Bhawan, Dhanbad (E-mail: gmenv.bccl@coalindia.in) |                                                                                                                                                             |                                                   |                                                    |                                                          | Date of Issue                                                                                                                                        | 26.10.2022                |                                                                |                      |
| Project                                                                                                                                                                                                                                            |                                                                                                                    | Sample Ref. No.                                                                                                                                             | REM/BCCL/2022/08                                  |                                                    | Sampling Method                                          | CMPDI/RI-II/LPM 13                                                                                                                                   |                           |                                                                |                      |
| Sampling Stations                                                                                                                                                                                                                                  | i                                                                                                                  | Block IV                                                                                                                                                    |                                                   | Date of Sampling                                   | 02.08.22                                                 | 18.08.22                                                                                                                                             | Zone Category of Station: | Buffer Zone                                                    |                      |
| Sl. No.                                                                                                                                                                                                                                            | Parameter                                                                                                          | Hour / Time of day                                                                                                                                          | Observed Values (in Leq dB(A))<br>First Fortnight | Observed Values (in Leq dB(A))<br>Second Fortnight | Method of Analysis                                       | Range Of Testing                                                                                                                                     | LDL                       | NOISE POLLUTION (REGULATION AND CONTROL) RULES, 2000 Standards |                      |
|                                                                                                                                                                                                                                                    |                                                                                                                    |                                                                                                                                                             |                                                   |                                                    |                                                          |                                                                                                                                                      |                           | Zones                                                          | Limits in dB         |
| 1                                                                                                                                                                                                                                                  | Noise Level dB(A)Leq - Day                                                                                         | 06:00 - 07:00                                                                                                                                               | 50.4                                              | 50.3                                               | CPCB, Protocol for Ambient Level Noise Monitoring - 2015 | 35 dB-135 dB                                                                                                                                         | 35 dB(A)                  | Industrial<br>Commercial<br>Residential<br>Silence             | 75<br>65<br>55<br>50 |
| 2                                                                                                                                                                                                                                                  |                                                                                                                    | 07:00 - 08:00                                                                                                                                               | 53.6                                              | 53.0                                               |                                                          |                                                                                                                                                      |                           |                                                                |                      |
| 3                                                                                                                                                                                                                                                  |                                                                                                                    | 08:00 - 09:00                                                                                                                                               | 55.2                                              | 55.5                                               |                                                          |                                                                                                                                                      |                           |                                                                |                      |
| 4                                                                                                                                                                                                                                                  |                                                                                                                    | 09:00 - 10:00                                                                                                                                               | 62.0                                              | 61.7                                               |                                                          |                                                                                                                                                      |                           |                                                                |                      |
| 5                                                                                                                                                                                                                                                  |                                                                                                                    | 10:00 - 11:00                                                                                                                                               | 62.9                                              | 63.1                                               |                                                          |                                                                                                                                                      |                           |                                                                |                      |
| 6                                                                                                                                                                                                                                                  |                                                                                                                    | 11:00 - 12:00                                                                                                                                               | 60.7                                              | 61.7                                               |                                                          |                                                                                                                                                      |                           |                                                                |                      |
| 7                                                                                                                                                                                                                                                  |                                                                                                                    | 12:00 - 13:00                                                                                                                                               | 62.8                                              | 64.6                                               |                                                          |                                                                                                                                                      |                           |                                                                |                      |
| 8                                                                                                                                                                                                                                                  |                                                                                                                    | 13:00 - 14:00                                                                                                                                               | 64.1                                              | 65.2                                               |                                                          |                                                                                                                                                      |                           |                                                                |                      |
| 9                                                                                                                                                                                                                                                  |                                                                                                                    | 14:00 - 15:00                                                                                                                                               | 60.1                                              | 60.2                                               |                                                          |                                                                                                                                                      |                           |                                                                |                      |
| 10                                                                                                                                                                                                                                                 |                                                                                                                    | 15:00 - 16:00                                                                                                                                               | 60.7                                              | 59.2                                               |                                                          |                                                                                                                                                      |                           |                                                                |                      |
| 11                                                                                                                                                                                                                                                 |                                                                                                                    | 16:00 - 17:00                                                                                                                                               | 65.8                                              | 67.2                                               |                                                          |                                                                                                                                                      |                           |                                                                |                      |
| 12                                                                                                                                                                                                                                                 |                                                                                                                    | 17:00 - 18:00                                                                                                                                               | 59.1                                              | 58.2                                               |                                                          |                                                                                                                                                      |                           |                                                                |                      |
| 13                                                                                                                                                                                                                                                 |                                                                                                                    | 18:00 - 19:00                                                                                                                                               | 57.4                                              | 57.3                                               |                                                          |                                                                                                                                                      |                           |                                                                |                      |
| 14                                                                                                                                                                                                                                                 |                                                                                                                    | 19:00 - 20:00                                                                                                                                               | 56.3                                              | 56.3                                               |                                                          |                                                                                                                                                      |                           |                                                                |                      |
| 15                                                                                                                                                                                                                                                 |                                                                                                                    | 20:00 - 21:00                                                                                                                                               | 55.9                                              | 55.6                                               |                                                          |                                                                                                                                                      |                           |                                                                |                      |
| 16                                                                                                                                                                                                                                                 |                                                                                                                    | 21:00 - 22:00                                                                                                                                               | 54.1                                              | 55.7                                               |                                                          |                                                                                                                                                      |                           |                                                                |                      |
|                                                                                                                                                                                                                                                    |                                                                                                                    | <b>Leq DAY</b>                                                                                                                                              | <b>60.6</b>                                       | <b>61.3</b>                                        |                                                          |                                                                                                                                                      |                           |                                                                |                      |
| 1                                                                                                                                                                                                                                                  | Noise Level dB(A)Leq -Night                                                                                        | 22:00-23:00                                                                                                                                                 | 45.5                                              | 45.8                                               | CPCB, Protocol for Ambient Level Noise Monitoring - 2015 | 35 dB-135 dB                                                                                                                                         | 35 dB(A)                  | Industrial<br>Commercial<br>Residential<br>Silence             | 70<br>55<br>45<br>50 |
| 2                                                                                                                                                                                                                                                  |                                                                                                                    | 23:00- 00:00                                                                                                                                                | 44.5                                              | 44.9                                               |                                                          |                                                                                                                                                      |                           |                                                                |                      |
| 3                                                                                                                                                                                                                                                  |                                                                                                                    | 00:00- 01:00                                                                                                                                                | 44.5                                              | 44.2                                               |                                                          |                                                                                                                                                      |                           |                                                                |                      |
| 4                                                                                                                                                                                                                                                  |                                                                                                                    | 01:00-02:00                                                                                                                                                 | 43.0                                              | 43.2                                               |                                                          |                                                                                                                                                      |                           |                                                                |                      |
| 5                                                                                                                                                                                                                                                  |                                                                                                                    | 02:00-03:00                                                                                                                                                 | 41.8                                              | 42.7                                               |                                                          |                                                                                                                                                      |                           |                                                                |                      |
| 6                                                                                                                                                                                                                                                  |                                                                                                                    | 03:00-04:00                                                                                                                                                 | 41.9                                              | 41.2                                               |                                                          |                                                                                                                                                      |                           |                                                                |                      |
| 7                                                                                                                                                                                                                                                  |                                                                                                                    | 04:00-05:00                                                                                                                                                 | 40.5                                              | 39.5                                               |                                                          |                                                                                                                                                      |                           |                                                                |                      |
| 8                                                                                                                                                                                                                                                  |                                                                                                                    | 05:00-06:00                                                                                                                                                 | 40.2                                              | 39.4                                               |                                                          |                                                                                                                                                      |                           |                                                                |                      |
|                                                                                                                                                                                                                                                    |                                                                                                                    | <b>Leq NIGHT</b>                                                                                                                                            | <b>43.1</b>                                       | <b>43.2</b>                                        |                                                          |                                                                                                                                                      |                           |                                                                |                      |

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

|                                           |                                                                                                                             |                                                                                                                                      |
|-------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------|
| Sampling Assistants<br><b>ANALYSED BY</b> | <br>(Gaurav Kant)<br><b>CHECKED BY</b> | <br>(Amit Raj Mishra)<br><b>HOD's Signature</b> |
|-------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------|

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---- End of Report ----  
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| <div style="display: flex; justify-content: space-between; align-items: center;"> <div>   <div> <b>cmpdi</b><br/> <i>A Bharat Coking Company</i> </div> </div> <div style="text-align: center;"> <b>CENTRAL MINE PLANNING AND DESIGN INSTITUTE LIMITED</b><br/> <b>Environment Laboratory, Regional Institute-II</b><br/> <b>Ambient Noise Level Test Report</b> </div> <div style="text-align: right;"> <b>CMPDIL, RI-II</b><br/> <b>KOYLA BHAWAN COMPLEX</b><br/> <b>DHANBAD. -826005</b><br/> <b>Phone:0326-223-850</b><br/> <b>email: rdri2cmpdi@coalindia.in</b> </div> </div> |                                                                                                                    |                    |                                                   |                                                    |                                                          |                           |                    |                                                                |                      |            |
|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------|--------------------|---------------------------------------------------|----------------------------------------------------|----------------------------------------------------------|---------------------------|--------------------|----------------------------------------------------------------|----------------------|------------|
| Month & Year                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        | 08/2022                                                                                                            | Cluster            | Cluster IV                                        |                                                    |                                                          |                           | Report No.         | RI-II/NOISE/2022-23/05                                         |                      |            |
| Customer                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            | Environment Department, Bharat Coking Coal Limited (BCCL), Koyla Bhawan, Dhanbad (E-mail: gmenv.bccl@coalindia.in) |                    |                                                   |                                                    |                                                          |                           |                    |                                                                | Date of Issue        | 26.10.2022 |
| Project                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             |                                                                                                                    | Sample Ref. No.    | REM/BCCL/2022/08                                  |                                                    |                                                          | Sampling Method           | CMPDI/RI-II/LPM 13 |                                                                |                      |            |
| Sampling Stations                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   | i                                                                                                                  | Nichitpur          | Date of Sampling                                  | 11.08.22                                           | 22.08.22                                                 | Zone Category of Station: | Buffer Zone        |                                                                |                      |            |
| Sl. No.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             | Parameter                                                                                                          | Hour / Time of day | Observed Values (in Leq dB(A))<br>First Fortnight | Observed Values (in Leq dB(A))<br>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      | 47.8                                              | 46.7                                               | CPCB, Protocol for Ambient Level Noise Monitoring - 2015 | 35 dB-135 dB              | 35 dB(A)           | Industrial<br>Commercial<br>Residential<br>Silence             | 75<br>65<br>55<br>50 |            |
| 2                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |                                                                                                                    | 07:00 - 08:00      | 50.3                                              | 49.2                                               |                                                          |                           |                    |                                                                |                      |            |
| 3                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |                                                                                                                    | 08:00 - 09:00      | 55.2                                              | 51.6                                               |                                                          |                           |                    |                                                                |                      |            |
| 4                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |                                                                                                                    | 09:00 - 10:00      | 58.5                                              | 57.2                                               |                                                          |                           |                    |                                                                |                      |            |
| 5                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |                                                                                                                    | 10:00 - 11:00      | 59.9                                              | 58.6                                               |                                                          |                           |                    |                                                                |                      |            |
| 6                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |                                                                                                                    | 11:00 - 12:00      | 58.5                                              | 57.2                                               |                                                          |                           |                    |                                                                |                      |            |
| 7                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |                                                                                                                    | 12:00 - 13:00      | 63.6                                              | 60.0                                               |                                                          |                           |                    |                                                                |                      |            |
| 8                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |                                                                                                                    | 13:00 - 14:00      | 62.6                                              | 61.3                                               |                                                          |                           |                    |                                                                |                      |            |
| 9                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |                                                                                                                    | 14:00 - 15:00      | 57.1                                              | 55.9                                               |                                                          |                           |                    |                                                                |                      |            |
| 10                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |                                                                                                                    | 15:00 - 16:00      | 56.4                                              | 55.0                                               |                                                          |                           |                    |                                                                |                      |            |
| 11                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |                                                                                                                    | 16:00 - 17:00      | 55.7                                              | 54.5                                               |                                                          |                           |                    |                                                                |                      |            |
| 12                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |                                                                                                                    | 17:00 - 18:00      | 55.2                                              | 54.0                                               |                                                          |                           |                    |                                                                |                      |            |
| 13                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |                                                                                                                    | 18:00 - 19:00      | 54.4                                              | 53.2                                               |                                                          |                           |                    |                                                                |                      |            |
| 14                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |                                                                                                                    | 19:00 - 20:00      | 53.4                                              | 52.2                                               |                                                          |                           |                    |                                                                |                      |            |
| 15                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |                                                                                                                    | 20:00 - 21:00      | 53.1                                              | 52.2                                               |                                                          |                           |                    |                                                                |                      |            |
| 16                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |                                                                                                                    | 21:00 - 22:00      | 52.9                                              | 51.7                                               |                                                          |                           |                    |                                                                |                      |            |
|                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |                                                                                                                    | <b>Leq DAY</b>     | <b>57.8</b>                                       | <b>56.0</b>                                        |                                                          |                           |                    |                                                                |                      |            |
| 1                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   | Noise Level dB(A)Leq -Night                                                                                        | 22:00-23:00        | 43.5                                              | 44.9                                               | CPCB, Protocol for Ambient Level Noise Monitoring - 2015 | 35 dB-135 dB              | 35 dB(A)           | Industrial<br>Commercial<br>Residential<br>Silence             | 70<br>55<br>45<br>50 |            |
| 2                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |                                                                                                                    | 23:00- 00:00       | 43.1                                              | 44.2                                               |                                                          |                           |                    |                                                                |                      |            |
| 3                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |                                                                                                                    | 00:00- 01:00       | 42.8                                              | 43.5                                               |                                                          |                           |                    |                                                                |                      |            |
| 4                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |                                                                                                                    | 01:00-02:00        | 41.5                                              | 42.0                                               |                                                          |                           |                    |                                                                |                      |            |
| 5                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |                                                                                                                    | 02:00-03:00        | 39.4                                              | 39.1                                               |                                                          |                           |                    |                                                                |                      |            |
| 6                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |                                                                                                                    | 03:00-04:00        | 39.2                                              | 38.9                                               |                                                          |                           |                    |                                                                |                      |            |
| 7                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |                                                                                                                    | 04:00-05:00        | 38.1                                              | 37.6                                               |                                                          |                           |                    |                                                                |                      |            |
| 8                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |                                                                                                                    | 05:00-06:00        | 37.9                                              | 37.4                                               |                                                          |                           |                    |                                                                |                      |            |
|                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |                                                                                                                    | <b>Leq NIGHT</b>   | <b>41.3</b>                                       | <b>41.9</b>                                        |                                                          |                           |                    |                                                                |                      |            |
| *LDL indicates Lower Detection Limit                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |                                                                                                                    |                    |                                                   |                                                    |                                                          |                           |                    |                                                                |                      |            |
| **All noise measurements are integrated for a 01 hour period, All units in dB(A)                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |                                                                                                                    |                    |                                                   |                                                    |                                                          |                           |                    |                                                                |                      |            |
| Sampling Assistants                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |                                                                                                                    | (Gaurav Kant)      |                                                   |                                                    | (Amit Raj Mishra)                                        |                           |                    |                                                                |                      |            |
| ANALYSED BY                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |                                                                                                                    | CHECKED BY         |                                                   |                                                    | HOD's Signature                                          |                           |                    |                                                                |                      |            |
| Note: The results above relate to the samples tested as received. This report can not be reproduced in part or full without the written permission of the HOD(Env) , CMPDI, RI-II.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |                                                                                                                    |                    |                                                   |                                                    |                                                          |                           |                    |                                                                |                      |            |
| ---- End of Report ----                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             |                                                                                                                    |                    |                                                   |                                                    |                                                          |                           |                    |                                                                |                      |            |
| Page -1 of 1                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |                                                                                                                    |                    |                                                   |                                                    |                                                          |                           |                    |                                                                |                      |            |

| <div style="display: flex; justify-content: space-between; align-items: center;"> <div>   <div> <b>cmpdi</b><br/> <i>A Mine Rules Company</i> </div> </div> <div style="text-align: center;"> <b>CENTRAL MINE PLANNING AND DESIGN INSTITUTE LIMITED</b><br/> <b>Environment Laboratory, Regional Institute-II</b><br/> <b>Ambient Noise Level Test Report</b> </div> <div style="text-align: right;"> <b>CMPDIL, RI-II</b><br/> <b>KOYLA BHAWAN COMPLEX</b><br/> <b>DHANBAD. -826005</b><br/> <b>Phone:0326-223-850</b><br/> <b>email: rdri2cmpdi@coalindia.in</b> </div> </div> |                                                                                                                    |                    |                                                    |                                                     |                                                                   |                  |                           |                                                                |                        |
|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------|--------------------|----------------------------------------------------|-----------------------------------------------------|-------------------------------------------------------------------|------------------|---------------------------|----------------------------------------------------------------|------------------------|
| Month & Year                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     | 08/2022                                                                                                            | Cluster            | Cluster IV                                         |                                                     |                                                                   |                  |                           | Report No.                                                     | RI-II/NOISE/2022-23/05 |
| Customer                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         | Environment Department, Bharat Coking Coal Limited (BCCL), Koyla Bhawan, Dhanbad (E-mail: gmenv.bccl@coalindia.in) |                    |                                                    |                                                     |                                                                   |                  |                           | Date of Issue                                                  | 26.10.2022             |
| Project                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |                                                                                                                    | Sample Ref. No.    | REM/BCCL/2022/08                                   |                                                     |                                                                   | Sampling Method  | CMPDI/RI-II/LPM 13        |                                                                |                        |
| Sampling Stations                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                | i                                                                                                                  | Rudhi Basti        |                                                    | Date of Sampling                                    | 08.08.22                                                          | 30.08.22         | Zone Category of Station: | Buffer Zone                                                    |                        |
| Sl. No.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          | Parameter                                                                                                          | Hour / Time of day | Observed Values (in Leq dB(A) )<br>First Fortnight | Observed Values (in Leq dB(A) )<br>Second Fortnight | Method of Analysis                                                | Range Of Testing | LDL                       | NOISE POLLUTION (REGULATION AND CONTROL) RULES, 2000 Standards |                        |
|                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |                                                                                                                    |                    |                                                    |                                                     |                                                                   |                  |                           | Zones                                                          | Limits in dB           |
| 1                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                | Noise Level<br>dB(A)Leq - Day                                                                                      | 06:00 - 07:00      | 45.8                                               | 46.7                                                | CPCB, Protocol for<br>Ambient Level<br>Noise Monitoring -<br>2015 | 35 dB-135 dB     | 35 dB(A)                  | Industrial<br>Commercial<br>Residential<br>Silence             | 75<br>65<br>55<br>50   |
| 2                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |                                                                                                                    | 07:00 - 08:00      | 48.2                                               | 49.2                                                |                                                                   |                  |                           |                                                                |                        |
| 3                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |                                                                                                                    | 08:00 - 09:00      | 53.4                                               | 51.6                                                |                                                                   |                  |                           |                                                                |                        |
| 4                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |                                                                                                                    | 09:00 - 10:00      | 56.1                                               | 57.2                                                |                                                                   |                  |                           |                                                                |                        |
| 5                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |                                                                                                                    | 10:00 - 11:00      | 57.4                                               | 58.6                                                |                                                                   |                  |                           |                                                                |                        |
| 6                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |                                                                                                                    | 11:00 - 12:00      | 62.3                                               | 57.2                                                |                                                                   |                  |                           |                                                                |                        |
| 7                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |                                                                                                                    | 12:00 - 13:00      | 58.8                                               | 60.0                                                |                                                                   |                  |                           |                                                                |                        |
| 8                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |                                                                                                                    | 13:00 - 14:00      | 60.0                                               | 61.3                                                |                                                                   |                  |                           |                                                                |                        |
| 9                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |                                                                                                                    | 14:00 - 15:00      | 55.6                                               | 55.9                                                |                                                                   |                  |                           |                                                                |                        |
| 10                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |                                                                                                                    | 15:00 - 16:00      | 53.9                                               | 55.0                                                |                                                                   |                  |                           |                                                                |                        |
| 11                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |                                                                                                                    | 16:00 - 17:00      | 53.4                                               | 54.5                                                |                                                                   |                  |                           |                                                                |                        |
| 12                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |                                                                                                                    | 17:00 - 18:00      | 52.9                                               | 54.0                                                |                                                                   |                  |                           |                                                                |                        |
| 13                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |                                                                                                                    | 18:00 - 19:00      | 52.1                                               | 53.2                                                |                                                                   |                  |                           |                                                                |                        |
| 14                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |                                                                                                                    | 19:00 - 20:00      | 51.2                                               | 52.2                                                |                                                                   |                  |                           |                                                                |                        |
| 15                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |                                                                                                                    | 20:00 - 21:00      | 50.6                                               | 52.2                                                |                                                                   |                  |                           |                                                                |                        |
| 16                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |                                                                                                                    | 21:00 - 22:00      | 50.4                                               | 51.7                                                |                                                                   |                  |                           |                                                                |                        |
|                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |                                                                                                                    | <b>Leq DAY</b>     | <b>55.9</b>                                        | <b>56.0</b>                                         |                                                                   |                  |                           |                                                                |                        |
| 1                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                | Noise Level<br>dB(A)Leq -Night                                                                                     | 22:00-23:00        | 44.3                                               | 44.9                                                | CPCB, Protocol for<br>Ambient Level<br>Noise Monitoring -<br>2015 | 35 dB-135 dB     | 35 dB(A)                  | Industrial<br>Commercial<br>Residential<br>Silence             | 70<br>55<br>45<br>50   |
| 2                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |                                                                                                                    | 23:00- 00:00       | 43.9                                               | 43.2                                                |                                                                   |                  |                           |                                                                |                        |
| 3                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |                                                                                                                    | 00:00- 01:00       | 41.9                                               | 42.7                                                |                                                                   |                  |                           |                                                                |                        |
| 4                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |                                                                                                                    | 01:00-02:00        | 42.5                                               | 42.9                                                |                                                                   |                  |                           |                                                                |                        |
| 5                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |                                                                                                                    | 02:00-03:00        | 43.0                                               | 42.0                                                |                                                                   |                  |                           |                                                                |                        |
| 6                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |                                                                                                                    | 03:00-04:00        | 40.9                                               | 41.6                                                |                                                                   |                  |                           |                                                                |                        |
| 7                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |                                                                                                                    | 04:00-05:00        | 40.1                                               | 41.2                                                |                                                                   |                  |                           |                                                                |                        |
| 8                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |                                                                                                                    | 05:00-06:00        | 40.2                                               | 41.0                                                |                                                                   |                  |                           |                                                                |                        |
|                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |                                                                                                                    | <b>Leq NIGHT</b>   | <b>42.4</b>                                        | <b>42.6</b>                                         |                                                                   |                  |                           |                                                                |                        |

*\*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)  
**CHECKED BY**

(Amit Raj Mishra)  
**HOD's Signature**

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

---- End of Report ----  
Page -1 of 1



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

| Category                                                                                                                                                | Pollutant                                                              | Time weighted average                 | Concentration in Ambient Air                                     | Method of Measurement                                                                 |
|---------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------|---------------------------------------|------------------------------------------------------------------|---------------------------------------------------------------------------------------|
| 1                                                                                                                                                       | 2                                                                      | 3                                     | 4                                                                | 5                                                                                     |
| <b>III</b><br>Coal mines located in the coal fields of <ul style="list-style-type: none"> <li>• Jharia</li> <li>• Raniganj</li> <li>• Bokaro</li> </ul> | Suspended Particulate Matter (SPM)                                     | Annual Average<br>*<br>24 hours<br>** | 500 $\mu\text{g}/\text{m}^3$<br><br>700 $\mu\text{g}/\text{m}^3$ | - High Volume Sampling (Average flow rate not less than 1.1)                          |
|                                                                                                                                                         | Respirable Particulate Matter (size less than 10 $\mu\text{m}$ ) (RPM) | Annual Average<br>*<br>24 hours<br>** | 250 $\mu\text{g}/\text{m}^3$<br><br>300 $\mu\text{g}/\text{m}^3$ | Respirable Particulate Matter sampling and analysis                                   |
|                                                                                                                                                         | Sulphur Dioxide ( $\text{SO}_2$ )                                      | Annual Average<br>*<br>24 hours<br>** | 80 $\mu\text{g}/\text{m}^3$<br><br>120 $\mu\text{g}/\text{m}^3$  | 1.Improvedwest and Gaeke method<br>2.Ultraviolet fluorescene                          |
|                                                                                                                                                         | Oxide of Nitrogen as $\text{NO}_2$                                     | Annual Average<br>*<br>24 hours<br>** | 80 $\mu\text{g}/\text{m}^3$<br><br>120 $\mu\text{g}/\text{m}^3$  | 1. Jacob & Hochheiser Modified (Na-Arsenic) Method<br>2. Gas phase Chemilumine-scence |

**Note:**

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

\*\* 24hourly/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 18<sup>th</sup> 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 11<sup>th</sup> April 1994 and S.O.935(E), dated 14<sup>th</sup> November 1998, the Central Pollution Control Board hereby notify the National Ambient Air Quality Standards with immediate effect.

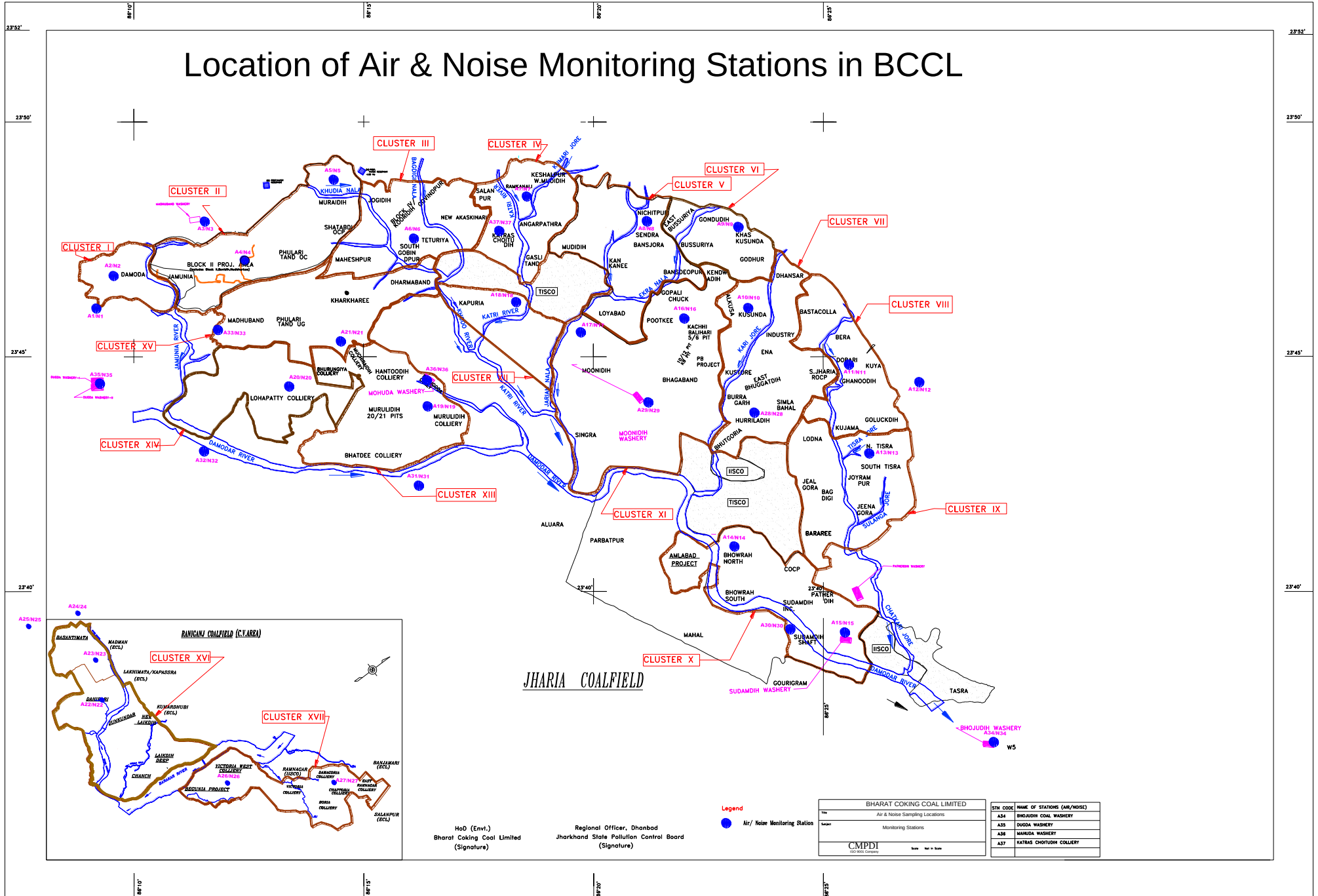
| Pollutant                                                                          | Time Weighted Average   | Concentration in Ambient Air                   |                                                              | Methods of Measurement                                                                                   |
|------------------------------------------------------------------------------------|-------------------------|------------------------------------------------|--------------------------------------------------------------|----------------------------------------------------------------------------------------------------------|
|                                                                                    |                         | Industrial, Residential, Rural and other Areas | Ecologically Sensitive Area (Notified by Central Government) |                                                                                                          |
| Sulphur Dioxide (SO <sub>2</sub> ), µg/m <sup>3</sup>                              | Annual *<br>24 Hours ** | 50<br>80                                       | 20<br>80                                                     | -Improved West and Gaeke Method<br>-Ultraviolet Fluorescence                                             |
| Nitrogendioxide (NO <sub>2</sub> ), µg/m <sup>3</sup>                              | Annual *<br>24 Hours ** | 40<br>80                                       | 30<br>80                                                     | -Jacob &Hochheiser modified (NaOH-NaAsO <sub>2</sub> ) Method<br>-Gas Phase Chemiluminescence            |
| Particulate Matter (Size less than 10µm) or PM <sub>10</sub> , µg/m <sup>3</sup>   | Annual *<br>24 Hours ** | 60<br>100                                      | 60<br>100                                                    | -Gravimetric<br>-TEOM<br>-Beta attenuation                                                               |
| Particulate Matter (Size less than 2.5µm) or PM <sub>2.5</sub> , µg/m <sup>3</sup> | Annual *<br>24 Hours ** | 40<br>60                                       | 40<br>60                                                     | -Gravimetric<br>-TEOM<br>-Beta attenuation                                                               |
| Ozone (O <sub>3</sub> ) , µg/m <sup>3</sup>                                        | 8 Hours *<br>1 Hour **  | 100<br>180                                     | 100<br>180                                                   | -UV Photometric<br>-Chemiluminescence<br>-Chemical Method                                                |
| Lead (Pb) , µg/m <sup>3</sup>                                                      | Annual *<br>24 Hours ** | 0.50<br>1.0                                    | 0.50<br>1.0                                                  | -AAS/ICP Method after sampling on EPM 2000 or equivalent filter paper<br>-ED-XRF using Teflon filter     |
| Carbon Monoxide (CO), mg/m <sup>3</sup>                                            | 8 Hours **<br>1 Hour ** | 02<br>04                                       | 02<br>04                                                     | -Non dispersive Infrared (NDIR) Spectroscopy                                                             |
| Ammonia (NH <sub>3</sub> ), µg/m <sup>3</sup>                                      | Annual *<br>24 Hours ** | 100<br>400                                     | 100<br>400                                                   | -Chemiluminescence<br>-Indophenol blue method                                                            |
| Benzene (C <sub>6</sub> H <sub>6</sub> ), µg/m <sup>3</sup>                        | Annual *                | 05                                             | 05                                                           | -Gas Chromatography (GC) based continuous analyzer<br>-Adsorption and desorption followed by GC analysis |
| Benzo(a)Pyrene (BaP) Particulate phase only, ng/m <sup>3</sup>                     | Annual *                | 01                                             | 01                                                           | -Solvent extraction followed byHPLC/GC analysis                                                          |
| Arsenic (As), ng/m <sup>3</sup>                                                    | Annual *                | 06                                             | 06                                                           | -AAS/ICP Method after sampling on EPM 2000 or equivalent filter paper                                    |
| Nickel (Ni), ng/m <sup>3</sup>                                                     | 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.

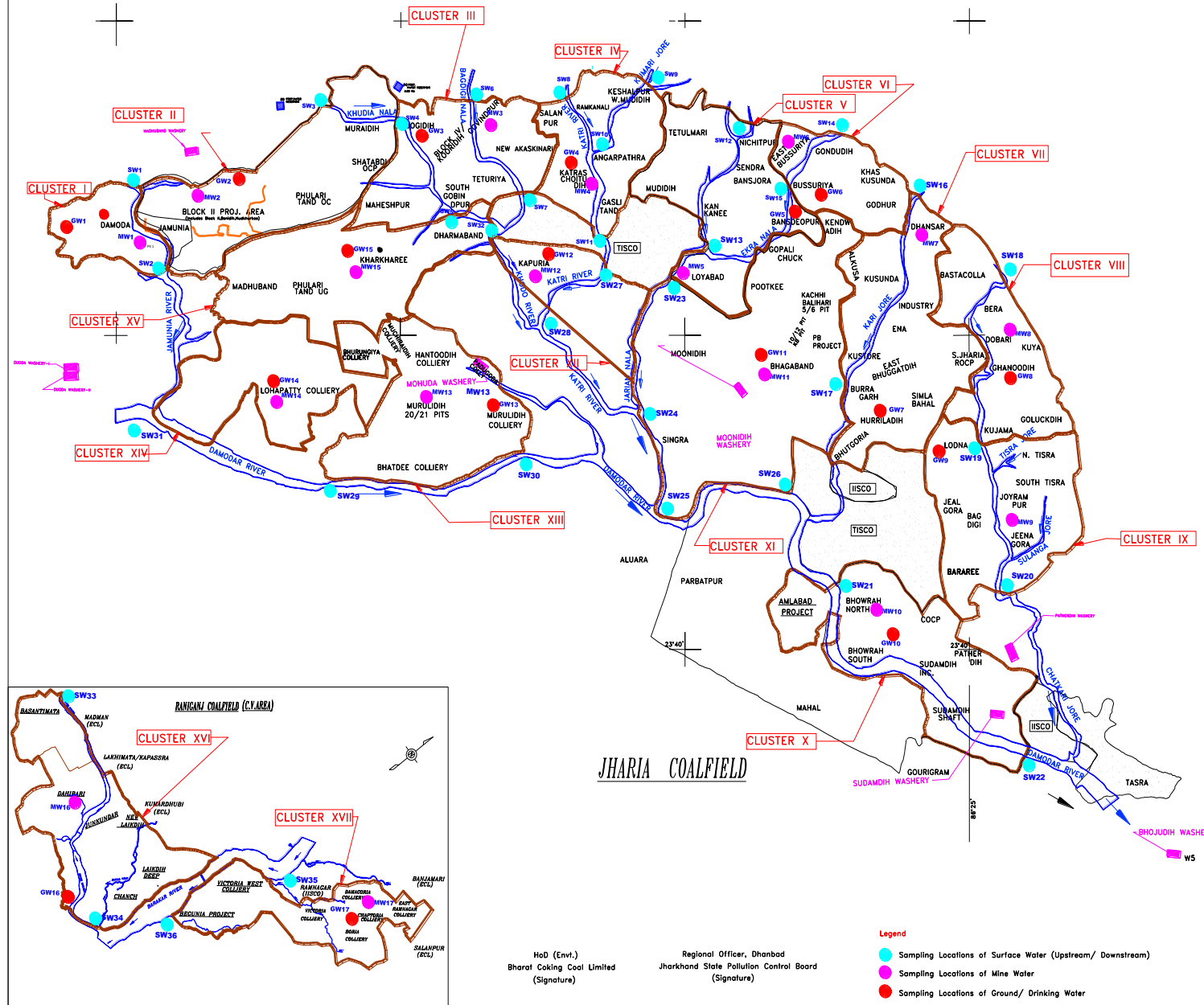
# Location of Air & Noise Monitoring Stations in BCCL



# Water Sampling Locations in BCCL

## INDEX

| Cluster | Surface Water (JUS, DIS) | Name of River/Nala / Jore  | Mine/ Effluent Water | Sampling Location  | Ground Water | Sampling Location   |
|---------|--------------------------|----------------------------|----------------------|--------------------|--------------|---------------------|
| I       | SW1, SW2                 | Damodar River              | MW1                  | Damodar Area       | GW1          | Chakraborty Village |
| II      | SW3, SW4                 | Khudra Nala                | MW2                  | Block II OCP       | GW2          | Joyrampur Village   |
| III     | SW4, SW5, SW6, SW7       | Khudra Nala, Bagdigi Nala  | MW3                  | Govindpur Colliery | GW3          | Jogdih Village      |
| IV      | SW8, SW11, SW9, SW10     | Kanti River, Kuranj Nala   | MW4                  | Chotudih           | GW4          | Kankanee Village    |
| V       | SW12, SW13, SW15         | Jarian Nala, Ekra Nala     | MW5                  | Mudih              | GW5          | Nichitpur           |
| VI      | SW14, SW15               | Ekra Nala                  | MW6                  | East Bassuria UGP  | GW6          | Bansjora Borewell   |
| VII     | SW16, SW17               | Kanti Jore                 | MW7                  | Dhanbari UGP       | GW7          | Humladih            |
| VIII    | SW18, SW19               | Kanti Jore                 | MW8                  | Dobari UGP         | GW8          | Ghanudih            |
| IX      | SW19, SW20               | Kanti Jore                 | MW9                  | Jeenagrah          | GW9          | Lodna               |
| X       | SW21, SW22               | Damodar River              | MW10                 | Bhowrah North      | GW10         | Bhowrah South       |
| XI      | SW23, SW24, SW25, SW26   | Jarian Nala, Damodar River | MW11                 | Bhagaband UGP      | GW11         | Bhagaband           |
| XII     | SW27, SW28               | Kanti River                | MW12                 | Kapuria            | GW12         | Kapuria             |
| XIII    | SW29, SW30               | Damodar River              | MW13                 | Murudih            | GW13         | Murudih             |
| XIV     | SW31, SW32               | Damodar River              | MW14                 | Lohapatti          | GW14         | Lohapatti           |
| XV      | SW33, SW34               | Khudra Nala                | MW15                 | Kharkharree UGP    | GW15         | Kharkharree         |
| XVI     | SW35, SW36               | Khudra River               | MW16                 | Dahibani OCP       | GW16         | Palabani Village    |
| XVII    | SW37, SW38               | Barakar River              | MW17                 | Damagoria Colliery | GW17         | Chaptoria           |

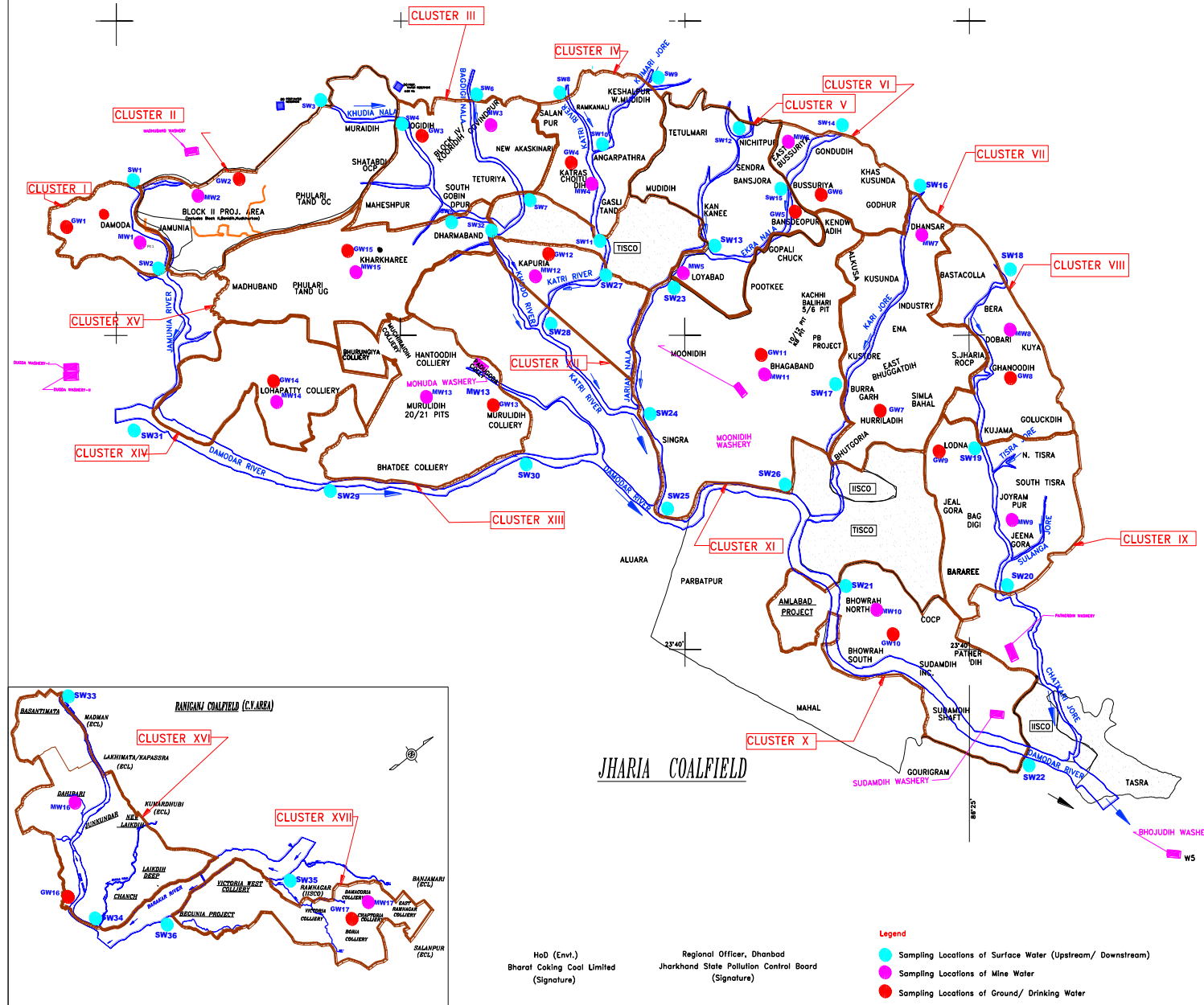


|          |                            |
|----------|----------------------------|
| Customer | BHARAT COKING COAL LIMITED |
| Title    | WATER SAMPLING LOCATIONS   |
| Subject  | MONITORING STATIONS        |
| Scale    | Not to Scale               |

# Water Sampling Locations in BCCL

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| III     | SW4, SW5, SW6, SW7       | Khudra Nala, Bagdigi Nala  | MW3                  | Govindpur Colliery | GW3          | Jogdih Village      |
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| XII     | SW27, SW28               | Kanti River                | MW12                 | Kapuria            | GW12         | Kapuria             |
| XIII    | SW29, SW30               | Damodar River              | MW13                 | Murudih            | GW13         | Murudih             |
| XIV     | SW31, SW32               | Damodar River              | MW14                 | Lohapatti          | GW14         | Lohapatti           |
| XV      | SW33, SW34               | Khudra Nala                | MW15                 | Kharkharer UGP     | GW15         | Kharkharer          |
| XVI     | SW35, SW36               | Khudra River               | MW16                 | Dahibani OCP       | GW16         | Palabani Village    |
| XVII    | SW37, SW38               | Barakar River              | MW17                 | Damagoria Colliery | GW17         | Chaptoria           |



|          |                            |
|----------|----------------------------|
| Customer | BHARAT COKING COAL LIMITED |
| Title    | WATER SAMPLING LOCATIONS   |
| Subject  | MONITORING STATIONS        |
| Scale    | Not to Scale               |

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

**(FOR THE Q.E. JUNE, 2022)**

**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, 2022)**

**CONTENTS**

| SL. NO. | CHAPTER                         | PARTICULARS                                        |
|---------|---------------------------------|----------------------------------------------------|
| 1.      |                                 | EXECUTIVE SUMMARY                                  |
| 2.      | CHAPTER - I                     | INTRODUCTION                                       |
| 3.      | CHAPTER-II                      | WATER SAMPLING & ANALYSIS                          |
| 4.      | <b>Plates:</b><br>PLATE NO. - I | SURFACE PLAN SHOWING WATER<br>MONITORING LOCATIONS |



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**Regional Institute-II**  
**Dhanbad, Jharkhand**

# **EXECUTIVE SUMMARY**

## **1.0 Introduction**

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

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

## **2.0 Sampling location and rationale**

### **2.1 Water sampling stations**

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

## **3.0 Methodology of sampling and analysis**

### **3.1 Water quality**

Water samples were collected as per standard practice. Effluent samples were analyzed for 25 parameters on quarterly basis. 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 within permissible limits.

## **CHAPTER - I**

### **INTRODUCTION**

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

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

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

The Cluster IV is in the Northern part of the Jharia coalfield. It includes Salanpur OCP, Katraschoitodih UG, Amalgamated Keshalpur – West Mudidih OCP & UG Mines, Amalgamated Ramkanali – Angarpathra OCP & UG mines, Gaslitand UG. 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 Katri River and Kuapri 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 23<sup>rd</sup> 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 Chotudih (**MW4**)

#### **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 parameters are within the permissible limits.



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

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

| Month & Year      | QUARTER ENDING JUNE 2022                                                                                           |                                                                                          | Cluster          | CLUSTER IV         |                                                                        |                         | Report No.                                                 | RI-2/GW/22-23/QE/01 |
|-------------------|--------------------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------|------------------|--------------------|------------------------------------------------------------------------|-------------------------|------------------------------------------------------------|---------------------|
| Customer          | Environment Department, Bharat Coking Coal Limited (BCCL), Koyla Bhawan, Dhanbad (E-mail: gmenv.bccl@coalindia.in) |                                                                                          |                  |                    |                                                                        |                         | Date of Issue                                              | 25.10.2022          |
| Project           | Kankanee Village                                                                                                   |                                                                                          |                  | Sample Ref. No.    | REM/BCCL/2022/DW/06/01                                                 | Sampling Method         | CMPDI/RI-II/LPM 13,(IS 3025:Part -1)                       |                     |
| Sampling Stations | GW4                                                                                                                |                                                                                          | Date of Sampling | 16.05..22          | Sample Collected in 5 Ltr Jerricane , Color as observed is transparent |                         |                                                            |                     |
|                   |                                                                                                                    |                                                                                          |                  | Period of Analysis |                                                                        | June                    | to                                                         | Sept'2022           |
| Sl. No.           | Parameter                                                                                                          | Method of Analysis                                                                       | Observed Values  |                    |                                                                        |                         | IS 10500: 2012                                             |                     |
|                   |                                                                                                                    |                                                                                          | GW4              | Range Of Testing   | LDL                                                                    | Acceptable Limit (Max)* | Permissible Limit in the Absence of Alternate Source (Max) |                     |
| 1                 | Colour, Hazen unit                                                                                                 | APHA, 23 <sup>rd</sup> Edition ,2120-c-Spectrophotometric Single Wavelength Method ,2017 | 3                | 1-500.0            | 1                                                                      | 5                       | 15                                                         |                     |
| 2                 | Calcium, mg/l                                                                                                      | IS 3025, (Part 40): 1991 R:2019,AAS-Flame Method & EDTA Method                           | 161              | 2.0-800.0          | 2                                                                      | 75                      | 200                                                        |                     |
| 3                 | Chlorides, mg/l                                                                                                    | IS-3025(Part 32):1988, R-2019 , Argentometric Method                                     | 81               | 2.0-1500.0         | 5                                                                      | 250                     | 1000                                                       |                     |
| 4                 | Fluoride, mg/l                                                                                                     | APHA, 23 <sup>rd</sup> Edition, SPADNS Method                                            | 0.93             | 0.2-2.00           | 0.2                                                                    | 1                       | 1.5                                                        |                     |
| 5                 | Iron, mg/l                                                                                                         | IS 3025 (Part 53) : 2003, R : 2019 , AAS-Flame Method                                    | 0.21             | 0.2-10             | 0.2                                                                    | 1                       | No relaxation                                              |                     |
| 6                 | Magnesium                                                                                                          | APHA 23 <sup>rd</sup> Edition, 3500-Mg B: Calculation Method                             | 0.04             | 6.0-700            | 6                                                                      | 30                      | 100                                                        |                     |
| 7                 | Nitrate , mg/l                                                                                                     | APHA, 23 <sup>rd</sup> Edition, UV-Spectrophotometric Method                             | 14.22            | 0.5-45.0           | 0.5                                                                    | 45                      | No relaxation                                              |                     |
| 8                 | Odour                                                                                                              | APHA, 23 <sup>rd</sup> Edition, , 2150-C                                                 | Agreeable        | Qualitative        | Qualitative                                                            | Agreeable               | Agreeable                                                  |                     |
| 9                 | pH value                                                                                                           | IS 3025, Part 11 : 1983 R 2017 Electrometric( pH Meter) Method                           | 7.68             | 1-14               | 0.1                                                                    | 6.5-8.5                 | No relaxation                                              |                     |
| 10                | Sulphate, mg/l                                                                                                     | APHA -23 <sup>rd</sup> Edition, 4500 S , Turbidity Method                                | 80               | 10.0-400.0         | 10                                                                     | 200                     | 400                                                        |                     |
| 11                | Taste                                                                                                              | APHA,23 <sup>rd</sup> Edition, 2160-C                                                    | Acceptable       | Qualitative        | Qualitative                                                            | Acceptable              | Agreeable                                                  |                     |
| 12                | Total Alkalinity (CaCO <sub>3</sub> ), mg/l, Max                                                                   | IS 3025, Part 23: 1986 R 2019 Titration Method                                           | 128              | 4.0-2000.0         | 4                                                                      | 200                     | 600                                                        |                     |
| 13                | Total Dissolved Solids, mg/l                                                                                       | IS 3025, Part 16: 1984 R 2017 Gravimetric method                                         | 1266             | 25.0-5000.0        | 25                                                                     | 500                     | 2000                                                       |                     |
| 14                | Total Hardness, mg/l                                                                                               | IS 3025, (Part 21): 2019 EDTA Method                                                     | 762              | 4.0-2000.0         | 4                                                                      | 200                     | 600                                                        |                     |
| 15                | Turbidity, NTU                                                                                                     | IS 3025, (Part 10):1984, R-2017 Nephelometric/Turbidititmetric Method                    | 2.3              | 1-800              | 0.1                                                                    | 1                       | 5                                                          |                     |
| 16                | Zinc, mg/l                                                                                                         | IS 3025(Part 49) : 1994,R:2019, AAS-Flame Method                                         | 1.09             | 0.1 - 2.0          | 0.1                                                                    | 5                       | 15                                                         |                     |

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

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

|                    |                   |                        |
|--------------------|-------------------|------------------------|
|                    |                   |                        |
|                    | (Kumar Vaibhav)   | (Amit Raj Mishra)      |
| <b>ANALYSED BY</b> | <b>CHECKED BY</b> | <b>HOD's Signature</b> |

**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.



**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 2022                                                                                           |                                                                        | Cluster          | CLUSTER IV         |                                                                        |                 | Report No.                           | RI-2/GW/22-23/QE/01 |                                                            |
|-------------------|--------------------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------|------------------|--------------------|------------------------------------------------------------------------|-----------------|--------------------------------------|---------------------|------------------------------------------------------------|
| Customer          | Environment Department, Bharat Coking Coal Limited (BCCL), Koyla Bhawan, Dhanbad (E-mail: gmenv.bccl@coalindia.in) |                                                                        |                  |                    |                                                                        |                 | Date of Issue                        | 25.10.2022          |                                                            |
| Project           | Kankanee Village                                                                                                   |                                                                        |                  | Sample Ref. No.    | REM/BCCL/2022/DW/06/01                                                 | Sampling Method | CMPDI/RI-II/LPM 13,(IS 3025:Part -1) |                     |                                                            |
| Sampling Stations | GW4                                                                                                                |                                                                        | Date of Sampling | 16.05.22           | Sample Collected in 5 Ltr Jerricane , Color as observed is transparent |                 |                                      |                     |                                                            |
|                   |                                                                                                                    |                                                                        |                  | Period of Analysis |                                                                        | June            |                                      | to                  | Sept'2022                                                  |
| Sl. No.           | Parameter                                                                                                          | Method of Analysis                                                     | Observed Values  |                    |                                                                        |                 | IS 10500: 2012                       |                     |                                                            |
|                   |                                                                                                                    |                                                                        | 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, 23rd Edition ,Carmine                                            | <0.2             | 0.2-10             | 0.2                                                                    |                 | 0.5                                  |                     | 1                                                          |
| 2                 | Copper (as Cu), mg/l, Max                                                                                          | IS 3025 Part 42 : 1992 R : 2019, AAS-Flame APHA, 23rd Edition, AAS-GTA | <0.03            | 0.01-10            | 0.01                                                                   |                 | 0.05                                 |                     | 1.5                                                        |
| 3                 | Free Residual Chlorine, mg/l, Min                                                                                  | APHA, 23rd Edition, , 4500-Cl-B. (Iodometric Method-I)                 | <0.04            | 0.04-5             | 0.04                                                                   |                 | 0.2                                  |                     | 1                                                          |
| 4                 | Lead (as Pb), mg/l, Max                                                                                            | IS:3025(Part 47):1994 (Reaffirmed 2019) APHA, 23rd Edition, AAS-GTA    | <0.005           | 0.005-10           | 0.005                                                                  |                 | 0.01                                 |                     | No relaxation                                              |
| 5                 | Phenolic compounds (as C6H5OH), mg/l, Max                                                                          | APHA, 22nd Edition,4-Amino Autipyrine                                  | <0.001           | 0.001-10           | 0.001                                                                  |                 | 0.002                                |                     | 0.002                                                      |
| 6                 | Selenium, mg/l, Max                                                                                                | APHA 23rd Edition IS-3025,part 56:2003, R-2019/, AAS-VGA               | <0.007           | 0.007-10           | 0.007                                                                  |                 | 0.01                                 |                     | No relaxation                                              |
| 7                 | Total Arsenic (as As), mg/l, Max                                                                                   | IS-3025,part 37:1988, R-2019/ APHA 23rd Edition AAS-VGA                | <0.006           | 0.006-10           | 0.006                                                                  |                 | 0.01                                 |                     | 0.05                                                       |
| 8                 | Total Chromium (as Cr), mg/l, Max                                                                                  | IS-3025 Part 52:2003, R:2019,AAS-Flame APHA, 23rd Edition, AAS-GTA     | <0.04            | 0.01-10            | 0.01                                                                   |                 | 0.05                                 |                     | No relaxation                                              |
| 9                 | Nickel as Ni, mg/l Max                                                                                             | IS 3025 Part 54 : 2003,R : 2019, AAS-Flame APHA, 23rd Edition, AAS-GTA | <0.01            | 0.005-10           | 0.005                                                                  |                 | 0.02                                 |                     | No relaxation                                              |

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

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

(Kumar Vaibhav)  
**CHECKED BY**

(Amit Raj Mishra)

**ANALYSED BY**

**HOD's Signature**

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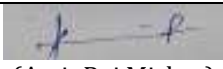


**CENTRAL MINE PLANNING AND DESIGN INSTITUTE LIMITED**  
**Environment Laboratory, Regional Institute-II**  
**SURFACE WATER ANALYSIS TEST REPORT**

| Month & Year      |                              | JUNE 2022                                                                                                          |                              | Cluster         |       | III&IV                                         |                  | Report No.      | RI-2/SW/22-23/QE/01                   |  |  |
|-------------------|------------------------------|--------------------------------------------------------------------------------------------------------------------|------------------------------|-----------------|-------|------------------------------------------------|------------------|-----------------|---------------------------------------|--|--|
| Customer          |                              | Environment Department, Bharat Coking Coal Limited (BCCL), Koyla Bhawan, Dhanbad (E-mail: gmenv.bccl@coalindia.in) |                              |                 |       |                                                |                  | Date of Issue   | 14.10.2022                            |  |  |
| Project           |                              | Sample Ref. No.                                                                                                    |                              |                 |       | REM/BCCL/2022/ 06 /SW /011                     |                  | Sampling Method | (IS 3025 , Part-1) CMPDI/RI-II/LPM 13 |  |  |
| Sampling Stations |                              |                                                                                                                    |                              |                 |       |                                                |                  |                 | Period of Analysis                    |  |  |
|                   |                              | (i)                                                                                                                | Upstream in Katri River(SW8) |                 |       | Date of Sampling                               |                  | 06.06.22        | June'2022 TO Sept'2022                |  |  |
| Sl. No.           | Parameter                    | Method of Analysis                                                                                                 |                              | Observed Values |       | IS : 2296 INLAND SURFACE WATER [1982] Class 'C | Range of Testing |                 | LDL                                   |  |  |
|                   |                              |                                                                                                                    |                              |                 | (i)   |                                                |                  |                 |                                       |  |  |
| 1                 | BOD (3 days 27°C), mg/l      | IS 3025 ( Part 44 ) : 1993, R-2019 , 3 day incubation at 27°C                                                      |                              |                 | <2.0  | 3                                              | 2.00-10.00       |                 | 2                                     |  |  |
| 2                 | Colour,Hazen Units           | APHA 23rd Edition , 2120-B-:2017                                                                                   |                              |                 | 3     | 10                                             | 1-100.0          |                 | 1                                     |  |  |
| 3                 | Chlorides, mg/l              | IS-3025(Part 32):1988, R-2019 Argentometric Method                                                                 |                              |                 | 33    | 600                                            | 5.0-1500.0       |                 | 5                                     |  |  |
| 4                 | Copper, mg/l                 | IS 3025 (Part 42) : 1992 R : 2019, AAS-Flame Method                                                                |                              |                 | <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                                                              |                              |                 | 5.3   | 4                                              | 0.1-10.0         |                 | 0.1                                   |  |  |
| 6                 | Fluoride, mg/l               | APHA, 23rd Edition, SPADNS Method                                                                                  |                              |                 | 0.69  | 1.5                                            | 0.2-2.00         |                 | 0.2                                   |  |  |
| 7                 | Hexavalent Chromium, mg/l    | APHA 23rd Edition, 1,5-Diphenylcarbohydrazide Method IS 3025 (Part 52) : 2003,R-2019                               |                              |                 | <0.01 | 0.05                                           | 0.01-1.4         |                 | 0.01                                  |  |  |
| 8                 | Iron, mg/l                   | IS 3025 (Part 53):2003,R:2019, AAS-Flame Method                                                                    |                              |                 | <2.0  | 50                                             | 0.2-10           |                 | 0.2                                   |  |  |
| 9                 | Nitrate , mg/l               | APHA, 23rd Edition, UV-Spectrophotometric Method                                                                   |                              |                 | 9.20  | 50                                             | 0.5-45.0         |                 | 0.5                                   |  |  |
| 10                | pH value                     | IS 3025, (Part 11) : 1983 R-2017 Electrometric (Ph Meter) method                                                   |                              |                 | 7.88  | 6.5-8.5                                        | 2.0-12.0         |                 | 2                                     |  |  |
| 11                | Sulphate, mg/l               | APHA -23rd Edition,4500- S, Turbidity Method                                                                       |                              |                 | 536   | 400                                            | 10.0-400.0       |                 | 10                                    |  |  |
| 12                | Total Dissolved Solids, mg/l | IS 3025, (Part 16): 1984 R-2017 Gravimetric method                                                                 |                              |                 | 908   | 1500                                           | 25.0-5000.0      |                 | 25                                    |  |  |
| 13                | Zinc, mg/l                   | IS 3025(Part 49) : 1994, R : 2019, AAS-Flame Method                                                                |                              |                 | <2.0  | 15                                             | 0.1 - 3.0        |                 | 0.1                                   |  |  |

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

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

Analysed by  (Kumar Vaibhav) **CHECKED BY**  (Amit Raj Mishra) **HOD's Initial/Signature**

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**SURFACE WATER ANALYSIS TEST REPORT**

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

| Month & Year      | Jun 2022                                                                                                           | Cluster                                                   | III&IV                       |                            |                                                | Report No.                            | RI-2/SW/22-23/QE/01    |  |
|-------------------|--------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------|------------------------------|----------------------------|------------------------------------------------|---------------------------------------|------------------------|--|
| Customer          | Environment Department, Bharat Coking Coal Limited (BCCL), Koyla Bhawan, Dhanbad (E-mail: gmenv.bccl@coalindia.in) |                                                           |                              |                            |                                                | Date of Issue                         | 14.10.2022             |  |
| Project           | Sample Ref. No.                                                                                                    |                                                           |                              | REM/BCCL/2022/ 06 /SW /011 | Sampling Method                                | (IS 3025 , Part-1) CMPDI/RI-II/LPM 13 |                        |  |
| Sampling Stations |                                                                                                                    |                                                           |                              |                            |                                                | Period of Analysis                    |                        |  |
|                   |                                                                                                                    | (i)                                                       | Upstream in Katri River(SW8) | Date of Sampling           |                                                | 06.06.22                              | June'2022 TO Sept'2022 |  |
| Sl. No.           | Parameter                                                                                                          | Method of Analysis                                        | Observed Values              |                            | IS : 2296 INLAND SURFACE WATER [1982] Class 'C | Range of Testing                      | LDL                    |  |
|                   |                                                                                                                    |                                                           |                              | (i)                        |                                                |                                       |                        |  |
| 1                 | Arsenic (as As), mg/l, Max                                                                                         | IS-3025,Part 37:1988, R-2019/ APHA 23rd Edition AAS-VGA   |                              | <0.006                     | 0.2                                            | 0.006-10                              | 0.006                  |  |
| 2                 | Lead (as Pb), mg/l, Max                                                                                            | APHA, 23rd Edition, AAS-GTA                               |                              | <0.005                     | 0.1                                            | 0.005-10                              | 0.005                  |  |
| 3                 | Phenolic compounds (as C6H5OH), mg/l, Max                                                                          | APHA, 22nd Edition 4-Amino Antipyrine                     |                              | <0.002                     | 0.005                                          | 0.002-10                              | 0.002                  |  |
| 4                 | Selenium, mg/l, Max                                                                                                | IS-3025 ,Part 56:2003, R-2019/ APHA 23rd Edition, AAS-VGA |                              | <0.007                     | 0.05                                           | 0.007-10                              | 0.007                  |  |

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

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

(Kumar Vaibhav)

(Amit Raj Mishra)

**Analysed by**

**CHECKED BY**

**HOD's Initial/Signature**

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

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

| Month & Year      |                              | JUNE 2022 |                                                                                                                    | Cluster |                 | IV   |                                                |  | Report No.       |               | RI-2/SW/22-23/QE/01                   |            |             |  |      |  |
|-------------------|------------------------------|-----------|--------------------------------------------------------------------------------------------------------------------|---------|-----------------|------|------------------------------------------------|--|------------------|---------------|---------------------------------------|------------|-------------|--|------|--|
| Customer          |                              |           | Environment Department, Bharat Coking Coal Limited (BCCL), Koyla Bhawan, Dhanbad (E-mail: gmenv.bccl@coalindia.in) |         |                 |      |                                                |  |                  | Date of Issue |                                       | 14.10.2022 |             |  |      |  |
| Project           |                              |           | Sample Ref. No.                                                                                                    |         |                 |      | REM/BCCL/2022/ 06 /SW /011                     |  | Sampling Method  |               | (IS 3025 , Part-1) CMPDI/RI-II/LPM 13 |            |             |  |      |  |
| Sampling Stations |                              | (i)       | Upstream in Kumar Jore(SW9)                                                                                        |         |                 |      | Date of Sampling                               |  | 06.06.22         |               | Period of Analysis                    |            |             |  |      |  |
|                   |                              | (ii)      | Downstream in Kumar Jore(SW10)                                                                                     |         |                 |      | Date of Sampling                               |  | 06.06.22         |               | June'2022 TO Sept'2022                |            |             |  |      |  |
| Sl. No.           | Parameter                    |           | Method of Analysis                                                                                                 |         | Observed Values |      | IS : 2296 INLAND SURFACE WATER [1982] Class 'C |  | Range of Testing |               | LDL                                   |            |             |  |      |  |
|                   |                              |           |                                                                                                                    |         | (i)             | (ii) |                                                |  |                  |               |                                       |            |             |  |      |  |
| 1                 | BOD (3 days 27°C), mg/l      |           | IS 3025 ( Part 44 ) : 1993, R-2019 , 3 day incubation at 27°C                                                      |         |                 |      | <2.0                                           |  | 2.0              |               | 3                                     |            | 2.00-10.00  |  | 2    |  |
| 2                 | Colour,Hazen Units           |           | APHA 23rd Edition , 2120-B-:2017                                                                                   |         |                 |      | 3                                              |  | 2                |               | 10                                    |            | 1-100.0     |  | 1    |  |
| 3                 | Chlorides, mg/l              |           | IS-3025(Part 32):1988, R-2019 Argentometric Method                                                                 |         |                 |      | 41                                             |  | 37               |               | 600                                   |            | 5.0-1500.0  |  | 5    |  |
| 4                 | Copper, mg/l                 |           | IS 3025 (Part 42) : 1992 R : 2019, AAS-Flame Method                                                                |         |                 |      | <0.2                                           |  | <0.2             |               | 1.5                                   |            | 0.2-10.0    |  | 0.2  |  |
| 5                 | Dissolved Oxygen, mg/L       |           | IS 3025 (Part 38) : 1989, R:2003 Winkler Azide Method                                                              |         |                 |      | 5.6                                            |  | 5.7              |               | 4                                     |            | 0.1-10.0    |  | 0.1  |  |
| 6                 | Fluoride, mg/l               |           | APHA, 23rd Edition, SPADNS Method                                                                                  |         |                 |      | 0.68                                           |  | 0.69             |               | 1.5                                   |            | 0.2-2.00    |  | 0.2  |  |
| 7                 | Hexavalent Chromium, mg/l    |           | APHA 23rd Edition, 1,5-Diphenylcarbohydrazide Method IS 3025 (Part 52) : 2003,R-2019                               |         |                 |      | 0.012                                          |  | 0.020            |               | 0.05                                  |            | 0.01-1.4    |  | 0.01 |  |
| 8                 | Iron, mg/l                   |           | IS 3025 (Part 53):2003,R:2019, AAS-Flame Method                                                                    |         |                 |      | <0.2                                           |  | <0.2             |               | 50                                    |            | 0.2-10      |  | 0.2  |  |
| 9                 | Nitrate , mg/l               |           | APHA, 23rd Edition, UV-Spectrophotometric Method                                                                   |         |                 |      | 6.32                                           |  | 10.37            |               | 50                                    |            | 0.5-45.0    |  | 0.5  |  |
| 10                | pH value                     |           | IS 3025, (Part 11) : 1983 R-2017 Electrometric (Ph Meter) method                                                   |         |                 |      | 8.32                                           |  | 8.31             |               | 6.5-8.5                               |            | 2.0-12.0    |  | 2    |  |
| 11                | Sulphate, mg/l               |           | APHA –23rd Edition,4500- S, Turbidity Method                                                                       |         |                 |      | 470                                            |  | 510              |               | 400                                   |            | 10.0-400.0  |  | 10   |  |
| 12                | Total Dissolved Solids, mg/l |           | IS 3025, (Part 16): 1984 R-2017 Gravimetric method                                                                 |         |                 |      | 807                                            |  | 868              |               | 1500                                  |            | 25.0-5000.0 |  | 25   |  |
| 13                | Zinc, mg/l                   |           | IS 3025(Part 49) : 1994, R : 2019, AAS-Flame Method                                                                |         |                 |      | <0.2                                           |  | <0.2             |               | 15                                    |            | 0.1 - 3.0   |  | 0.1  |  |

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

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

(Kumar Vaibhav)

(Amit Raj Mishra)

**Analysed by**

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**HOD's Initial/Signature**

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

CMPDI, RI-II  
KOYLA BHAWAN COMPLEX  
DHANBAD - 826005  
Phone: 0326-223-850  
email: rdr12.cmpdi@coalindia.in

| Month & Year      | Jun 2022                                                                                                           | Cluster                                                   | IV                         |        |                                                | Report No.                            | RI-2/SW/22-23/QE/01 |  |
|-------------------|--------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------|----------------------------|--------|------------------------------------------------|---------------------------------------|---------------------|--|
| Customer          | Environment Department, Bharat Coking Coal Limited (BCCL), Koyla Bhawan, Dhanbad (E-mail: gmenv.bccl@coalindia.in) |                                                           |                            |        |                                                | Date of Issue                         | 14.10.2022          |  |
| Project           | Sample Ref. No.                                                                                                    |                                                           | REM/BCCL/2022/ 06 /SW /011 |        | Sampling Method                                | (IS 3025 , Part-1) CMPDI/RI-II/LPM 13 |                     |  |
| Sampling Stations | (i)                                                                                                                | Upstream in Kumar Jore(SW9)                               | Date of Sampling           |        | 06.06.22                                       | Period of Analysis                    |                     |  |
|                   | (ii)                                                                                                               | Downstream in Kumar Jore(SW10)                            | Date of Sampling           |        | 06.06.22                                       | June'2022 TO Sept'2022                |                     |  |
| Sl. No.           | Parameter                                                                                                          | Method of Analysis                                        | Observed Values            |        | IS : 2296 INLAND SURFACE WATER [1982] Class 'C | Range of Testing                      | LDL                 |  |
|                   |                                                                                                                    |                                                           | (i)                        | (ii)   |                                                |                                       |                     |  |
| 1                 | Arsenic (as As), mg/l, Max                                                                                         | IS-3025,Part 37:1988, R-2019/ APHA 23rd Edition AAS-VGA   | <0.006                     | <0.006 | 0.2                                            | 0.006-10                              | 0.006               |  |
| 2                 | Lead (as Pb), mg/l, Max                                                                                            | APHA, 23rd Edition, AAS-GTA                               | <0.005                     | <0.005 | 0.1                                            | 0.005-10                              | 0.005               |  |
| 3                 | Phenolic compounds (as C6H5OH), mg/l, Max                                                                          | APHA, 22nd Edition 4-Amino Antipyrine                     | <0.002                     | <0.002 | 0.005                                          | 0.002-10                              | 0.002               |  |
| 4                 | Selenium, mg/l, Max                                                                                                | IS-3025 ,Part 56:2003, R-2019/ APHA 23rd Edition, AAS-VGA | <0.007                     | <0.007 | 0.05                                           | 0.007-10                              | 0.007               |  |

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

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

(Kumar Vaibhav)

(Amit Raj Mishra)

**Analysed by**

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

| Month & Year      |                              | JUNE 2022                                                                                                          |                                 | Cluster |                                                | IV & V           |                 | Report No.                            | RI-2/SW/22-23/QE/01 |  |
|-------------------|------------------------------|--------------------------------------------------------------------------------------------------------------------|---------------------------------|---------|------------------------------------------------|------------------|-----------------|---------------------------------------|---------------------|--|
| Customer          |                              | Environment Department, Bharat Coking Coal Limited (BCCL), Koyla Bhawan, Dhanbad (E-mail: gmenv.bccl@coalindia.in) |                                 |         |                                                |                  |                 | Date of Issue                         | 14.10.2022          |  |
| Project           |                              | Sample Ref. No.                                                                                                    |                                 |         | REM/BCCL/2022/ 06 /SW /011                     |                  | Sampling Method | (IS 3025 , Part-1) CMPDI/RI-II/LPM 13 |                     |  |
| Sampling Stations |                              | (i)                                                                                                                | Downstream in Katri River(SW11) |         | Date of Sampling                               |                  | 06.06.22        | Period of Analysis                    |                     |  |
|                   |                              |                                                                                                                    |                                 |         |                                                |                  |                 | June'2022 TO Sept'2022                |                     |  |
| Sl. No.           | Parameter                    | Method of Analysis                                                                                                 | Observed Values                 |         | IS : 2296 INLAND SURFACE WATER [1982] Class 'C | Range of Testing | LDL             |                                       |                     |  |
|                   |                              |                                                                                                                    | (i)                             |         |                                                |                  |                 |                                       |                     |  |
| 1                 | BOD (3 days 27°C), mg/l      | IS 3025 ( Part 44 ) : 1993, R-2019 , 3 day incubation at 27°C                                                      | 2.1                             |         | 3                                              | 2.00-10.00       | 2               |                                       |                     |  |
| 2                 | Colour,Hazen Units           | APHA 23rd Edition , 2120-B-:2017                                                                                   | 4                               |         | 10                                             | 1-100.0          | 1               |                                       |                     |  |
| 3                 | Chlorides, mg/l              | IS-3025(Part 32):1988, R-2019 Argentometric Method                                                                 | 52                              |         | 600                                            | 5.0-1500.0       | 5               |                                       |                     |  |
| 4                 | Copper, mg/l                 | IS 3025 (Part 42) : 1992 R : 2019, AAS-Flame Method                                                                | <0.2                            |         | 1.5                                            | 0.2-10.0         | 0.2             |                                       |                     |  |
| 5                 | Dissolved Oxygen, mg/L       | IS 3025 (Part 38) : 1989, R:2003 Winkler Azide Method                                                              | 5.2                             |         | 4                                              | 0.1-10.0         | 0.1             |                                       |                     |  |
| 6                 | Fluoride, mg/l               | APHA, 23rd Edition, SPADNS Method                                                                                  | 0.81                            |         | 1.5                                            | 0.2-2.00         | 0.2             |                                       |                     |  |
| 7                 | Hexavalent Chromium, mg/l    | APHA 23rd Edition, 1,5-Diphenylcarbohydrazide Method IS 3025 (Part 52) : 2003,R-2019                               | 0.010                           |         | 0.05                                           | 0.01-1.4         | 0.01            |                                       |                     |  |
| 8                 | Iron, mg/l                   | IS 3025 (Part 53):2003,R:2019, AAS-Flame Method                                                                    | <0.2                            |         | 50                                             | 0.2-10           | 0.2             |                                       |                     |  |
| 9                 | Nitrate , mg/l               | APHA, 23rd Edition, UV-Spectrophotometric Method                                                                   | 6.54                            |         | 50                                             | 0.5-45.0         | 0.5             |                                       |                     |  |
| 10                | pH value                     | IS 3025, (Part 11) : 1983 R-2017 Electrometric (Ph Meter) method                                                   | 8.25                            |         | 6.5-8.5                                        | 2.0-12.0         | 2               |                                       |                     |  |
| 11                | Sulphate, mg/l               | APHA -23rd Edition,4500- S, Turbidity Method                                                                       | 478                             |         | 400                                            | 10.0-400.0       | 10              |                                       |                     |  |
| 12                | Total Dissolved Solids, mg/l | IS 3025, (Part 16): 1984 R-2017 Gravimetric method                                                                 | 820                             |         | 1500                                           | 25.0-5000.0      | 25              |                                       |                     |  |
| 13                | Zinc, mg/l                   | IS 3025(Part 49) : 1994, R : 2019, AAS-Flame Method                                                                | <0.2                            |         | 15                                             | 0.1 - 3.0        | 0.1             |                                       |                     |  |

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

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

(Kumar Vaibhav)

(Amit Raj Mishra)

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SURFACE WATER ANALYSIS TEST REPORT

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

| Month & Year      | Jun 2022                                                                                                           | Cluster                                                   | IV &V                      |                 |                                                | Report No.       | RI-2/SW/22-23/QE/01 |
|-------------------|--------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------|----------------------------|-----------------|------------------------------------------------|------------------|---------------------|
| Customer          | Environment Department, Bharat Coking Coal Limited (BCCL), Koyla Bhawan, Dhanbad (E-mail: gmenv.bccl@coalindia.in) |                                                           |                            |                 |                                                | Date of Issue    | 14.10.2022          |
| Project           | Sample Ref. No.                                                                                                    |                                                           | REM/BCCL/2022/ 06 /SW /011 | Sampling Method | (IS 3025 , Part-1) CMPDI/RI-II/LPM 13          |                  |                     |
| Sampling Stations | (i)                                                                                                                | Downstream in Katri River(SW11)                           | Date of Sampling           | 06.06.22        | Period of Analysis                             |                  |                     |
|                   |                                                                                                                    |                                                           |                            |                 | June'2022 TO Sept'2022                         |                  |                     |
| Sl. No.           | Parameter                                                                                                          | Method of Analysis                                        | Observed Values            |                 | IS : 2296 INLAND SURFACE WATER [1982] Class 'C | Range of Testing | LDL                 |
|                   |                                                                                                                    |                                                           | (i)                        |                 |                                                |                  |                     |
| 1                 | Arsenic (as As), mg/l, Max                                                                                         | IS-3025,Part 37:1988, R-2019/ APHA 23rd Edition AAS-VGA   | <0.006                     |                 | 0.2                                            | 0.006-10         | 0.006               |
| 2                 | Lead (as Pb), mg/l, Max                                                                                            | APHA, 23rd Edition, AAS-GTA                               | <0.005                     |                 | 0.1                                            | 0.005-10         | 0.005               |
| 3                 | Phenolic compounds (as C6H5OH), mg/l, Max                                                                          | APHA, 22nd Edition 4-Amino Antipyrine                     | <0.002                     |                 | 0.005                                          | 0.002-10         | 0.002               |
| 4                 | Selenium, mg/l, Max                                                                                                | IS-3025 ,Part 56:2003, R-2019/ APHA 23rd Edition, AAS-VGA | <0.007                     |                 | 0.05                                           | 0.007-10         | 0.007               |

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

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

(Kumar Vaibhav)

(Amit Raj Mishra)

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**MINE EFFLUENT ANALYSIS TEST REPORT**

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

| Month & Year      | QUARTER ENDING JUNE 2022                                                                                           | Cluster                                                       |                 | CLUSTER IV         |                                                                        |                                                 | Report No.                           | RI-2/MW/2022-23/HY/01 |
|-------------------|--------------------------------------------------------------------------------------------------------------------|---------------------------------------------------------------|-----------------|--------------------|------------------------------------------------------------------------|-------------------------------------------------|--------------------------------------|-----------------------|
| Customer          | Environment Department, Bharat Coking Coal Limited (BCCL), Koyla Bhawan, Dhanbad (E-mail: gmenv.bccl@coalindia.in) |                                                               |                 |                    |                                                                        |                                                 | Date of Issue                        | 25.10.2022            |
| Project           | Choutudih                                                                                                          |                                                               | Sample Ref. No. |                    | REM/BCCL/2022/MW/06/01                                                 | Sampling Method                                 | CMPDI/RI-II/LPM 13,(IS 3025:Part -1) |                       |
| Sampling Stations | MW4                                                                                                                | Date of Sampling                                              | 27.06.22        |                    | Sample Collected in 5 Ltr Jerricane , Color as observed is transparent |                                                 |                                      |                       |
|                   |                                                                                                                    |                                                               |                 | Period of Analysis |                                                                        | JUNE                                            | TO                                   | SEPT'2022             |
| Sl. No.           | Parameter                                                                                                          | Method of Analysis                                            |                 |                    |                                                                        |                                                 |                                      |                       |
|                   |                                                                                                                    |                                                               | MW4             | 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            | 2-1000.0           | 2                                                                      | 30                                              |                                      |                       |
| 2                 | Colour                                                                                                             | APHA,23 <sup>RD</sup> Edition ,2120-B-:2017                   | 2               | 1.0-500.0          | 1                                                                      | -                                               |                                      |                       |
| 3                 | COD, mg/l, Max                                                                                                     | APHA 23rd Edition 5220 C Titrimetric Method                   | 32              | 4.0-800.0          | 4                                                                      | 250                                             |                                      |                       |
| 4                 | Copper (as Cu), mg/l, Max                                                                                          | IS 3025(Part42): 1992 R : 2019, AAS-Flame                     | <0.2            | 0.2-10.0           | 0.2                                                                    | 3                                               |                                      |                       |
| 5                 | Dissolved Phosphate (as P), mg/l, Max                                                                              | IS 3025/ 31, 1988 R 2019                                      | <0.1            | 0.1-5              | 0.1                                                                    | 5                                               |                                      |                       |
| 6                 | Fluoride (as F) mg/l, Max                                                                                          | APHA, 23RD Edition, Page 4-90 to , 4500 –F- D (SPADNS Method) | 0.82            | 0.2-2              | 0.2                                                                    | 2                                               |                                      |                       |
| 7                 | Hexavalent Chromium, mg/l, Max                                                                                     | IS 3025 (Part 52) : 2003,Reaffirmed 2019                      | <0.01           | 0.01-1.4           | 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, 23 <sup>rd</sup> Edition, AAS-GTA                       | <0.2            | 0.1-10             | 0.005                                                                  | 0.1                                             |                                      |                       |
| 10                | Nickel (as Ni), mg/l, Max                                                                                          | IS-3025(Part 54):2003, R:2019 AAS-Flame                       | <0.2            | 0.1-10.0           | 0.1                                                                    | 3                                               |                                      |                       |
| 11                | Nitrate Nitrogen, mg/l, Max                                                                                        | APHA, 23 rd Edition,UV-Spectrphotometric                      | <0.50           | 0.5-45             | 0.5                                                                    | 10                                              |                                      |                       |
| 12                | Oil & Grease, mg/l, Max                                                                                            | IS 3025/39:1991, R : 2019, Partition Gravimetric              | <2.0            | 2.0-1000           | 2                                                                      | 10                                              |                                      |                       |
| 13                | pH value                                                                                                           | IS-3025/11:1983, R-2017, Electrometric                        | 7.78            | 1 -14              | 0.1                                                                    | 5.5 to 9.0                                      |                                      |                       |
| 14                | Temperature (°C )                                                                                                  | IS-3025/09:1984, Thermometric                                 | 35.3            | 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                       | <0.2            | 0.1-8              | 0.1                                                                    | 2                                               |                                      |                       |
| 16                | Total Suspended Solids, mg/l, Max                                                                                  | IS 3025/17:1984, R :2017, Gravimetric                         | 45              | 10-5000            | 10                                                                     | 100                                             |                                      |                       |
| 17                | Zinc (as Zn), mg/l, Max                                                                                            | IS 3025 /49 : 1994, R : 2019, AAS-Flame                       | <0.2            | 0.1-2.0            | 0.1                                                                    | 5                                               |                                      |                       |
| 18                | Odour                                                                                                              | APHA, 23rd Edition, , 2150-C                                  | Agreeable       | Qualitative        | Qualitative                                                            | Qualitative                                     |                                      |                       |

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

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

(Kumar Vaibhav)  
**CHECKED BY**

(Amit Raj Mishra)

**ANALYSED BY**

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**KOYLA BHAWAN COMPLEX**  
**DHANBAD. -826005**  
**Phone:0326-223-850**  
**mail: rdri2cmpdi@coalindia.in**

| Month & Year      | QUARTER ENDING JUNE 2022                                                                                           | Cluster                                                                                   |                 | CLUSTERIV                                                              |                        |                                  | Report No.                           | RI-2/MW/2022-23/HY/01 |
|-------------------|--------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------|-----------------|------------------------------------------------------------------------|------------------------|----------------------------------|--------------------------------------|-----------------------|
| Customer          | Environment Department, Bharat Coking Coal Limited (BCCL), Koyla Bhawan, Dhanbad (E-mail: gmenv.bccl@coalindia.in) |                                                                                           |                 |                                                                        |                        |                                  | Date of Issue                        | 25.10.2022            |
| Project           | Choutudih                                                                                                          |                                                                                           | Sample Ref. No. |                                                                        | REM/BCCL/2022/MW/06/01 | Sampling Method                  | CMPDI/RI-II/LPM 13,(IS 3025:Part -1) |                       |
| Sampling Stations | MW4                                                                                                                | Date of Sampling                                                                          | 27.06.22        | Sample Collected in 5 Ltr Jerricane , Color as observed is transparent |                        |                                  |                                      |                       |
|                   |                                                                                                                    |                                                                                           |                 | Period of Analysis                                                     |                        | JUNE                             | TO                                   | SEPT'2022             |
| Sl. No.           | Parameter                                                                                                          | Method of Analysis                                                                        |                 |                                                                        |                        |                                  |                                      |                       |
|                   |                                                                                                                    |                                                                                           | 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 23 <sup>rd</sup> Edition AAS-VGA                       | <0.006          | 0.006-5                                                                | 0.006                  | 0.2                              |                                      |                       |
| 3                 | Free Ammonia, mg/l, Max                                                                                            | IS:3025/34:1988, Nessler's                                                                | <0.01           | 0.01-10                                                                | 0.01                   | 5                                |                                      |                       |
| 4                 | Lead (as Pb), mg/l, Max                                                                                            | IS-3025(Part 59):2006, R 2017 AAS-Flame /APHA, 23 <sup>rd</sup> Edition, 3111B, AAS-Flame | <0.005          | 0.2-10                                                                 | 0.2                    | 2                                |                                      |                       |
| 5                 | Phenolic compounds                                                                                                 | APHA, 23rd Edition4-Amino Antipyrine                                                      | <0.002          | 0.002-5                                                                | 0.002                  | 1                                |                                      |                       |
| 6                 | Selenium, mg/l, Max                                                                                                | IS-3025,part 56:2003, R-2019/ APHA 23 <sup>rd</sup> Edition, AAS-VGA                      | <0.007          | 0.007-5                                                                | 0.007                  | 0.05                             |                                      |                       |
| 7                 | Sulphide (as S <sup>2-</sup> ) mg/l Max.                                                                           | APHA 23 <sup>rd</sup> Edition Methylene Blue Method                                       | <0.005          | 0.005-5                                                                | 0.005                  | 2                                |                                      |                       |
| 8                 | Total Kjeldahl Nitrogen, mg/l, Max                                                                                 | IS:3025/34:1988, Nessler's                                                                | <1.0            | 1-200                                                                  | 1                      | 100                              |                                      |                       |
| 9                 | Total Residual Chlorine, mg/l, Max                                                                                 | APHA, 23rd Edition, , 4500-Cl B. (Iodometric Method-I)                                    | <0.04           |                                                                        | 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,

|                    |                   |                        |
|--------------------|-------------------|------------------------|
|                    |                   |                        |
| <b>ANALYSED BY</b> | <b>CHECKED BY</b> | <b>HOD's Signature</b> |

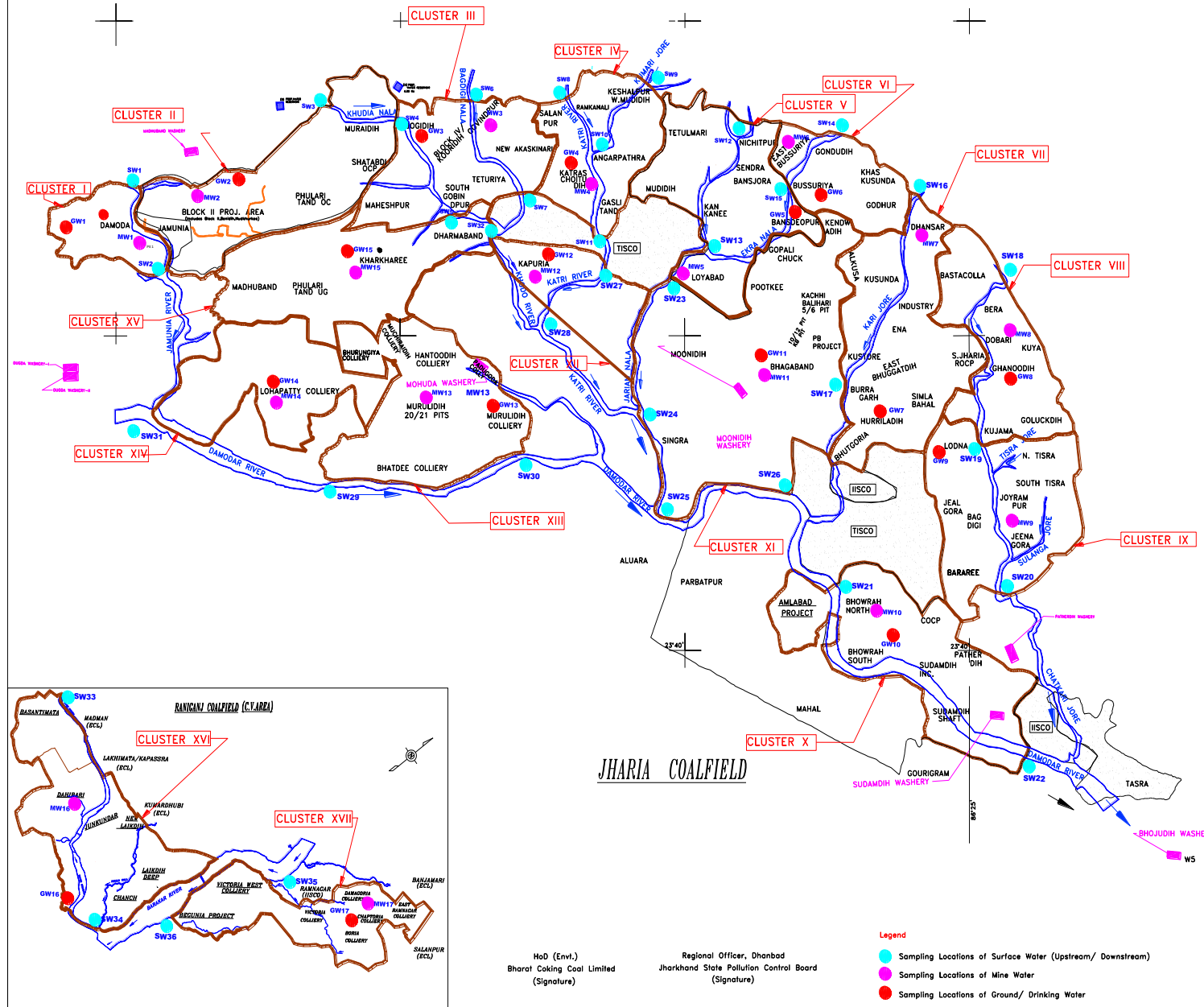
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# Water Sampling Locations in BCCL



## INDEX

| Cluster | Surface Water (urs, drs) | Name of River/ Nala / Jore  | Mineral Effluent Water | Sampling Location  | Ground Water | Sampling Location |
|---------|--------------------------|-----------------------------|------------------------|--------------------|--------------|-------------------|
| I       | SW1, SW2                 | Jamunia River               | MW1                    | Damoda Area        | GW1          | Ghuzway Village   |
| II      | SW3, SW4                 | Khudra Nala                 | MW2                    | Block II OCP       | GW2          | Joyampur Village  |
| III     | SW4, SW5, SW6, SW7       | Khudra Nala, Bagdigi Nala   | MW3                    | Gowindpur Colliery | GW3          | Jogdih Village    |
| IV      | SW8, SW11, SW9, SW10     | Kanti River, Kumari Jore    | MW4                    | Chotudih           | GW4          | Kankane Village   |
| V       | SW12, SW13, SW15         | Jamunia Nala, Ekra Nala     | MW5                    | Mudidih            | GW5          | Nichitpur         |
| VI      | SW14, SW15               | Ekra Nala                   | MW6                    | East Baesuria UGP  | GW6          | Bansjora Borewell |
| VII     | SW16, SW17               | Kanti Jore                  | MW7                    | Dhansar UGP        | GW7          | Humildih          |
| VIII    | SW18, SW19               | Kanti Jore                  | MW8                    | Dohari UGP         | GW8          | Ghanudih          |
| IX      | SW19, SW20               | Kanti Jore                  | MW9                    | Jeenagora          | GW9          | Lodna             |
| X       | SW21, SW22               | Damodar River               | MW10                   | Bhowrah North      | GW10         | Bhowrah South     |
| XI      | SW23, SW24, SW25, SW26   | Jamunia Nala, Damodar River | MW11                   | Shagaband h UGP    | GW11         | Shagabandh        |
| XII     | SW27, SW28               | Kanti River                 | MW12                   | Kapuria            | GW12         | Kapuria           |
| XIII    | SW29, SW30               | Damodar River               | MW13                   | Muridih (20/21)    | GW13         | Muridih           |
| XIV     | SW31, SW32               | Damodar River               | MW14                   | Lohapatti          | GW14         | Lohapatti         |
| XV      | SW5, SW32                | Khudra Nala                 | MW15                   | Kharkharee UGP     | GW15         | Kharkharee        |
| XVI     | SW33, SW34               | Khudra River                | MW16                   | Dahbari OCP        | GW16         | Pattabari Village |
| XVII    | SW35, SW36               | Barakar River               | MW17                   | Damagora Colliery  | GW17         | Chaptoria         |


**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](mailto:cgmkatras@bccl.gov.in)**

Ref. No.-BCCL/ IV/2022/ 20

Dated- 28/05/2022

 To  
 The Director,  
 Ministry of environment, forest and climate charge  
 Regional office (ECZ)  
 Bungalow office no.42, Shyamali colony  
 Ranchi-834002

Sub:-six monthly compliance report on implementation of environmental measures for the period from October 2021 to March 2022

Dear Sir

Kindly find enclosed herewith the six monthly compliance report on implementation of environmental measures for the period from October 2021 to March 2022 in respect of cluster IV group of mines under Katras Area, BCCL.

Hope you will find in order.

Enclosed:-As Above.

Yours Faithfully

General Manager  
 Cluster-IV, BCCL  
 Ritesh Kumar

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 - Bhuneshwar 751023
- 4.The Member Secretary, Jharkhand state Pollution Control Board, Ranchi-834004
5. The Regional Officer, Jharkhand state Pollution Board, Dhanabad-826001
- 6.HOD,(ENV),BCCL,Koyla Bhawan,Dhanbad
- 6.Office Copy



# भारत कोकिंग कोल लिमिटेड

एक मिनीरत्न कम्पनी

(कोल इण्डिया लिमिटेड का एक अंग)

सभी संबन्धित व्यक्तियों को यह सूचित किया जाता है की '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                                                                                                                                                                                                                                                                                                                                   | स्वीकृत आदेश संख्या एवं तिथि                          |
|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------|
| क्लस्टर चार- (घनबाद जिले में स्थित भारत कोकिंग कोल लिमिटेड के पांच मिश्रित कोयला खदानों का समूह- सलानपुर कोलियरी, कतरास चोइटुडिह कोलियरी, अमलगमेटेड केशलपुर पश्चिम मुडीडीह कोलियरी, अंगारपथरा और रामकानली कोलियरी, गजलीटांड कोलियरी) जिसका कुल क्षेत्र 1123.79 हेक्टेयर 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 स्वीकृती की प्रतिलिपि झारखंड राज्य प्रदूषण नियंत्रण विभाग के पास उपलब्ध है एवं पर्यावरण वन एवं जलवायु परिवर्तन मंत्रालय की वेबसाइट [www.environmentclearance.nic.in](http://www.environmentclearance.nic.in) एवं कंपनी की वेबसाइट [www.boclweb.in](http://www.boclweb.in) पर भी उपलब्ध है।

26.07.2018.

स्थ,

र

13.7.2018

-19

स्थ विभाग के निर्माण के 16 जिनिक निर्माण य सरकार के विभाग/डाक स्थान सरकार ई-प्रोक्चुरमेंट आईपीआर की an.gov.in ॥ सकता है।

SOB00503  
SOB00504  
SOB00505  
SOB00506  
SOB00507  
SOB00508  
SOB00509  
SOB00510

स्यता  
स्वास्थ्य



# भारत कोकिंग कोल लिमिटेड

(एक लिमिटेड कंपनी)

(कोल इंडिया का एक उपक्रम)

सभी संबंधित 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 खदानों का समूह-सलानपुर कोलियरी, कतरास चोइदुडिह कोलियरी, अमलगमेटेड केशलपुर पश्चिम मुडीडीह कोलियरी, अंगारपथरा और रामकानली कोलियरी, गजलीटांड कोलियरी) जिसका कुल क्षेत्र 1123.79 हैकटेयर है और बढी हुई सामान्य क्षमता 7.34 एमटीपीए है और अधिकतम क्षमता 9.55 एमटीपीए है। | ज-11015/372/2013-<br>आईए- ॥ (एम) दिनांक 14th<br>जुलाई 2018 |

पर्यावरण स्वीकृति की प्रतिलिपि झारखंड राज्य प्रदूषण नियंत्रण विभाग के पास उपलब्ध है एवं पर्यावरण वन एवं जलवायु परिवर्तन मंत्रालय की वेबसाइट [www.environmentclearance.nic.in](http://www.environmentclearance.nic.in) एवं कंपनी की वेबसाइट [www.bcclweb.in](http://www.bcclweb.in) पर भी उपलब्ध है।

PR-188890 (Health Med Edu and Family Welfare) 2018-19

स्वास्थ्य