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/2024/ 831 **Dated-** 28/11/2024
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To
The Director,
Ministry of environment, forest and climate charge
Integrated Regional Office,
2nd Floor, Headquarter- Jharkhand State Housing Board,
Harmu Chowk, Ranchi, Jharkhand -834002

Sub:-six monthly compliance report on implementation of environmental measures for the period from April 2024 to Sept 2024

Dear Sir
Kindly find enclosed herewith the six monthly compliance report on implementation of environmental measures for the period from April 2024 to sept 2024 in respect of cluster IV group of mines under Katras Area, BCCL.

Hope you will find in order.

Enclosed:-As Above.

Yours Faithfully

BJKumar 28/11/24
General Manager
Cluster-IV, BCCL

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

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

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SL	Mining	Compliance
1	The environmental clearance shall be valid for a period of one year from the issue of this letter. Further extension/continuance of the project shall be based on evaluation of the action taken on each of the observations of this Ministry's Regional Office during their site visit on 22nd August, 2016.	Agreed. Validity extension of Environmental clearance has been made. EC validity has been extended for life of mine or 30 years whichever is earlier vide EC order no J-11015/372/2013-IA-II (M), dated 23.10.2019. **Annexure 1-** EC order
2	The project proponent shall obtain Consent to establish from the State Pollution Control Boards of Jharkhand for the proposed peak capacity of 9.55 MTPA prior to commencement of the increased production.	Agreed.
3	Transportation of coal from face to Coal heap shall be carried out by truck. Further, the coal transportation from Coal heap to Coal Handling Plant shall be carried out through covered trucks.	It is being complied. **Annexure 2- Pictures of Tarpaulin covered coal transportation in Cluster IV of Bharat Coking Coal Limited**
4	Mitigative measures to be undertaken to control dust and other fugitive emissions all along the roads by providing sufficient numbers of water sprinklers.	It is being complied. 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. **Annexure 3- Pic of Mobile water tanker with mist fitting, truck mounted fog cannon and fixed water sprinkler.**
5	Sufficient coal pillars shall be left un-extracted around the air shaft (within the subsidence influence area) to protect from any damage from subsidence, if any.	It is Being Complied. Sufficient coal pillars have been left un-extracted around the air shaft.
6	Solid barrier shall be left below the roads falling within the block to avoid any damage to the roads and no depillaring operation shall be carried out below the township/colony.	Solid barrier have been left below the roads falling within the block to avoid any damage to the roads and no depillaring operation have been carried out below the township/colony.
7	Depression due to subsidence resulting in water accumulating within the low lying areas shall be filled up or drained out by cutting drains.	It is being complied.
8	Sufficient number of pumps of adequate capacity shall be deployed to pump out mine water during peak rain fall.	It is being complied.
9	The company shall obtain approval of CGWA for use of groundwater for mining operations at its enhanced capacity of 9.55 MTPA.	**Renewal of NOC has also been applied. Application is currently in progress.** **Earlier,** 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. Renewal of NOC has also been applied. **Annexure-3(A)**
10	Continuous monitoring of occupational safety and other health hazards, and the corrective actions need to be ensured.	It is being complied. Safety talk is being given to workers at mine during starting of shift. PPE has been provided to workers. **Annexure 4-safety talk pic and distribution list of PPE.**

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i1	The fire dealing operations by excavating out fire should be expedited.	It is being complied. **Annexure 5-** Pic of fire dealing operation.
1	Mining shall be carried out under strict adherence to provisions of the Mines Act, 1952 and subordinate legislations made there-under as applicable.	It is being Complied.
2	Mining shall be carried out as per the approved mining plan(including Mine Closure Plan) abiding by mining laws related to coal mining and the relevant circulars issued by Directorate General Mines Safety (DGMS).	It is being Complied. Mining Plans of mines of Cluster-IV has been approved on 03.08.2017 on 333th Board Meeting & revision of Katras choitudih colliery has also been made on 392nd Board Meeting of M/s BCCL whereas Mine life of Katras choitudih colliery has been extended upto 24 years. **Annexure 6-** Copy of approved mining plan
3	No mining shall be carried out in forest land without obtaining Forestry Clearance as per Forest (Conservation) Act, 1980	There is no forest land existing under the leasehold of Cluster IV. **Annexure 7-** No forest land certificate
4	No change in mining method i.e. UG to OC, calendar programme and scope of work shall be made without obtaining prior approval of the Ministry of Environment, Forests and Climate Change (MoEFCC).	It is being Complied. OCP based on shovel-dumper combination and UG based on bord and pillar are in operation at present.
5	Underground work place environmental conditions shall be rendered ergonomic and air breathable with adequate illumination in conformance with DGMS standards.	It is being Complied.
	Land reclamation and water conservation	
1	Digital Survey of entire lease hold area/core zone using Satellite Remote Sensing survey shall be carried out at least once in three years for monitoring land use pattern and report in 1:50,000 scale or as notified by the Ministry of Environment, Forest and Climate Change from time to time shall be submitted to MoEFCC/Regional Office.	The proponent has got a study carried out through NRSC Hyderabad. NRSC has been awarded the work to prepare time series map by isothermal mapping. NRSC has carried out the work of Isothermal Mapping in 2014, 2018 and 2021. **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/EIAIEMP report and with due approval of the concerned State/Go I Authority. The construction of embankment to prevent any danger against inrush of surface water into the mine should be as per the approved Mining Plan and as per the permission of DGMS or any other authority as prescribed by the law.	The surface drainage plan is attached herewith. No diversion of natural water courses has been done. The construction of embankment to prevent any danger against inrush of surface water into the mine has been constructed. **Annexure- 9-** surface drainage plan

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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. In the FY 2024-25 greenery has been developed on 2.4 Ha area of OB dump. **Apart of that 1200 Nos of avenue plantation has been done.** **Annexure 10- land reclamation monitoring Report**
5	Fly ash shall be used for external dump of overburden, backfilling or stowing of mine as per provisions contained in clause (i) and (ii) of subparagraph (8) of fly ash notification issued vide S.0.2804 (E) dated 3rd November, 2009 as amended from time to time. Efforts shall be made to utilize gypsum generated from Flue Gas Desulfurization (FGD), if any, along with fly ash for external dump of overburden, backfilling or stowing of mines. Compliance report shall be submitted to Regional Office of MoEF&CC, CPCB and SPCB.	There is no generation of fly ash in cluster IV.
6	It shall be ensured that as per the time schedule specified in mine closure plan it should remain live till the point of utilization. The top soil shall temporarily be stored at earmarked site(s) only and shall not be kept unutilized. The top soil shall be used for land reclamation and plantation purposes. Active OB dumps shall be stabilised with native grass species to prevent erosion and surface run off. The other overburden dumps shall be vegetated with native flora species. The excavated area shall be backfilled and afforested in line with the approved Mine Closure Plan. Monitoring and management of rehabilitated areas shall continue until the vegetation becomes self-sustaining. Compliance status shall be submitted to the Ministry.	It is being Complied. Top soil is being stored. Top soil is being utilized as plantation site. Grassing after preparing of seed ball has been done over 36 Ha OB area till date. Backfilling of excavated area is being done as per mine closure guidelines. 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. **Annexure 10 A- Top soil storage plan** **Annexure 10 B- Plantation details (2014-15 to till date)**

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	Post-mining land shall be rendered usable for agricultural/forestry purposes and handed over to the respective State Government, as specified in the Ministry of Coal Guidelines dated 27th August, 2009 for Preparation of Mine Closure Plan.	It will be complied. **Annexure 11- Approval copy of Mine closure plan.**
8	Regular monitoring of subsidence movement on the surface over and around the working areas and its impact on natural drainage pattern, water bodies, vegetation, structure, roads and surroundings shall be continued till movement ceases completely. In case of observation of any high rate of subsidence beyond the limit prescribed, appropriate effective mitigation measures shall be taken to avoid loss of life and materials. Cracks should be effectively plugged in with ballast and clay soil/suitable material.	No depillaring in underground mine is going on hence no mining induced subsidence is taking place. Regular monitoring of subsidence is being done by subsidence monitoring committee of the area.
9	A separate team for subsidence monitoring and surface mitigation measures shall be constituted and continuous monitoring & implementation of mitigation measures be carried out.	It is being complied. A Certificate of Project Officers and General Manager of the Cluster IV, indicating no subsidence due to mining operation is being attached. **Annexure 12- Certificate Regarding no subsidence due to mining operation.**
10	Thorough inspection of the mine lease area for any cracks developed at the surface due to mining activities below ground shall be carried out to prevent inrush of water in the mine.	It is being complied.
11	Native tree species shall be selected and planted over areas affected by subsidence.	Plants like seesam, Gamhar, Aam, Peepal,Bargad, Sagwan, Kathal etc. has been planted over areas likely to be affected by subsidence.
	Emissions, effluents, and waste disposal	
1	Transportation of coal, to the extent permitted by road, shall becarried out by covered trucks/conveyors. Effective control measures such as regular water/mist sprinkling/rain gun etc shall be carried out in critical areas prone to air pollution (with higher values of PM1Q/PM2.s)such as haul road, loading/unloading and transfer points. Fugitive dust emissionsfrom all sourcesshall be controlled regularly. It shall be ensured that the Ambient Air Quality parameters confirm to the norms prescribed by the Central/State Pollution Control Board.	Vehicular emission is kept under control by proper maintenance of vehicles. Vehicular emissions are being monitored in every prescribed period. Only those vehicles are being allowed to run having PUC. In addition to the above coal transportation is done by tarpaulins covered and optimally loaded vehicles. The project authorities are regularly checking all the loaded trucks/dumpers coming inside the plant about their valid PUC.
2	Greenbelt consisting of 3-tier plantation of width not less than 7.5 m shall be developed all along the mine lease area as soon as possible. The green belt comprising a mix of native species (endemic species should be given priority) shall be developed all along the major approach/ coal transportation roads.	In the FY 2024-25 greenery has been developed on 2.4 Ha area of OB dump. . **Apart of that 1200 Nos of avenue plantation has been done.** 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 being carried out in available spaces for creation

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		of thick green belt. It is being Complied. 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. 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. **Annexure 13 - plantation Pics.**
3	The transportation of coal shall be carried out as per the provisions and route envisaged in the approved Mining Plan or environment monitoring plan. Transportation of the coal through the existing road passing through any village shall be avoided. In case, it is proposed to construct a 'bypass' road, it should be so constructed so that the impact of sound, dust and accidents could be appropriately mitigated.	Presently, road transportation is being done by covering vehicle with tarpaulin.
4	Vehicular emissions shall be kept under control and regularly monitored. All the vehicles engaged in mining and allied activities shall operate only after obtaining 'PUC' certificate from the authorized pollution testing centres.	Vehicular emissions are being monitored in every prescribed period. Only those vehicles are being allowed to run having PUC. In addition to the above coal transportation is done by tarpaulins covered and optimally loaded vehicles. The project authorities are regularly checking all the loaded trucks/dumpers coming inside the plant about their valid PUC.
5	Coal stock pile/crusher/feeder and breaker material transfer points shall invariably be provided with dust suppression system. Belt-conveyors shall be fully covered to avoid air borne dust. Side cladding all along the conveyor gantry should be made to avoid air borne dust. Drills shall be wet operated or fitted with dust extractors.	It is being complied. Dust suppression arrangement has been made at crusher. Fixed type water sprinkler have been installed. Installation of Belt conveyor system may leads to fire Hazard as the existence of fiery coal seam in our command area. **Annexure 14- Dust suppression arrangement at coal loading point of CHP.**
6	Coal handling plant shall be operated with effective control measures w.r.t. Various environmental parameters. Environmental friendly sustainable technology should be implemented for mitigating such parameters.	It is being complied. 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.
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

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		quality are being monitored by CMPDIL, Ranchi. Rain water Harvesting arrangement has been made. Roof top rain water harvesting system has also been developed at coal dump colony under cluster IV. **Annexure 15- Ground water monitoring report** **Annexure 16- Rain water harvesting arrangement.**
8	Catch and or garland drains and siltation ponds in adequate numbers and appropriate size shall be constructed around the mine working, coal heaps & OB dumps to prevent run off of water and flow of sediments directly into the river and water bodies. Further, dump material shall be properly consolidated/ compacted and accumulation of water over dumps shall be avoided by providing adequate channels for flow of silt into the drains. The drains/ ponds so constructed shall be regularly de-silted particularly before onset of monsoon and maintained properly. Sump capacity should provide adequate retention period to allow proper settling of silt material. The water so collected in the sump shall be utilised for dust suppression and green belt development and other industrial use. Dimension of the retaining wall constructed, if any, at the toe of the OB dumps within the mine to check run-off and siltation should be based on the rainfall data. The plantation of native species to be made between toe of the dump and adjacent field/habitation/water bodies.	**It is being complied. Total 400 meter length of Toe wall has been prepared along OB dump. Total 1200 meter length of Toe wall has been prepared till date.** **An spillway has also been prepared to prevent the entry of silt in main stream.** **Annexure 17- Pic of toe wall made along OB dump.** **Annexure 18- Pic of siltation pond.**
9	Adequate groundwater recharge measures shall be taken up for augmentation of ground water. The project authorities shall meet water requirement of nearby village(s) after due treatment conforming to the specific requirement (standards).	Five nos of Rain water Harvesting pond has been created. Water is being supplying to nearby villages after treatment of mine water as per requirement.
10	Solid waste/hazardous waste generated in the mines shall be addressed in accordance to the MSW Rules, 2016.	It is being complied. Solid waste/hazardous waste generated in the mines is being addressed in accordance to the MSW Rules, 2016.
11	The water pumped out from the mine, after siltation, shall be utilized for industrial purpose viz. watering the mine area, roads, green belt development etc. The drains shall be regularly desilted particularly after monsoon and maintained properly.	It is being complied. Pumped out water are being utilized for water sprinkling on haul road, green belt development, fire dealing etc.
12	Major approach roads shall be black topped and properly maintained.	It is being complied.
13	The project proponent shall not alter major water channels around the site. Appropriate embankment shall beprovided along the side of the river/nallah flowing near or adjacent to the mine. The embankment constructed along the river/nallah boundary shall be of suitable dimensions and critical patches shall be strengthened by stone pitching on the river front side, stabilized with plantation so as to withstand the peak water pressure preventing any chance of mine inundation.	The embankment constructed along the river boundary is of suitable dimension and critical patches has been strengthened by concreting and stone pitching as per design made by Central Mine Planning and Design Institute Limited (CMPDIL) on the river front side and stabilized with plantation to withstand the peak water flow and prevent mine inundation. Construction of concrete embankment at critical patch of nallah/Jore has been done. Total length of constructed embankment is 3000 m.

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		Annexure 19-Pic of embankment constructed.
14	Garland drains (of suitable size, gradient and length) around the critical areas i.e. mine shaft and low lying areas, shall be designed keeping at least 50% safety margin over and above the peak sudden rainfall and maximum discharge in the area adjoining the mine sites. The sump capacity shall also provide adequate retention period to allow proper settling of silt material of the surface runoff.	It is being complied. Garland drains (of suitable size, gradient and length) around the critical areas i.e. mine shaft and low lying areas, has been designed.
15	Industrial waste water from coal handling plant and mine water shall be properly collected and treated so as to conform to the standards prescribed under the Environment (Protection) Act, 1986 and the Rules made there under, and as amended from time to time. Oil and grease trap shall be installed before discharge of workshop effluent. Sewage treatment plant of adequate capacity shall be installed for treatment of domestic waste water.	Mine water is being reused in mine for industrial purposes (sprinkling, fire control etc.) Oil and grease trap has been installed at the workshops. **Annexure 20- Pic of Oil & Grease trap**
	Illumination, noise & vibration	
1	Adequate illumination shall be ensured in all mine locations (as per DGMS standards) and monitored weekly. The report on the same shall be submitted to this ministry & its RO on six-monthly basis.	It is being complied. Latest report of the same is being attached herewith. **Annexure 21- Illumination monitoring report.**
2	Adequate measures shall be taken for control of noise levels as per noise pollution Rules, 2016 in the work environment. Workers engaged in blasting and drilling operations, operation of HEMM, etc shall be provided with personal protective equipments (PPE) like ear plugs/muffs in conformity with the prescribed norms and guidelines in this regard. Adequate awareness programme for users to be conducted.	Personnel operating near HEMMs, drilling machine comply with safety regulation and are equipped with Personal Protective Equipment. Awareness programmes are being given to all the personnel at Vocational training center and mine site.
3	Controlled blasting techniques shall be practiced in order to mitigate ground vibrations, fly rocks, noise and air blast etc. as per the guidelines prescribed by the DGMS.	It is being complied. Controlled blasting techniques are being practiced in order to mitigate ground vibrations, fly rocks, noise and air blast etc. as per the guidelines prescribed by the DGMS. **Annexure 22- Ground vibration report.**
4	The noise level survey shall be carried out as per the prescribed guidelines to assess noise exposure of the workmen at vulnerable points in the mine premises, and report in this regard shall be submitted to the Ministry/RO on six-monthly basis.	It is being complied. Noise level is being monitored by CMPDIL. **Annexure 23- Noise level Monitoring Report**
	Occupational health & safety	
1	The project proponent shall undertake occupational health survey for initial and periodical medical examination of the personnel engaged in the project and maintain records accordingly as per the provisions of the Mines Rules, 1955 and DGMS circulars. Besides regular periodic health check-up, 20% of the personnel identified from workforce engaged in active mining operations shall be subjected to health check-up for occupational diseases and hearing impairment, if any, as amended time to time.	IME/PME is done periodically for the workers to observe any contractions due to exposure to dust and to take corrective measures, if needed and records maintained thereof. **Annexure 24- IME/PME report**

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	Personnel working in core zone shall wear protective respiratory devices and shall also be provided with adequate training and information on safety and health aspects.	Training and awareness programmes are being given to all the personnel working in dusty areas. PPE kit have been provided to the personnel engaged in mining and working under cluster IV. **Annexure 25- training photograph**
	Ecosystem and biodiversity conservation	
1	The project proponent shall take all precautionary measures during mining operation for conservation and protection of endangered/endemic flora/fauna, if any, spotted/reported in the study area. The Action plan in this regard, if any, shall be prepared and implemented in consultation with the State Forest and Wildlife Department.	In the FY 2024-25 greenery has been developed on 2.4 Ha area of OB dump. Ecological restoration are being done in consultation with FRI, dehradun. Road Map of Ecological restoration has been made. **Annexure 26- Afforestation Programme of cluster-IV**
2	The project proponent shall take all precautionary measures to ensure riverine/riparian ecosystem in and around the coal mine upto a distance of 5 km. A riverine/riparian ecosystem conservation and management plan should be prepared and implemented in consultation with the irrigation/water resource department in the State Government.	Monitoring of river water is being done regularly. Special affords has been made for cleaning of river water, drives like swachhta pakhwada are being organised regularly.
	Public Hearing, R&R and CSR	
1	Implementation of the action plan on the issues raised during the public hearing shall be ensured. The project proponent shall undertake all the tasks/measures as per the action plan submitted with budgetary provisions during the public hearing. Land oustees shall be compensated as per the norms laid down in the R&R policy of the company/State Government/Central Government, as applicable.	It is being complied. Compliance report of public hearing has been sent to ministry. Land oustees are getting their compensation as per norms laid down in R&R policy of the company.
2	The project proponent shall ensure the expenditure towards socio-economic development in and around the mine every financial year in pursuance of the Corporate Social Responsibility Policy as per the provisions under Section 135 of the Companies Act, 2013.	It is being complied. Expenditure towards socio-economic development has been ensured. During the COVID-19 pandemic distribution of food packets, mask, sanitizer and other essentials has been provided to local peoples. **Annexure 27- List of activities undertaken in and around the mine in pursuance of CSR policy.**
3	The project proponent shall follow the mitigation measures provided in this Ministry's OM NO.Z-11013/5712014-IA.11 (M) dated 29th October, 2014, titled 'Impact of mining activities on habitations-issues related to the mining projects wherein habitations and villages are the part of mine lease areas or habitations and villages are surrounded by the mine lease area'.	It is being complied.

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

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

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	Continuous ambient air quality monitoring stations as prescribed in the statue be established in the core zone as well as in the buffer zone for monitoring of pollutants, namely PM1o, PM2.5, S02 and NOx. Location of the stations shall be decided based on the meteorological data, topographical features and environmentally and ecologically sensitive targets in consultation with the State Pollution Control Board. Online ambient air quality monitoring stations may also be installed in addition to the regular monitoring stations as per the requirement and/or in consultation with the SPCB. Monitoring of heavy metals such as Hg, As, Ni, Cd, Cr, etc to be carried out at least once in six months.	Location of Monitoring station in the Jharia Coal Field have been finalized with the Jharkhand State Pollution Control Board. Five ambient air quality monitoring station has been established two at core zone and three at buffer zone. At core zone station established at AARC (Ramkanali) & Katras Chotudih Mine office and at buffer zone station established at Mine office- Block-IV, Nichitpur and RudhiBasti respectively. Presently air quality monitoring is being done as per norms at each location. Monitoring data regularly submitted to the Ministry including its Regional Office at Ranchi. Monitoring of air quality is being done by Central Mining & Planning Design Institute (CMPDIL), Dhanbad. CoAAQMS was procured but some due to some issues with BID guidelines commissioning of the same has not not been done yet, issues is expected to rectify shortly.
2	The Ambient Air Quality monitoring in the core zone shall be carried out to ensure the Coal Industry Standards notified vide GSR 742 (E) dated 25.9.2000 and as amended from time to time by the Central Pollution Control Board. Data on ambient air quality and heavy metals such as Hg, As, Ni, Cd, Cr and other monitoring data shall be regularly reported to the Ministry/Regional Office and to the CPCB/SPCB.	It is being complied. CMPDIL has been engaged for Air Quality monitoring as well as heavy metals. **Annexure 32- Ambient Air quality monitoring report**
3	The effluent discharge (mine waste water, workshop effluent) shall be monitored in terms of the parameters notified under the Water Act, 1974 Coal Industry Standards vide GSR 742 (E) dated zs" September, 2000 and as amended from time to time by the Central Pollution Control Board.	Monitoring of River water are being done by CMPDIL regularly in Upstream and Downstream. **Annexure 33- Monitoring Report**
4	The monitoring data shall be uploaded on the company's website and displayed at the project site at a suitable location. The circular No. J-20012/1/2006-IA.11 (M) dated 27th May, 2009 issued by the Ministry shall also be referred in this regard for compliance.	It is being complied.

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

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

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	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.	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

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

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

To,

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

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

Sir,

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

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

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

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

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

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

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

(Sharath Kumar Pallerla)
Scientist F

Copy to:

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

(Sharath Kumar Pallerla)
Scientist F

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

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

To,

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

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

Sir,

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

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

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

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

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

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

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

Pre-Mining:

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

Post- Mining & Core Area

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

(v) Sufficient coal pillars shall be left un-extracted around the air shaft (within the subsidence influence area) to protect from any damage from subsidence, if any.

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

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

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

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

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

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

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

(a) Mining

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

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

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

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

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

(b) Land reclamation and water conservation

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

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

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

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

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

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

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

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

(viii) Regular monitoring of subsidence movement on the surface over and around the working areas and its impact on natural drainage pattern, water bodies, vegetation, structure, roads and surroundings shall be continued till movement ceases completely. In case of observation of any high rate of subsidence beyond the limit prescribed, appropriate effective mitigation measures shall be taken to avoid loss of life and materials. Cracks should be effectively plugged in with ballast and clay soil/suitable material

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

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

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

(c) Emissions, effluents, and waste disposal

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

(d) Illumination, noise & vibration

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

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

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

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

(e) Occupational health & safety

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

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

(f) Ecosystem and biodiversity conservation

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

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

(g) Public Hearing, R&R and CSR

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

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

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

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

(h) Corporate environment responsibility

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

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

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

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

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

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

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

(i) Statutory Obligations

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

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

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

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

(j) Monitoring of project

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

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

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

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

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

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

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

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

(k) Miscellaneous

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

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

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

(iv) The EC shall be uploaded on the company's website. The compliance status of the stipulated EC conditions shall also be uploaded by the project authorities on their website and updated at least once every six months so as to bring the same in public domain.

(v) The project authorities shall advertise at least in two local newspapers widely circulated, one of which shall be in the vernacular language of the locality concerned, within 7 days of the issue of the clearance letter informing that the project has been accorded environmental clearance and a copy of the clearance letter is available with the State Pollution Control Board and also at web site of this Ministry at www.environmentclearance.nic.in and a copy of the same shall be forwarded to the Regional Office.

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

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

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

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

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

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

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

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

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

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

16/7/2018

(S K Srivastava)
Scientist E

Copy to

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

16/7/2018

(S K Srivastava)
Scientist E

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

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

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

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

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

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JH10AD
2936


Water Sprinkling at Coal Dump



Mist Sprinkler in Cluster-IV


TATA



Annexure-3(A)



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: (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.

CENTRAL GROUND WATER AUTHORITY

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

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

Mandatory conditions:

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

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

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

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

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

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

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

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

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

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

General conditions:

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

29) The NOC issued is conditional subject to the conditions mentioned in the Public notice dated 27.01.2021 failing which penalty/EC/cancellation of NOC shall be imposed as the case may be.
30) This NOC is issued subject to the clearance of Expert Appraisal Committee (EAC) (if applicable).

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

CENTRAL GROUND WATER AUTHORITY

PPE distribution details of FY 2024-25 in respect of Cluster IV group of mine

Sl No.	ITEMS	Total distribution in nos
1	Mining Shoes	550
2	GUMBOOT	110
3	HELMET	95
4	DUST MASK	800
5	Fluorescent Jackets	1200




L&T 9020






05 18 2019


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Annexure - I

NOTING SHEET

Dept: Environment Deptt.

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

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

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

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

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

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

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

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

Dy GM(Env)

Director (T)Op

RD, RI II

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

This Space is not for use.

Annexure-A

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

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

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

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

Annexure - II

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

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

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

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

933
17.06.15

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

महोदय,

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

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

Thanking you.

भवदीय

संलग्नक यथोपरि

महाप्रबंधक (योजना एवं परियोजना)

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

D:\BCCL\Letter-15

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

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

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

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

D/Sir,

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

This is for your kind information and necessary action please.

Thanking you

26/05/15

PROJECT OFFICER
AKWMC

Annexure-III

A

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

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

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

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

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

महोदय,

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

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

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

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

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

Matter most urgent.

भवदीय

महाप्रबंधक (योजना एवं परियोजना)

Annexure-IV

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

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

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

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

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

महोदय,

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

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

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

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

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

Annexure - I

NOTING SHEET

Dept: Environment Deptt.

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

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

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

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

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

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

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

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

Dy GM(Env)

Director (T)Op

RD, RI II

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

This Space is not for use

Annexure-A

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

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

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

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		Bassuriya Colliery	0.120	0.156	162.76
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		Industry UG (Closed)	-	-	137.20
		Alkusa UG	0.115	0.150	101.77
		Ena OC	0.170	0.221	181.3
		South Jharia/ Rajapur OCP	1.300	1.690	207.48
		Burragarh UG	0.170	0.221	147.83
		Sinlabahal UG	0.250	0.325	178.13
		Hurriladih UG	0.090	0.117	127.17
		Bhutgoria UG (Re-opening Proposed)	0.360	0.468	131.67
		Kustor UG (Closed)	-	-	250.71
		East Bhuggatdih UG (Closed)	-	-	242.62
		Vishwakerma OC (Proposed)	0.700	0.910	43.5 (Within Dhansar & Industry LH
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		Bastacolla UG	0.33	0.429	
		Bera OCP	0.15	0.195	209.56
		Bera UG	0.19	0.247	
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		Kuya UG	0.10	0.130	
		Goluckdih (NC) OCP (Proposed)	1.2	1.560	
		Ghanoodih Colliery (OCP)	1.40	1.820	73.00
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	IX	Lodna (UG)	0.115	0.150	391.64
		North Tisra (UG)	0.15	0.195	246.24
		NT/ST (OCP)	1.65	2.145	256.15
		Jealgora (UG) Closed	NIL	NIL	138.00
		Bagdigi (UG)	0.11	0.143	61.00
		Joyrampur (UG)	0.153	0.199	98.04
		Jeenagora (OC)	0.7	0.91	276.05
		Banaree (UG)	0.17	0.221	475.00
		NT/ST EXPANSION (OCP)	6.0	7.8	755.15

Annexure-II

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

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

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

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

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

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

महोदय,

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

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

संलग्नक: यथोपरि

भवदीय
(सुबीर घोष)
महाप्रबंधक (योजना एवं परियोजना)

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

D:\BCCL\Letter-16 77

Annexure-III

A

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

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

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

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

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

महोदय,

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

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

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

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

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

Matter most urgent.

भवदीय

महाप्रबंधक (योजना एवं परियोजना)

Annexure-IV

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

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

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

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

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

महोदय,

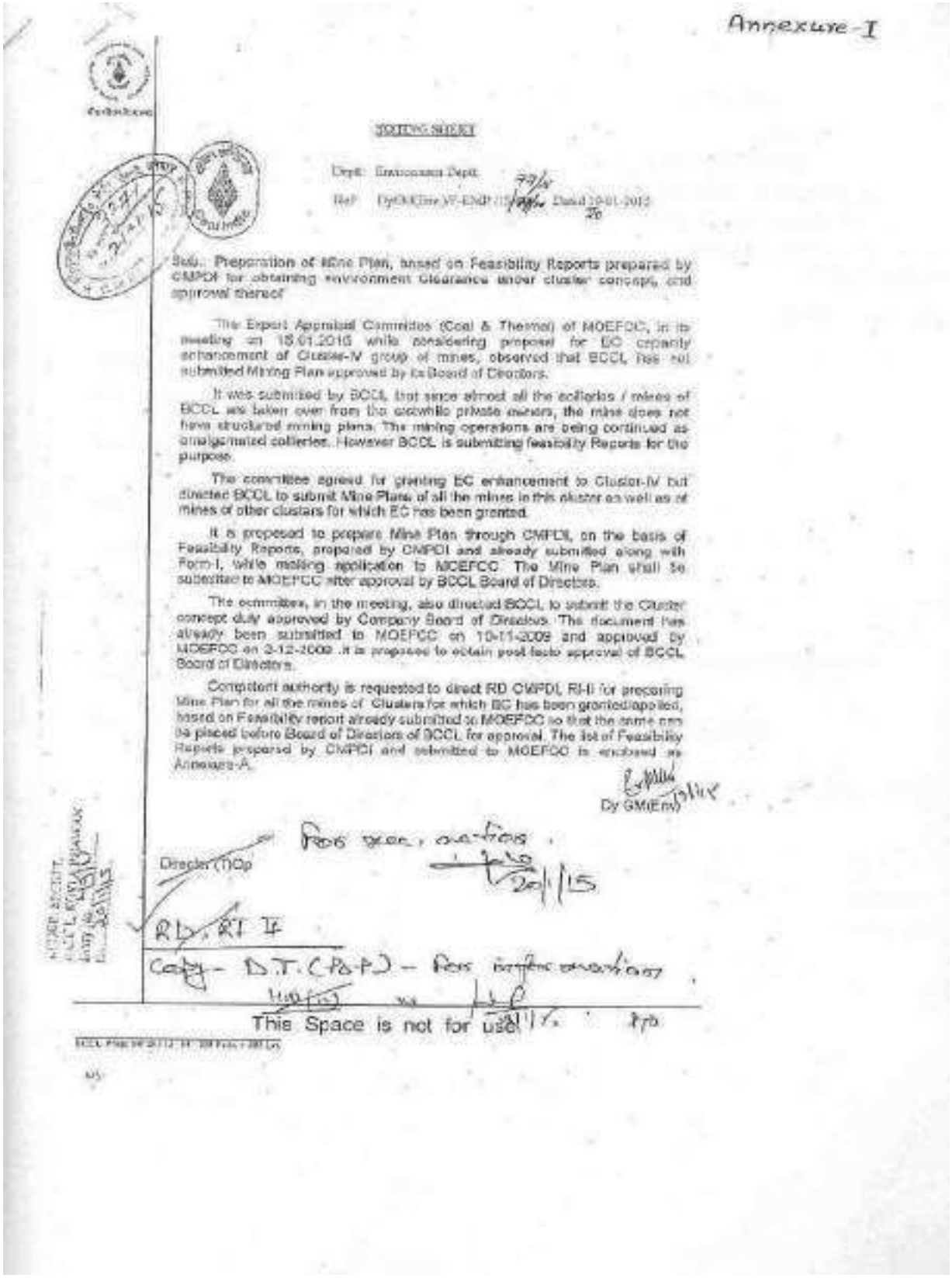
For EC capacity enhancement of Cluster-IV (Katras Area) from existing 3.708 MTPA peak to 9.55 MTPA peak, application was made to MoEFCC in 2013.

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

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

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

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



Annexure-I

NOTING SHEET

Dept: Environment Dept.

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

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

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

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

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

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

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

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

Dy GM(Env)

Director (Tech)Op

Pls see, as-fars.

20/1/15

RD, RI II

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

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Annexure-II

18

BCCL

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

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

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

विषय : Draft Mining Plan for Gaslitand Colliery.

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

महाशय,

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

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

आपका विश्वासी

महाप्रबंधक
कतरास क्षेत्र

संलग्नक :

1. Draft Mining Plan

प्रतिलिपि :

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

ANNEXURE-I

NOTING SHEET

Deptt: Environment Deptt.

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

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

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

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

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

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

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

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

Dy GM(Env)

Director (T)Op

RD, RI II

copy- D.T. (P&P) – for information

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Annexure - I

NOTING SHEET

Dept: Environment Deptt.

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

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

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

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

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

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

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

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

Dy GM(Env)

Director (T)Op

RD, RI II

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

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Annexure-A

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

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

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

	VI	East Bassuriya Colliery	1.500	1.950	141.07
		Bassuriya Colliery	0.120	0.156	162.76
		Gondudih Khas kusunda Colliery	2.000	2.600	410
		Godhar Colliery	2.000	2.6	162.72
	VII	Dhansar UG	0.372	0.484	174.12
		Dhansar OC	0.800	1.040	
		Kusunda OC	2.000	2.600	247.7
		Industry UG (Closed)	-	-	137.20
		Alkusa UG	0.115	0.150	101.77
		Ena OC	0.170	0.221	181.3
		South Jharia/ Rajapur OCP	1.300	1.690	207.48
		Burragarh UG	0.170	0.221	147.83
		Sinlabahal UG	0.250	0.325	178.13
		Hurriladih UG	0.090	0.117	127.17
		Bhutgoria UG (Re-opening Proposed)	0.360	0.468	131.67
		Kustor UG (Closed)	-	-	250.71
		East Bhuggatdih UG (Closed)	-	-	242.62
		Vishwakerma OC (Proposed)	0.700	0.910	43.5 (Within Dhansar & Industry LH
	VIII	Bastacolla OCP	0.10	0.130	239.45
		Bastacolla UG	0.33	0.429	
		Bera OCP	0.15	0.195	209.56
		Bera UG	0.19	0.247	
		Dobari Colliery (UG)	0.24	0.312	146.90
		Kuya OCP	0.60	0.780	340.50
		Kuya UG	0.10	0.130	
		Goluckdih (NC) OCP (Proposed)	1.2	1.560	
		Ghanoodih Colliery (OCP)	1.40	1.820	73.00
		Kujama Colliery (OCP)	0.60	0.780	191.00
	IX	Lodna (UG)	0.115	0.150	391.64
		North Tisra (UG)	0.15	0.195	246.24
		NT/ST (OCP)	1.65	2.145	256.15
		Jealgora (UG) Closed	NIL	NIL	138.00
		Bagdigi (UG)	0.11	0.143	61.00
		Joyrampur (UG)	0.153	0.199	98.04
		Jeenagora (OC)	0.7	0.91	276.05
		Banaree (UG)	0.17	0.221	475.00
		NT/ST EXPANSION (OCP)	6.0	7.8	755.15

Annexure-II

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

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

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

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

18/4/15

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

महोदय,

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

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

Thanking you.

भवदीय

7/4/15

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

संलग्नक: यथोपरि

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

Annexure-III

A

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

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

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

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

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

महोदय,

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

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

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

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

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

Matter most urgent.

भवदीय

महाप्रबंधक (योजना एवं परियोजना)

Annexure-IV

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

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

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

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

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

महोदय,

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

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

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

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

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

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

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

बोर्ड सचिवालय /Board Secretariat

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

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

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

Dear Sir,

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

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

भवदीय,

बी.के.पारूई
कंपनी सचिव

Encl: As above

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

Sri Bahera

Item No. 392.6B

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

Background:

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

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

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

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

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

Decision:

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

The Board passed the following resolution:

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

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

Item No.392.PoT-1

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

Background:

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

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

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

Certified to be True Copy

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

Decision:

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

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

Item No.392.PoT-2

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

Background:

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

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

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

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

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

Certified to be True Copy

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

STRICTLY RESTRICTED
FOR COMPANY USE ONLY

RESTRICTED

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

BHARAT COKING COAL LIMITED

MINING PLAN OF KATRAS CHOITUDIH COLLIERY

JULY 2022

CENTRAL MINE PLANNING & DESIGN INSTITUTE LTD.

(A Subsidiary of Coal India Limited)

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

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CHAPTER – I

1.1 INTRODUCTION

BACKGROUND OF THE MINING COMPANY

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

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

BACKGROUND OF THE MINE

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

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

1.1.1 NAME OF COAL BLOCK AND ITS BOUNDARY

Katras Choitudih Colliery is located in Kumari geological block.

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

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

1.1.2 NAME OF THE COAL FIELD

Katras Choitudih Colliery is located in Jharia coalfield.

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

The Zero Date of the Mining Plan is 01.06.2022.

1.1.4 LINKED END USE PLANTS

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

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

1.1.6 MODE OF COAL TRANSPORT

Road

1.1.7 COAL WASHING:

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

1.1.8 SCOPE OF THE REPORT:

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

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

1.2 LOCATION, TOPOGRAPHY & COMMUNICATION

1.2.1 LOCATION OF COAL DEPOSIT

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

1.2.2 COMMUNICATION

NATIONAL HIGHWAY & PWD ROADS

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

RAILWAY LINES

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

MAJOR TOWNSHIP

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

1.2.4 PROMINENT PHYSIOGRAPHIC FEATURES

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

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

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

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

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

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

OWNERSHIP WISE DISTRIBUTION OF LAND

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

INVOLVEMENT OF FOREST LAND

No forest land is involved.

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

DB Road :

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

The diverted route is given in the surface plan.

BRIDGE

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

1.4 DETAILS OF THE ALLOTMENT AGREEMENT

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

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

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

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

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

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

Chapter – 2

EXPLORATION, GEOLOGY, SEAM SEQUENCE, COAL QUALITY & RESERVE

2.1 DETAILS OF THE BLOCK

2.1.1 Particulars of the block

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

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

Katras choitudih Colliery shares its boundary with following collieries:

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

2.1.2 Location of the Block

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

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

2.1.3 Area of the Block

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

2.1.4 Area of the block projectized

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

2.1.5 Balance area yet to be projectized

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

2.1.6 Reserve in the area yet to be projectized

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

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

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

4	429571.3	2630554.96200187
5	429570.959061223	2630549.14487889
6	429570.193662934	2630543.03828425
7	429569.373423519	2630536.92662666
8	429569.026308952	2630533.49835936
9	429568.724772032	2630531.43952816
10	429568.240245938	2630526.26015871
11	429567.272292062	2630516.33483202
12	429566.673980152	2630511.39135271
13	429565.893539068	2630504
14	429565.086930159	2630498.15118943
15	429564.321615653	2630491.04101978
16	429563.704131345	2630486.13806428
17	429563.615176011	2630484.40211625
18	429562.797808524	2630475.60516929
19	429561.257121246	2630458.59869692
20	429558.398784024	2630439.30960398
21	429557.946804666	2630433.29132043
22	429557.802391769	2630428.67201471
23	429557.262851543	2630421.45560713
24	429556.6	2630416.22247079
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

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
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

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

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
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

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

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

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

2.1.9 KML file of the proposed lease and geological block

Available.

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

Yes

2.1.11 If project extends outside the allotted block boundary

Not applicable

2.1.12 Type of Project and year of starting

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

2.2 EXPLORATION, GEOLOGY AND ASSESSMENT OF RESERVE

2.2.1 Regional Geology of the Area

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

Stratigraphy

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

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

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

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

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

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

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

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

Table-2.1

Geological Succession of Jharia coalfield

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

2.2.2 Local Geology

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

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

Table-2.2

Sequence of Coal Seams (within the colliery boundary)

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

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

Note-

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

Geological Structure of the Block

Strike & Dip

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

Faults

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

Table- 2.3

Description of faults

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

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

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

2.2.3 Geological Block Area

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

2.2.4 Status of Exploration of the block

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

2.2.5 Area covered by detailed exploration within the block

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

2.2.6 Whether entire area covered by detailed exploration

Yes.

2.2.7 No. of boreholes drilled within the block

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

Table- 2.4

Status of Exploration

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

2.2.8 Whether any further exploration is required or not

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

2.2.9 Year wise future program of exploration

Not applicable.

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

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

2.2.11 No. of Seams available as per GR

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

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

Table – 2.5

Nomenclature of coal seams Vis-À-Vis Colliery Nomenclature

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

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

Quality

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

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

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

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

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

Where:

F = Fixed carbon %, VM = Volatile Matter %

A = Ash %, M = Moisture %

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

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

Where:

A = Ash%

Exploitation Status

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

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

Seams Considered for Mining

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

2.2.12 Seams not considered for Mining

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

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

2.2.13 Strike & Dip of the Seam

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

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

2.2.14 Seam wise thickness, depth and reserve

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

Table – 2.6

Seam wise thickness, depth and reserve within colliery leasehold

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

2.2.15 Methodology of Reserve estimation

Reserve Estimation Criteria

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

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

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

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

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

Methodology of Reserves Calculation

The reserve has been estimated through “MINEX” software.

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

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

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

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

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

2.2.16 Average GCV

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

Table No. - 2.7

Seam wise average grade

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

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

2.2.17 Gross Geological Reserve of the block

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

Table No. - 2.8 (A)

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

Table No. - 2.8 (B)

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

2.2.18 Net Geological Reserve of the block

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

Table No.- 2.9 (A)

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

Table No.- 2.9 (B)

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

2.2.19 Minable Geological Reserve of the block

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

Table No.- 2.10 (A)

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

2.2.20 Blocked Reserve

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

Table No.- 2.11

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

2.2.21 Corresponding extractable reserve of the block

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

2.2.22 Percentage of extraction

For opencast mining percent of extraction is considered 100 percent.

2.2.23 Reserve already depleted

Not applicable.

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

2.2.24 Balance Reserve

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

CHAPTER - III

MINING

3.1 MINING METHOD

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

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

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

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

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

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

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

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

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

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

- **Choice of mining method**

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

- **Optimisation of targeted capacity**

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

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

Sequence of mining

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

Production scheduling

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

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

The year wise production from the AGKCC is given below:

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

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

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

Equipment configuration

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

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

- **Description of all mining operation**

a) Wining

Coal Extraction:

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

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

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

OB Excavation

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

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

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

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

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

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

b) Transport

Coal Transportation:

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

OB Transportation

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

c) Blasting

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

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

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

Elements of drilling & blasting in OB & Coal

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

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

d) Overburden Removal & Disposal

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

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

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

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

Time frame for commencement of Backfilling & Justification therefor:

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

Life of the mine

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

Geological & extractable reserve

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

Net Geological Reserve (NGR)

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

Mineable Reserve (MR):

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

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

Summarised account of reserves is as follows:

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

Net Geological Reserve of the block

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

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

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

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

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

Average stripping ratio

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

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

Quarry parameters

The broad parameters of Katras Choitudih Colliery are given here

Mine boundaries delineation

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

North : 45m from railway acquired land

South : 45 m from railway acquired land.

East : 45 m from diverted DB Road

West : 60 m from Katri River

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

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

Mining parameters of the quarry is given below:

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

3.1.3 Coal Production Capacity Proposed “Mtpa”:

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

3.1.4 Calendar Year from Which the Production will Start:

Katras Choitudih colliery is already under operation.

3.1.5 Coal Production Plan "MT":

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

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

3.1.6 Peak Rated Capacity:

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

3.1.7 Life of the Mine:

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

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

No external dump proposed

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

Not applicable

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

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

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

3.1.11 Type of Equipment/HEMM Proposed:

No equipment is proposed in the mining plan.

CHAPTER - IV
SAFETY MANAGEMENT

4.1 MINING METHOD

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

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

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

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

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

4.1.1 Important Safety Aspects:

a) Proximity to river

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

b) Adjacent working

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

c) Geo-mining disturbances

The mine is generally free from pyrolisation.

d) Slope stability and remedial measures suggested

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

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

e) Disaster management

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

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

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

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

f) Danger from inrush of water

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

g) Existing underground mine fire (if any)

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

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

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

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

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

4) Provision of fire extinguishers

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

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

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

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

4.2.2 Commitment from the Company Board

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

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

CHAPTER - V

INFRASTRUCTURE FACILITIES

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

5.1.1 Existing Infrastructure facilities available

A. Road-

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

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

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

B. Rail-

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

C. Water Storage

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

Water consumption and usage -

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

Non-Drinking- **1570 KLD**

D. Coal Stock Yard and its Locations-

Coal staking/heap name

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

E. Existing effluent treatment plant & sewage treatment plant

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

F. Pit / Shaft in the Leasehold Area

Exists but, sealed off

5.1.2 WORKSHOP & STORE

WORKSHOP

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

5.1.3 MAGAZINE – LOCATION, CAPACITY AND AREA

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

5.2 POWER SUPPLY & ILLUMINATION

5.2.1 PRESENT POWER SUPPLY

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

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

II. Existing Power Supply System:

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

   (2) 5 PIT Substation:-

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

   (3) Hadadia Substation:-

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

   (4) AGKCC Office Substation:-

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

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

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

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

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

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

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

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

(iv) 2x65 HP Motor pump

III. Existing Electrically Operated HEMM Equipment in KCC:

Nil

5.2.2 PROPOSED POWER SUPPLY

In the proposed system the existing supply system will continue.

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

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

5.3.1 PRESENT PUMPING ARRANGEMENT

Make of water-

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

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

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

PROPOSED PUMPING ARRANGEMENT

Estimation of Surface Make of Water for Quarry

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

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

Proposed Pumping Arrangement

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

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

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

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

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

At present, no crushing arrangement available at site.

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

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

CHAPTER VI
LAND REQUIREMENT

6.1 LAND REQUIREMENT

6.1.1

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

Ownership wise land data not provided by colliery authority.

6.1.2 Landuse Details

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

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

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

6.1.3 Surface Features Over the Block Area

Important surface features are as follows:

Road: DB Road and colliery road

Rail: Dhanbad Chandrapura Railway Line , Mohuda Bhaga rail line

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

6.1.4 No. of Villages/Houses to be Shifted

1) Lakarka village no. 1

2) Lakarka village no. 2

6.1.5 Population to be Affected by the Project

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

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

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

6.1.6 Proposed Rehabilitation Programme

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

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

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

Chapter 7: ENVIRONMENTAL MANAGEMENT

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Impact Assessment

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

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

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

Core Zone:

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

Buffer Zone:

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

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

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

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

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

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

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

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

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

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

Water Quality Management:

Sources

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

Water Quality Report

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

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

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

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

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

Water pollution control measures:

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

Ground water resources

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

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

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

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

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

Water conservation measures

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

Impact on Noise level

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

Core Zone:

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

Buffer Zone:

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

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

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

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

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

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

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

Noise pollution control measures

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

Hazardous Waste:

Details of Hazardous waste generated and their method of disposal:

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

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

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

Socio-Economic Issues:

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

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

Biological reclamation

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

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

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

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

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

Plantation program has been delineated in Plate No XIV

Monitoring & Management Organisation:

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

ORGANISATION CHART

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

CHAPTER VIII

PROGRESSIVE AND FINAL MINE CLOSURE PLAN

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

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

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

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

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

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

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

8.1.2 Biological Reclamation (Cumulative in "Ha")

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

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

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

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

8.5

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

(All Figures are Cumulative and in MM3)

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

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

8.6	Management of Coal Rejects.	There is no washery.

8.7 Restoration of Land used for Infrastructure

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

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

8.8 Disposal of Mining Machinery

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

8.9 Safety & Security

Fencing around Opencast Workings:

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

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

8.10 Abandonment Cost and Financial Assurance

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

The amount deposited in Escrow Accounts is appended below:

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

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

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

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

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

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

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

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

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

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

To,

D.F.O
Combined Building
DHANBAD

Sub: Details of Jungle Jari under Katras Area of BCCL

Dear Sir,

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

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

This is for your information please.

Yours faithfully,

15/3/17

Chief Manager (Env.)
Katras Area
BCCL

15/3/17

Encl. As above

General Manager
Katras Area,BCCL

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

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Annexure-1

(1)

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

अंचल का नाम – बाघमारा, जिला का नाम – धनबाद

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

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

Scanned by CamScanner

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

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

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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
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INDIAN SPACE RESEARCH ORGANISATION
DEPT. OF SPACE, GOVT. OF INDIA
HYDERABAD-500 037

AUGUST, 2021

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

Report for

BHARAT COKING COAL LIMITED (BCCL)

(A SUBSIDIARY OF COAL INDIA LTD.)

ENVIRONMENT DEPARTMENT, KOYLA BHAWAN

KOYLA NAGAR, DHANBAD – 826 005, JHARKHAND

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

PROJECT TEAM

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

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EXECUTIVE SUMMARY

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

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CHAPTER I

INTRODUCTION

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

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

1.1 Background

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

1.2 Objectives

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

I. To map Coal fire in the study area based on pixel integrated relative radiant temperature derived from latest available Landsat-8 data of 2020 time period.
II. To compare the change in the coal fire distribution in the Jharia coalfield between the period of 2017 and 2020.
III. To delineate probable subsidence areas in the region using differential interferometry method.

1.3 Study Area

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

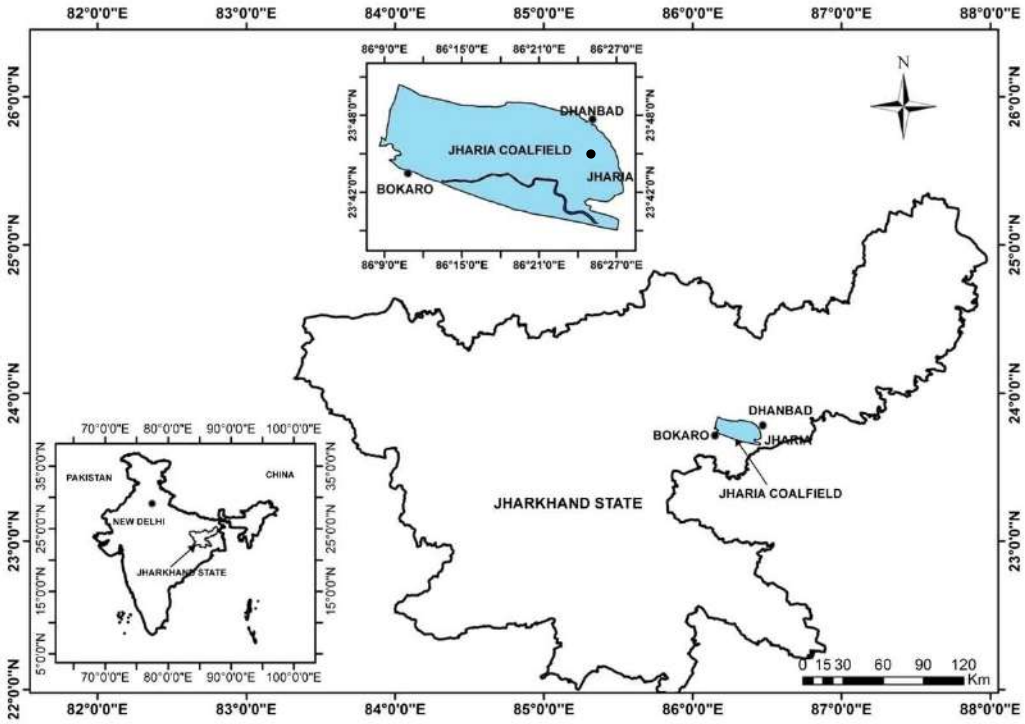


Figure 1: Study area map of Jharia Coalfied, Jharkhand

CHAPTER II

GENERAL DESCRIPTION OF THE STUDY AREA

2.1 Location and Accessibility

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

2.2 Physiography, Drainage and Climate

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

2.3 General Geology

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

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

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

Table 1: Generalised stratigraphy of JCF.

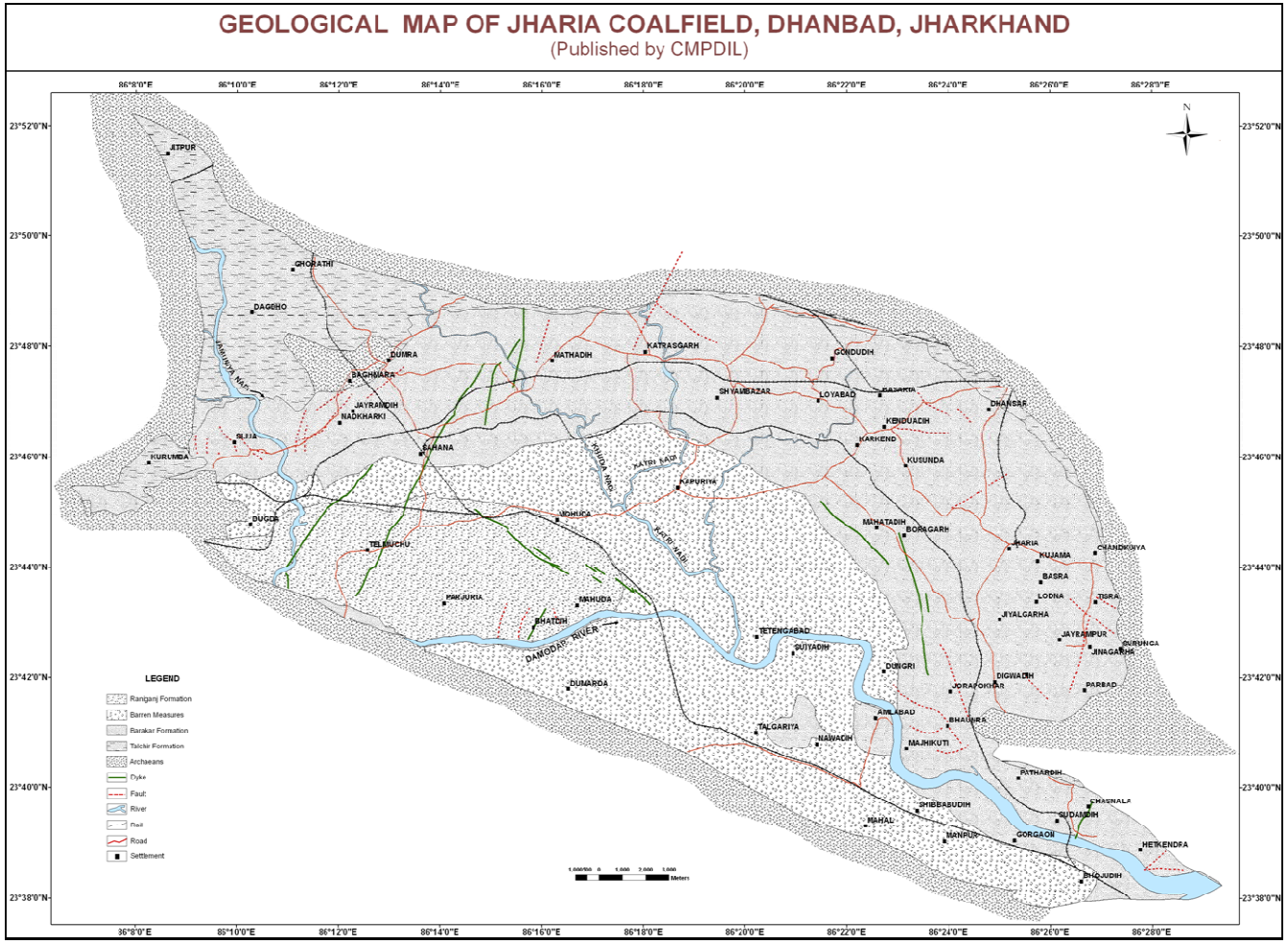


Figure 2 : Geological map of Jharia coal field, Dhanbad, Jharkhand (published by CMPDIL)

CHAPTER III

DATA REQUIREMENTS

3.1 Remote Sensing Data

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

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

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

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

3.2 Ancillary data

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

CHAPTER IV

REMOTE SENSING DATA ANALYSIS

4.1 Methodology

4.1.1 Processing of Landsat 8 Data

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

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

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

Where:

L_λ = Spectral radiance (Watts/ (m^2 * srad * μm)).

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

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

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

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

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

T_R = Radiant (brightness) temperature,

K_1 = Calibration constant (1260.56 K),

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

L_λ = Spectral radiance

4.1.2 Thresholding of radiant temperature image

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

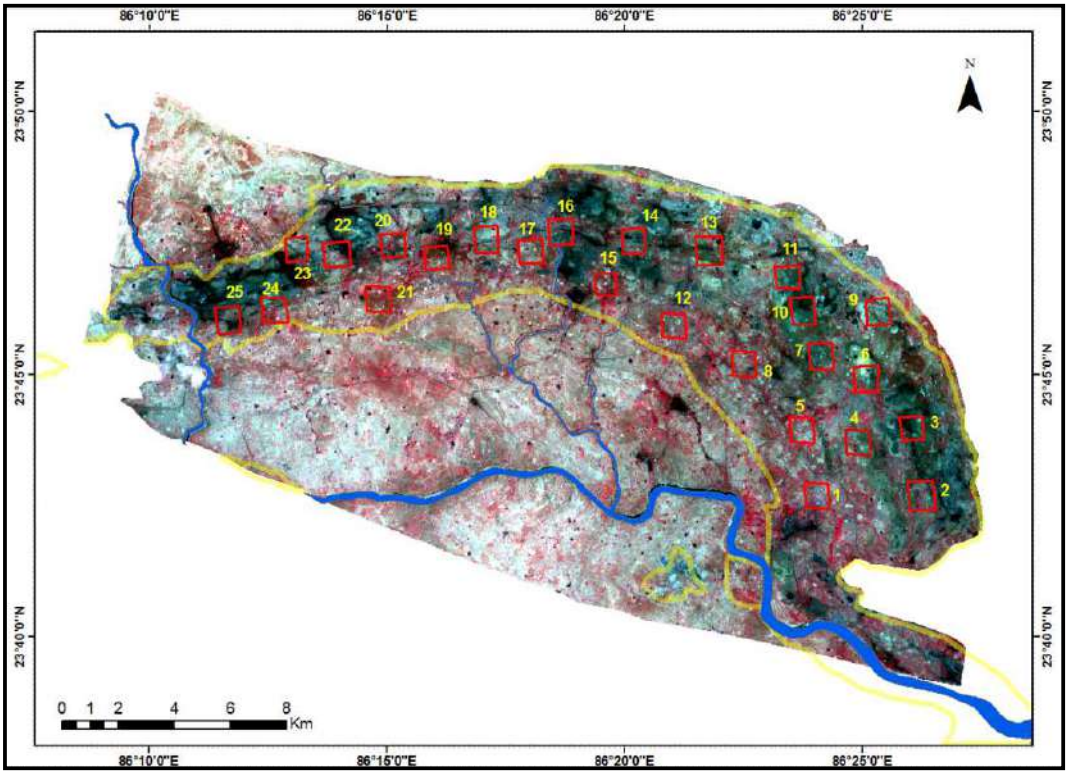


Figure 3. False colour composite image of Jharia Coalfield, with subset blocks (in red boxes) to obtain temperature values (from radiant temperature image) within the Barakar formation across the Jharia coalfield.

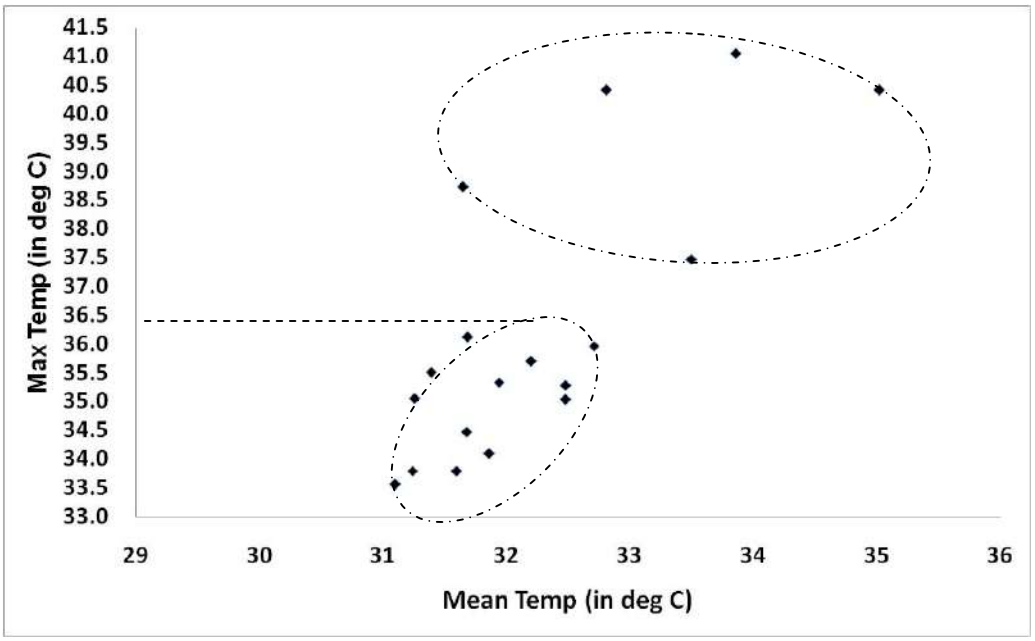


Figure 4. Maximum temperature plotted against mean temperature for various locations; cluster separation observed around 36.5 °C (marked with arrow)

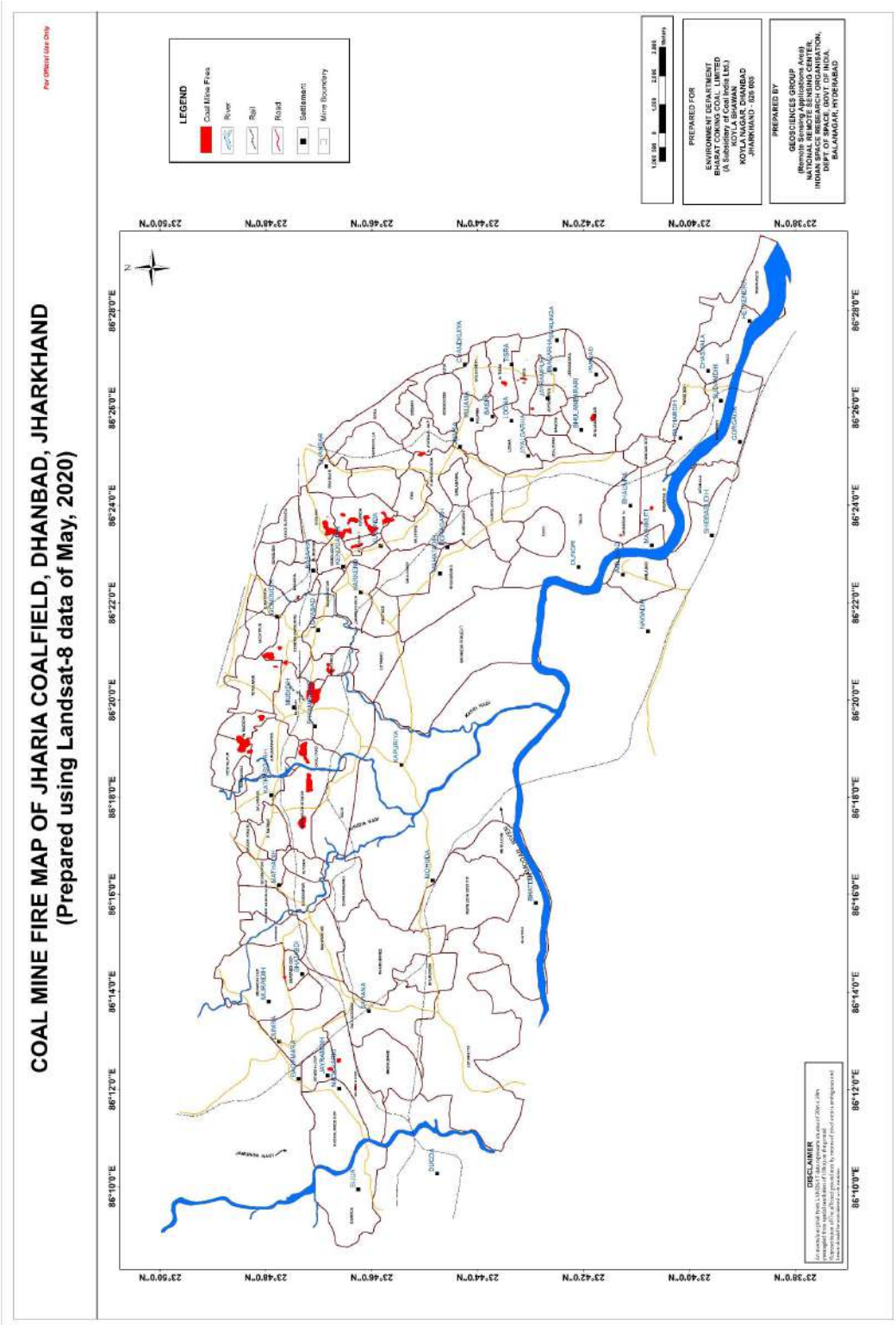


Figure 5: Coal mine fire map (May, 2020) of Jharia coal field, Dhanbad. The fire areas shown in this map have been verified in the field as per field points in figure 12.

4.2 Methodology For Subsidence Detection

4.2.1 Processing of ALOS-PALSAR 2 Data

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

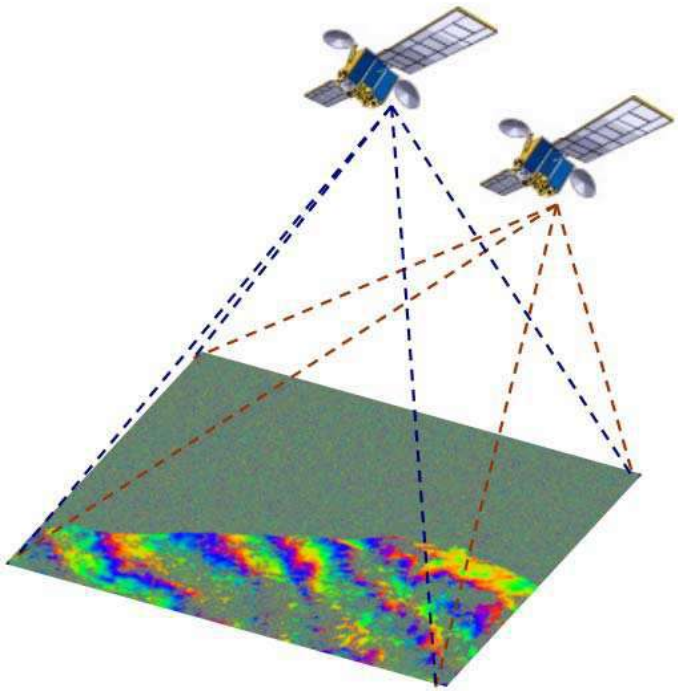


Figure 6. DInSAR acquisition scheme.

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

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

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

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

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

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

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

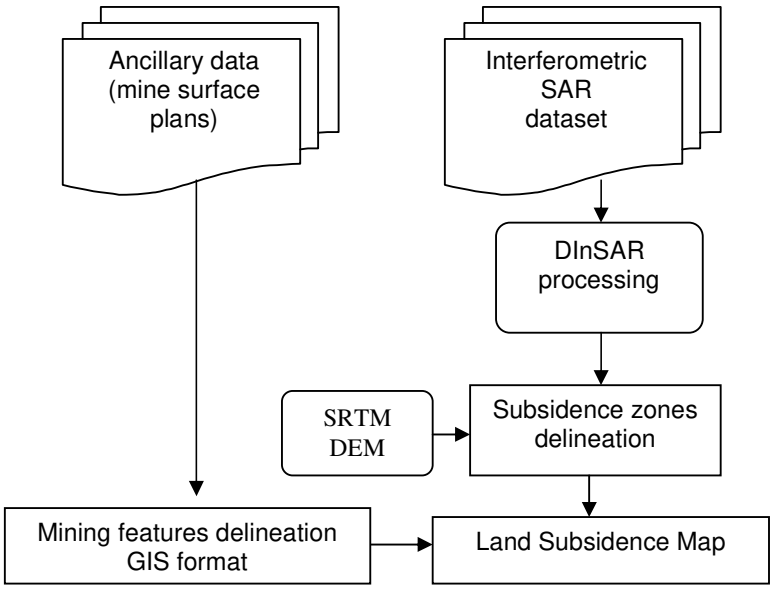


Figure 7. Work flow diagram for generating land subsidence map using DInSAR technique.

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

This has been illustrated in figure 8.

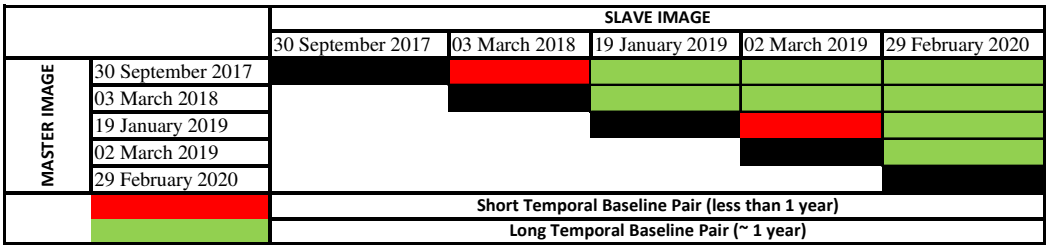


Figure 8. ALOS-PALSAR - 2 Master-Slave pairs for short and long temporal base line processing

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

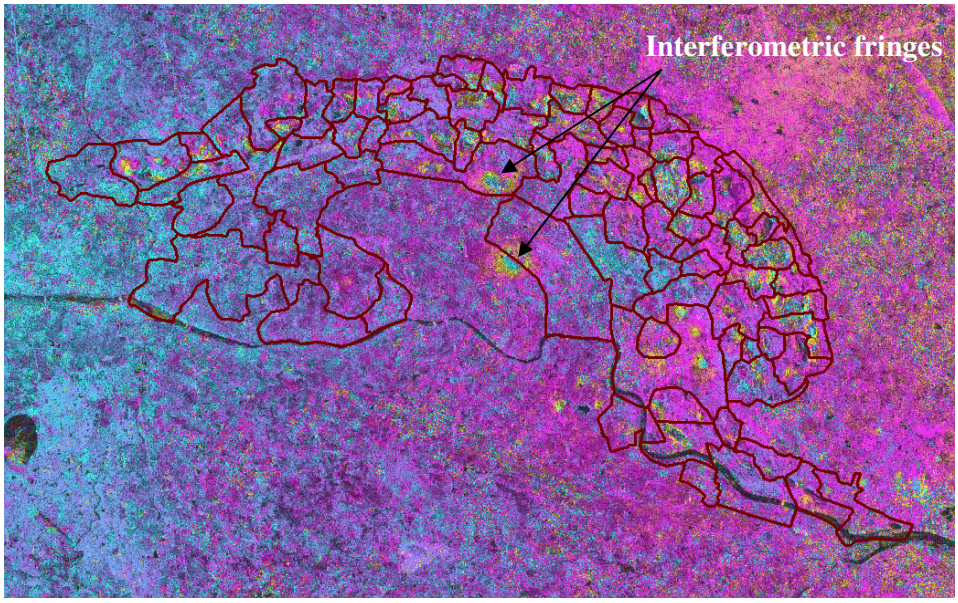


Figure 9. Fringe patterns generated from short baseline processing (e.g. Master: Oct, 19, Slave: Feb, 20).

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

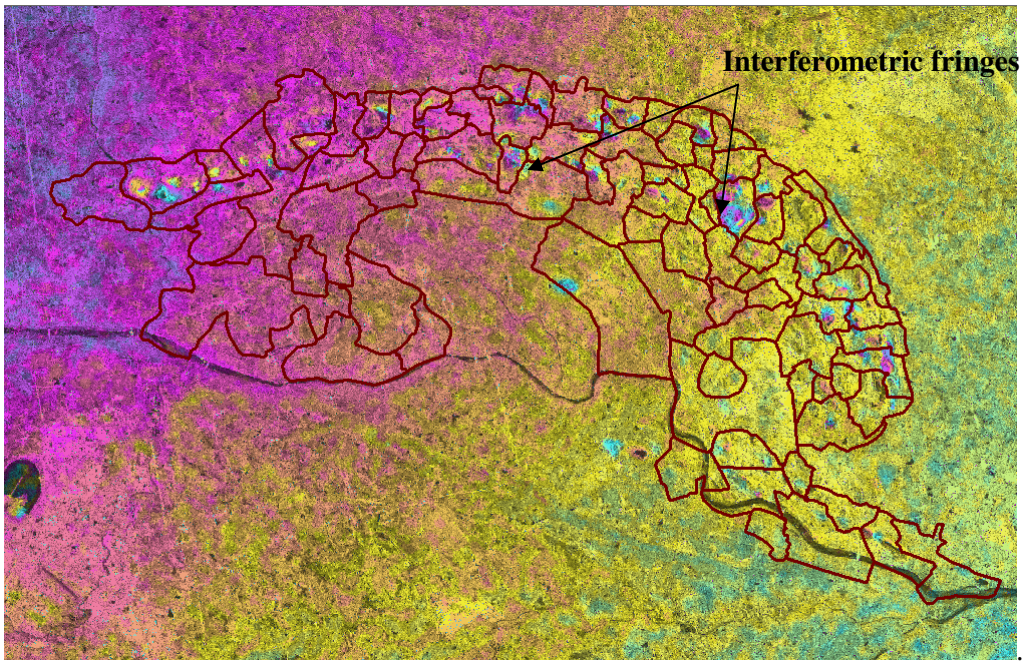


Figure 10. Fringe patterns generated from long baseline processing (e.g. Master: Sept, 17, Slave: Feb, 2020).

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

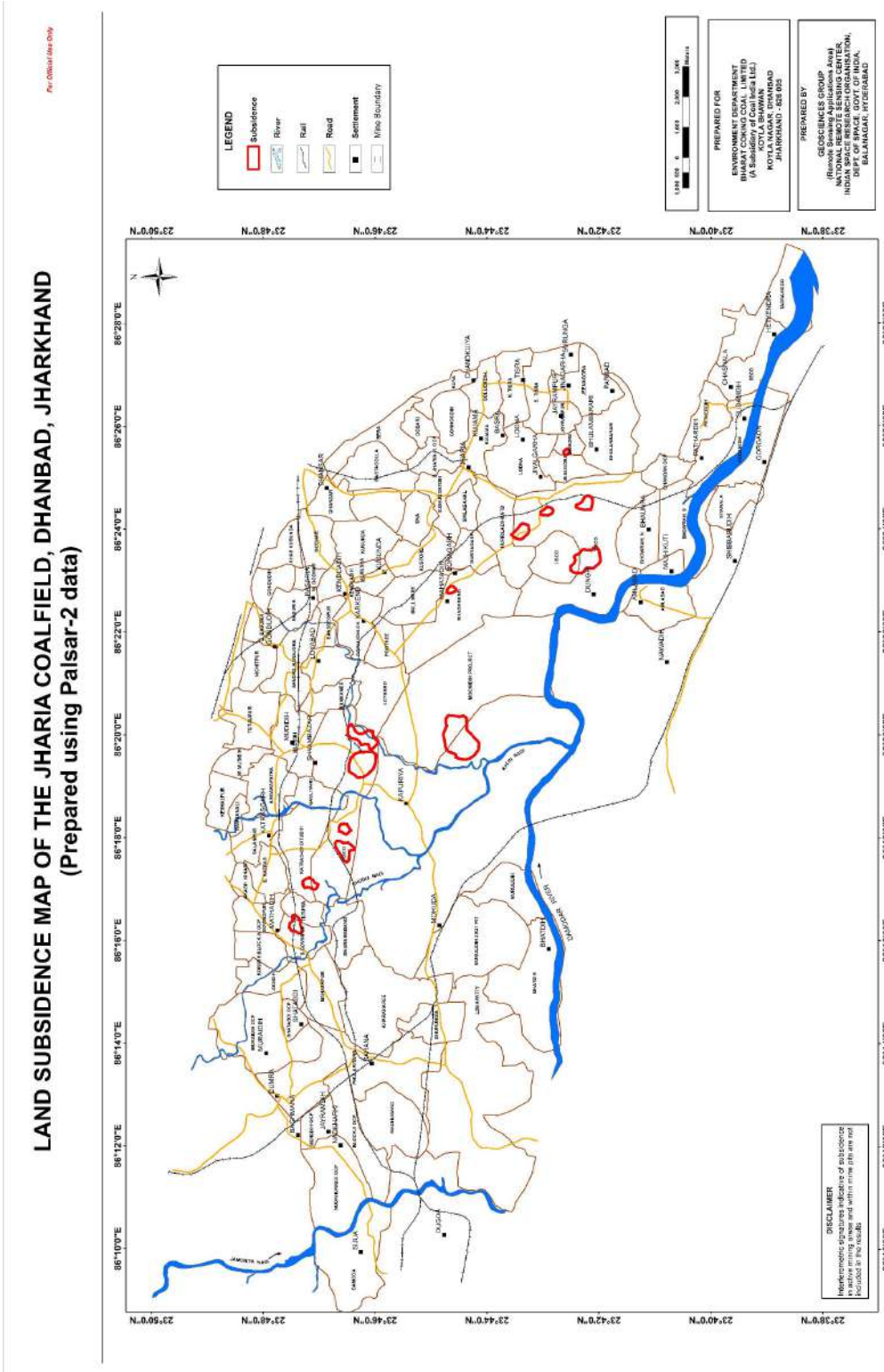


Figure 11: Subsidence map (2017-2020) of the Jharia coal field, Dhanbad.

CHAPTER V

FIELD WORK

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

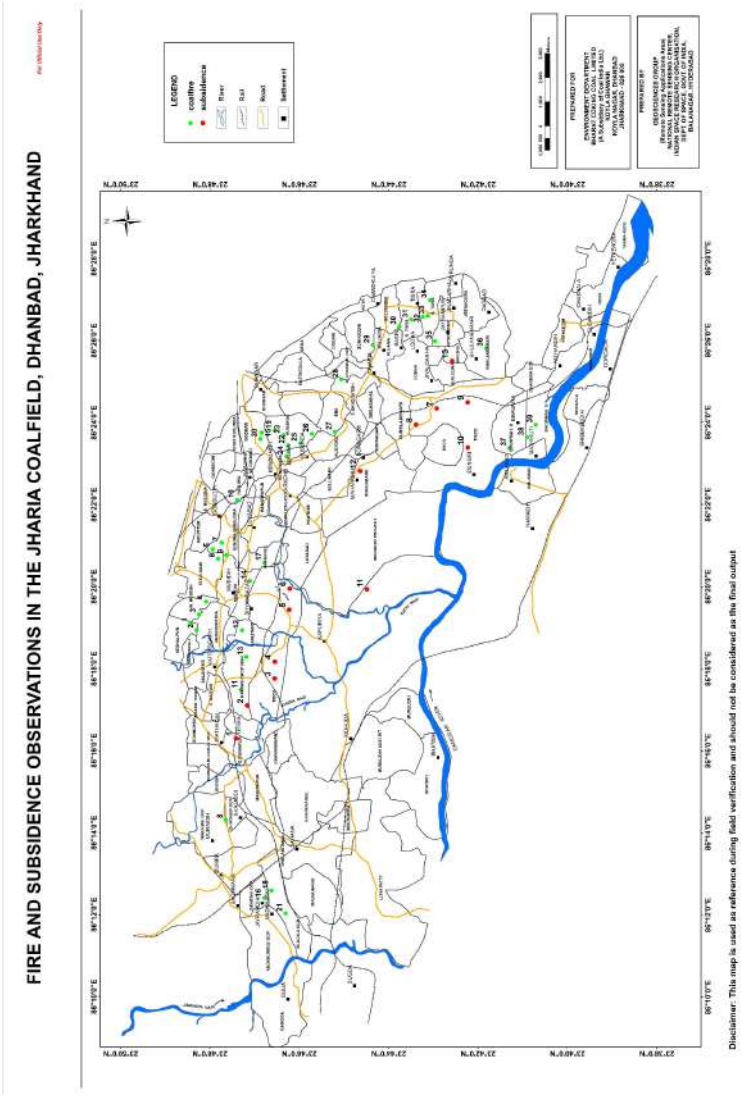


Figure 12. Field data points for coal fire and subsidence verification

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

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

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

Subsidence location observations:

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

CHAPTER VII

DISCUSSIONS AND CONCLUSIONS

7.1 Discussions

7.1.1 Coal fire analysis

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

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

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

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

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

7.1.2 Subsidence analysis

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

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

7.2 Conclusions

The following conclusions can be made:

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

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

CHAPTER VIII

LIMITATIONS

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

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

2) There are locations as observed during the fieldwork, where coal seams are affected by active fires along vertical/semi-vertical sections of open cast mines (see cover page). In such cases, the actual areal expression of the fire affected area as seen by the sensor changes considerably and the representation from the same is not accurate.

3) As discussed in section 4.1.2, thresholding the data to separate the fires from the non fire areas, is a statistical technique. However, this method is dependent on how the temperature of non-fire background area is distinctive from the fire temperature.

4) The background temperatures vary with the time of the day when the data are collected, topography, and season of the year when the data is acquired. Night-time data has lower background temperature as compared to day-time. Similarly a data collected in October-November will have a considerably lower background temperature than that collected in May-June due to seasonal temperature variations. Hence, identification of the background temperature range becomes essential in

estimation of threshold temperature and the same varies depending upon the discussed controlling factors.

6) Due to the mitigation measures taking place in various mines, it is seen that in a number of places the fire affected seam is excavated and dumped as overburden. However, these overburden dumps retains the excavated burning coals and thus are seen to have active fires occasionally. There lies a possibility that the same will be identified as anomalous pixels and hence, although the fire is not a part of any active coal seam, it will be included as a fire affected area in the final map.

7) Considering the precision of DInSAR data for different wavelengths, topographic and atmospheric errors, slow subsidence rates may not be detected. Further, the displacement measured is along the line of sight of the sensor and not vertical displacement.

8) Temporal decorrelation and noise due to adverse land use and land cover may affect DInSAR based detection and monitoring of land subsidence. Changes vegetation pattern over time can cause significant decorrelation between the master and slave image, thus producing a very low coherent output. Under such conditions, subsidence information may not be retrieved

9) Verification of the subsidence zones as detected from the interferometric technique is sometimes difficult due to lack in observable signatures of subsidence such as cracks on the ground and damage to anthropogenic structures.

Therefore, in quantitative estimation of fire affected areas and areas denoted as subsidence, the above mentioned limitations needs to be taken into account diligently, as it is inevitable that the area estimate will not define the actual fire/subsidence affected area on the ground. However, the areal extent estimated from the data can be "like to like" compared to earlier estimates of similar studies to understand the change and dynamism of the fire in terms of area affected and spatial disposition.

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Annexure –I

Colliery wise break-up of change in fire area from 2017 to 2020

COLLIERY AREA NAME	FIRE AREA 2017 (SQ. KM.)	FIRE AREA 2020 (SQ. KM.)	AREA CHANGE (SQ. KM.)	Increase/Decrease
BENEDIH OCP	0.045	0.020	-0.026	DECREASE
BLOCK-II OCP	0.135	0.034	-0.101	DECREASE
MURAIDIH OCP	0.002	0.006	0.004	INCREASE
SHATABDI OCP	0.036	0.005	-0.031	DECREASE
PHULARITAND	0.021	0.000	-0.021	DECREASE
KATRAS-CHOITUDIH	0.137	0.214	0.077	INCREASE
KESHALPUR	0.001	0.134	0.132	INCREASE
BASURIA	0.000	0.012	0.012	INCREASE
TETULMARI	0.022	0.011	-0.011	DECREASE
GODHAR	0.000	0.132	0.132	INCREASE
INDUSTRY	0.051	0.000	-0.051	DECREASE
KUSUNDA	0.740	0.399	-0.340	DECREASE
SENDRA-BANSJORA	0.027	0.110	0.083	INCREASE
BASTACOLLA	0.081	0.000	-0.081	DECREASE
GOLUCKDIH	0.112	0.000	-0.112	DECREASE
KUJAMA	0.240	0.000	-0.240	DECREASE
S. JHARIA-R. OCP	0.112	0.010	-0.102	DECREASE
GONHOODIH	0.032	0.001	-0.031	DECREASE
ENA	0.043	0.004	-0.040	DECREASE
N. TISRA	0.180	0.031	-0.149	DECREASE
LODNA	0.353	0.000	-0.353	DECREASE
S. TISRA	0.102	0.021	-0.081	DECREASE
BARAREE	0.107	0.040	-0.068	DECREASE
KENDUADIH	0.000	0.001	0.001	INCREASE
GASLITAND	0.122	0.156	0.034	INCREASE
KANKANEE	0.052	0.057	0.004	INCREASE
MUDIDIH	0.110	0.220	0.110	INCREASE
LOYABAD	0.006	0.000	0.079	DECREASE
E.BHUGGATDIH	0.021	0.020	-0.001	DECREASE
ALKUSHA	0.029	0.046	0.016	INCREASE
KUSTORE	0.046	0.014	-0.032	DECREASE
ANGARAPATRA	0.015	0.036	0.021	INCREASE
BHOWRAH. N	0.098	0.006	-0.092	DECREASE
BAGDIGI	0.021	0.000	-0.021	DECREASE
JEALGORA	0.007	0.000	-0.007	DECREASE
JEENAGORA	0.047	0.000	-0.047	DECREASE
JOYRAMPUR	0.104	0.011	-0.093	DECREASE

TOTAL AREA	**3.3**	**1.8**	**1.5**	**DECREASE**

Note:

1) The minimum mapable unit from satellite image it 30m by 30m or 0.0009 km^2

2) "INCREASE" implies, increase in fire area OR emergence of fire areas not identified in 2017 study

3) "DECREASE" implies, decrease in fire area OR fire areas in 2017 not identified in present study *(either absent or below sensor resolution)*

4) Values marked in "blue" are collieries where fire has was reported in 2017 study but presently shows no such signatures.

Annexure –II



Figure 13: Active fires in Keshalpur-West Mudidih. (Points 1, 2, 3 & 4 in figure 12)



Figure 14: Active fires in Sendra-Bansjora Mines (Points 5, 6, 7 & 9 in figure 12)



Figure 15: OB dump fires in Sendra Bansjora (Points 10 in figure 12)



Figure 16: Active fires in Godhar-Kusunda Mines (Points 20 to 24 in figure 12)



Figure 17: Fire in R-OCP. (Point 28 in figure 12)



Figure 18: Active fires in N-S Tisra mines (Points 31-33 in figure 12).



Figure 19: Subsidence area in Bagdigi Mines



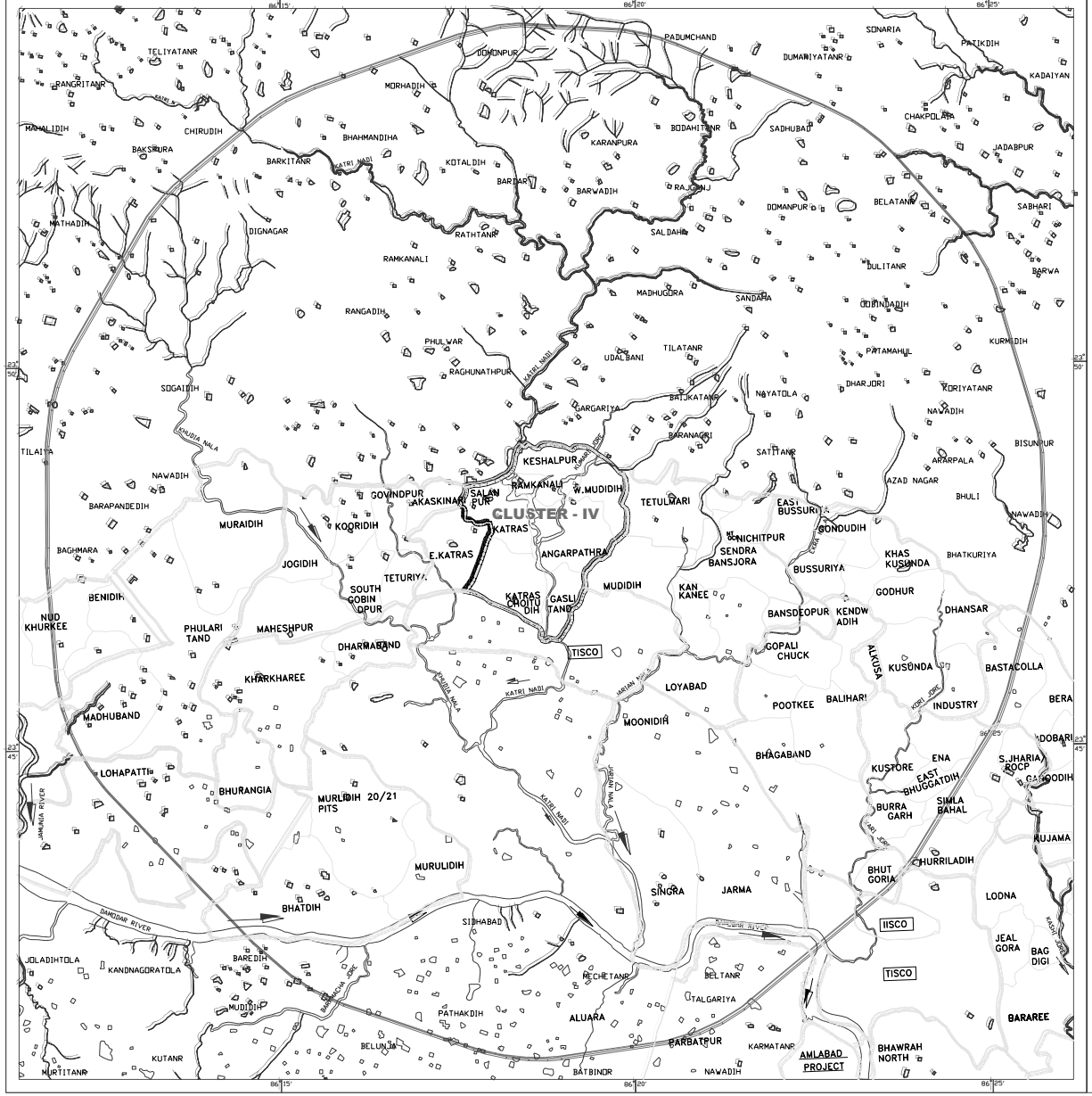
Figure 20: Subsidence (sag ponds) around Moonidih mine area

Annexure –III

Coordinates of Fire locations.

Mine	UTM_X	UTM_Y	Longitude	Latitude
Keshalpur	430560.28	2633068.44	86.3183	23.8074
Keshalpur	430287.86	2632817.14	86.3156	23.8051
W. Mudidih	430935.00	2632710.00	86.3220	23.8042
W. Mudidih	431468.57	2632417.14	86.3273	23.8015
Kendra Bansjora	433626.56	2632140.94	86.3484	23.7991
Tetulmari	433245.00	2631915.00	86.3447	23.7971
Kendra Bansjora	433899.00	2631765.00	86.3511	23.7958
Shatabdhi	422415.00	2631645.00	86.2384	23.7942
Kendra Bansjora	433383.75	2631563.75	86.3461	23.7939
Kendra Bansjora	435666.92	2631113.08	86.3685	23.7899
Katras-Chotudih	427797.06	2630997.35	86.2913	23.7886
Gaslitand	430270.06	2630936.18	86.3156	23.7881
Katras-Chotudih	429170.29	2630763.09	86.3048	23.7865
Mudidih	432313.36	2630596.98	86.3356	23.7851
Godhar	438450.00	2630085.00	86.3959	23.7808
Benedih OCP	419198.18	2630070.00	86.2069	23.7798
Kankanee	433072.50	2629995.00	86.3431	23.7797
Block II OCP	419491.36	2629772.73	86.2098	23.7771
Kusunda	438532.86	2629547.14	86.3967	23.7759
Godhar	438187.50	2630145.00	86.3933	23.7813
Block II OCP	418545.00	2629200.00	86.2006	23.7719
Kusunda	437910.00	2629005.00	86.3906	23.7710
Kusunda	438335.37	2629195.97	86.3948	23.7727
Alkusha	437452.80	2629068.00	86.3861	23.7715
Kusunda	438007.50	2628495.00	86.3916	23.7664
Kusunda	438392.33	2628011.36	86.3954	23.7620
Ena	438465.00	2627070.00	86.3962	23.7535
R -OCP	440644.55	2626785.45	86.4176	23.7510
Goonhodih	442050.00	2625480.00	86.4314	23.7393
NT-ST	442815.00	2624385.00	86.4389	23.7294
NT-ST	443100.00	2623890.00	86.4418	23.7250
NT-ST	443205.00	2623410.00	86.4428	23.7206
NT-ST	443253.33	2623211.67	86.4433	23.7189
NT-ST	443910.00	2623110.00	86.4497	23.7180
Jayrampur	442200.00	2622915.00	86.4330	23.7161
Bhulanbarari	441898.64	2620804.77	86.4301	23.6971
Bhaura	437768.57	2619865.71	86.3896	23.6884
Bhaura	438202.50	2619131.25	86.3939	23.6818
Bhaura	438720.00	2618775.00	86.3990	23.6786

STUDY AREA MAP OF CLUSTER - IV
SHOWING HYDROLOGICAL FEATURES



INDEX

POND

RIVER

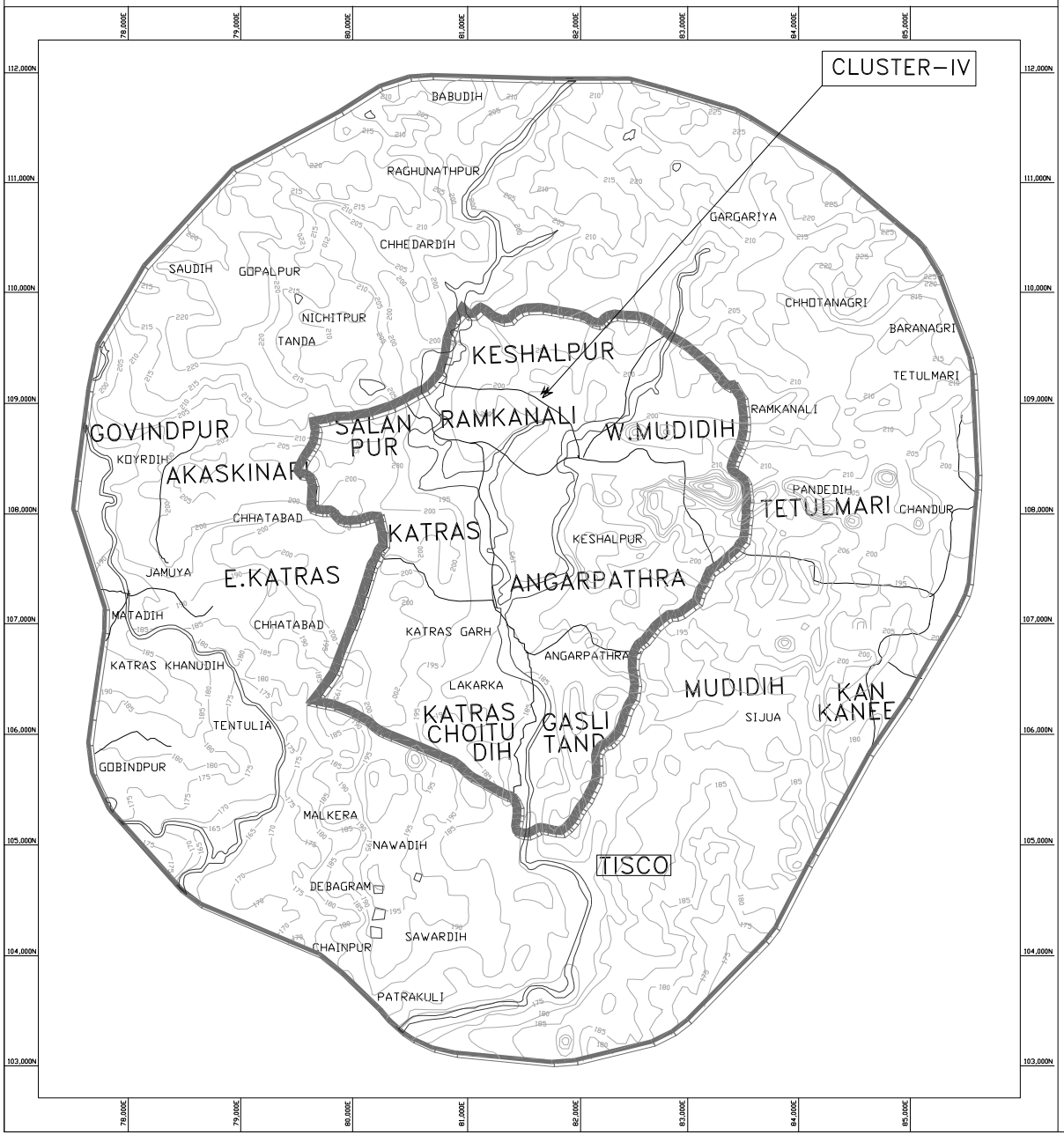
PROPOSED PROJECT (CORE ZONE)

BUFFER ZONE

PLATE NO-10

A/C NO. D\CLUSTER_IV/\HYDROLOGICAL PLAN

STUDY AREA OF CLUSTER - IV SHOWING DRAINAGE CONTOUR



INDEX

POND

RIVER

PROPOSED PROJECT (CORE ZONE)

2 KM. ZONE

CONTOUR(m)

PLATE NO -11

A/C No.:- D\CLUSTER_IV\
\CLUSTER_IV DRAINAGE CONTOUR

WATER TABLE CONTOUR MAP OF CLUSTER-IV

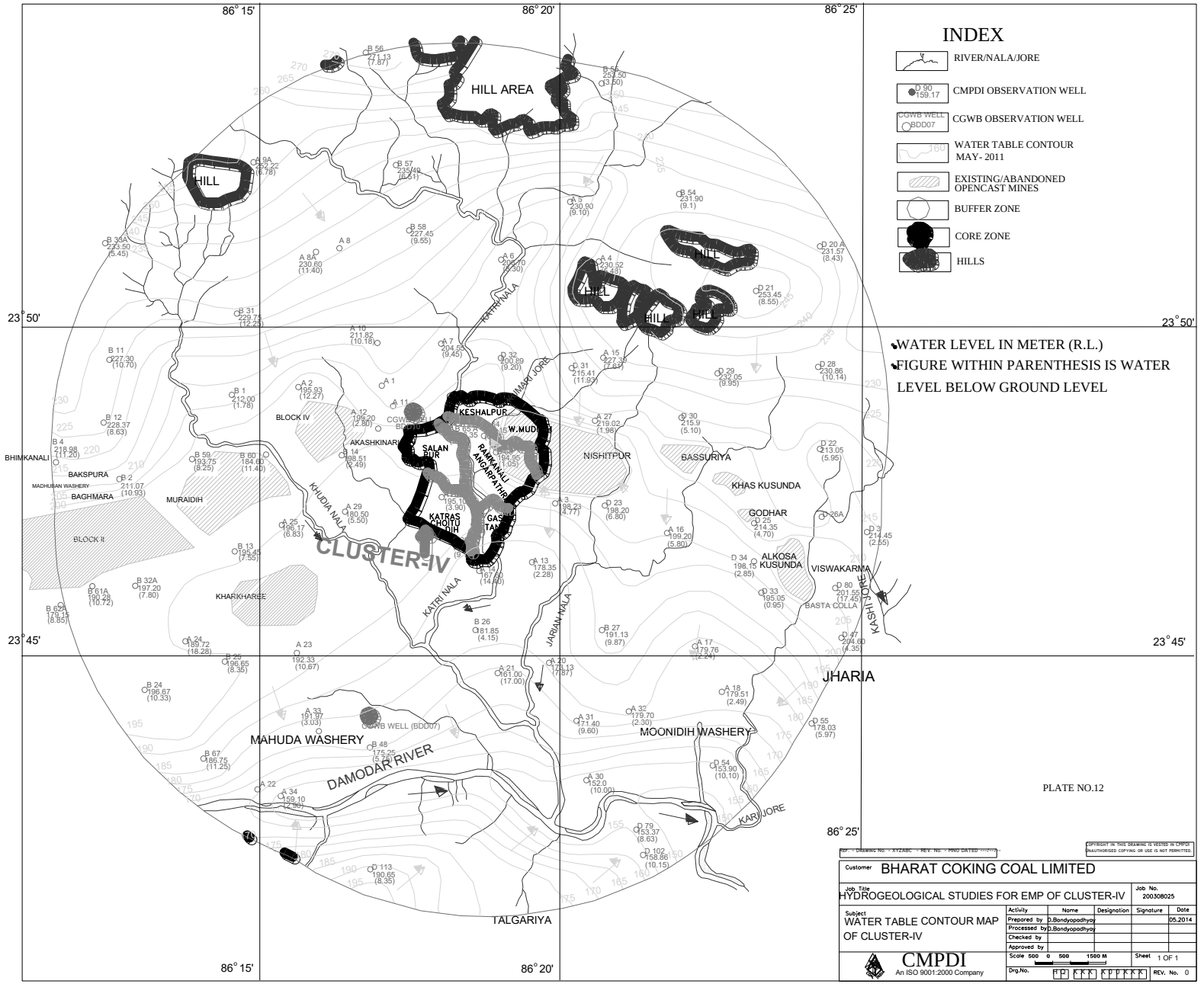


PLATE NO.12

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Customer: BHARAT COKING COAL LIMITED

Job Title: HYDROGEOLOGICAL STUDIES FOR EMP OF CLUSTER-IV

Job No.: 200308025

Subject: WATER TABLE CONTOUR MAP OF CLUSTER-IV

Activity	Name	Designation	Signature	Date
Prepared by	D.Bandyopadhyay			05.2014
Processed by	D.Bandyopadhyay			
Checked by				
Approved by				

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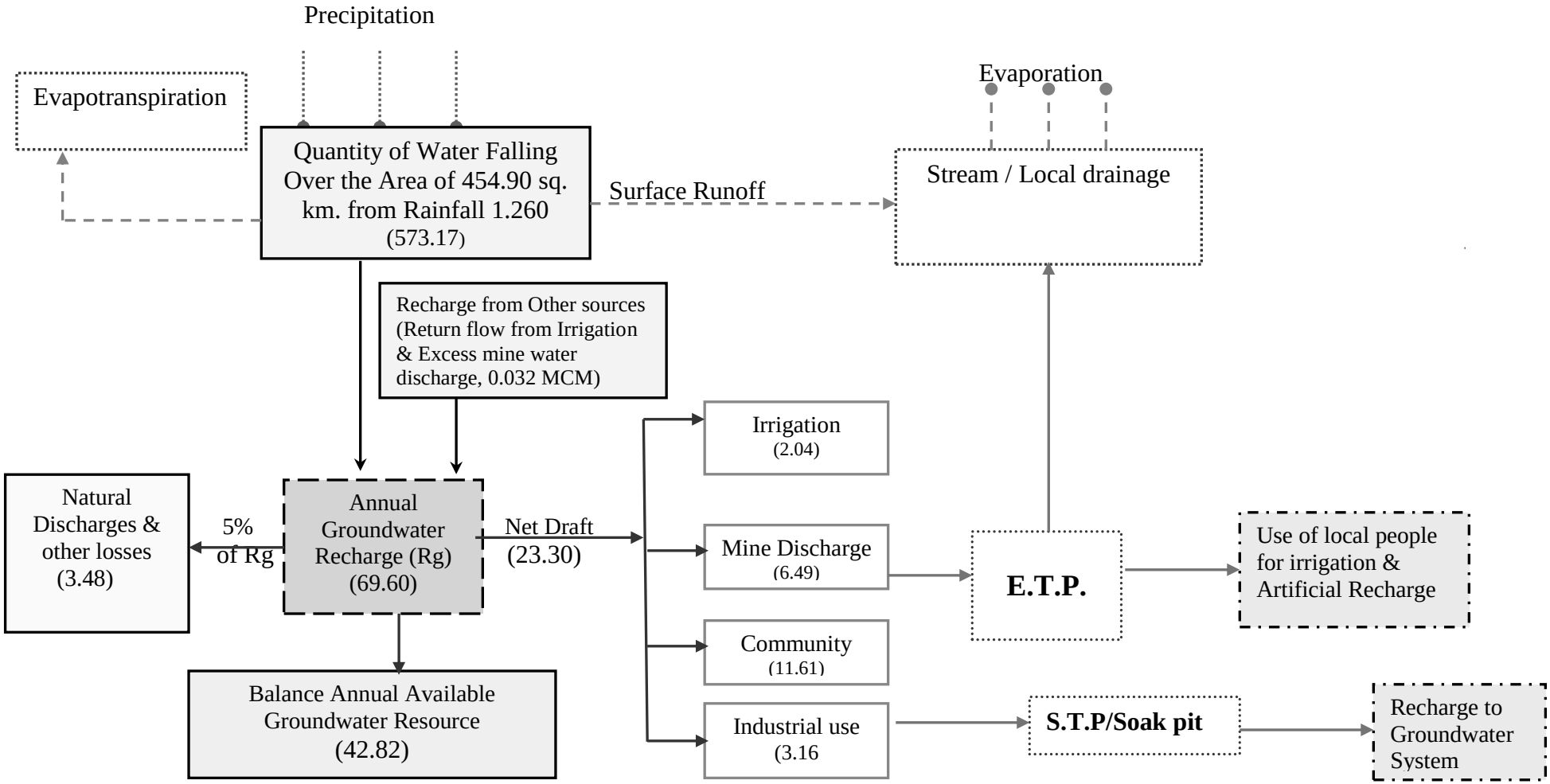
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Sheet 1 OF 1

Drg.No. [illegible] REV. No. 0

GROUNDWATER BALANCE FLOW DIAGRAM, BUFFER ZONE OF CLUSTER-IV

(All Values are in M.Cu.m)



Job No - 200308025

PLATE NO: 13

CMPDI

WATER USAGE DIAGRAM OF CLUSTER-IV MINES

(All Values are in m^3 / day)

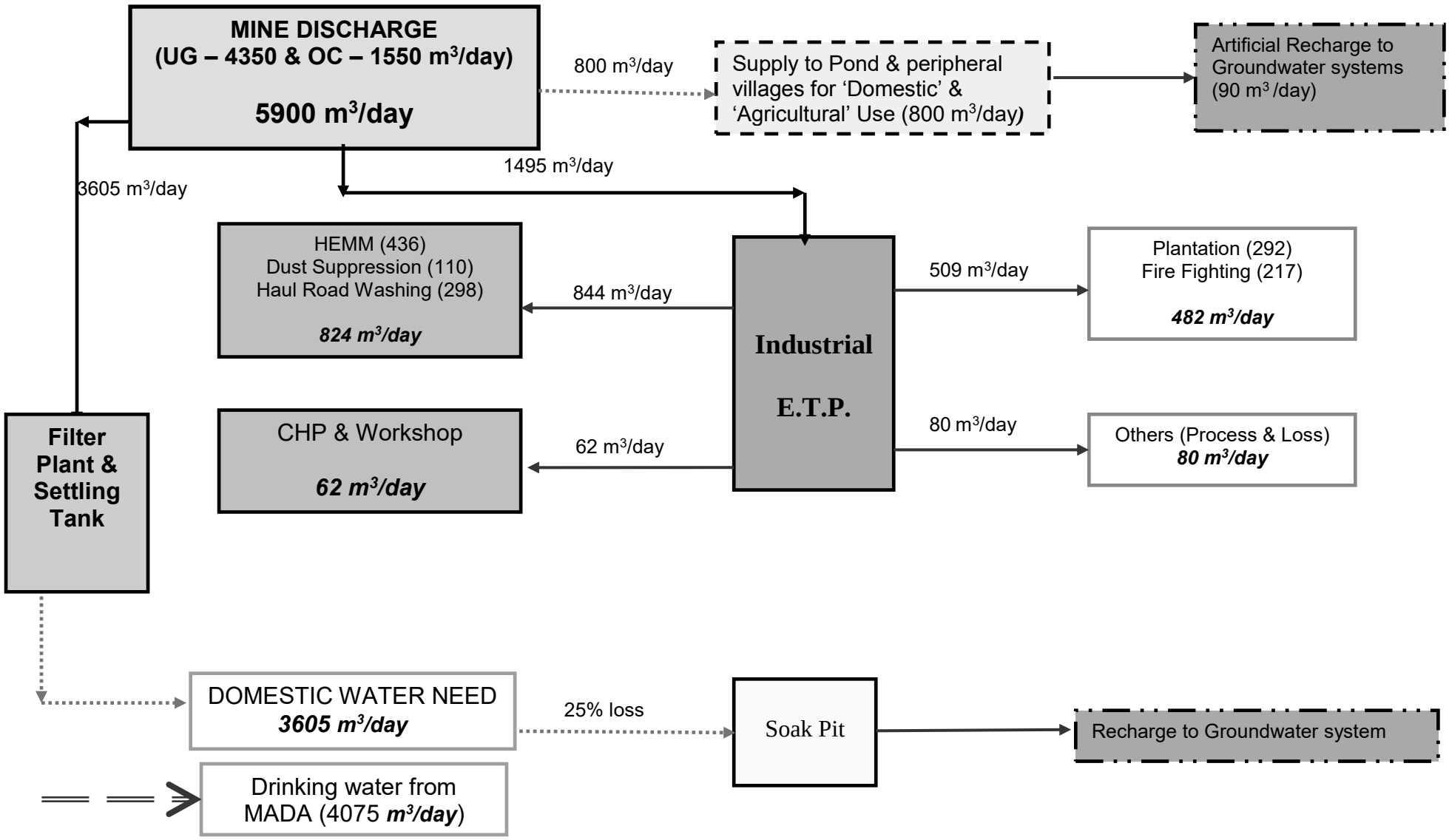


PLATE NO: 14

JOB NO - 200308025

GROUND WATER RECHARGE BALANCE - BUFFER ZONE OF Cluster IV
(Mcum &%)

Net ground water Recharge 66.12

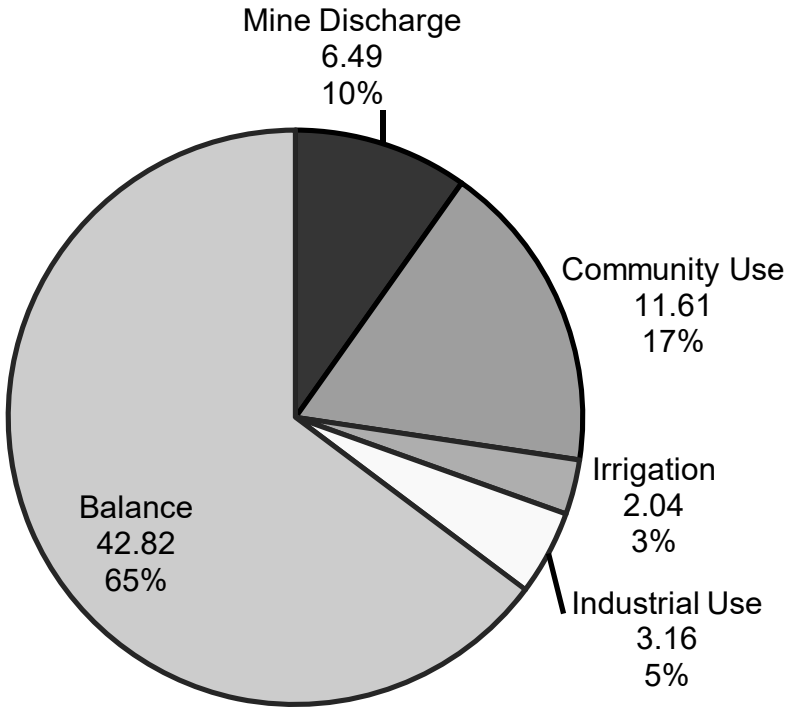
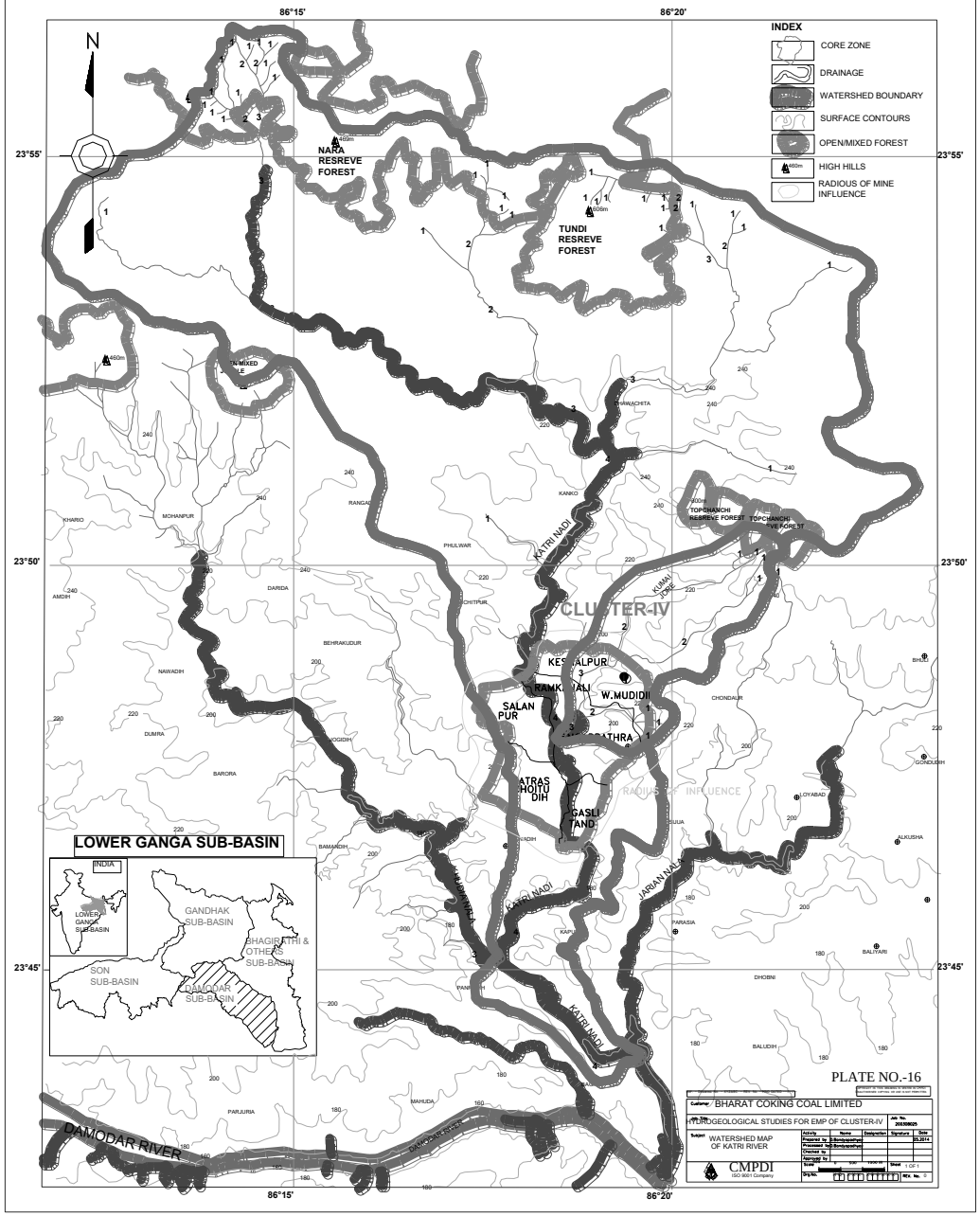
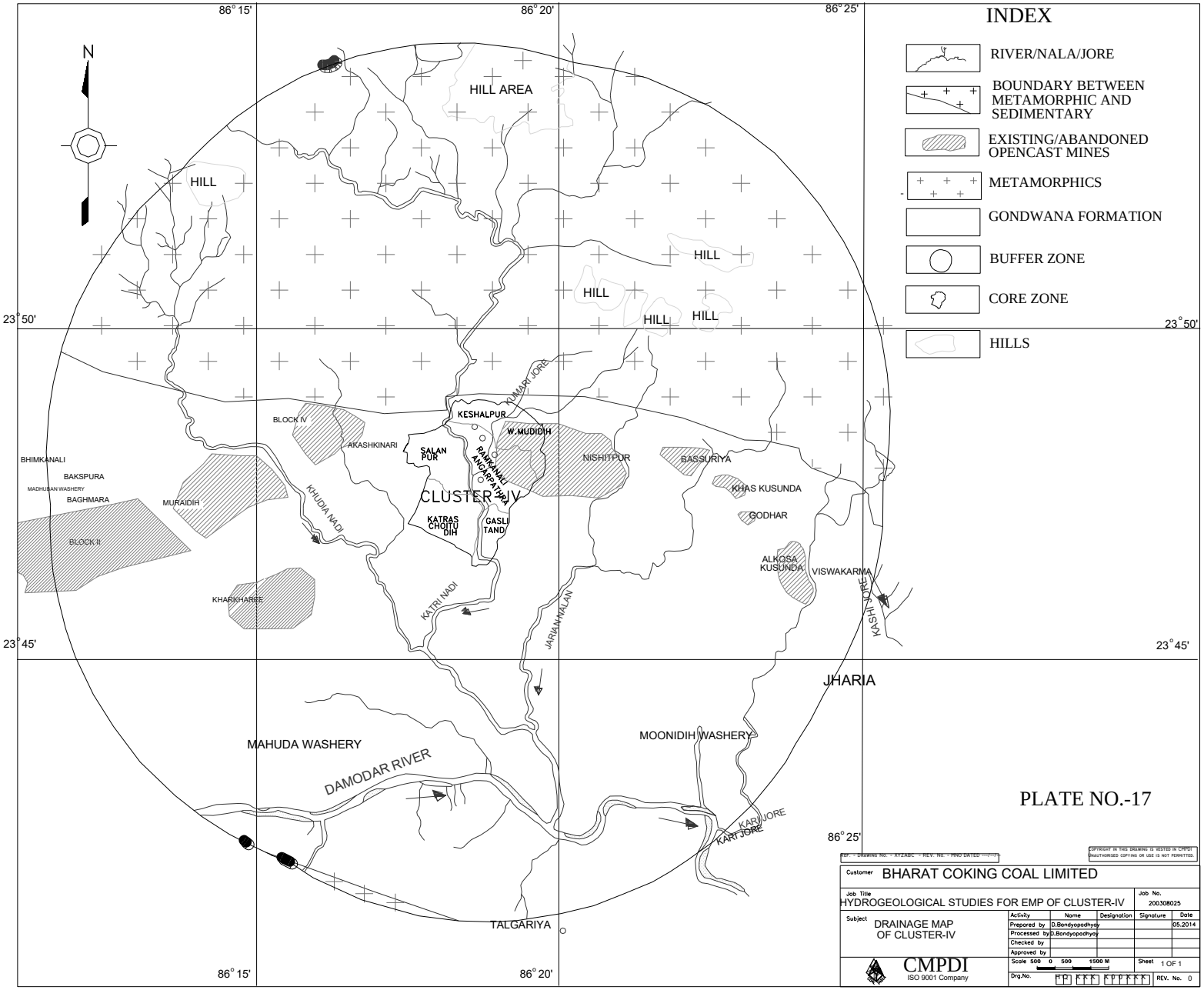


PLATE NO-15

WATERSHED MAP OF CLUSTER IV



DRAINAGE MAP OF THE CLUSTER-IV



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Customer: BHARAT COKING COAL LIMITED

Job Title: HYDROGEOLOGICAL STUDIES FOR EMP OF CLUSTER-IV

Job No.: 200308025

Subject: DRAINAGE MAP OF CLUSTER-IV

Activity	Name	Designation	Signature	Date
Prepared by	D.Bandyopadhyay			05.2014
Processed by	D.Bandyopadhyay			
Checked by				
Approved by				

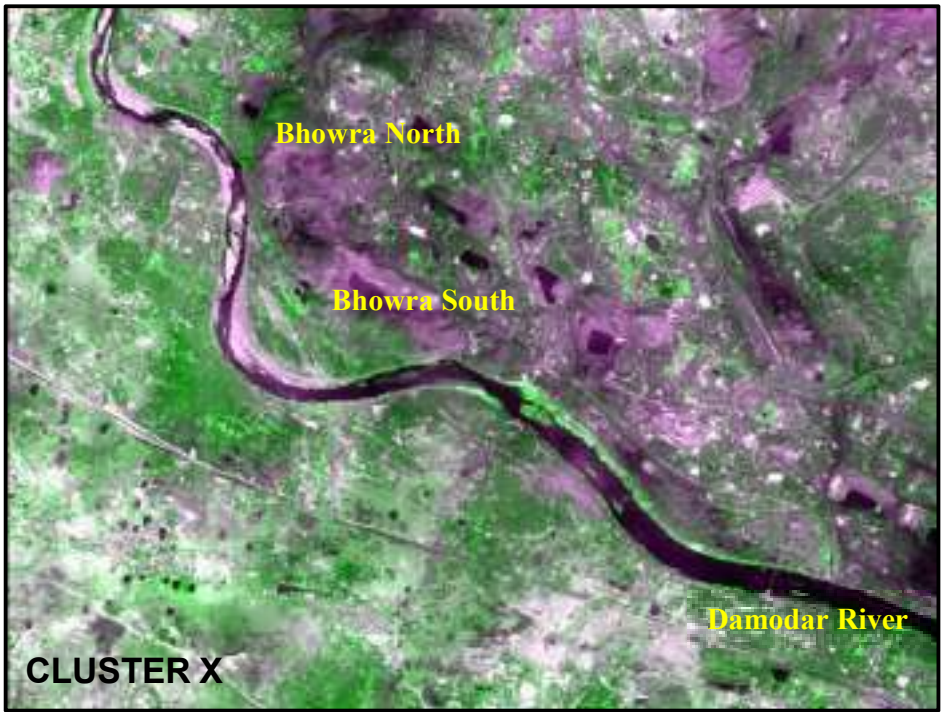
Scale 500 0 500 1500 M

Sheet 1 OF 1

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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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Photo-7: Plantation on OB Dump in Cluster X 20

Executive Summary

1. Project — Land reclamation/ restoration monitoring of five clusters of (Opencast + Underground) coal mines of Bharat Coking Coal Ltd. (BCCL) based on satellite data on every three-year basis.

2. Objective — Objective of land reclamation/ restoration monitoring is to assess the area of backfilled, plantation, social forestry, active mining area, water bodies, distribution of wasteland, agricultural land and forest in the leasehold area of the project. This will help in assessing the progressive status of mined land reclamation and to take up remedial measures, if any, required for environmental protection.

3. Salient Findings

- Out of 5 Clusters of mines viz. I, IV, VII, X and XI considered for land reclamation monitoring during the year 2021-22; cluster XI group of mines is added during the year 2021-22. These clusters consist of mainly opencast mines.

- Out of the total mine leasehold area of 9411.54 Ha. of the 05 clusters considered for monitoring during the year 2021-22; total excavated area is 1218.18 Ha. out of which 61.92 Ha. area (5.08%) has been planted on backfill (Biological Reclamation) and 712.90 Ha. area (58.52%) is under backfilling (Technical Reclamation) and 443.36 Ha. area (36.40%) is under active mining. Cluster wise details of land reclamation of the above Clusters is given in Table-1.

- Total area under plantation (green cover) covers an area of 968.94 Ha. which is 10.30% of total leasehold area.

- This report and the findings will be considered as basis for further monitoring and reclamation related activities.

Table 1

Land Reclamation Status in five Clusters (Underground + Opencast Mines) of BCCL based on Satellite Data of the Year 2021

(Area in Hectare)

Sl. No.	Cluster No.	Total Leasehold Area		Technical Reclamation		Plantation						Area under Active Mining		Total Excavated Area		Total Area under Plantation (% Green Cover Generated in Leasehold)		Total Area under Reclamation	
						Biological Reclamation		Other Plantations											
				Area under Backfilling		Plantation on Excavated / Backfilled Area		Plantation on External OB Dumps		Social Forestry, Avanue Plantation Etc.									
1	*2*	*3*		*4*		*5*		*6*		*7*		*8*		*9 (=4+5+8)*		*10 (=5+6+7)*		*11(=4+5)*	
		2018	2021	2018	2021	2018	2021	2018	2021	2018	2021	2018	2021	2018	2021	2018	2021	2018	2021
1	Cluster I	575.00	575.00	10.11	11.10	7.29	7.29	47.99	45.21	25.53	25.53	28.39	27.61	45.79	46.00	80.81	78.03	17.40	18.39
				22.08%	24.13%	15.92%	15.85%					62.00%	60.02%			14.05%	13.57%	38.00%	39.98%
2	Cluster IV	1123.79	1123.79	147.22	176.03	0.00	0.00	27.11	27.11	165.09	165.09	166.67	152.29	313.89	328.32	192.20	192.20	147.22	176.03
				46.90%	53.62%	0.00%	0.00%					53.10%	46.38%			17.10%	17.10%	46.90%	53.62%
3	Cluster VII	2127.70	2127.70	351.54	351.68	37.47	25.47	15.52	11.43	238.67	238.67	122.23	183.42	511.24	560.57	291.66	275.57	389.01	377.15
				68.76%	62.74%	7.33%	4.54%					23.91%	32.72%			13.71%	12.95%	76.09%	67.28%
4	Cluster X	2057.47	2057.47	116.28	143.64	29.16	29.16	66.09	66.09	140.75	140.75	59.41	45.71	204.85	218.51	236.00	236.00	145.44	172.80
				56.76%	65.74%	14.23%	13.34%					29.00%	20.92%			11.47%	11.47%	71.00%	79.08%
5	Cluster XI	-	3527.58	-	30.45	-	0.00	-	0.00	-	187.14	-	34.33	-	64.78	-	187.14	-	30.45
					47.01%		0.00%						52.99%				5.31%		47.01%
	TOTAL	**5883.96**	**9411.54**	**625.15**	**712.90**	**73.92**	**61.92**	**156.71**	**149.84**	**570.04**	**757.18**	**376.70**	**443.36**	**1075.77**	**1218.18**	**800.67**	**968.94**	**699.07**	**774.82**
				58.11%	**58.52%**	**6.87%**	**5.08%**					**35.02%**	**36.40%**			**13.61%**	**10.30%**	**64.98%**	**63.60%**

(% is calculated with respect to Excavated Area as applicable)

Note: In reference of the above Table, different parameters are classified as follows: (Cluster XI started from current year)

1. Area under Biological Reclamation includes Areas under Plantation done on Backfilled Area Only.

2. Area under Technical Reclamation includes Area under Barren Backfilling only.

3. Area under Active Mining Includes Coal Quarry, Advance Quarry Site and Quarry filled with water etc., if any.

4. Social Forestry and Plantation on External OB Dumps are not included in Biological Reclamation and are put under separate categories as shown in the above Table.

5. (%) calculated in the above Table is in respect to Total Excavated Area except for "Total Area under Plantation" where % is in terms of "Leasehold Area".

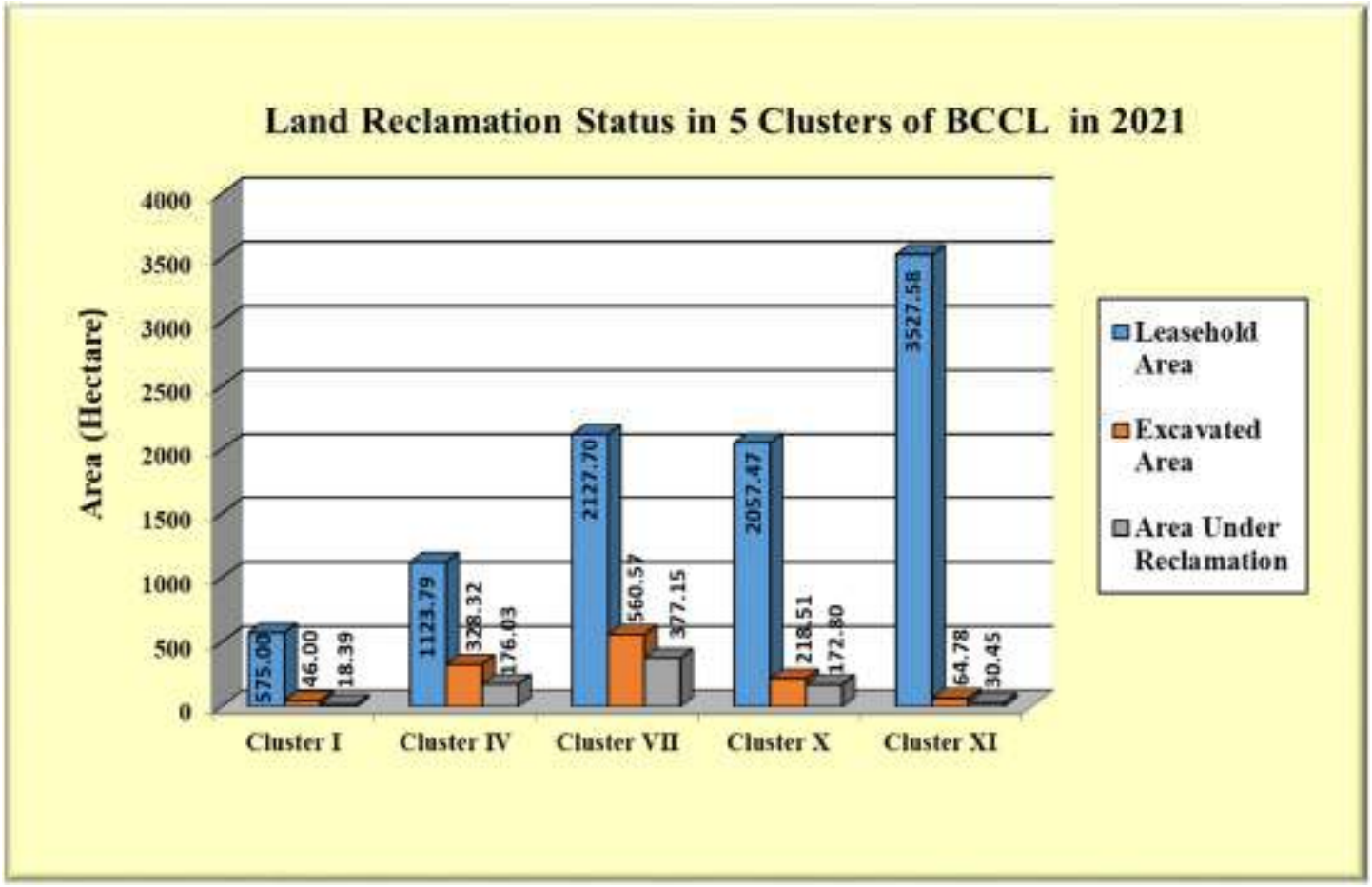


Fig. 1: Cluster wise Land Reclamation Status in five Clusters - 2021 (BCCL)

1. Background

1.1 Land is the most important natural resource which embodies soil, water, flora, fauna and total ecosystem. All human activities are based on the land which is the scarcest natural resource in our country. Mining is a site specific industry and it could not be shifted anywhere else from the location where mineral occurs. It is a fact that surface mining activities do affect the land environment due to ground breaking. Therefore, there is an urgent need to reclaim and restore the mined out land for its productive use for sustainable development of mining. This will not only mitigate environmental degradation, but would also help in creating a more congenial environment for land acquisition by coal companies in future.

1.2 Keeping above in view, Coal India Ltd. (CIL) issued a work order vide letter no. CIL/WBP/ENV/2017/DP/8391 dated 22.06.2017 to Central Mine Planning & Design Institute (CMPDI), Ranchi, for monitoring of clusters with coal mines (both underground and open cast projects) having less than 5 million m^3 per annum capacity (Coal +OB) at an interval of three years based on remote sensing satellite data for sustainable development of mining. Earlier, CMPDI used to carry out land reclamation monitoring for individual projects of less than 5 million capacity, but from 2017 the same was carried out cluster wise for mines of BCCL. For operational reasons and convenience, underground and opencast mines (often with multiple overlapping seams), have now been clustered together. The result of land reclamation status of all such mines are hosted on the website of CIL, (www.coalindia.in), CMPDI (www.cmpdi.co.in) and the concerned coal companies in public domain. Detailed report is submitted to Coal India and respective subsidiaries.

1.3 Land reclamation monitoring of all cluster coal mining projects would also comply the statutory requirements of Ministry of Environment, Forest & Climate Change (**MoEF&CC**). Such monitoring would not only facilitate in taking timely mitigation measures against environmental degradation, but would also enable coal companies to utilize the reclaimed land for larger socio-economic benefits in a planned way.

1.4 Present report is embodying the finding of the study based on satellite data of the year 2021 carried out for five clusters of mines comprising both underground and OC projects for Bharat Coking Coal Ltd.

2. Objective

Objective of the land reclamation/restoration monitoring is to assess the area of backfilled, plantation, OB dumps, social forestry, active mining area, settlements and water bodies, distribution of wasteland, agricultural land and forest land in the leasehold area of the project. This is an important step taken up for assessing the progressive status of mined land reclamation and for taking up remedial measures, if any, required for environmental protection.

3. Methodology

There are number of steps involved between raw satellite data procurement and preparation of final map. National Remote Sensing Centre (NRSC) Hyderabad, being the nodal agency for satellite data supply in India, provides only raw digital satellite data, which needs further digital image processing for extracting the information and map preparation before uploading the same in the website. Methodology for land reclamation monitoring is given in fig 2. Following steps are involved in land reclamation/ restoration monitoring:

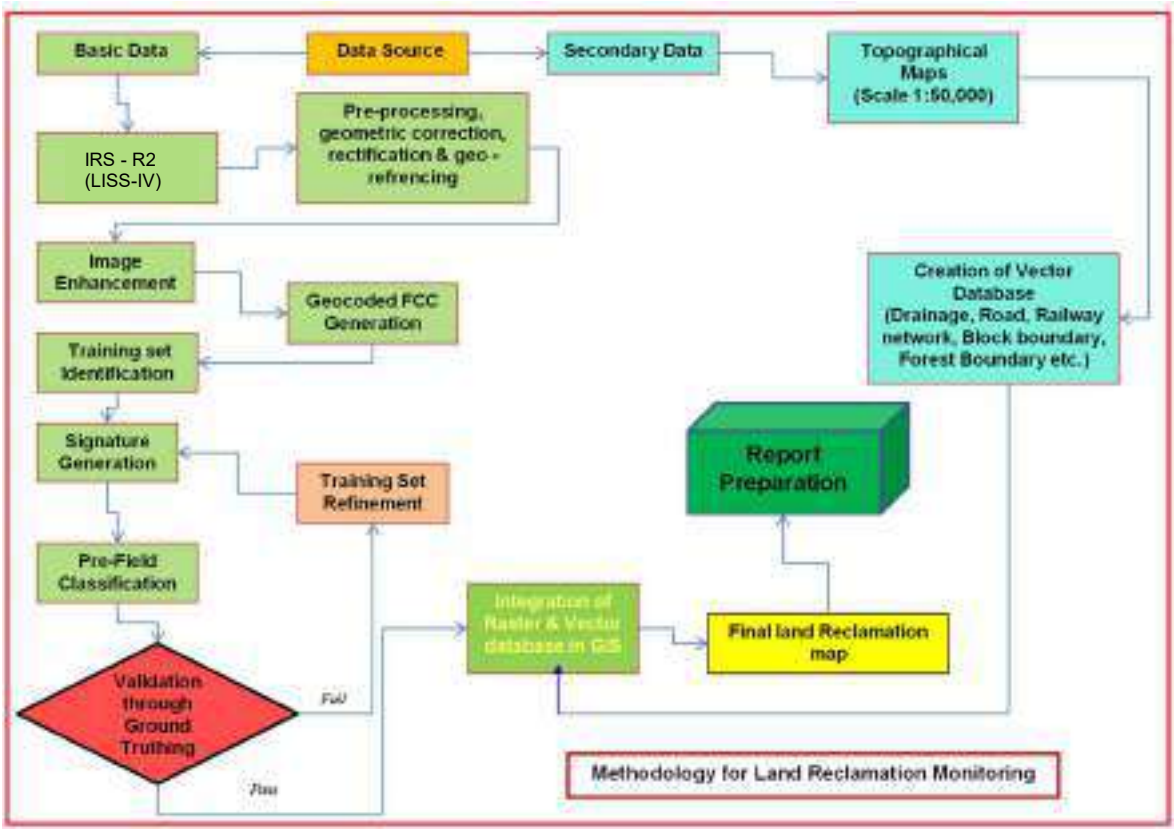


Fig. 2: Methodology of Land Reclamation Monitoring

3.1 Data Procurement: After browsing the data quality and date of pass on internet, supply order for data is placed to NRSC. Secondary data like leasehold boundary, toposheet are procured for creation of vector database.

3.2 Satellite Data Processing: Satellite data are processed using ERDAS IMAGINE digital image processing s/w. Methodology involves the following major steps:

- **Rectification & Geo-referencing:** Inaccuracies in digital imagery may occur due to 'systematic errors' attributed to earth curvature and rotation as well as 'non-systematic errors' attributed to satellite receiving station itself. Raw digital images may contain geometric distortions, which make

them unusable as maps. Therefore, geo-referencing is required for correction of image data using ground control points (GCP) to make it compatible with the new series WGS-84 compatible SoI toposheet.

- **Image enhancement:**

  To improve the interpretability of the raw data, image enhancement is necessary. Local operations modify the value of each pixel based on brightness value of neighbouring pixels using ERDAS IMAGINE 14.0 s/w. and enhance the image quality for interpretation.

- **Training set selection**

  Training set requires to be selected, so that software can classify the image data accurately. The image data are analysed based on the interpretation keys. These keys are evolved from certain fundamental image-elements such as tone/colour, size, shape, texture, pattern, location, association and shadow. Based on the image-elements and other geo-technical elements like land form, drainage pattern and physiography; training sets were selected/identified for each land use/cover class. Field survey was carried out by taking selective traverses in order to collect the ground information (or reference data) so that training sets are selected accurately in the image. This was intended to serve as an aid for classification.

- **Classification and Accuracy assessment**

  Image classification is carried out using the maximum likelihood algorithm. The classification proceeds through the following steps: (a) calculation of statistics [i.e. signature generation] for the identified training areas, and (b) the decision boundary of maximum probability based on the mean vector, variance, covariance and correlation matrix of the pixels. After evaluating the statistical parameters of the training sets, reliability test of training sets is conducted by measuring the statistical separation between

the classes that resulted from computing divergence matrix. The overall accuracy of the classification was finally assessed with reference to ground truth data.

- **Area calculation**

  The area of each land use class in the leasehold is determined using ERDAS IMAGINE v. 14.0 s/w.

- **Overlay of Vector data base**

  Vector data base is created based on secondary data. Vector layer like drainage, railway line, leasehold boundary, forest boundary etc. are superimposed on the image as vector layer in the Arc GIS database.

- **Pre-field map preparation**

  Pre-field map is prepared for validation of the classification result.

3.3 Ground Truthing:

Selective ground verification of the land use classes are carried out in the field and necessary corrections if required, are incorporated before map finalization.

3.4 Land reclamation database on GIS:

Land reclamation database is created on GIS platform to identify the temporal changes identified from satellite data of different cut - of dates. The database boundary shape files (.shp), kml files and the maps thus prepared confirm to the WGS-84 datum and UTM projected co-ordinate system.

4. Land Reclamation Status in Bharat Coking Coal Ltd.

4.1 Following 5 clusters of mines comprising both underground and opencast projects of Bharat Coking Coal Ltd. have been taken up for land reclamation monitoring during the year 2021-22:

- **Cluster I** (Damoda OCP)
- **Cluster IV** (Salanpur Colliery, Amalgamated Keshalpur West Mudidih Colliery, Amalgamated Gaslitand Katras Choitudih Colliery)
- **Cluster VII** (Kusunda OCP, Kustore OCP, Alkusa OCP, Dhansar OCP, Industry, Ena OCP, Rajapur OCP, Amalgamated East Bhuggatdih Simlabahal Colliery)
- **Cluster X** (Bhowra North Colliery, Bhowra South Colliery, Patherdih Colliery, Sudamdih Shaft, Sudamdih INC, Amlabad Colliery)
- **Cluster XI** (Gopalichuck, Pootkee, Kendwadih)

4.2 Cluster wise Land Reclamation status of above mentioned clusters in BCCL is given in Table 1 and also shown graphically in Fig 1. Area statistics of different land use classes present in the mine leasehold of the above clusters for the year 2021 are shown in Table 2. Land use maps derived from the satellite data are shown in Plate 1 - 5. Different land use classes based on satellite data are depicted in bar charts in Fig. 3 - 7.

4.3 Study reveals that out of total mine leasehold area of 9411.54 Ha. of the 5 clusters of mines (Underground + Opencast) of BCCL mentioned above taken for this study in 2021-22, total excavated area is 1218.18 Ha. out of which 61.92 Ha. (5.08%) has been planted (*Biologically Reclaimed*), 712.90 Ha. (58.52%) is under backfilling (*Technically Reclaimed*) and balance 443.36 Ha. (36.40%) is under active mining.

4.4 Land reclamation monitoring for cluster XI of BCCL is taken up for the first time in the year 2021-22. Hence comparison of this cluster in year 2021 has not been made with respect to year 2018. The data thus generated in the year 2021 will be considered as base data for comparison of land reclamation of this cluster of mines at the interval of every three years.

4.5 Study indicates that overall all the projects of BCCL considered for this study in the year 2021-22 indicate increase or static trend in Technical reclamation (area under backfill) with respect to the year 2018.

4.6 After analyzing the satellite data of the year 2018 vs 2021, it reveals that area under total plantation (Green cover) carried out on backfilled area, OB dumps as well as under social forestry in all the clusters of BCCL has increased from 800.67 Ha. (13.61%) to 968.94 Ha. (10.30%) in span of last three years. This significant increase of 168.27 Ha. area under total plantation (Green Cover) in the leasehold boundary during three years is due to addition of cluster-XI.

4.7 On comparing the status of land reclamation for the year 2021 with respect to the year 2018 in all cluster of mines of BCCL considered for land reclamation in the year 2021-22, it is evident from the analysis that area under total land reclamation has increased from 699.07 Ha. (Yr 2018) to 774.82 Ha. (Yr 2021). This increase of 75.75 Ha. area under total land reclamation in the period of three years is the result of sincere effort made by BCCL towards land reclamation.

4.8 In Cluster VII, it is seen that area under plantation on backfill (Biological Reclamation) has decreased from 37.47 Ha. in the year 2018 to 25.47 Ha. in the year 2021. This decrease of 12 Ha. area in Biological reclamation is due to rehandling of backfill and also there is effect of mine fire in this

cluster. Hence total area under plantation on backfill has decreased from 73.92 Ha. (Yr 2018) to 61.92 Ha. (Yr 2021).

4.9 Out of the 5 Clusters in BCCL considered for satellite data based land reclamation monitoring in 2021, Cluster X tops with 79.08% reclamation followed by Cluster VII with 67.28%, Cluster IV with 53.62%, Cluster XI with 47.01% and Cluster I with 39.98%.

4.10 The area under total plantation (Green Cover) is maximum in Cluster IV (17.10%) followed by Cluster I with (13.57%), Cluster VII with (12.95%), Cluster X with (11.47%) and Cluster XI with (5.31%).

4.11 This study will again will be carried out after an interval of three years to assess the land reclamation status in the above projects.

Table 2

Cluster wise Area Statistics of Land Use/ Cover classes in five Clusters of (OC+UG) mines of BCCL based on Satellite Data of the year 2021

Status of Land Reclamation in 5 Clusters of (UG+OC) mines of Bharat Coking Coal Ltd. based on Satellite data of the Year 2021

(Area in Hectare)

		CLUSTER I		CLUSTER IV		CLUSTER VII		CLUSTER X		CLUSTER XI		TOTAL	
		Area	%	Area	%	Area	%	Area	%	Area	%	Area	%
FORESTS	Dense Forest	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Open Forest	0.00	0.00	0.00	0.00	0.00	0.00	64.34	3.13	0.00	0.00	64.34	0.68
	Total Forest (A)	0.00	0.00	0.00	0.00	0.00	0.00	64.34	3.13	0.00	0.00	64.34	0.68
SCRUBS	**Scrubs (B)**	230.09	40.02	172.78	15.37	572.72	26.92	645.77	31.39	1177.06	33.37	2798.42	29.73
PLANTATION	Social Forestry/Avenue Plantation	25.53	4.44	165.09	14.69	238.67	11.22	140.75	6.84	187.14	5.31	757.18	8.05
	Plantation on OB Dump	45.21	7.86	27.11	2.41	11.43	0.54	66.09	3.21	0.00	0.00	149.84	1.59
	Plantation on Backfill (Biological Reclamation)	7.29	1.27	0.00	0.00	25.47	1.20	29.16	1.42	0.00	0.00	61.92	0.66
	Total Plantation (C)	78.03	13.57	192.20	17.10	275.57	12.95	236.00	11.47	187.14	5.31	968.94	10.30
	Total Vegetation (A+B+C)	**308.12**	**53.59**	**364.98**	**32.48**	**848.29**	**39.87**	**946.11**	**45.98**	**1364.20**	**38.67**	**3831.70**	**40.71**
	Coal Dump	1.99	0.35	1.94	0.17	8.92	0.42	1.12	0.05	0.73	0.02	14.70	0.16
ACTIVE MINING	Coal Quarry	11.14	1.94	145.67	12.96	177.97	8.36	26.66	1.30	31.66	0.90	393.10	4.18
	Advance Quarry Site	1.73	0.30	0.00	0.00	0.00	0.00	0.00	0.00	2.67	0.08	4.40	0.05
	Quarry Filled With Water	14.74	2.56	6.62	0.59	5.45	0.26	19.05	0.93	0.00	0.00	45.86	0.49
	Total Area under *Active Mining*	**27.61**	**4.80**	**152.29**	**13.55**	**183.42**	**8.62**	**45.71**	**2.22**	**34.33**	**0.97**	**443.36**	**4.71**
	Barren OB Dump	21.18	3.68	110.42	9.83	53.57	2.52	90.49	4.40	22.66	0.64	298.32	3.17
RECLAMED	Area Under Backfilling (Technical Reclamation)	11.10	1.93	176.03	15.66	351.68	16.53	143.64	6.98	30.45	0.86	712.90	7.57
	Total Area under Mine Operation	**61.88**	**10.76**	**440.68**	**39.21**	**597.59**	**28.09**	**280.96**	**13.66**	**88.17**	**2.50**	**1469.28**	**15.61**
WASTELAND	Waste Lands	65.94	11.47	82.19	7.31	182.23	8.56	152.75	7.42	708.59	20.09	1191.70	12.66
	Fly Ash Pond / Sand Body	15.55	2.70	0.00	0.00	0.00	0.00	53.37	2.59	15.83	0.45	84.75	0.90
	Total Wasteland	**81.49**	**14.17**	**82.19**	**7.31**	**182.23**	**8.56**	**206.12**	**10.02**	**724.42**	**20.54**	**1276.45**	**13.56**
WATERBODIES	Reservoir, Nallah, Ponds	15.38	2.67	12.13	1.08	20.60	0.97	185.47	9.01	63.67	1.80	297.25	3.16
	Total Waterbodies	**15.38**	**2.67**	**12.13**	**1.08**	**20.60**	**0.97**	**185.47**	**9.01**	**63.67**	**1.80**	**297.25**	**3.16**
AGRICULTURE	Crop Lands	3.42	0.59	3.45	0.31	38.23	1.80	18.08	0.88	81.78	2.32	144.96	1.54
	Fallow Lands	80.92	14.07	37.02	3.29	20.12	0.95	109.95	5.34	822.67	23.32	1070.68	11.38
	Total Agriculture	**84.34**	**14.67**	**40.47**	**3.60**	**58.35**	**2.74**	**128.03**	**6.22**	**904.45**	**25.64**	**1215.64**	**12.92**
SETTLEMENTS	Urban Settlement	7.17	1.25	166.29	14.80	390.66	18.36	228.39	11.10	336.58	9.54	1129.09	12.00
	Rural Settlement	14.04	2.44	16.81	1.50	9.41	0.44	57.90	2.81	14.68	0.42	112.84	1.20
	Industrial Settlement	2.58	0.45	0.24	0.02	20.57	0.97	24.49	1.19	31.41	0.89	79.29	0.84
	Total Settlements	**23.79**	**4.14**	**183.34**	**16.31**	**420.64**	**19.77**	**310.78**	**15.10**	**382.67**	**10.85**	**1321.22**	**14.04**
	Grand Total	**575.00**	**100.00**	**1123.79**	**100.00**	**2127.70**	**100.00**	**2057.47**	**100.00**	**3527.58**	**100.00**	**9411.54**	**100.00**

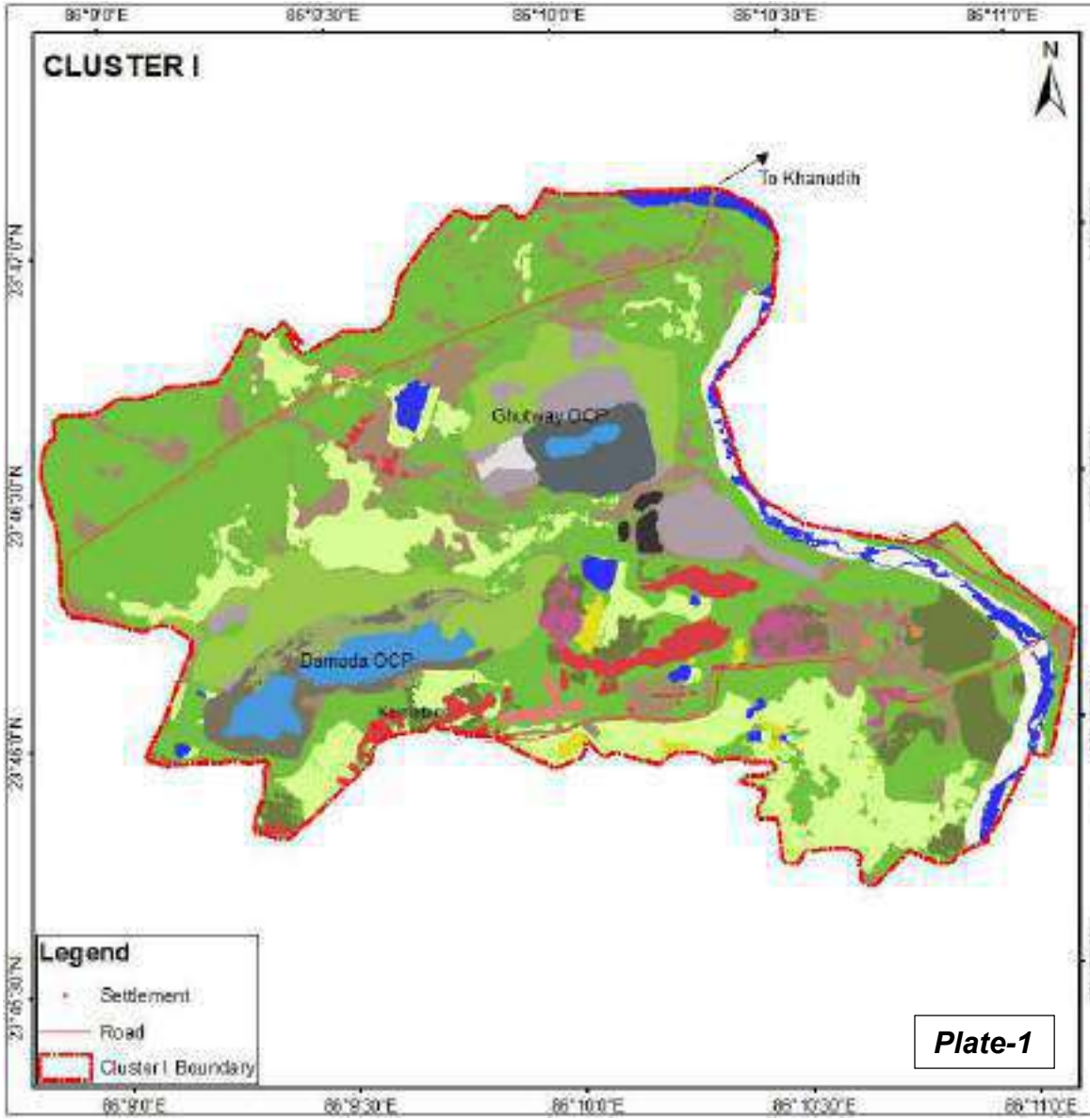
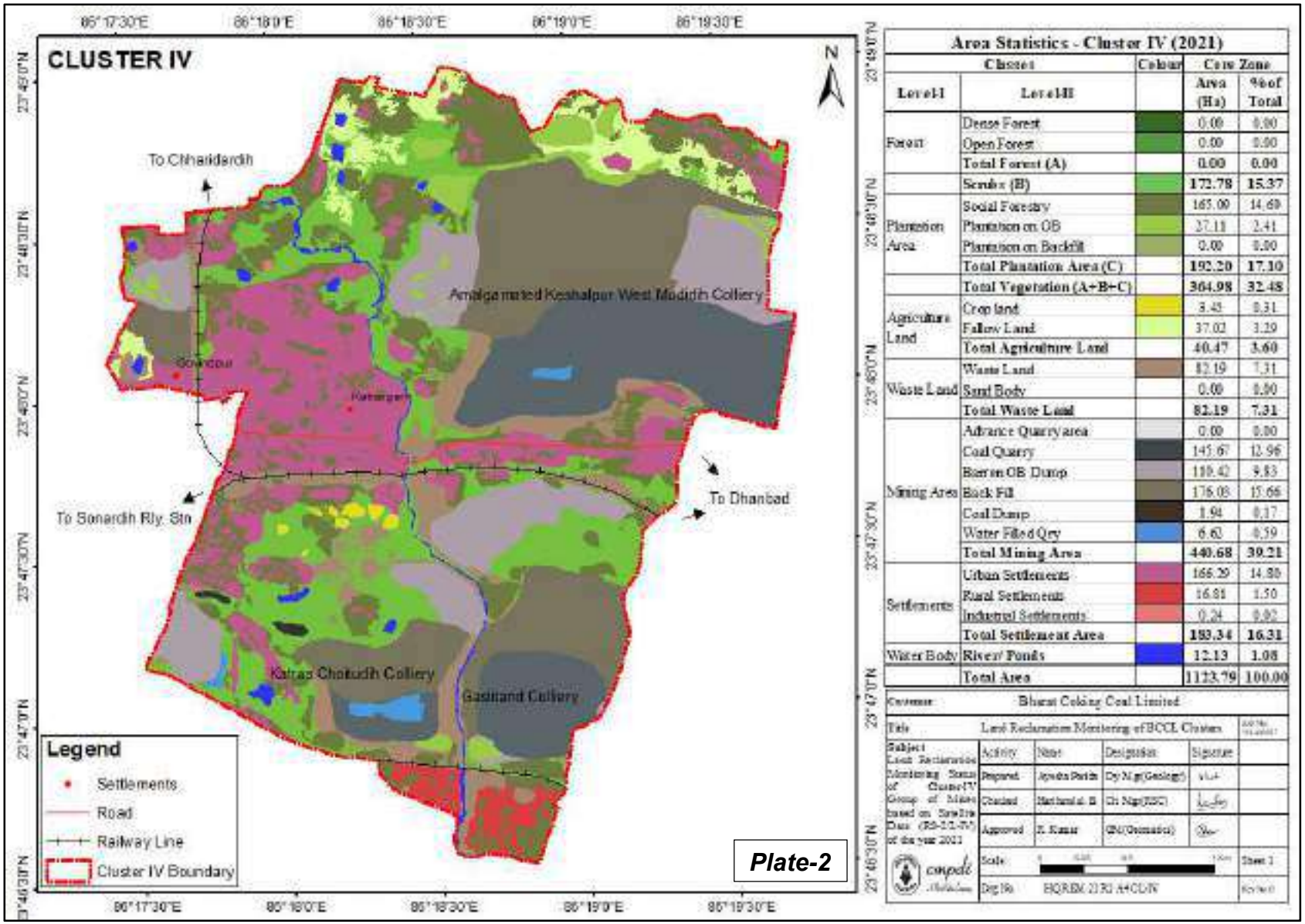


Plate-1

Area Statistics - Cluster I (2021)				
Classes		Colour	Core Zone	
Level-I	Level-II		Area (Ha)	% of Total
Forest	Dense Forest		0.00	0.00
	Open Forest		0.00	0.00
	Total Forest (A)		**0.00**	**0.00**
	Scrubs (B)		230.89	40.01
Plantation Area	Social Forestry		25.53	4.44
	Plantation on OB		45.21	7.86
	Plantation on Backfill		7.29	1.27
	Total Plantation Area (C)		**78.03**	**13.57**
	Total Vegetation (A+B+C)		**308.11**	**53.59**
Agriculture Land	Crop land		3.42	0.59
	Fallow Land		80.92	14.07
	Total Agriculture Land		**84.34**	**14.67**
Waste Land	Waste Land		65.84	11.47
	Sand Body		15.55	2.70
	Total Waste Land		**81.49**	**14.17**
Mining Area	Advance Quarry area		1.73	0.30
	Coal Quarry		11.14	1.94
	Barren OB Dump		21.18	3.68
	Back Fill		11.10	1.93
	Coal Dump		1.99	0.35
	Water Filled Qry		14.74	2.56
	Total Mining Area		**61.88**	**10.76**
Settlements	Urban Settlements		7.17	1.25
	Rural Settlements		14.04	2.44
	Industrial Settlements		2.58	0.45
	Total Settlement Area		**23.79**	**4.14**
Water Body	**River/ Ponds**		**15.38**	**2.67**
	Total Area		**575.00**	**100.00**

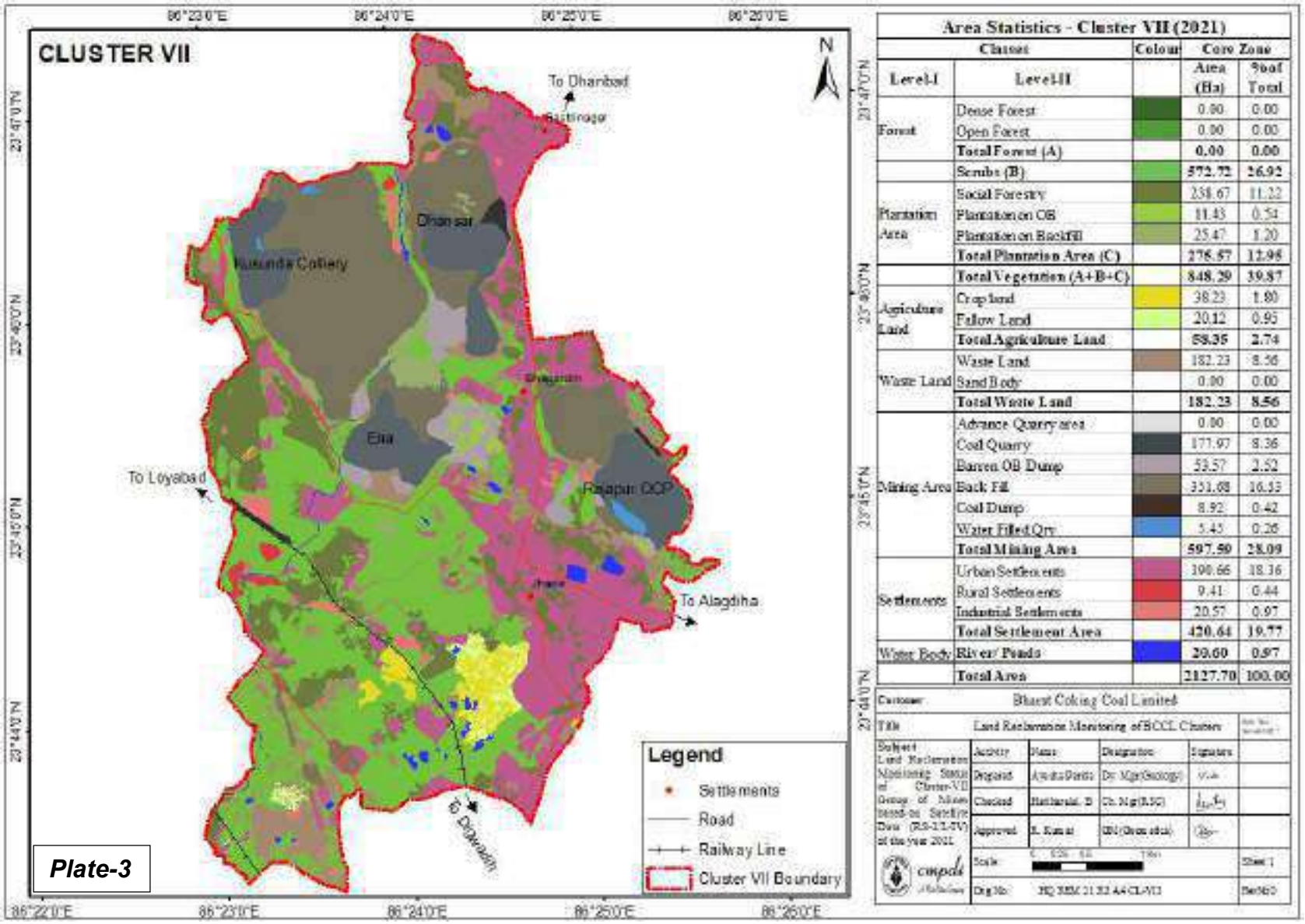
Customer	Bharat Coking Coal Limited				
Title	Land Reclamation Monitoring of BCCL Clusters				
Subject	Activity	Name	Designation	Signature	
Land Reclamation Monitoring Status of Cluster I Group of Mines based on Satellite Data (R.S-2 L-IV) of the year 2021	Prepared	Ayesha Parida	Dy. Mgr(Geology)		
	Checked	Shrikanta K. B.	Ch. Mgr(RSC)		
	Approved	R. Khanna	GM(Geomatics)		
cmpdi	Scale:				Sheet 1
	Drg No:	HQ/RSC/21/RL/A4-CL-I			



Area Statistics - Cluster IV (2021)

Cluster		Colour	Core Zone	
Level-I	Level-II		Area (Ha)	%of Total
Forest	Dense Forest		0.00	0.00
	Open Forest		0.00	0.00
	Total Forest (A)		**0.00**	**0.00**
	Scrubs (B)		**172.78**	**15.37**
Plantation Area	Social Forestry		165.00	14.69
	Plantation on OB		27.13	2.41
	Plantation on Backfill		0.00	0.00
	Total Plantation Area (C)		**192.20**	**17.10**
	Total Vegetation (A+B+C)		**364.98**	**32.48**
Agriculture Land	Crop land		3.45	0.31
	Fallow Land		37.02	3.29
	Total Agriculture Land		**40.47**	**3.60**
Waste Land	Waste Land		82.19	7.31
	Sand Body		0.00	0.00
	Total Waste Land		**82.19**	**7.31**
Mining Area	Advance Quarry area		0.00	0.00
	Coal Quarry		145.67	12.96
	Barren OB Dump		110.42	9.83
	Back Fill		176.08	15.66
	Coal Dump		1.94	0.17
	Water Filled Qry		6.60	0.59
	Total Mining Area		**440.68**	**39.21**
Settlements	Urban Settlements		166.29	14.80
	Rural Settlements		16.81	1.50
	Industrial Settlements		0.24	0.02
	Total Settlement Area		**183.34**	**16.31**
Water Body	River/ Ponds		12.13	1.08
	Total Area		**1123.79**	**100.00**

Customer	Bharat Coking Coal Limited				
Title	Land Reclamation Monitoring of BCCL Clusters				
Subject	Activity	Name	Designation	Signature	
Land Reclamation Monitoring Status of Cluster IV Group of Mines based on Satellite Data (23-12-21) of the year 2021	Prepared	Jayanta Parida	Dy Mgr(Geology)		
	Checked	Mathematical B	Ch Mgr(RSC)		
	Approved	S. Kumar	GM(Geomatics)		
cmpdi	Scale				Sheet 1
	Dwg No.	HQ/REM/2130/A4/CLIV			



Area Statistics - Cluster VII (2021)

Classes		Colour	Core Zone	
Level-I	Level-II		Area (Ha)	%of Total
Forest	Dense Forest		0.00	0.00
	Open Forest		0.00	0.00
	Total Forest (A)		**0.00**	**0.00**
	Scrubs (B)		572.72	26.92
Plantation Area	Social Forestry		238.67	11.22
	Plantation on OB		11.43	0.54
	Plantation on BackFill		25.47	1.20
	Total Plantation Area (C)		**275.57**	**12.96**
	Total Vegetation (A+B+C)		**848.29**	**39.87**
Agriculture Land	Crop land		38.23	1.80
	Fallow Land		20.12	0.95
	Total Agriculture Land		**58.35**	**2.74**
Waste Land	Waste Land		182.23	8.56
	Sand Body		0.00	0.00
	Total Waste Land		**182.23**	**8.56**
Mining Area	Advance Quarry area		0.00	0.00
	Coal Quarry		177.97	8.36
	Barren OB Dump		53.57	2.52
	Back Fill		351.68	16.53
	Coal Dump		8.92	0.42
	Water Filled Qry		5.45	0.26
	Total Mining Area		**597.50**	**28.09**
Settlements	Urban Settlements		390.66	18.36
	Rural Settlements		9.41	0.44
	Industrial Settlements		20.57	0.97
	Total Settlement Area		**420.64**	**19.77**
Water Body	River/ Ponds		20.60	0.97
	Total Area		**2127.70**	**100.00**

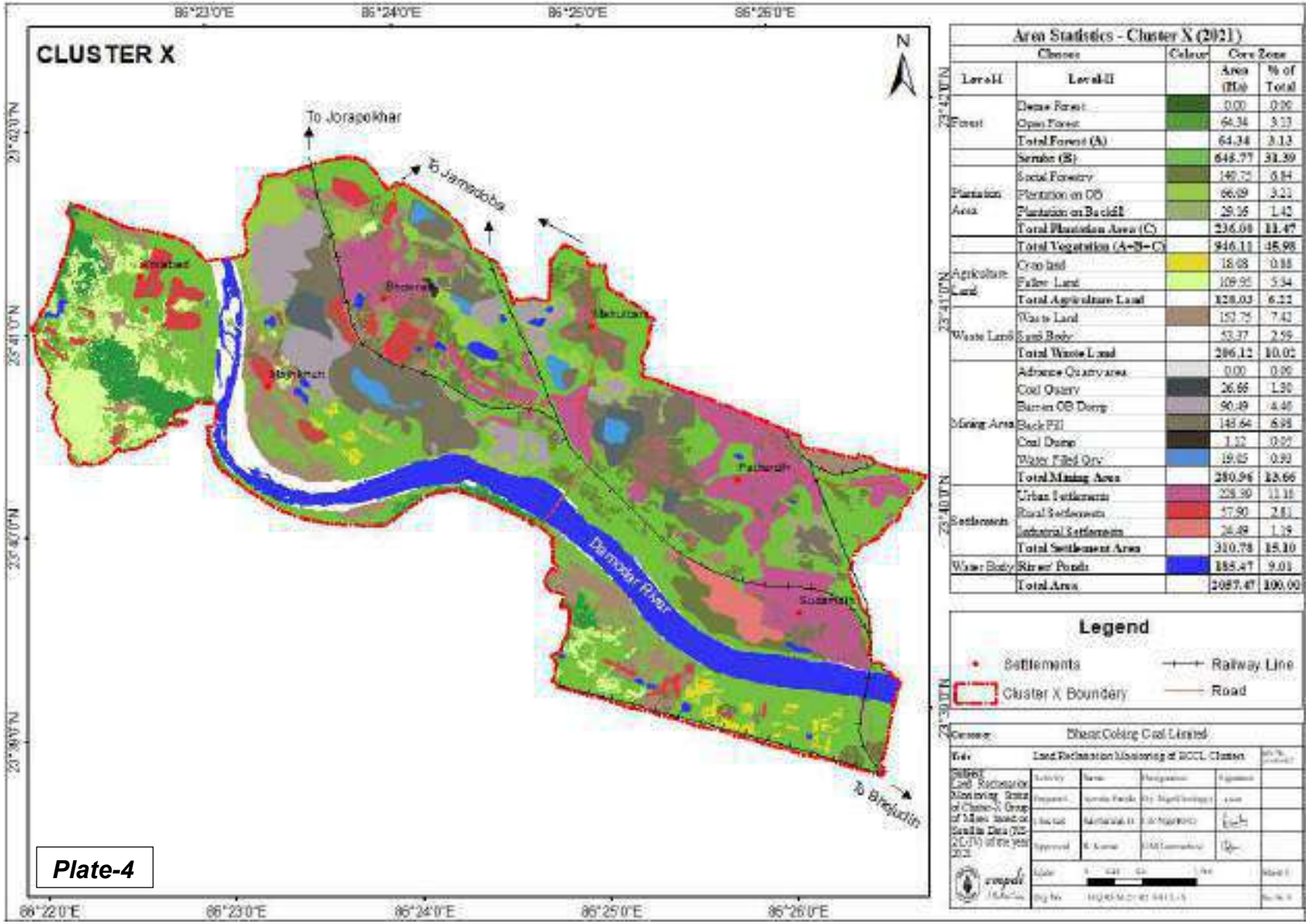
Customer	Bharat Coking Coal Limited
Title	Land Reclamation Monitoring of BCCL Clusters
Subject	Land Reclamation Monitoring Status of Cluster-VII Group of Mines based on Satellite Data (RS-2/LISS IV) of the year 2021

Activity	Name	Designation	Signature
Prepared	Ankita Dutta	Dy. Mgr(Geology)	
Checked	Hariharan. D	Ch. Mgr(RSG)	
Approved	S. Kumar	GM(Geomatics)	

Scale: 0 0.25 0.5 1 Km

Drg No: HQ/RSG/21.22/A4/CL-VII

Sheet 1



Classes		Colour	Core Zone	
Level-I	Level-II		Area (Ha)	% of Total
Forest	Dense Forest		0.00	0.00
	Open Forest		64.34	3.13
	Total Forest (A)		64.34	3.13
	Scrubs (B)		648.77	31.39
Plantation Area	Social Forestry		140.75	6.84
	Plantation on OB		66.09	3.21
	Plantation on Backfill		29.36	1.42
	Total Plantation Area (C)		236.00	11.47
	Total Vegetation (A+B+C)		948.11	45.98
Agriculture Land	Crop land		18.08	0.88
	Fallow Land		109.95	5.34
	Total Agriculture Land		128.03	6.22
Waste Land	Waste Land		152.75	7.42
	Sand Body		53.37	2.59
	Total Waste Land		206.12	10.02
Mining Area	Advance Quarry area		0.00	0.00
	Coal Quarry		26.66	1.30
	Barren OB Dump		90.49	4.40
	Back Fill		143.64	6.98
	Coal Dump		1.12	0.05
	Water Filled Qry		19.05	0.93
	Total Mining Area		280.96	13.66
Settlements	Urban Settlements		228.39	11.10
	Rural Settlements		57.90	2.81
	Industrial Settlements		24.49	1.19
	Total Settlement Area		310.78	15.10
Water Body	River/ Ponds		185.47	9.01
	Total Area		2057.47	100.00

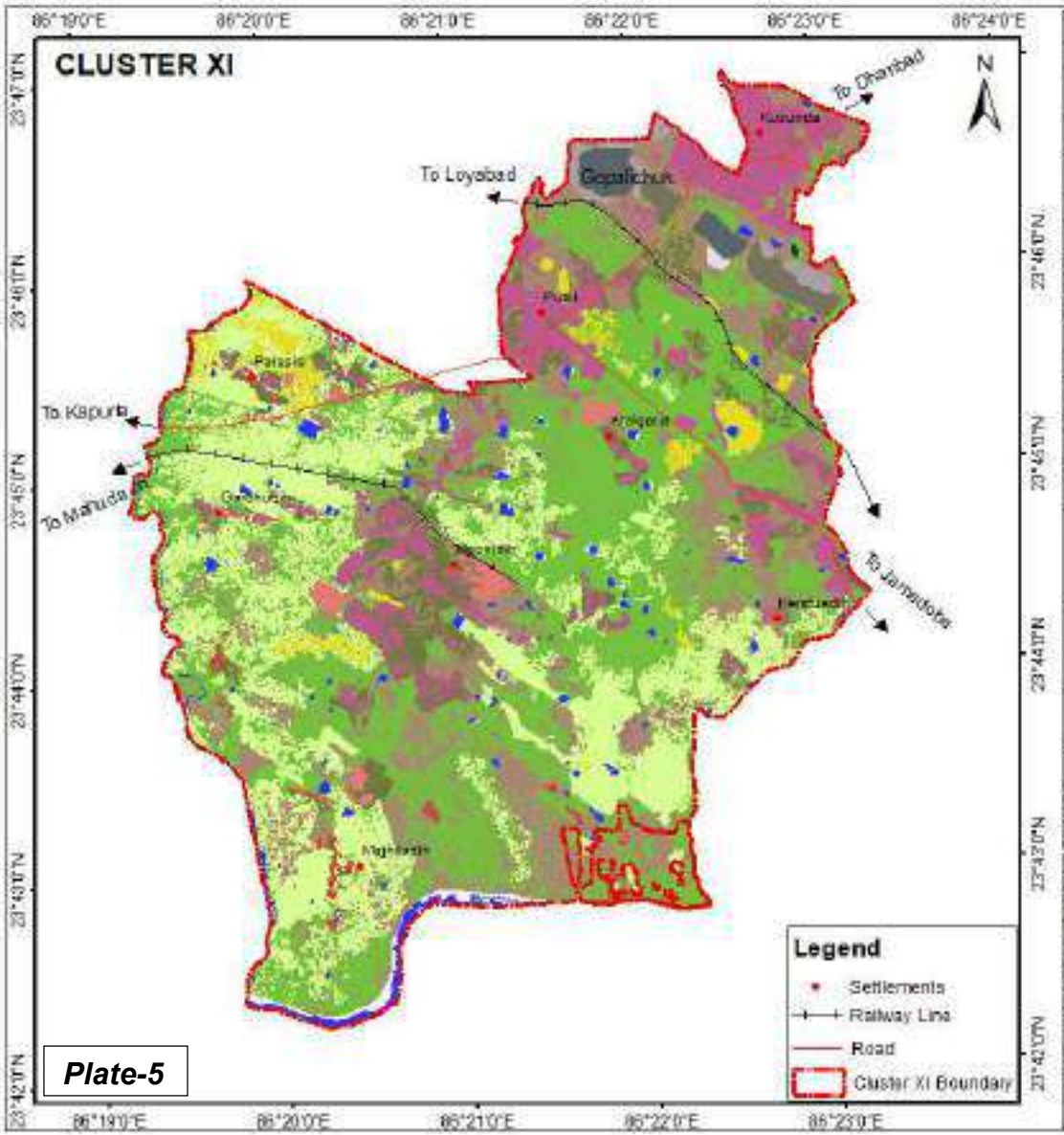


Plate-5

Area Statistics - Cluster XI (2021)

Classes		Colour	Core Zone	
Level-I	Level-II		Area (Ha)	% of Total
Forest	Dense Forest		0.00	0.00
	Open Forest		0.00	0.00
	Total Forest (A)		**0.00**	**0.00**
	Scrubs (B)		**1177.06**	**33.37**
Plantation Area	Social Forestry		187.14	5.31
	Plantation on OB		0.00	0.00
	Plantation on Backfill		0.00	0.00
	Total Plantation Area (C)		**187.14**	**5.31**
	Total Vegetation (A+B+C)		**1364.20**	**38.67**
Agriculture Land	Crop land		81.78	2.32
	Fallow Land		822.67	23.32
	Total Agriculture Land		**904.45**	**25.64**
Waste Land	Waste Land		708.59	20.09
	Sand Body		15.83	0.45
	Total Waste Land		**724.42**	**20.54**
Mining Area	Advance Quarry area		2.67	0.08
	Coal Quarry		31.66	0.90
	Barren OB Dump		22.66	0.64
	Back Fill		30.45	0.86
	Coal Dump		0.73	0.02
	Water Filled Qry		0.00	0.00
	Total Mining Area		**88.17**	**2.50**
Settlements	Urban Settlements		330.58	9.34
	Rural Settlements		14.68	0.42
	Industrial Settlements		31.41	0.89
	Total Settlement Area		**382.67**	**10.85**
Water Body	River/ Ponds		63.67	1.80
	Total Area		**3527.58**	**100.00**

Customer	Bharat Coking Coal Limited				
Title	Land Reclamation Monitoring of BCCL Clusters				
Subject	Activity	Name	Designation	Signature	
Land Reclamation Monitoring Status of Cluster-XI Group of Mines based on Satellite Data (IRS-1A-LISS-IV) of the year 2021	Prepared	Ayesha Parida	Dy Mgr(Geology)		
	Checked	Harbansilal. B	Ch.Mgr(RSC)		
	Approved	R.Kumar	GM(Geomatics)		
	Scale				Sheet 1
	Drg No.	HQ/RSC/2/RL/A4/CL-XI			Rev No.0

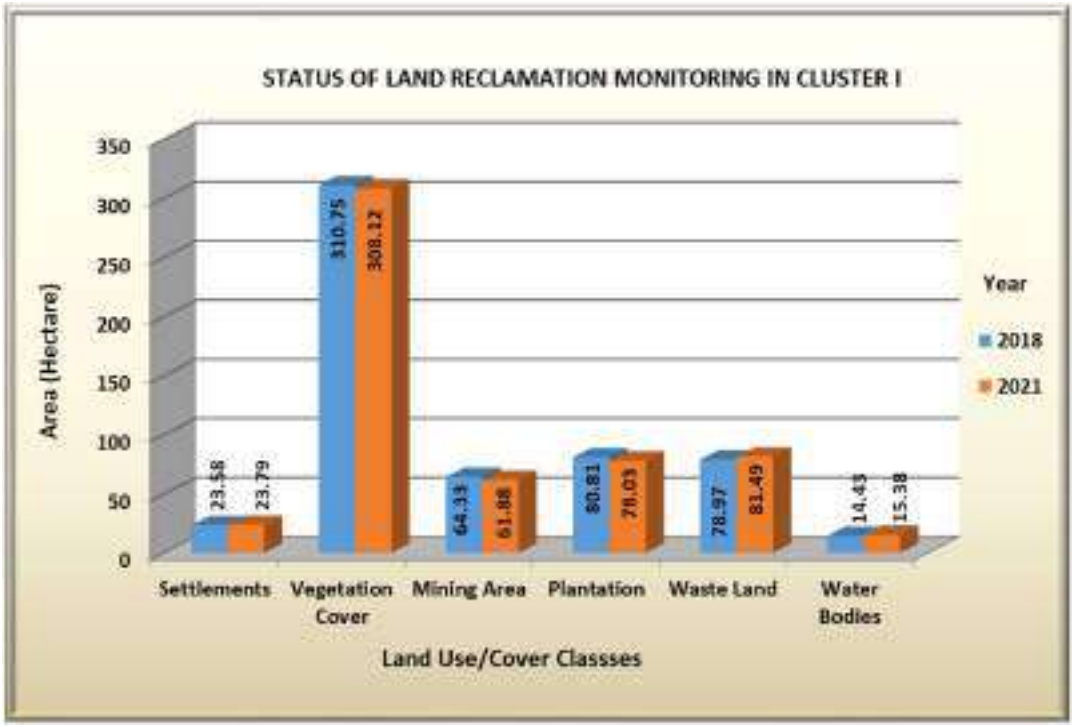


Fig. 3: Land Reclamation Status of Cluster I

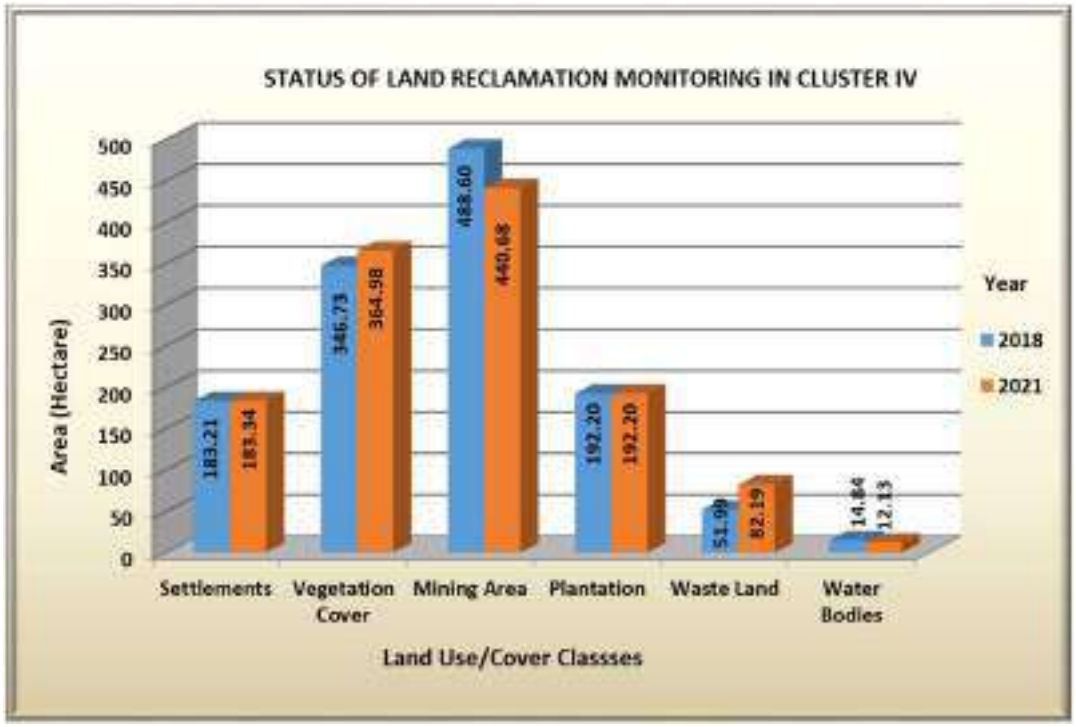


Fig. 4: Land Reclamation Status of Cluster IV

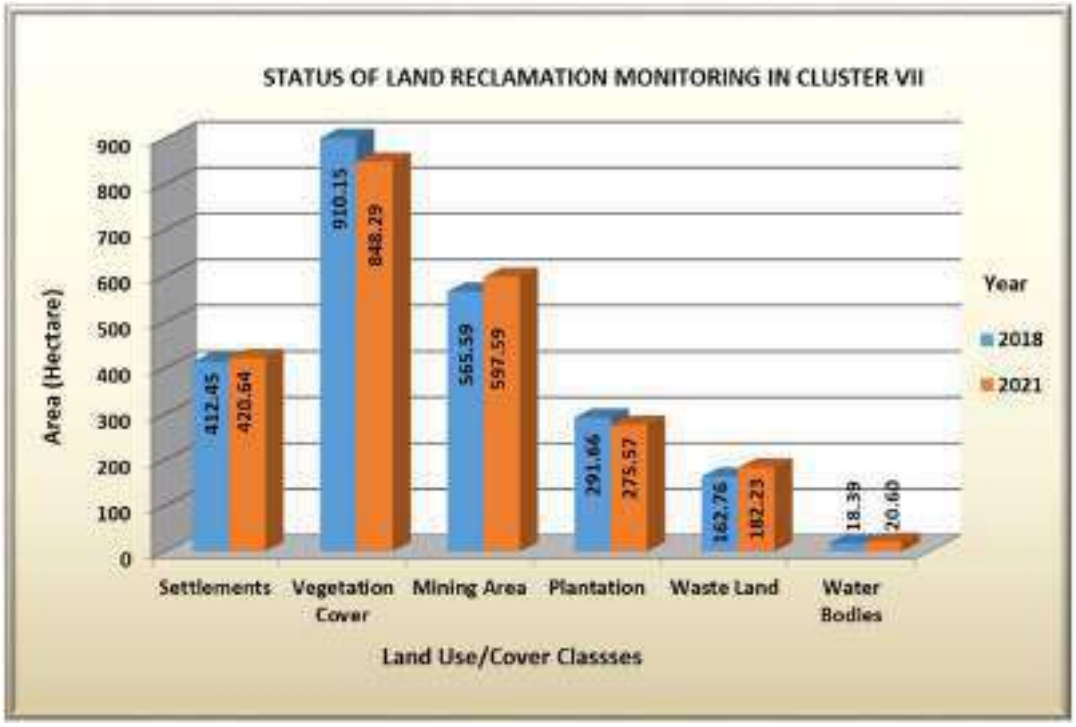


Fig. 5: Land Reclamation Status of Cluster VII

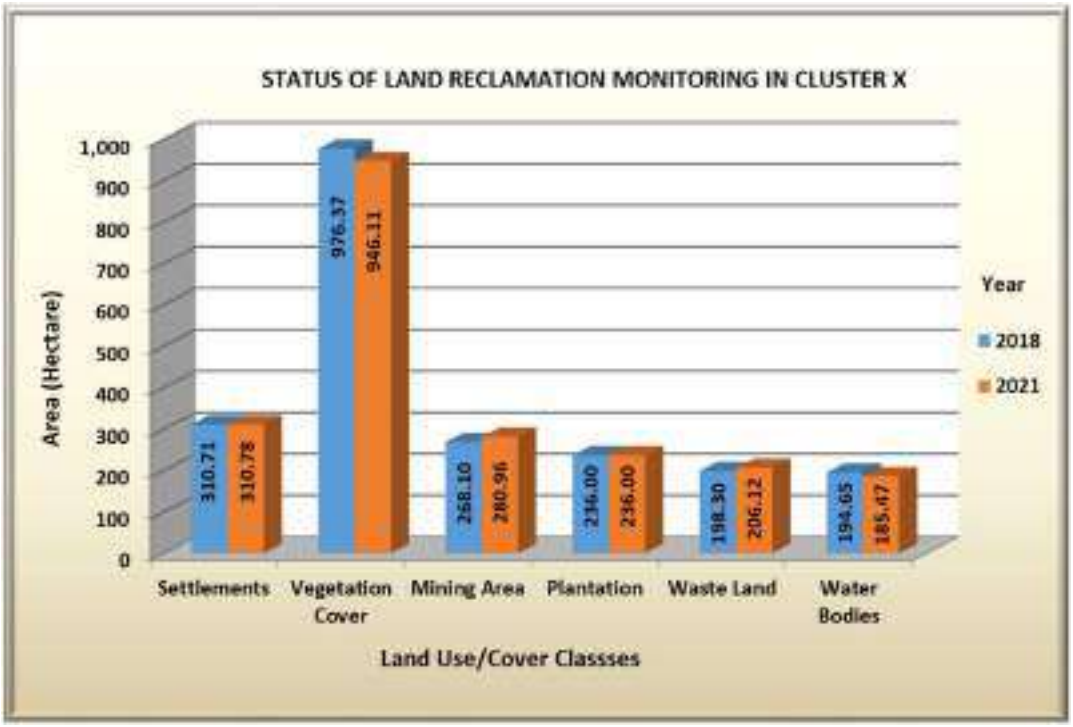


Fig. 6: Land Reclamation Status of Cluster X

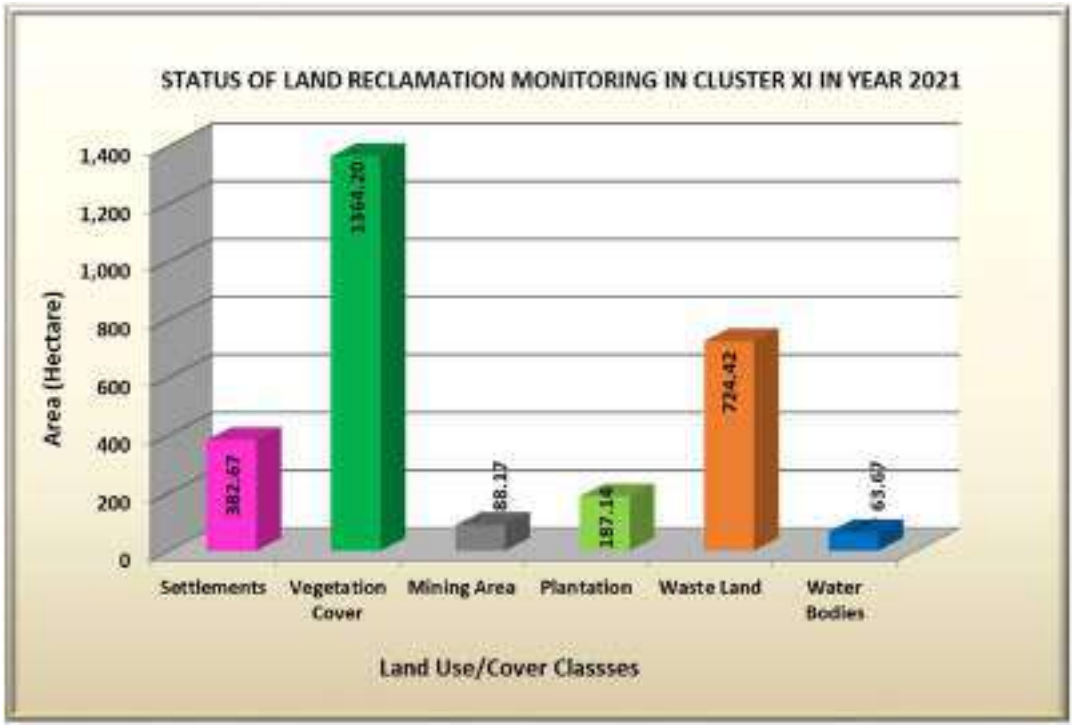


Fig. 7: Land Reclamation Status of Cluster XI



Photo 1: Social Forestry Plantation in Cluster XI



Photo 2: Ecological Restoration Site in Cluster I



Photo 3: Plantation on OB Dump in Cluster I



Photo 4: Plantation on OB Dump in Cluster IV



Photo 5: Parasnath Udyaan in Cluster IV



Photo 6: Road side Plantation in Cluster VII



Photo 7: Plantation on OB Dump in Cluster X

Top Soil Dump is demarcated
81400E
107200N
B6
B5
B4
B7
B8
B.H NO. A.P.-79 DIA =150mm DIP= 286.00m
B.H NO. 4 SURFACE TO 10 SEAM DIA =150mm DIP= 34.67m
AP15-45 AIR SHAFT UP TO 10 SEAM DEP=17.88
AIRSHAFT
B.H AP.-41
D. B. ROAD
H.T. LINE 11 KV
12 SEAM INC FILLED UP
189.00 m
183.512
188.722
176.071
187.305
181.829
192.653
171.616
XI Seam
81800E
QUARTER
FLAT
BUNG
RLY QRT
RLY OHT
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RLY QR

Bharat Coking Coal Ltd.
(*A Subsidiary of Coal India Limited)*
Office of the General Manager, Katras Area
P.O. KATRAS, P.S.- Jogta, Dhanbad-828121
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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 mriti Upwan, Gaslitand	Departmentally	
2020-21	1	Keshalpur, Sneh Smriti Upwan site, AKWMC	Departmentally	
2020-21	0.5	Parasnath udyan		Plantation done over extended portion of Parasnath Udhyan
2020-2021	11	AKWMC	By DFO, Dhanbad	
2021-2022	13	KCC	By DFO, Dhanbad	
2022-23	*4.5*	*AKWMC*	*Depatmentally*	
2023-24	*2.5*	*AKWMC*	*Departmentally*	

In FY 2024-25 total 2.4 Ha plantation has been done departmentally.Apart of that total 2285 nos of gabion plantation has also been done in the above mentioned period.

CHAPTER - XII

PROGRESSIVE AND FINAL MINE CLOSURE PLAN

12.0 MINE CLOSURE PLANNING

12.1 OBJECTIVES OF CLOSURE PLANNING

Mine closure planning has to be carried out at the starting of the mine and needs periodic reviewing and revision during its life cycle to cope with the geo-technical constraints, safety and economic risks, social and environmental challenges. Various other objectives are as follows:

- To allow a productive and sustainable after-use of the site which is acceptable to the mine owner and the regulatory authority;
- To protect public health and safety;
- To alleviate or eliminate environmental damage and thereby encourage environmental sustainability;
- To minimize adverse socio-economic impacts.

12.2 DIFFERENT ASPECTS OF MINE CLOSURE PLANNING

The mine closure planning broadly involves the following aspects:

(a) <u>Technical aspects:</u>

The following technical aspects would be reviewed in the final mine closure planning. Details can be worked in closure plans envisaged to be prepared.

- **Safety hazards including management of fire and subsidence**: In the mine closure plan, action will be taken to cover all the safety aspects including management of fire & subsidence and mine inundation.

- **Management of Pit Slopes:** During operation of the mine, overall slope will be maintained at an angle not exceeding 22^0-28^0. Vegetation cover will also be provided along the slopes to arrest any failure.

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.

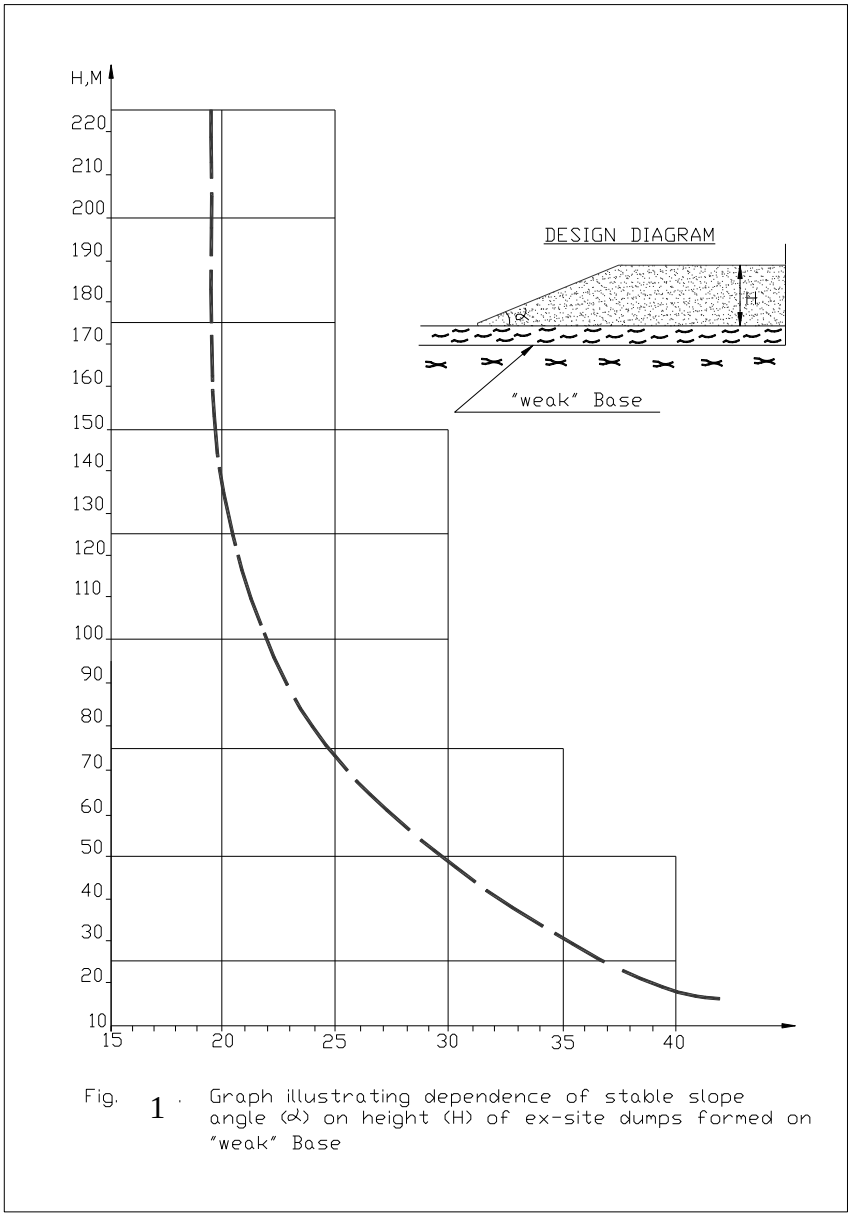


Fig. 1 . Graph illustrating dependence of stable slope angle (α) on height (H) of ex-site dumps formed on "weak" Base

Backfilling has already started in the OCP and the final level of reclaimed backfill will be matched with the levels of surrounding areas leaving a final residual void which will also serve as a lagoon which may be utilised as water reservoir for the locality. Most of the back filled area shall be afforested by selecting proper plant species in consultation with State Forest Department. A part of the back filled area would also be developed for agricultural purpose with the help of the concerned State Authority.

- **Management of hydrology and hydro-geology**: In the mine closure plan, the surface flow pattern of precipitation and mine water would be clearly developed and water channel suitably laid down so that it does not disturb the general hydrology of the area.

  Mining operation may reduce the water table of the area. To recharge the water table, it is proposed that the mine water during operation will be discharged into surface water settling tank over flow of settled water from the tank will be used for water sprinkling, plantation, domestic purpose, etc. Therefore, the excess over flow water will be discharged into the nearby river. After closure of the mine vegetation will be grown on the entire vacant area.

- **Details of decommissioning of the infrastructures:** The decommissioning of the various infrastructures developed for the mine like office complex, roads, pipelines and transmission line etc. shall be planned in details so that the land occupied by these infrastructures are released. However, before such decommissioning, the possibility of re-use of these infrastructures for the neighbouring mines shall be explored.

- **Closure of entry to the open-cast mine:** At the end of the mine life, end pit slope within the seam and every exposed mouths of development gallery along the length of the bench / box-cut should be closed with non-combustible material (OB rock & mutti), compacted properly and sprayed with Thermoseal (a mica based sealant).

(b) Environmental aspects

This would include the following:

- **Management of final voids**: In the mine closure plan, voids due to mining are to be dealt and the final land use plan will include filling of the voids for land reclamation where possible and for hydro reclamation where feasible.

- **Reclamation of forests/vegetation:** It is to be ensured that in the final land use plan, all vacant land acquired for the project is afforested.

- **Channelisation of available water:** If the mine is having sufficient water and if on closure, the mine water flows into the surface water courses, channelising this water for surrounding community for their irrigational/domestic uses may be taken up. This can be planned by providing structures involving one time costing.

- **Management of Recharge Areas**: The pre-mining and post mining scenario on the hydrogeological recharge system would be included in the closure plan.

- **Acceptable Surface and Ground Water Flows**: In the final closure plan of the mine, wherever the mine water is likely to flow out to surface and meet the surface water sources; the quality of water from such mines would be assessed and flow pattern designed in the final plan.

(c) Social aspects

The social aspects of land use planning relating to mine closure would include the following:

- **Re-deployment of Workforce:** The company employees will be gainfully engaged in the neighbouring projects after cessation of mining activities.

- **Management of Community Facilities:** In view of the short life of the project no new community facility will be created. However, the existing facilities of adjoining areas will be strengthened.

(d) Financial aspects:

There are two types of Closure, namely, Progressive Mine Closure (Concurrent) and Final Mine Closure. The cost of Progressive Closure activities is realized by levying a cost of 2.50/Te of coal for UG Mines.

The Final Mine closure cost has to deal with the following:

- Cost of closure activities.
- Cost towards organization for executing the closure activities.
- Cost of the post project monitoring.
- Creation of a corpus fund for the final mine closure.

12.3 MINE CLOSURE OBLIGATIONS

There is need to define the liabilities, responsibilities and authorities of the mine management, other regulatory bodies, Central and State Governments after mine closure. Some obligations relating to the Mine Management Companies are as follows:

(a) **Health & Safety :** Regulation Nos. 6, 61, 106, 112 of Coal Mines Regulations, 1957 and its related DGMS Circulars;

(b) **Environment :** Water (Prevention & Control of Pollution) Act, 1974; Air (Prevention & Control of Pollution) Act, 1981; Environmental (Protection) Act, 1986 and Environmental Protection (Amendment) Rule, 2000; DGMS Directives on Noise & Ground Vibration;

(c) **Forest :** Forest (Conservation) Act, 1980.

(d) **Rehabilitation :** CIL's policy, however, applicable for land oustees only.

(e) **Decommissioning/asset disposal, etc.**

12.4 IMPACT ASSESSMENT REMEDIAL MEASURES

Post-Mining Land Use Plan has been shown in Chapter IX. Environmental Impact on Landscape, Water Source, air and noise pollution during mine life has been discussed earlier. It is imperative that the environmental monitoring may be continued for 3 years after closure of UG in order to assess corrective measures to be implemented to sustain pre-mining ecosystem and environment in the core and buffer zone (to the extent possible).

12.5 STAKEHOLDERS INVOLVEMENT

Various stakeholders effected due to mine closure need to be identified and they may be as follows :

The Company	:	Employees, Management & Stakeholders
The Community	:	Local business and service providers, landholders, neighbours and nearby residents, local Government and NGOs and Community Groups.
The State	:	The State Government. The Central Government and concerned Government Agencies.

There is need of regular consultations between the stakeholders to evolve the needs of the stakeholders and their involvement in the process.

12.6 CLOSURE ACTION PLAN

Closure planning is a whole-of-life exercise that begins at the start of a mine and continues till post-closure. The dynamic nature of closure planning requires regular and critical review to reflect changing circumstances as a result of any operational change, new regulation, and new technology and remain flexible enough to cope with unexpected events.

The following steps have to be undertaken in relation to Mine Closure Planning:

- Prior to the surface demolition/restoration a surface audit should be undertaken on all surface structures, spoil heaps, lagoons, etc. to assess whether there are any hazardous materials that could cause problems; viz. explosives, chemicals, etc. A list of surface assets should be prepared and made available to potential purchasers, prospective purchasers could be invited and asked to submit sealed bids, this could ensure that the sale of assets give better financial gain.
- In order to identify potential impact, necessary hydro-geological studies into post-mining ground water recharge have to be done.
- Work force on roll of BCCL may be re-deployed for gainful utilization in the same or other mines of BCCL.
- As a detailed component of the Closure Plan, a Decommissioning Plan is to be developed towards the final stages preferably 5 years prior to tentative closure of the mine. Once established, it may be updated annually.

12.7 PROTECTIVE MEASURES TO BE TAKEN

Protective measures must include the following :

- The protection of mine Entries , building and other structure on the project site against access by unauthorized persons;
- The maintenance of all mechanical, hydraulic and waste management system;
- The continuation of all monitoring programmes;
- The control of all contaminated effluents;
- The securing of all petroleum products, chemicals and waste;
- The rendering of all tailings, dams and piles of earth, rock and waste resulting from work done on the project site in a stable and safe condition.

12.8 CLOSURE COSTS

As per MOC guidelines, a corpus escrow account @ ₹ 1.0 lakhs (August, 2009 Price Level) per Ha (for UG) and @ ₹ 6.0 lakhs (for OC) of the project area shall be opened with the coal controller organization to meet the expenses of mine closure. The current Guidelines read as:

"It has been estimated that typically closure cost for an opencast mine will come around Rs. 6.00 lakh per Hectare of the project area and it would be Rs. 1.00 lakh per Hectare for underground mine project area at current price levels (August, 2009) and these rates will stand modified based on Wholesale Price Index as notified by Government of India from time to time".

There is already a mine closure plan approved by the 305th BCCL Board, Dated 12.03.2014. According to the approved mine closure plan the total life of the mine was considered to be 7 years and total mine closure cost up to the considered life of the mine was calculated to be ₹ 1484.114 Lakhs. As per the directives ₹ 814.801 (Principal amount) Lakhs were deposited in to the Escrow Account Number 150100009051 by 31st March 2017. Further, the same escrow account shall be continued for AKWM Colliery and the amount already accrued shall be adjusted against the new closure cost calculated.

A revised mine closure plan is prepared incorporating all the major current and proposed changes in the mining activities. As per the data furnished by the mine/area, the project area and leasehold area in respect AKWM Colliery is the same and the closure cost is calculated accordingly. The mine closure cost for the revised mine closure plan is calculated in following way:

In AKWM colliery, the existing leasehold area and project area is 325.10 Ha. An area of 207.50 Ha is required for opencast operations in the leasehold of AKWMC. Also, **4.27 Ha** of the Project Area is now abandoned quarry. Thus, out of the project area of 325.10 Ha, **211.77 Ha** (207.50+4.27) area has been considered for the calculation of closure cost **as per Open cast norms** and the remaining **113.33 Ha** has been considered for the calculation of closure cost of the area as **per Underground norms**.

The overlapping area (where UG & OC operations have been done in different vertical levels) has been considered for calculation of closure cost as per opencast norms.

12.8.1 The total amount that shall be further deposited for final mine closure activities of **AKWM Colliery** in case of underground workings during the considered period of 28 years stands out to be **₹ 276.798 lakhs** and in case of opencast workings during the considered period of 8 years stands out to be **₹ 1228.382 lakhs** as per the present status of the mine.

Table No. 12.1 Break-Up cost of Mine Closure of AKWM Colliery

Year	UG Section	OC Section	Total
1	4.739	128.638	133.378
2	4.976	135.07	140.047
3	5.225	141.824	147.049
4	5.487	148.915	154.402
5	5.761	156.361	162.122
6	6.049	164.179	170.228
7	6.351	172.388	178.739
8	6.669	181.007	187.676
9	7.002		7.002
10	7.352		7.352
11	7.720		7.72
12	8.106		8.106
13	8.511		8.511
14	8.937		8.937
15	9.384		9.384
16	9.853		9.853
17	10.346		10.346
18	10.863		10.863
19	11.406		11.406
20	11.976		11.976
21	12.575		12.575
22	13.204		13.204
23	13.864		13.864
24	14.557		14.557
25	15.285		15.285
26	16.050		16.050
27	16.852		16.852
28	17.695		17.695
Total	**276.798**	**1228.382**	**1505.18**

The amount already deposited in the escrow account will also be available for mine closure activities and should be included to arrive at the total funds available for Mine Closure Activities.

Table No. 12.2 Total Amount available for Mine Closure Activities of AKWMColliery

	Amount (in ₹ lakhs)	
	UG Section	**OC Section**
Amount Already Deposited in Escrow Account	29.157	785.644
Amount to be Deposited in the Escrow Account in the Future	276.798	1228.382
Total Amount available for Mine Closure Activities	**305.955**	**2014.026**

12.11.2 Based on the existing mine closure planning norms, the above calculated cost at Final WPI of January 2017 on mine closure may be tentatively grouped under different heads as given in Table No. 12.3 A and 12.3 B for underground and opencast respectively, as per guidelines of CMPDI(HQ).

Table 12.3 A Break up costs of Mine Closure Activities for AKWM Colliery (Underground)

Sl. No.	Activity	Mine Closure Cost (₹ in Lakhs)
A	**Dismantling of Structures**	
	Service Buildings	10.708
	Residential Buildings	32.370
	Industrial Structures like CHP, Workshop, field sub-station, cap lamp room, haulage, fan installation etc.	19.367
B	**Permanent Sealing of mine entries(incline mouth and air shaft)**	
	Sealing of incline mouths and air shafts	16.277
C	***Subsidence Management**	14.533
D	**LANDSCAPING**	
	Landscaping of the cleared land for improving its esthetic	26.924
E	***Plantation**	
	Plantation over the cleared area obtained after dismantling and on other barren spaces	39.774
F	**Monitoring/Testing of parameters for three years**	
	Air Quality	20.897
	Water Quality	19.398
G	***Enterpreneuship Development(Vocational/skill development training for sustainable income of affected people**	23.406
H	***Miscellaneous and other mitigative measures**	44.669
I	**Manpower Cost for Supervision**	37.632
	TOTAL	**305.955**

Note: * : To be covered under Progressive Mine Closure activities also

Table 12.3 B Break up costs of Mine Closure Activities for AKWM Colliery (Opencast including Abandoned Quarry)

Sl. No.	Activity	Mine Closure Cost (₹ in Lakhs)
A	**Dismantling of Structures**	
	Service Buildings	4.028
	Residential Buildings	53.774
	Industrial Structures like CHP, Workshop, field sub-station, etc.	6.042
B	**Permanent Fencing of Mine Void and other dangerous area**	
	Random Ruble masonry of height 1.2 metre including levelling up in cement concrete 1:6:12 in mud mortar	30.210
C	**Grading of Highwall slopes**	
	Levelling and grading of highwall slopes	35.648
D	***OB Dump Reclamation**	
	Handling/Dozing of external OB Dump into mine void	1785.635
	Bio-Reclamation including soil spreading, plantation and maintenance	8.056
E	**LANDSCAPING**	
	Landscaping of the cleared land for improving its esthetic	6.042
F	***Plantation**	
	Plantation over area obtained after dismantling	10.070
	Plantation around fencing	4.028
	Plantation over the cleared external OB Dump	0.403
G	**Monitoring/Testing of parameters for three years**	
	Air Quality	4.431
	Water Quality	4.028
H	***Enterpreneuship Development(Vocational/skill development training for sustainable income of affected people**	5.236
I	***Miscellaneous and other mitigative measures**	40.281
J	**Manpower Cost for Supervision**	16.112
	TOTAL	**2014.026**

Note: * : To be covered under Progressive Mine Closure activities also

12.8.3 Progressive Closure Costs

The break up costs of Progressive Closure Activities undertaken by BCCL in AKWM Colliery as per earlier approved Mine Closure Plan is given in the following table:

Table 12.4 Break up costs of Mine Closure Activities for AKWM Colliery (earlier approved) and Expenditure incurred during Progressive Closure Activities

Sl. No.	Activity	Mine Closure Cost (₹ in Lakhs)			Amount Claimed (Lakhs) (2014-15)	Amount Claimed (Lakhs) (2015-16)
		OC	UG	Total		
A	**Dismantling of Structures**					
	Service Buildings	2.968	15.730	**18.698**		
	Residential Buildings	39.626	47.549	**87.175**		
	Industrial Structures like CHP, Workshop, field sub-station, etc.	4.452	28.449	**32.901**		
B	**Permanent Fencing of Mine Void and other dangerous area**					
	Random Ruble masonry of height 1.2 metre including levelling up in cement concrete 1:6:12 in mud mortar	22.262		**22.262**		
C	**Permanent Sealing of mine entries(incline mouth and air shaft)**					
	Sealing of incline mouths and air shafts		23.909	**23.909**		
D	**Subsidence Management**		21.348	**21.348**		
E	**Grading of Highwall slopes**					
	Levelling and grading of highwall slopes	26.269		**26.269**		
F	**OB Dump Reclamation**			**0.000**		
	Handling/Dozing of external OB Dump into mine void	1315.815		**1315.815**		1524.638
	Bio-Reclamation including soil spreading, plantation and maintenance	5.936		**5.936**		
G	**LANDSCAPING**					
	Landscaping of the cleared land for improving its esthetic	4.452	39.550	**44.002**		2.071
H	**Plantation**					
	Plantation over area obtained after dismantling	7.421	58.425	**65.846**		
	Plantation around fencing and around quarry area	2.968		**2.968**	67.94789	
	Plantation over the cleared external OB Dump	0.297		**0.297**		82.844
I	**Monitoring/Testing of parameters for three years**					
	Air Quality	3.265	30.696	**33.961**		
	Water Quality	2.968	28.494	**31.462**		
J	**Enterpreneuship Development(Vocational/skill development training for sustainable income of affected people**	3.859	34.381	**38.240**	16.62778	8.285
K	**Miscellaneous and other mitigative measures**	29.682	65.616	**95.298**		
L	**Manpower Cost for Supervision**	11.873	55.279	**67.152**		
	TOTAL(%)	**1484.113**	**449.426**	**1933.539**	**84.57567**	**1617.838**

The estimate of total expenditure incurred upon the progressive closure activities are provided by BCCL.

CHAPTER - XII

PROGRESSIVE AND FINAL MINE CLOSURE PLAN

12.0 MINE CLOSURE PLANNING

12.1 OBJECTIVES OF CLOSURE PLANNING

Mine closure planning has to be carried out at the starting of the mine and needs periodic reviewing and revision during its life cycle to cope with the geo-technical constraints, safety and economic risks, social and environmental challenges. Various other objectives are as follows:

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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.
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- **Closure of entry to the open-cast mine:** Not applicable.

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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.

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As per MOC guidelines, a corpus escrow account @ ₹ 1.0 lakhs (August, 2009 Price Level) per Ha (for UG) and @ ₹ 6.0 lakhs (for OC) of the project area shall be opened with the coal controller organization to meet the expenses of mine closure. The current Guidelines read as:

"It has been estimated that typically closure cost for an opencast mine will come around Rs. 6.00 lakh per Hectare of the project area and it would be Rs. 1.00 lakh per Hectare for underground mine project area at current price levels (August, 2009) and these rates will stand modified based on Wholesale Price Index as notified by Government of India from time to time".

There is already a mine closure plan approved by the 305th BCCL Board, Dated 12.03.2014. According to the approved mine closure plan the total life of the mine was considered to be 13 years and total mine closure cost up to the considered life of the mine was calculated to be Rs 361.094 Lakhs. As per the directives Rs.112.46 Lakhs (Principal amount) were deposited in to the Escrow Account Number 150100009053 by 31st March 2017. **Further, the same escrow account shall be continued for AAR Colliery.**

A revised mine closure plan is prepared incorporating all the major current and proposed changes in the mining activities. As per the data furnished by the mine/area, the project area and leasehold area in respect of AAR Colliery differs and is given below and the closure cost is calculated accordingly. The mine closure cost for the revised mine closure plan is calculated in following way:

In AAR colliery, the existing leasehold area is 254.64 Ha. As per data furnished by the mine, the present Project area is 175.57 Ha excluding the area falling under DC Railway line, DB road and River and Barrier (79.07 Ha). **An area of 91.34 Ha is required for opencast operations** in the leasehold of AARC. Based on the land use of TOR, 64 Ha is abandoned, not backfilled quarry. However, as per the data furnished by the mine/area, only **1.56 Ha** of the Project Area is now abandoned quarry which is not backfilled at present. **Thus, out of the project area of 175.57 Ha, 92.90 (91.34+1.56) Ha area has been considered for the calculation of closure cost as per Open cast norms and the remaining 82.67 Ha has been considered for the calculation of closure cost of the area as per Underground norms.**

The overlapping area (where UG & OC operations have been done in different vertical levels) has been considered for calculation of closure cost as per opencast norms.

The money deposited in the Escrow Account has to deal with the following:

- Cost of closure activities.
- Cost towards organization for executing the closure activities.
- Cost of the post project monitoring.
- Creation of a corpus fund for the final mine closure

12.11.1 Thus, total amount that shall be further deposited for mine closure activities of **AAR Colliery** in case of underground workings during the considered period of 21 years stands out to be **₹ 64.83 lakhs** and in case of opencast workings during the considered period of 8 years stands out to be **₹ 903.250 lakhs** as per the present status of the mine.

Table No. 12.1 Break-Up cost of Mine Closure of AAR Colliery

Year	UG Section	OC Section	Total
1	1.815	95.45	97.265
2	1.906	100.223	102.129
3	2.001	105.234	107.235
4	2.101	110.496	112.597
5	2.206	116.02	118.226
6	2.316	121.821	124.137
7	2.432	127.912	130.344
8	2.554	134.308	136.862
9	2.682		2.682
10	2.816		2.816
11	2.956		2.956
12	3.104		3.104
13	3.259		3.259
14	3.422		3.422
15	3.594		3.594
16	3.773		3.773
17	3.962		3.962
18	4.160		4.16
19	4.368		4.368
20	4.586		4.586
21	4.816		4.816
	64.830	**911.464**	**976.294**

The amount already deposited in the escrow account will also be available for mine closure activities and should be included to arrive at the total funds available for Mine Closure Activities.

Table No. 12.2 Total Amount available for Mine Closure Activities of AAR Colliery

	Amount (in ₹ lakhs)	
	UG Section	**OC Section**
Amount Already Deposited in Escrow Account	79.958	32.500
Amount to be Deposited in the Escrow Account in the Future	64.830	911.464
Total Amount available for Mine Closure Activities	**144.788**	**943.964**

12.11.2 Based on the existing mine closure planning norms, the above calculated cost at Final WPI of January 2017 on mine closure may be tentatively grouped under different heads as given in Table No. 12.3 A and 12.3 B for underground and opencast respectively, as per guidelines of CMPDI(HQ).

Table 12.3 A Break up costs of Mine Closure Activities for AAR Colliery (Underground)

Sl. No.	Activity	Mine Closure Cost (₹ in Lakhs)
A	**Dismantling of Structures**	
	Service Buildings	5.068
	Residential Buildings	15.319
	Industrial Structures like CHP, Workshop, field sub-station, cap lamp room, haulage, fan installation etc.	9.165
B	**Permanent Sealing of mine entries(incline mouth and air shaft)**	
	Sealing of incline mouths and air shafts	7.703
C	***Subsidence Management**	6.877
D	**LANDSCAPING**	
	Landscaping of the cleared land for improving its esthetic	12.741
E	***Plantation**	
	Plantation over the cleared area obtained after dismantling and on other barren spaces	18.822
F	**Monitoring/Testing of parameters for three years**	
	Air Quality	9.889
	Water Quality	9.180
G	***Enterpreneuship Development(Vocational/skill development training for sustainable income of affected people**	11.076
H	***Miscellaneous and other mitigative measures**	21.139
I	**Manpower Cost for Supervision**	17.809
	TOTAL	**144.788**

Note: * : To be covered under Progressive Mine Closure activities also

Table 12.3 B Break up costs of Mine Closure Activities for AAR Colliery (Opencast)

Sl. No.	Activity	Mine Closure Cost (₹ in Lakhs)
A	**Dismantling of Structures**	
	Service Buildings	1.888
	Residential Buildings	25.204
	Industrial Structures like CHP, Workshop, field sub-station, etc.	2.832
B	**Permanent Fencing of Mine Void and other dangerous area**	
	Random Ruble masonry of height 1.2 metre including levelling up in cement concrete 1:6:12 in mud mortar	14.159
C	**Grading of Highwall slopes**	
	Levelling and grading of highwall slopes	16.708
D	***OB Dump Reclamation**	
	Handling/Dozing of external OB Dump into mine void	836.918
	Bio-Reclamation including soil spreading, plantation and maintenance	3.776
E	**LANDSCAPING**	
	Landscaping of the cleared land for improving its esthetic	2.832
F	***Plantation**	
	Plantation over area obtained after dismantling	4.720
	Plantation around fencing	1.888
	Plantation over the cleared external OB Dump	0.189
G	**Monitoring/Testing of parameters for three years**	
	Air Quality	2.077
	Water Quality	1.888
H	***Enterpreneuship Development(Vocational/skill development training for sustainable income of affected people**	2.454
I	***Miscellaneous and other mitigative measures**	18.879
J	**Manpower Cost for Supervision**	7.552
	TOTAL	**943.964**

Note: * : To be covered under Progressive Mine Closure activities also

12.8.3 Progressive Closure Costs

The break up costs of Progressive Closure Activities undertaken by BCCL in AAR Colliery as per earlier approved Mine Closure Plan is given in the following table:

Table 12.4 Break up costs of Mine Closure Activities for AAR Colliery (earlier approved) and Expenditure incurred during Progressive Closure Activities

Sl. No.	Activity	Mine Closure Cost (₹ in Lakhs)	Amount Claimed (Lakhs) (2014-15)	Amount Claimed (Lakhs) (2015-16)
A	**Dismantling of Structures**			
	Service Buildings	11.501		4.2
	Residential Buildings	34.765		
	Industrial Structures like CHP, Workshop, field sub-station, cap lamp room, haulage, fan installation etc.	20.8		
B	**Permanent Sealing of mine entries(incline mouth and air shaft)**			
	Sealing of incline mouths and air shafts	17.481		
C	**Subsidence Management**	15.608	2.69877	2.55357
D	**LANDSCAPING**			
	Landscaping of the cleared land for improving its esthetic	28.916		66.08629
E	**Plantation**			
	Plantation over the cleared area obtained after dismantling and on other barren spaces	42.717		
F	**Monitoring/Testing of parameters for three years**			
	Air Quality	22.443		
	Water Quality	20.833		
G	**Enterpreneuship Development(Vocational/skill development training for sustainable income of affected people**	25.137	74.94412	8.69345
H	**Miscellaneous and other mitigative measures**	47.975		
I	**Manpower Cost for Supervision**	40.417		
J	**Reclamation of Abandoned Quarry**	32.5		
	TOTAL	**361.094**	**77.64289**	**81.53331**

The estimate of total expenditure incurred upon the progressive closure activities are provided by BCCL.

CHAPTER - XII

PROGRESSIVE AND FINAL MINE CLOSURE PLAN

12.0 MINE CLOSURE PLANNING

12.1 OBJECTIVES OF CLOSURE PLANNING

Mine closure planning has to be carried out at the starting of the mine and needs periodic reviewing and revision during its life cycle to cope with the geo-technical constraints, safety and economic risks, social and environmental challenges. Various other objectives are as follows:

- To allow a productive and sustainable after-use of the site which is acceptable to the mine owner and the regulatory authority;
- To protect public health and safety;
- To alleviate or eliminate environmental damage and thereby encourage environmental sustainability;
- To minimize adverse socio-economic impacts.

12.2 DIFFERENT ASPECTS OF MINE CLOSURE PLANNING

The mine closure planning broadly involves the following aspects :

(a) Technical aspects;

The following technical aspects would be reviewed in the final mine closure planning. Details can be worked in closure plans envisaged to be prepared.

Safety hazards including management of fire and subsidence: In the mine closure plan, action will be taken to cover all the safety aspects including management of fire & subsidence and mine inundation.

Management of Pit Slopes: During operation of the mine, overall slope will be maintained at an angle not exceeding 22^0-28^0. Vegetation cover will also be provided along the slopes to arrest any failure.

As regards stability of back-filled dumps, the final level of reclaimed backfill will be matched with the levels of surrounding areas leaving a final residual void which will serve as a lagoon which may be utilised as water reservoir for the locality.

During operation, the external and internal OB dump will be developed with 40 m berm width and maximum height of 60m in case of external OB dump and the overall dump slope shall not exceed 22 to 28 degrees. The waste dumps will be provided with toe wall and garland drains. The dump will be technically reclaimed and vegetation will be grown after spreading the top soil. The above measures will prevent slope failure and improve the aesthetic value.

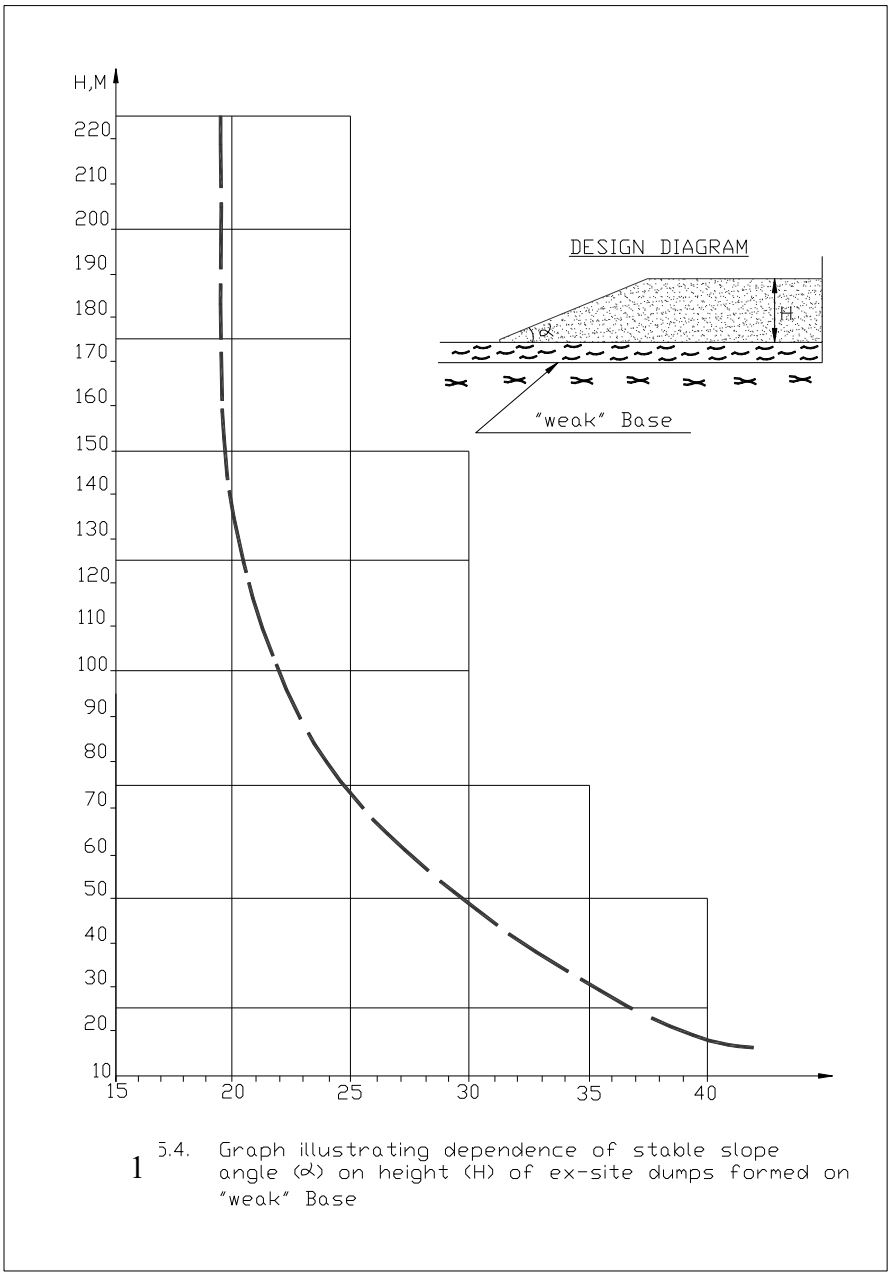


Fig. 5.4. Graph illustrating dependence of stable slope angle (α) on height (H) of ex-site dumps formed on "weak" Base

Backfilling has already started in the OCP and the final level of reclaimed backfill will be matched with the levels of surrounding areas leaving a final residual void which will also serve as a lagoon which may be utilised as water reservoir for the locality. Most of the back filled area shall be afforested by selecting proper plant species in consultation with State Forest Department. A part of the back filled area would also be developed for agricultural purpose with the help of the concerned State Authority.

- **Management of hydrology and hydro-geology**: In the mine closure plan, the surface flow pattern of precipitation and mine water would be clearly developed and water channel suitably laid down so that it does not disturb the general hydrology of the area.

  Mining operation may reduce the water table of the area. To recharge the water table, it is proposed that the mine water during operation will be discharged into surface water settling tank over flow of settled water from the tank will be used for water sprinkling, plantation, domestic purpose, etc. Therefore, the excess over flow water will be discharged into the nearby river. After closure of the mine vegetation will be grown on the entire vacant area..

- **Details of decommissioning of the infrastructures:** The decommissioning of the various infrastructures developed for the mine like office complex, roads, pipelines and transmission line etc. shall be planned in details so that the land occupied by these infrastructures are released. However, before such decommissioning, the possibility of re-use of these infrastructures for the neighboring mines shall be explored.

i) **Closure of entry to the open-cast mine :** After closure of the mining activities, all the entries to the mine will be effectively sealed off to avoid any accident and to prevent access to any unauthorized person. The area that is not reclaimed shall be properly fenced/ sealed to prevent any unauthorized entry into the area. However, the guidelines / instructions from DGMS, if any, will be followed.

(b) Environmental aspects

This would include the following:

- **Management of final voids**: In the mine closure plan, voids due to mining are to be dealt and the final land use plan will include filling of the voids for land reclamation where possible and for hydro reclamation where feasible.

- **Reclamation of forests/vegetation:** It is to be ensured that in the final land use plan, all vacant land acquired for the project is afforested

- **Channelisation of available water:** If the mine is having sufficient water and if on closure, the mine water flows into the surface water courses, channelising this water for surrounding community for their irrigational/domestic uses may be taken up. This can be planned by providing structures involving one time costing

- **Management of Recharge Areas**: The pre-mining and post mining scenario on the hydrogeological recharge system would be included in the closure plan.

- **Acceptable Surface and Ground Water Flows**: In the final closure plan of the mine, wherever the mine water is likely to flow out to surface and meet the surface water sources; the quality of water from such mines would be assessed and flow pattern designed in the final plan.

(c) Social aspects;

The social aspects of land use planning relating to mine closure would include the following:

- **Re-deployment of Workforce:** The company employees will be gainfully engaged in the neighboring projects after cessation of mining activities.

- **Management of Community Facilities:** In view of the short life of the project no new community facility will be created. However, the existing facilities of adjoining areas will be strengthened.

(d) Financial aspects.

Mine Closure activities would be a constant exercise for the mine which would begin with the commencement of mining operations and continue till post closure. The mine closure activities would naturally entail certain expenditures, which will have to be borne by the mine operator. There are two types of Closure, namely, Progressive Mine Closure (Concurrent) and Final Mine Closure. This would cover the activities which are being executed along with normal mining operation and would continue to be executed in course of execution of the project.

The Final Mine closure cost has to deal with the following:

- Cost of closure activities.
- Cost towards organization for executing the closure activities.
- Cost of the post project monitoring.
- Creation of a corpus fund for the final mine closure.

12.3 MINE CLOSURE OBLIGATIONS

There is need to define the liabilities, responsibilities and authorities of the mine management, other regulatory bodies, Central and State Governments after mine closure. Some obligations relating to the Mine Management Companies are as follows :

(a) **Health & Safety :** Regulation Nos. 6, 61, 106, 112 of Coal Mines Regulations, 1957 and its related DGMS Circulars;

(b) **Environment :** Water (Prevention & Control of Pollution) Act, 1974; Air (Prevention & Control of Pollution) Act, 1981; Environmental (Protection) Act, 1986 and Environmental Protection (Amendment) Rule, 2000;

DGMS Directives on Noise & Ground Vibration;

(c) **Forest :**

Forest (Conservation) Act, 1980.

(d) **Rehabilitation :**

CIL's policy, however, applicable for land oustees only.

(e) Decommissioning/asset disposal, etc.

12.4 IMPACT ASSESSMENT REMEDIAL MEASURES

Post-Mining Land Use Plan has been shown in Chapter IX. Environmental Impact on Landscape, Water Source, air and noise pollution during mine life has been discussed earlier. It is imperative that the environmental monitoring may be continued for 3 years after closure of mines in order to assess corrective measures to be implemented to sustain pre-mining ecosystem and environment in the core and buffer zone (to the extent possible).

12.5 STAKEHOLDERS INVOLVEMENT

Various stakeholders effected due to mine closure need to be identified and they may be as follows :

The Company	:	Employees, Management & Stakeholders
The Community	:	Local business and service providers, landholders, neighbours and nearby residents, local Government and NGOs and Community Groups.
The State	:	The State Government. The Central Government and concerned Government Agencies.

There is need of regular consultations between the stakeholders to evolve the needs of the stakeholders and their involvement in the process.

12.6 CLOSURE ACTION PLAN

Closure planning is a whole-of-life exercise that begins at the start of a mine and continues till post-closure. The dynamic nature of closure planning requires regular and critical review to reflect changing circumstances as a result of any operational change, new regulation, and new technology and remain flexible enough to cope with unexpected events.

The following steps have to be undertaken in relation to Mine Closure Planning:

Prior to the surface demolition/restoration a surface audit should be undertaken on all surface structures, spoil heaps, lagoons, etc. to assess whether there are any hazardous materials that could cause problems; viz. explosives, chemicals, etc. A list of surface assets should be prepared and made available to potential purchasers, prospective purchasers could be

invited and asked to submit sealed bids, this could ensure that the sale of assets give better financial gain.

In order to identify potential impact, necessary hydro-geological studies into post-mining ground water recharge have to be done.

Work force on roll of BCCL may be re-deployed for gainful utilization in the same or other mines of BCCL.

As a detailed component of the Closure Plan, a Decommissioning Plan is to be developed towards the final stages preferably 5 years prior to tentative closure of the mine. Once established, it may be updated annually.

12.7 PROTECTIVE MEASURES TO BE TAKEN

Protective measures must include the following :

- The protection of mine Entries , building and other structure on the project site against access by unauthorized persons;
- The maintenance of all mechanical, hydraulic and waste management system;
- The continuation of all monitoring programmes;
- The control of all contaminated effluents;
- The securing of all petroleum products, chemicals and waste;
- The rendering of all tailings, dams and piles of earth, rock and waste resulting from work done on the project site in a stable and safe condition.

12.8 CLOSURE COSTS

As per MOC guidelines, a corpus escrow account @ 6.0 lakhs (August, 2009 Price Level) per Ha of the property leasehold shall be opened with the coal controller organization to meet the expenses of final mine closure. In 7th June 2011, MOC issued a revised guideline to replace the Para 6.2 of the original guidelines issued on 27.08.2009 by the following Para:

"It has been estimated that typically closure cost for an opencast mine will come around Rs. 6.00 lakh per Hectare of the property leasehold and it would be Rs. 1.00 lakh per Hectare for underground mine leasehold at current price levels (August, 2009) and these rates will stand modified based on Wholesale Price Index as notified by Government of India from time to time. The mine closure cost for overlapping area of the mine would be deposited in the Escrow Account as applicable for opencast area and no separate cost for underground portion of the overlapping area is payable".

It is difficult to conclusively predict the mining parameters on a long term basis owing to rapidly changing mining technology, developments in the field of clean coal technologies and R&D activities in development of alternative energy sources.

As per the latest Guidelines issued by the MoC, GoI(dt. 07.01.2013) the *"annual closure cost is to be computed considering the total project area at the above mentioned rates and dividing the same by the entire life of the mine in years for new projects and balance life of mine in years for operating/existing mines."*

In this Mining plan only opencast operation is taken into consideration and therefore Mine closure cost is computed based on opencast operation. At present u/g operation is closed due to fire and water, the life based on u/g working is not considered for determination of Mine Closure cost. The mine has adequate reserve to be mined in future. The underlying seams cannot be worked by underground method until the fire has been taken care off and only after that the underground mine will be restarted again. If so happens, a fresh new Mine Closure Plan will be submitted incorporating all the changes.

In Gaslitand Colliery, the existing leasehold area is 138.66 Ha, out of which 70.00 Ha is for opencast project. There is an abandoned quarry (Backfilled) of 6.50 Ha in the northern side of the leasehold area. The remaining 62.16 Ha of leasehold area (excluding Opencast Project and the abandoned backfilled quarry) has not been considered for the calculation of closure cost as the underground section is not operational, hence not considered as the existing project area. The cost of closure of 70.00 Ha (Opencast Project Area) is calculated as per the Open cast norms.

The Closure cost is estimated to be approximately **Rs. 674.523 lakhs**. The amount has been escalated based on WPI of October, 2016 (183.6) vis-à-vis WPI of August ’09 (129.6).

The tentative break up cost of activities as per the current guideline is given below in Table No. 12.1:

Table 12.1: Break up costs of the Mine Closure Activities of Gaslitand Colliery

Sl. No.	Activity	Mine Closure Cost (Rupees in Lakhs)
A	**Dismantling of Structures**	
	Service Buildings	**1.349**
	Residential Buildings	**18.010**
	Industrial Structures like CHP, Workshop, field sub-station, etc.	**2.024**
B	**Permanent Fencing of Mine Void and other dangerous area**	
	Random Ruble masonry of height 1.2 metre including levelling up in cement concrete 1:6:12 in mud mortar	**10.118**
C	**Grading of Highwall slopes**	
	Levelling and grading of highwall slopes	**11.939**
D	***OB Dump Reclamation**	
	Handling/Dozing of external OB Dump into mine void	**598.032**
	Bio-Reclamation including soil spreading, plantation and maintenance	**2.698**
E	***LANDSCAPING**	
	Landscaping of the cleared land for improving its esthetic	**2.024**
F	***Plantation**	
	Plantation over area obtained after dismantling	**3.373**
	Plantation around fencing	**1.349**
	Plantation over the cleared external OB Dump	**0.135**
G	**Monitoring/Testing of parameters for three years**	
	Air Quality	**1.484**
	Water Quality	**1.349**
H	***Entrepreneurship Development (Vocational/skill development training for sustainable income of affected people**	**1.754**
I	***Miscellaneous and other mitigative measures**	**13.490**
J	**Manpower Cost for Supervision**	**5.396**
	TOTAL	**674.523**

Note: *: To be covered under Progressive Mine Closure activities also.

CHAPTER VIII

PROGRESSIVE AND FINAL MINE CLOSURE PLAN

- Mine Closure Plan has two components viz. i) Progressive or Concurrent Mine Closure Plan, and ii) Final Mine Closure Plan. Progressive mine Closure Plan would include various land use activities to be done concurrently and sequentially during the entire period of the mining operations, whereas the Final mine Closure activities would start towards the end of mine life, and may continue even after the reserves are exhausted and/or mining is discontinued till the mining area is restored to an acceptable level. The Mine Closure details of the Mining Plan should be oriented towards the restoration of land back to its original condition as far as practicable.

- Mining is to be carried out in a phased manner along with reclamation and afforestation work in the mined out area.

- This Progressive mine closure plans shall be reviewed after a period of every five years. These plans would be examined periodically in every five years period and to be subjected to the third party monitoring by the agencies approved by the Central Government, like Central Mine Planning and Design Institute Ltd. (CMPDIL), National Environmental Engineering Research Institute (NEERI), Indian Institute of technology (IIT-ISM) or any other institutes/organizations/agencies specified from time to time for the purpose.

- Various project specific activities viz. mined-out land details & their technical and biological restoration plan, water quality management, infrastructure to be retained and demolished, disposal of mining machinery, etc. have been furnished in the relevant paras. As the backfilling of the mine void is being carried out as part of regular mining operation, it shall not be included in the list of progressive mine closure activities. However, in case, if the backfilling of mine void is being carried out specifically for closure of the mine in future due any reason, the same shall be included in the list of activities to be taken up for mine closure.

	Parameters	*Details*
8.1	**Land Degradation and restoration Schedule**	

8.1.1 Land Degradation and Technical Reclamation (Commutative Area "Ha")

Stage/Year	Land Degraded				Technically Reclaimed Area			
	Excav	Dump (Extn+Top Soil)	Infra/others*	Total	Backfill	Dump (Extn+Top Soil)	Infra/others	Total
Up to Base year*	46.93	23.70						
Y-5	85.43		0.5					
Y-15	133.43				40.4			
Y-24	176.80				85.4			

8.1.2 Biological Reclamation (Cumulative in "Ha")

Stage/Year	Biologically Reclaimed Area					Forest land (Return)	Un Distrubed/To be left for Public/com Use	Total
	Agriculture	Plantation	Water Body	Public Company Use	Total			
Up to Base year*								
Y-1		0.54						
Y-2		0.54						
Y-3		0.54						
Y-4		0.54						
Y-5		0.54						
Y-6		0.54						
Y-7		0.54						
Y-8		0.54						
Y-9		0.54						
Y-10		0.54						
Y-11		0.54						
Y-12		0.54						
Y-13		0.6						
Y-14		0.6						
Y-15		0.6						
Y-16		0.6						
Y-17		0.6						
Y-18		0.6						
Y-19		0.6						
Y-20		0.6						

Y-21			0.6							
Y-22			0.6							
Y-23			0.6							
Y-24			0.6							
Post Closure										
Y-25			1.8	32.4						
Y-26			1.1							
Y-27			0.6							

8.2	**Post Closure Water Quality management:**	Routine Environmental Monitoring will be carried out for water quality analysis of following samples: **S. No. / Sample / Frequency** 1 – Mine Water – Fortnightly Mine Water – Half Yearly 2. – Surface Water – Quarterly 3. – Ground Water – Quarterly If any discrepancy from statutory standards is observed, necessary corrective measures will be undertaken by the management.
8.3	**Post Closure Air Quality management:**	Fortnightly Air Quality Monitoring will be carried out at 03 Air Quality monitoring Stations during three years post closure period.
8.4	**Waste Management** (Figures in MM3)	

Stage/Year		OB Removal (Cumulative)			External Dump (Cumulative)		Internal Backfilling (Cumulative)		Embankment (Cumulative)	
		Top Soil	OB	Total	Top Soil	OB	Top Soil	OB	Top Soil	OB
Up to Base year*		0.23	24.84	25.07						
Y-1		0.23	32.1	32.33						
Y-3		0.23	46.3	46.53						
Y-5		0.24	58.9	59.14						
Y-10		0.36	96.96	97.32						
Y-15		0.51	134.98	135.49			0.10			
Y-20		0.66	173.01	173.67	0.12		0.22			
Y-24		**0.68**	**202.82**	203.5	0.24	123.92	0.42	78.9		
Post Closure										

8.5

Top Soil Management – (Including Action Plan for Top Soil Management)

(All Figures are Cumulative and in MM3)

Stage/Year	Top Soil Removal Plan	Top Soil Used				
		Spreading Over Embankment	Spreading Over Backfill area	Spreading over External OB Dump area	Used in Green Belt Area	Total Utilised
Up to Base year*	0.23					
Y-1	0.23				0.001	
Y-3	0.23				0.003	
Y-5	0.24				0.005	
Y-10	0.36				0.008	
Y-15	0.51		0.10		0.01	
Y-20	0.66		0.22	0.12	0.015	
Y-24	**0.68**		0.42	0.24	0.02	
Post Closure						

Top Soil removed will be used in Plantation activities, Spreading over External OB Dump area, Spreading Over Backfill area and also in Green Belt Area.

8.6	Management of Coal Rejects.	There is no washery.

8.7 Restoration of Land used for Infrastructure

The other entire infrastructure related to the opencast coal mining operation will be dismantled, after end of the mineable reserve/ mine life. The list of infrastructure to be dismantled at the end of the mine life is given in the following table:

Sl. No.	**Particulars**
1.	Workshop, Mine Office & Stores

8.8 Disposal of Mining Machinery

After end of production life of Cluster IV group of mines, all mining machinery will be shifted to other mines of BCCL as per requirements.

8.9 Safety & Security

Fencing around Opencast Workings:

i) The top edge of the opencast working shall be kept fenced with wire rope strands or barbed wire, supported by posts of timber, iron or concrete (movable). The gap between the adjacent rope strand or wires shall not be more than 0.30 m and bottom most rope, strand or wire shall not be more than 0.25 m and the topmost rope, strand or wire shall not be less than 1.0 m from ground level.

ii) At the finishing stage, opencast working shall be fenced with a masonry wall using lime mortar not less than 0.40 m thick and not less than 1.2 m high, with a parapet top.

8.10 Abandonment Cost and Financial Assurance

8.10.1 Abandonment Cost: Cost of Activities to be taken up for closure of the mine**

Head	Parameters	Unit	Quantity	Escalated rate (in Rs. Crs.)	Escalated Amount (in Rs. Crs.)
Progressive Closure	Water Quality Management	LS	1	0.39	0.3893925
	Air Quality Management	LS	1	0.74	0.7417000
	Waste Management	MM3		-	-
	Barbed wire fencing around dump	m	1000	0.000332669	0.3326691
	Barbed wire fencing around the pit	m		0.000332669	-
	Filling of Void- Rehandling of Crown Dump	MM3		0	-
	Top Soil Management	MM3	0.5	7.42	3.7084999
	Technical and biological Reclamation of Mined cut of land and OB Dump	Ha	50	0.13	6.4898748
	Plantation over virgin area including green belt	Ha	14	0.06	0.8307040
	Manpower Cost and supervision	Year	24	0.19	4.4501999
	Toe wall around the dump	m	1000	0.001762865	1.7628651

Head	Parameters	Unit	Quantity	Escalated rate (in Rs. Crs.)	Escalated Amount (in Rs. Crs.)
	Garland Drain	m	1000	0.00	0.0927125
	Garland Drain around the dump	m		-	-
	Subsidence management	LS		0.55627	0.5562750
	Any other Activity(Avenue Plantation)	Nos.	1000	0.00046	0.4635625
Dismantling of Infrastructure & Disposal / rehabilitation of Mining Machinery	Dismantling of workshop and washery	sq m	12375	0.00002	0.2294634
	Rehabilitation of the Dismantled facilities	LS	15	0.01	0.1390687
	Dismantling of pumps /other facilities	No.	25	0.01	0.1390687
	Dismantling of pipes/other facilities	Km	10	0.01	0.1297975
	Dismantling of Stowing Bunker, provisioning of pumps for bore well pumping arrangement	CUM		0.00	-
	Dismantling of UG equipment	L.S.		-	-
	Rearranging water pipeline to dump top park / Agriculture land (Assumed Data)	Km	10	0.01	0.0834412
	Dismantling of power lines (33KV H.T. Line)	*km*	*7*	0.01	0.0778785
Safety and Security	Barbed wire fencing around dump	m		-	-
	Barbed wire fencing around the pit	m		0.000332669	-
	Barbed wire fencing with masonry pillar	m	1000	0.0007417	0.7417000
	Concrete wall with Masonry pillars around the pit	m		0.001162615	-
	Securing air shaft and installation of bore well pump	sqm	750	0.000463562	0.3476719
	Securing incline	sqm	750	0.000463562	0.3476719
	Concrete wall fencing around water body	m		-	-
	Boundary wall around the water body	m		-	-
	Stabilization (viz benching, pitching etc.) of side walls of the water body	sqm		-	-
	Toe wall around the dump	m		0.00	-
	Garland Drain	m		0.00	-
	Garland Drain around the dump	m	1000	9.27125E-05	0.0927125
	Drainage Channel from main OB Dump (Assumed Data)	m		-	-
Technical and Biological Reclamation of Mined Out of land and OB Dump	Filling of Void			-	-
	Top Soil Management	Ha		-	-
	OB Rehandling for backfilling			-	-
	Terracing, Blanketing with soil and vegetation of External OB Dump	sqm		0.00	-
	Peripheral road, gates, view point cemented steps on bank	m	1000	0.00185425	1.8542500
	Expenditure on development of Agricultural land	Ha		-	-
	Landscaping and Plantation	Ha	3.5	0.06	0.2076760
Post Closure management and supervision	Power Cost	LS	1	0.09	0.0927125
	Post Mining Water quality management		114	0.00	0.1220957
	Post Mining Air quality management		216	0.01	1.1503678
	Subsidence monitoring for 5 years	LS		-	-
	Waste Management		0	-	-
	Manpower Cost and supervision	Year	3	1.11	3.3376499
Others	Entrepreneurship development (Vocational/ Skill development training for sustainable income of affected people)	1.6684185			

Head	Parameters	Unit	Quantity	Escalated rate (in Rs. Crs.)	Escalated Amount (in Rs. Crs.)
	Golden Handshake/ Retrenching benefits to 100 employees of OC				
	Golden Handshake/ Retrenching benefits to 200 employees of UG				
	Onetime financial grant to societies/institutions/organizations which is dependent upon the project				
	Provide jobs in other mines of the Company				
	Continuation of other services like running of Schools etc.				
Total		**30.5801**			

Note: ** The cost shown above is only estimated and the exact cost for these activities can be established at the time of execution only. If the total cost at the time of execution of above mentioned activities exceed the total estimated cost, the shortfall shall be borne by the company.

8.10.2 Financial Assurance: Amount to be deposited in Escrow account as a security against the mine activities to be carried out of the closure of the mine

COST CALCULATION- KCC OC MINE			
WPI as on	Apr-19		121.1
WPI as on base date	Mar-22		148.9
Escalation rate of Closure cost			1.229562
	UG	OC	
Base Rate of Closure Cost "Rs . Crs/Ha"	0.015	0.09000	
Closure Cost "Rs. Crs/Ha"	0.0184434	0.11066	
Project Area	39.83	176.800	
Amount to be deposited into Escrow Account "Rs. in Crs.	0.734602	19.56480	
Amount already deposited into Escrow Account "Rs. in Crs.		7.53000	
Amount already released from Escrow Account "Rs. in Crs.			
Net Amount to be deposited into Escrow Account "Rs. in Crs.	0.734602	12.03480	
Rate of compounding of Annual Closure Cost		5.00%	
Balance Life of the project "in yrs"		24	

Amount to be deposited into escrow account annually				
Year	**OC**	**Year**	**UG**	**Total**
Y1	0.50145	Y-1	0.73460	1.23605
Y2	0.52652	Y-2		0.52652
Y3	0.55285	Y-3		0.55285
Y4	0.58049	Y-4		0.58049
Y5	0.60952	Y-5		0.60952
Y6	0.63999	Y-6		0.63999
Y7	0.67199	Y-7		0.67199
Y8	0.70559	Y-8		0.70559
Y9	0.74087	Y-9		0.74087
Y10	0.77791	Y-10		0.77791
Y11	0.81681	Y-11		0.81681
Y12	0.85765	Y-12		0.85765
Y13	0.90053	Y-13		0.90053
Y14	0.94556	Y-14		0.94556

Annual Closure Cost	0.73460	0.50145		
Amount to be deposited into Excrow Account after compounding @ of 5% "Rs. in Crs"		**23.05012**		

Y15	0.99284	Y-15		0.99284
Y16	1.04248	Y-16		1.04248
Y17	1.09460	Y-17		1.09460
Y18	1.14933	Y-18		1.14933
Y19	1.20680	Y-19		1.20680
Y20	1.26714	Y-20		1.26714
Y21	1.33050	Y-21		1.33050
Y22	1.39702	Y-22		1.39702
Y23	1.46687	Y-23		1.46687
Y24	1.54022	Y-24		1.54022
Total	22.31552		0.73460	23.05012

Mining and Mine Closure Plan of Katras Choitodih Colliery was prepared and approved by BCCL Board. And as per the approved Mine Closure Plan total deposited amount in the Escrow Account till **31.3.2022** was **Rs. 753.0 Lakhs**. The amount already accrued in account shall be adjusted against the new closure cost calculated.

The amount calculated above shall be deposited every year by BCCL in the Escrow Account in the name of Katras Chotudih OC Mine.

Thus, total amount that shall be deposited for final mine closure activities of **KCC Group of mines during the life of 24 years stands out to be Rs. 23.05012 Crores** as per the present status of the mine.

The amount already deposited in the escrow account will also be available for mine closure activities and should be included to arrive at the total funds available for mine closure activities.

	Amount (Rs. in Lakhs)	
	UG Section	**OC Section**
Amount Already Deposited in Escrow Account		**753.0**
Amount to be Deposited in the Escrow Account in the Future	**73.460**	**2231.552**
Total Amount available for Mine Closure Activities	**73.460**	**2984.552**
Grand Total	**3058.012**	

The amount deposited in Escrow Accounts is appended below:

Name of Mine: Katras Chatudihl OC Mine Escrow account no: 00150100010086			
S.No :	Year	Rs. in Lakhs	
		OC	Total
1	2013-2014	-	-
2	2014-2015	82.12	82.12
3	2015-2016	86.23	86.23
4	2016-2017	90.54	90.54
5	2017-2018	114.64	114.64
6	2018-2019	120.37	120.37
7	2019-2020	126.39	126.39
8	2020-2021	132.71	132.71
9	**2021-2022**	**-**	**-**
Total		**753.0**	**753.0**

The money deposited in the Escrow Account has to deal with the following:

- Cost of closure activities.
- Cost towards organization for executing the closure activities.
- Cost of the post project monitoring.
- Creation of a corpus fund for final mine closure

Mine Closure Plan of following two mines have been approved by BCCL Board are mentioned below:

Name of Mine	BCCL Board No.	Date	Escrow A/c at Bank of Baroda, Dhanbad Branch
Katras Choitudih OC Mine	312th Board of BCCL	13.12.2014 02.02.2018	00150100010086

- **Implementation of the approved Mine Closure Plan shall be sole responsibility of the mine owner**. Mining is to be carried out in a phase manner i.e. continuation of mining activities from one phase to another indicating the sequence of operations depending on the geo-mining conditions of the mine. Up to 50% of the total deposited amount including interest accrued in the escrow account may be released after every five years in line

with the periodic examinations of the closure plan. The amount released should be equal to expenditure incurred on the progressive mine closure in past five years or 50% whichever is less. The balance amount shall be released to the mine owner//leaseholder at the end of the final mine closure on compliance of all provisions of Closure Plan. This compliance report should be duly signed by the lessee and certify that said closure of mine complied all statutory rules, regulations order made by the central or state government, statutory organizations, court etc. and certified by the coal controller.

Final Mine Closure would be considered to be completed only after acceptance of the third party audit report by the coal controller on the compliance of all provisions on Mine Closure Plan. Any institute/ Organization/ Agency as may be notified by the Government for this purpose may be engaged for third party audit.

CHAPTER—XII

PROGRESSIVE AND FINAL MINE CLOSURE PLAN

12.0 Need of Mine Closure Planning -

Mining is a hazardous operation as it offsets the equilibrium of natural depositional environment viz. in-situ stress field, ground water, surface drainage system as well as the socio-economic condition. Although mining activities are usually short term phenomena, they are liable to leave long lasting impacts on landscape, ecology and on the mine set of local inhabitants. Thus, it is imperative that any mining venture should have adequate closure plan addressing issues viz. Reclamation and environmental protection, rehabilitation of disturbed area. Community implementation of mine closure plan will incur some extra cost, neglecting this aspect will lead to future problems of attending compensation or expensive socio-economic problems.

Mine closure encompasses restoration process designed to restore physical, chemical and biological quality, disturbed by the mining activities. Mine closure is not just something that happens at the end of a mine's life rather mine closure is an ongoing series of decisions and activities beginning in the pre-mining stage of mine and ending with a creation of self-sustainable site that can be returned to the community.

Thus, a mine closure plan needs to define the liabilities, responsibilities and authorities of the different agencies like the mine management, other regulatory bodies, Central and State Governments after mine closure.

Hence, efforts have been made to identify the likely impacts on geo-environmental and socio-political set-up due to closure of the proposed mine during the planning stage itself, so that it will offer an opportunity to generate resources for mitigative measures during closure of the mine.

12.1 Reasons for closure-

Major part of the leasehold area of Salanpur Colliery falls beneath important surface features like Katras Township, DC Railway Line and Nichitpur link line of EC Railway, Railway Colony (Katrasgarh RS), IOW (Katrasgarh), RK siding line (abandoned in Aug. 2003), Salanpur Village, Guhi Bandh Village, Rampujan Village, MADA Water Tank, State Govt. Offices, DB Road etc (Refer Surface cum Topographical Plan).

The Railways are not permitting development beneath its property. Permission for depillaring in the area is not being granted by DGMS resulting in closure of underground mining operation. It is being considered to shift DC Railway line from the existing alignment on account of fire in some mines and a study by RITES is underway to firm up an alternate alignment on non-coal bearing area. This may result in vacation of the major surface area in future and pave the way for future mining. However, no approved plan exists in place as of now and the scenario of future mining in the leasehold area appears very bleak at present.

At present, Seam III and II(Top) is being developed. In this mining plan, II(Top) is not proposed for development due to thinness of the seam. The total development reserves has been estimated as 1.362 Mt considering Seam-III, II(Bot) & Seam-I. The life of the Mine life would be 11 years with normative production of 0.13 Mty Depillaring is not possible due to major surface constraint within the lease hold area.

The mine may be closed in future on account of exhaustion of economically recoverable coal reserves in the lease hold area. The mine may also be closed on account of other unforeseen reasons i.e. Force Majeure or directives from statutory organizations or court etc. for which information and notices shall be served to concerned Government authorities and departments. As per guidelines of Ministry of Coal, Govt. of India, Mine Closure Plan has to be submitted along with the mine plan for getting competent approval within one or two years of date of approval of mine plan.

12.2 Life Cycle Concepts-

Mining projects have a definite life cycle. All the mines have to eventually close their operation. The reasons for the closure may be many including economic conditions, depletion of mine-able resource or any other unforeseen safety reasons.

In the present project proposal the mine life cycle planning is governed by the extractable reserves of the proposed mining area. In general, the total extractable reserve is estimated considering both development as well as depillaring reserves of identified workable seams. In this mine, depillaring has not been done in past due to surface constrain and unless overlying seams are depillared, lower seams can not be depillared. This is mainly due to major surface constrain like Katras Town, Private basti, Rly land etc, Considering the development reserves Seam-III, II(Bottom) & Seam-I and its production

schedule, the life is estimated as 11 years from the date of obtaining Environmental Clearance from MoEFCC. The life of the mine will extent further and may be more if surface constrain is removed in future. It is suggested that the activities for closure will be initiated at an early stage of project life in a gradual/ planned manner.

12.3 Objectives of Closure Planning-

The mine closure phase is supposed to be closed when the mine is decommissioned, facilities at site are removed, the mine entries are sealed/ fenced off, the management of waste dump/ tailing is completed and the site is released in ecologically sustainable state suitable for proposed land use.

Mine closure planning has to be carried out at the starting of the mine and needs periodic reviewing and revision during its life cycle to cope with the geo-technical constraints, safety and economic risks, social and environmental challenges. Various other objectives are as follows:

- To allow a productive and sustainable after-use of the site which is acceptable to the mine owner and the regulatory authority;
- To protect public health and safety;
- To alleviate or eliminate environmental damage and thereby encourage environmental sustainability;
- To minimize adverse socio-economic impacts.

12.4 Different aspects of Mine Closure Planning-

The mine closure planning broadly involves the following aspects :

(a) Technical aspects;

The following technical aspects would be reviewed in the final mine closure planning. Details can be worked in closure plans envisaged to be prepared.

- **Safety hazards including management of subsidence**:-

  Action will also be suggested to cover all the safety aspects.

Following steps will be taken as precaution subsidence while mining:-

i. Panel size will be so designed so that depillaring with caving (if done in future) will be completed within the incubation period of the coal seam. Depillaring is possible only when surface constrain is removed and land is acquired.
ii. Panel will be isolated in proper fashion before depillaring takes place.
iii. Surface will be properly dozed and leveled wherever there are cracks and fissures so that air does not breathe in through surface.

❖ **Management of Pit Slopes (for existing as well as proposed quarry):**

The final quarry slopes shall be so designed and then subsequently developed that after the closure of the mine, there is no likelihood of any slope failure. The final slope of the quarry has been designed with above consideration. However, strict compliance with the proposed final slope of quarry and subsequent slope stability studies would be made.

❖ **Management of hydrology and hydro-geology**:

In the mine closure plan, the surface flow pattern of precipitation and mine water would be clearly developed and water channel suitably laid down so that it does not disturb the general hydrology of the area.

Mining operation may reduce the water table of the area. To recharge the water table, it is proposed that the mine water during operation will be discharged into surface water settling tank Over flow of settled water from the tank will be used for water sprinkling, plantation, domestic purpose, etc. Therefore, the excess over flow water will be discharged into the nearby Katri River flowing southerly on west side of the property. After closure of this mine (if depillaring in underground working is done in future or quarry is made) , the entire surface area will be back filled, dozed and vegetation will be grown.

❖ **Details of decommissioning of the infrastructures:**

The decommissioning of the various infrastructures developed for the mine like office complex, roads, pipelines and transmission line etc. shall be planned in details so that the land occupied by these infrastructures are released. However, before such decommissioning, the possibility of re-use of these infrastructures for the neighbouring mines shall be explored.

❖ **Closure of entry to the open-cast mine and underground mine:**

All entries to the mine (UG or OC/ Quarry) must be planned to be effectively closed so that illegal mining from these openings and safety hazards by way of entry of fire and water etc, will be prevented in the abandoned mines.

(b) Environmental aspects:

This would include the following-

❖ **Management of final voids in case of quarry**: -

In the mine closure plan, voids due to mining are to be dealt and the final land use plan will include filling of the voids for land reclamation where possible and for hydro reclamation where feasible. The study on slope study will be made by some scientific agency and in final closure plan their suggestions will be incorporated.

❖ **Reclamation of forests/vegetation: -**

It is to be ensured that in the final land use plan, all vacant land acquired for the project is afforested

❖ **Channelisation of available water: -**

If the mine (UG/OC/Quarry) is having sufficient water and if on closure, the mine water flows into the surface water courses, channelising this water for surrounding community for their irrigational/domestic uses may be taken up. This can be planned by providing structures involving one time costing

❖ **Management of recharge areas**: -

The pre-mining and post mining scenario on the hydro-geological recharge system would be included in the closure plan.

❖ **Acceptable Surface and Ground Water Flows**:

In the final closure plan of the mine, wherever the mine water is likely to flow out to surface and meet the surface water sources; the quality of water from such mines would be assessed and flow pattern designed in the final plan.

(c) Social aspects:-

The social aspects of land use planning relating to mine closure would include the following:

❖ **Re-deployment of Workforce:**

The company employees will be gainfully engaged in the neighbouring projects after cessation of mining activities.

❖ **Management of Community Facilities:**

In view of the short life of the project, no new community facility will be created. However, the existing facilities of adjoining areas will be strengthened.

(d) Financial aspects.

There are two types of Closure, namely, Progressive Mine Closure and Final Mine Closure. The cost of Progressive Closure activities is realized by levying a cost of Rs. 2.50/Te of coal for UG Mines. The Final Mine closure cost has been dealt with at the end of this Chapter. It has to deal with the following:

- Cost of closure activities.
- Cost towards organization for executing the closure activities.
- Cost of the post project monitoring.
- Creation of a corpus fund for the final mine closure.

12.4 Mine Closure Obligations:-

There is need to define the liabilities, responsibilities and authorities of the mine management, other regulatory bodies, Central and State Governments after mine closure. Some obligations relating to the Mine Management Companies are as follows :

(a)	**Health & Safety**:	i)	Regulation Nos. 6, 61, 106, 112 of Coal Mines
		ii)	Regulations, 1957 and its related DGMS Circulars;
(b)	**Environment :**	i)	Water (Prevention & Control of Pollution) Act, 1974;
		ii)	Air (Prevention & Control of Pollution) Act, 1981;
		iii)	Environmental (Protection) Act, 1986
		iv)	Environmental Protection (Amendment) Rule , 2000;

v) DGMS Directives on Noise & Ground Vibration;

(c) **Forest :** Forest (Conservation) Act, 1980.

(d) **Rehabilitation :** CIL's policy, however, applicable for land oustees only.

(e) **Decommissioning/asset disposal**, etc**.**

12.5 Impact assessment remedial measures:

Post-Mining Land Use Plan has been given in Chapter IX. Environmental Impact on Landscape, Water Source, air and noise pollution during mine life has been discussed earlier. It is imperative that the environmental monitoring may be continued for 1-2 years after closure of UG in order to assess corrective measures to be implemented to sustain pre-mining ecosystem and environment in the core and buffer zone (to the extent possible).

12.6 Practice after the closure of the mine-

As the sources of dust and fume generation would no longer be present, the present practice of arresting the air pollution, as enumerated in Chapter-XI. However, water sprinkling would be done on the roads, which remain in use after the mine closure.

Quality of air would be monitored for a period of 3 years after cessation of mining activity. Three samples at fortnight frequency for 3 years, one sample in core zone and one sample each in upwind and downwind direction will be collected and analysed.

12.6.1 Dump Reclamation -

Most of the back filled area shall be afforested by selecting proper plant species in consultation with State Forest Department. A part of the back filled area would also be developed for agricultural purpose with the help of the concerned State Authority. The existing void will serve as a lagoon and may be utilised as water reservoir for the locality. The entire area shall be suitably fenced.

The present mine is an underground unit and generally no solid waste will be generated during the mining operation except stone generates during drift drivage .

12.6.2 Details of Surface Structures proposed for dismantling-

12.6.2.1 Infrastructure details -

As far as possible, industrial structures shall be utilised by the adjacent mine. However, if these structures are not found fit at the end of mine life, the same will be dismantled and salvaged. The equipments will be removed and used somewhere else. Every effort will be made to restore the area to economic utilization value in line with mine closure plan.

A. Service Buildings: The service buildings/ structures, viz. workshop, stores, office building, cap-lamp room, Pit Top office, winding rooms, etc. are to be demolished after collecting all re-useable items, or be used for some other projects and the land covered by them restored for productive use. However, it has to be ensured that as and when a service building is vacated/ abandoned, the same should be demolished to prevent any unauthorized occupation.

B. Other Infrastructures: All other infrastructures like sub-stations, transformers, community services, pump-houses, water-treatment/ filtration plants, waterlines, power lines, roads etc. will be utilized for the neighbouring projects.

However, possibility shall be explored for handing over the buildings and other infrastructures including the reclaimed land to the State Government for the benefit of local villagers and strengthening the area infrastructures. The end use of these facilities shall be decided by the State Government with the help of District Authorities and Village Panchayat. The peripheral village community facilities developed by the Mine Authorities will be left to the Local Body/ State Government for their management and public use.

Prior to surface demolition/ restoration, a surface audit will be undertaken on all surface structures, spoil heaps etc. to assess whether there is any hazardous material that could cause problem, i.e. explosive, asbestos, chemical, oil, etc.

A list of surface and UG assets (Plant & Machinery) will be prepared and made available to potential purchasers or transferred to other new/ working mines of the company. This will ensure that the assets perform during their economic life.

12.6.2.2 Post closure disposal / Re-use of the Buildings, Plants & Machineries-

a. Disposal or reuse of existing HEMM, CHP, workshop and railway siding for OC-
No quarry is in operation in Salanpur Mine.

b. Disposal or reuse of haulage, ventilation, workshop and railway siding for UG-

At the time of closure of the mine, it is expected that most of the equipments would complete its rated life and would be surveyed off as per the Company's guidelines. The surveyed off equipments would be auctioned as per prevalent norms.
However, if some of the equipments would not have covered their rated life, they would be diverted to the neighbouring projects for gainful utilisation.

There is a abandoned R K Railway siding in the leasehold area which is under dismantling with due care.

c. Disposal or reuse of transmission lines and sub-station-
As per the electricity demand of the existing neighbouring projects, an analysis would be made as to whether the existing sub-station and transmission lines could be gainfully used or not. If the scope of gainful utilization is not found, they will be dismantled and the usable items/spares/conductors etc. would be dispatched to needy Areas/Projects.

d. Disposal or reuse of residential and non-residential buildings-

At the time of final closure, a list of surface buildings would be prepared in detail. Thereafter following steps would be taken in chorological order in respect of the available buildings:-

- An assessment would be made to find that whether the available buildings can be used by the existing neighboring projects or any new project that might have come up in the vicinity.

- In case, the listed assets cannot be utilized by the nearby project, efforts would be made to sale these assets after making the list available to potential purchasers and asking the interested purchasers to submit sealed bids.
- Thereafter, the state agencies/local agencies may be asked to take possession of the buildings, if they required few of them.
- When there would be no takers, the buildings would be demolished and usable items would be recovered for future use.

12.7 Safety and Security Arrangement

12.7.1 Mine entry-

After closure of the mining activities, all the entries to the mine will be effectively sealed off to avoid any accident and to prevent access to any unauthorized person. The area that is not reclaimed shall be properly fenced/ sealed to prevent any unauthorized entry into the area. Flags/Boards with warning signals shall be posted at vulnerable places to avoid chances of accidents. However, the guidelines / instructions from DGMS, if any, will be followed.

Sealing details and dimensions shall also be prepared for the purpose. The minimum thickness of mine sealing will be 100cm RCC (M20) with nominal reinforcement. For incline entry, the mine entry path of 5 m will be filled with debris and clay before sealing the mine.

12.7.2 Details of fencing around abandoned quarry, indicating the length of the fencing-

At present, no quarry exist in Mine area. If re-opened in future then the void of the existing quarry would be properly fenced to avoid any inadvertent entry of animals or human beings. Sufficient Boards and danger signs shall be placed all around.

Later on, the responsibility of keeping the fencing secured would be entrusted on the State Authorities.

12.7.3 Slope stability arrangement for high wall and back filled dumps

As regards stability of existing back-filled dumps, the final level of reclaimed backfill will be matched with the levels of surrounding hill ranges leaving a final residual void which will serve as a lagoon which may be utilised as water reservoir for the locality. For the stability of the back-filled dump, the slope of the dump will be maintained at a stable angle. Vegetation cover will also be provided along the slopes to arrest any failure.

12.7.4 Providing one time lighting arrangement-

Sufficient lighting as per standard is provided at all the required places, i.e., Mine office, haulage room, fan house, cap lamp room, mine entry, workshop, sub-station, haul road in quarry etc.

After closure of the mine, the lighting arrangements will be kept maintained at all locations which are not required to be demolished or dismantled like sub-stations, transformers, community services, pump-houses, water-treatment/ filtration plants, waterlines, power lines, roads etc. to be utilised for the neighbouring projects and local communities.

12.7.5 Survey records of workings-

All the mine workings including subsidence areas, roads, ponds, tanks etc. shall be resurveyed and records shall be updated. Copy of such records shall also be submitted to the appropriate competent authorities, such as DGMS and State Authorities.

12.7.6 Disposal management of hazardous material-

At the time of closure, assessment would be made as to find whether there is any hazardous material that could cause problem. Such hazardous material e.g. explosives, chemicals, oil etc. shall be appropriately disposed off.

12.8 Stakeholders Involvement -

Various stakeholders effected due to mine closure need to be identified and they may be as follows:

The Company	:	Employees, Management & Stakeholders
The Community	:	Local business and service providers, land holders, neighbours and nearby residents, local Government and NGOs and Community Groups.
The State	:	The State Government, the Central Government and its concerned Government Agencies.

There is need of regular consultations between the stakeholders to evolve the needs of the stakeholders and their involvement in the process.

12.9 Closure Action Plan-

Closure planning is an exercise that begins at the start of a mine opening and continues till post-closure. The dynamic nature of closure planning requires regular and critical review to reflect changing circumstances as a result of any operational change, new regulation, and new technology and remain flexible enough to cope with unexpected events.

The following proposal / steps have to be undertaken in relation to Mine Closure Planning:

Prior to the surface (including infra-structure) demolition/restoration, a surface audit should be undertaken on all surface structures, spoil heaps, lagoons, etc. to assess whether there are any hazardous materials that could cause problems; viz. explosives, chemicals, waste material, etc. A list of surface assets should be prepared and made available to potential purchasers, prospective purchasers could be invited and asked to submit sealed bids, this could ensure that the sale of assets give better financial gain.

In order to identify potential impact, necessary hydro-geological studies into post-mining ground water recharge have to be done.

Work force on roll of BCCL may be re-deployed for gainful utilization of employees of BCCL.

As a detailed component of the Closure Plan, a Decommissioning Plan is to be developed towards the final stages preferably 5 years prior to tentative closure of the mine. Once established, it may be updated annually.

12.10 Protective Measures to be taken-

Protective measures must include the following:

- Protection of mine Entries , building and other structure on the project site against access by unauthorized persons;
- Maintenance of all mechanical, hydraulic and waste management system;
- Continuation of all monitoring programmes;
- Control of all contaminated effluents;
- Securing of all petroleum products, chemicals and waste;

12.11 Mine Closure Cost:

Mine Closure activities would be a constant exercise for the mine which would begin with the commencement of mining operations and continue till post closure. The mine closure activities would naturally entail certain expenditures, which will have to be borne by the mine operator.

There would be two types of expenditures on account of mine closure activities in respect of Salanpur Colliery.

A) Revenue expenditures

This would cover the activities which are being executed along with normal mining operation and would continue to be executed in course of execution of the project. The cost of progressive mine closure activities is already part of the project cost.

B) Expenditures to be incurred just prior to actual mine closure and in the post closure period

As per MOC guidelines, a corpus escrow account @Rs.1.0 lakhs (August, 2009 Price Level) per Ha (for UG) and @ Rs.6.0 lakhs (for OC) of the project area shall be opened with the coal controller organization to meet the expenses of final mine closure. The current Guidelines read as:

"It has been estimated that typically closure cost for an opencast mine will come around Rs. 6.00 lakh per Hectare of the project area and it would be Rs. 1.00 lakh per Hectare for underground mine project area at current price levels (August, 2009) and these rates will stand modified based on Wholesale Price Index as notified by Government of India from time to time".

There is already a mine closure plan approved by the 305th BCCL Board, Dated 12.03.2014. According to the approved mine closure plan the total life of the mine was considered to be 12 years and total mine closure cost up to the considered life of the mine was calculated to be Rs 369.439 Lakhs. As per the directives Rs 142.90049 Lakhs (Principal Rs 125.296 lakhs and Interest Rs 17.604 lakhs) were deposited in to the Escrow Account Number 150100009050 by the year 2016. Further, the same escrow account shall be continued for Salanpur Colliery.

As per the data furnished by the mine/area, leasehold area and project area in respect of Salanpur UG mine is the same and the closure cost is calculated accordingly.

In Salanpur Colliery, the existing leasehold and project area is 177.49 Ha. Out of this, 5.46 Ha is abandoned and not backfilled quarry, 21.00 Ha is considered for suspended opencast patch and the remaining 151.03 Ha is considered for underground operations. Thus, out of the project area of 177.49 Ha, 26.46 (5.46 + 21.00) Ha area has been considered for the calculation of closure cost as per Open cast norms and the remaining 151.03 Ha has been considered for the calculation of closure cost of the area as per Underground norms.
The overlapping area (where UG & OC operations have been done in different vertical levels) has been considered for calculation of closure cost as per opencast norms.

The money deposited in the Escrow Account has to deal with the following:-

- Cost of closure activities.
- Cost towards organization for executing the closure activities.
- Cost of the post project monitoring.
- Creation of a corpus fund for the final mine closure

12.11.1 The total amount that shall be further deposited for final mine closure activities of **Salanpur Colliery** in case of underground workings during the considered period of 11 years stands out to be **₹ 198.309 lakhs** and in case of opencast workings during the considered period of 5 years stands out to be **₹ 176.585 lakhs** as per the present status of the mine. The year-wise break-Up cost of Mine Closure of Salanpur Colliery is given in Table No. 12.1.

Table No. 12.1

Break-Up cost of Mine Closure of Salanpur Colliery

Year	Amount to be Deposited (in ₹ lakhs)		
	UG Section	OC Section	Total
1	13.959	31.958	45.916
2	14.657	33.555	48.212
3	15.390	35.233	50.623
4	16.159	36.995	53.154
5	16.967	38.845	55.812
6	17.815		17.815
7	18.706		18.706
8	19.641		19.641
9	20.623		20.623
10	21.655		21.655
11	22.737		22.737
	198.309	**176.585**	**374.895**

The amount already deposited in the escrow account will also be available for mine closure activities and should be included to arrive at the total funds available for Mine Closure Activities.

Table No. 12.2

Total Amount available for Mine Closure Activities of Salanpur Colliery

	Amount (in ₹ lakhs)	
	UG Section	OC Section
Amount Already Deposited in Escrow Account	60.296	65.000
Amount to be Deposited in the Escrow Account in the Future	198.309	176.585
Total Amount available for Mine Closure Activities	**258.605**	**241.585**

12.11.2 Based on the existing mine closure planning norms, the above calculated cost at Final WPI of November 2016 on mine closure may be tentatively grouped under different heads as given in Table No. 12.3 A and 12.3 B for underground and opencast respectively, as per guidelines of CMPDI(HQ).

Table 12.3 A

Break up costs of Mine Closure Activities for Salanpur Colliery (Underground)

Sl. No.	Activity	Mine Closure Cost (₹ in Lakhs)
A	**Dismantling of Structures**	
	Service Buildings	9.051
	Residential Buildings	27.360
	Industrial Structures like CHP, Workshop, field sub-station, cap lamp room, haulage, fan installation etc.	16.370
B	**Permanent Sealing of mine entries(incline mouth and air shaft)**	
	Sealing of incline mouths and air shafts	13.758
C	***Subsidence Management**	12.284
D	**LANDSCAPING**	
	Landscaping of the cleared land for improving its esthetic	22.757
E	***Plantation**	
	Plantation over the cleared area obtained after dismantling and on other barren spaces	33.619
F	**Monitoring/Testing of parameters for three years**	
	Air Quality	17.663
	Water Quality	16.396
G	***Enterpreneuship Development(Vocational/skill development training for sustainable income of affected people**	19.783
H	***Miscellaneous and other mitigative measures**	37.756
I	**Manpower Cost for Supervision**	31.808
	TOTAL	**258.605**

Note: * : To be covered under Progressive Mine Closure activities also

Table 12.3 B

Break up costs of Mine Closure Activities for Salanpur Colliery (Opencast)

Sl. No.	Activity	Mine Closure Cost (₹ in Lakhs)
A	**Dismantling of Structures**	
	Service Buildings	0.483
	Residential Buildings	6.450
	Industrial Structures like CHP, Workshop, field sub-station, etc.	0.725
B	**Permanent Fencing of Mine Void and other dangerous area**	
	Random Ruble masonry of height 1.2 metre including levelling up in cement concrete 1:6:12 in mud mortar	3.624
C	**Grading of Highwall slopes**	
	Levelling and grading of highwall slopes	4.276
D	***OB Dump Reclamation**	
	Handling/Dozing of external OB Dump into mine void	214.189
	Bio-Reclamation including soil spreading, plantation and maintenance	0.966
E	**LANDSCAPING**	
	Landscaping of the cleared land for improving its esthetic	0.725
F	***Plantation**	
	Plantation over area obtained after dismantling	1.208
	Plantation around fencing	0.483
	Plantation over the cleared external OB Dump	0.048
G	**Monitoring/Testing of parameters for three years**	
	Air Quality	0.531
	Water Quality	0.483
H	***Enterpreneuship Development(Vocational/skill development training for sustainable income of affected people**	0.628
I	***Miscellaneous and other mitigative measures**	4.832
J	**Manpower Cost for Supervision**	1.933
	TOTAL	**241.585**

Note: * : To be covered under Progressive Mine Closure activities also

12.11.3 *The break up costs of Progressive Closure Activities undertaken by BCCL in Salanpur Colliery as per earlier approved Mine Closure Plan is given in the following table:*

Table 12.4

Break up costs of Mine Closure Activities for Salanpur Colliery (earlier approved) and Expenditure incurred during Progressive Closure Activities

Sl. No.	Activity	Mine Closure Cost (₹ in Lakhs)	Amount Claimed (Lakhs) (2014-15)	Amount Claimed (Lakhs) (2015-16)
A	**Dismantling of Structures**			
	Service Buildings	10.655		
	Residential Buildings	32.21		
	Industrial Structures like CHP, Workshop, field sub-station, etc.	19.271		
B	**Permanent Sealing of mine entries(incline mouth and air shaft)**			
	Sealing of incline mouths and air shafts	16.196		
C	**Subsidence Management**	14.461		**2.56609**
D	**LANDSCAPING**			
	Landscaping of the cleared land for improving its esthetic	26.791		
E	**Plantation**			
	Plantation over area obtained after dismantling	39.577		**1.81038**
F	**Monitoring/Testing of parameters for three years**			
	Air Quality	20.793		
	Water Quality	19.301		
G	**Enterpreneuship Development(Vocational/skill development training for sustainable income of affected people**	23.29	41.80181	
H	**Miscellaneous and other mitigative measures**	44.448		**173.29465**
I	**Manpower Cost for Supervision**	37.446		
	Sub-Total(UG Part)	**304.439**		
	Abandoned Quarry Reclamation			
J	**Reclamation of the abandoned quarry**	65.000		
	Sub-Total(OC Part)	**65.000**		
	GRAND TOTAL	**369.439**	**41.802**	**177.671**

The estimate of total expenditure incurred upon the progressive closure activities are provided by BCCL.

Bharat Coking Coal Ltd.
(A Subsidiary of Coal India Limited)
Office of the General Manager, Katras Area
P.O. KATRAS, P.S.- Jogta, Dhanbad-828121
CIN: U1010JH1972GOI000918
Phone/Fax No.: 0326-2371213
Email ID: cgmkatras@bccl.gov.in

To whom it may concern

This is to certify herethat there is no mining induced subsidence movement over and around the working area of cluster-IV group of mines namely Amalgamated Keshalpur west mudidih colliery, Amalgamated Angarpathra Ramkanali colliery, Gaslitand colliery, Katras Choitudih colliery & Salanpur colliery have been observed after obtaining Environmental clearance.

AM(Env)
Cluster IV

Scanned by CamScanner









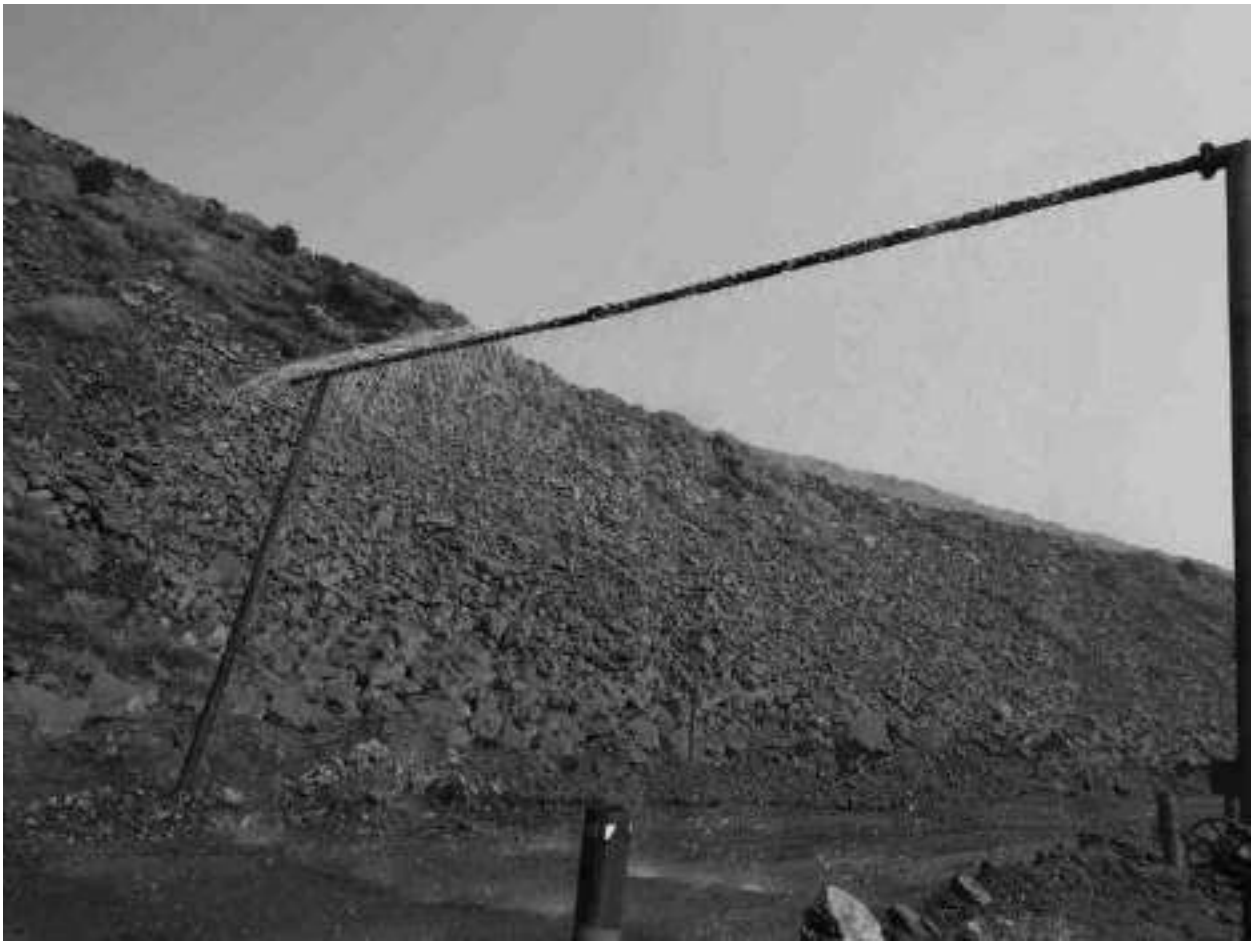
Plantation in FY 2019-20 over 11 Ha Ob dump Area



Preparation of nursery for plantation site 13 Ha Ob dump



Hole digging for plantation site 13 Ha Ob dump



Over Head Dust Suppression Arrangement installed at Haul Road for wetting the coal loaded over trucks



Block Plantation Around CHP



Water Arrangement at CHP Hooper

Annexure-15

STRICTLY RESTRICTED
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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.

GROUNDWATER LEVEL & QUALITY REPORT

FOR CLUSTER OF MINES, BCCL

(Assessment year – 2022-23)

[CLUSTER – I, II, III, IV, V, VI, VII, VIII, IX, X, XI, XIII, XIV, XV & XVI of Mines, BCCL]

JHARIA COALFIELD AND RANIGANJ COALFIELD (PART)

For
(BHARAT COKING COAL LIMITED)

(A Subsidiary of Coal India Limited)

KOYLA BHAWAN (DHANBAD)

Prepared by

Hydrogeology Department

Exploration Division

CMPDI (HQ), Ranchi

MARCH – 2023

Job no - 200422005

GROUNDWATER LEVEL & QUALITY REPORT

FOR CLUSTER OF MINES, BCCL

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JHARIA COALFIELD AND RANIGANJ COALFIELD (PART)

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KOYLA BHAWAN (DHANBAD)

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CMPDIL

CENTRAL MINE PLANING & DESIGN INSTITUTE

HYDROGEOLOGY SECTION, EXPLORATION DEPARTMENT

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(Accredited Groundwater Professional Institutions by CGWA)

(Accredited as a GWCO by QCI-NABET)

(Accredited by NABL, CMPDI, RI-II, Lab)

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Annexure – I

DETAILS OF THE REPORT

Sl No.	ITEMS	INFORMATIONS
1	Geographical Area	Jharia Coalfield (JCF): 453 sq. km. Raniganj Coalfield (RCF part): 19.64 sq. km. (Cluster-XVI area only)
2	Major Physiographic Units	Dissected Pediplain with surface Reduced Level (RL) varies from 160 m to 220 m above mean sea level (AMSL) in JCF and 100 m to 140 m AMSL in RCF.
3	Drainage System	Damodar River is the master drainage flowing along western boundary of the JCF. Jamunia River, Khudia River, Katri River, Jarian Nala, Ekra Jore, Kari Jore, Kashi Jore, Chatkari Jore and their tributaries are flowing through the JCF area. Damodar River, Barakar River is the master drainage of the part of RCF area (CV Area).
4	Annual Rainfall (IMD-report)	Jharkhand State: 1264.10 mm Rainfall data given in **Annexure-IV**.
5	Geological Formations	Gondwana Formation (Talchir Formation, Barakar Formation, Barren Measure Formation & Raniganj Formation)
6	Aquifer System	Unconfined/Phreatic Aquifer – thickness 25 m (Avg.) Semi-confined to confined Aquifer – thickness from 25 m upto 650 m
7	Hydrogeological properties (Aquifer Pump Test)	Unconfined Aquifer (Damoda BJ Section & Block-II): Hydraulic Conductivity – upto 0.50 m/day Transmissivity – 10 - 42 m^2/day
		Semi-confined to confined Aquifer (Sitanala & Kumari Block): Hydraulic Conductivity – 0.0006-1.44 & 0.05-0.0027 m/day Transmissivity – 0.06 – 0.573 m^2/day
8	Groundwater Level Monitoring Network	Out of total 252 nos. of monitoring stations 64 nos located within core mining area and rest comes within Buffers zone. 60 Nos. of Groundwater monitoring well (Dug Wells) network established by CMPDI to record groundwater level data in and around the Core Zone of JCF and 4 Nos. of Groundwater monitoring well (Dug Wells) in RCF (CV Area).
9	Groundwater Levels Below Ground Level (bgl)	JCF area: Pre-monsoon – 0.42 to 11.90 m (Avg. 5.12 m bgl) in '2022-23 Post-monsoon – 0.29 to 11.12 m (Avg. 3.32 m bgl) in '2022-23 RCF area (part): Pre-monsoon – 1.73 to 2.68 m (Avg. 2.20 m bgl) in '2022-23 Post-monsoon – 1.63 to 2.20 m (Avg. 1.90 m bgl) in '2022-23
10	Groundwater Quality	Potable as per GEC-2015 Norms (**Annexure- VIII**)
11	Proposed Piezometers	Piezometers (23 nos.) to monitor impact of coal mining on groundwater regime within the coalfield area (JCF & part of RCF)
12	Stage of Groundwater Development (CGWB)	Dhanbad District-Safe to Over-exploited category (GWRA-2022)

GROUNDWATER LEVEL & QUALITY REPORT FOR CLUSTER OF MINES OF BCCL

1.0 INTRODUCTION

1.1 LOCATION DETAILS AND BRIEF ABOUT THE PROJECT

The 15 nos. Cluster of mines (Cluster-I, II, III, IV, V, VI, VII, VIII, IX, X, XI, XIII, XIV, XV and XVI) of BCCL is located in the Jharia coalfield in Bokaro and Dhanbad districts of Jharkhand and part of Raniganj coalfield in Dhanbad district of Jharkhand.

The area of Jharia Coalfield (JCF) is 453 sq. km. and Raniganj Coalfield (RCF part) is 19.64 sq. km. (Cluster-XVI area only). Located about 3.0 km south-west of Dhanbad town and 10.0 km north-east of Bokaro town. The coalfield bounded by Jamunia River in the west, Damodar river in the south, and Metamorphics (hard rock) in the north and east side. **(Plate-I)**.

1.2 OBJECTIVE OF THE STUDY:

The objective of the report is to conduct hydrogeological study by quarterly monitoring of groundwater level and quality of the Jharia coalfield and Raniganj coalfield (part) within BCCL command area for 15 Cluster of mines. The data collected shall be submitted to the MoEF&CC, CPCB & SPCB within stipulated timeframe. The work is being done yearly and required to be continued as per the specific condition mentioned invariably in Environmental Condition (EC) for all of the Clusters of BCCL.

1.3 SCOPE OF THE STUDY:

The following scope has been taken into account for hydro-geological investigation of the study area.

i) To monitor the groundwater levels four times/year during (May, August, Nov and Jan).
ii) To monitor the groundwater quality during May including Arsenic and Fluoride.
iii) To evaluate the status of ground water level condition in the area.
iv) To study the ground water flow direction in the mining areas.
v) To study the depth to ground water level condition in the mining areas.
vi) To study the ground water quality data and interpretation in the mining areas.

File No. 08HBDD/JRRI/BCCL/ENV/0003/2018-BD Divn.-CMPDI (Computer No. 68378)
Receipt No : 188686/2018/O/e-HEAD OF BUSINESS DEVELOPMENT, CMPDI HQ

भारत कोकिंग कोल लिमिटेड
एक मिनी रत्न कंपनी
(कोल इंडिया लिमिटेड का एक अंग)
कोयलाभवन, कोयलानगर,धनबाद –826005

Bharat Coking Coal Limited
A Mini Ratna Company
(A Subsidiary of Coal India Limited)
Regd.Off: Koyla Bhawan, Koyla Nagar
CIN: U10101JH1972GOI000918
Environment Department

पत्र संख्या भाकोकोलि/उप महाप्रबंधक(पर्या0)/संचिका-/18/1086-1088/H) दिनांक : 14.06.2018

सेवा में,
महाप्रबंधक
व्यापार विकास
सीएमपीडीआई - कांके रोड रांची ८३४०३१-

Sub: For work of Ground water level and quality monitoring

महोदय,

This is with reference to earlier letter ref no. BCCL/HOD(Env)/F-Env/13/161 dated 11.02.2014 regarding conducting hydrological study by quarterly monitoring of groundwater level and quality of the study to be carried out by establishing a network of existing wells. The monitoring for quantity shall be done four times a year in pre-monsoon (May), monsoon (August), post-monsoon (November) and winter (January) season and for quality including Arsenic and Fluoride during month of May. Data thus collected shall be submitted to the Ministry of Environment & Forest and to Central Pollution Control Board/SPCB quarterly within one month of monitoring.

The above work is being done yearly and required to be continued as per the specific condition mentioned invariably in Environment Clearance order of all clusters of BCCL.

This is for your kind information and further necessary action

भवदीय

14/6/18

उप-महाप्रबंधक (पर्यावरण)

Copy To:
१ महाप्रबंधक (गवेषण), कांके रोड रांची ८३४०३१-

1.4 TOPOGRAPHY AND DRAINAGE

Northern part of the JCF area covered with hills and thin forest. In general, the altitude varies from 220 m above mean sea level (AMSL) in Barora area (Cluster-I) to 160 m AMSL in Sudamdih area (Cluster-X). Pediplains developed over sedimentary rocks or Gondwana formation consisting of Sandstone, Shale, coal, etc. Dissected pediplains developed over Gondwana formations found in Jharia, Baghmara, Katras areas etc. However, in RCF (part) area, the altitude varies from 100 m to 140 m AMSL (Cluster-XVI). The general slope of the topography is towards south, i.e. Damodar River.

The drainage pattern of the area is dendritic in nature. The drainage system of the area is the part of Damodar sub-basin. All the rivers that originate or flow through the coalfield area have an easterly or southeasterly course and ultimately joins Damodar River - the master drainage. The drainage of the JCF is mainly controlled by Jamuniya River (5th order), Khudia nala (3rd order), Katri River (4th) and Chatkari nala (3rd order) flowing from north to south and joins Damodar River. Whereas, Barakar River and Khudia River are controlling the drainage pattern of RCF (part) and joins Damodar River in the south. Damodar River is the main drainage channel and flows from west to east along the southern boundary of JCF and RCF.

The drainage map of the JCF and part of RCF has been prepared on topographic map of scale 1:50,000 (***Plate-I***). The watershed of all tributary rivers (Jamuniya River to Barakar River) falls within the north-western part of Damodar sub-basin which comes under Lower Ganga Basin.

Besides, a large number of ponds/tanks distributed in and around JCF, out of which one prominent lake is located at Topchanchi in the north-west part. Two reservoirs, Maithon dam on Barakar River and Panchet dam on Damodar River near to Chanch Victoria Area of BCCL (part of RCF), are the main source of water supply to the nearby area. Jharia Water Board, Damodar Water Supply Scheme and Mineral Area Development Authority (MADA) are supplying water.

1.5 DETAILS REGARDING WETLANDS

A **wetland** is a distinct ecosystem that gets flooded by water, either permanently or seasonally. The primary factor that distinguishes **wetlands** from other landforms or water bodies is its characteristic vegetation (aquatic plants). Wetland are protective ecosystem as per new guidelines of CGWA & MoEF&CC. There are no Wetlands in and around the area (Jharia coalfield and Raniganj coalfield) as per the list available on official website of MoEF&CC, Govt. of India. The list enclosed as **Annexure-III.**

1.6 CLIMATE & RAINFALL

The Jharia Coalfield (JCF) and part of Raniganj Coalfield (RCF) area in Dhanbad District belongs to sub-humid tropical climatic region. The maximum temperature during summer shoots up to 45^{o} C and falls between 10^{o} C to 5^{o} C in winter. The maximum rainfall occurs during the period between June and September. Rainfall data of IMD Dhanbad and Mine Rescue Station Dhanbad given in ***Annexure-IV***.

In Jharkhand state, Daily Rainfall data from 1989 to 2018 considered for analysis of trend variability and mean rainfall patterns. From the daily rainfall data, monthly rainfall series of each station is computed and then monthly district rainfall series is constructed by considering arithmetic average of all the station rainfall values within the district. The monthly rainfall series of the state is computed by using area weighted rainfall values of all the districts within the state. The objective of the analysis is to:

1. Identify the spatial pattern of the mean rainfall
2. Understand district wise observed rainfall trend and variability in annual and SW monsoon season (June, July, August and September).

Daily station rainfall data is utilized for identification of the mean spatial patterns and rainfall intensity trends. From mean and standard deviation (SD), the coefficient of variation (CV) is calculated using following equation:

Coefficient of variation (CV) = [Standard Deviation / Mean] × 100

The analysis has done in two parts. For identification of the spatial pattern mean rainfall and variability and observed trends we have used district rainfall series and results have been brought out for four southwest monsoon months viz. June, July, August, September, for the southwest monsoon season and also for annual.

Table shows the mean rainfall (mm) and coefficient of variation of the state for the monsoon months, southwest monsoon season and annual during the period 1989-2018. It can be seen that the state gets highest rainfall (31%) of southwest monsoon rainfall in July month while the August month get 28% of the southwest monsoon rainfall. June and September receive 19% and 22% of southwest monsoon rainfall. Also more than 84% of annual rainfall receives during the southwest monsoon season only. The variability of monsoon or annual rainfall is also very less.

Jharkhand State

	June	July	August	September	Sub-total	Annual
Mean	190.3	313.9	289.2	225.7	1019.1	1211.4
CV	44.4	29.0	24.8	37.0	18.7	16.9

Dhanbad District

	June	July	August	September	Sub-total	Annual
Mean	203.9	327.7	302.5	271.5	1105.6	1332.2
CV	41.0	35.0	33.5	48.7	20.8	19.4

Fig. 1 and 2 show the time series of rainfall in mm for the months of June, July, August and September along with southwest monsoon season and annual rainfall. The trend lines are displayed for each of the series. Neither monthly rainfall nor seasonal rainfall shows any significant increasing/decreasing trend while annual rainfall shows significant decreasing trend. The monthly rainfall during June, July, August and September as well as seasonal rainfall show decreasing trend. During the last 30 years, highest rainfall of 390.3 mm was received in June in the year 1994, 492.1 mm was received in July in the year 2017, 431.5 mm was received in August in the year 1997, while highest rainfall of 395.2 in September was received in the year 1995. Highest annual rainfall of 1587.9 mm was received in the year 1999 and highest southwest monsoon rainfall of 1364.6 mm was received in the year 1994 (Climate Research and Services, IMD, Ministry of Earth Sciences, Pune, Jan'2020).

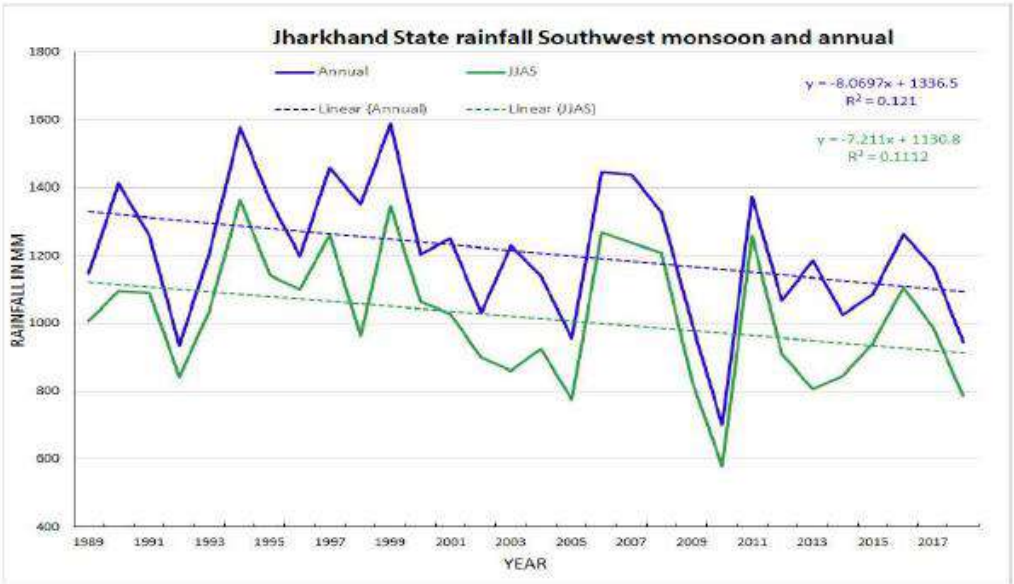


Fig-1.

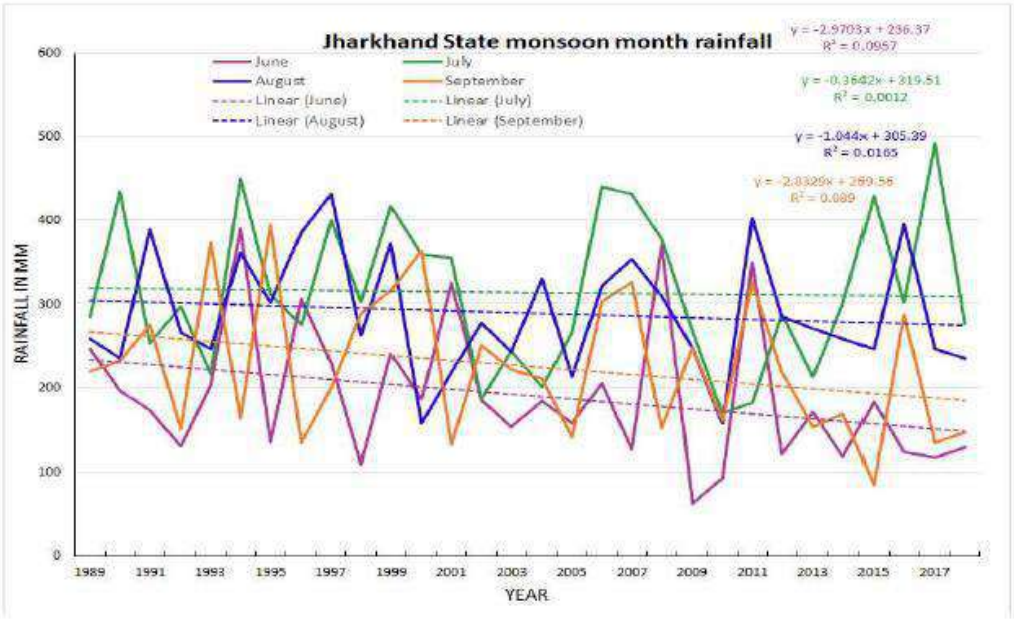


Fig-2.

2.0 GEOLOGY AND HYDROGEOLOGICAL SETUP OF THE AREA

2.1 REGIONAL GEOLOGY

The Jharia Coalfield covering an area of 453 sq. km. is located in Dhanbad District, Jharkhand. The non-coal bearing Talchir Formation is exposed in patches along the northern fringe of the Coalfield. The Barakar Formation (Coal Bearing horizon) overlies the Talchir and covers the most part of the Jharia Coalfield and have an area of 218 sq. km. This is successively overlain by the non-coal bearing Barren Measures Formation which is mainly exposed in the central part of the Coalfield. This, in turn, is overlain by the Raniganj Formation (Coal Bearing horizon) in the south-west part of the Coalfield and covers an area of 54 sq. km.

Chanch-Victoria Area is located in the western part of Raniganj Coalfield. The Raniganj coalfield represents the eastern most coal basin in the Damodar Valley Region, located at the border of Dhanbad District of Jharkhand and Bardhaman District of West Bengal. The Coalfield is almost elliptical in shape and covers an area of about 1530 sq. km. Out of this, only 35 sq. km. comes under leasehold area of BCCL within which 19.64 sq. km is the study area (Cluster-XVI only). The coal bearing formations of the area belongs to Barakar Formation of the Lower Gondwana in **Table-1**.

Table – 1: Regional Geological Succession of Jharia Coalfield

Geological Formations		Age
Quaternary/Recent	Soil cover/Weathered mantle	Recent
Post-Gondwana	Dolerite	Upper Cretaceous
	Lamprophyres	Jurassic
Damoda Group	Raniganj Formation	Upper Permian
	Barren Measures Formation	Middle Permian
	Barakar Formation	Lower Permian
	Karharbari	
	Talchir Formaton	Upper Carboniferous
----------Unconformity----------		
Metamorphics		Proterozoic

2.2 HYDROGEOLOGICAL SET- UP

The permeable formations, mainly composed of sandstone, behave as aquifer units. The coal seam and shales developed in the area act as impermeable beds i.e. aquiclude. The aquifer materials of Gondwana Formation constitute of fine to coarse grain sandstone having primary porosity of inter-granular void space. The secondary porosity formed due to presence of faults, fracture, joints, etc. Sandstones of Gondwana formation in JCF and RCF are very hard, compact and cemented and form less potential aquifer, particularly in deeper aquifer system. The secondary porosity along with primary porosity forms a conduit system making these formations good aquifers for movement and storage of ground water.

2.3 AQUIFERS DESCRIPTION

The aquifer system for shallow and deeper aquifer has been established through hydrogeological studies, exploration, surface and subsurface geophysical studies in the JCF and RCF (part) covering all geological formations. The aquifer can be divided into two zones – Un-confined/Phreatic (shallow) and Semi-confined to confined (deeper) aquifer.

PHREATIC/UN-CONFINED AQUIFER

The top aquifer occurred above the top most coal seam/shale bed is called un-confined or water table aquifer and it consists of relatively permeable formation such as weathered sandstone and loose soil. The thickness of the un-confined aquifer is varying from few meters to 50 m. This un-confined aquifer is more potential than semi-confined to confined aquifer.

SEMI-CONFINED TO CONFINED AQUIFER

The semi-confined to confined aquifer consisting of sandstone bed is sandwiched between coal seams/shale beds and thus, multiple aquifer system developed due to presence of multiple number of coal seams/shale beds. With the presence of intercalated shale and carbonaceous shale beds and reduction in permeability with depth, the lower aquifers are poor in potentiality.

Table –2 Generalized Hydrogeological Units developed in the study Area

Sl. No.	Type of Aquifer	Depth range (m)	Core zone (within 2 km)	Buffer zone (within 10 km)
1.	Unconfined	0 – 50 (Avg. 25)	Alluvium, weathered sandstone	Alluvium, weathered sandstone
2.	Semiconfined/ confined	Beyond 25 upto 650 m	Multiple Sandstone horizons in Barakar formation	Multiple Barakar sandstone, Barren Measure, Raniganj sandstone, Talchir shale and Metamorphics

2.4 GENERAL AQUIFER PARAMETERS

PHREATIC/UN-CONFINED AQUIFER

The wells tested by CMPDI for determination of aquifer parameters in Damuda (BJ Section) and Block-III area of JCF. The hydraulic conductivity of the un-confined aquifer is 0.50 m/day as computed from pumping tests on the wells. The transmissivity of the unconfined aquifer ranges from 10.68 m^2 /day to 41.48 m^2 /day.

SEMI-CONFINED TO CONFINED AQUIFER

The sandstone partings in-between impervious layers of shale and coal seams is designated as semi-confined / confined aquifers. The sandstones in these aquifers are fine to coarse grained, hard and compact with very low porosity. Mostly groundwater occurs in the weak zones formed due to weathering, fracture, faults, which create the secondary porosity. The hydrogeological parameter has determined by CMPDI in Sitanala Block by conducting aquifer performance test (APT). The hydraulic conductivity (K) of semi-confined aquifer in Barakar Formation ranges from 0.0006 m/day to 1.44 m/day. The hydrogeological parameter has also been determined at Kumari OCP Block in the central JCF by conducting aquifer performance test. The hydraulic conductivity (K) of semi-confined aquifer in Barakar Formation in this area ranges from 0.0027 m/day to 0.05 m/day.

Table – 3: Aquifer parameters considered for the study Area

Hydraulic Parameter	**Unconfined aquifer** Site: Damuda (BJ Section) and Block-III area	**Semi-confined aquifer** Site: (1): Sitanala Block (2): Kumari Block
Transmissivity (m^2/d)	10.68 – 41.48	0.0621 – 0.573
Hydraulic conductivity (m/d)	0.5	0.05 – 0.0027
Specific yield	0.03 to 0.04 (as per GEC recommended values)	

3.0 GROUND WATER LEVEL MONITORING

To collect the representative groundwater levels in the study area, CMPDI has established a monitoring network of total 252 monitoring stations out of which 64 located within core zone and rest falls in Buffer zone. Total 60 nos. dug well within JCF and 04 nos. dug well within RCF (part) area (Details of the Hydrograph stations & water level given in **Annexure-V, VA** & **VB**) spread over the entire BCCL leasehold area, **Plate-I**. Water level data collection in all monitoring stations has been done in pre-monsoon as well as in post monsoon whereas in 64 monitoring stations the data collection has been done on quarterly basis (May'22, Aug'22, Nov'22 and Jan'23).

Depth to water level of the water table depict the inequalities in the position of water table with respect to ground surface and is useful in delineating recharge / discharge areas, planning of artificial recharge structure and shows the overall status of the groundwater level in the area. Historical groundwater level

(GWL) of entire JCF and part of RCF with fluctuation, GWL of Non-mining / Mining areas and GWL of the Cluster of Mines of BCCL are shown in this report to assess the effect of Coal mining activity on the groundwater regime in and around the Coalfield area.

Mining is a dynamic phenomenon. The mining activity creates dis-equilibrium in environmental scenario of the area and disturbs the groundwater conditions/regime in particular. The impact on shallow water regime due to mining activity can be broadly viewed as under:

- Historical GWL with annual fluctuation over the years
- GWL scenario in Non-mining and Mining area (OC/UG mines)
- GWL scenario of Cluster of mines of BCCL

3.1 HISTORICAL GROUNDWATER LEVEL (GWL)

Historical GWL of JCF and part of RCF of CMPDI monitoring stations given from 2005 to 2021 (total 64 stations within Coalfield area). Pre-monsoon and Post-monsoon GWL with Fluctuation has been mentioned below in the table.

Table – 4: Historical Groundwater Level

Period		(Water level in metre below ground level)								
		Pre-Monsoon (April/May)			Post-Monsoon (Nov/Dec)			Fluctuation		
		From	To	Average	From	To	Average	From	To	Average
JCF	2005	0.07	19.08	6.29	0.84	12.13	3.20	0.12	12.45	3.21
	2007	0.40	19.27	5.66	0.35	8.21	2.87	0.02	16.15	2.96
	2008	0.45	18.35	5.42	0.35	14.20	3.62	0.03	9.22	2.45
	2010	0.85	14.47	5.24	0.10	15.88	4.48	0.02	5.55	1.54
	2012	1.27	18.68	5.58	0.15	7.80	2.72	0.08	13.45	2.96
	2013	0.70	19.20	5.65	0.45	8.35	2.77	0.29	15.88	3.17
	2014	0.70	16.28	4.92	0.75	14.98	3.27	0.25	10.15	2.17
	2015	1.38	17.20	6.00	0.45	14.58	3.92	0.28	7.62	2.15
	2016	0.78	16.73	5.64	0.30	12.43	3.19	0.23	6.35	2.88
	2017	0.67	16.28	5.61	0.15	6.97	2.41	0.10	12.10	3.25
	2018	1.20	14.58	5.55	0.40	7.17	2.83	0.20	9.45	2.68
	2019	0.95	15.88	5.46	0.45	5.95	2.34	0.20	13.40	3.05
	2020	0.80	16.25	4.95	0.75	10.10	3.26	0.25	11.05	2.15
	2021	0.62	11.26	5.23	0.05	7.62	2.28	0.15	9.03	2.94
	2022	0.42	11.90	5.12	0.29	11.12	3.32	0.03	7.2	1.80
RCF (part)	2008	5.02	10.50	7.59	2.85	4.90	3.71	1.82	6.60	3.87
	2010	2.20	8.85	4.74	2.78	9.58	4.63	0.68	1.10	0.89
	2011	3.57	8.02	4.98	2.50	6.21	3.75	0.55	1.90	1.23
	2012	3.10	7.34	4.59	1.55	7.00	3.66	0.05	2.78	0.94
	2013	1.70	9.87	6.54	2.90	8.85	4.71	1.02	5.54	2.84
	2014	3.27	6.48	4.57	2.13	3.03	2.63	0.54	3.45	1.94
	2015	3.38	9.52	5.33	2.68	8.20	5.11	1.06	1.32	1.81
	2016	3.61	10.65	6.24	0.90	6.50	3.18	1.63	4.40	3.06
	2017	1.93	5.80	3.25	1.63	3.78	2.47	1.63	3.78	0.78
	2018	2.34	8.70	4.35	1.75	5.70	2.75	0.41	2.55	1.59
	2019	1.60	9.35	5.29	0.80	3.88	2.10	0.80	5.47	3.20
	2020	2.30	9.70	4.30	1.75	5.50	2.70	0.40	2.75	1.60
	2021	2.00	6.20	3.34	1.10	5.25	2.44	0.80	0.95	0.90
	2022	1.73	2.68	2.20	1.63	2.2	1.91	0.10	0.48	0.29

3.2 DEPTH TO WATER LEVEL & HYDRAULIC GRADIENT

Depth to water level (DTW) range in different formations with respect to mining and non-mining areas is summarized in the Table-5.

Table – 5: Depth to water table

Formation	*Area*	*DTW (bgl, m) [Year-2022-23]*	
		Pre-monsoon (Apr/May)	*Post-monsoon (Nov/Dec)*
Sedimentary (Gondwana Formation / Core Zone)	Non-mining	2.0-10.0	1.0-10.0
	Mining	1.0-12.0	0.50-11.0
Metamorphics (Hard rock)	Peripheral part of the Coalfield	<2.0-7.0	1.0-7.0

The study revealed that water table is in shallow depth and there is no significant stress in the water table due to coal mining activity. Mining and Non-mining areas shows barely any difference in water table condition in JCF and RCF (part) area. The average hydraulic gradient of the water table within mining and non-mining areas is given in Table-6. No significant change in hydraulic gradient is observed. Relatively steep gradient near active opencast mining areas w.r.t., non-mining, underground mines and Metamorphics areas is observed.

Table – 6: Average hydraulic gradient

Sl. No	*Formation*	*Area*	*Average hydraulic gradient*
1	Sedimentary (Gondwana Formation / Core Zone)	Non-Mining	1.0×10^{-3} to 2.5×10^{-3}
		Mining	1.0×10^{-2} to 4.0×10^{-3}
2	Metamorphics (Buffer Zone)	Peripheral part of the Coalfield	1.0×10^{-3} to 3.5×10^{-3}

3.3 GROUND WATER LEVEL DATA OF THE CLUSTER OF MINES OF BCCL

A GROUND WATER LEVEL OF CLUSTER-I

Cluster-I (Damuda Group of Mines consisting of Damuda UG, Albion OCP, Proposed BJ Section OCP and Abandoned Gutway OCP) of Barora area, BCCL is located in the western most part of Jharia coalfield in Bokaro district of Jharkhand. The life of the project has been worked out to be up to 15 years considering annual target production of 1.17 MTPA. It is located in the extreme western part of JCF in Bokaro district of Jharkhand (Toposheet no – 73 I/1).

The present leasehold area of Cluster-I is 575.0 Ha. The Damuda block area marked by more or less flat and gently undulating topography. The RL varies from 179 m to 208 m AMSL and the general slope of topography is towards east. Jamuniya River, Kari Jore, Podo Jore and its tributaries are controlling the drainage system of the area. The area comes under the watershed of Jamuniya River.

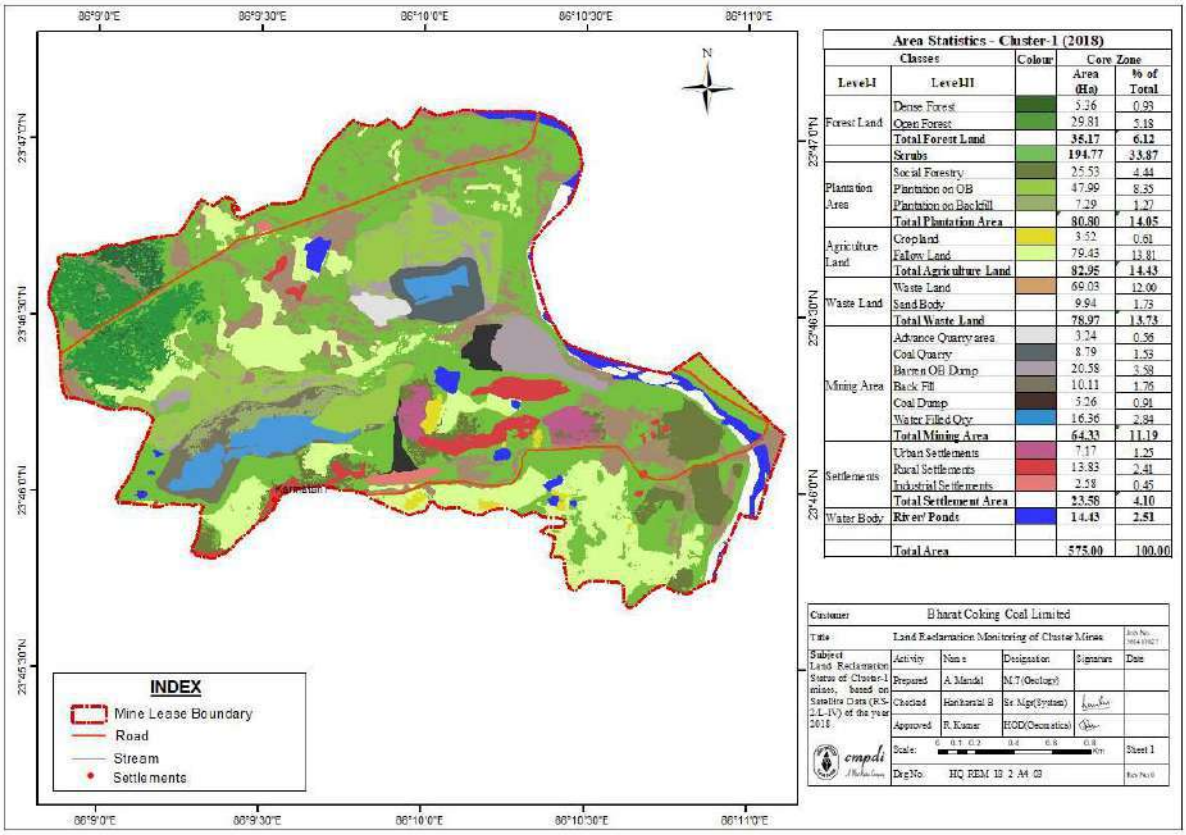
Monitoring stations (**B-15, B-21A, B51 and B-53**) are located in the core zone of the mine area. Water level monitoring in these monitoring stations has done in the months of May'22, August'22, and Nov'22 and January'23. The Ground water level data is presented in the table below:

Sl No.	Well No.	Location	Water level (bgl in meters)											
			2022-23				2021-22				2020-21			
			May	Aug	Nov	Jan	May	Aug	Nov	Jan	May	Aug	Nov	Jan
1	B-15	Bera Basti	3.67	0.45	1.02	2.30	1.46	0.25	0.35	1.01	3.70	0.15	1.47	1.70
2	B21A	Dugdha	9.65	5.55	4.35	Abn.	8.38	2.50			10.00	4.15	5.80	6.70
3	B-51	Taranga	5.06	0.00	4.57	2.87	5.70	0.90	1.00	4.88	5.00	0.88	2.10	3.00
4	B-53	Karmatanr	4.42	1.78	3.54	1.68	4.85	1.52	1.87	2.87	3.12	1.07	1.40	1.92
Average WL (bgl)			5.70	1.95	3.37	2.28	5.10	1.29	1.07	2.92	3.70	0.15	1.47	1.70

LAST THREE-YEAR ASSESSMENT:

Pre-monsoon GW Level (m): Min – 1.46 m Max – 10.00 m
Post-monsoon GW Level (m): Min – 0.35 m Max – 5.80 m

LAND USE / LAND COVER MAP OF THE CLUSTER-I MINES, BCCL



Sl no	Land Use Details	Existing (sq. meter)	Proposed (sq. meter)	Grand Total (sq. meter)
1	Green Belt Area	393.69 x 10^4	0.0	393.69 x 10^4
2	Open Land	204.89 x 10^4	0.0	204.89 x 10^4
3	Road/ Paved Area	09.0 x 10^4	0.0	09.0 x 10^4
4	Rooftop area of building/ sheds	14.58 x 10^4	0.0	14.58 x 10^4
5	Total	575.00 x 10^4	0.0	575.00 x 10^4

B. GROUND WATER LEVEL OF CLUSTER-II

Cluster-II consists of seven mines namely; Block II Mixed mines (OCP & UGP), Jamunia OCP, Shatabdi OCP, Muraidih Mixed mines (OCP & UGP), and Phularitand OCP of BCCL is located in the western most part of Jharia coalfield in Bokaro district and Dhanbad district of Jharkhand. The life of the project has been worked out to be up to 30 years considering annual target production of 20.215 MTPA. It is located in the extreme western part of Jharia Coalfield in Dhanbad district of Jharkhand (Toposheet no- 73 I/1 and I/5).

The present leasehold area of Cluster-II is 2260.54 Ha. The Damuda block area marked by more or less flat and gently undulating topography. The RL varies from 176 m to 235 m AMSL. Jamuniya River, Khudia River and its tributaries are controlling the drainage system of the area. The area comes under the watershed of Jamuniya River and Khudia River.

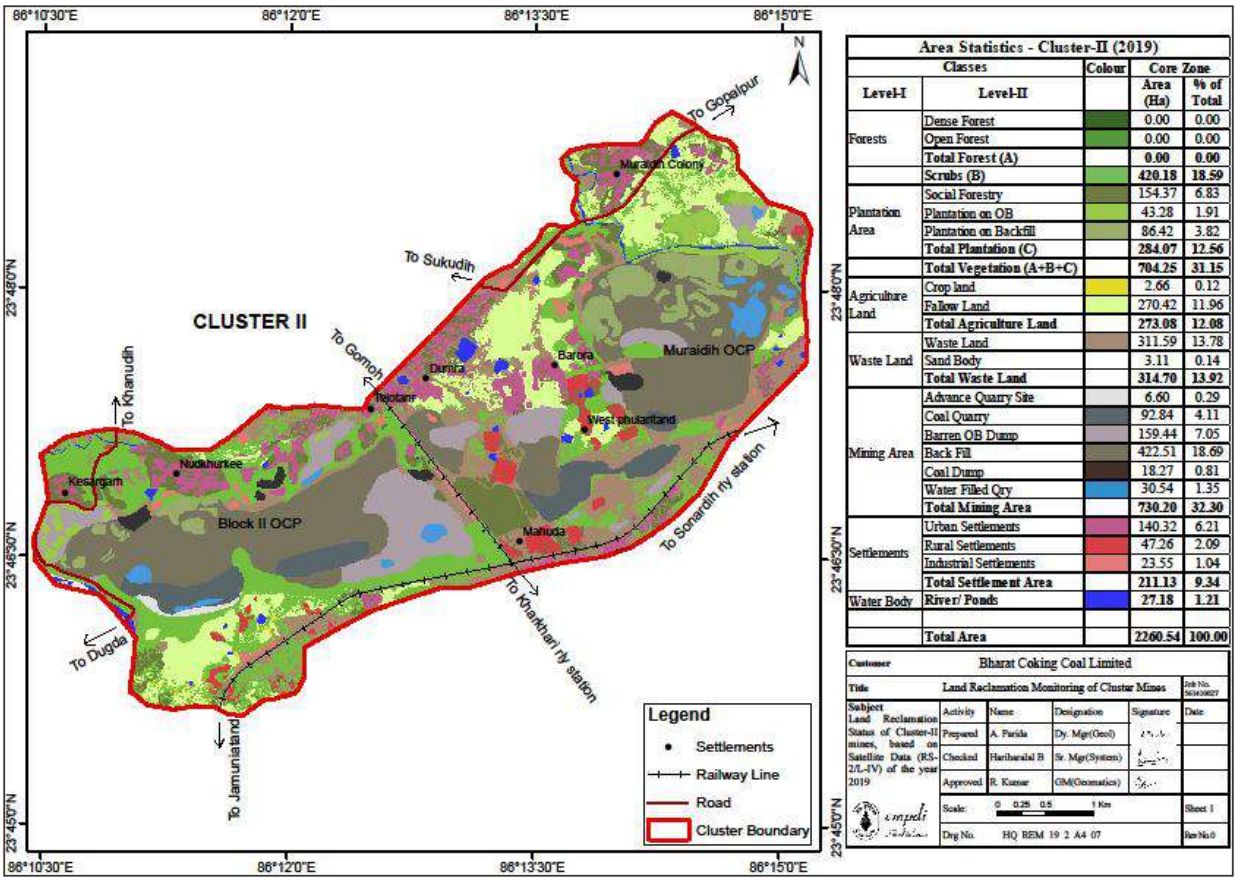
Monitoring stations (**B-1, B-59, B-60, B-61A and B-62A**) are located in the core zone of the mine area. Water level monitoring in these monitoring stations has done in the months of May'22, August'22, and Nov'22 and January'23. The Ground water level data is presented in the table below:

Sl No.	Well No.	Location	Water level (bgl in meters)											
			2022-23				2021-22				2020-21			
			May	Aug	Nov	Jan	May	Aug	Nov	Jan	May	Aug	Nov	Jan
1	B-1	Muraidih	2.10	1.65	1.81	2.73	2.58	0.58	1.91	2.03	3.28	0.73	1.63	1.73
2	B-59	Khodovaly	4.50	0.44	1.14	1.04	5.49	0.30	0.90	0.95	5.25	0.67	1.40	2.10
3	B-60	Bahiyardih	10.53	1.08	5.80	9.38	11.26	1.33	2.23	6.53	10.33	0.91	3.21	6.13
4	B61A	Kesargora	1.20	0.52	0.97	Abn	4.42	0.47	0.97	0.97	3.32	0.85	1.60	2.07
5	B62A	Sadiyardih	6.45	1.77	4.91	5.15	6.87	1.35	4.50	4.60	6.95	2.77	3.00	4.95
Average WL (bgl)			4.96	1.09	2.93	4.58	6.12	0.81	2.10	3.02	5.83	1.19	2.17	3.40

LAST THREE-YEAR ASSESSMENT:

Pre-monsoon GW Level (m): Min – 1.20m Max – 11.26 m
Post-monsoon GW Level (m): Min – 0.90 m Max – 5.80 m

LAND USE / LAND COVER MAP OF THE CLUSTER-II MINES, BCCL



Area Statistics - Cluster-II (2019)

Classes		Colour	Core Zone	
Level-I	Level-II		Area (Ha)	% of Total
Forests	Dense Forest		0.00	0.00
	Open Forest		0.00	0.00
	Total Forest (A)		**0.00**	**0.00**
	Scrubs (B)		420.18	18.59
Plantation Area	Social Forestry		154.37	6.83
	Plantation on OB		43.28	1.91
	Plantation on Backfill		86.42	3.82
	Total Plantation (C)		**284.07**	**12.56**
	Total Vegetation (A+B+C)		**704.25**	**31.15**
Agriculture Land	Crop land		2.66	0.12
	Fallow Land		270.42	11.96
	Total Agriculture Land		**273.08**	**12.08**
Waste Land	Waste Land		311.59	13.78
	Sand Body		3.11	0.14
	Total Waste Land		**314.70**	**13.92**
Mining Area	Advance Quarry Site		6.60	0.29
	Coal Quarry		92.84	4.11
	Barren OB Dump		159.44	7.05
	Back Fill		422.51	18.69
	Coal Dump		18.27	0.81
	Water Filled Qry		30.54	1.35
	Total Mining Area		**730.20**	**32.30**
Settlements	Urban Settlements		140.32	6.21
	Rural Settlements		47.26	2.09
	Industrial Settlements		23.55	1.04
	Total Settlement Area		**211.13**	**9.34**
Water Body	River/ Ponds		27.18	1.21
	Total Area		**2260.54**	**100.00**

Customer	Bharat Coking Coal Limited				
Title	Land Reclamation Monitoring of Cluster Mines				Job No. 50420022
Subject: Land Reclamation Status of Cluster-II mines, based on Satellite Data (RS-2/L-IV) of the year 2019	Activity	Name	Designation	Signature	Date
	Prepared	A. Parida	Dy. Mgr(Geol)		
	Checked	Hariharalal B	Sr. Mgr(System)		
	Approved	R. Kumar	GM(Geomatics)		
	Scale: 0 0.25 0.5 1 Km				Sheet 1
	Drg No. HQ REM 19 2 A4 07				Rev No:0

Sl no	Land Use Details	Existing (sq. meter)	Proposed (sq. meter)	Grand Total (sq. meter)
1	Green Belt Area	977.33×10^4	0.0	977.33×10^4
2	Open Land	1072.08×10^4	0.0	1072.08×10^4
3	Road/ Paved Area	140.32×10^4	0.0	140.32×10^4
4	Rooftop area of building/ sheds	70.81×10^4	0.0	70.81×10^4
5	Total	2260.54×10^4	0.0	2260.54×10^4

C. GROUND WATER LEVEL OF CLUSTER-III

Cluster-III consists of nine mines namely, Jogidih UG, Govindpur UG, Maheshpur UG, Kooridih/Block-IV Mixed Mine, New Akashkinaree Mixed Mine, South Govindpur UG (closed), and Teturiya UG (closed) mines. The life of the project has been worked out to be up to 60 years considering annual production target of 3.60 MTPA. This Cluster of mines is located in western part of Jharia Coalfield in Dhanbad district of Jharkhand (Toposheet no – 73 I/5).

The present leasehold area of Cluster-III is 1552.53 Ha. The area is plain with gentle undulation with RL varying from 160 m to 208.80 m AMSL. The general slope of the area is towards south. Khudia River, Baghdigi Jore, Katri River and its tributaries are controlling the drainage system of the area. The area comes under the watershed of Khudia River.

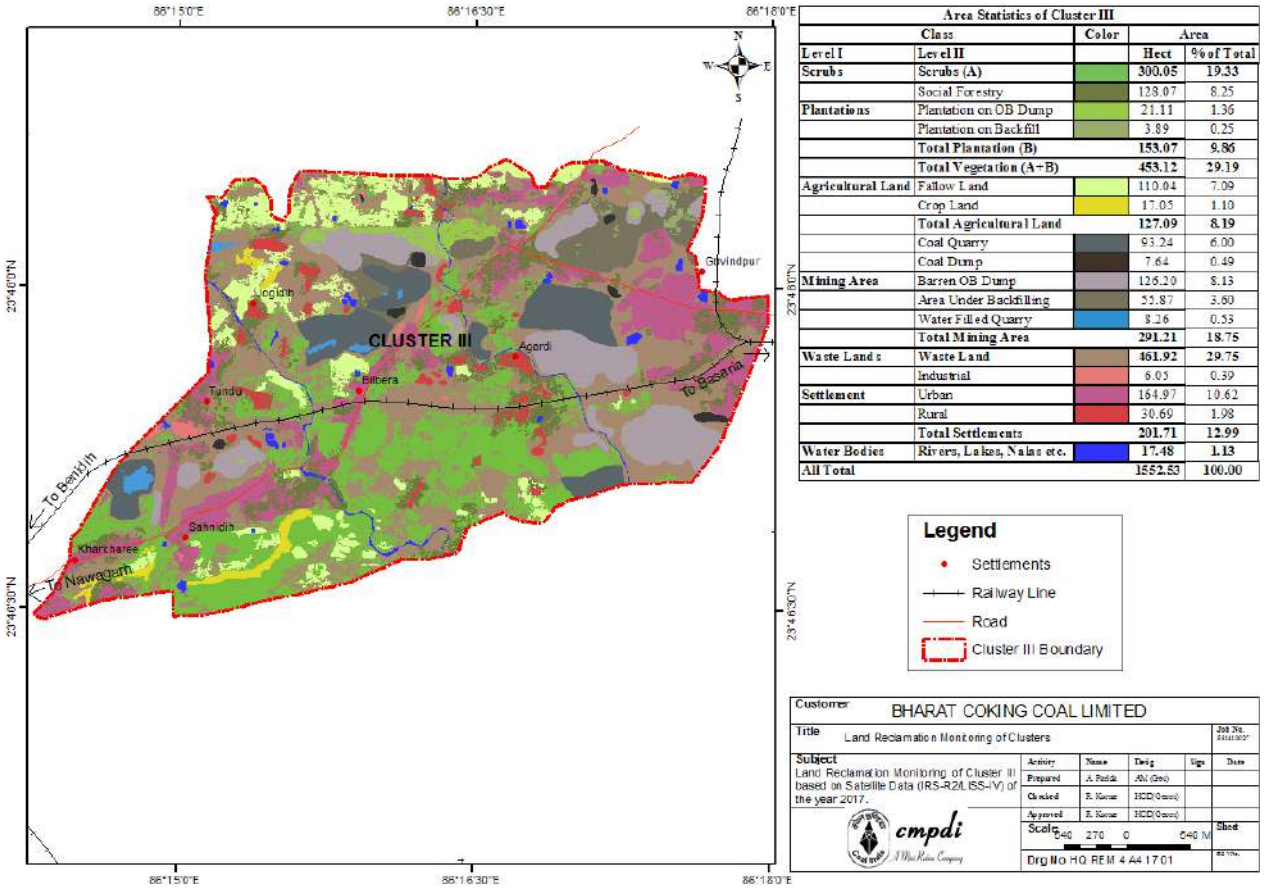
Monitoring stations (**A-12, A-25, A-29, B-14 and B-60**) are located in the core zone of the mine area. Water level monitoring in these monitoring stations has been done in the months of May'22, August'22, and Nov'22 and January'23. The Ground water level data is presented in the table below:

Sl No.	Well No.	Location	Water level (bgl in meters)											
			2022-23				2021-22				2020-21			
			May	Aug	Nov	Jan	May	Aug	Nov	Jan	May	Aug	Nov	Jan
1	A12	Jamua	1.50	0.30	0.67	0.70	1.92	0.50	1.10	1.72	2.60	0.32	0.50	1.20
2	A25	Sinidih	3.31	1.33	2.08	2.51	5.78	1.73	2.43	2.53	2.98	1.30	1.83	2.53
3	A29	Dharmaband	4.60	1.20	1.15	1.12	6.49	2.90	5.90	6.65	6.20	1.21	3.20	3.25
4	B14	Mathadih	3.24	0.09	2.60	2.55	2.84	0.24	2.04	2.10	2.44	0.32	1.04	1.69
5	B60	Sonardih	10.53	1.08	5.80	9.38	11.26	1.33	2.23	6.53	10.33	0.91	3.21	6.13
Average WL (bgl)			4.64	0.80	2.46	3.25	5.66	1.34	2.74	3.91	4.91	0.81	1.96	2.96

LAST THREE-YEAR ASSESSMENT:

Pre-monsoon GW Level (m): Min – 1.50 m Max – 11.26 m
Post-monsoon GW Level (m): Min – 0.50 m Max – 5.90 m

LAND USE / LAND COVER MAP OF THE CLUSTER-III MINES, BCCL



Area Statistics of Cluster III				
Class		Color	Area	
Level I	Level II		Hect	% of Total
Scrubs	Scrubs (A)		300.05	19.33
	Social Forestry		128.07	8.25
Plantations	Plantation on OB Dump		21.11	1.36
	Plantation on Backfill		3.89	0.25
	Total Plantation (B)		**153.07**	**9.86**
	Total Vegetation (A+B)		**453.12**	**29.19**
Agricultural Land	Fallow Land		110.04	7.09
	Crop Land		17.05	1.10
	Total Agricultural Land		**127.09**	**8.19**
Mining Area	Coal Quarry		93.24	6.00
	Coal Dump		7.64	0.49
	Barren OB Dump		126.20	8.13
	Area Under Backfilling		55.87	3.60
	Water Filled Quarry		8.26	0.53
	Total Mining Area		**291.21**	**18.75**
Waste Lands	**Waste Land**		**461.92**	**29.75**
	Industrial		6.05	0.39
Settlement	Urban		164.97	10.62
	Rural		30.69	1.98
	Total Settlements		**201.71**	**12.99**
Water Bodies	Rivers, Lakes, Nalas etc.		17.48	1.13
All Total			1552.53	100.00

Legend
- Settlements
- Railway Line
- Road
- Cluster III Boundary

Customer: BHARAT COKING COAL LIMITED
Title: Land Reclamation Monitoring of Clusters
Subject: Land Reclamation Monitoring of Cluster III based on Satellite Data (IRS-R2/LISS-IV) of the year 2017.
cmpdi
Scale: 540 270 0 540 M
Drg No HQ REM 4 A4 17 01

Sl no	Land Use Details	Existing (sq. meter)	Proposed (sq. meter)	Grand Total (sq. meter)
1	Green Belt Area	580.21×10^4	0.0	580.21×10^4
2	Open Land	770.61×10^4	0.0	770.61×10^4
3	Road/ Paved Area	164.97×10^4	0.0	164.97×10^4
4	Rooftop area of building/ sheds	36.74×10^4	0.0	36.74×10^4
5	Total	1552.53×10^4	0.0	1552.53×10^4

D. GROUND WATER LEVEL OF CLUSTER-IV

Cluster-IV consists of six mines namely, Amalgamated Keshalpur & West Mudidih colliery, Amalgamated Angarpathra & Ramkanali colliery, Katras-Choitudih Colliery, Salanpur colliery and Gaslitand colliery of Katras area, BCCL. It is located in the north-central part of Jharia Coalfield in Dhanbad district of Jharkhand. The life of the project has been worked out to be more than 30 years considering annual target production of 9.55 MTPA (Toposheet no – 73 I/5).

The present leasehold area of Cluster-IV is 1123.79 Ha. The area has a general undulating topography, with an overall gentle south-west slope. The RL varies from 182 m to 216 m AMSL. Katri River, Kumari Jore and their tributaries are controlling the drainage pattern of the area. The area comes under the watershed of Katri River.

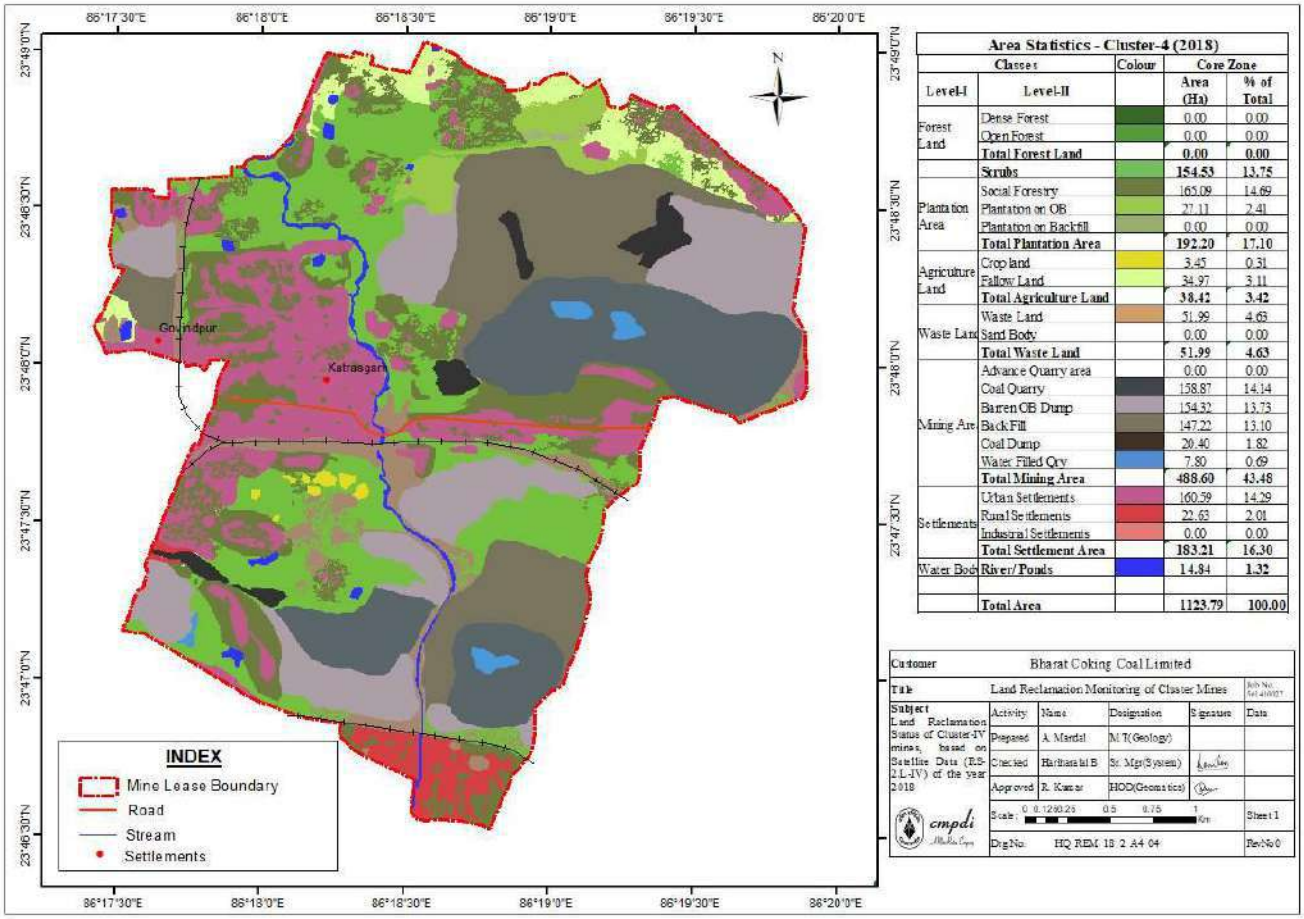
Monitoring stations (**A-26, A28A, B-64 and B-65A**) are located in the core zone of the mine area. Water level monitoring in these monitoring stations has been done in the months of May'22, August'22, and Nov'22 and January'23. The Ground water level data is presented in the table below:

Sl No.	Well No.	Location	Water level (bgl in meters)											
			2022-23				2021-22				2020-21			
			May	Aug	Nov	Jan	May	Aug	Nov	Jan	May	Aug	Nov	Jan
1	A-26	Malkhera	6.42	2.83	4.31	3.62	6.70	2.10	2.73	3.63	6.98	2.69	3.18	4.78
2	A28A	Lakarka	4.23	2.85	3.30	3.57	6.23	0.53	3.75	4.47	4.00	1.33	3.03	3.35
3	B-64	Keshalpur	1.00	0.35	0.60	0.75	2.35	0.30	0.95	1.00	1.85	0.93	0.50	1.37
4	B65A	Jhinjipahari	7.45	0.50	2.27	3.45	9.03	0.45	1.42	2.80	9.25	0.03	2.30	4.10
Average WL (bgl)			4.78	1.63	2.62	2.85	6.08	0.85	2.21	2.98	5.52	1.25	2.25	3.40

LAST THREE-YEAR ASSESSMENT:

Pre-monsoon GW Level (m): Min – 1.00 m Max – 9.25 m
Post-monsoon GW Level (m): Min – 0.50 m Max – 4.31 m

LAND USE / LAND COVER MAP OF THE CLUSTER-IV MINES, BCCL



Sl no	Land Use Details	Existing (sq. meter)	Proposed (sq. meter)	Grand Total (sq. meter)
1	Green Belt Area	385.15×10^4	0.0	385.15×10^4
2	Open Land	555.43×10^4	0.0	555.43×10^4
3	Road/ Paved Area	160.59×10^4	0.0	160.59×10^4
4	Rooftop area of building/ sheds	22.63×10^4	0.0	22.63×10^4
5	Total	1123.79×10^4	0.0	1123.79×10^4

E. GROUND WATER LEVEL OF CLUSTER-V

Cluster-V consists of twelve mines namely; Tetulmari OC & UG mines, Mudidih OC & UG mines, Nichitpur OC mine, Sendra Bansjora OC & UG mines, Bansdeopur OCP (proposed) & UG Mines, Kankanee OC & UG mines and Loyabad UG mine (closed) of Sijua area, BCCL. This Cluster of mines is located in northern part of Jharia Coalfield in Dhanbad district of Jharkhand. The life of the project has been worked out to be more than 30 years considering annual production target of 6.311 MTPA (Toposheet no – 73 I/6).

The present leasehold area of Cluster-V is 1724.52 Ha. The area has a general undulating topography, with an overall gentle south-west slope. The RL varies from 210 m to 170 m AMSL. Jarian Nala, Nagri Jore, Ekra Jore and their tributaries are controlling the drainage pattern of the area. The area comes under the watershed of Jarian Nala and Ekra Jore.

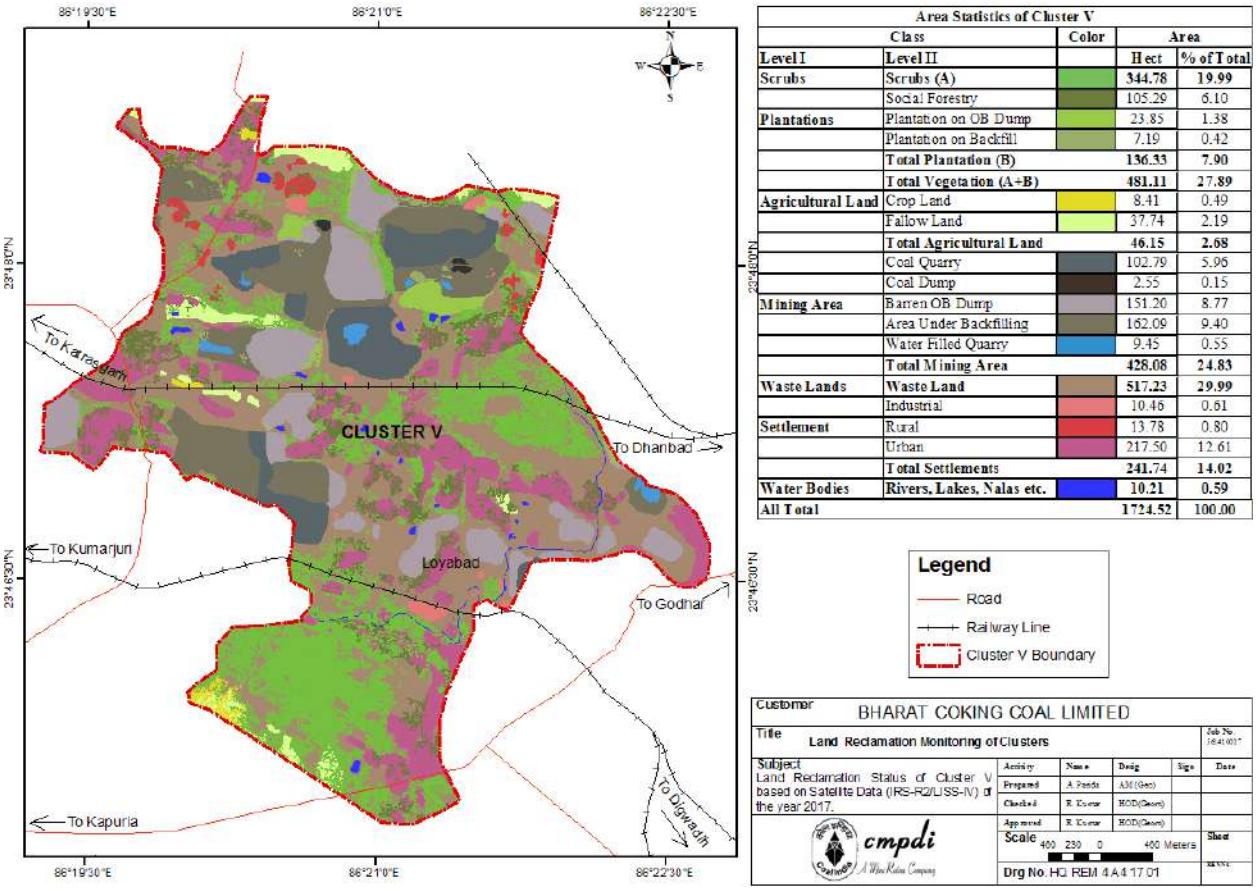
Monitoring stations (**A-3, A-16, A-27 and D-23**) are located in the core zone of the mine area. Water level monitoring in these monitoring stations has been done in the months of May'22, August'22, and Nov'22 and January'23. The Ground water level data is presented in the table below:

Sl No.	Well No.	Location	Water level (bgl in meters)											
			2022-23				2021-22				2020-21			
			May	Aug	Nov	Jan	May	Aug	Nov	Jan	May	Aug	Nov	Jan
1	A-3	Sijua	0.42	0.22	0.29	0.32	0.62	0.07	0.05	0.07	1.57	0.02	0.47	0.77
2	A-16	Ekra	5.80	1.35	3.08	2.99	3.45	1.90	2.00	3.00	7.15	1.34	1.75	3.20
3	A-27	Tetulmari	1.90	0.10	1.33	1.50	1.67	0.80	0.90	1.13	2.40	0.03	1.10	1.90
4	D-23	Jogta	1.85	0.45	1.57	1.85	5.43	1.87	1.60	1.65	5.60	1.69	3.35	3.70
Average WL (bgl)			2.49	0.53	1.57	1.67	2.79	1.16	1.14	1.46	4.18	0.77	1.67	2.39

LAST THREE-YEAR ASSESSMENT:

Pre-monsoon GW Level (m): Min – 0.42 m Max – 7.15 m
Post-monsoon GW Level (m): Min – 0.05 m Max – 3.35 m

LAND USE / LAND COVER MAP OF THE CLUSTER-V MINES, BCCL



Sl no	Land Use Details	Existing (sq. meter)	Proposed (sq. meter)	Grand Total (sq. meter)
1	Green Belt Area	527.26×10^4	0.0	527.26×10^4
2	Open Land	973.52×10^4	0.0	973.52×10^4
3	Road/ Paved Area	217.50×10^4	0.0	217.50×10^4
4	Rooftop area of building/ sheds	24.24×10^4	0.0	24.24×10^4
5	Total	1724.52×10^4	0.0	1724.52×10^4

F. GROUND WATER LEVEL OF CLUSTER-VI

Cluster–VI consists of four coal mines namely, East Bassuriya opencast (OC), Bassuriya underground (UG), Gondudih Khas-Kusunda OC and Godhur Mixed Mines (OC and UG) of BCCL. This Cluster of mines is located in central part of Jharia Coalfield in Dhanbad district of Jharkhand. The life of the project has been worked out to be more than 30 years considering annual production target of 7.631 MTPA (Toposheet no – 73 I/6).

The present leasehold area of Cluster-VI is 831.83 Ha. The area has a general undulating topography with general slope towards south. The RL varies from 180 m to 240 m AMSL. Ekra Jore, Kari Jore and their tributaries are controlling the drainage pattern of the area. The area comes under the watershed of Ekra Jore and Kari Jore.

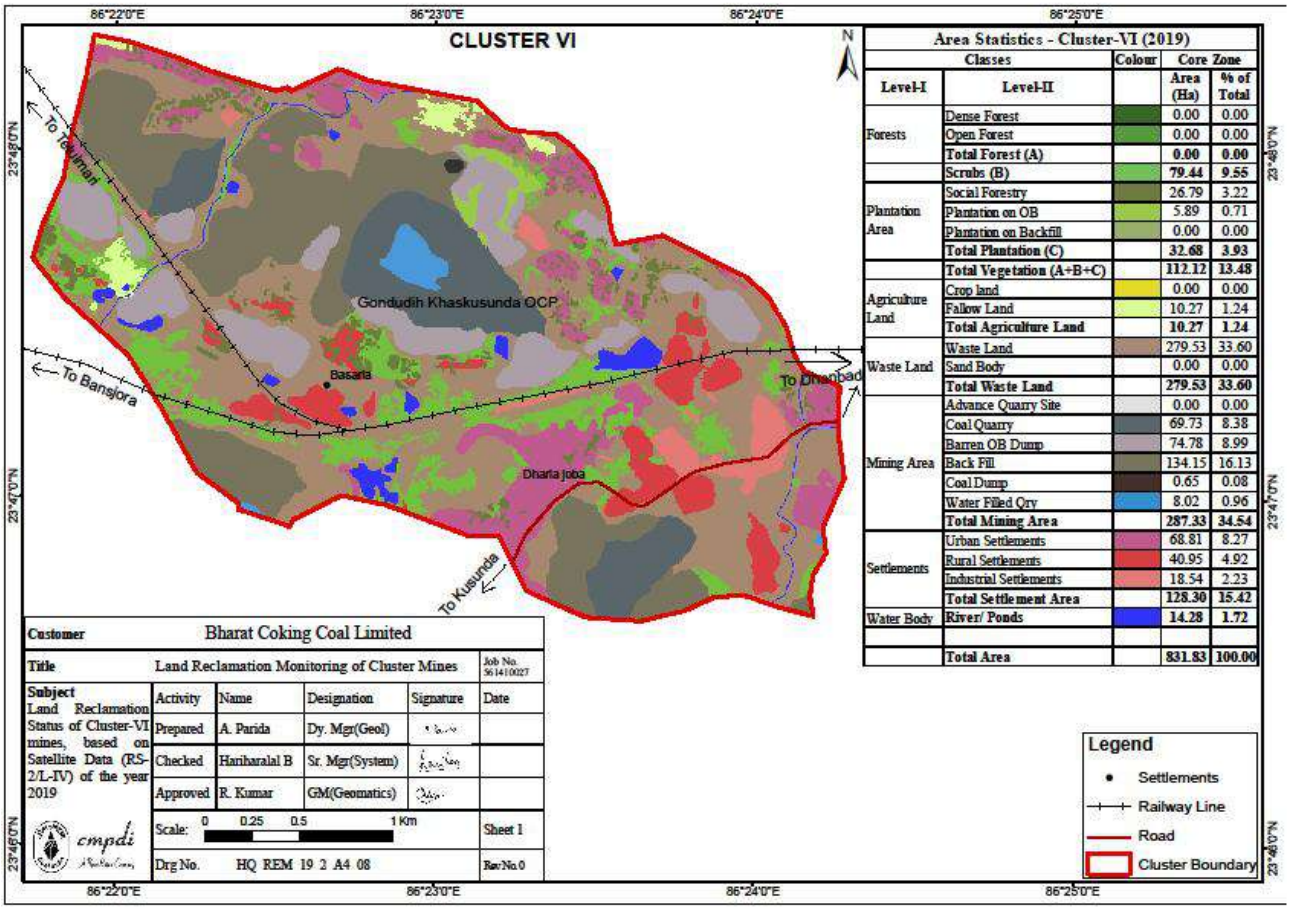
Monitoring stations (**D-25 and D-30**) are located in the core zone of the mine area. Water level monitoring in these monitoring stations has been done in the months of May'22, August'22, and Nov'22 and January'23. The Ground water level data is presented in the table below:

Sl No.	Well No.	Location	Water level (bgl in meters)											
			2022-23				2021-22				2020-21			
			May	Aug	Nov	Jan	May	Aug	Nov	Jan	May	Aug	Nov	Jan
1	D25	Godhur	11.9	2.58	4.70	5.30	10.50	2.90	3.80	4.40	10.50	2.28	5.62	6.40
2	D30	Borkiboa	4.37	1.80	2.29	4.15	4.23	0.60	0.84	1.80	4.50	1.65	1.35	2.40
Average WL (bgl)			8.14	2.19	3.50	4.73	7.37	1.75	2.32	3.10	7.50	1.97	3.49	4.40

LAST THREE-YEAR ASSESSMENT:

Pre-monsoon GW Level (m): Min – 4.23 m Max – 11.90 m
Post-monsoon GW Level (m): Min – 0.84m Max – 5.62 m

LAND USE / LAND COVER MAP OF THE CLUSTER-VI MINES, BCCL



Sl no	Land Use Details	Existing (sq. meter)	Proposed (sq. meter)	Grand Total (sq. meter)
1	Green Belt Area	122.39 X 10^4	0.0	122.39 X 10^4
2	Open Land	581.14 X 10^4	0.0	581.14 X 10^4
3	Road/ Paved Area	68.81 X 10^4	0.0	68.81 X 10^4
4	Rooftop area of building/ sheds	59.49 X 10^4	0.0	59.49 X 10^4
5	Total	831.83 X 10^4	0.0	831.83 X 10^4

G. GROUND WATER LEVEL OF CLUSTER-VII

Cluster-VII consists of fourteen mines within Kusunda Area, Bastacolla Area and PB Area, B.C.C.L, Jharia Coalfield. Coal mines namely Dhansar UG, Dhansar OCP, Kusunda OCP and Viswakarma OCP (proposed) are under the administrative control of Kusunda Area and Industry UG (closed), Alkusa UG, Ena OCP, S.Jharia/Rajapur OCP, Burragarh UG, Simlabahal UG, Hurriladih UG, Bhutgoria UG (Re-opening), Kustore UG (closed) and E.Bhuggatdih UG (closed) are under Bastacolla and PB Area. This Cluster of mines is located in east central part of Jharia Coalfield in Dhanbad district of Jharkhand. The life of the project has been worked out to be more than 30 years considering annual production target of 8.226 MTPA (Toposheet no – 73 I/6).

The present leasehold area of Cluster-VII is 2127.70 Ha. The area has a general undulating topography with general slope towards south. The RL varies from 172 m to 221 m above M.S.L. Kari Jore, Chatkari Jore and their tributaries are controlling the drainage pattern of the area. The area comes under the watershed of Kari Jore and Chatkari Jore.

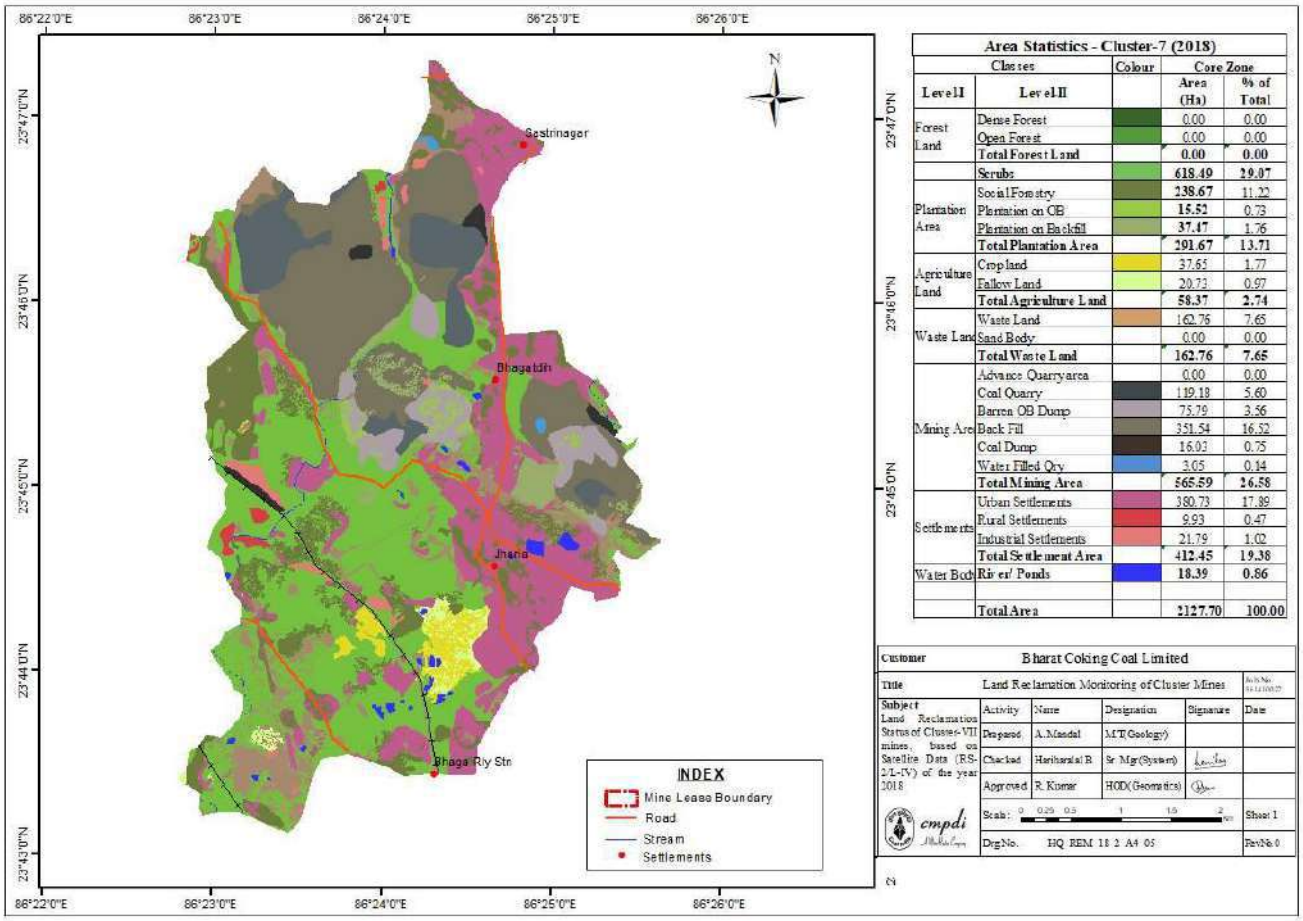
Monitoring stations (**D-3, D-4, D-33, D-34, D-47, D-55 and D-80**) are located in the core zone of the mine area. Water level monitoring in these monitoring stations has been done in the months of May'22, August'22, and Nov'22 and January'23. The Ground water level data is presented in the table below:

Sl No.	Well No.	Location	Water level (bgl in meters)											
			2022-23				2021-22				2020-21			
			May	Aug	Nov	Jan	May	Aug	Nov	Jan	May	Aug	Nov	Jan
1	D-3	Dhansar	5.96	0.55	1.32	1.34	3.41	0.80	0.85	1.30	1.75	1.05	1.30	1.45
2	D-4	Jharia	1.71	0.98	1.55	1.66	3.01	1.41	1.16	1.61	2.81	1.16	1.71	2.16
3	D33	Kustore	1.20	0.45	0.65	0.95	1.75	0.62	0.85	1.60	2.35	0.25	1.65	2.35
4	D34	Kusunda	5.00	2.15	3.15	3.22	3.78	2.05	2.90	2.95	4.75	2.10	2.40	2.55
5	D47	Parastanr	6.55	5.32	5.85	11.40	4.05	3.22	2.45	4.88	4.55	1.90	4.35	4.20
6	D55	Hariladih	11.32	9.46	11.12	Abn.	9.52	5.62	7.62	9.02	8.42	2.97	5.47	8.62
7	D80	Bastacolla	3.30	2.40	3.08	1.80	7.10	2.17	2.55	3.10	5.00	2.30	3.05	3.80
Average WL (bgl)			5.01	3.04	3.82	3.40	4.66	2.27	2.63	3.49	4.23	1.68	2.85	3.59

LAST THREE-YEAR ASSESSMENT:

Pre-monsoon GW Level (m): Min – 1.20 m Max – 11.32 m
Post-monsoon GW Level (m): Min – 0.65 m Max – 11.12 m

LAND USE / LAND COVER MAP OF THE CLUSTER-VII MINES, BCCL



Sl no	Land Use Details	Existing (sq. meter)	Proposed (sq. meter)	Grand Total (sq. meter)
1	Green Belt Area	968.53 x 10^4	0.0	968.53 x 10^4
2	Open Land	746.72 x 10^4	0.0	746.72 x 10^4
3	Road/ Paved Area	380.73 x 10^4	0.0	380.73 x 10^4
4	Rooftop area of building/ sheds	31.71 x 10^4	0.0	31.71 x 10^4
5	Total	2127.70 x 10^4	0.0	2127.70 x 10^4

H. GROUND WATER LEVEL OF CLUSTER-VIII

Cluster - VIII of B.C.C.L mines are under administrative control of Bastacolla Area, Jharia Coalfield. Cluster-VIII consists of ten mines namely Bastacolla mixed mines (OC & UG), Bera mixed mines (OC&UG), Dobari UG, Kuya mixed mines (OC&UG), Proposed Goluckdih (NC) OC mine, Ghanoodih OC mine and Kujama OC mine. This cluster is located in west part of Jharia Coalfield in Dhanbad district of Jharkhand. All the above mines are contiguous in nature and the environmental impact is overlapping in ambient environment due to cumulative effect of mining activities. The life of the project has been worked out to be up to 25 years considering annual production target of 6.383 MTPA (toposheet no. 73 I/5 and I/6).

The present leasehold area of Cluster-VIII is 1331.95 Ha. The area has a general undulating topography with general slope towards south and south-west. The ground elevation in the area ranges from 175 m to 221 m AMSL. Chatkari Jore, Tisra Jore and their tributaries are controlling the drainage pattern of the area. The area comes under the watershed of Chatkari Jore.

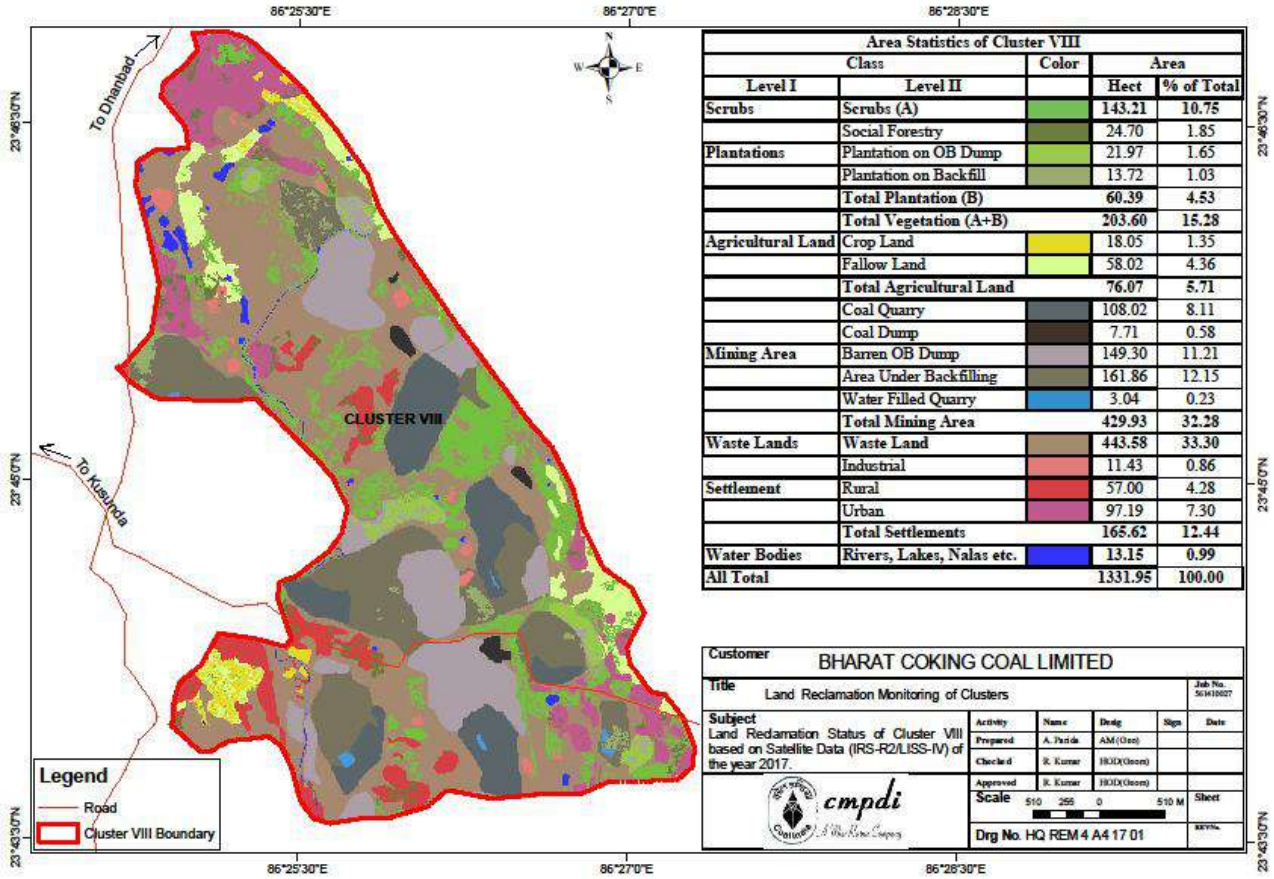
Monitoring stations (**D-8, D-43, D-49 and D-51**) are located in the core zone of the mine area. Water level monitoring in these monitoring stations has been done in the months of May'22, August'22, and Nov'22 and January'23. The Ground water level data is presented in the table below:

Sl No.	Well No.	Location	Water level (bgl in meters)											
			2022-23				2021-22				2020-21			
			May	Aug	Nov	Jan	May	Aug	Nov	Jan	May	Aug	Nov	Jan
1	D-8	Alokdiha	6.32	4.25	5.42	6.34	4.55	1.85	2.27	3.20	5.83	1.70	2.75	3.20
2	D43	Alagdih	5.35	3.11	4.71	5.65	4.65	2.40	2.60	3.35	6.60	2.31	2.55	3.05
3	D49	Galucdih	2.00	1.27	1.91	2.17	1.40	0.73	0.85	1.00	3.25	1.41	1.65	1.98
4	D51	Chankuiya	10.95	6.55	8.50	Abn.	9.43	5.65	5.65	7.50	8.45	6.03	5.70	7.35
Average WL (bgl)			6.16	3.80	5.14	4.72	5.01	2.66	2.84	3.76	6.03	2.86	3.16	3.90

LAST THREE-YEAR ASSESSMENT:

Pre-monsoon GW Level (m): Min – 1.40 m Max – 10.95 m
Post-monsoon GW Level (m): Min – 0.85 m Max – 8.50 m

LAND USE / LAND COVER MAP OF THE CLUSTER-VIII MINES, BCCL



Sl no	Land Use Details	Existing (sq. meter)	Proposed (sq. meter)	Grand Total (sq. meter)
1	Green Belt Area	279.69 x 10^4	0.0	279.69 x 10^4
2	Open Land	886.66 x 10^4	0.0	886.66 x 10^4
3	Road/ Paved Area	97.19 x 10^4	0.0	97.19 x 10^4
4	Rooftop area of building/ sheds	68.43 x 10^4	0.0	68.43 x 10^4
5	Total	1331.95 x 10^4	0.0	1331.95 x 10^4

I. GROUND WATER LEVEL OF CLUSTER-IX

Mines of cluster-IX are under administrative control of Lodna Area of B.C.C.L in western part of Jharia Coalfield which is located in Dhanbad district of Jharkhand. Cluster- IX consists of eight mines namely; North Tisra/South Tisra OCP, Jeenagora OCP, North Tisra UG, Lodna UG, Bagdigi UG, Bararee UG, Joyrampur UG and Jealgora UG (closed). Among them N. Tisra/S. Tisra OCP, Jeenagora OCP and N. Tisra UG mine will be amalgamated and will form North Tisra/South Tisra Expansion OCP. All above the mines are contiguous in nature and the environmental impact is overlapping in ambient environment due to cumulative effect of mining activities. The life of the project has been worked out to be up to 30 years considering annual production target of 8.513 MTPA (toposheet no. 73 I/6).

The present leasehold area of Cluster-IX is 1967.22 Ha. The topography of the area is undulating with gentle slope towards south. The RL varies from 221 m to 188.44 m AMSL. Chatkari Jore, Tisra Jore, Sulunga Jore and their tributaries are controlling the drainage pattern of the area. The area comes under the watershed of Chatkari Jore.

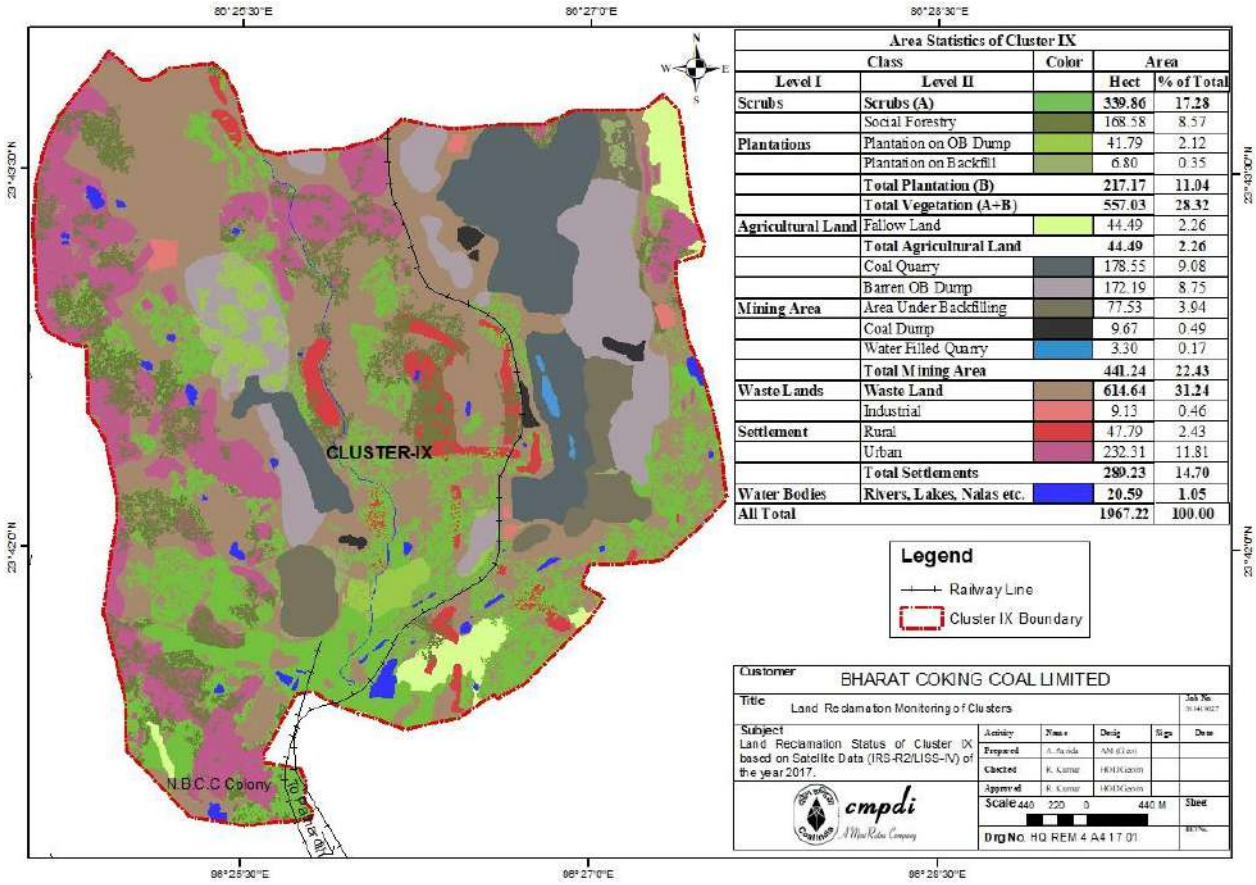
Monitoring stations (**D-5, D-7, D-39, D-40A, D-41 and D-74**) are located in the core zone of the mine area. Water level monitoring in these monitoring stations has been done in the months of May'22, August'22, and Nov'22 and January'23. The Ground water level data is presented in the table below:

Sl No.	Well No.	Location	Water level (bgl in meters)											
			2022-23				2021-22				2020-21			
			May	Aug	Nov	Jan	May	Aug	Nov	Jan	May	Aug	Nov	Jan
1	D-5	Jiyalgora	8.40	3.36	7.01	8.95	7.28	3.35	4.00	6.40	8.60	3.20	7.70	7.90
2	D-7	Golden Pahari	9.03	2.17	5.67	6.57	6.08	2.38	2.63	3.88	7.33	2.56	5.13	5.35
3	D-39	Tilaboni	7.50	1.85	3.05	1.75	10.70	4.60	5.10	8.15	9.40	3.35	6.05	6.78
4	D40A	Khapa Dhawra	2.35	1.60	1.80	Abn.	1.95	1.35	1.80	2.35	1.95	0.30	1.43	6.78
5	D-41	Joyrampur	1.55	0.90	0.88	0.92	1.95	1.34	1.38	1.45	3.30	1.43	1.45	1.60
6	D-74	BhulanBararee	6.17	3.20	5.77	7.90	6.93	3.20	2.90	3.70	4.30	2.58	3.93	4.00
Average WL (bgl)			5.83	2.18	4.03	5.22	5.82	2.70	2.97	4.32	5.81	2.24	4.28	4.54

LAST THREE-YEAR ASSESSMENT:

Pre-monsoon GW Level (m): Min – 1.55 m Max – 10.70 m
Post-monsoon GW Level (m): Min – 0.88 m Max – 7.70 m

LAND USE / LAND COVER MAP OF THE CLUSTER-IX MINES, BCCL



Sl no	Land Use Details	Existing (sq. meter)	Proposed (sq. meter)	Grand Total (sq. meter)
1	Green Belt Area	601.52×10^4	0.0	601.52×10^4
2	Open Land	1076.47×10^4	0.0	1076.47×10^4
3	Road/ Paved Area	232.31×10^4	0.0	232.31×10^4
4	Rooftop area of building/ sheds	56.92×10^4	0.0	56.92×10^4
5	Total	1967.22×10^4	0.0	1967.22×10^4

J. GROUND WATER LEVEL OF CLUSTER-X

Cluster-X consists of Bhowrah North OC & UG, Bhowrah South OC & UG, Amalgamated Sudamdih Patherdih, Sudamdih Shaft, Amlabad UG (Closed) and Sudamdih Coal Washery which comes under the administrative control of Eastern Jharia Area of Bharat Coking Coal Limited (B.C.C.L - A Subsidiary of Coal India Limited). This cluster of mines is located in eastern part of Jharia Coalfield in Dhanbad district of Jharkhand. The life of the project has been worked out to be more than 30 years considering annual production target of 2.289 MTY.

Cluster-X mine involves leasehold area of about 2057.47 Ha of land. It is covered in Survey of India toposheet no. 73 I/6. The area of Bhowrah North OC & UG, Bhowrah South OC & UG, Amalgamated Sudamdih Patherdih, Sudamdih Shaft, Amlabad UG (Closed) are 280.83 Ha, 571.58 Ha, 498.61 Ha, 391.50 Ha and 386.95 Ha respectively.

The present leasehold area of Cluster-X is 2057.47 Ha. The area has an undulating topography with gentle slope towards south and south-east. The RL varies from 185 m to 150.0 m AMSL. Gaurkuthi Nala and few seasonal streams are controlling the drainage pattern of the area. The area comes under the watershed of Damodar River.

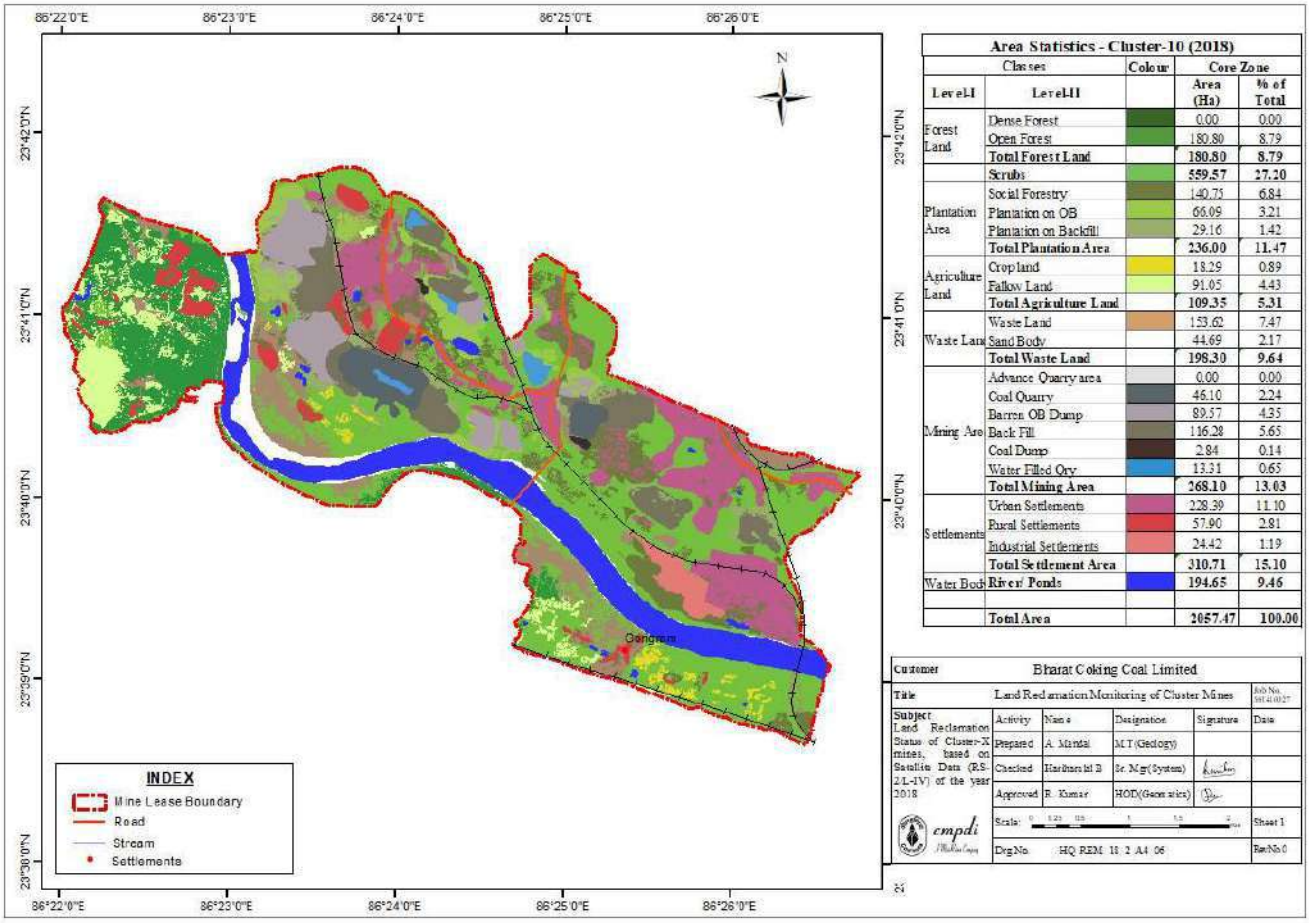
Monitoring stations (**A-19, D-35, D-36 and D-77**) are located in the core zone of the mine area. Water level monitoring in these monitoring stations has been done in the months of May'22, August'22, and Nov'22 and January'23, the Ground water level data is presented in the table below:

Sl No.	Well No.	Location	Water level (bgl in meters)											
			2022-23				2021-22				2020-21			
			May	Aug	Nov	Jan	May	Aug	Nov	Jan	May	Aug	Nov	Jan
1	A-19	Bhowrah	4.10	1.82	2.54	1.79	3.30	1.95	1.90	2.20	6.05	2.30	3.25	3.70
2	D-35	Patherdih	6.10	3.70	4.68	5.50	6.60	2.70	2.90	4.30	8.20	2.98	5.40	5.62
3	D-36	Sudamdih	3.25	0.15	0.60	1.44	2.02	0.45	0.55	0.55	2.10	0.06	1.00	1.15
4	D-77	Amlabad	6.50	3.40	4.70	6.00	5.98	2.60	4.69	5.60	6.40	5.90	3.50	4.25
Average WL (bgl)			4.99	2.27	3.13	3.68	4.48	1.93	2.51	3.16	5.69	2.81	3.29	3.68

LAST THREE-YEAR ASSESSMENT:

Pre-monsoon GW Level (m): Min – 2.02 m Max – 8.20 m
Post-monsoon GW Level (m): Min – 0.55 m Max – 5.40 m

LAND USE / LAND COVER MAP OF THE CLUSTER-X MINES, BCCL



Sl no	Land Use Details	Existing (sq. meter)	Proposed (sq. meter)	Grand Total (sq. meter)
1	Green Belt Area	1085.72 x 10^4	0.0	1085.72 x 10^4
2	Open Land	661.04 x 10^4	0.0	661.04 x 10^4
3	Road/ Paved Area	228.39 x 10^4	0.0	228.39 x 10^4
4	Rooftop area of building/ sheds	82.32 x 10^4	0.0	82.32 x 10^4
5	Total	2057.47 x 10^4	0.0	2057.47 x 10^4

K. GROUND WATER LEVEL OF CLUSTER-XI

Cluster–XI consists of eight coal mines; Moonidih UG, Gopalichak UG Project, Kachi Balihari 10/12 Pit UG, Pootkee Balihari Project UG, Bhagaband UG, Kendwadih UG (closed), Pootkee UG (closed), Kachi Balihari 5/6 Pit UG (closed) which are under the administrative control of Western Jharia Area of Bharat Coking Coal Limited (B.C.C.L - A Subsidiary of Coal India Limited). The Cluster- XI is located in central part of Jharia Coalfield in Dhanbad district of Jharkhand. The life of the project has been worked out to be up to 50 years considering annual production target of 6.604 MTPA (toposheet no. no. 73 I/5 7 73 I/6).

The present leasehold area of Cluster-XI is 3527.58 Ha. The area has an undulating topography with gentle slope towards south. The RL varies from 201 m to 166 m AMSL. Katri River, Jarian Nala, Ekra Jore and Kari Jore are controlling the drainage of the area. The area comes under the watershed of Katri River and Kari Jore.

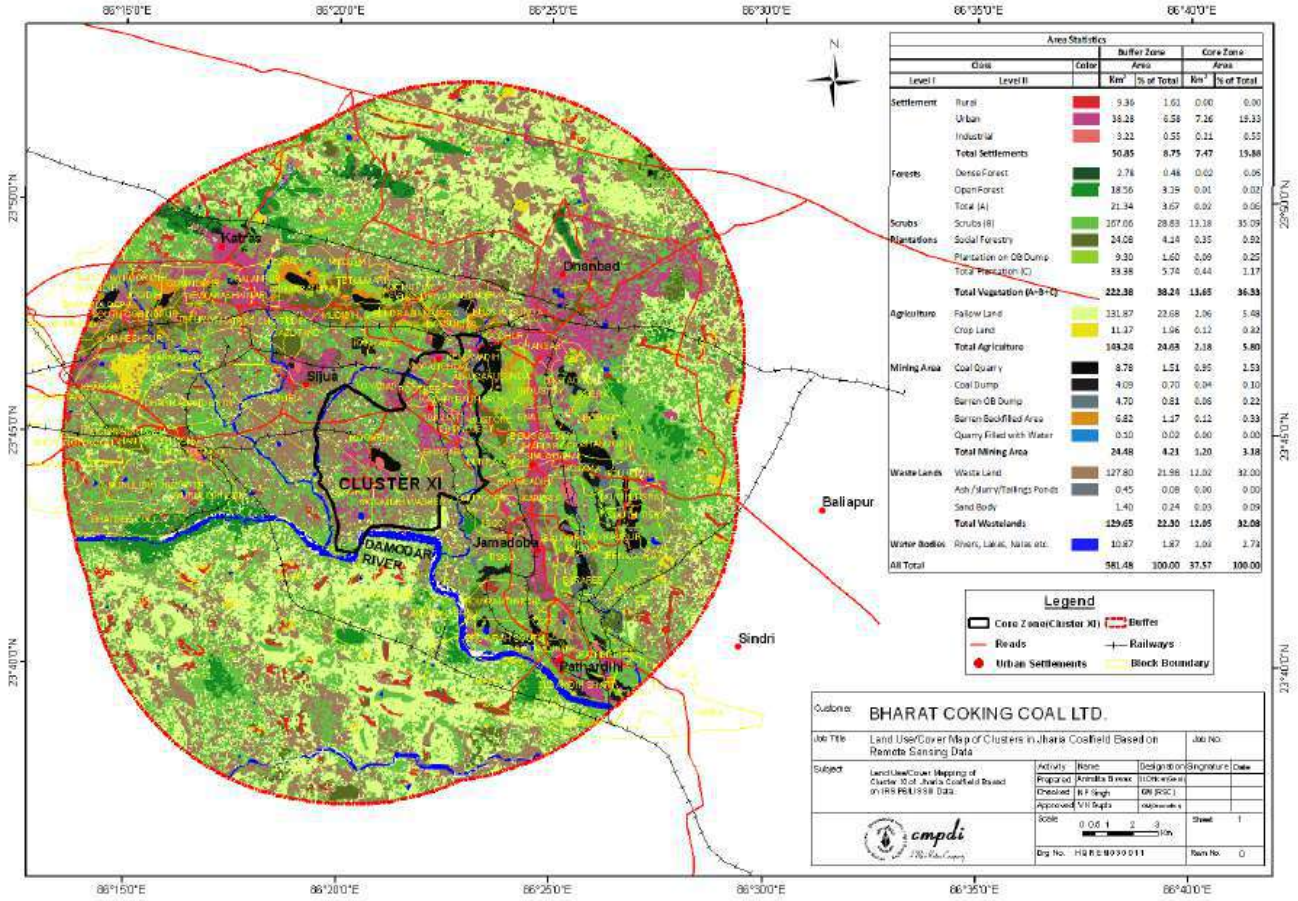
Monitoring stations (**A-17, A-18, A-20 and A-32**) are located in the core zone of the mine area. Water level monitoring in these monitoring stations has been done in the months of May'22, August'22, and Nov'22 and January'23. The Ground water level data is presented in the table below:

Sl No.	Well No.	Location	Water level (bgl in meters)											
			2022-23				2020-21				2019-20			
			May	Aug	Nov	Jan	May	Aug	Nov	Jan	May	Aug	Nov	Jan
1	A-17	Kachi Balihari	2.62	2.06	2.59	2.64	3.36	1.62	2.37	2.54	2.14	0.64	1.69	1.79
2	A-18	Baghaband	0.62	0.49	0.56	Abn.	1.09	0.54	0.57	0.74	1.09	0.39	0.34	0.89
3	A-20	Gorbudih	5.59	3.18	3.54	5.27	5.47	1.47	2.02	3.07	8.47	1.44	3.87	4.42
4	A-32	Baludih	2.25	0.65	1.75	2.79	2.35	0.73	0.96	1.50	1.90	0.36	1.75	1.80
Average WL (bgl)			2.77	1.60	2.11	3.57	3.07	1.09	1.48	1.96	3.40	0.71	1.91	2.23

LAST THREE-YEAR ASSESSMENT:

Pre-monsoon GW Level (m): Min – 0.62m Max – 8.47 m
Post-monsoon GW Level (m): Min – 0.34 m Max – 3.87 m

LAND USE / LAND COVER MAP OF THE CLUSTER-XI MINES, BCCL



Sl no	Land Use Details	Existing (sq. meter)	Proposed (sq. meter)	Grand Total (sq. meter)
1	Green Belt Area	1060.61×10^4	0.0	1293.46×10^4
2	Open Land	1518.33×10^4	0.0	1509.06×10^4
3	Road/ Paved Area	171.08×10^4	0.0	171.08×10^4
4	Rooftop area of building/ sheds	777.56×10^4	0.0	563.06×10^4
5	Total	3527.58×10^4	0.0	3527.58×10^4

L. GROUND WATER LEVEL OF CLUSTER-XIII

Cluster-XIII, consists of one running mine (Murulidih 20/21 pit UG mine) and six abandoned mines i.e. Bhurungiya colliery, Muchraidih colliery, Hantoodih colliery, Padugora colliery, Murulidih colliery and Bhatdee colliery of Western Jharia area, BCCL which is located in the south-western part of Jharia coal field in Dhanbad district of Jharkhand. The area is covered under Survey of India toposheet no. 73 I/6. The life of the project has been worked out to be about 15 years considering annual production target of 0.234 MTPA.

The present leasehold area of Cluster-XIII is 1898.62 Ha. The area has an undulating topography with gentle slope towards south-east. The maximum RL is 224 m AMSL in the north-western part of the area whereas the minimum RL is 179 m AMSL at southern part. The area comes under the watershed area of Jamunia River and Katri River.

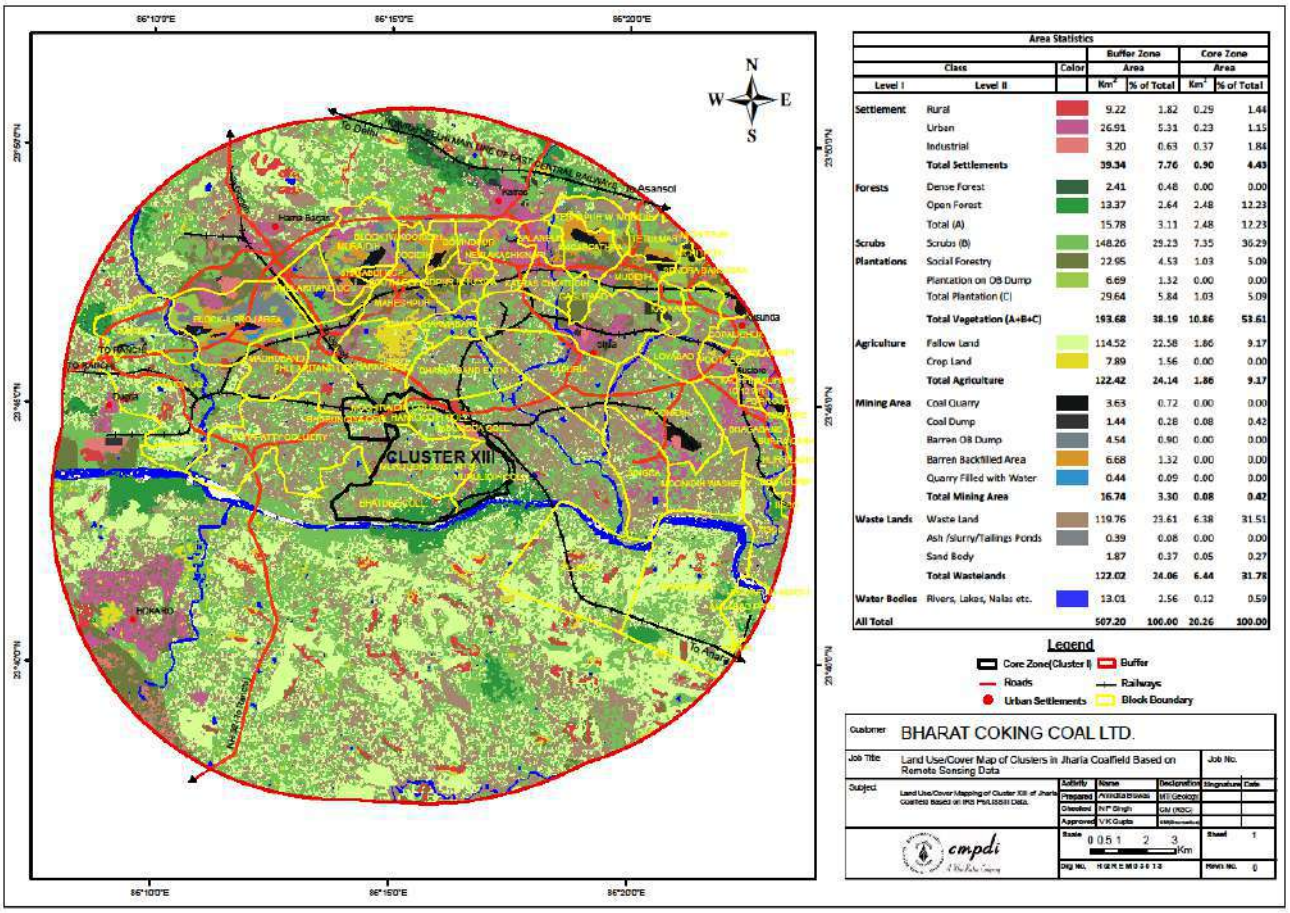
Monitoring stations (**A-22, A-23, A-33, A-34, B-25 and B-48**) are located in the core zone of the mine area. Water level monitoring in these monitoring stations has been done in the months of May'22, August'22, Nov'22 and January'23. The Ground water level data is presented in the table below:

Sl No.	Well No.	Location	Water level (bgl in meters)											
			2022-23				2021-22				2020-21			
			May	Aug	Nov	Jan	May	Aug	Nov	Jan	May	Aug	Nov	Jan
1	A22A	Nagdah	6.35	1.90	2.10	Abn.	2.90	0.40	1.10	1.50	2.90	0.20	1.98	2.00
2	A-23	Machhayara	7.97	1.14	4.79	6.67	9.52	1.87	2.82	4.82	8.92	1.12	5.62	7.12
3	A-33	Mahuda Wa	3.50	0.50	2.05	2.95	2.85	0.80	0.85	1.33	4.55	0.38	1.85	2.85
4	A-34	Mahuda vil.	8.20	3.65	6.35	6.95	5.20	1.83	3.55		8.35	3.43	3.45	5.35
5	B-25	Mahuda more	6.40	2.90	3.52	Abn.	5.10	1.98	2.58	3.30	7.90	3.02	2.55	3.45
6	B-48	Mahuda	6.85	0.65	6.25	5.80	7.23	2.28	6.05	6.60	8.20	3.37	3.85	4.51
Average WL (bgl)			6.55	1.57	4.18	5.59	5.47	1.53	2.83	3.51	6.80	1.92	3.22	4.21

LAST THREE-YEAR ASSESSMENT:

Pre-monsoon GW Level (m): Min – 2.85 m Max – 8.35 m
Post-monsoon GW Level (m): Min – 0.85 m Max – 6.35 m

LAND USE / LAND COVER MAP OF THE CLUSTER-XIII MINES, BCCL



Area Statistics

Class		Color	Buffer Zone Area		Core Zone Area	
Level I	Level II		Km²	% of Total	Km²	% of Total
Settlement	Rural		9.22	1.82	0.29	1.44
	Urban		26.91	5.31	0.23	1.15
	Industrial		3.20	0.63	0.37	1.84
	Total Settlements		**39.34**	**7.76**	**0.90**	**4.43**
Forests	Dense Forest		2.41	0.48	0.00	0.00
	Open Forest		13.37	2.64	2.48	12.23
	Total (A)		15.78	3.11	2.48	12.23
Scrubs	Scrubs (B)		148.26	29.23	7.35	36.29
Plantations	Social Forestry		22.95	4.53	1.03	5.09
	Plantation on OB Dump		6.69	1.32	0.00	0.00
	Total Plantation (C)		29.64	5.84	1.03	5.09
	Total Vegetation (A+B+C)		**193.68**	**38.19**	**10.86**	**53.61**
Agriculture	Fallow Land		114.52	22.58	1.86	9.17
	Crop Land		7.89	1.56	0.00	0.00
	Total Agriculture		**122.42**	**24.14**	**1.86**	**9.17**
Mining Area	Coal Quarry		3.63	0.72	0.00	0.00
	Coal Dump		1.44	0.28	0.08	0.42
	Barren OB Dump		4.54	0.90	0.00	0.00
	Barren Backfilled Area		6.68	1.32	0.00	0.00
	Quarry Filled with Water		0.44	0.09	0.00	0.00
	Total Mining Area		**16.74**	**3.30**	**0.08**	**0.42**
Waste Lands	Waste Land		119.76	23.61	6.38	31.51
	Ash /slurry/Tailings Ponds		0.39	0.08	0.00	0.00
	Sand Body		1.87	0.37	0.05	0.27
	Total Wastelands		**122.02**	**24.06**	**6.44**	**31.78**
Water Bodies	Rivers, Lakes, Nalas etc.		13.01	2.56	0.12	0.59
All Total			507.20	100.00	20.26	100.00

Sl no	Land Use Details	Existing (sq. meter)	Proposed (sq. meter)	Grand Total (sq. meter)
1	Green Belt Area	1484.41 x 10^4	0.0	1570.48 x 10^4
2	Open Land	183.28 x 10^4	0.0	97.22 x 10^4
3	Road/ Paved Area	71.84 x 10^4	0.0	71.83 x 10^4
4	Rooftop area of building/ sheds	159.09 x 10^4	0.0	159.09 x 10^4
5	Total	1898.62 x 10^4	0.0	1898.62 x 10^4

M. GROUND WATER LEVEL OF CLUSTER-XIV

Mines of Cluster-XIV are under administrative control of Western Jharia Area of B.C.C.L (Jharia Coalfield) which is located in Dhanbad district of Jharkhand. This cluster consists of Lohapatty UG and Lohapatty OC patch (proposed). The life of the project has been worked out to be up to 08 years considering annual production target of 0.526 MTPA. It is covered in Survey of India toposheet no. 73 I/2.

The present leasehold area of Cluster-XIV is 1418.25 Ha. The topography of the area is undulating with slope towards south west. The maximum RL is 224 m in the north-eastern part whereas the minimum RL is 170 m above mean sea level on the south-western part of the area. Jamunia River and its tributaries are controlling the drainage of the area. The area comes under the watershed area of Jamunia River.

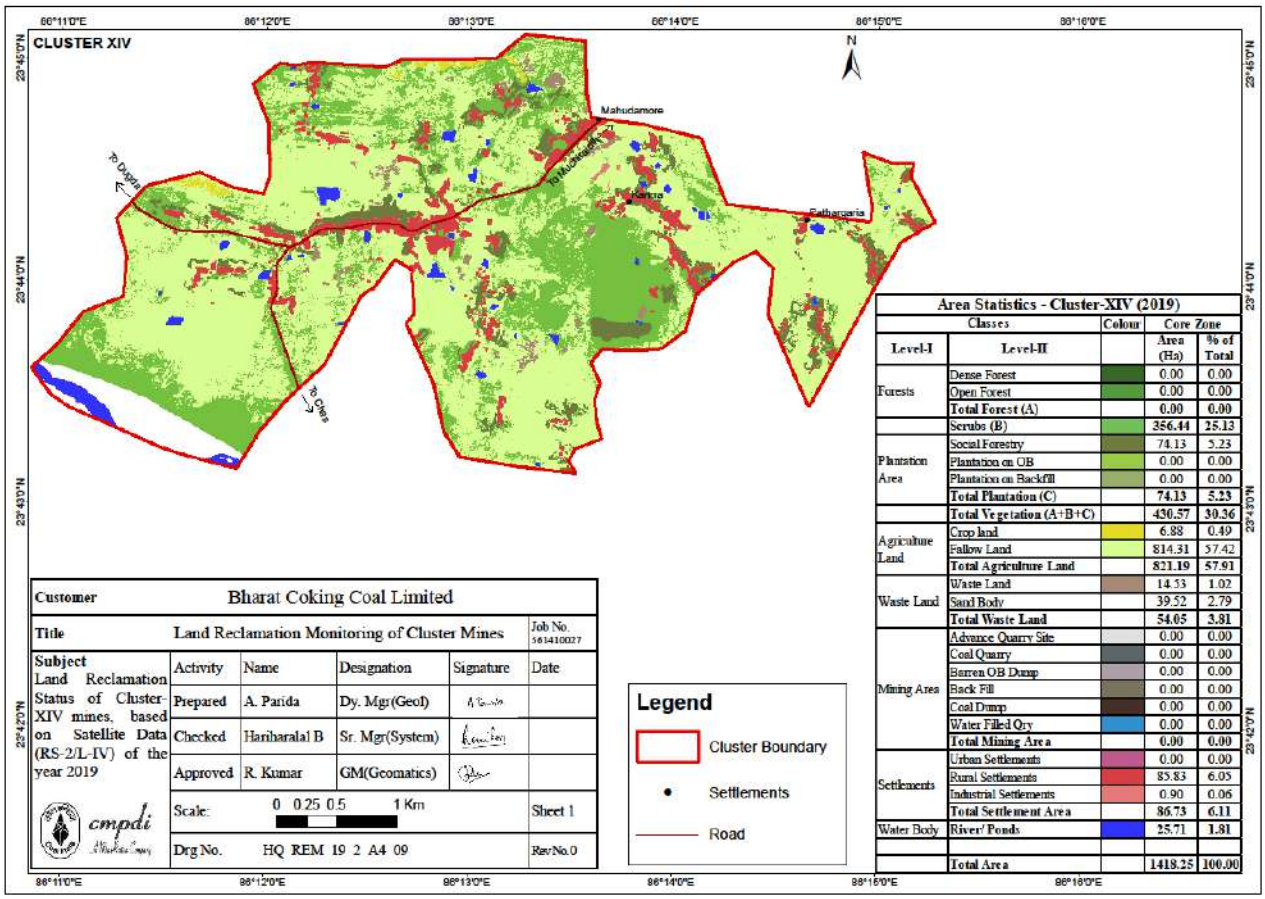
Monitoring stations (**B-23, B-24 and B-67**) are located in the core zone of the mine area. Water level monitoring in these monitoring stations has been done in the months of May'22, August'22, and Nov'22 and January'23. The Ground water level data is presented in the table below:

Sl No.	Well No.	Location	Water level (bgl in meters)											
			2022-23				2021-22				2020-21			
			May	Aug	Nov	Jan	May	Aug	Nov	Jan	May	Aug	Nov	Jan
1	B-23	Lohapatti	2.98	1.31	1.73	2.12	4.12	1.24	1.44	1.81	3.24	0.77	1.76	2.69
2	B-24	Telmuchu	5.53	1.34	3.46	4.23	5.68	1.55	2.08	3.07	5.48	1.13	3.53	4.38
3	B-67	Simatanr	8.50	3.55	6.30	7.35	8.95	2.45	2.95	3.65	7.55	1.83	3.95	5.90
Average WL (bgl)			5.67	2.07	3.83	4.57	6.25	1.75	2.16	2.84	5.42	1.24	3.08	4.32

LAST THREE-YEAR ASSESSMENT:

Pre-monsoon GW Level (m): Min – 2.98 m Max – 8.95 m
Post-monsoon GW Level (m): Min – 1.44 m Max – 6.30 m

LAND USE / LAND COVER MAP OF THE CLUSTER-XIV MINES, BCCL



Area Statistics - Cluster-XIV (2019)

Classes		Colour	Core Zone	
Level-I	Level-II		Area (Ha)	% of Total
Forests	Dense Forest		0.00	0.00
	Open Forest		0.00	0.00
	Total Forest (A)		**0.00**	**0.00**
	Scrubs (B)		356.44	25.13
Plantation Area	Social Forestry		74.13	5.23
	Plantation on OB		0.00	0.00
	Plantation on Backfill		0.00	0.00
	Total Plantation (C)		**74.13**	**5.23**
	Total Vegetation (A+B+C)		**430.57**	**30.36**
Agriculture Land	Crop land		6.88	0.49
	Fallow Land		814.31	57.42
	Total Agriculture Land		**821.19**	**57.91**
Waste Land	Waste Land		14.53	1.02
	Sand Body		39.52	2.79
	Total Waste Land		**54.05**	**3.81**
Mining Area	Advance Quarry Site		0.00	0.00
	Coal Quarry		0.00	0.00
	Barren OB Dump		0.00	0.00
	Back Fill		0.00	0.00
	Coal Dump		0.00	0.00
	Water Filled Qry		0.00	0.00
	Total Mining Area		**0.00**	**0.00**
Settlements	Urban Settlements		0.00	0.00
	Rural Settlements		85.83	6.05
	Industrial Settlements		0.90	0.06
	Total Settlement Area		**86.73**	**6.11**
Water Body	River/ Ponds		25.71	1.81
	Total Area		**1418.25**	**100.00**

Sl no	Land Use Details	Existing (sq. meter)	Proposed (sq. meter)	Grand Total (sq. meter)
1	Green Belt Area	1251.76 x 10^4	0.0	1251.76 x 10^4
2	Open Land	79.76 x 10^4	0.0	79.76 x 10^4
3	Road/ Paved Area	85.83 x 10^4	0.0	85.83 x 10^4
4	Rooftop area of building/ sheds	0.90 x 10^4	0.0	0.90 x 10^4
5	Total	1418.25 x 10^4	0.0	1418.25 x 10^4

N. GROUND WATER LEVEL OF CLUSTER-XV

Mines o Cluster - XV comes under administrative control of Govindpur Area and barora Area of B.C.C.L (Jharia Coalfield) which is located in Dhanbad district of Jharkhand. Cluster–XV consists of four coal mines; Kharkharee UG (underground mine) and Dharmaband UG which are under administrative control of Govindpur Area and Madhuband UG & Phularitand UG which are under the administrative control of Barora Area. The life of the project has been worked out to be up to 30 years considering annual production target of 0.423 MTPA. It is covered in Survey of India toposheet no. 73 I/1 and 73 I/5.

The present leasehold area of Cluster-XV is 1696.55 Ha. The topography of the area is undulating with slope towards south-west. The maximum RL is 235 m in the Kharkharee mine area whereas the minimum RL is 165 m AMSL on the eastern & western part of the Cluster. Jamunia River and Khudia River are controlling the drainage of the area. The area comes under the watershed area of both Jamunia River and Khudia River.

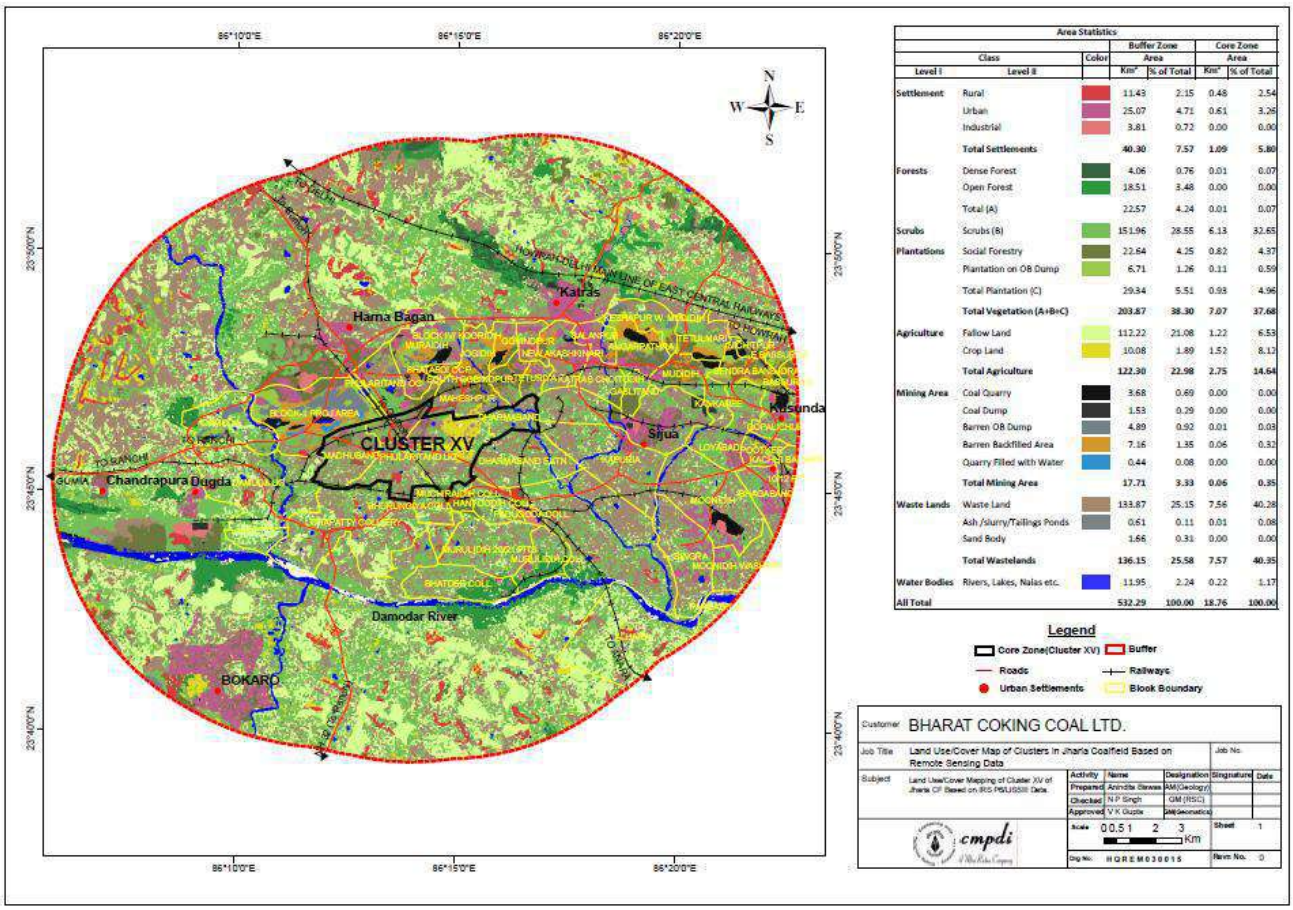
Monitoring stations (**A-24, B-32A and B-61A**) are located in the core zone of the mine area. Water level monitoring in these monitoring stations has been done in the months of May'22, August'22, and Nov'22 and January'23. The Ground water level data is presented in the table below:

Sl No.	Well No.	Location	Water level (bgl in meters)											
			2022-23				2021-22				2020-21			
			May	Aug	Nov	Jan	May	Aug	Nov	Jan	May	Aug	Nov	Jan
1	A24	Pipratanr	7.28	2.55	4.33	5.32	10.13		2.78	4.55	4.88	-	4.28	4.68
2	B32A	Madhuband	4.15	0.70	2.56	4.15	5.60	1.34	1.70	2.30	3.30	1.18	2.00	2.21
3	B61A	Kesargora	1.82	0.52	0.97	Abn.	4.42	0.47	0.97	0.97	3.32	0.85	1.60	2.07
4.	B62A	Sadiyardih	6.45	1.77	4.91	5.15	6.87	1.35	4.50	4.60	6.95	2.77	3.00	4.95
Average WL (bgl)			4.96	1.09	2.93	4.58	6.72	0.91	1.82	2.61	3.83	1.02	2.63	2.99

LAST THREE-YEAR ASSESSMENT:

Pre-monsoon GW Level (m): Min – 1.82 m Max – 10.13 m
Post-monsoon GW Level (m): Min – 0.97 m Max – 4.91 m

LAND USE / LAND COVER MAP OF THE CLUSTER-XV MINES, BCCL



Sl no	Land Use Details	Existing (sq. meter)	Proposed (sq. meter)	Grand Total (sq. meter)
1	Green Belt Area	365.18 x 10^4	0.0	957.34 x 10^4
2	Open Land	1130.53 x 10^4	0.0	538.37 x 10^4
3	Road/ Paved Area	101.67 x 10^4	0.0	101.67 x 10^4
4	Rooftop area of building/ sheds	99.17 x 10^4	0.0	99.17 x 10^4
5	Total	1696.55 x 10^4	0.0	1696.55 x 10^4

O. GROUN D WATER LEVEL OF CLUSTER-XVI

Mines of Cluster - XVI (Dahibari-Basantimata Group of mines) are under administrative control of Chanch Victoria Area of B.C.C.L (western part of Raniganj Coalfield) which is located in Dhanbad district of Jharkhand. There are total five collieries within this Cluster- XVI (Dahibari-Basantimata OC, Basantimata UG, New Laikdih OC, Laikdih Deep UG and Chanch UG Colliery). All the above mines are contiguous in nature and the environmental impact is overlapping in ambient environment due to cumulative effect of mining activities. Life of the project has been worked out to be up to 24 years considering annual production target of 1.963 MTPA. It is covered in Survey of India toposheet no. 73 I/14.

The present leasehold area of Cluster-XVI is 2008.40 Ha. The topography of the area is undulating with slope towards south-west. The area is plain with gently undulating with elevation varying from 100 m to 140 m AMSL. The general slope of the area is towards southeast. Barakar River and Khudia River are controlling the drainage of the area. The area comes under the watershed area of Barakar River.

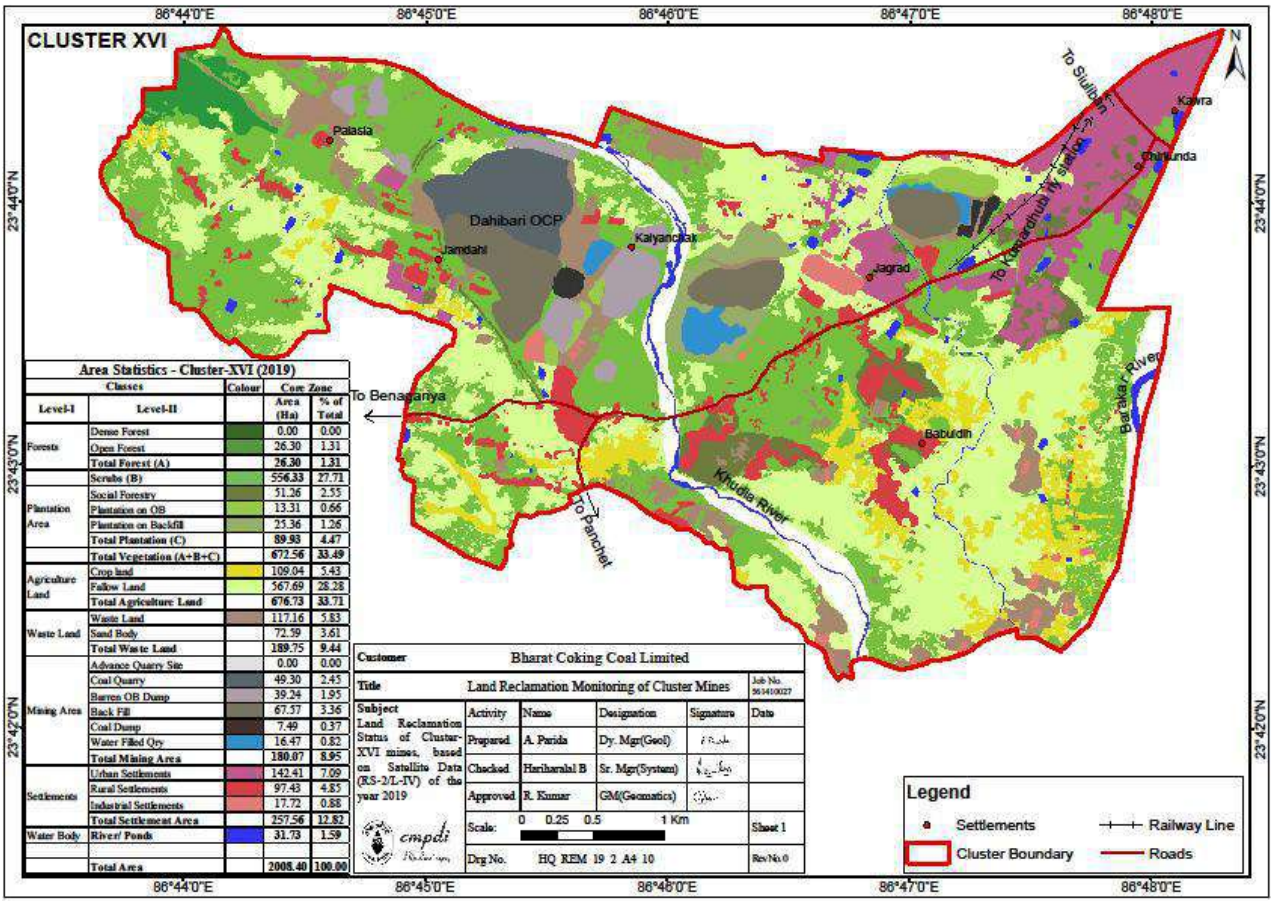
Monitoring stations (**DB-22, DB-23, DB-24 & DB-25**) are located in the core zone of the mine area. Water level monitoring in these monitoring stations has been done in the months of May'22, August'22, and Nov'22 and January'23. The Ground water level data is presented in the table below:

Sl No.	Well No.	Location	Water level (bgl in meters)											
			2022-23				2021-22				2020-21			
			May	Aug	Nov	Jan	May	Aug	Nov	Jan	May	Aug	Nov	Jan
1	DB22	Dahibari, Basti	1.73	1.47	1.63	1.58	2.31	1.55	1.38	1.57	2.63	1.30	2.25	2.38
2	DB23	Dahibari OC	2.68	1.71	2.20	2.40	2.00	1.05	1.10	1.70	2.50	0.70	1.95	2.17
3	DB24	Dahibari	Abandoned				6.20	4.20	5.25	5.80	3.60	1.57	5.70	5.90
4	DB25	Basantimata	Abandoned				2.83	1.01	2.03	2.63	3.98	1.19	2.63	2.68
Average WL (bgl)			2.21	1.59	1.92	1.99	3.34	1.95	2.44	2.93	3.18	1.19	3.13	3.28

LAST THREE-YEAR ASSESSMENT:

Pre-monsoon GW Level (m): Min – 1.73 m Max – 6.20 m
Post-monsoon GW Level (m): Min – 1.10 m Max – 5.70 m

LAND USE / LAND COVER MAP OF THE CLUSTER-XVI MINES, BCCL



Sl no	Land Use Details	Existing (sq. meter)	Proposed (sq. meter)	Grand Total (sq. meter)
1	Green Belt Area	1349.29 x 10^4	0.0	1349.29 x 10^4
2	Open Land	401.55 x 10^4	0.0	401.55 x 10^4
3	Road/ Paved Area	142.41 x 10^4	0.0	142.41 x 10^4
4	Rooftop area of building/ sheds	115.15 x 10^4	0.0	115.15 x 10^4
5	Total	2008.40 x 10^4	0.0	2008.40 x 10^4

4.0 GROUND WATER LEVEL SCENARIO

The summarized water level data of all clusters given in **Table – 7**.

Table –7: Groundwater level data (Cluster-wise)

Sl. No.	Cluster of BCCL	No. of Monitoring Wells	Water level Below ground level (May, Aug, Nov'22 & Jan'23)	Avg. Fluctuation (in meters) during 2022-23	Geological Formation
1	I	4 nos.	0.45 to 9.65 m	2.33 m	Barakar
2	II	5 nos.	0.45 to 10.53 m	2.03 m	Barakar
3	III	5 nos.	0.30 to 10.53 m	2.18 m	Barakar
4	IV	4 nos.	0.35 to 7.45 m	2.16 m	Barakar
5	V	4 nos.	0.10 to 5.80 m	0.93 m	Barakar
6	VI	2 nos.	1.80 to 11.90 m	4.64 m	Barakar
7	VII	7 nos.	0.45 to 11.32 m	1.20 m	Barakar
8	VIII	4 nos.	1.27 to 10.95 m	1.02 m	Barakar
9	IX	6 nos.	0.90 to 9.03 m	1.80 m	Barakar
10	X	4 nos.	0.15 to 6.50 m	1.86 m	Barakar
11	XI	4 nos.	0.50 to 5.60 m	0.70 m	Barakar & Barren Measure
12	XIII	6 nos.	0.50 to 8.20 m	2.37 m	Raniganj
13	XIV	3 nos.	1.30 to 8.50 m	1.85 m	Raniganj
14	XV	4 nos.	0.50 to 7.30 m	1.80 m	Barakar & Barren Measure
15	XVI	4 nos.	1.50 to 2.70 m	0.30 m	Barakar

Depth to water level (in bgl) values describe that water level goes down to maximum 11.90 m during summer season and minimum up to 0.10 m during monsoon season of 2022. Un-confined aquifer is affected around 20 m to 30 m of maximum radius close to active opencast mining areas, showing steep gradient towards mine void. Other than that, there is no mining effect in the water level within JCF area and RCF area (part). Historical water level data and hydrograph of permanent observation stations from CGWB is shown in **Annexure–VI**. Water Table contour map and Depth to water level map both during pre & post-monsoon season is shown in **Plate-IV (A, B) & V (A, B)**.

Monitoring of groundwater (quantity & quality) to assess the present condition and resource has been done regularly in the coalfield area. Well hydrographs (**Annexure–VI**) are prepared and studied to identify long-term trends. Hydrograph trend analysis of CGWB monitoring wells and observation wells reveals

increasing groundwater level trends in most of the Cluster of mines. However, declining trends in both Pre and Post-monsoon GW level in Cluster-I, Cluster-V, Cluster-VI and Cluster-VII are recorded but no significant declining trend (>1.0 m/year) of water level is noticed in any particular area for the last 10 years within the coalfield area. Regarding quality monitoring, the water sample location map (**Plate–II**) with collection points details (dug wells) are given in **Annexure–V** and Quality is given in **Annexure–VII**.

5.0 GROUND WATER QUALITY

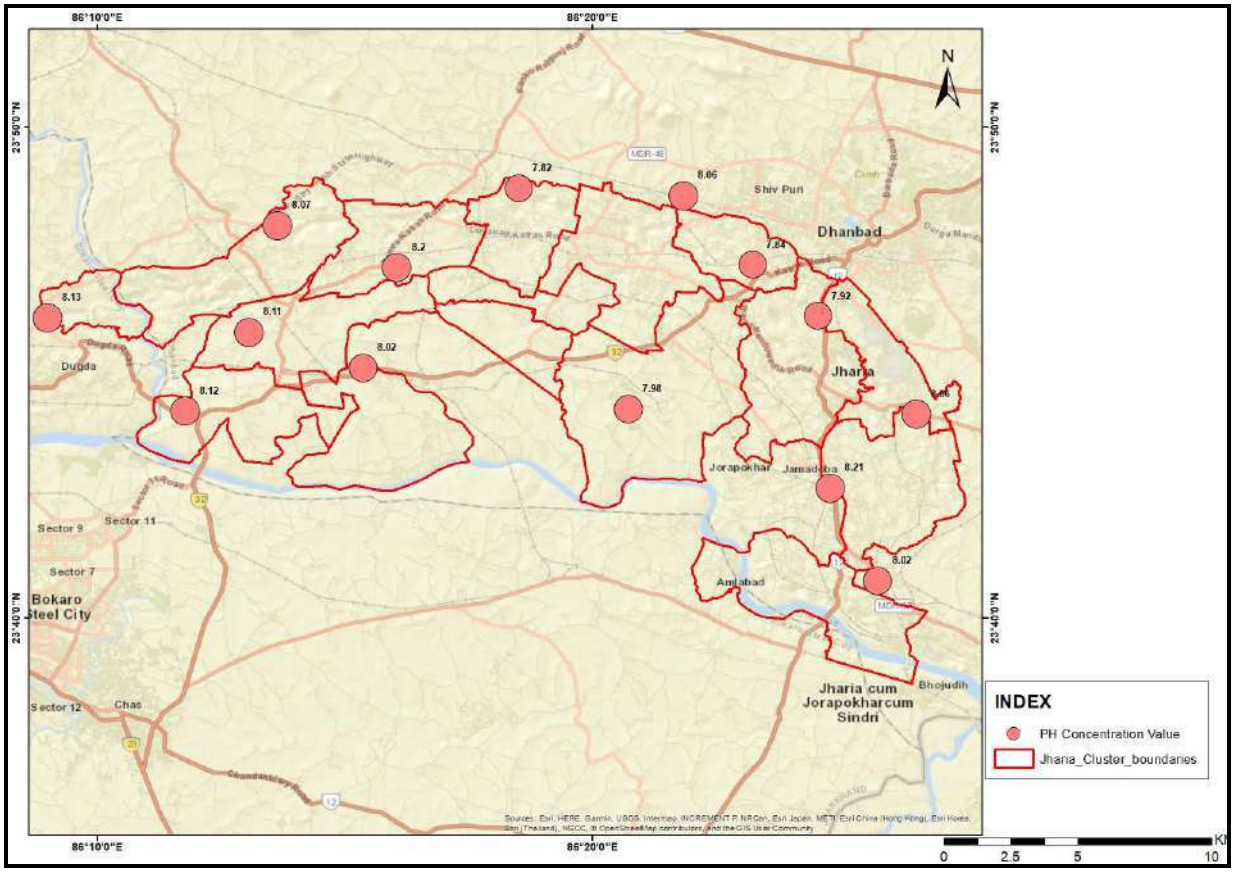
The ground water samples of the study area (15 nos. of Cluster of mines, BCCL) were collected from dug wells and analyzed. Fifteen ground water samples (GW-1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 13, 14, 15 & 16) analyzed during the month of June'2022 at CMPDI, RI-II, Dhanbad. The water sampling details is given in **Annexure–V** and Water sample locations are shown in **Plate-II**. The water quality data is presented in **Annexure–VII.**

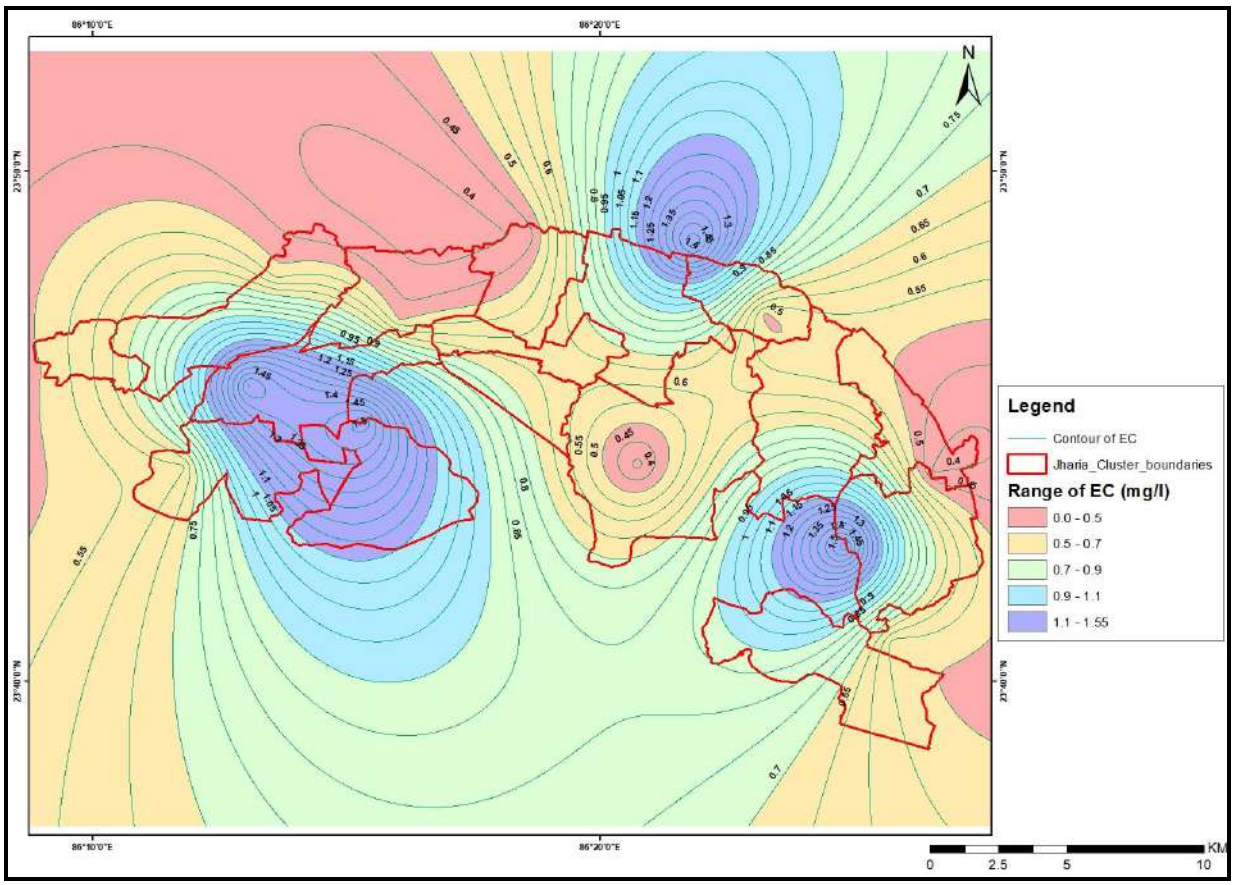
The study of the variations in water quality parameters is described below:

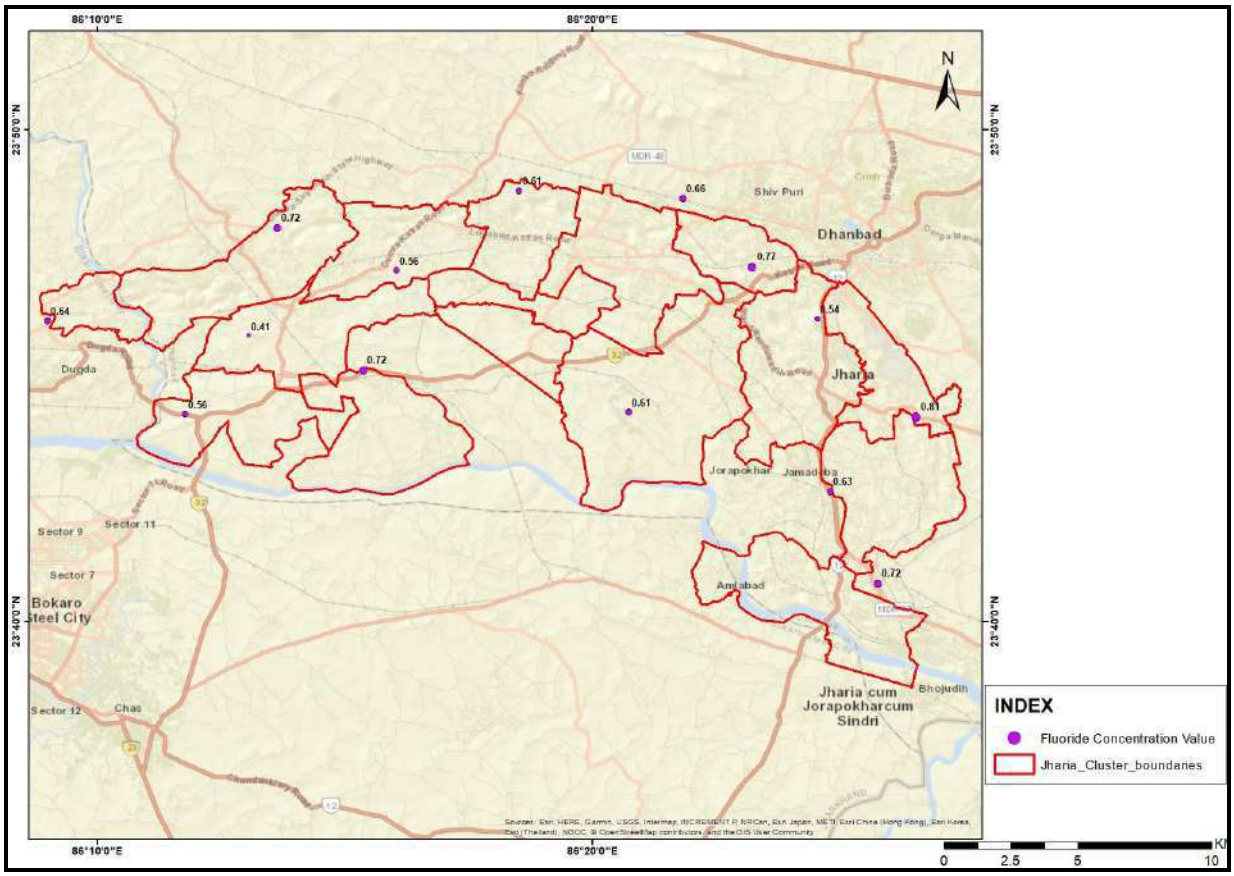
The pH of the groundwater samples varies between 7.82 (GW-4) to 8.21 (GW-9), the pH is within the IS 10500:2012 limit of drinking water standard.

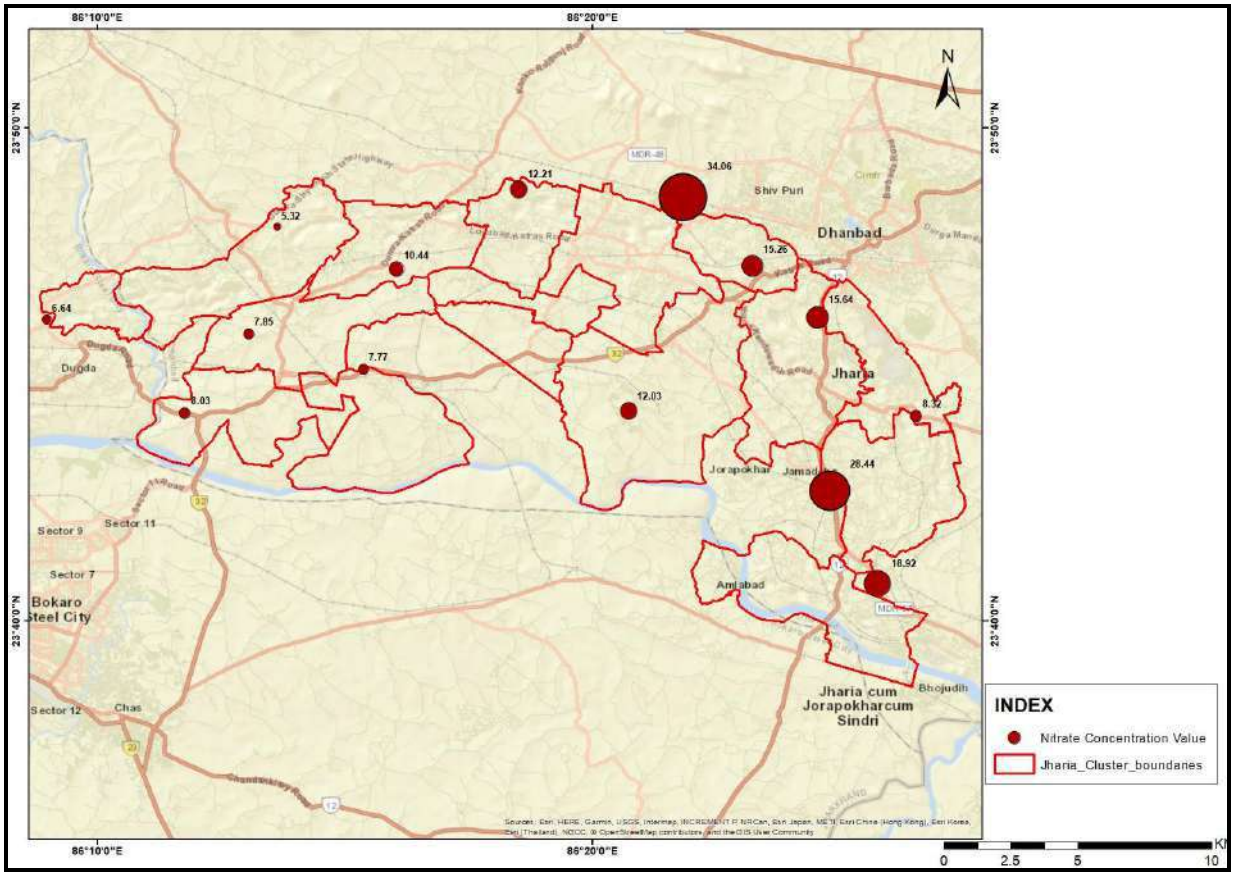
The mineral constituents dissolved in water constitute the dissolved solids. The total dissolved solids (TDS) vary from 192 (GW-11) to 764 mg/l (GW-9). The TDS values are ranging slightly above the IS 10500:2012 standards limit of drinking water.

The alkalinity of the water samples varies from 82 (GW-7) to 142 mg/l (GW-11) and are within the stipulated standard of (200 mg/l) drinking water. The concentration of calcium in the water samples varies from 38 (GW-1) to 172 mg/l (GW-13) and is ***slightly above*** the permissible limit (75 mg/l) of drinking water standards. The total hardness ranges between 152 (GW-8) to 666 mg/l (GW-5) and the value of total hardness in water samples are ***above*** the permissible limit (200 mg/l). The sulphate ranges between 42(GW-4) to 178 mg/l (GW-13) and the value of sulphate in water sample are within the permissible limit (200 mg/l). The Iron, Copper, Manganese, Lead, Zinc and Chromium concentration in the water samples found to be below the upper IS 10500:2012 limits for drinking water.


86°10'0"E
86°20'0"E
23°50'0"N
23°40'0"N
N
7.82
8.06
Shiv Puri
Dhanbad
8.07
8.2
7.84
8.13
8.11
7.92
8.02
Dugda
Jharia
8.12
7.98
8.06
Jorapokhar
Jamadoba
8.21
Sector 9
Sector 11
Sector 7
8.02
Amlabad
Bokaro
Steel City
Jharia cum
Jorapokharcum
Sindri
Bhojudih
Sector 12
Chas
INDEX
PH Concentration Value
Jharia_Cluster_boundaries
0
2.5
5
10


86°10'0"E
86°20'0"E
23°50'0"N
23°40'0"N
N
Legend
Contour of EC
Jharia_Cluster_boundaries
Range of EC (mg/l)
0.0 - 0.5
0.5 - 0.7
0.7 - 0.9
0.9 - 1.1
1.1 - 1.55
0
2.5
5
10


86°10'0"E
86°20'0"E
23°50'0"N
23°40'0"N
N
Shiv Puri
Dhanbad
Jharia
Dugda
Jorapokhar
Jamadoba
Amlabad
Bokaro Steel City
Sector 9
Sector 11
Sector 7
Sector 12
Chas
Bhojudih
Jharia cum Jorapokharcum Sindri
0.61
0.66
0.72
0.56
0.77
0.64
0.41
0.54
0.72
0.56
0.61
0.81
0.63
0.72
INDEX
Fluoride Concentration Value
Jharia_Cluster_boundaries
0
2.5
5
10


86°10'0"E
86°20'0"E
23°50'0"N
23°40'0"N
N
Shiv Puri
Dhanbad
Jharia
Dugda
Jorapokhar
Jamadoba
Amlabad
Bokaro Steel City
Sector 9
Sector 11
Sector 7
Sector 12
Chas
Bhojudih
Jharia cum Jorapokharcum Sindri
12.21
34.06
5.32
10.44
15.26
5.64
7.85
15.64
7.77
8.03
12.03
8.32
28.44
18.92
INDEX
Nitrate Concentration Value
Jharia_Cluster_boundaries
0
2.5
5
10

6.0 STAGE OF GROUNDWATER EXTRACTION

The groundwater is mainly utilized for domestic needs and irrigation purposes. The groundwater abstraction is mainly through dug wells and bore wells. The stage of groundwater development in Dhanbad District is 76.30% (as per 2017 GWRA). The highest stage of development is in Jharia Block (127.0%) & Dhanbad Block (107.50%) and lowest stage of development is in Chirkunda Block (35.5%) as per GWRA-2013. The Gondwana sandstones in general, known to constitute good aquifers at many places. However, the yield potential of the area adjoining to active mines in the coal belt is poor. The active mines often act as groundwater "sinks". In contrast, the water logged abandoned mines and pits act as potential sources of groundwater. As per the assessment by Central Ground Water Board (CGWB), Patna in 2022, Block wise data of Dhanbad District given below:

Table–8A: Block wise Stage of Groundwater development

Sl No.	Administrative Unit		Category (GWRA-2013)	Category (GWRA-2017)	Category (GWRA-2022)
	District	**Block**			
1	Bokaro	Bermo	**Over- exploited**	**Over- exploited**	**Over- exploited**
2	Dhanbad	Baghmara	Critical	Critical	Safe
3	Dhanbad	Baliapur	Semi- Critical	Semi- Critical	**Over- exploited**
4	Dhanbad	Dhanbad	**Over- exploited**	**Over- exploited**	Semi-critical
5	Dhanbad	Jharia / Dhanbad Urban	**Over- exploited**	**Over- exploited**	Critical
6	Dhanbad	Topchachi	Critical	Critical	Critical
7	Dhanbad	Chirkunda	Safe	Safe	Safe

- **Dynamic Groundwater Resource Assessment, CGWB as per 2013, 2017 and 2022.**

Table–8B: Cluster wise Groundwater development scenario

Cluster/ Area	Adminis-trative Blocks/Stage Of GW Extraction	Total Water demand (cum/day)				Avg. GW level (bgl in m) 2022-23		GW level declining trend 2005-2022		Remarks
		Mine Discharge + BH pumping	Surface Water Source	Total Use (Domestic + Industrial)	Excess Or other use	Pre-monsoon	Post-monsoon	Pre-monsoon	Post-monsoon	
Cluster-I	Bermo (SOD: Over-exploited)	2173 (2065+108)	NIL	2112 (1698+414)	61	5.70	3.37	YES	YES	Recharge structure needed
Cluster-II	Baghmara (SOD: Safe)	8350	Jamunia river	6737 (2755+3982)	1613	4.96	2.93	NO	NO	Excess mine water needed to be utilized
Cluster-III		12760 (10960+1800)	NIL	8946 (7849+1097)	3814	4.64	2.46	NO	NO	
Cluster-IV		5900	MADA	5100 (3605+1495)	800	4.78	2.62	NO	NO	
Cluster-V		12690 (11025+1665)	MADA	11063 (5710+5353)	1897	2.49	1.57	YES	YES	
Cluster-VI	Dhanbad (SOD: Semi-critical)	4150	MADA	4150 (1664+2486)	0.0	8.14	3.50	YES	NO	--
Cluster-VII		21565	MADA	20826 (17596+3230)	739	5.01	3.82	YES	YES	Excess mine water needed to be utilized water
Cluster-VIII	Jharia / Dhanbad Urban (SOD: Critical)	9320	MADA	5294 (3730+1564)	4026	6.16	5.14	NO	NO	
Cluster-IX		12980	MADA	9358 (4549+4809)	3622	5.83	4.03	NO	NO	
Cluster-X		11825	Damodar river	6201 (4255+1946)	5624	4.99	3.13	YES	NO	
Cluster-XI	Dhanbad (SOD: Critical)	24960	MADA & DVC	19425 (14015+5410)	5535	2.77	2.11	NO	NO	
Cluster-XIII	Baghmara (SOD: Safe)	750	Damodar river	692	58.0	6.55	4.18	NO	NO	--
Cluster-XIV		943	NA	668	275	5.67	3.83	NO	NO	--
Cluster-XV		6200	NA	5941 (4600+1341)	259	4.93	3.19	NO	NO	--
Cluster-XVI	Chirkunda (SOD: Safe)	1910	DVC (Barakar river)	1730 (1380+350)	180	2.21	1.92	NO	NO	--

MADA – Mineral Area Development Authority, Jharkhand, Dhanbad (payment basis).

DVC – Damodar Valley Corporation, Maithon/Panchet, Jharkhand (payment basis).

7.0 IMPACT OF MINING ON GROUND WATER REGIME

7.1 GENERAL CONSEQUENCES OF COAL MINES ON AMBIENT HYDROGEOLOGICAL REGIME

Mining of coal either by opencast or underground method is bound to incise one or more water bearing strata (aquifers) which, in turn, may result in depletion or draw down in water levels and a corresponding inflow of water into the mine workings. The potential effects of coal mining operations on the hydrogeological regime are as under:

- Creates disruption in formation/aquifer
- Dewatering of aquifers
- Change in hydraulic gradient
- Modification in recharge of aquifers
- Change in groundwater flow pattern

The general need in mine planning from the hydrogeological point of view is the estimation of ground water seepage into the mine, its rate, the mine pumping capacity to meet the storm rainwater accumulation, extent of depression of water surface and management of mine effluent (mine water). It is also desirable that the consequences of mining operation on groundwater regime be determined in advance. However, the mine pumping in most of the cases are passive dewatering for the safety of the mine pit, active mine dewatering is done in few cases for very high potential aquifers.

7.2 POTENTIAL CONSEQUENCES OF OPENCAST AND UNDERGROUND COAL MINES ON HYDROGEOLOGICAL REGIME IN JHARIA COALFIELD

Generally, in the opencast and underground mines of Jharia Coalfield, alluvium and overlying weathered mantle are the first to be excavated, followed by upper Barakar Formation / Aquifer. Since these formations vary in thickness, compaction and their constituents over the area, their aquifer properties also vary.

The porosity and the compactness in the sandstone controls the discharge from these aquifers. The alluvium and weathered Formation wherever loose and fragile possess more porosity and this has high groundwater potential. Due to the mine cut, a depression in the water table is created. The initial discharges due to this depression is large in amount because of concentration of flow to that region. In the top zones, water table condition prevails and semi-confined conditions exist in the stratified section (Gondwana Sedimentary basin). With progress of mine operations, there is an increase in the depth of incision, as a result which, the semi-confined aquifers are also gets punctured.

During mining, the hydraulic gradients generally steeps down near mine i.e. within the mine influence area. In the up-dip region, only un-confined aquifer is punctured through the mining process and thus only unconfined aquifer is affected whereas in the down-dip region both un-confined and semi-confined aquifers may be affected. The confined aquifers of lower Barakar Formation in the mining area are not punctured as it lies below the working coal seams and hence normally there is no noticeable effect in the aquifer related to this formation.

7.3 ESTIMATION OF RADIUS OF MINE INFLUENCE ZONE

Radius of Influence can be defined as the radial distance from the center of the borehole to the point where there is no lowering of groundwater table/potentiometric surface.

The radius of influence (R) for Opencast and UG Mines within Jharia CF is calculated by using Sichardt's formula based on present mining scenario.

$$R_0 = C*(H-h) * \sqrt{(K)}$$

Where, R_0- Radius of influence (m), C - Constant =3000,

(H-h)- Drawdown (m), K – Hydraulic conductivity (m/s).

Here, K for Barakar Formations is 0.05 m/d or 5.7 x 10^{-7} m/sec.

Here, it may be appropriate to mention that the presence of prominent boundaries/water bodies, faults or inter-fringing of sandstone and shale beds may restrict the propagation of drawdown cone. With the presence of low permeable beds such as clay/shale and younger coal seams in the formation, laying above the working seams the water level in the phreatic aquifer is not directly affected. Both, the phreatic and semi-confined aquifers, get affected during the working by board and pillar method as subsidence takes place while extracting total coal (depillaring). Surface vigilance and filling up subsided zone, if any, has to be constantly under observation. The effect on groundwater level for most of the coalmine in Jharia coalfield has been observed in the down-dip side, generally within a distance up to 500 m from active mine zone and becomes milder/ negligible thereafter.

8.0 CONSERVATION MEASURES & FUTURE STRATEGY

- BCCL has installed 25 Pressure Filter Plant of total capacity of 4.16 MGD to meet drinking water requirement in nearby area. At present 63 Water Treatment Plants are operational having

capacity of 16.16 MGD within Jharia Coalfield area. Further, installation of 28 more Pressure Filter Plants having capacity of 5.84 MGD are in progress.

- BCCL has participated in development of low cost technology for drinking water in a CSIR project along with CIMFR, Dhanbad and a pilot plant of 4000 Liters/hour is functional at PB Project site of BCCL. Similar plants have been proposed at other sites of BCCL.
- A scheme titled 'Scheme for multi-purpose utilization of surplus mine water of Barora Area, Block II and Govindpur Area of BCCL' was prepared with a view to harness the excess water discharge to take care of the persistence problem of water scarcity in the nearby villages. In the scheme, two water reservoirs of capacity 27 MG and 17 MG have been proposed in the non-coal bearing area for storage of 3250 GPM and 2000 GPM surplus mine water which will be fed by mine discharge at mines of Barora, Block-II and Govindpur Area through pipe line.
- Rooftop rainwater harvesting (RWH) has been taken up in the project areas using the administrative buildings. 138 no. of quarters having roof-top area of about 14950 sq. m. is ready to harvest rainwater and around 13150 cum/annum of water is going to recharge the nearby groundwater system through RWH structures. Proposal has already been made to facilitate this kind of RWH structure at suitable locations i.e., Lodna Area, Kusunda Area (Jawahar Nagar, Matkuria, Coal Board Colony), Sijua Area (Nichitpur and Tetulmari Colony) within Jharia Coalfield to augment groundwater recharge.
- After cessation of mining, with plenty of rainfall and abundant ground water recharge, the water levels will recoup and attain normalcy. Thus, the impact of mining on groundwater system may be considered as a temporary phenomenon. The abandoned mine workings (UG) behave as water pool and improves the resources availability in the coalfield area.
- Utilization of treated mine water discharge by both, industry and local people, in the mine influence area. The excess mine water can be used to recharge groundwater system by connecting pipelines to abandoned dug wells. Utilization of mine water for irrigation will also enhance the ground water recharge potential through artificial recharge in the area.
- Increase vegetative cover by plantation in the mine area under land amelioration measures. This will contain the surface run-off and increase the groundwater recharge.
- Imparting awareness among workers and local peoples about Rainwater harvesting and artificial recharge will have priority. This aspect is usually covered during the Environmental Week celebrated every year (5 to 12 June).
- 23 nos. of Piezometers have been installed within JCF and RCF to monitor GW level (**Plate-III**).

Monitoring of water quality of mine water discharge, local River/nala and domestic water source (dug well/hand pump wells) will continue under routine monitoring (May, August, November & Jan). The groundwater level during the month of Jan'23 has been recorded in those piezometers and given below:

PZ NO.	LATITUDE	LONGITUDE	January 2023 Water level (m) BGL
PZ7A	23.770115	86.410951	110.4
PZ7B	23.740017	86.39971	-
PZ7C	23.734152	86.443317	76.7
PZ8A	23.755621	86.427106	70
PZ9A	23.730468	86.446387	41.55
PZ13A	23.713845	86.251622	32.85
PZ14A	23.741512	86.213866	7.6
PZ14B	23.741512	86.213866	11.82
PZ1B	23.769165	86.175347	29.75
PZ1A	23.769176	86.175446	12.15
PZ2A	23.767181	86.189037	29.41
PZ2B	23.790844	86.24701	4.85
PZ5A	23.781658	86.356924	5.15
PZ5B	23.79986	86.36189	-
PZ4A	23.776446	86.312329	29.7
PZ4B	23.776503	86.312519	107.5
PZ3A	23.779754	86.241757	19.1
PZ3B	23.80146	86.282446	85.82
PZ3C	23.801619	86.282436	-
PZ11A	23.726355	86.341936	60.6
PZ9B	23.696164	86.41592	66.8
PZ10A	23.687975	86.405108	5.92
PZ16A	23.730825	86.760491	35.2

However, as per revised proposal, from assessment year 2023-24 the groundwater level and quality monitoring work in the BCCL command area will be revised as per the guidelines of CGWA, New Delhi regarding NoC from CGWA for groundwater abstraction in Mining Sector. As per revised proposal, total 150 nos. of Dug well and 23 nos. of Piezometers will be monitored in quarterly basis and total 50 nos. of groundwater quality sampling will be conducted during the month of May in each assessment year onwards. 12 nos. of existing monitoring wells have been discarded for evenly distribution of key wells within the buffer zone, these are: A-18, A-22A, B-25, B-21A, B-61A, D-23, D-40A, D-43, D-51, D-55, DB-24 & DB-25.

9.0 EXISTING/PROPOSED RAINWATER HARVESTING STRUCTURES IN BCCL COAL MINES

Fig-3 to 4.



Proposed Rain Water Harvesting Site GVTC, Cluster-I, Barora Area



Proposed Rain Water Harvesting Site Nehru Balika Vidhalaya, Cluster-I, Barora Area

Fig-5 to 6.



Proposed Rain Water Harvesting Site Barora Area Guest House, Cluster-I, Barora Area



Proposed Rain Water Harvesting Site Regional Hospital Baghmara, Cluster-I, Barora Area

Fig-7 to 8.



Proposed Rain Water Harvesting Site – Barora Area Office, Cluster-I, Barora Area



RECHARGE POND / ABANDONDED IN THE JCF MINE AREA

Fig-9 to 10.



RECHARGE POND / ABANDONDED IN THE JCF MINE AREA



FILTER PLANT IN THE MINE AREA

Fig-11 to 12.

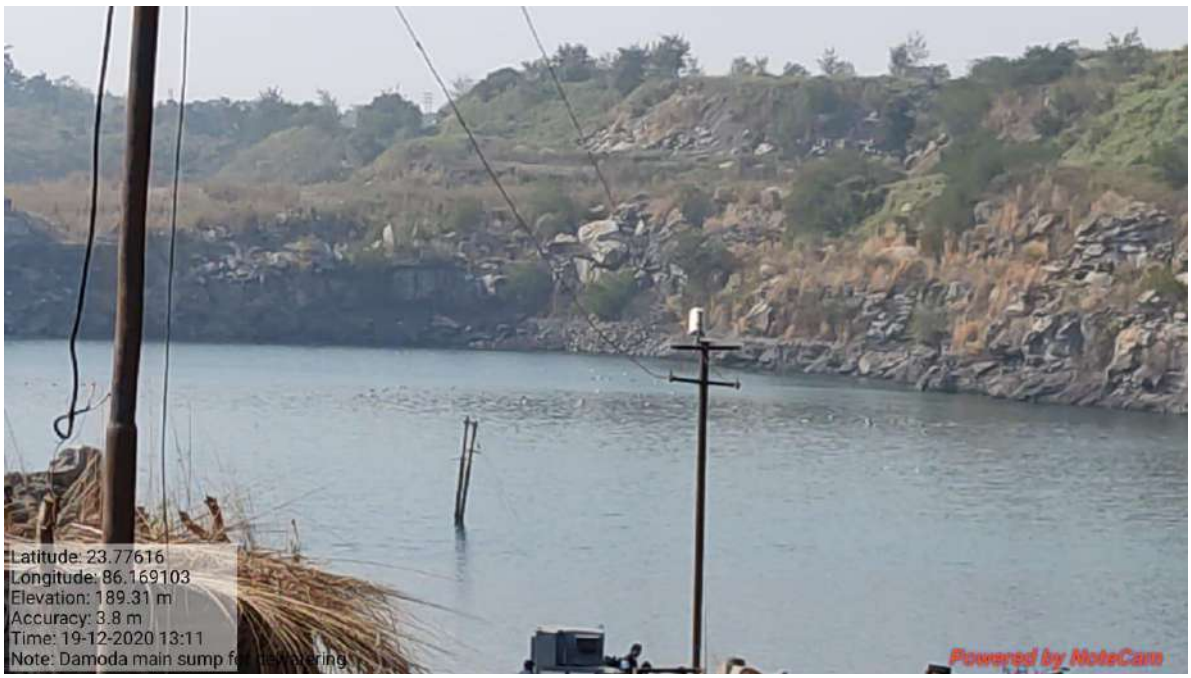


RECHARGE POND / ABANDONDED IN THE JCF MINE AREA



RECHARGE POND / ABANDONDED IN THE JCF MINE AREA

Fig-13 to 14.



RECHARGE POND / ABANDONDED IN THE JCF MINE AREA



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
2021	0.00	0.00	21.8	12	157.4	295	382.2	130.2	451.8	285	54.4	43	1832.8
2022	12.8	85.8	0	0	61.8	130.2	104.6	350.1	172.2	64.4	0	3	984.9

Annexure – V

Location of Hydrograph Stations (Dug Wells)

Well No	Latitude	Longitude	Well No	Latitude	Longitude
A-3	23^{0}47'53.35" N	86^{0}19'55.14" E	**B-62A**	23^{0}45'44.15" N	86^{0}11'27.80" E
A-12	23^{0}48'20.31" N	86^{0}16'51.64" E	**B-64**	23^{0}48'45.58" N	86^{0}18'31.03" E
A-16	23^{0}46'57.00" N	86^{0}21'38.57" E	**B-65A**	23^{0}49'5.12" N	86^{0}18'15.77" E
A-17	23^{0}45'09.44" N	86^{0}22'16.35" E	**B-67**	23^{0}43'30.70" N	86^{0}14'01.45" E
A-18	23^{0}44'37.65" N	86^{0}22'58.90" E	**D-3**	23^{0}46'46.31" N	86^{0}24'49.30" E
A-19	23^{0}40'50" N	86^{0}24'14" E	**D-4**	23^{0}44'29.37" N	86^{0}24'42.88" E
A-20	23^{0}45'26.63" N	86^{0}20'42.86" E	**D-5**	23^{0}42'39.06" N	86^{0}24'47.95" E
A-21	23^{0}44'58" N	86^{0}18'38" E	**D-7**	23^{0}43'12.08" N	86^{0}27'11.89" E
A-22	23^{0}43'06.65" N	86^{0}14'48.53" E	**D-8**	23^{0}44'06.13" N	86^{0}27'20.72" E
A-23	23^{0}45'6" N	86^{0}15'22" E	**D-23**	23^{0}47'20.89" N	86^{0}20'09.96" E
A-24	23^{0}45'20.44" N	86^{0}13'45.12" E	**D-25**	23^{0}47'12.03" N	86^{0}23'14.08" E
A-25	23^{0}47'06.20" N	86^{0}15'27.79" E	**D-30**	23^{0}48'36.10" N	86^{0}21'50.07" E
A-26	23^{0}46'49.24" N	86^{0}18'12.12" E	**D-33**	23^{0}45'34.62" N	86^{0}23'18.50" E
A-27	23^{0}48'42.55" N	86^{0}20'21.80" E	**D-34**	23^{0}47'1.88" N	86^{0}23'39.62" E
A-28A	23^{0}47'34.74" N	86^{0}18'04.18" E	**D-35**	23^{0}40'46.54" N	86^{0}25'46.33" E
A-29	23^{0}47'08.02" N	86^{0}16'02.72" E	**D-36**	23^{0}40'19.26" N	86^{0}25'18.98" E
A-32	23^{0}44'15.56" N	86^{0}20'43.80" E	**D-39**	23^{0}43'28.50" N	86^{0}26'0.10" E
A-33	23^{0}44'32.58" N	86^{0}16'58.28" E	**D-40A**	23^{0}43'20.18" N	86^{0}25'45.70" E
A-34	23^{0}42'58.63" N	86^{0}15'19.31" E	**D-41**	23^{0}42'40.00" N	86^{0}26'17.20" E
B-1	23^{0}48'48.06" N	86^{0}14'16.87" E	**D-43**	23^{0}43'55.06" N	86^{0}27'24.98" E
B-14	23^{0}48'00.81" N	86^{0}16'25.88" E	**D-47**	23^{0}45'20.59" N	86^{0}24'34.86" E
B-15	23^{0}46'06.92" N	86^{0}08'59.30" E	**D-49**	23^{0}44'08.96" N	86^{0}26'32.71" E
B-21A	23^{0}45'10.50" N	86^{0}09'36.38" E	**D-51**	23^{0}44'20.86" N	86^{0}27'11.37" E
B-23	23^{0}44'13.05" N	86^{0}11'46.56" E	**D-55**	23^{0}43'58.37" N	86^{0}24'07.45" E
B-24	23^{0}44'26.80" N	86^{0}13'09.38" E	**D-74**	23^{0}41'33.66" N	86^{0}25'06.10" E
B-25	23^{0}44'44.98" N	86^{0}13'57.80" E	**D-77**	23^{0}41'00.74" N	86^{0}22'25.55" E
B-32A	23^{0}45'49.18" N	86^{0}13'03.64" E	**D-80**	23^{0}46'09.46" N	86^{0}24'33.08" E
B-48	23^{0}43'35.04" N	86^{0}16'38.78" E	**DB-22**	23^{0}42'49.79" N	86^{0}45'9.97" E
B-51	23^{0}46'58.55" N	86^{0}09'22.18" E	**DB-23**	23^{0}43'43.03" N	86^{0}45'04.97" E
B-53	23^{0}45'55.25" N	86^{0}09'35.44" E	**DB-24**	23^{0}43'53.00" N	86^{0}45'03.88" E
B-59	23^{0}47'59.87" N	86^{0}13'37.97" E	**DB-25**	23^{0}44'10.75" N	86^{0}44'35.84" E
B-60	23^{0}48'7.87" N	86^{0}15'37.12" E			
B-61A	23^{0}45'59.85" N	86^{0}11'40.80" E			

These wells (red color) will be excluded from next assessment year.

Annexure – VA

Details of Hydrograph Stations (Dug Wells)

Well No	Location	M.P. (agl) in m	Well Dia in m	Well Depth (m bmp)	Formation	Owner	Utility
A-3	Sijua	0.53	3.00	5.20	Barakar	Govt.	Domestic
A-12	Jamua	0.80	1.90	3.30	Barakar	Govt.	Domestic
A-16	Ekra, Kalali	0.45	3.10	6.50	Barakar	Govt.	Domestic
A-17	Kachi Balihari	0.56	1.60	5.30	Barakar	Govt.	Domestic
A-18	Bhagabandh	0.61	1.45	3.37	Barakar	Govt.	Domestic
A-19	Bhaura	0.54	3.15	11.65	Barakar	Govt.	Domestic
A-20	Gorbhudih	0.43	3.30	8.30	BM	Govt.	Domestic
A-22	Nagdah, Niche	0.00	1.40	9.50	Raniganj	Govt	Irrigation
A-23	Machhyara	0.43	1.85	12.40	Raniganj	Govt	Domestic
A-24	Pipra Tanr	0.22	1.80	19.55	Raniganj	Govt	Domestic
A-25	Sinidih	0.22	2.00	11.30	Barakar	Govt	Domestic
A-26	Pasitanr	0.32	1.80	9.65	Barakar	Govt	Domestic
A-27	Chandor	0.60	2.50	5.50	Barakar	Govt	Domestic
A-28A	Lakarka 6 no.	0.65	1.30	5.25	Barakar	BCCL	Domestic
A-29	Aambagan	0.10	2.60	9.15	Barakar	Govt	Domestic
A-32	Baludih	0.55	2.30	6.85	BM	Govt	Domestic
A-33	Mahuda	0.75	2.00	10.80	BM	BCCL	Domestic
A-34	Bhatdih	0.55	3.50	24.50	Raniganj	BCCL	Domestic
B-1	Muraidih	0.47	1.80	5.35	Talchir	Govt	Domestic
B-14	Mathadih	0.76	2.15	3.75	Barakar	Govt	Domestic
B-15	Bera Basti	0.55	1.60	2.50	Talchir	Dhanu Roy	Domestic
B-21A	Dugdha	0.55	2.10	10.35	Metamorphics	Govt	Domestic
B-23	Lohapati	0.26	3.60	10.85	Raniganj	Govt	Domestic
B-24	Telmuchu	0.67	4.35	10.83	Raniganj	Govt	Domestic
B-25	Mahuda More	0.10	2.45	8.45	Raniganj	Govt	Domestic
B-32A	Madhuband	0.80	4.30	8.60	Barakar	BCCL	Domestic
B-48	Mahuda	0.65	2.10	11.50	Raniganj	Mosque	Domestic
B-51	Taranga	0.00	2.50	5.75	Metamorphics	Bisun	Irrigation
B-53	Karmatanr	0.58	2.70	13.25	Barakar	Govt	Domestic
B-59	Khodovaly	0.60	2.40	9.30	Barakar	BCCL	Domestic
B-60	Bahiyardih	0.77	3.00	15.60	Barakar	BCCL	Domestic
B-61A	Kesargora	0.48	2.00	11.20	Barakar	BCCL	Domestic
B-62A	Sadariyadih	0.15	3.10	9.50	Barakar	Govt	Domestic

Annexure – VA

Details of Hydrograph Stations (Dug Wells)

Well No	Location	M.P. (agl) in m	Well Dia in m	Well Depth (m bmp)	Formation	Owner	Utility
B-64	Keshalpur	0.65	1.10	3.40	Barakar	BCCL	Domestic
B-65A	Jhinjipahari	0.95	2.20	12.40	Barakar	Shiv Temple	Domestic
B-67	Simatanr	0.55	2.20	11.80	Raniganj	Govt	Domestic
D-3	Dhansar	0.60	1.70	8.70	Barakar	Govt	Domestic
D-4	Jharia	0.59	1.90	5.73	Barakar	Govt	Domestic
D-5	Jiyalgora	0.70	2.80	10.55	Barakar	Govt	Domestic
D-7	Golden Pahari	0.67	2.85	10.05	Barakar	BCCL	Domestic
D-8	Alokdiha	0.35	1.75	7.57	Metamorphics	BCCL	Domestic
D-23	Jogta (Sindra)	0.40	3.10	7.25	Barakar	BCCL	Domestic
D-25	Godhar More	0.60	2.75	5.60	Barakar	Govt	Domestic
D-30	Borkiboa	0.70	2.00	5.60	Talchir	H.Kumbhakar	Domestic
D-33	Kustore-4	0.55	1.85	3.45	Barakar	BCCL	Domestic
D-34	Kusunda-7	0.60	1.50	3.45	Barakar	BCCL	Domestic
D-35	Patherdih	0.40	2.00	11.20	Barakar	BCCL	Domestic
D-36	Sudamdih	0.90	2.00	6.20	Barakar	BCCL	Domestic
D-39	Tilabani	0.85	2.00	5.90	Barakar	BCCL	Domestic
D-40A	Khapra Dhaora	0.55	1.95	3.70	Barakar	Panchayat	Domestic
D-41	Joyrampur	0.50	1.80	4.00	Barakar	BCCL	Domestic
D-43	Alagdih	0.45	2.20	8.90	Metamorphics	Govt	Domestic
D-47	Parastanr	0.45	3.20	23.80	Barakar	BCCL	Domestic
D-49	Goluckdih	0.55	1.80	6.15	Barakar	BCCL	Domestic
D-51	Chankuiya	0.55	3.70	11.90	Barakar	BCCL	Domestic
D-55	Hariladih	0.48	2.80	11.80	Barakar	Govt	Domestic
D-74	Bhulan Barari	0.10	1.60	12.80	Barakar	Govt	Domestic
D-77	Rohoniatanr	0.40	3.15	6.70	Barakar	Govt	Domestic
D-80	Bastacolla	0.70	2.50	24.95	Barakar	Govt	Domestic
DB-22	Nichebasti	0.67	2.40	10.65	Barakar	Govt	Domestic
DB-23	Dahibari OC	0.70	2.30	8.00	Barakar	BCCL	Domestic
DB-24	Dahibari	0.60	3.60	13.70	Barakar	BCCL	Domestic
DB-25	Palasya	0.37	1.55	5.25	Barakar	Govt	Domestic

These wells (red color) will be excluded from next assessment year.

MP: Measuring Point R.L.: Reduced Level W.L.: Water Level m: Meter
Abn.: Abandoned b.g.l.: Below Ground Level a.g.l.: Above Ground Level
G.L.: Ground Level bmp: Below Measuring Point BM: Barren Measure

Annexure – VB

Historical Water Level data of Hydrograph Stations

Well No	Water level below ground level (bgl) in meters															
	May 15	Nov 15	May 16	Nov 16	May 17	Nov 17	May 18	Nov 18	May 19	Nov 19	May 20	Nov 20	May 21	Nov 21	May 22	Nov 22
A-3	3.70	3.42	4.87	0.47	0.67	0.77	1.27	0.47	3.47	0.47	1.57	0.47	0.62	0.05	0.42	0.29
A-12	3.00	2.68	2.50	0.70	2.55	0.85	2.80	1.0	2.10	0.45	2.60	0.50	1.92	1.10	1.5	0.67
A-16	5.55	4.17	5.85	3.15	3.65	2.20	4.30	3.65	5.45	1.95	7.15	1.75	3.45	2.00	5.8	3.08
A-17	3.79	2.64	2.44	2.69	2.44	2.24	3.34	2.84	2.94	2.24	2.14	1.69	3.36	2.37	2.62	2.59
A-18	2.84	1.29	1.14	0.89	1.29	0.99	1.24	0.99	2.29	0.69	1.09	0.34	1.09	0.57	0.62	0.56
A-19	3.05	2.75	7.81	4.11	6.37	2.45	5.55	2.45	4.85	3.43	6.05	3.25	3.30	1.90	4.1	2.54
A-20	4.59	2.93	7.49	3.50	4.27	1.77	4.57	2.57	4.57	1.82	8.47	3.87	5.47	2.02	5.59	3.54
A22A	3.20	1.96	3.25	1.75	4.27	1.77	3.35	1.30	2.60	2.00	2.90	1.98	2.90	1.10	6.35	2.1
A-23	11.3	9.37	11.87	8.13	6.40	1.50	11.15	7.17	11.97	3.77	8.92	5.62	9.52	2.82	7.97	4.79
A-24	17.2	14.5	16.62	12.43	11.87	6.97	14.58	6.88	15.88	2.48	*4.88	4.28	10.13	2.78	7.28	4.33
A-25	7.78	5.85	7.43	4.58	6.38	2.88	6.63	3.13	6.08	1.93	2.98	1.83	5.78	2.43	3.31	2.08
A-26	7.73	3.18	8.93	4.48	5.28	2.53	6.23	3.88	6.58	3.33	6.98	3.18	6.70	2.73	6.42	4.31
A-27	4.40	3.95	4.85	1.80	2.90	1.25	2.90	1.0	2.40	0.92	2.40	1.10	1.67	0.90	1.90	1.33
A28A	4.35	3.60	3.35	1.47	4.30	1.55	4.15	2.51	2.45	3.15	4.00	3.03	6.23	3.75	4.23	3.30
A-29	4.55	4.60	5.92	6.96	4.40	1.30	6.45	2.10	4.85	3.40	6.20	3.20	6.49	5.90	4.60	1.15
A-32	4.41	2.13	4.75	2.10	3.15	1.55	2.80	0.70	2.75	0.95	1.90	1.75	2.35	0.96	2.25	1.75
A-33	4.91	1.97	5.75	2.60	6.45	1.55	4.07	2.35	3.65	1.25	4.55	1.85	2.85	0.85	3.50	2.05
A-34	8.40	4.81	4.75	4.45	12.45	4.45	5.90	3.70	6.35	3.95	8.35	3.45	5.20	3.55	8.20	6.35
B-1	3.28	2.75	3.58	1.93	2.33	0.85	2.88	2.08	3.18	1.73	3.28	1.63	2.58	1.91	2.10	1.81
B-14	2.94	2.29	2.44	0.47	2.94	1.84	3.64	2.84	2.24	0.94	2.44	1.04	2.84	2.04	3.24	2.60
B-15	1.50	0.45	1.85	0.55	4.85	0.15	1.85	0.85	1.90	1.65	3.70	1.47	1.46	0.35	3.67	1.02
B21A	7.37	4.65	5.55	4.50	8.85	5.65	9.65	2.65	9.45	-	10.00	5.80	8.38	-	9.65	4.35
B-23	7.86	4.29	6.81	2.41	7.74	2.14	6.64	2.14	2.84	1.34	3.24	1.76	4.12	1.44	2.98	1.73
B-24	10.0	5.78	10.63	4.28	10.03	4.03	9.28	4.33	4.58	2.33	5.48	3.53	5.68	2.08	5.53	3.46
B-25	6.88	-	7.05	1.70	6.70	1.40	5.90	3.70	4.80	1.40	7.90	2.55	5.10	2.58	6.40	3.52
B32A	7.55	3.32	6.95	3.07	6.95	2.80	6.75	3.90	5.55	1.70	3.30	2.00	7.23	6.05	4.15	2.56
B-48	7.90	5.42	9.35	4.60	7.70	4.15	7.33	3.97	7.05	4.35	8.20	3.85	7.23	6.05	6.85	6.25
B-51	4.65	3.40	4.90	3.18	4.98	2.55	5.02	2.42	5.10	2.70	5.00	2.10	5.70	1.0	5.06	4.57
B-53	5.58	2.82	4.70	1.45	4.02	1.92	3.92	1.42	3.22	1.42	3.12	1.40	4.85	1.87	4.42	3.54
B-59	4.12	1.60	4.40	0.50	5.40	0.60	5.47	1.10	6.20	0.90	5.25	1.40	5.49	0.90	4.50	1.14
B-60	9.21	5.28	10.33	5.03	13.23	3.18	13.68	4.23	8.13	3.23	10.33	3.21	11.26	2.23	10.53	5.80
B61A	6.15	4.52	6.58	3.87	2.57	0.82	2.57	2.02	3.32	0.52	3.32	1.60	4.42	0.97	1.20	0.97
B62A	9.10	5.21	9.30	4.95	8.15	4.35	8.27	4.78	7.55	3.25	6.95	3.00	6.87	4.50	6.45	4.91

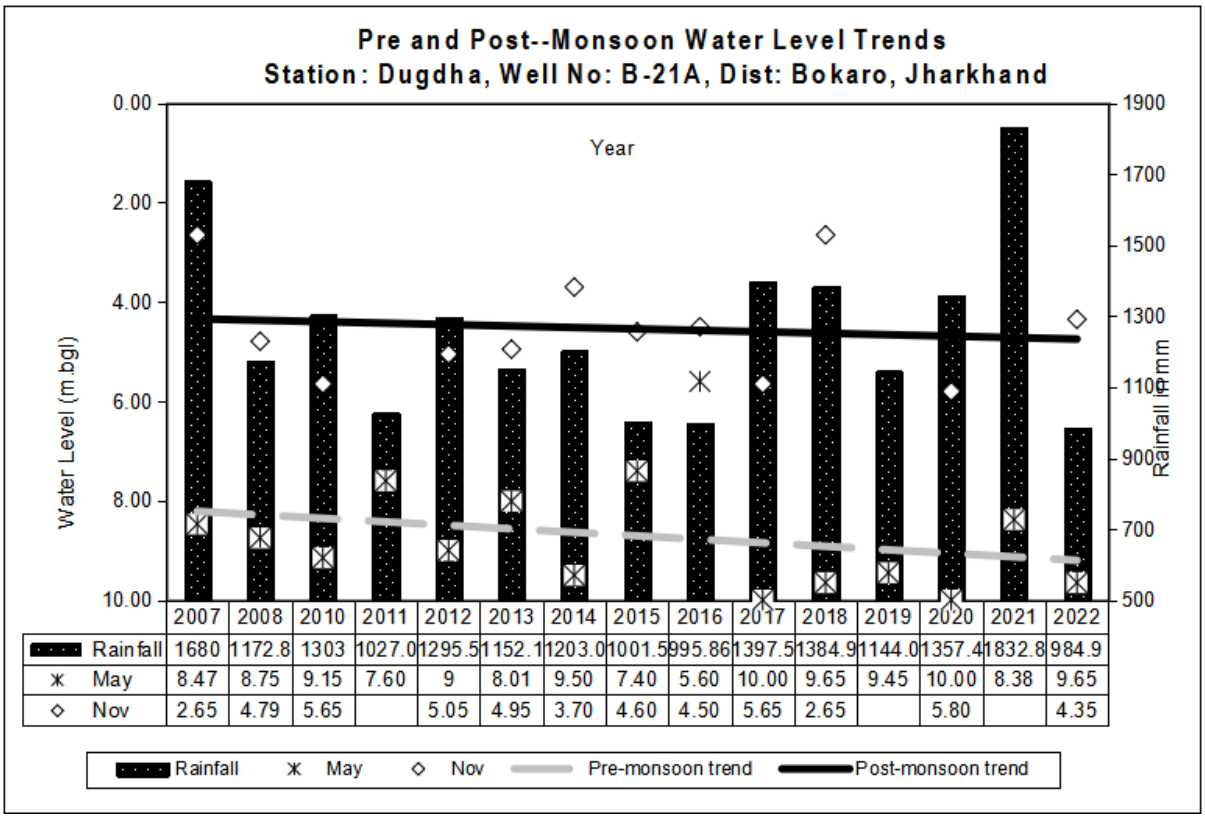
Annexure – VB

Historical Water Level data of Hydrograph Stations

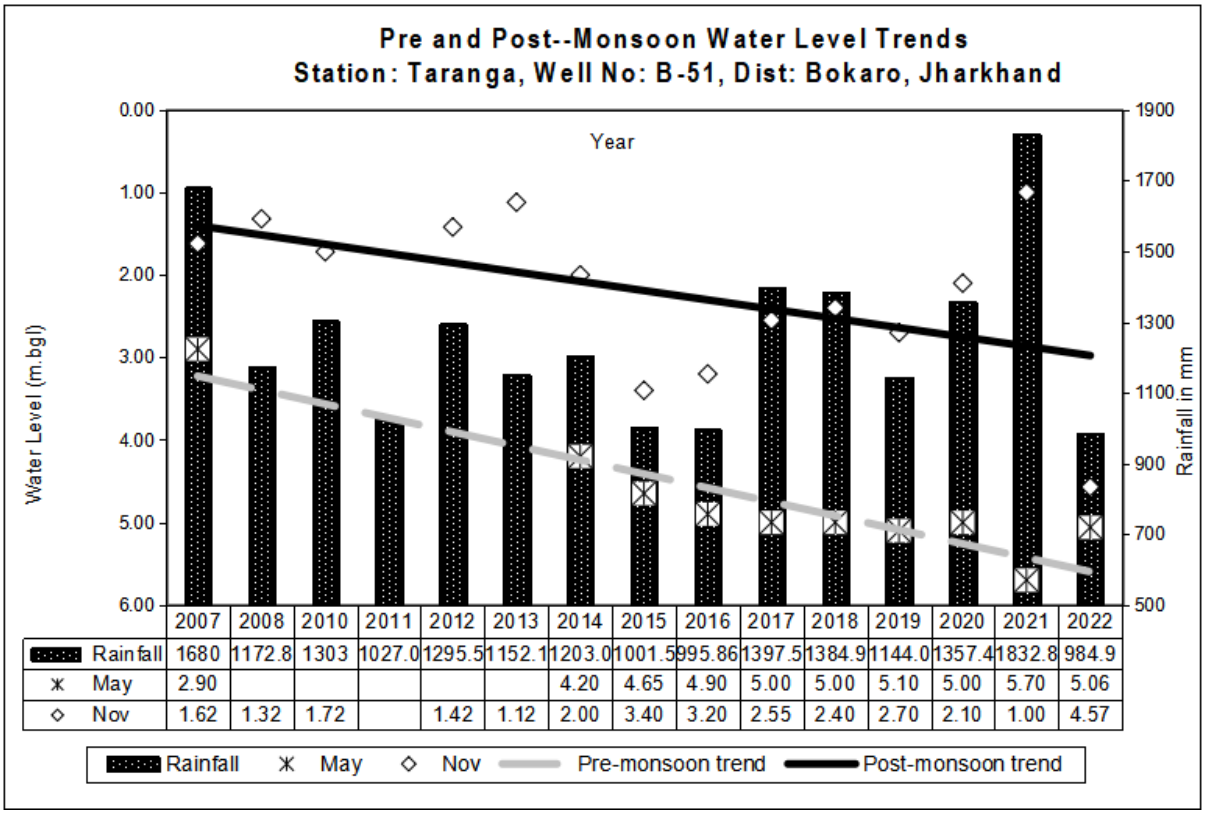
Well No	Water level below ground level (bgl) in meters															
	May 15	Nov 15	May 16	Nov 16	May 17	Nov 17	May 18	Nov 18	May 19	Nov 19	May 20	Nov 20	May 21	Nov 21	May 22	Nov 22
B-64	1.38	0.95	2.35	0.55	1.25	0.85	2.15	1.85	0.95	0.45	1.85	0.50	2.35	0.95	1.00	0.60
B65A	7.82	5.87	7.15	2.68	9.05	1.25	10.03	2.40	11.05	0.95	9.25	2.30	9.03	1.42	7.45	2.27
B-67	9.23	5.53	9.53	4.30	10.00	2.15	9.55	4.0	8.57	4.35	7.55	3.95	8.95	2.95	8.50	6.30
D-3	4.25	2.25	2.35	1.90	2.15	2.30	3.43	2.45	1.75	1.30	5.40	1.38	3.41	0.85	5.96	1.32
D-4	2.41	1.27	1.21	1.36	1.21	1.46	1.91	1.56	2.81	1.71	3.41	1.41	3.01	1.16	1.71	1.55
D-5	9.37	8.33	9.40	6.40	7.90	5.20	7.80	5.30	8.25	4.85	8.60	7.70	7.28	4.00	8.40	7.01
D-7	8.25	5.61	7.53	4.03	7.33	2.88	7.53	2.83	8.23	3.28	7.33	5.13	6.08	2.63	9.03	5.67
D-8	6.24	4.38	8.00	3.43	5.15	1.85	5.65	1.85	4.80	2.85	5.83	2.75	4.55	2.27	6.32	5.42
D-23	6.55	3.48	5.70	1.63	2.80	2.98	4.40	3.40	4.70	1.40	5.60	3.35	5.43	1.60	1.85	1.57
D-25	4.48	2.45	2.40	1.90	2.40	1.20	2.60	2.40	*9.90	*5.38	10.50	5.62	10.50	3.80	11.90	4.70
D-30	4.55	3.15	4.45	3.20	4.40	1.25	4.58	1.10	4.60	0.75	4.50	1.35	4.23	0.84	4.37	2.29
D-33	2.25	1.10	2.50	1.95	0.75	0.75	2.85	0.95	2.35	1.65	3.65	1.45	1.75	0.85	1.20	0.65
D-34	2.55	1.45	2.30	0.30	0.80	0.55	2.80	0.45	4.75	2.40	3.30	2.80	3.78	2.90	5.00	3.15
D-35	9.80	7.90	9.52	6.45	8.80	3.60	8.40	4.45	8.00	3.80	8.20	5.40	6.60	2.90	6.10	4.68
D-36	1.66	1.13	0.78	0.95	1.30	0.70	1.20	0.60	1.20	0.55	2.10	1.00	2.02	0.55	3.25	0.6
D-39	5.00	2.61	2.18	2.65	6.17	4.75	4.95	4.35	*12.60	*5.95	9.40	6.05	10.70	5.10	7.50	3.05
D40A	3.07	2.45	1.40	0.85	1.45	1.35	2.10	1.40	1.85	1.45	1.95	1.43	1.95	1.80	2.35	1.80
D-41	2.65	2.32	1.30	1.52	1.40	1.20	1.59	1.32	2.30	1.25	3.30	1.45	1.95	1.38	1.55	0.88
D-43	6.61	5.05	8.20	3.35	7.50	3.60	7.15	3.45	7.35	2.70	6.60	2.55	4.65	2.60	5.35	4.71
D-47	9.60	3.60	3.18	2.95	3.15	2.85	5.33	2.55	4.55	4.35	9.45	5.45	4.05	2.45	6.55	5.85
D-49	3.55	2.35	2.45	1.72	2.70	2.05	3.45	2.45	1.75	1.50	3.25	1.65	1.40	0.85	2.00	1.91
D-51	10.48	9.15	11.15	6.45	10.45	5.43	10.93	7.10	9.95	5.75	8.45	5.70	9.43	5.65	10.95	8.50
D-55	6.15	1.57	2.52	3.62	6.42	2.37	8.42	1.57	8.42	5.47	9.42	8.60	9.52	7.62	11.32	11.12
D-74	10.05	7.20	7.73	5.00	9.25	3.85	8.60	4.80	5.80	3.57	4.30	3.93	6.93	2.90	6.17	5.77
D-77	6.44	5.60	4.60	2.90	6.50	4.90	6.30	5.20	6.40	3.20	6.40	3.50	5.98	4.69	6.50	4.70
D-80	10.97	3.35	6.55	4.15	8.65	3.70	9.35	4.20	5.00	3.05	4.30	4.90	7.10	2.55	3.30	3.08
RCF (part)	May 15	Nov 15	May 16	Nov 16	May 17	Nov 17	May 18	Nov 18	May 19	Nov 19	May 20	Nov 20	May 21	Nov 21	May 22	Nov 22
DB22	4.59	3.53	5.38	3.33	1.93	1.63	2.34	1.93	4.93	1.63	2.63	2.25	2.31	1.38	1.73	1.63
DB23	3.38	6.04	5.30	0.90	2.05	1.90	2.85	1.75	1.60	0.80	2.50	1.95	2.00	1.10	2.68	2.20
DB24	9.52	8.20	10.65	6.50	5.80	3.78	8.25	5.70	9.35	3.88	5.70	3.60	6.20	5.25	-	-
DB25	3.83	2.68	3.61	1.98	3.23	2.58	3.93	1.63	-	-	3.98	2.63	2.83	2.03	-	-

These wells (red color) will be excluded from next assessment year.

HYDROGRAPHS OF CLUSTER-I

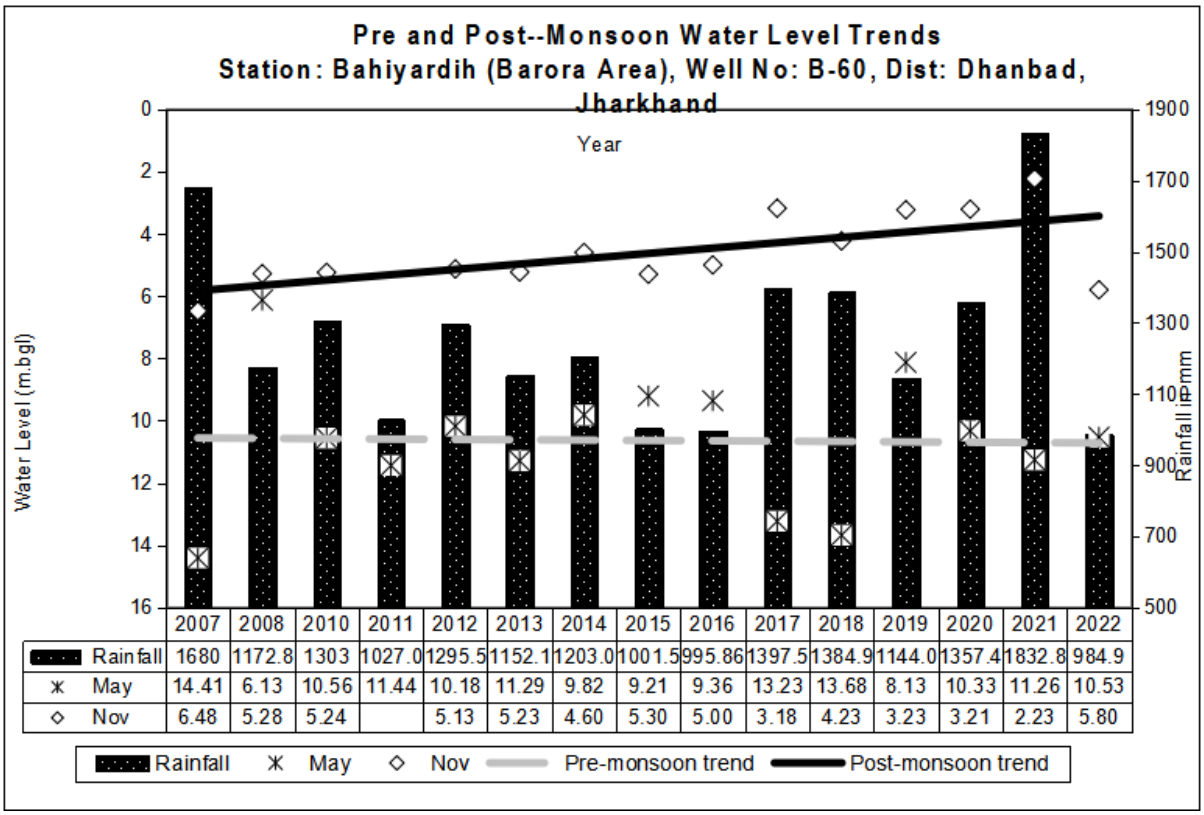


	2007	2008	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022
Rainfall	1680	1172.8	1303	1027.0	1295.5	1152.1	1203.0	1001.5	995.86	1397.5	1384.9	1144.0	1357.4	1832.8	984.9
May	8.47	8.75	9.15	7.60	9	8.01	9.50	7.40	5.60	10.00	9.65	9.45	10.00	8.38	9.65
Nov	2.65	4.79	5.65		5.05	4.95	3.70	4.60	4.50	5.65	2.65		5.80		4.35

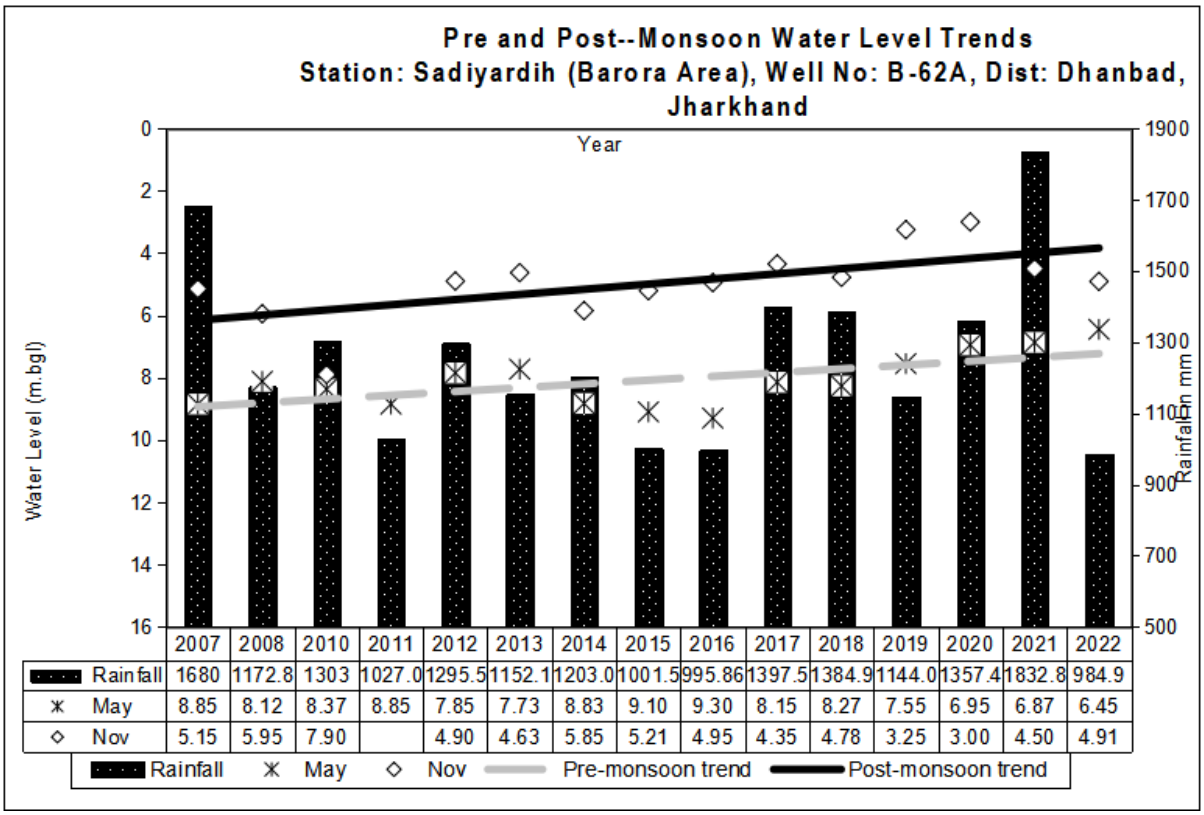


	2007	2008	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022
Rainfall	1680	1172.8	1303	1027.0	1295.5	1152.1	1203.0	1001.5	995.86	1397.5	1384.9	1144.0	1357.4	1832.8	984.9
May	2.90						4.20	4.65	4.90	5.00	5.00	5.10	5.00	5.70	5.06
Nov	1.62	1.32	1.72		1.42	1.12	2.00	3.40	3.20	2.55	2.40	2.70	2.10	1.00	4.57

HYDROGRAPHS OF CLUSTER-II

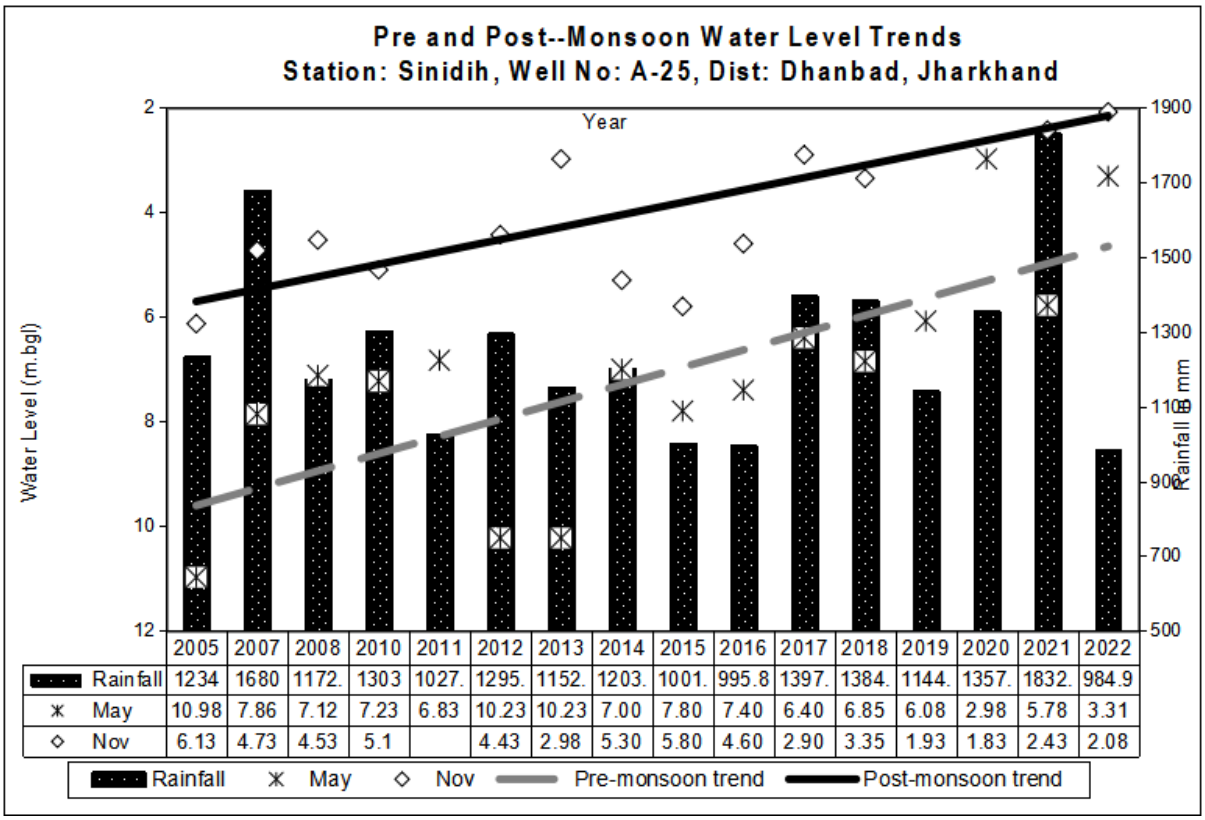


	2007	2008	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022
Rainfall	1680	1172.8	1303	1027.0	1295.5	1152.1	1203.0	1001.5	995.86	1397.5	1384.9	1144.0	1357.4	1832.8	984.9
May	14.41	6.13	10.56	11.44	10.18	11.29	9.82	9.21	9.36	13.23	13.68	8.13	10.33	11.26	10.53
Nov	6.48	5.28	5.24		5.13	5.23	4.60	5.30	5.00	3.18	4.23	3.23	3.21	2.23	5.80

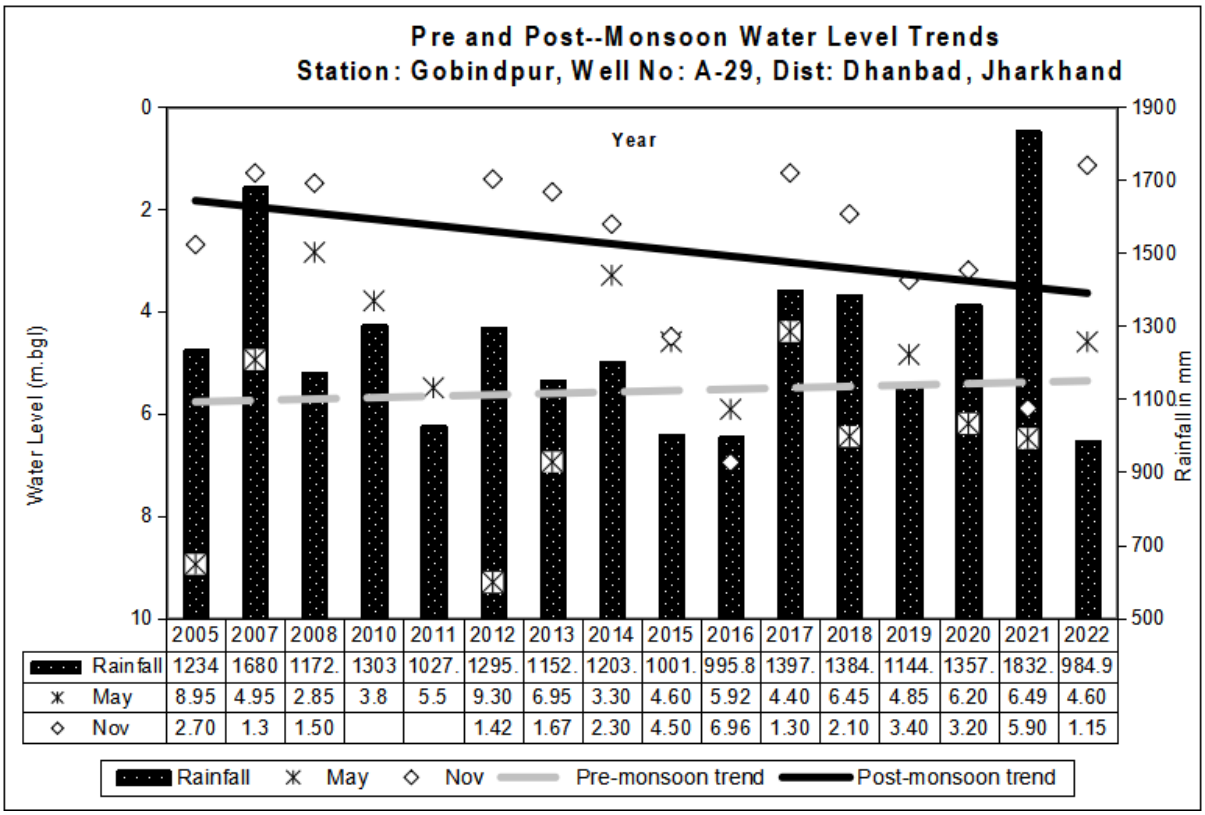


	2007	2008	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022
Rainfall	1680	1172.8	1303	1027.0	1295.5	1152.1	1203.0	1001.5	995.86	1397.5	1384.9	1144.0	1357.4	1832.8	984.9
May	8.85	8.12	8.37	8.85	7.85	7.73	8.83	9.10	9.30	8.15	8.27	7.55	6.95	6.87	6.45
Nov	5.15	5.95	7.90		4.90	4.63	5.85	5.21	4.95	4.35	4.78	3.25	3.00	4.50	4.91

HYDROGRAPHS OF CLUSTER-III

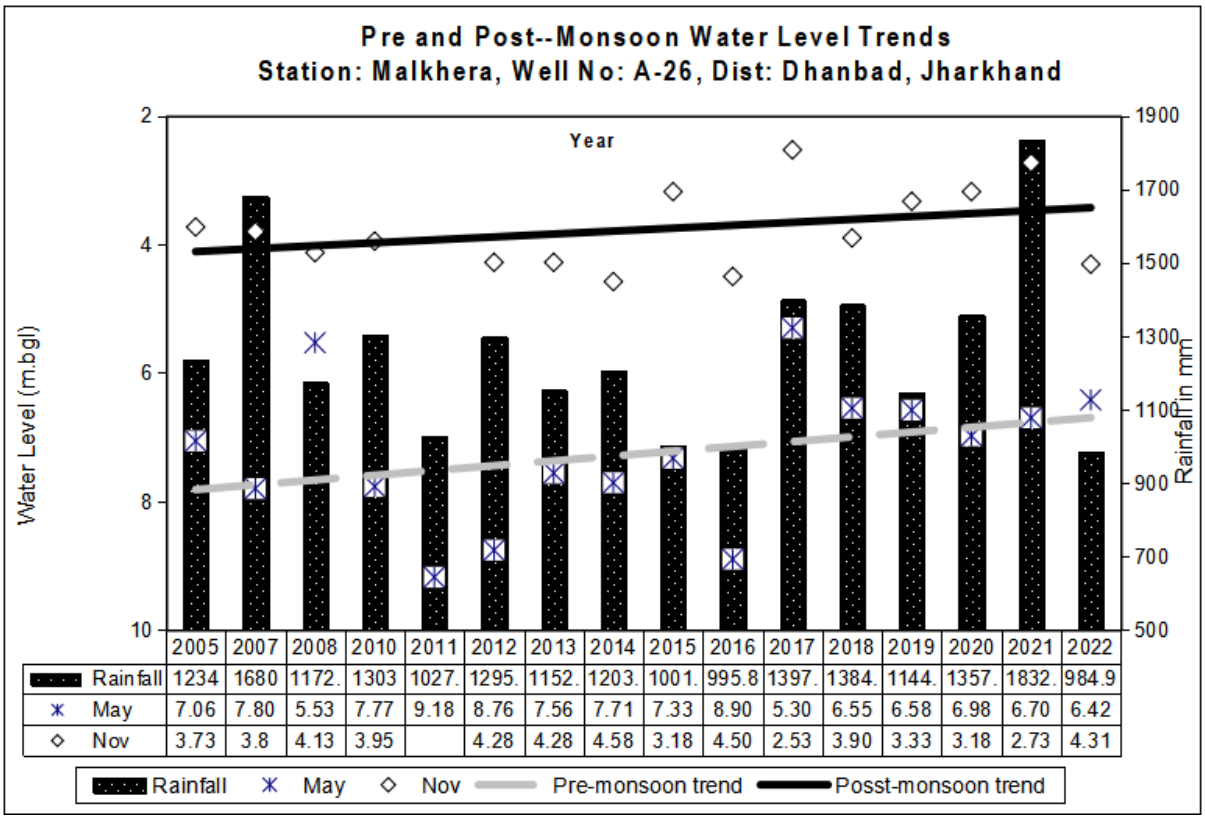


	2005	2007	2008	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022
Rainfall	1234	1680	1172.	1303	1027.	1295.	1152.	1203.	1001.	995.8	1397.	1384.	1144.	1357.	1832.	984.9
May	10.98	7.86	7.12	7.23	6.83	10.23	10.23	7.00	7.80	7.40	6.40	6.85	6.08	2.98	5.78	3.31
Nov	6.13	4.73	4.53	5.1		4.43	2.98	5.30	5.80	4.60	2.90	3.35	1.93	1.83	2.43	2.08

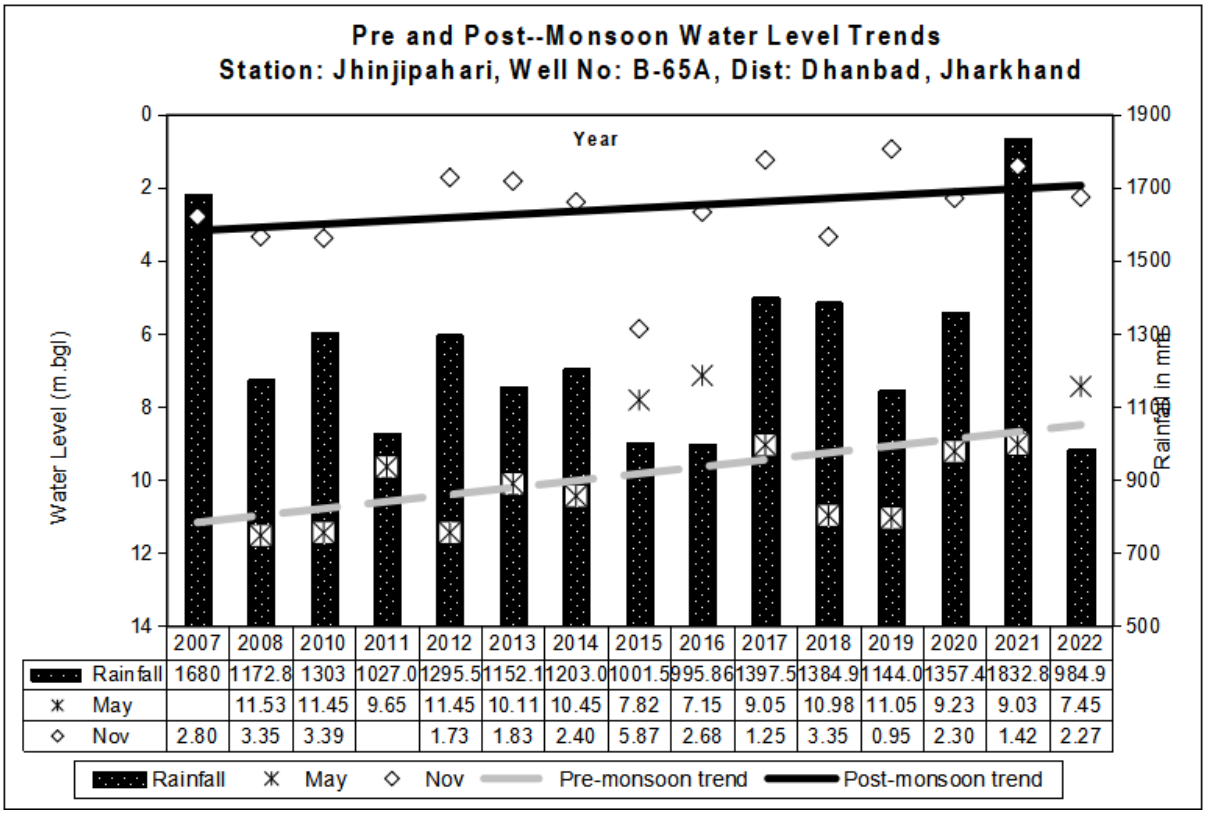


	2005	2007	2008	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022
Rainfall	1234	1680	1172.	1303	1027.	1295.	1152.	1203.	1001.	995.8	1397.	1384.	1144.	1357.	1832.	984.9
May	8.95	4.95	2.85	3.8	5.5	9.30	6.95	3.30	4.60	5.92	4.40	6.45	4.85	6.20	6.49	4.60
Nov	2.70	1.3	1.50			1.42	1.67	2.30	4.50	6.96	1.30	2.10	3.40	3.20	5.90	1.15

HYDROGRAPHS OF CLUSTER-IV

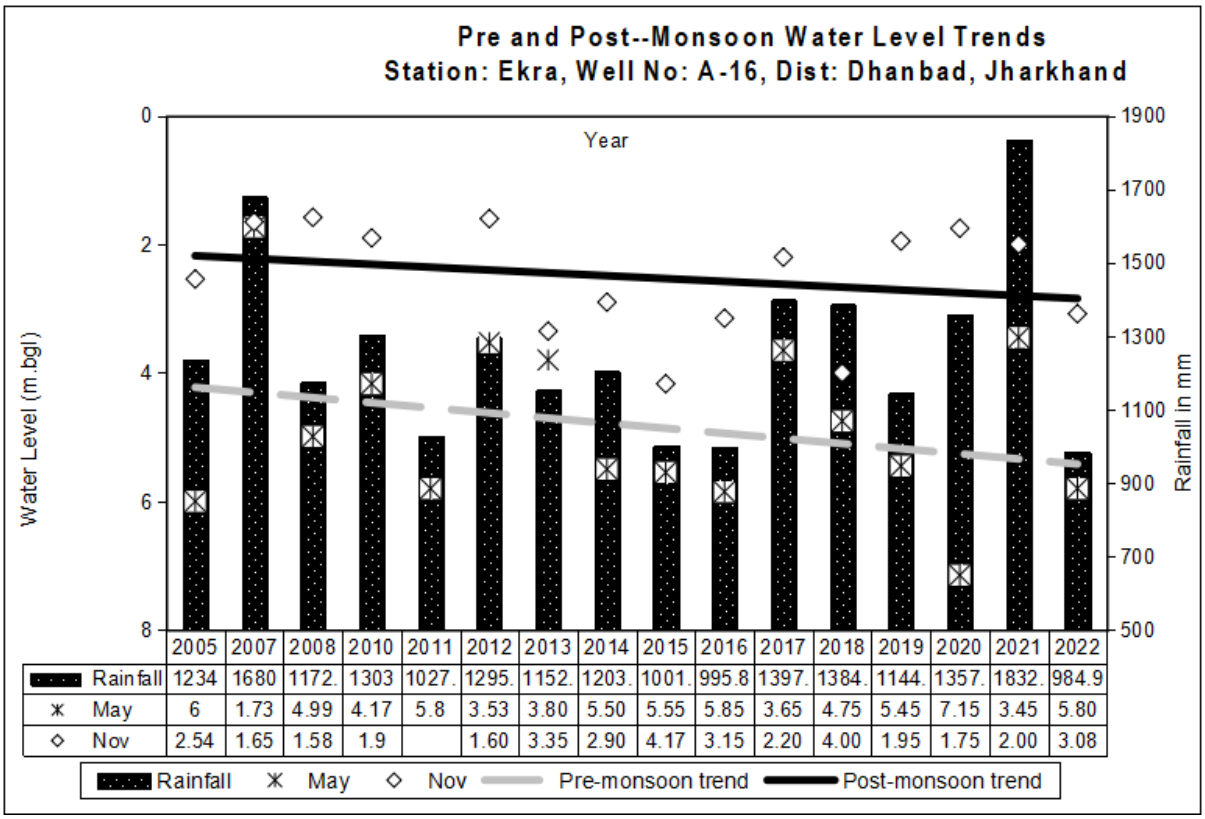


	2005	2007	2008	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022
Rainfall	1234	1680	1172.	1303	1027.	1295.	1152.	1203.	1001.	995.8	1397.	1384.	1144.	1357.	1832.	984.9
May	7.06	7.80	5.53	7.77	9.18	8.76	7.56	7.71	7.33	8.90	5.30	6.55	6.58	6.98	6.70	6.42
Nov	3.73	3.8	4.13	3.95		4.28	4.28	4.58	3.18	4.50	2.53	3.90	3.33	3.18	2.73	4.31

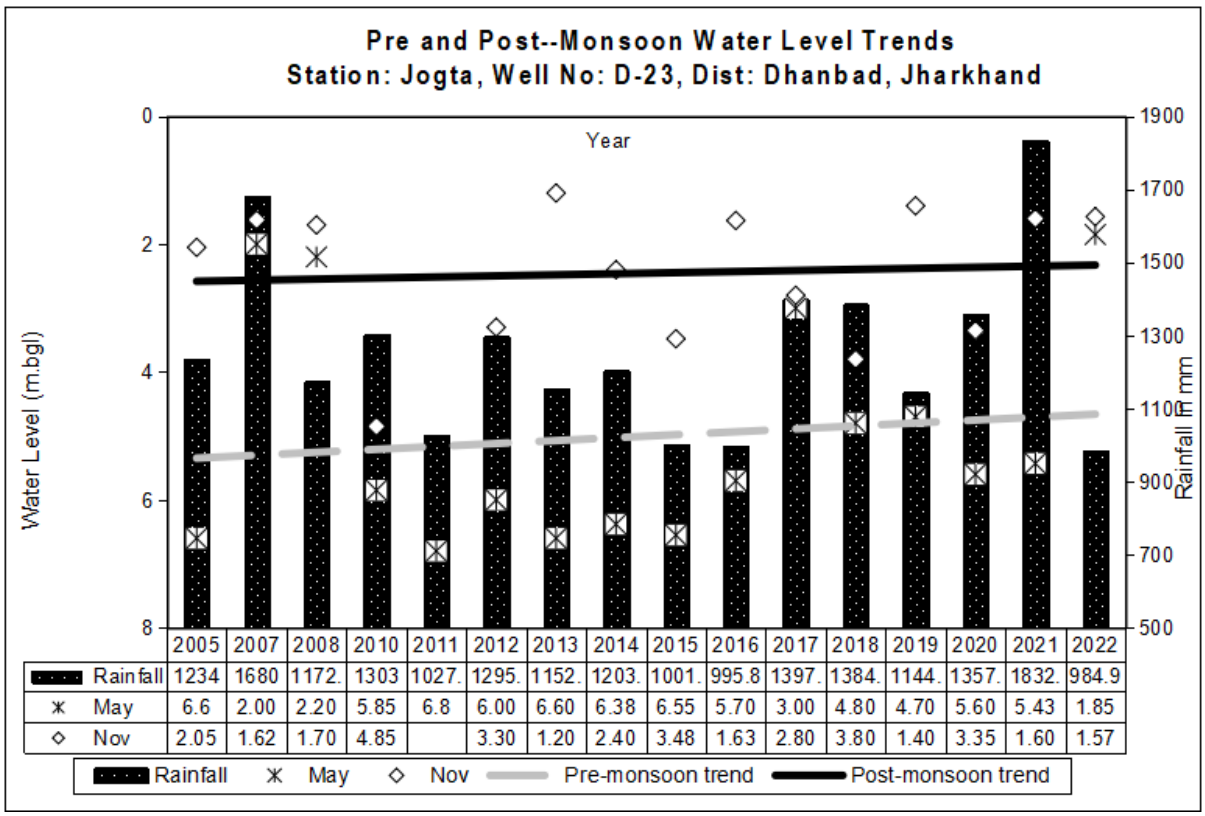


	2007	2008	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022
Rainfall	1680	1172.8	1303	1027.0	1295.5	1152.1	1203.0	1001.5	995.86	1397.5	1384.9	1144.0	1357.4	1832.8	984.9
May		11.53	11.45	9.65	11.45	10.11	10.45	7.82	7.15	9.05	10.98	11.05	9.23	9.03	7.45
Nov	2.80	3.35	3.39		1.73	1.83	2.40	5.87	2.68	1.25	3.35	0.95	2.30	1.42	2.27

HYDROGRAPHS OF CLUSTER-V

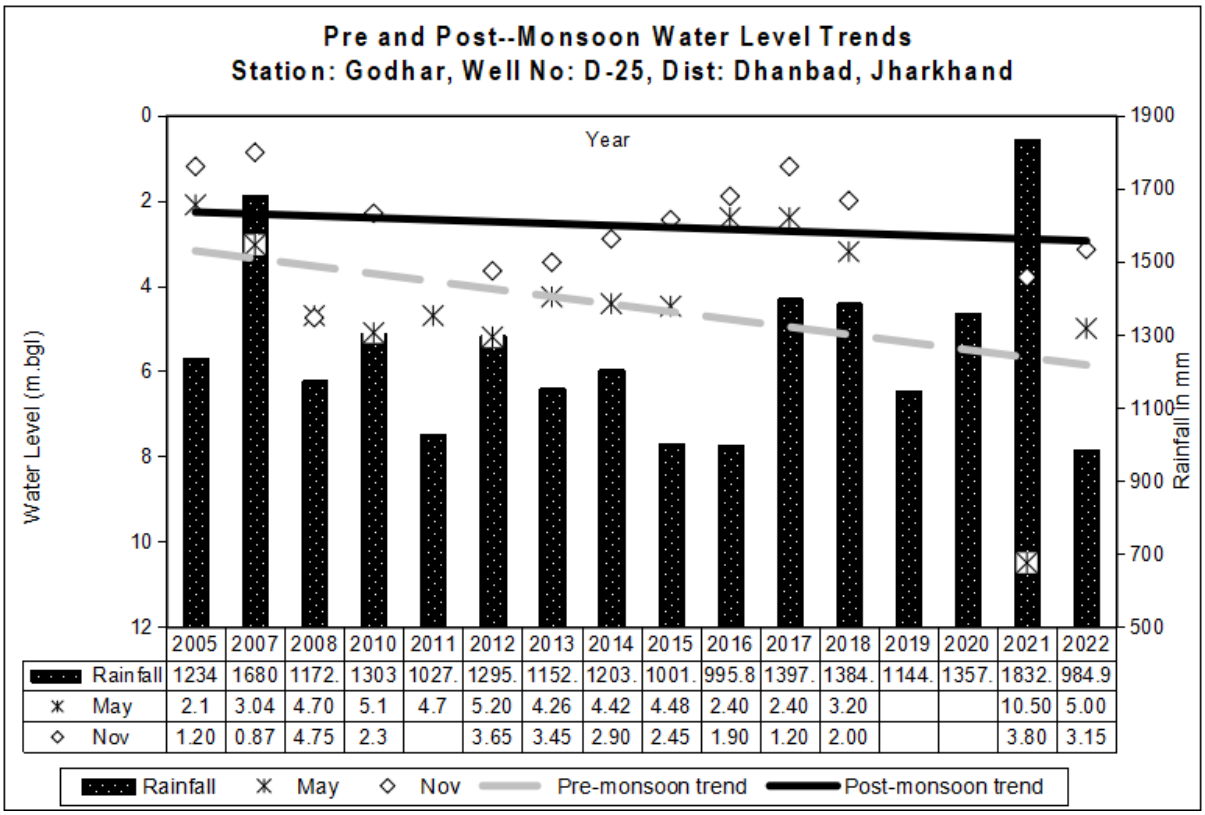


	2005	2007	2008	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022
Rainfall	1234	1680	1172.	1303	1027.	1295.	1152.	1203.	1001.	995.8	1397.	1384.	1144.	1357.	1832.	984.9
May	6	1.73	4.99	4.17	5.8	3.53	3.80	5.50	5.55	5.85	3.65	4.75	5.45	7.15	3.45	5.80
Nov	2.54	1.65	1.58	1.9		1.60	3.35	2.90	4.17	3.15	2.20	4.00	1.95	1.75	2.00	3.08

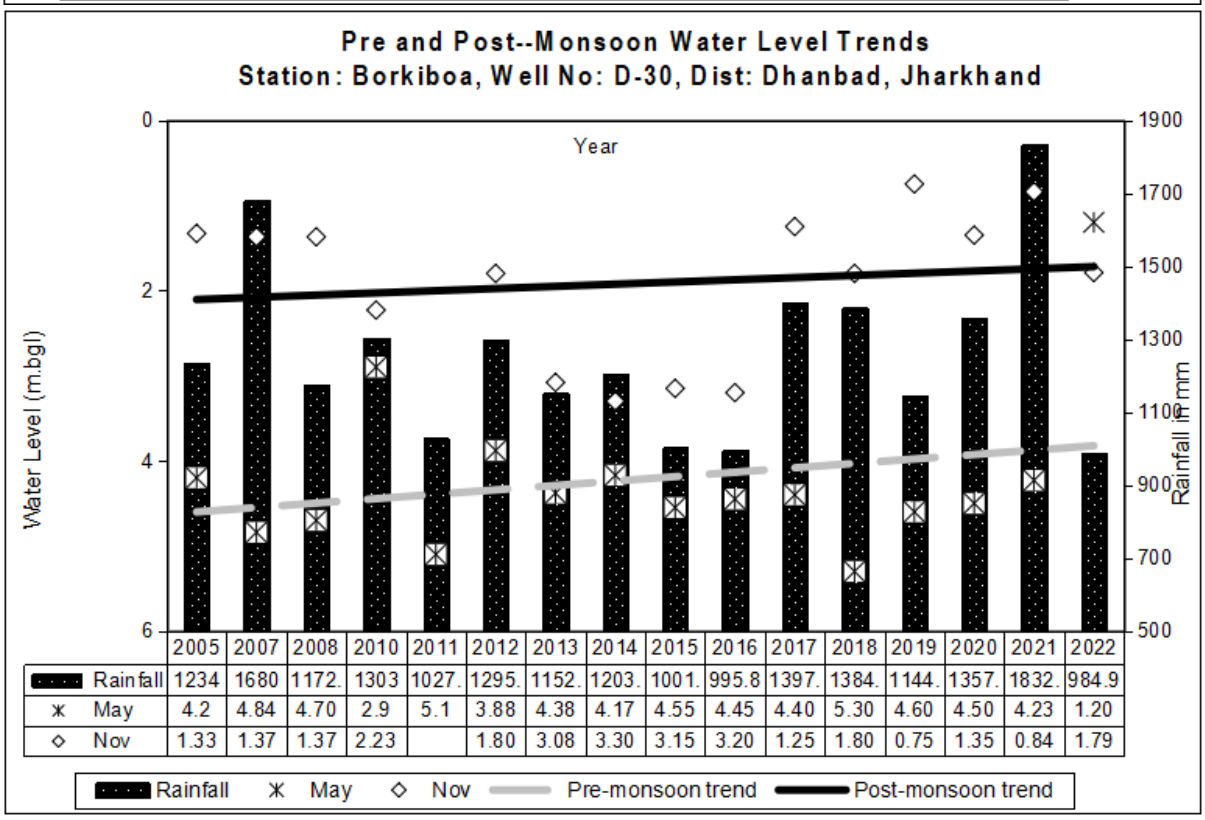


	2005	2007	2008	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022
Rainfall	1234	1680	1172.	1303	1027.	1295.	1152.	1203.	1001.	995.8	1397.	1384.	1144.	1357.	1832.	984.9
May	6.6	2.00	2.20	5.85	6.8	6.00	6.60	6.38	6.55	5.70	3.00	4.80	4.70	5.60	5.43	1.85
Nov	2.05	1.62	1.70	4.85		3.30	1.20	2.40	3.48	1.63	2.80	3.80	1.40	3.35	1.60	1.57

HYDROGRAPHS OF CLUSTER-VI

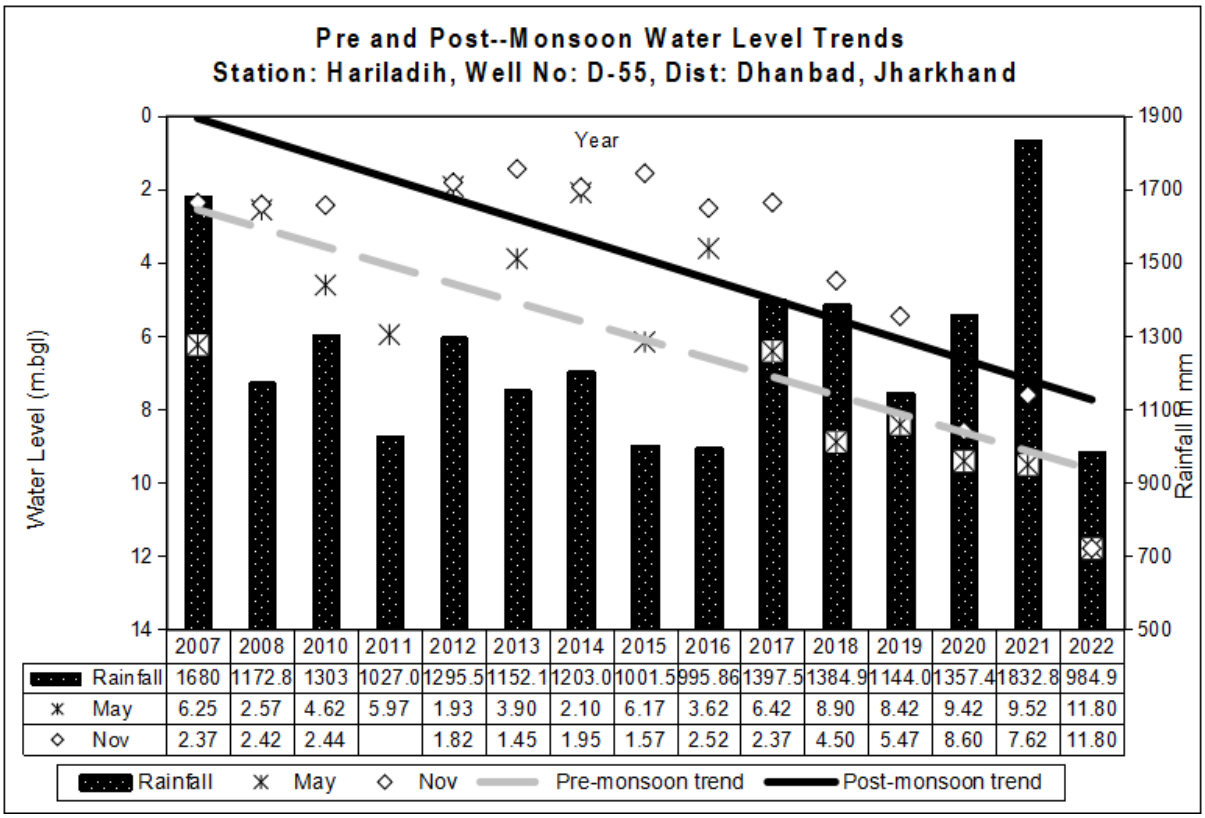


	2005	2007	2008	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022
Rainfall	1234	1680	1172.	1303	1027.	1295.	1152.	1203.	1001.	995.8	1397.	1384.	1144.	1357.	1832.	984.9
May	2.1	3.04	4.70	5.1	4.7	5.20	4.26	4.42	4.48	2.40	2.40	3.20			10.50	5.00
Nov	1.20	0.87	4.75	2.3		3.65	3.45	2.90	2.45	1.90	1.20	2.00			3.80	3.15

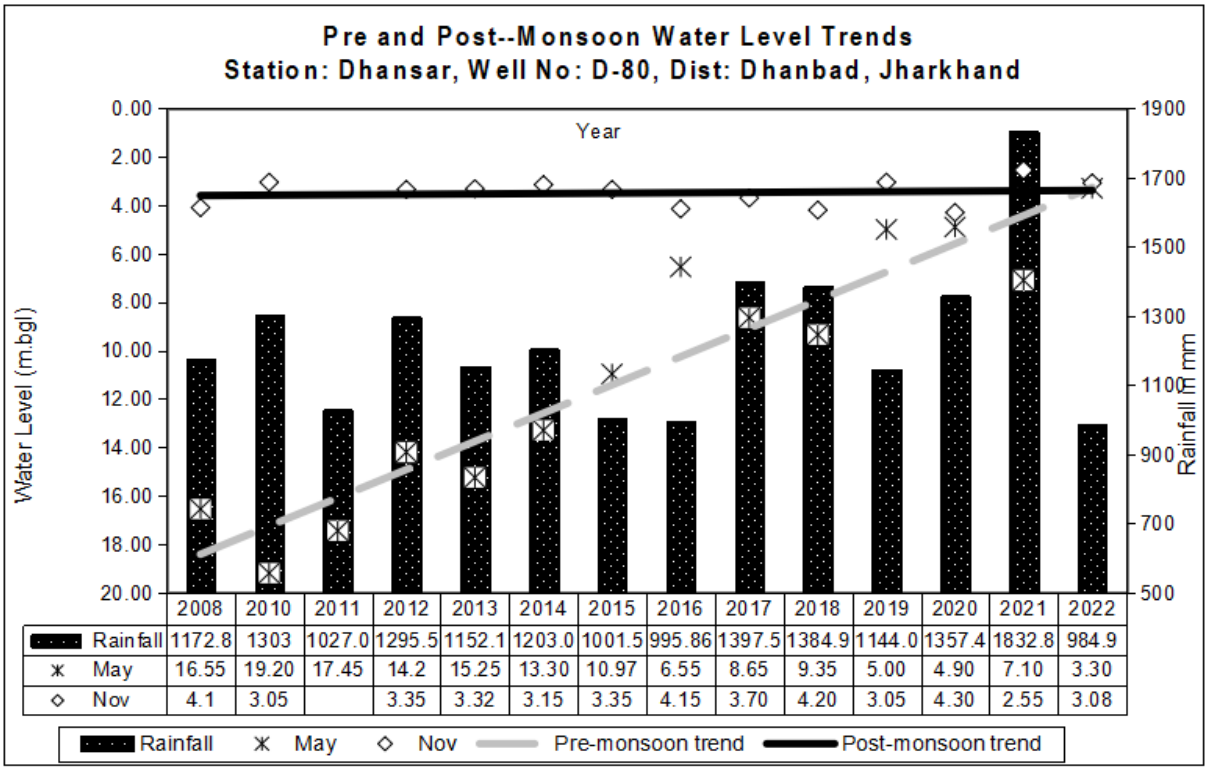


	2005	2007	2008	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022
Rainfall	1234	1680	1172.	1303	1027.	1295.	1152.	1203.	1001.	995.8	1397.	1384.	1144.	1357.	1832.	984.9
May	4.2	4.84	4.70	2.9	5.1	3.88	4.38	4.17	4.55	4.45	4.40	5.30	4.60	4.50	4.23	1.20
Nov	1.33	1.37	1.37	2.23		1.80	3.08	3.30	3.15	3.20	1.25	1.80	0.75	1.35	0.84	1.79

HYDROGRAPHS OF CLUSTER-VII

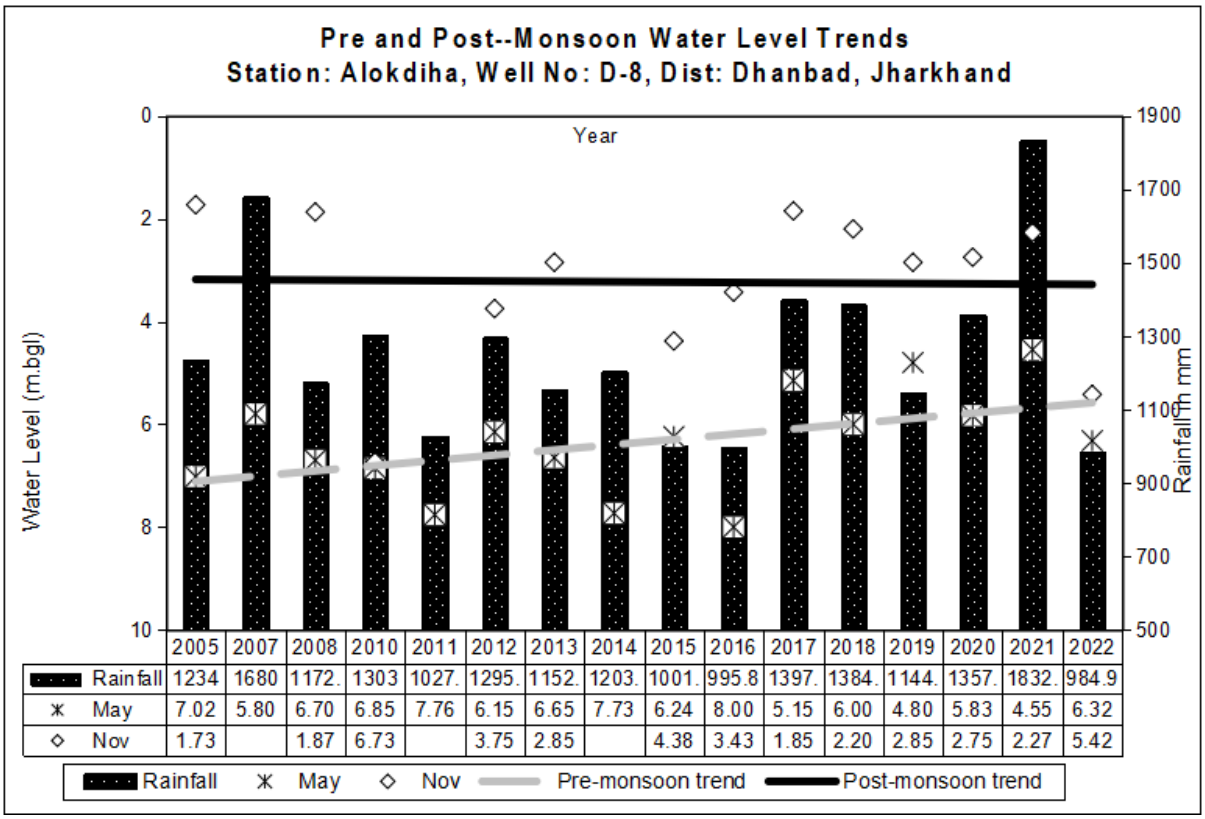


	2007	2008	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022
Rainfall	1680	1172.8	1303	1027.0	1295.5	1152.1	1203.0	1001.5	995.86	1397.5	1384.9	1144.0	1357.4	1832.8	984.9
May	6.25	2.57	4.62	5.97	1.93	3.90	2.10	6.17	3.62	6.42	8.90	8.42	9.42	9.52	11.80
Nov	2.37	2.42	2.44		1.82	1.45	1.95	1.57	2.52	2.37	4.50	5.47	8.60	7.62	11.80

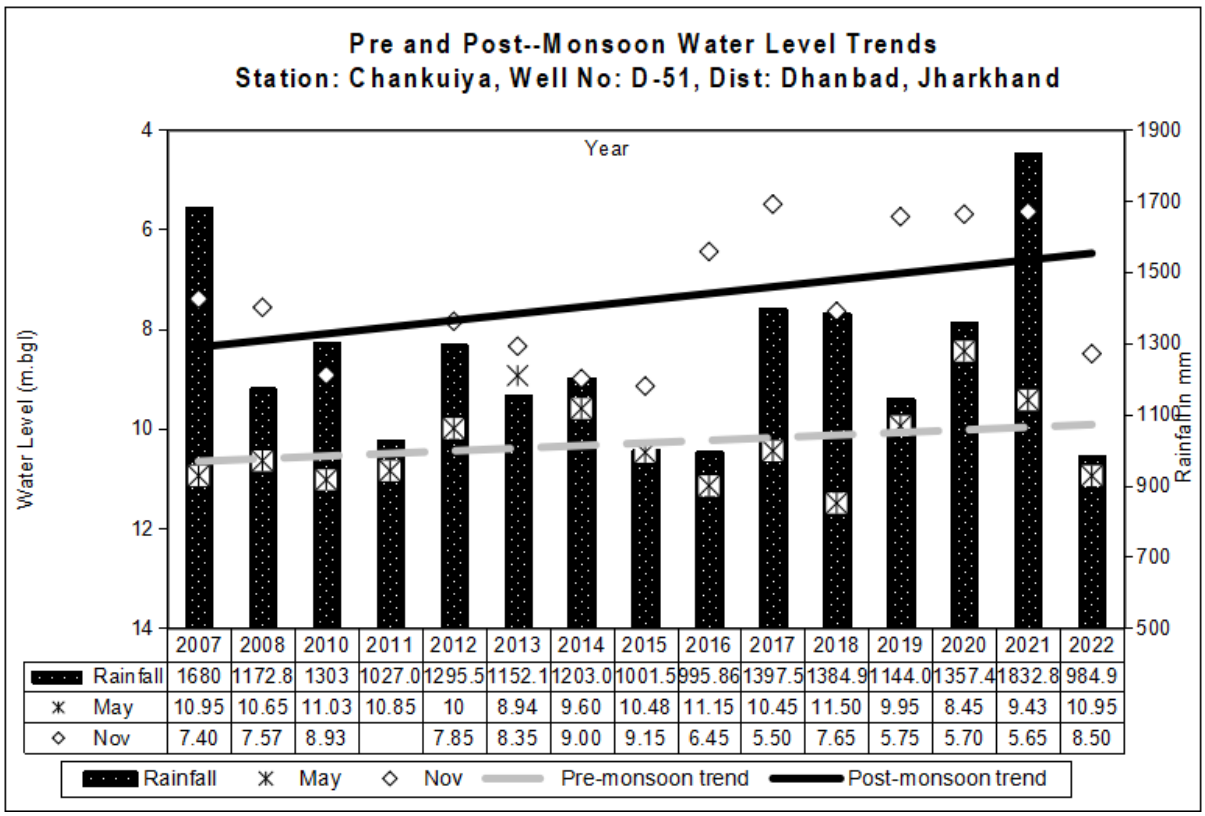


	2008	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022
Rainfall	1172.8	1303	1027.0	1295.5	1152.1	1203.0	1001.5	995.86	1397.5	1384.9	1144.0	1357.4	1832.8	984.9
May	16.55	19.20	17.45	14.2	15.25	13.30	10.97	6.55	8.65	9.35	5.00	4.90	7.10	3.30
Nov	4.1	3.05		3.35	3.32	3.15	3.35	4.15	3.70	4.20	3.05	4.30	2.55	3.08

HYDROGRAPHS OF CLUSTER-VIII

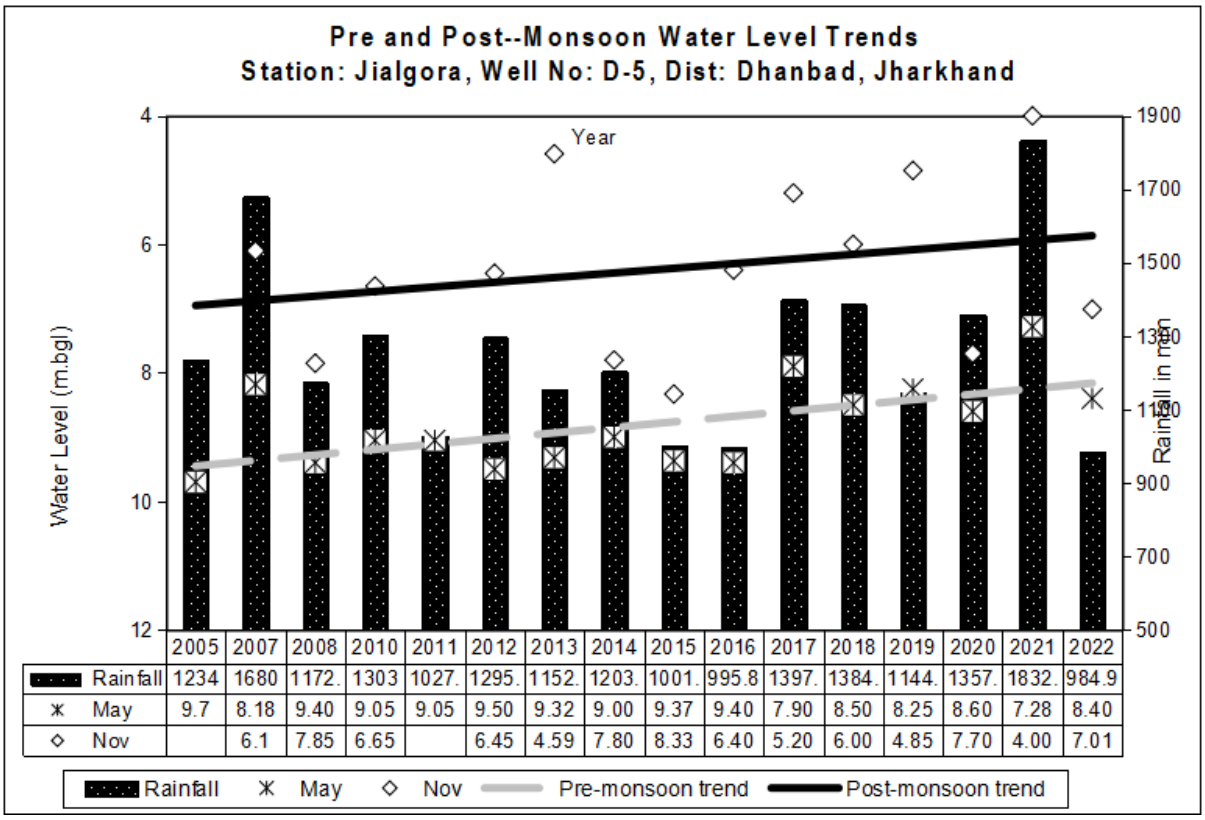


	2005	2007	2008	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022
Rainfall	1234	1680	1172.	1303	1027.	1295.	1152.	1203.	1001.	995.8	1397.	1384.	1144.	1357.	1832.	984.9
May	7.02	5.80	6.70	6.85	7.76	6.15	6.65	7.73	6.24	8.00	5.15	6.00	4.80	5.83	4.55	6.32
Nov	1.73		1.87	6.73		3.75	2.85		4.38	3.43	1.85	2.20	2.85	2.75	2.27	5.42

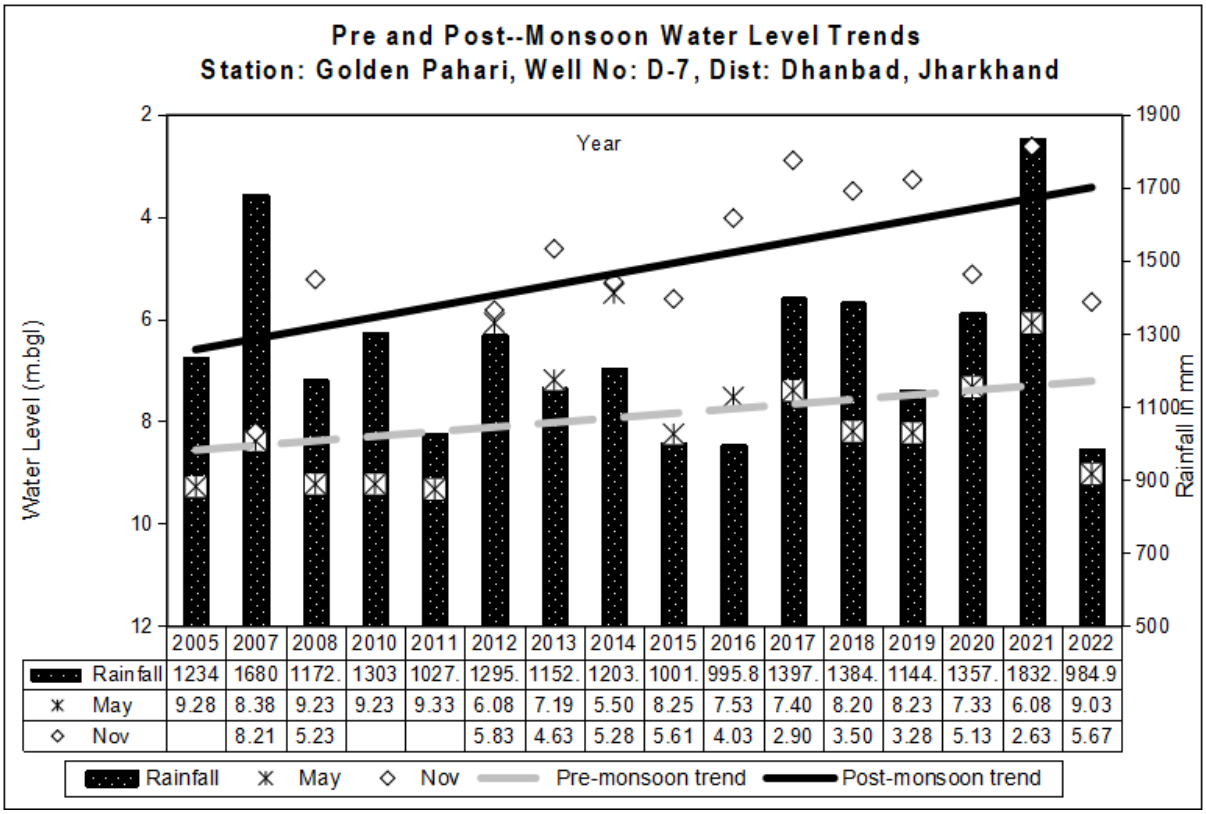


	2007	2008	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022
Rainfall	1680	1172.8	1303	1027.0	1295.5	1152.1	1203.0	1001.5	995.86	1397.5	1384.9	1144.0	1357.4	1832.8	984.9
May	10.95	10.65	11.03	10.85	10	8.94	9.60	10.48	11.15	10.45	11.50	9.95	8.45	9.43	10.95
Nov	7.40	7.57	8.93		7.85	8.35	9.00	9.15	6.45	5.50	7.65	5.75	5.70	5.65	8.50

HYDROGRAPHS OF CLUSTER-IX

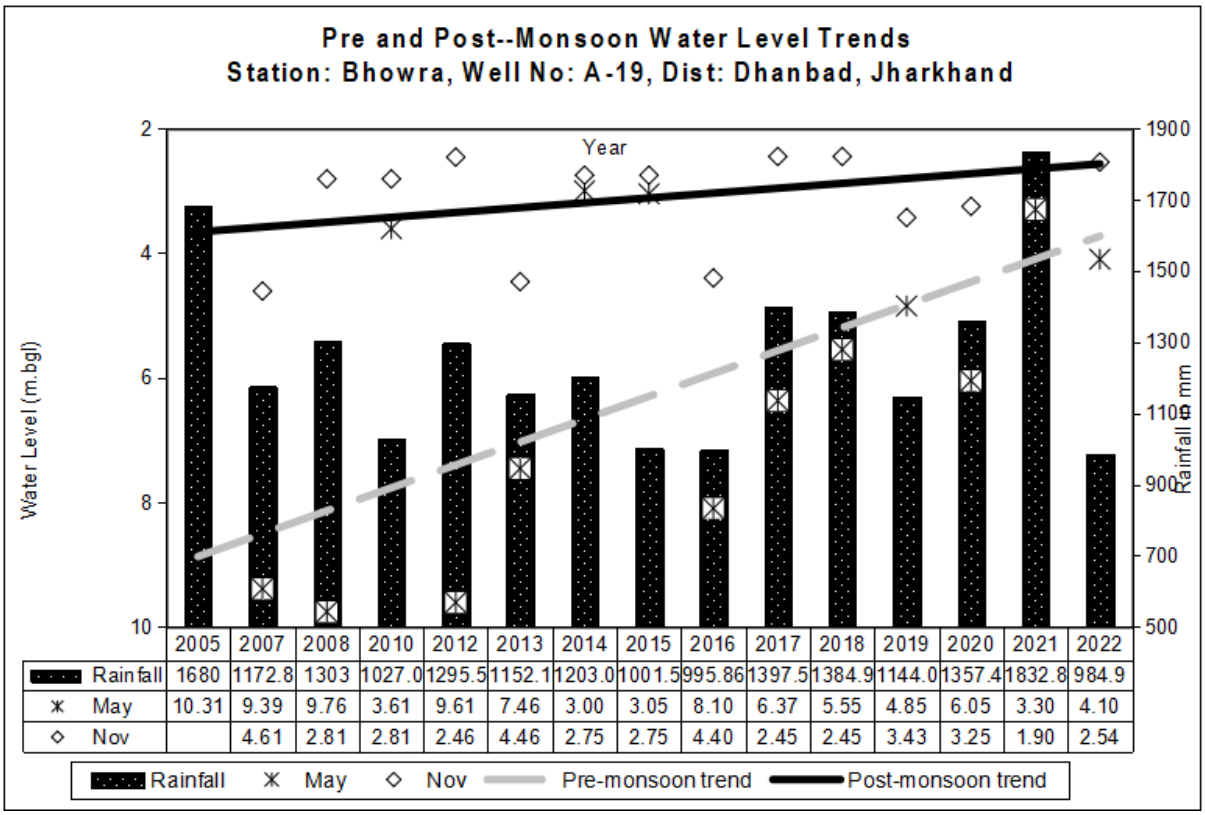


	2005	2007	2008	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022
Rainfall	1234	1680	1172.	1303	1027.	1295.	1152.	1203.	1001.	995.8	1397.	1384.	1144.	1357.	1832.	984.9
May	9.7	8.18	9.40	9.05	9.05	9.50	9.32	9.00	9.37	9.40	7.90	8.50	8.25	8.60	7.28	8.40
Nov		6.1	7.85	6.65		6.45	4.59	7.80	8.33	6.40	5.20	6.00	4.85	7.70	4.00	7.01

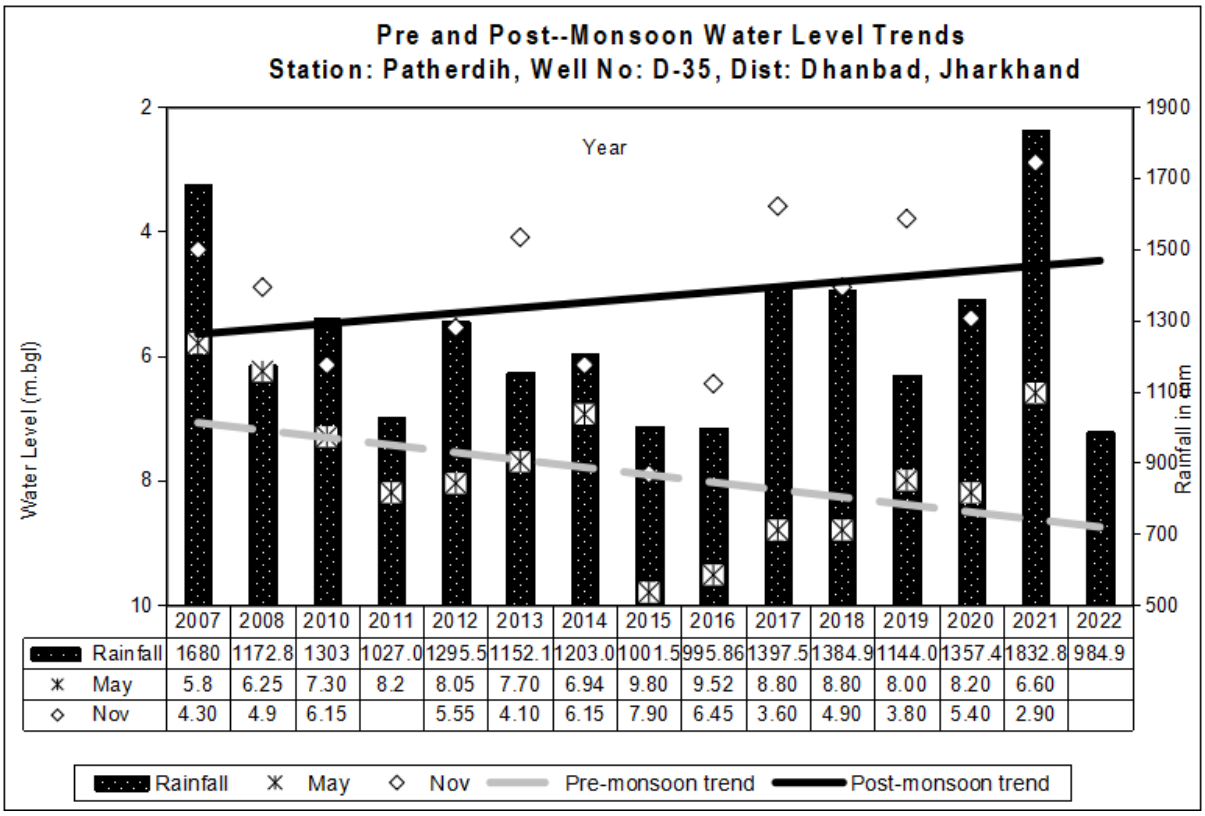


	2005	2007	2008	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022
Rainfall	1234	1680	1172.	1303	1027.	1295.	1152.	1203.	1001.	995.8	1397.	1384.	1144.	1357.	1832.	984.9
May	9.28	8.38	9.23	9.23	9.33	6.08	7.19	5.50	8.25	7.53	7.40	8.20	8.23	7.33	6.08	9.03
Nov		8.21	5.23			5.83	4.63	5.28	5.61	4.03	2.90	3.50	3.28	5.13	2.63	5.67

HYDROGRAPHS OF CLUSTER-X

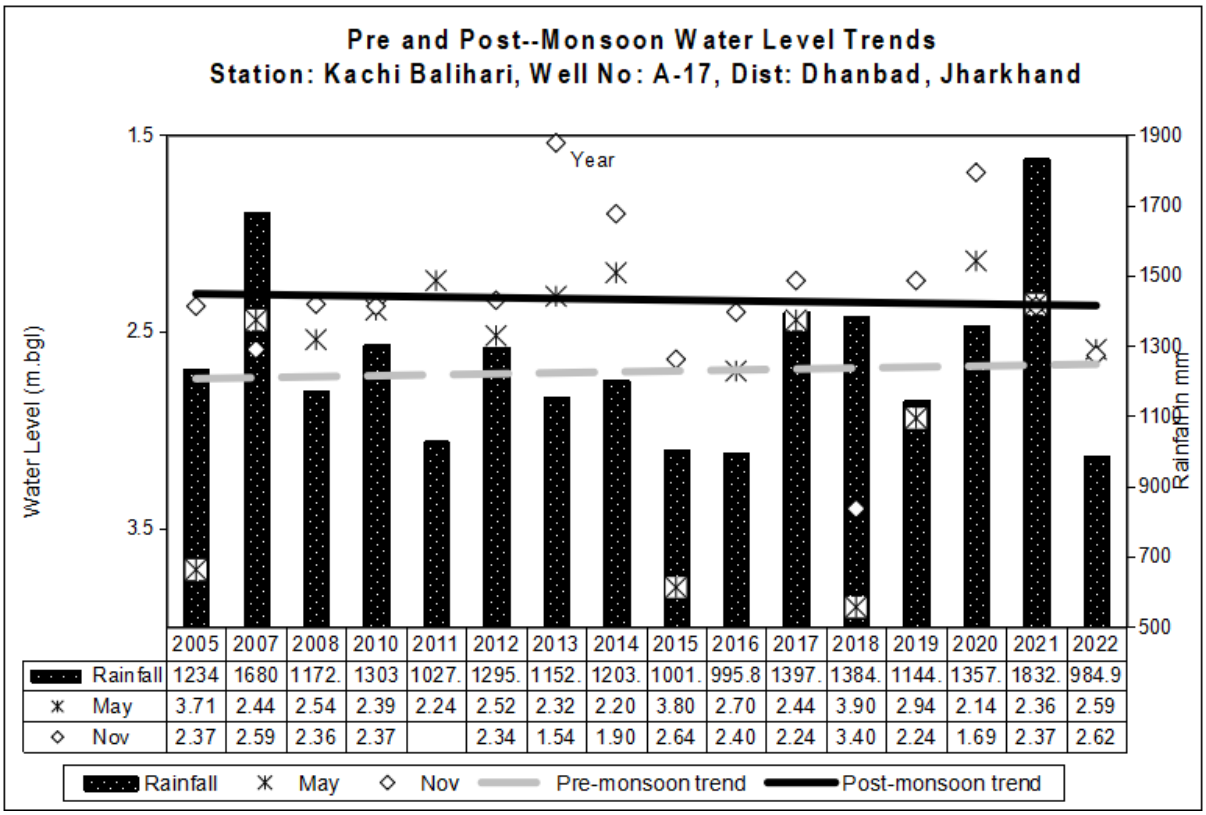


	2005	2007	2008	2010	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022
Rainfall	1680	1172.8	1303	1027.0	1295.5	1152.1	1203.0	1001.5	995.86	1397.5	1384.9	1144.0	1357.4	1832.8	984.9
May	10.31	9.39	9.76	3.61	9.61	7.46	3.00	3.05	8.10	6.37	5.55	4.85	6.05	3.30	4.10
Nov		4.61	2.81	2.81	2.46	4.46	2.75	2.75	4.40	2.45	2.45	3.43	3.25	1.90	2.54

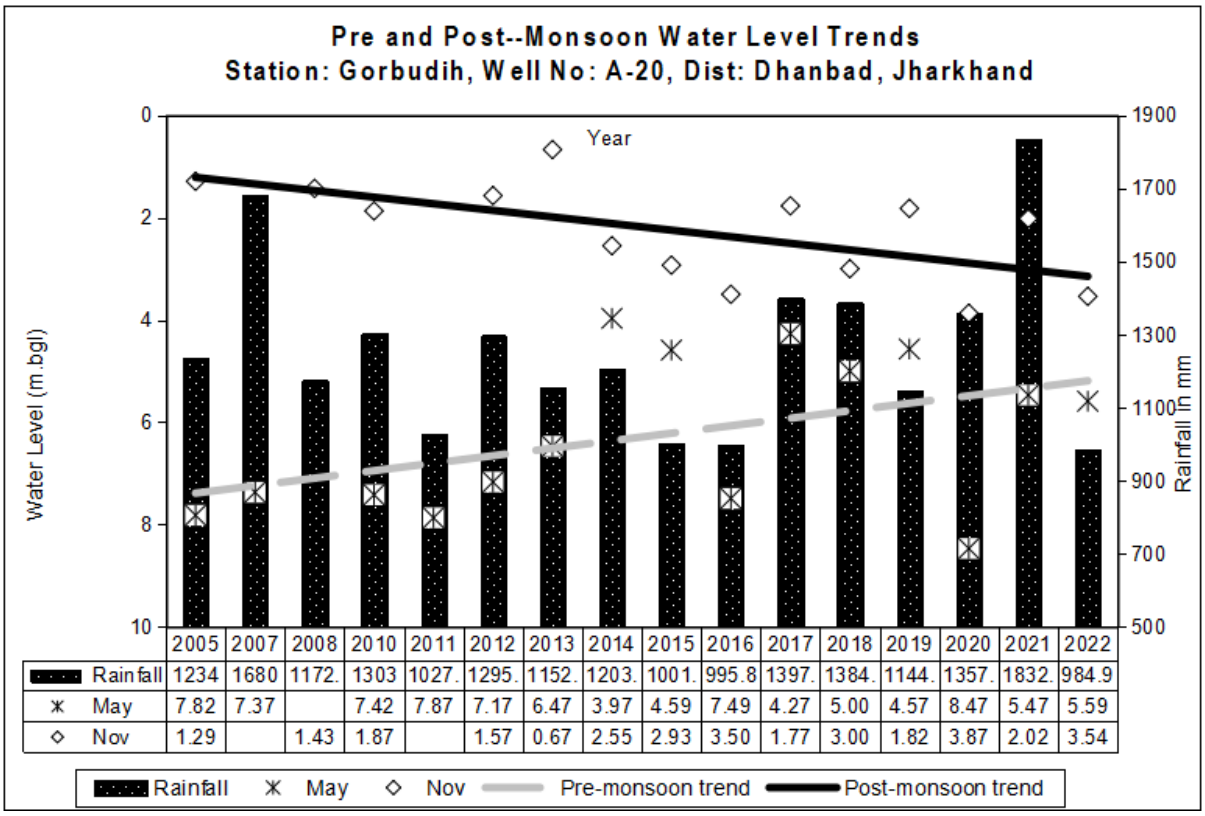


	2007	2008	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022
Rainfall	1680	1172.8	1303	1027.0	1295.5	1152.1	1203.0	1001.5	995.86	1397.5	1384.9	1144.0	1357.4	1832.8	984.9
May	5.8	6.25	7.30	8.2	8.05	7.70	6.94	9.80	9.52	8.80	8.80	8.00	8.20	6.60	
Nov	4.30	4.9	6.15		5.55	4.10	6.15	7.90	6.45	3.60	4.90	3.80	5.40	2.90	

HYDROGRAPHS OF CLUSTER-XI

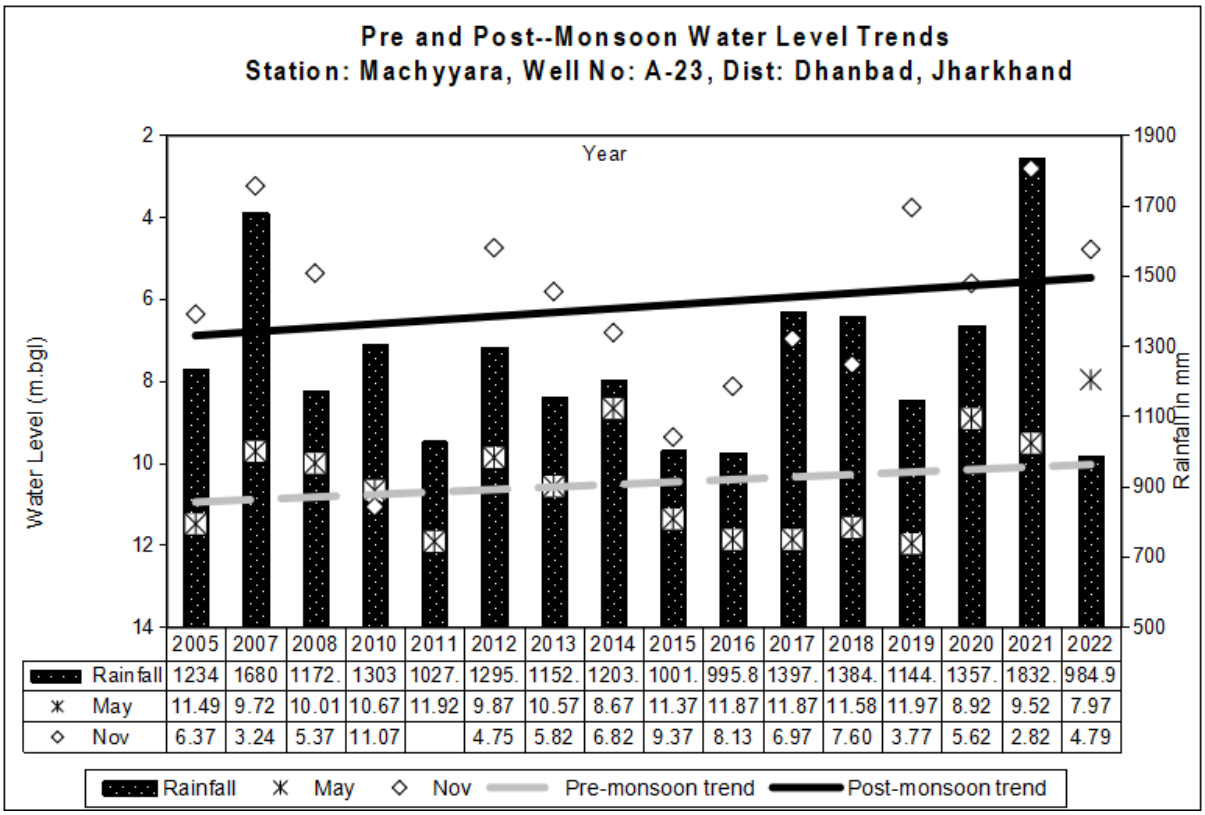


	2005	2007	2008	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022
Rainfall	1234	1680	1172.	1303	1027.	1295.	1152.	1203.	1001.	995.8	1397.	1384.	1144.	1357.	1832.	984.9
May	3.71	2.44	2.54	2.39	2.24	2.52	2.32	2.20	3.80	2.70	2.44	3.90	2.94	2.14	2.36	2.59
Nov	2.37	2.59	2.36	2.37		2.34	1.54	1.90	2.64	2.40	2.24	3.40	2.24	1.69	2.37	2.62

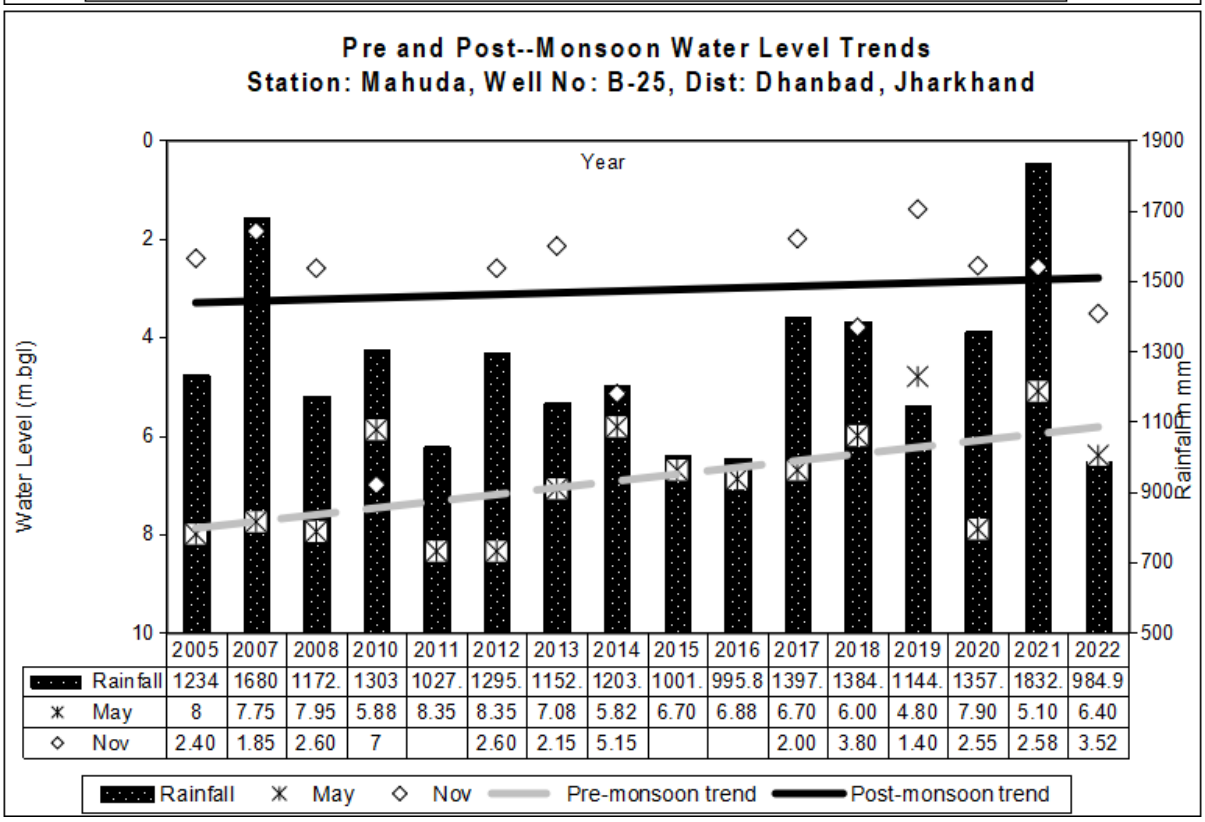


	2005	2007	2008	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022
Rainfall	1234	1680	1172.	1303	1027.	1295.	1152.	1203.	1001.	995.8	1397.	1384.	1144.	1357.	1832.	984.9
May	7.82	7.37		7.42	7.87	7.17	6.47	3.97	4.59	7.49	4.27	5.00	4.57	8.47	5.47	5.59
Nov	1.29		1.43	1.87		1.57	0.67	2.55	2.93	3.50	1.77	3.00	1.82	3.87	2.02	3.54

HYDROGRAPHS OF CLUSTER-XIII

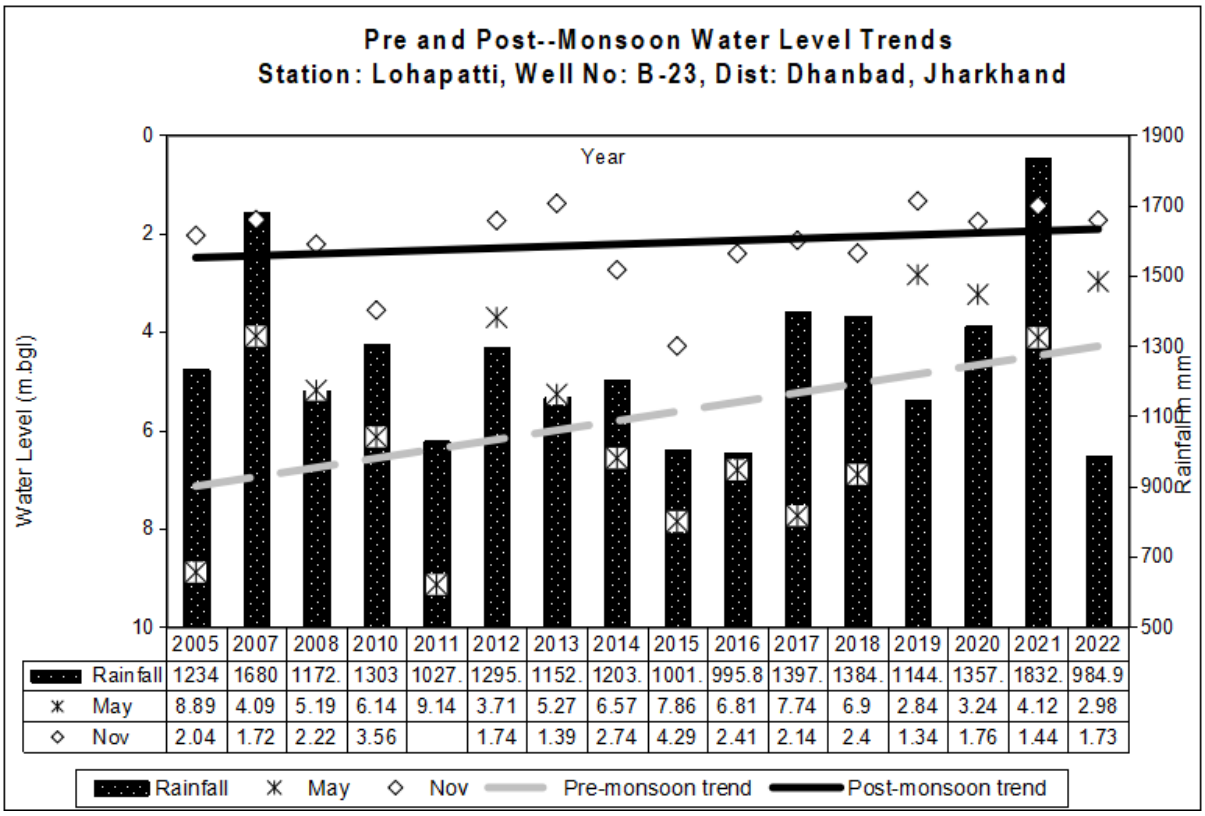


	2005	2007	2008	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022
Rainfall	1234	1680	1172.	1303	1027.	1295.	1152.	1203.	1001.	995.8	1397.	1384.	1144.	1357.	1832.	984.9
May	11.49	9.72	10.01	10.67	11.92	9.87	10.57	8.67	11.37	11.87	11.87	11.58	11.97	8.92	9.52	7.97
Nov	6.37	3.24	5.37	11.07		4.75	5.82	6.82	9.37	8.13	6.97	7.60	3.77	5.62	2.82	4.79

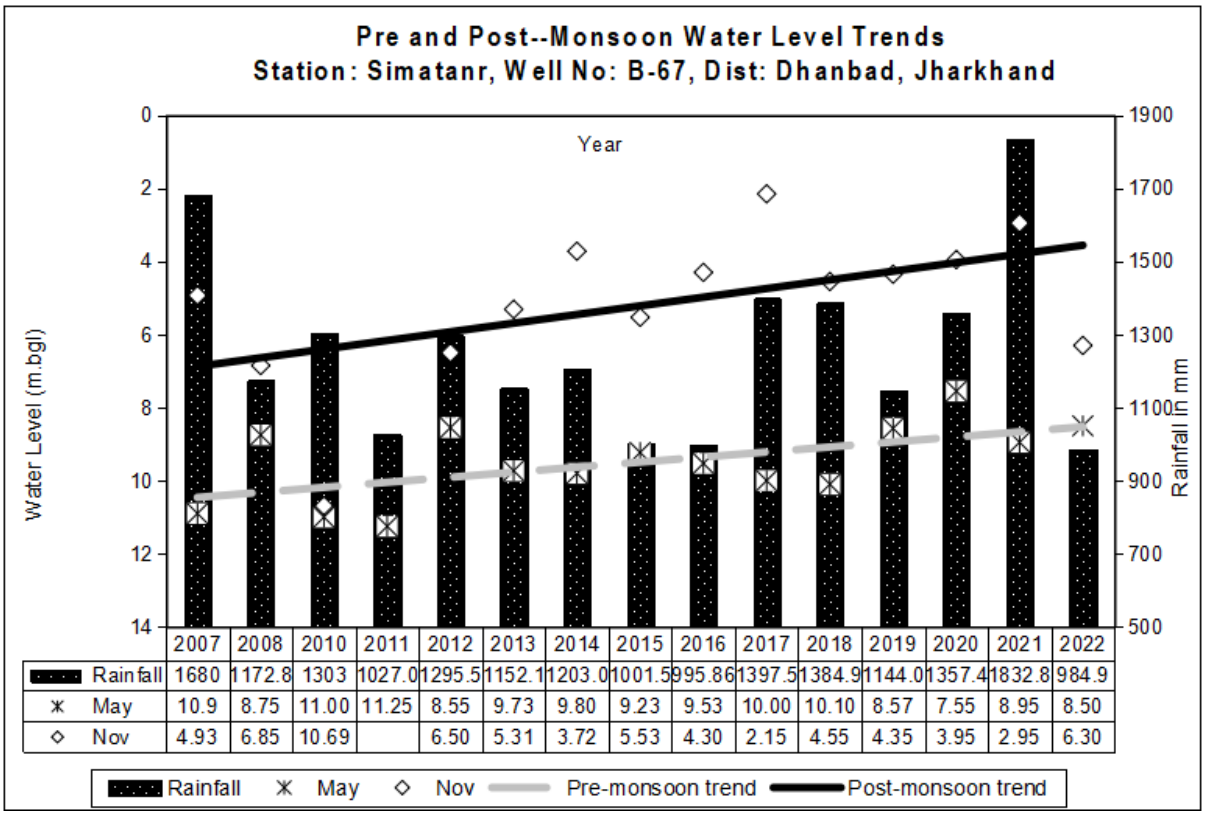


	2005	2007	2008	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022
Rainfall	1234	1680	1172.	1303	1027.	1295.	1152.	1203.	1001.	995.8	1397.	1384.	1144.	1357.	1832.	984.9
May	8	7.75	7.95	5.88	8.35	8.35	7.08	5.82	6.70	6.88	6.70	6.00	4.80	7.90	5.10	6.40
Nov	2.40	1.85	2.60	7		2.60	2.15	5.15			2.00	3.80	1.40	2.55	2.58	3.52

HYDROGRAPHS OF CLUSTER-XIV

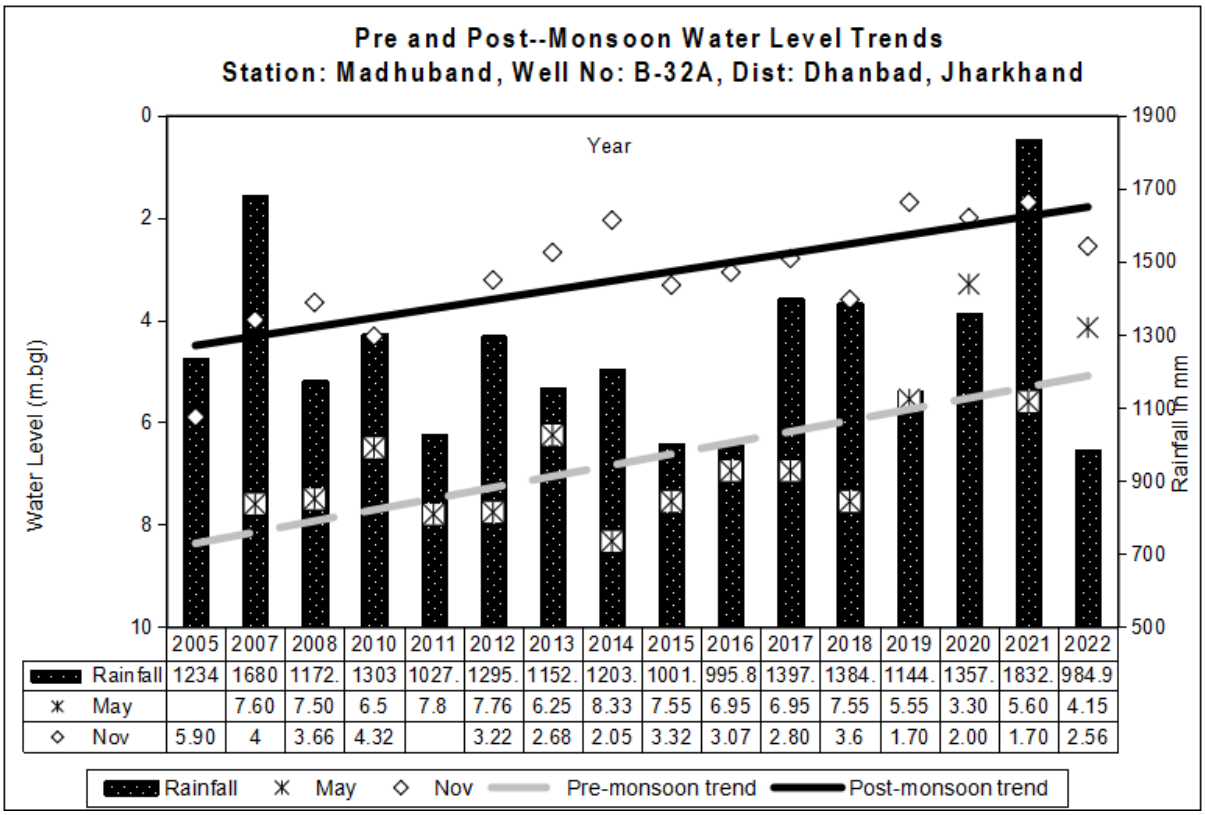


	2005	2007	2008	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022
Rainfall	1234	1680	1172.	1303	1027.	1295.	1152.	1203.	1001.	995.8	1397.	1384.	1144.	1357.	1832.	984.9
May	8.89	4.09	5.19	6.14	9.14	3.71	5.27	6.57	7.86	6.81	7.74	6.9	2.84	3.24	4.12	2.98
Nov	2.04	1.72	2.22	3.56		1.74	1.39	2.74	4.29	2.41	2.14	2.4	1.34	1.76	1.44	1.73

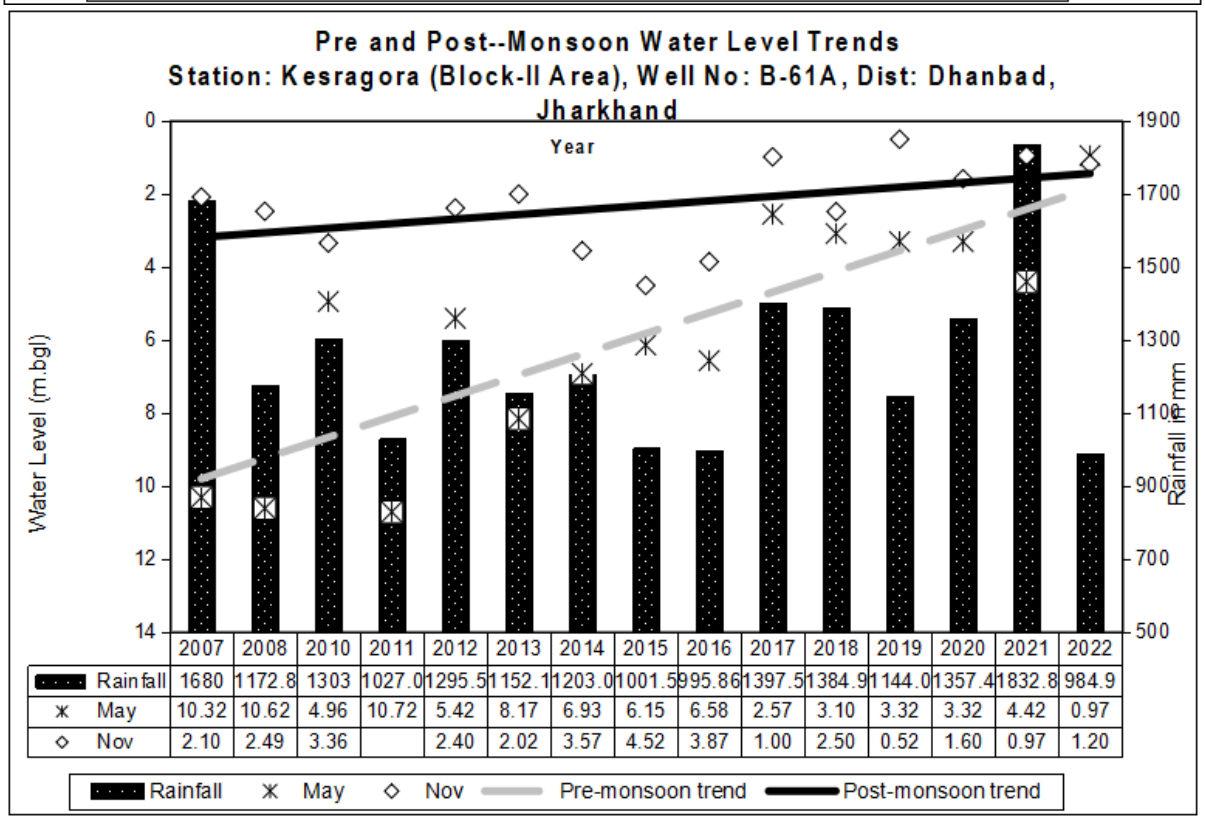


	2007	2008	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022
Rainfall	1680	1172.8	1303	1027.0	1295.5	1152.1	1203.0	1001.5	995.86	1397.5	1384.9	1144.0	1357.4	1832.8	984.9
May	10.9	8.75	11.00	11.25	8.55	9.73	9.80	9.23	9.53	10.00	10.10	8.57	7.55	8.95	8.50
Nov	4.93	6.85	10.69		6.50	5.31	3.72	5.53	4.30	2.15	4.55	4.35	3.95	2.95	6.30

HYDROGRAPHS OF CLUSTER-XV



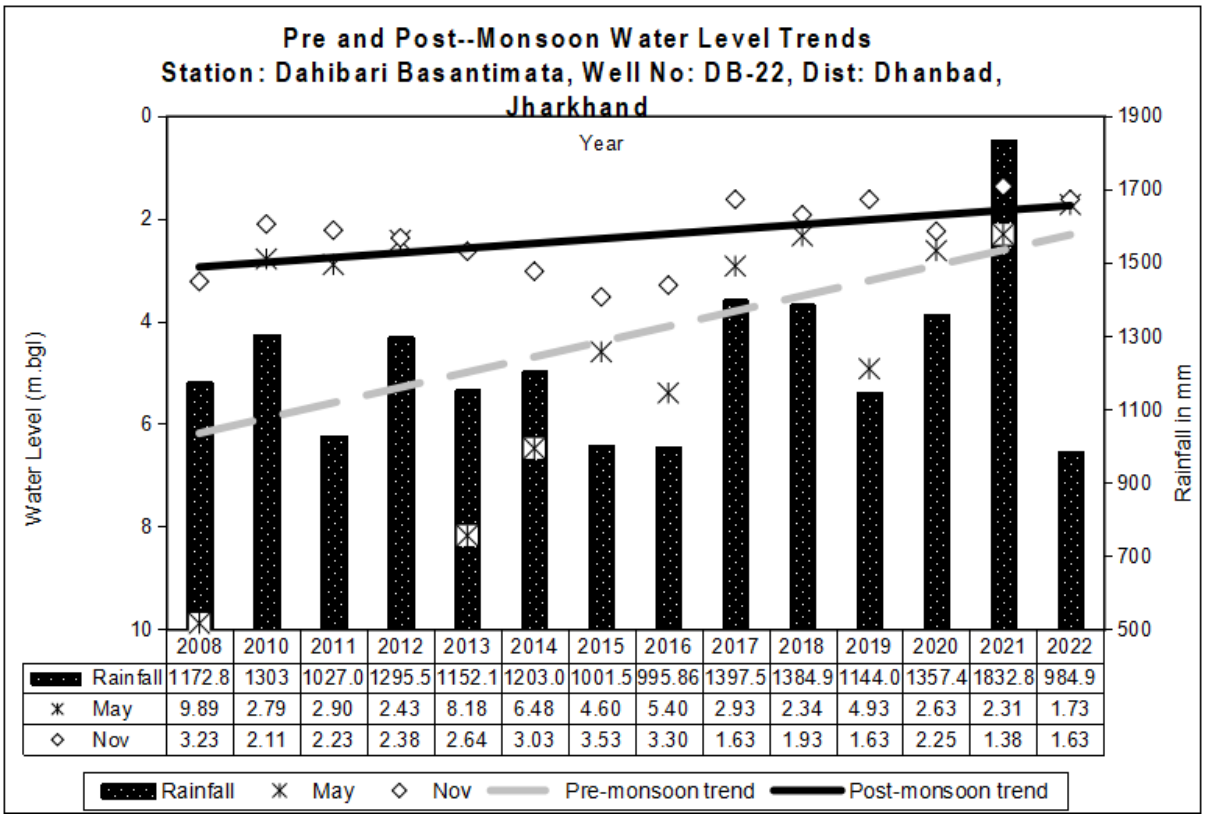
	2005	2007	2008	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022
Rainfall	1234	1680	1172.	1303	1027.	1295.	1152.	1203.	1001.	995.8	1397.	1384.	1144.	1357.	1832.	984.9
May		7.60	7.50	6.5	7.8	7.76	6.25	8.33	7.55	6.95	6.95	7.55	5.55	3.30	5.60	4.15
Nov	5.90	4	3.66	4.32		3.22	2.68	2.05	3.32	3.07	2.80	3.6	1.70	2.00	1.70	2.56



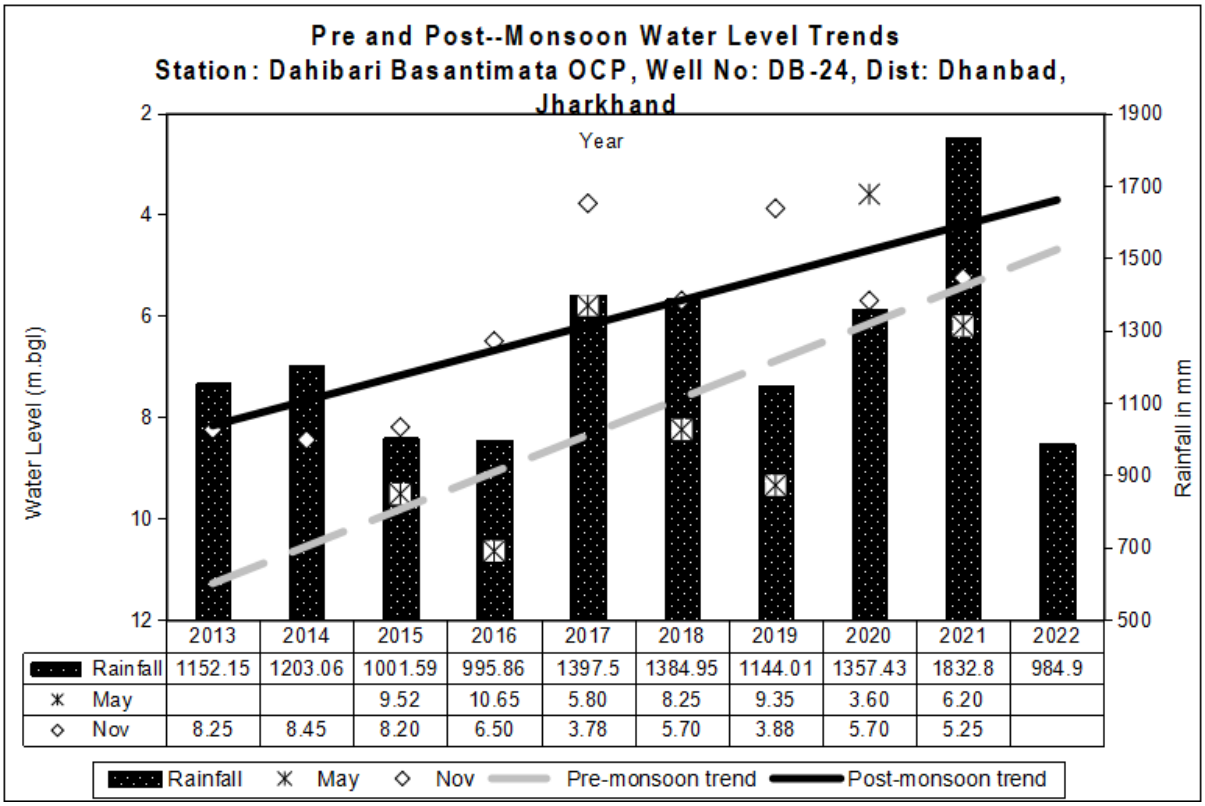
	2007	2008	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022
Rainfall	1680	1172.8	1303	1027.0	1295.5	1152.1	1203.0	1001.5	995.86	1397.5	1384.9	1144.0	1357.4	1832.8	984.9
May	10.32	10.62	4.96	10.72	5.42	8.17	6.93	6.15	6.58	2.57	3.10	3.32	3.32	4.42	0.97
Nov	2.10	2.49	3.36		2.40	2.02	3.57	4.52	3.87	1.00	2.50	0.52	1.60	0.97	1.20

Annexure – VI

HYDROGRAPHS OF CLUSTER-XVI

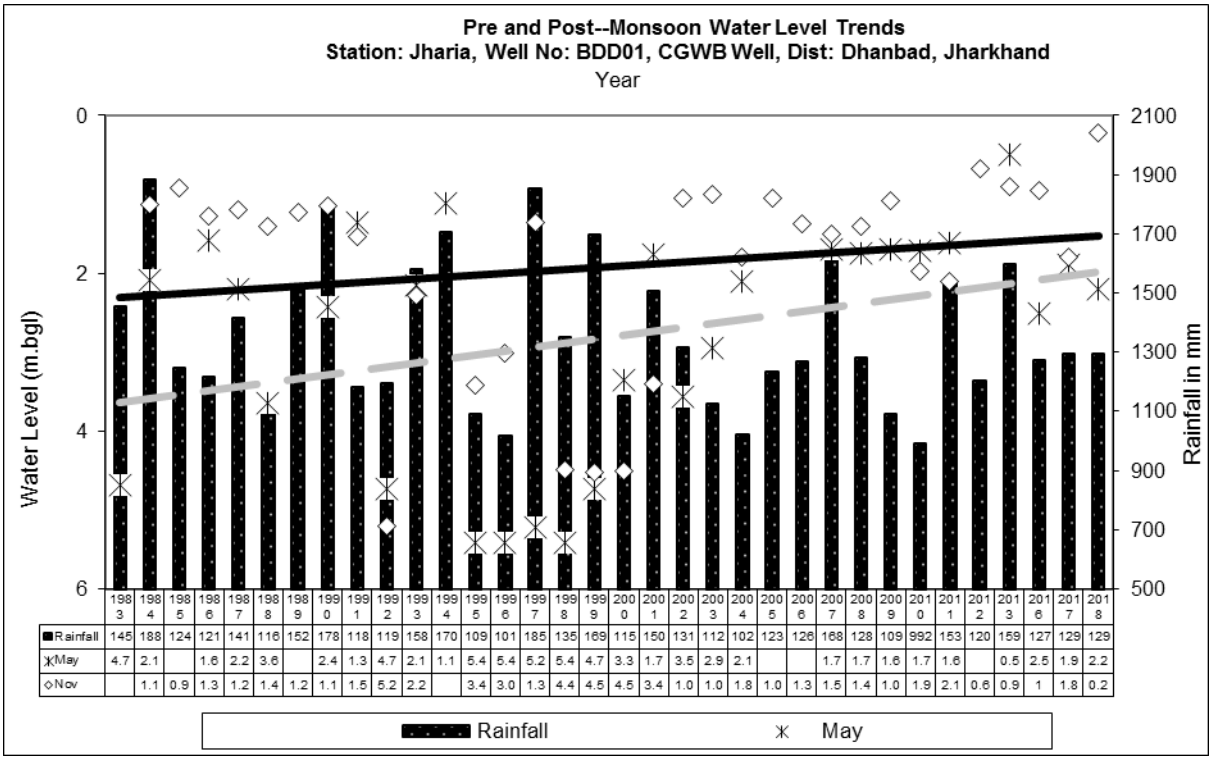


	2008	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022
Rainfall	1172.8	1303	1027.0	1295.5	1152.1	1203.0	1001.5	995.86	1397.5	1384.9	1144.0	1357.4	1832.8	984.9
May	9.89	2.79	2.90	2.43	8.18	6.48	4.60	5.40	2.93	2.34	4.93	2.63	2.31	1.73
Nov	3.23	2.11	2.23	2.38	2.64	3.03	3.53	3.30	1.63	1.93	1.63	2.25	1.38	1.63

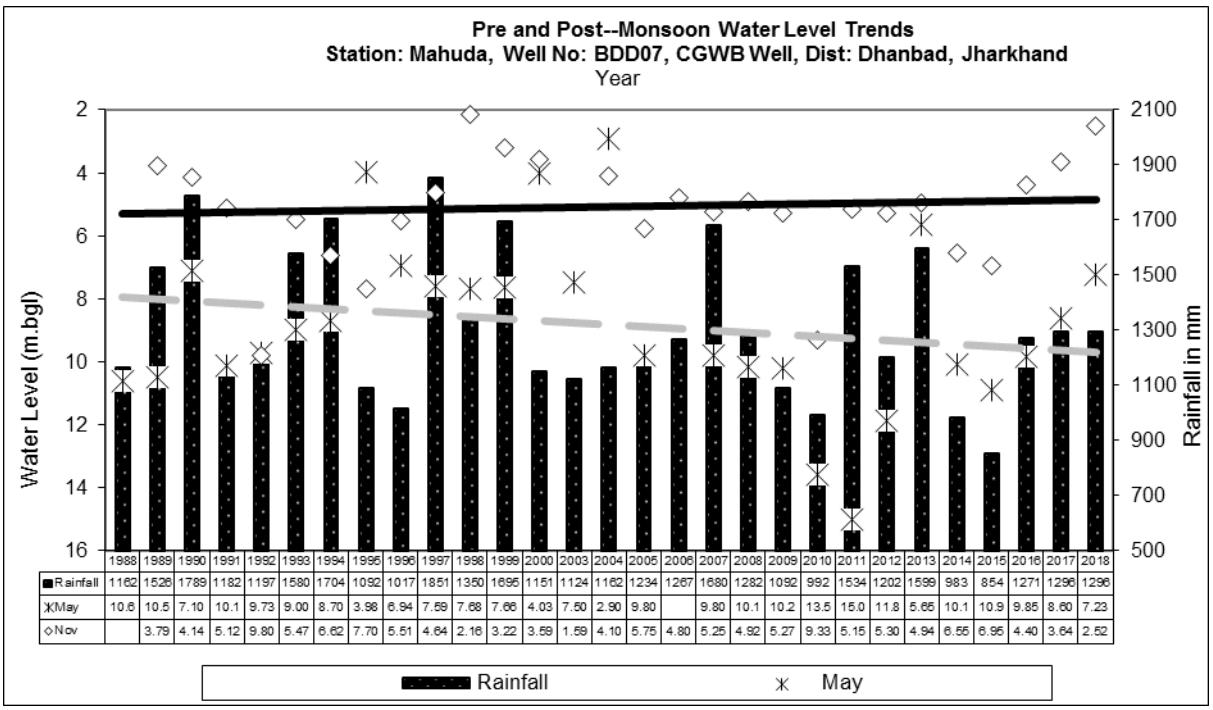


	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022
Rainfall	1152.15	1203.06	1001.59	995.86	1397.5	1384.95	1144.01	1357.43	1832.8	984.9
May			9.52	10.65	5.80	8.25	9.35	3.60	6.20	
Nov	8.25	8.45	8.20	6.50	3.78	5.70	3.88	5.70	5.25	

HYDROGRAPHS OF CGWB PERMANENT OBSERVATION STATIONS

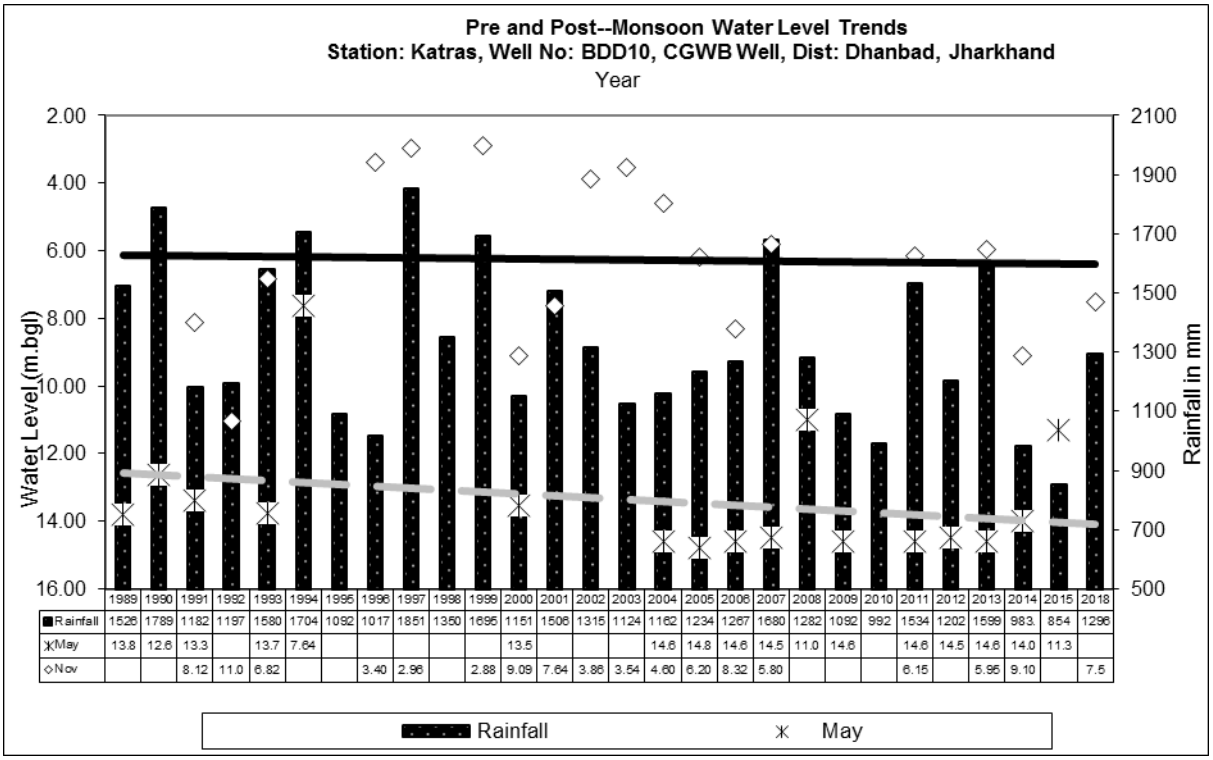


	1983	1984	1985	1986	1987	1988	1989	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018
Rainfall	145	188	124	121	141	116	152	178	118	119	158	170	109	101	185	135	169	115	150	131	112	102	123	126	168	128	109	992	153	120	159	127	129	129		
May	4.7	2.1		1.6	2.2	3.6		2.4	1.3	4.7	2.1	1.1	5.4	5.4	5.2	5.4	4.7	3.3	1.7	3.5	2.9	2.1			1.7	1.7	1.6	1.7	1.6		0.5	2.5	1.9	2.2		
Nov		1.1	0.9	1.3	1.2	1.4	1.2	1.1	1.5	5.2	2.2		3.4	3.0	1.3	4.4	4.5	4.5	3.4	1.0	1.0	1.8	1.0	1.3	1.5	1.4	1.0	1.9	2.1	0.6	0.9	1	1.8	0.2		

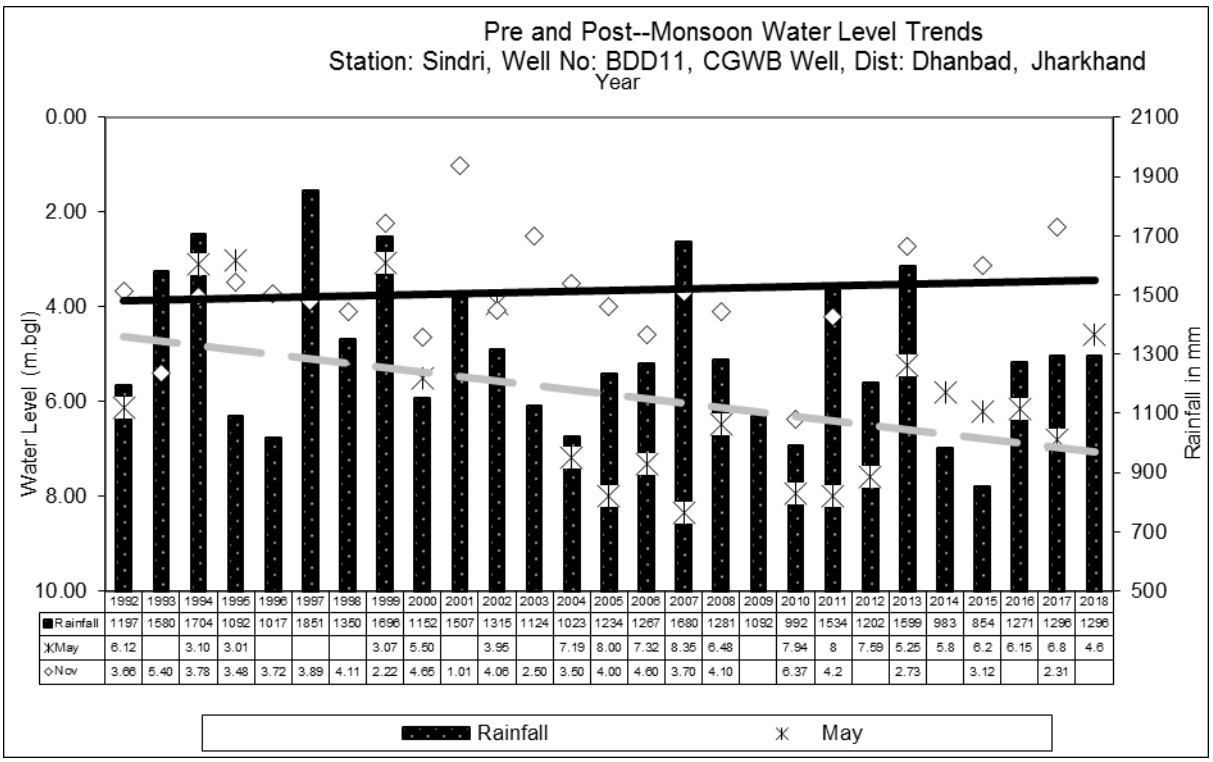


	1988	1989	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018
Rainfall	1162	1526	1789	1182	1197	1580	1704	1092	1017	1851	1350	1695	1151	1124	1162	1234	1267	1680	1282	1092	992	1534	1202	1599	983	854	1271	1296	1296
May	10.6	10.5	7.10	10.1	9.73	9.00	8.70	3.98	6.94	7.59	7.68	7.66	4.03	7.50	2.90	9.80		9.80	10.1	10.2	13.5	15.0	11.8	5.65	10.1	10.9	9.85	8.60	7.23
Nov		3.79	4.14	5.12	9.80	5.47	6.62	7.70	5.51	4.64	2.16	3.22	3.59	1.59	4.10	5.75	4.80	5.25	4.92	5.27	9.33	5.15	5.30	4.94	6.55	6.95	4.40	3.64	2.52

HYDROGRAPHS OF CGWB PERMANENT OBSERVATION STATIONS



	1989	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2018
Rainfall	1526	1789	1182	1197	1580	1704	1092	1017	1851	1350	1695	1151	1506	1315	1124	1162	1234	1267	1680	1282	1092	992	1534	1202	1599	983.	854	1296
May	13.8	12.6	13.3		13.7	7.64						13.5				14.6	14.8	14.6	14.5	11.0	14.6		14.6	14.5	14.6	14.0	11.3	
Nov			8.12	11.0	6.82			3.40	2.96		2.88	9.09	7.64	3.86	3.54	4.60	6.20	8.32	5.80				6.15		5.95	9.10		7.5



	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018
Rainfall	1197	1580	1704	1092	1017	1851	1350	1696	1152	1507	1315	1124	1023	1234	1267	1680	1281	1092	992	1534	1202	1599	983	854	1271	1296	1296
May	6.12		3.10	3.01				3.07	5.50		3.95		7.19	8.00	7.32	8.35	6.48		7.94	8	7.59	5.25	5.8	6.2	6.15	6.8	4.6
Nov	3.66	5.40	3.78	3.48	3.72	3.89	4.11	2.22	4.65	1.01	4.06	2.50	3.50	4.00	4.60	3.70	4.10		6.37	4.2		2.73		3.12		2.31	

Annexure – VII

GROUNDWATER SAMPLE LOCATION DETAILS

Sampling month: June month of the assessment year of 2021-22

Sl No	Name of Cluster	Ground Water Sample	Dug well (CMPDI)	Location	Sampling Date
					May-June'2022
1	CLUSTER-I	GW-1	B-15	BERA VILLAGE	25.05.2022
2	CLUSTER-II	GW-2	B-59	KHODOVALY VILLAGE	25.05.2022
3	CLUSTER-III	GW-3	A-29	GOVINDPUR,AMBAGAN VILLAGE	26.05.2022
4	CLUSTER-IV	GW-4	B-64	KESHALPUR, BATIGHAR	26.05.2022
5	CLUSTER-V	GW-5	D-30	BORKIBOA VILLAGE	26.05.2022
6	CLUSTER-VI	GW-6	D-25	GODHUR MORE	27.05.2022
7	CLUSTER-VII	GW-7	D-80	DHANSAR MINE RESCUE STN.	27.05.2022
8	CLUSTER-VIII	GW-8	D-49	NEAR GHANOODIH OC	27.05.2022
9	CLUSTER-IX	GW-9	D-5	JEALGORA, NEAR P.O.	28.05.2022
10	CLUSTER-X	GW-10	D-35	PATHERDIH RLY. COLONY	28.05.2022
11	CLUSTER-XI	GW-11	A-32	MONNIDIH BAZAR	28.05.2022
12	CLUSTER-XIII	GW-13	A-23	MACHHAYARA	28.05.2022
13	CLUSTER-XIV	GW-14	B-23	LOHAPATTI VILLAGE	28.05.2022
14	CLUSTER-XV	GW-15	B-32A	MADHUBAND VILLAGE	25.05.2022
15	CLUSTER-XVI	GW-16	DB-22	DAHIBARI,NICHE BASTI	17.06.2022

WATER QUALITY
(GROUND WATER- ALL PARAMETERS)

Sl. No	Parameter	Sampling Stations			Detection Limit	IS:10500 Drinking Water Standards	Standard / Test Method
		GW1 25.05.2022	GW2 25.05.2022	GW3 26.05.2022			
1	Colour, Hazen unit	2	2	1	1	5	APHA, 23rd Edition ,2120-c-Spectrophotometric Single Wavelength Method ,2017
2	Calcium, mg/l	38	52	50	2	75	IS 3025, (Part 40): 1991 R:2019,AAS-Flame Method & EDTA Method
3	Chlorides, mg/l	24	28	26	5	250	IS-3025(Part 32):1988, R-2019 , Argentometric Method
4	Fluoride, mg/l	0.64	0.72	0.56	0.2	1	APHA, 23rd Edition, SPADNS Method
5	Iron, mg/l	<0.2	<0.2	<0.2	0.2	1	IS 3025 (Part 53) : 2003, R : 2019 , AAS-Flame Method
6	Manganese	<0.02	<0.02	<0.02	0.02	0.1	IS 3025 (Part 59) : 2006, R : 2019 , AAS-Flame Method
7	Nitrate , mg/l	6.64	5.32	10.44	0.5	45	APHA, 23rd Edition, UV-Spectrophotometric Method
8	Odour	Agreeable	Agreeable	Agreeable	Qualitative	Agreeable	APHA, 23rd Edition, , 2150-C
9	pH value	8.13	8.07	8.20	0.1	6.5-8.5	IS 3025, Part 11 : 1983 R 2017 Electrometric(pH Meter) Method
10	Sulphate, mg/l	48	52	42	10	200	APHA –23rd Edition, 4500 S , Turbidity Method
11	Taste	Acceptable	Acceptable	Acceptable	Qualitative	Acceptable	APHA,23rd Edition, 2160-C
12	Total Alkalinity (c_ac_o3), mg/l, Max	108	136	141	4	200	IS 3025, Part 23: 1986 R 2019 Titration Method
13	Total Dissolved Solids, mg/l	250	262	244	25	500	IS 3025, Part 16: 1984 R 2017 Gravimetric method
14	Total Hardness, mg/l	206	215	204	4	200	IS 3025, (Part 21): 2019 EDTA Method
15	Turbidity, NTU	1	1	1	0.1	1	IS 3025, (Part 10):1984, R-2017 Nephelometric/Turbiditimetric Method
16	Zinc, mg/l	<0.1	<0.1	<0.1	0.1	5	IS 3025(Part 49) : 1994,R:2019, AAS-Flame Method
17	Boron (as B), mg/l, Max	<0.2	<0.2	<0.2	0.2	0.5	APHA, 23rd Edition ,Carmine
18	Copper (as Cu), mg/l, Max	<0.03	<0.03	<0.03	0.01	0.05	IS 3025 Part 42 : 1992 R : 2019, AAS-Flame APHA, 23rd Edition, AAS-GTA
19	Free Residual Chlorine, mg/l, Min	<0.04	<0.04	<0.04	0.04	0.2	APHA, 23rd Edition, , 4500-Cl- B. (Iodometric Method-I)
20	Lead (as Pb), mg/l, Max	<0.005	<0.005	<0.005	0.005	0.01	IS:3025(Part 47):1994 (Reaffirmed 2019) APHA, 23rd Edition, AAS-GTA
21	Phenolic compounds (as C6H5OH), mg/l, Max	<0.001	<0.001	<0.001	0.001	0.002	APHA, 22nd Edition,4-Amino Autipyrine
22	Selenium, mg/l, Max	<0.007	<0.007	<0.007	0.007	0.01	APHA 23rd Edition IS-3025,part 56:2003, R-2019/, AAS-VGA
23	Total Arsenic (as As), mg/l, Max	<0.006	<0.006	<0.006	0.006	0.01	IS-3025,part 37:1988, R-2019/ APHA 23rd Edition AAS-VGA
24	Total Chromium (as Cr), mg/l, Max	<0.04	<0.04	<0.04	0.01	0.05	IS-3025 Part 52:2003, R:2019,AAS-Flame APHA, 23rd Edition, AAS-GTA
25	Nickel as Ni, mg/l Max	<0.01	<0.01	<0.01	0.005	0.02	IS 3025 Part 54 : 2003,R : 2019, AAS-Flame APHA, 23rd Edition, AAS-GTA

WATER QUALITY

(GROUND WATER- ALL PARAMETERS)

Sl. No	Parameter	Sampling Stations			Detection Limit	IS:10500 Drinking Water Standards	Standard / Test Method
		GW4 26.05.2022	GW5 26.05.2022	GW6 27.05.2022			
1	Colour, Hazen unit	4	1	2	1	5	APHA, 23rd Edition ,2120-c-Spectrophotometric Single Wavelength Method ,2017
2	Calcium, mg/l	38	152	60	2	75	IS 3025, (Part 40): 1991 R:2019,AAS-Flame Method & EDTA Method
3	Chlorides, mg/l	22	92	36	5	250	IS-3025(Part 32):1988, R-2019 , Argentometric Method
4	Fluoride, mg/l	0.61	0.66	0.77	0.2	1	APHA, 23rd Edition, SPADNS Method
5	Iron, mg/l	<0.2	<0.2	<0.2	0.2	1	IS 3025 (Part 53) : 2003, R : 2019 , AAS-Flame Method
6	Manganese	<0.02	<0.02	<0.02	0.02	0.1	IS 3025 (Part 59) : 2006, R : 2019 , AAS-Flame Method
7	Nitrate , mg/l	12.21	34.06	15.26	0.5	45	APHA, 23rd Edition, UV-Spectrophotometric Method
8	Odour	Agreeable	Agreeable	Agreeable	Qualitative	Agreeable	APHA, 23rd Edition, , 2150-C
9	pH value	7.82	8.06	7.84	0.1	6.5-8.5	IS 3025, Part 11 : 1983 R 2017 Electrometric(pH Meter) Method
10	Sulphate, mg/l	42	134	58	10	200	APHA –23rd Edition, 4500 S , Turbidity Method
11	Taste	Acceptable	Acceptable	Acceptable	Qualitative	Acceptable	APHA,23rd Edition, 2160-C
12	Total Alkalinity ($c_ac_{o_3}$), mg/l, Max	114	92	110	4	200	IS 3025, Part 23: 1986 R 2019 Titration Method
13	Total Dissolved Solids, mg/l	204	750	246	25	500	IS 3025, Part 16: 1984 R 2017 Gravimetric method
14	Total Hardness, mg/l	162	666	220	4	200	IS 3025, (Part 21): 2019 EDTA Method
15	Turbidity, NTU	3	1	1	0.1	1	IS 3025, (Part 10):1984, R-2017 Nephelometric/Turbiditimetric Method
16	Zinc, mg/l	<0.1	<0.1	<0.1	0.1	5	IS 3025(Part 49) : 1994,R:2019, AAS-Flame Method
17	Boron (as B), mg/l, Max	<0.2	<0.2	<0.2	0.2	0.5	APHA, 23rd Edition ,Carmine
18	Copper (as Cu), mg/l, Max	<0.03	<0.03	<0.03	0.01	0.05	IS 3025 Part 42 : 1992 R : 2019, AAS-Flame APHA, 23rd Edition, AAS-GTA
19	Free Residual Chlorine, mg/l, Min	<0.04	<0.04	<0.04	0.04	0.2	APHA, 23rd Edition, , 4500-Cl- B. (Iodometric Method-I)
20	Lead (as Pb), mg/l, Max	<0.005	<0.005	<0.005	0.005	0.01	IS:3025(Part 47):1994 (Reaffirmed 2019) APHA, 23rd Edition, AAS-GTA
21	Phenolic compounds (as C_6H_5OH), mg/l, Max	<0.001	<0.001	<0.001	0.001	0.002	APHA, 22nd Edition,4-Amino Autipyrine
22	Selenium, mg/l, Max	<0.007	<0.007	<0.007	0.007	0.01	APHA 23rd Edition IS-3025,part 56:2003, R-2019/, AAS-VGA
23	Total Arsenic (as As), mg/l, Max	<0.006	<0.006	<0.006	0.006	0.01	IS-3025,part 37:1988, R-2019/ APHA 23rd Edition AAS-VGA
24	Total Chromium (as Cr), mg/l, Max	<0.04	<0.04	<0.04	0.01	0.05	IS-3025 Part 52:2003, R:2019,AAS-Flame APHA, 23rd Edition, AAS-GTA
25	Nickel as Ni, mg/l Max	<0.01	<0.01	<0.01	0.005	0.02	IS 3025 Part 54 : 2003,R : 2019, AAS-Flame APHA, 23rd Edition, AAS-GTA

WATER QUALITY

(GROUND WATER- ALL PARAMETERS)

Sl. No	Parameter	Sampling Stations			Detection Limit	IS:10500 Drinking Water Standards	Standard / Test Method
		GW7 27.05.2022	GW8 27.05.2022	GW9 28.05.2022			
1	Colour, Hazen unit	3	2	1	1	5	APHA, 23rd Edition ,2120-c-Spectrophotometric Single Wavelength Method ,2017
2	Calcium, mg/l	56	58	132	2	75	IS 3025, (Part 40): 1991 R:2019,AAS-Flame Method & EDTA Method
3	Chlorides, mg/l	32	28	62	5	250	IS-3025(Part 32):1988, R-2019 , Argentometric Method
4	Fluoride, mg/l	0.54	0.81	0.63	0.2	1	APHA, 23rd Edition, SPADNS Method
5	Iron, mg/l	<0.2	<0.2	<0.2	0.2	1	IS 3025 (Part 53) : 2003, R : 2019 , AAS-Flame Method
6	Manganese	<0.02	<0.02	<0.02	0.02	0.1	IS 3025 (Part 59) : 2006, R : 2019 , AAS-Flame Method
7	Nitrate , mg/l	15.64	8.32	28.44	0.5	45	APHA, 23rd Edition, UV-Spectrophotometric Method
8	Odour	Agreeable	Agreeable	Agreeable	Qualitative	Agreeable	APHA, 23rd Edition, , 2150-C
9	pH value	7.92	8.06	8.21	0.1	6.5-8.5	IS 3025, Part 11 : 1983 R 2017 Electrometric(pH Meter) Method
10	Sulphate, mg/l	66	42	164	10	200	APHA –23rd Edition, 4500 S , Turbidity Method
11	Taste	Acceptable	Acceptable	Acceptable	Qualitative	Acceptable	APHA,23rd Edition, 2160-C
12	Total Alkalinity ($c_ac_{o_3}$), mg/l, Max	82	126	92	4	200	IS 3025, Part 23: 1986 R 2019 Titration Method
13	Total Dissolved Solids, mg/l	262	198	764	25	500	IS 3025, Part 16: 1984 R 2017 Gravimetric method
14	Total Hardness, mg/l	176	152	648	4	200	IS 3025, (Part 21): 2019 EDTA Method
15	Turbidity, NTU	2	1	2	0.1	1	IS 3025, (Part 10):1984, R-2017 Nephelometric/Turbiditimetric Method
16	Zinc, mg/l	<0.1	<0.1	<0.1	0.1	5	IS 3025(Part 49) : 1994,R:2019, AAS-Flame Method
17	Boron (as B), mg/l, Max	<0.2	<0.2	<0.2	0.2	0.5	APHA, 23rd Edition ,Carmine
18	Copper (as Cu), mg/l, Max	<0.03	<0.03	<0.03	0.01	0.05	IS 3025 Part 42 : 1992 R : 2019, AAS-Flame APHA, 23rd Edition, AAS-GTA
19	Free Residual Chlorine, mg/l, Min	<0.04	<0.04	<0.04	0.04	0.2	APHA, 23rd Edition, , 4500-Cl- B. (Iodometric Method-I)
20	Lead (as Pb), mg/l, Max	<0.005	<0.005	<0.005	0.005	0.01	IS:3025(Part 47):1994 (Reaffirmed 2019) APHA, 23rd Edition, AAS-GTA
21	Phenolic compounds (as C6H5OH), mg/l, Max	<0.001	<0.001	<0.001	0.001	0.002	APHA, 22nd Edition,4-Amino Autipyrine
22	Selenium, mg/l, Max	<0.007	<0.007	<0.007	0.007	0.01	APHA 23rd Edition IS-3025,part 56:2003, R-2019/, AAS-VGA
23	Total Arsenic (as As), mg/l, Max	<0.006	<0.006	<0.006	0.006	0.01	IS-3025,part 37:1988, R-2019/ APHA 23rd Edition AAS-VGA
24	Total Chromium (as Cr), mg/l, Max	<0.04	<0.04	<0.04	0.01	0.05	IS-3025 Part 52:2003, R:2019,AAS-Flame APHA, 23rd Edition, AAS-GTA
25	Nickel as Ni, mg/l Max	<0.01	<0.01	<0.01	0.005	0.02	IS 3025 Part 54 : 2003,R : 2019, AAS-Flame APHA, 23rd Edition, AAS-GTA

WATER QUALITY

(GROUND WATER- ALL PARAMETERS)

Sl. No	Parameter	Sampling Stations			Detection Limit	IS:10500 Drinking Water Standards	Standard / Test Method
		GW10 28.05.2022	GW11 28.05.2022	GW13 28.05.2022			
1	Colour, Hazen unit	3	1	1	1	5	APHA, 23rd Edition ,2120-c-Spectrophotometric Single Wavelength Method ,2017
2	Calcium, mg/l	48	38	172	2	75	IS 3025, (Part 40): 1991 R:2019,AAS-Flame Method & EDTA Method
3	Chlorides, mg/l	40	28	106	5	250	IS-3025(Part 32):1988, R-2019 , Argentometric Method
4	Fluoride, mg/l	0.72	0.61	0.72	0.2	1	APHA, 23rd Edition, SPADNS Method
5	Iron, mg/l	<0.2	<0.2	<0.2	0.2	1	IS 3025 (Part 53) : 2003, R : 2019 , AAS-Flame Method
6	Manganese	<0.02	<0.02	<0.02	0.02	0.1	IS 3025 (Part 59) : 2006, R : 2019 , AAS-Flame Method
7	Nitrate , mg/l	18.92	12.03	7.77	0.5	45	APHA, 23rd Edition, UV-Spectrophotometric Method
8	Odour	Agreeable	Agreeable	Agreeable	Qualitative	Agreeable	APHA, 23rd Edition, , 2150-C
9	pH value	8.02	7.98	8.02	0.1	6.5-8.5	IS 3025, Part 11 : 1983 R 2017 Electrometric(pH Meter) Method
10	Sulphate, mg/l	82	46	178	10	200	APHA –23rd Edition, 4500 S , Turbidity Method
11	Taste	Acceptable	Acceptable	Acceptable	Qualitative	Acceptable	APHA,23rd Edition, 2160-C
12	Total Alkalinity ($c_a co_3$), mg/l, Max	102	142	94	4	200	IS 3025, Part 23: 1986 R 2019 Titration Method
13	Total Dissolved Solids, mg/l	264	194	764	25	500	IS 3025, Part 16: 1984 R 2017 Gravimetric method
14	Total Hardness, mg/l	188	154	656	4	200	IS 3025, (Part 21): 2019 EDTA Method
15	Turbidity, NTU	3	3	1	0.1	1	IS 3025, (Part 10):1984, R-2017 Nephelometric/Turbiditimetric Method
16	Zinc, mg/l	<0.1	<0.1	<0.1	0.1	5	IS 3025(Part 49) : 1994,R:2019, AAS-Flame Method
17	Boron (as B), mg/l, Max	<0.2	<0.2	<0.2	0.2	0.5	APHA, 23rd Edition ,Carmine
18	Copper (as Cu), mg/l, Max	<0.03	<0.03	<0.03	0.01	0.05	IS 3025 Part 42 : 1992 R : 2019, AAS-Flame APHA, 23rd Edition, AAS-GTA
19	Free Residual Chlorine, mg/l, Min	<0.04	<0.04	<0.04	0.04	0.2	APHA, 23rd Edition, , 4500-Cl- B. (Iodometric Method-I)
20	Lead (as Pb), mg/l, Max	<0.005	<0.005	<0.005	0.005	0.01	IS:3025(Part 47):1994 (Reaffirmed 2019) APHA, 23rd Edition, AAS-GTA
21	Phenolic compounds (as C6H5OH), mg/l, Max	<0.001	<0.001	<0.001	0.001	0.002	APHA, 22nd Edition,4-Amino Autipyrine
22	Selenium, mg/l, Max	<0.007	<0.007	<0.007	0.007	0.01	APHA 23rd Edition IS-3025,part 56:2003, R-2019/, AAS-VGA
23	Total Arsenic (as As), mg/l, Max	<0.006	<0.006	<0.006	0.006	0.01	IS-3025,part 37:1988, R-2019/ APHA 23rd Edition AAS-VGA
24	Total Chromium (as Cr), mg/l, Max	<0.04	<0.04	<0.04	0.01	0.05	IS-3025 Part 52:2003, R:2019,AAS-Flame APHA, 23rd Edition, AAS-GTA
25	Nickel as Ni, mg/l Max	<0.01	<0.01	<0.01	0.005	0.02	IS 3025 Part 54 : 2003,R : 2019, AAS-Flame APHA, 23rd Edition, AAS-GTA

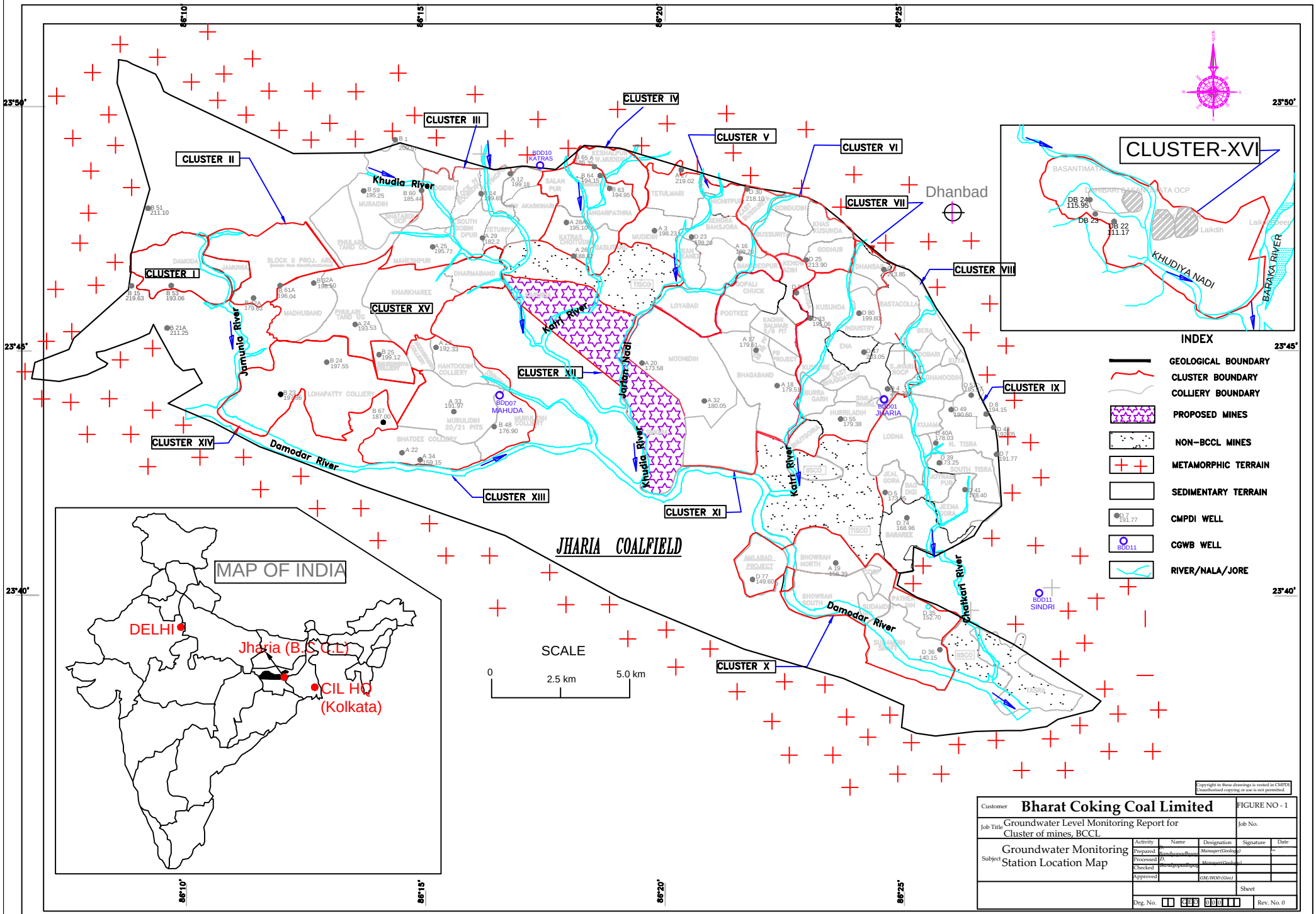
WATER QUALITY
(GROUND WATER- ALL PARAMETERS)

Sl. No	Parameter	Sampling Stations			Detection Limit	IS:10500 Drinking Water Standards	Standard / Test Method
		GW14 28.05.2022	GW15 25.05.2022	GW16 17.06.2022			
1	Colour, Hazen unit	2	2	2	1	5	APHA, 23rd Edition ,2120-c-Spectrophotometric Single Wavelength Method ,2017
2	Calcium, mg/l	40	172	103	2	75	IS 3025, (Part 40): 1991 R:2019,AAS-Flame Method & EDTA Method
3	Chlorides, mg/l	54	102	54	5	250	IS-3025(Part 32):1988, R-2019 , Argentometric Method
4	Fluoride, mg/l	0.56	0.41	0.61	0.2	1	APHA, 23rd Edition, SPADNS Method
5	Iron, mg/l	<0.2	<0.2	<0.2	0.2	1	IS 3025 (Part 53) : 2003, R : 2019 , AAS-Flame Method
6	Manganese	<0.02	<0.02	<0.02	0.02	0.1	IS 3025 (Part 59) : 2006, R : 2019 , AAS-Flame Method
7	Nitrate , mg/l	8.03	7.85	14.61	0.5	45	APHA, 23rd Edition, UV-Spectrophotometric Method
8	Odour	Agreeable	Agreeable	Agreeable	Qualitative	Agreeable	APHA, 23rd Edition, , 2150-C
9	pH value	8.12	8.11	7.92	0.1	6.5-8.5	IS 3025, Part 11 : 1983 R 2017 Electrometric(pH Meter) Method
10	Sulphate, mg/l	48	144	132	10	200	APHA –23rd Edition, 4500 S , Turbidity Method
11	Taste	Acceptable	Acceptable	Acceptable	Qualitative	Acceptable	APHA,23rd Edition, 2160-C
12	Total Alkalinity ($c_ac_{o_3}$), mg/l, Max	92	122	110	4	200	IS 3025, Part 23: 1986 R 2019 Titration Method
13	Total Dissolved Solids, mg/l	296	752	520	25	500	IS 3025, Part 16: 1984 R 2017 Gravimetric method
14	Total Hardness, mg/l	218	613	440	4	200	IS 3025, (Part 21): 2019 EDTA Method
15	Turbidity, NTU	1	2	1	0.1	1	IS 3025, (Part 10):1984, R-2017 Nephelometric/Turbiditimetric Method
16	Zinc, mg/l	<0.1	<0.1	<0.1	0.1	5	IS 3025(Part 49) : 1994,R:2019, AAS-Flame Method
17	Boron (as B), mg/l, Max	<0.2	<0.2	<0.2	0.2	0.5	APHA, 23rd Edition ,Carmine
18	Copper (as Cu), mg/l, Max	<0.03	<0.03	<0.03	0.01	0.05	IS 3025 Part 42 : 1992 R : 2019, AAS-Flame APHA, 23rd Edition, AAS-GTA
19	Free Residual Chlorine, mg/l, Min	<0.04	<0.04	<0.04	0.04	0.2	APHA, 23rd Edition, , 4500-Cl- B. (Iodometric Method-I)
20	Lead (as Pb), mg/l, Max	<0.005	<0.005	<0.005	0.005	0.01	IS:3025(Part 47):1994 (Reaffirmed 2019) APHA, 23rd Edition, AAS-GTA
21	Phenolic compounds (as C6H5OH), mg/l, Max	<0.001	<0.001	<0.001	0.001	0.002	APHA, 22nd Edition,4-Amino Autipyrine
22	Selenium, mg/l, Max	<0.007	<0.007	<0.007	0.007	0.01	APHA 23rd Edition IS-3025,part 56:2003, R-2019/, AAS-VGA
23	Total Arsenic (as As), mg/l, Max	<0.006	<0.006	<0.006	0.006	0.01	IS-3025,part 37:1988, R-2019/ APHA 23rd Edition AAS-VGA
24	Total Chromium (as Cr), mg/l, Max	<0.04	<0.04	<0.04	0.01	0.05	IS-3025 Part 52:2003, R:2019,AAS-Flame APHA, 23rd Edition, AAS-GTA
25	Nickel as Ni, mg/l Max	<0.01	<0.01	<0.01	0.005	0.02	IS 3025 Part 54 : 2003,R : 2019, AAS-Flame APHA, 23rd Edition, AAS-GTA

Abbreviations

Abn.: Abandoned
AMSL: Above mean sea level
Avg.: Average
APT: Aquifer Pumping Test
BCCL: Bharat Coking Coal Ltd.
bgl: Below Ground Level
Buffer zone: periphery of the 10 km radius from the project boundary
Core zone: Project / mine / colliery boundary (leasehold area)
CMPDI: Central Mine Plan & Design Institute
DVC: Damodar Valley Corporation
DTW: Depth to water level
GW: Groundwater
IMD: Indian Meteorological Division
JCF: Jharia Coalfield
RCF: Raniganj Coalfield
MADA: Mineral Area Development Authority
MCM: Million Cubic Meter
MGD: Million Gallon per day
NTU: Nephlometric Turbidity unit
OC / UG: Opencast / Underground
OCP / UGP: Opencast Project / Underground Project
RL: Reduced Level
RWH: Rainwater Harvesting
FF: Fire Fighting

GROUNDWATER MONITORING STATION LOCATION MAP



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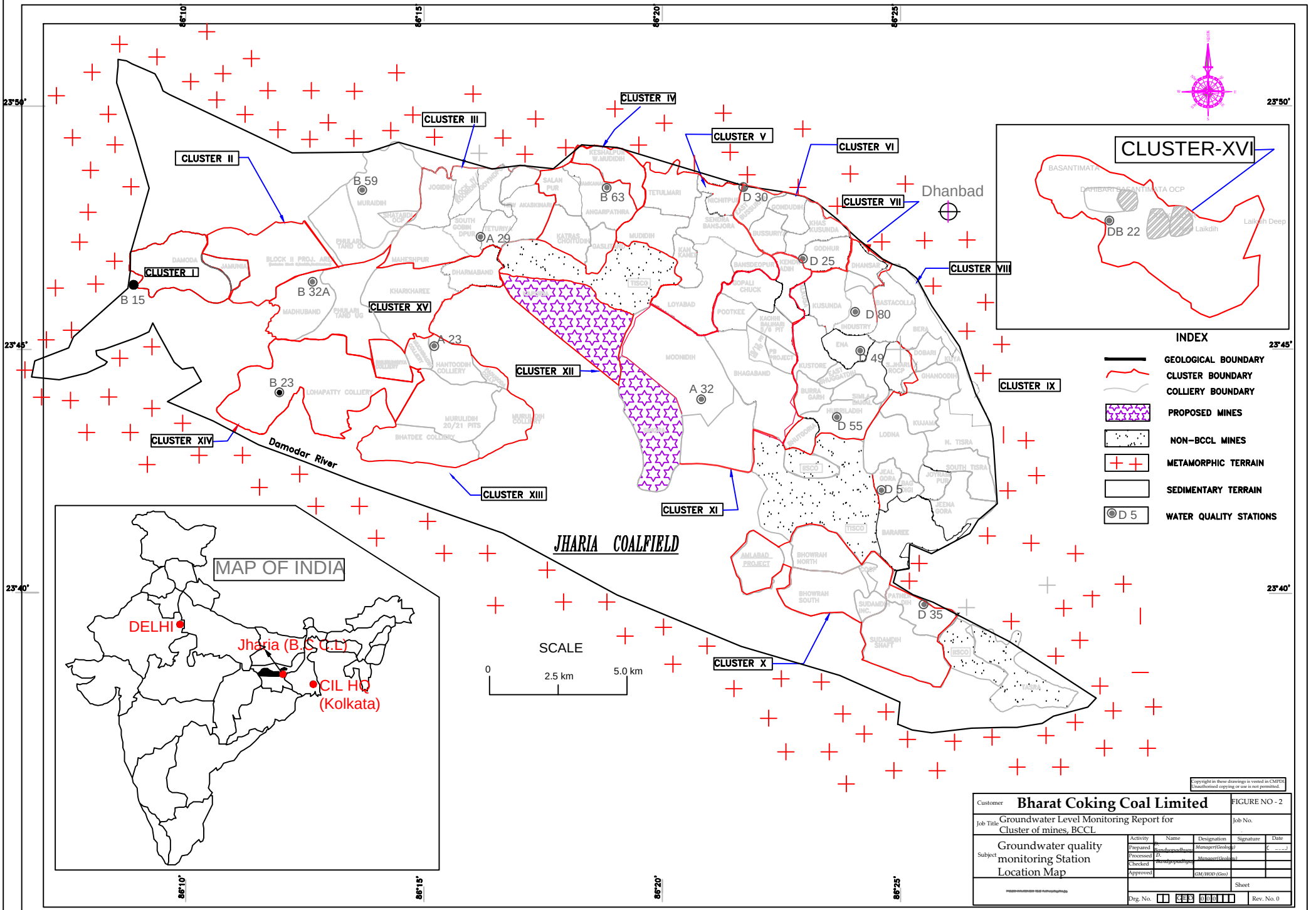
Customer	**Bharat Coking Coal Limited**	FIGURE NO - 1
Job Title	Groundwater Level Monitoring Report for Cluster of mines, BCCL	Job No.
Subject	Groundwater Monitoring Station Location Map	

Activity	Name	Designation	Signature	Date
Prepared	S. Bandyopadhyay	Manager(Geology)		
Processed	D. Bandyopadhyay	Manager(Geology)		
Checked				
Approved		GM/HOD (Geo)		

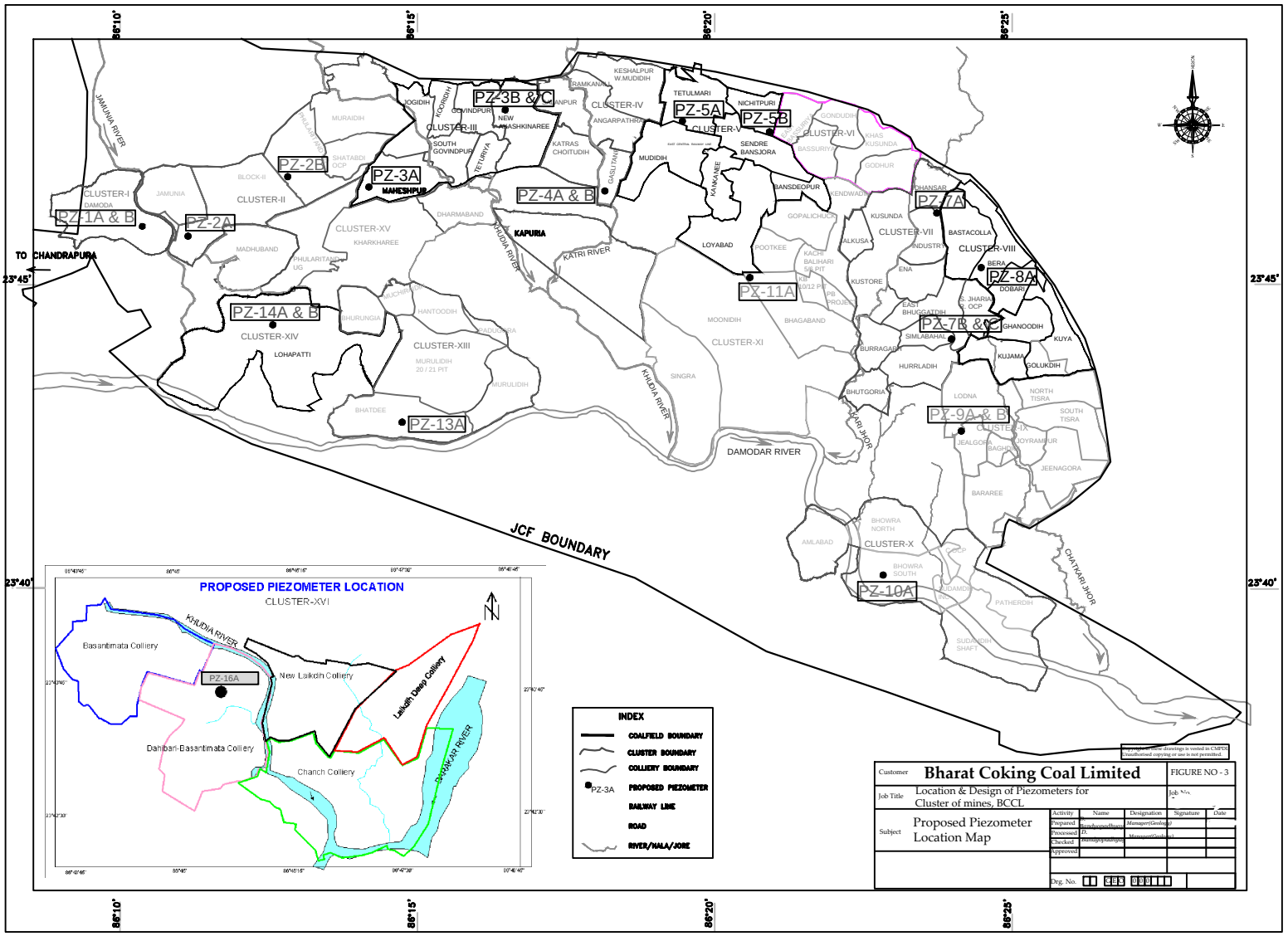
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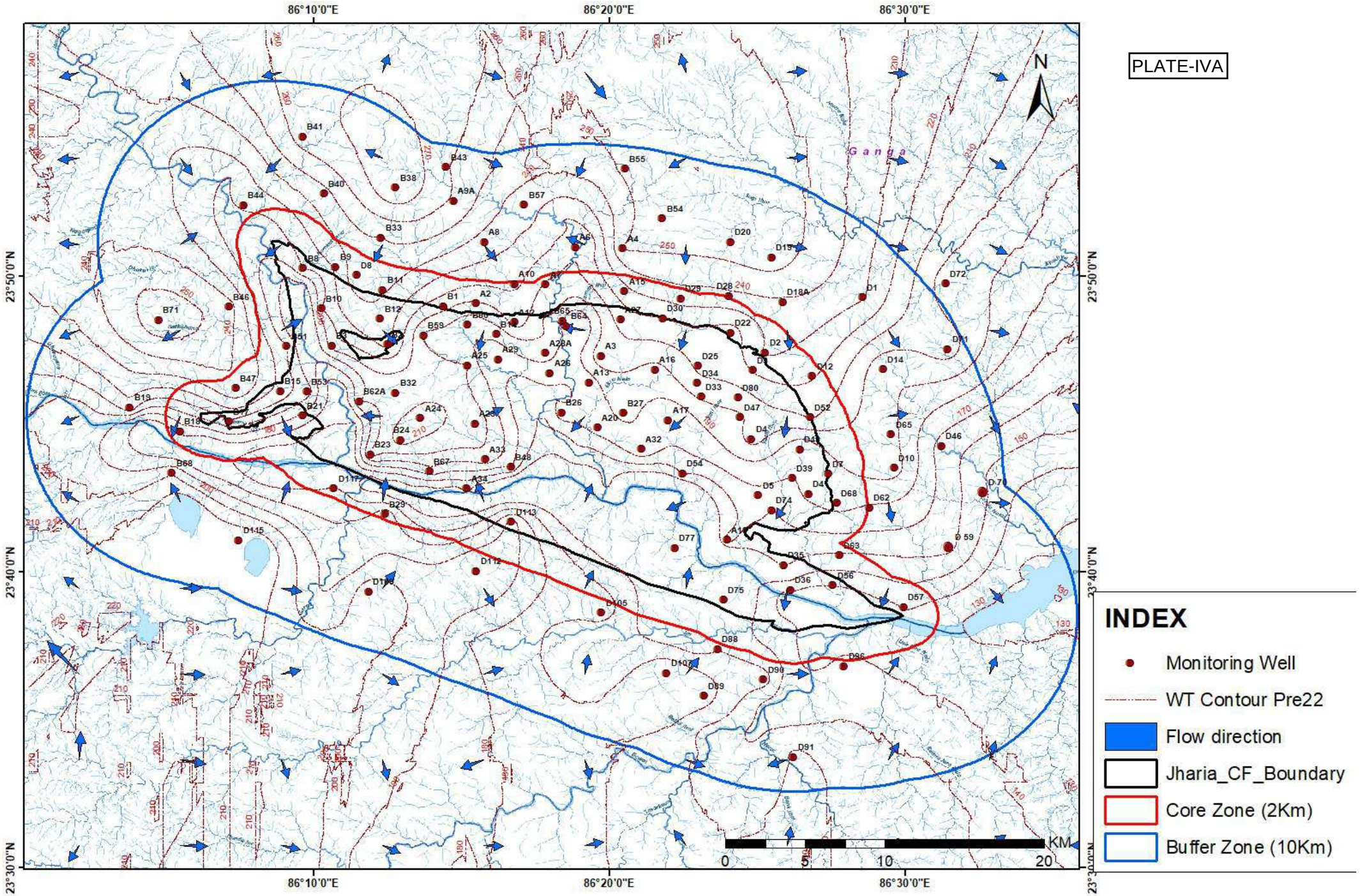
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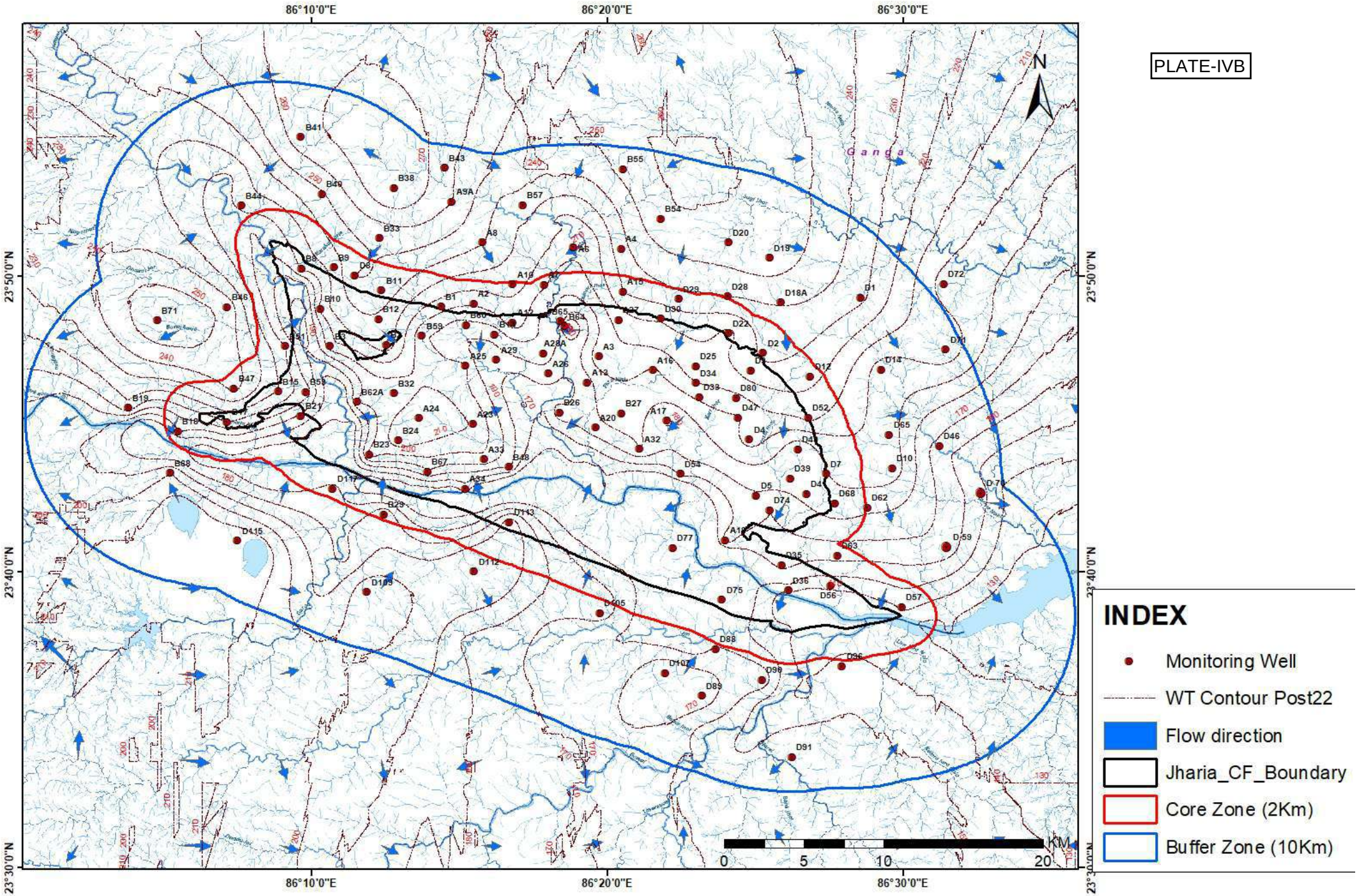
GROUNDWATER QUALITY MONITORING STATION LOCATION MAP



PROPOSED PIEZOMETER LOCATION MAP, JCF & RCF (part)




PLATE-IVA
86°10'0"E
86°20'0"E
86°30'0"E
23°50'0"N
23°40'0"N
23°30'0"N
N
Ganga
INDEX
Monitoring Well
WT Contour Pre22
Flow direction
Jharia_CF_Boundary
Core Zone (2Km)
Buffer Zone (10Km)
0
5
10
20
KM


PLATE-IVB
86°10'0"E
86°20'0"E
86°30'0"E
23°50'0"N
23°40'0"N
23°30'0"N
N
Ganga
INDEX
Monitoring Well
WT Contour Post22
Flow direction
Jharia_CF_Boundary
Core Zone (2Km)
Buffer Zone (10Km)
0
5
10
20
KM

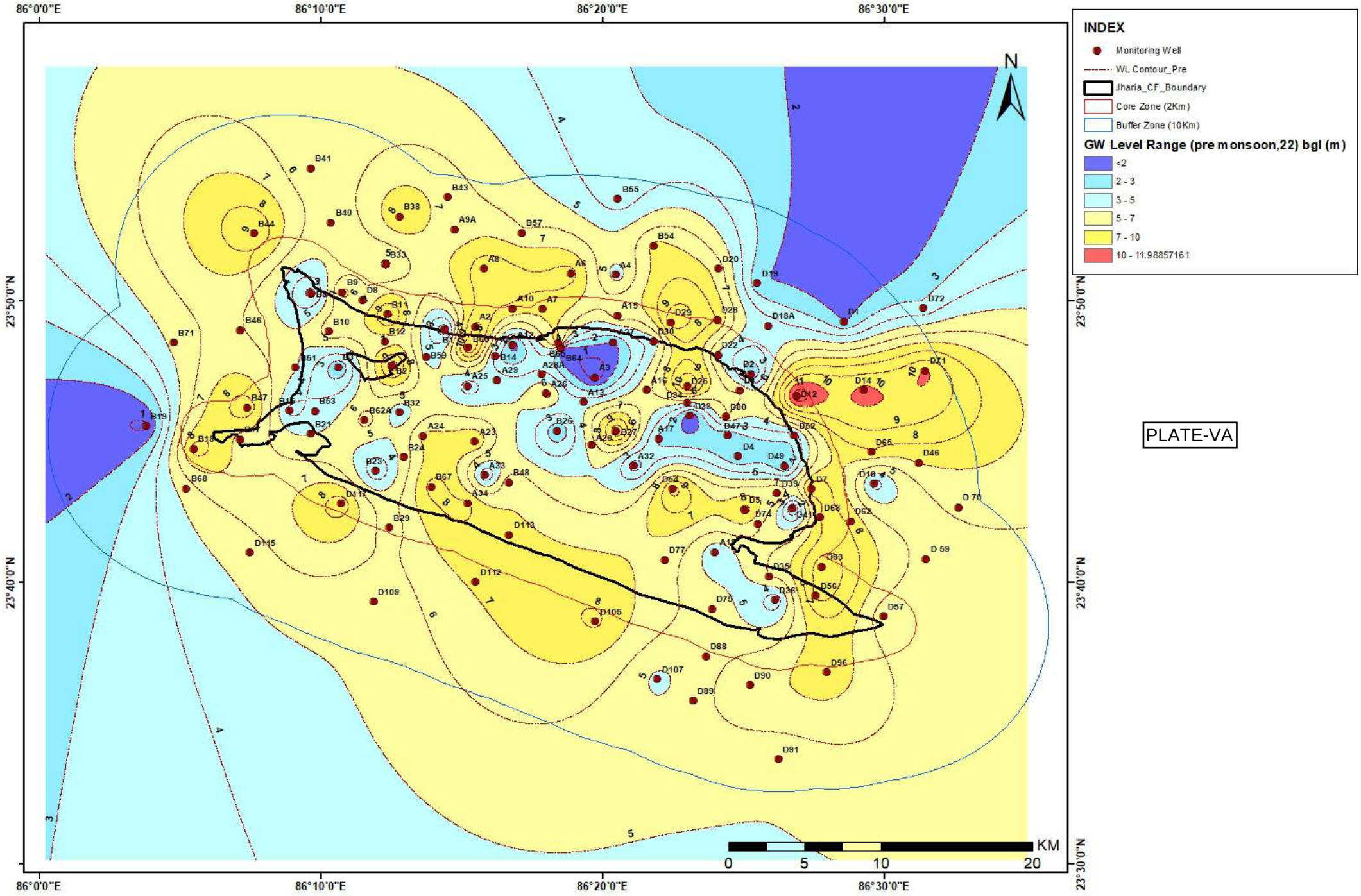
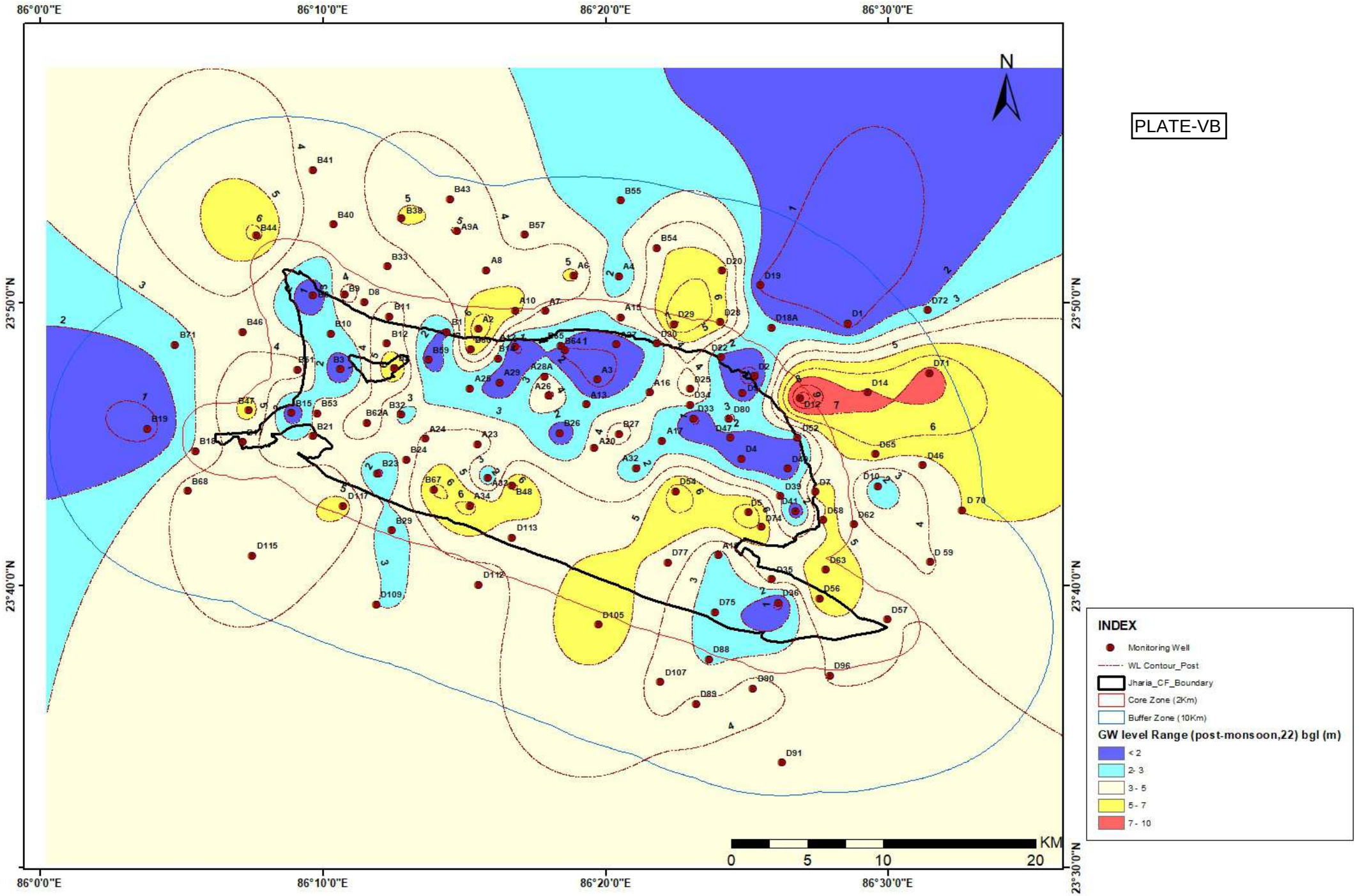
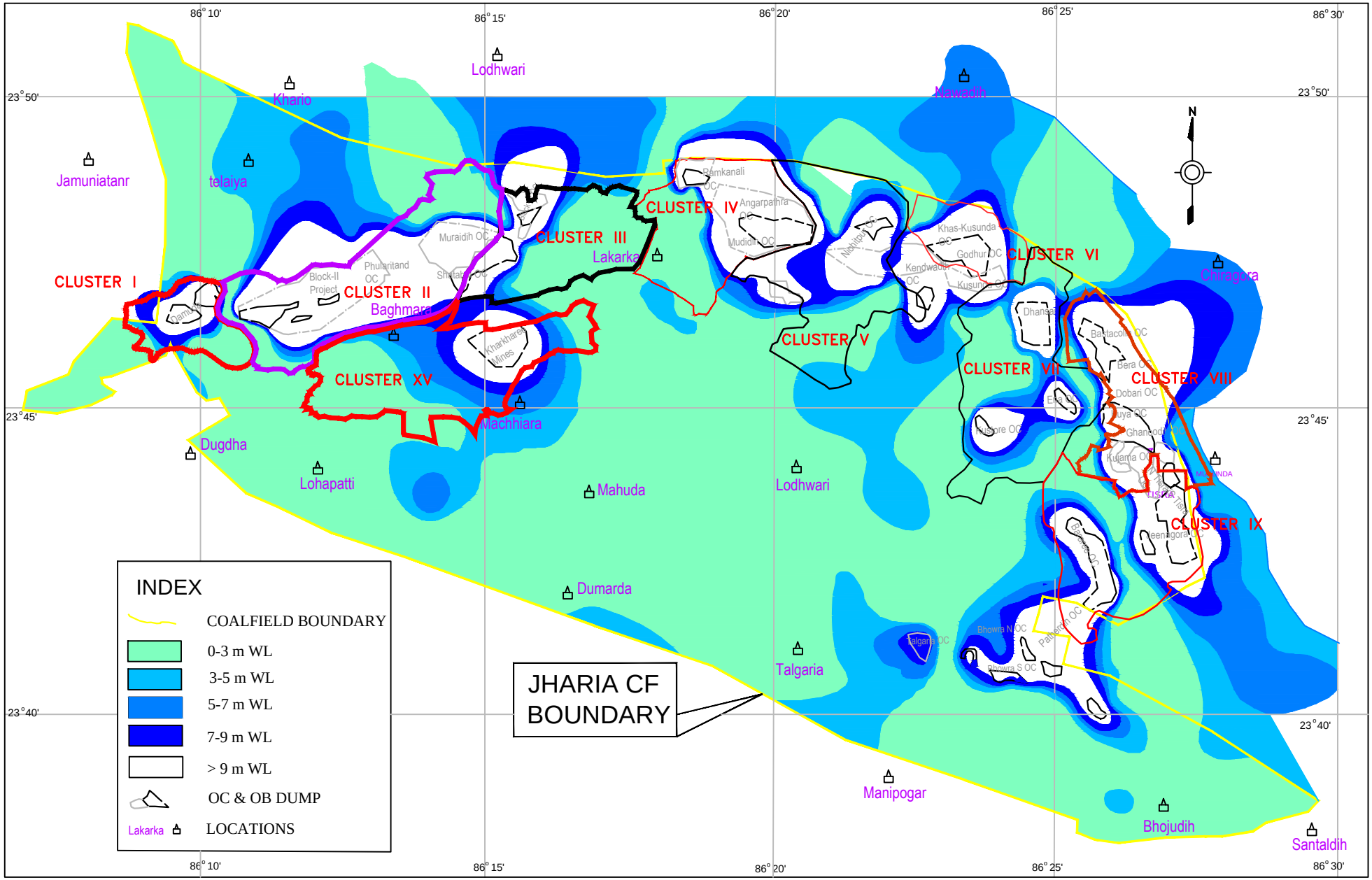

86°0'0"E
86°10'0"E
86°20'0"E
86°30'0"E
23°50'0"N
23°40'0"N
23°30'0"N
N
INDEX
Monitoring Well
WL Contour_Pre
Jharia_CF_Boundary
Core Zone (2Km)
Buffer Zone (10Km)
GW Level Range (pre monsoon,22) bgl (m)
<2
2 - 3
3 - 5
5 - 7
7 - 10
10 - 11.98857161
KM
0
5
10
20

PLATE-VA


86°0'0"E
86°10'0"E
86°20'0"E
86°30'0"E
23°50'0"N
23°40'0"N
23°30'0"N
N
PLATE-VB
INDEX
Monitoring Well
WL Contour_Post
Jharia_CF_Boundary
Core Zone (2Km)
Buffer Zone (10Km)
GW level Range (post-monsoon,22) bgl (m)
< 2
2- 3
3 - 5
5 - 7
7 - 10
KM
0
5
10
20

DEPTH TO WATER LEVEL MAP OF JHARIA COALFIELD



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Ref. - Drawing No. - XYZ/ABC - REV. No. - HNO DATED ---/--

Customer: BHARAT COKING COAL LIMITED

Job No.

Job Title: HYDROGEOLOGICAL STUDIES FOR BCCL CLUSTERS

Subject: DEPTH TO WATER LEVEL MAP

	Name	Designation	Signature	Date
Activity				
Prepared by	D.BANDYOPADHYAY			
Processed by	D.BANDYOPADHYAY			
Checked by				
Approved by				

Scale: 5 0 5 10 15 KM

Sheet: XX

Drg.No.: HQ XXX XX0 XXX

REV. No. 0

CMPDI
ISO 9001 Company

Rain Water Harvesting

The recharge to semi-confined aquifers takes place due to infiltration of direct rainfall in the outcrop zones/areas of these partings and interconnections formed by faults, fractures, etc. between top unconfined aquifer and themselves. The semi-confined aquifer is confining in nature in down dip-side whereas the same aquifer is in unconfined condition in the incrop side within the mining area of Cluster-IV (Geological Plan, **Plate No-IV** and Geological Cross section, **Plate No-VI**).

The artificial recharge structure in the core zone area may not be a viable solution because of the reason that recharged water would drain into the mine at a faster rate due to the steep hydraulic gradients resulted in the mining activity. Again, it may also lead to mine inundation.

Rain Water harvesting is a deliberate collection and storage of rain water that runs off on natural and man-made catchments area. The amount of water harvested depends on the frequency and intensity of the rainfall and characteristics of the catchments to allow the precipitate to infiltrate through the sub-soil and percolate down to recharge aquifers.

The rainwater within the mining area is being accumulated in earthen water pool developed on the surface and abandoned mine void for recharging the ground water of the area. The details have been tabulated below:

Table No-21: Surface ponds / reservoirs

Name of Colliery	Area of pond/mine void		Location
	Area (Ha.)	Depth (m)	
Amalgamated Keshalpur & west Mudidih	0.60	1.75 m	Keshalpur
	0.30	1.2 m	
	0.30	1.3 m	Belaujabad
	1.0	2.0 m	West Mudidih
	0.30	1.25 m	
Amalgamated Ramkanali Angarpathra	0.90	2 m	Rampur
	1.10	3 m	
	1.0	2.5 m	
	0.60	1.75 m	Kumarjuri
	0.30	1.55 m	
Salanpur	0.42	2.0 m	Salanpur
	0.70	2.35 m	
Around 15750 cum/annum of water is added to the groundwater system within the Cluster-IV mining area due to this recharge structures. Considering average water spread area is 0.6 times of total area and recharge factor is 0.0014 m/day during 150 days in a year.			

After mine closure, void of opencast will be filled up with rainwater and will maintaining the water table in the surrounding areas and may become a source of water supply to the community.

The abandoned underground mine workings (Salanpur Colliery and Katras Chitudih Colliery) and old quarry behave as huge ground water reservoirs and contain groundwater runoff (i.e. planned recharge). The pond, tanks, stop dams etc constructed in the rehabilitated and affected villages also augment the groundwater recharge.





Roof-top rainwater harvesting (RWH) will be taken up in the project area using the administrative buildings. 138 no of quarters having roof-top area of about 14950 sq. m. is already prepared to harvest rainwater at Koyla Nagar Campus, Dhanbad. Proposal already made to facilitate this kind of RWH structure at suitable locations i.e. Lodna Area, Kusunda Area (Jawahar Nagar, Matkuria, Coal Board Colony), Sijua Area (Nichitpur and Tetulmari Colony) within Jharia Coalfield to augment groundwater recharge.



Pipeline layouts for roof water catchments area



Roof Water collection and recharging tank



Underground pipe layout



Roof water pipeline layout

Figure No-3: Rain Water Harvesting Structure at Koyla Nagar, BCCL Township towards north-east of Cluster-IV.

Check dams/Nala bunds **(Figure No-4)** have been made in the Jogta Nala and Kari Jore for recharging ground water aquifer within the buffer zone of Cluster-IV. A check dams (Weighted area 0.95 hac) in Kari Jore near Dhansar Colliery (around 8.50 km towards east) and another one at Jogta nala (Weighted area 0.80 hac) around 1.8 km towards east of Cluster-IV boundary is provided to facilitate groundwater recharge in the mining area. Considering recharge factor of 0.0014 m/day around 3700 cum/annum of water is added to the groundwater system through this check dams or Nala bunds near to the Cluster-IV area.



Figure No-4: Check Dams / Nala bunds at Jogta Nala, near Nischitpur OCP Mine, BCCL. This Recharge structure is within the buffer zone (1.8 km towards east of Cluster-IV).



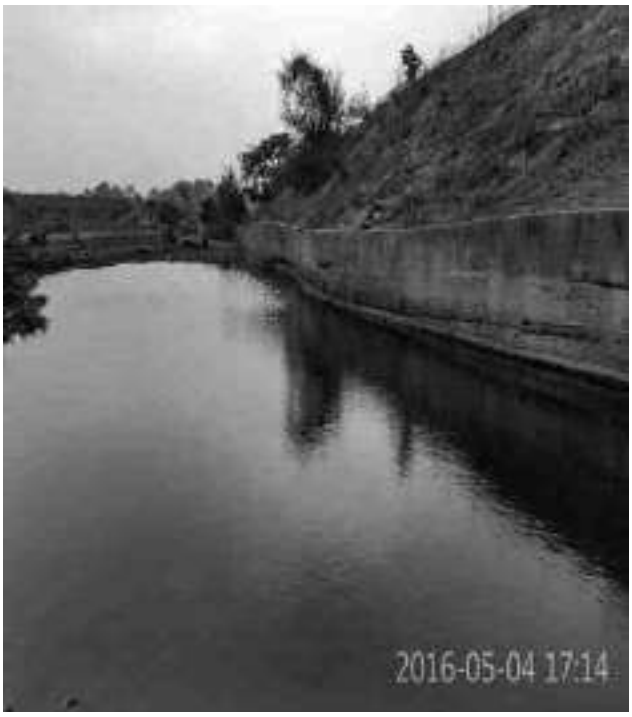
Rain Water Harvesting Pond at Green Park,Cluster-IV


Vivo V11Pro
AI Dual Camera


Vivo V11Pro
AI Dual Camera



Water Harvesting at Cluster IV







Toe wall and Embankment at Cluster IV

Oil and Grease Trap (48 KL)

AKWMC WORKSHOP, Katras Area




OIL AND GREASE TRAP
AUTO WORKSHOP
CLUSTER-IN KATRAS AREA

Annexure-21

Illumination Survey at Departmental O.C.P on 27.04.2024

Sl No	place of illumination obtained	Height of light source	Distance of light source	Standard of illumination	Illumination obtained	Types of light provided	Remarks
1	view point CISF challa	18m	12 m	H= 10	H= 18	Tower light (LED)	
2.	Tyre Colai Junction	20m	20 m	H =10	H= 20	Tower light (LED)	
3.	Shovel no 523	Machine Height	10 m from the front side	H= 15 V=25	H= 28 V= 34	Machine light	
		— do —	20m from the front side	H= 15 V=25	H= 27 V= 31	— do —	

Manager
AKUOMC

Colliery Engineer
AKUOMC

29/4/24
Safety Officer
AKUOMC

CamScanner

Illumination Survey at Departmental O.C.P. on 27.04.2024

Sl.No	place of illumination obtained	Height of light Source	Distance of light Source	Standard of illumination	Illumination obtained	Types of light provided	Remarks
4.	Shovel no 577	Machine Height	10m from the front Side	H=15 V=25	H=27 V=38	Machine light	
		— do —	20m from the front Side	H=15 V=25	H=19 V=37	— do —	
5.	Rel - 750 (Drill machine)	Machine Height	10m from the front Side	H=15 V=25	H=33 V=40	Machine light	
		— do —	20m from the front Side	H=15 V=25	H=27 V=35	— do —	

Manager
AKWMC

Colliery Engineer
AKWMC

28/4/24
Safety officer
AKWMC

Illumination Survey at Ampl mixed O.C.P on 28.04.2024

Sl.No	place of illumination Obtained	Height of light source	Distance of light source	Standard of illumination	Illumination obtained	Types of light provided	Remarks
1.	At pumping station	12m	20m	H=40	H=276	Tower light metal highlight	
		-do-	40m		H=174	-do-	
		-do-	60m		H=118	-do-	
2.	VOLVO 300 VIII A	Machine Height	10m from the front side	H=15, V=25	H=32 V=42	Machine Light + metal highlight	
			20m. from the front side		H=31 V=34	-do-	
3.	Komatsu 300 V seam	Machine Height	10m from the front side	H=15, V=25	H=36 V=44	machine light	
			20m from the front side		H=28 V=33	-do-	

Manager
AKUMC

Colliery Engineer
AKUMC

Safety Officer
AKUMC
28/4/24

Illumination Survey at Ampl Hard. @ C.C.P on 28.04.2024

Sl.No	place of illumination obtained	Height of light source	Distance of light source	Standard of illumination	Illumination obtained	Types of light provided	Remarks
4.	Volvo 480 III B	Machine Height	10 m from the front side	H=15 V=25	H=36 V=49	Machine light	
					H=21 V=28	— do —	
			20 m from the front side				
5.	Haul road	20 m	20 m from the light source	H=10	H=13	Metal Highlight	
6.	Volvo 480 III Seam	Machine Height	10 m from the front side	H=15 V=25	H=38 V=47	Machine light	
			20 m from the front side		H=22 V=27	— do —	

Manager
AKVME

Colliery Engineer
AKVME

29/4/24
Safety Officer
AKVME

Illumination Survey at Departmental O.C.P on 28.05.2024

Sl.No	place of Illumination obtained	Height of light source	Distance of light source	Standard of Illumination	Illumination obtained	Types of light provided	Remarks
1.	view point CISF challa	18 m	12 m	H=10	H= 17	Tower light (LED)	
2.	Shovel no 523	machine Height	10m from the front side	H= 15 V=25	H=37 V= 49	metal Highlight	
		— do —	20 m from the front side	H=15 V=25	H = 24 V= 31	— do —	
3.	Coal Dump 33A	12 m	25 m	H =15 V=15	H= 19 V= 24	Towerlight LED	
	- Centre	10 m	15m		H = 22 V = 27	LED light	
	- Junction point	12 m	10 m		H = 17 V = 22	Towerlight LED	

Manager
AKWMC

Colliery Engineer
AKWMC

Safety officer
AKWMC

Illumination Survey at Departmental P.O.C.P. for 28.05.2024

Sl.No	place of Illumination obtained	Height of light Source	Distance of light source	Standard of Illumination	Illumination obtained	Types of light provided	Remarks
4.	Haul road pole no 1	12 m	10 m	H = 10	H = 14	LED light	
	pole no 2	12 m	10 m	H = 10	H = 13	– do –	
	pole no 3	12 m	10 m	H = 10	H = 14	– do –	
	pole no 4	12 m	10 m	H = 10	H = 11	– do –	
	pole no 5	12 m	10 m	H = 10	H = 12	– do –	
	pole no 6	12 m	10 m	H = 10	H = 12	– do –	
5.	Shovel no 577	Machine Height	10m from the front side	H = 15 V = 25	H = 34 V = 52	Metal Highlight	
			20m from the front side		H = 26 V = 40	– do –	

Manager
AKUMC

Colliery Engineer
AKUMC

Safety officer
AKUMC

Illumination Survey at AMPL Hirod on 29.05.2024

Sl no	place of Illumination obtained	Height of light source	Distance of light source	Standard of Illumination	Illumination obtained	Types of light provided	Remarks
1.	Volvo 480 VIII A	Machine Height	10m from the front side	H=15 V=25	H= 26 V= 43	Machine light	
	— do —						
			20m from the front side	H=15 V=25	H= 19 V= 32	— do —	
	— do —						
	— do —						
	— do —						
2.	Volvo 480 VIII B	Machine Height	10m from the front side	H=15 V=25	H= 27 V=38	Machine light	
			20m from the front side	H=15 V=25	H= 19 V= 27	— do —	
	— do —						
3.	Haul Road	20 m	20m from the light source	H=10	H= 13	LED light	

Manager
AKUMC

Colliery Engineer
AKUMC

Safety officer
AKUMC

Illumination Survey at AMPL Hirad O.C.P on 29.05.2024

Sl.No	place of Illumination obtained	Height of light source	Distance of light source	standard of Illumination	Illumination obtained	Types of light provided	Remarks
3.	volvo 480 V Seam	Machine Height	10m from the front side	H=15 V=25	H=27 V=41	Machine light	
	— do —	— do —	20m from the front side	H=15 V=25	H=19 V=26	— do —	
4.	Volvo 480 VII Seam top	Machine Height	10m from the front side	H=15 V=25	H=29 V=39	machine light	
	— do —	— do —	20m from the front side	H=15 V=25	H=21 V=27	— do —	
5.	At pumping station	12m	30m	H=40	H=230	Towerlight + metal Highlight	
		- do -	50m		H=168	— do —	
		- do -	70m		H=118	— do —	

Manager
AKVOMC

Colliery Engineer
AKVOMC

Safety officer
AKVOMC

Illumination survey at AMPL

Hired O.C.P on 26.06.2024

Sl.No	place of illumination obtained	Height of light source	Distance of light source	Standard of Illumination	Illumination obtained	Types of light provided	Remarks
1.	Volvo 480 VIII A	Machine Height	10 m from the front side	H=15 V=25	H=28 V=46	Machine Height	
			20m from the front side	H=15 V=25	H=19 V=38	— do —	
2.	Volvo 480 VIII B	Machine Height	10 m from the front side	H=15 V=25	H=29 V=47	Machine Height	
			20m from the front side	H=15 V=25	H=21 V=31	— do —	
3.	Haul road	20m	20 m from the front side	H=10	H=16	LED light	

Manager
AKWMC

Colliery Engineer
Safety officer
AKWMC

Safety officer
AKWMC

Illumination Survey at AMPL Mixed O.C.P on 26.06.2024

Sl.NO	place of Illumination obtained	Height of light source	Distance of light source	standard of illumination	Illumination obtained	Types of light provided	Remarks
4.	At pumping station	12 m	30m	H=40	H= 228	Towerlight + Metal Halllight	
		— do —	50m		H= 172	— do —	
		— do —	70m		H = 114	— do —	
5.	VOLVO 480 VII seam top	Machine Height	10 m from the front side	H=15 V=25	H= 27 V= 41	Machine light	
			20m from the front side	H=15 V=25	H = 18 V=28	— do —	
6.	VOLVO 480 I seam	Machine Height	10 m from the front side	H=15 V=25	H= 29 V= 38	Machine light	
			20m from the front side	H=15 V=25	H= 20 V=31	— do —	

Manager
AKVMC

Colliery Engineer
AKVMC

Safety officer
AKVMC

Illumination Survey at Departmental O.C.P. on 27.06.2024

Sl.No	place of illumination obtained	Height of light source	Distance of light source	Standard of illumination	Illumination obtained	Types of light provided	Remarks
1.	View point CISF challa	18 m	12 m	H=10	H=16	Towerlight + LED light	
2.	Tyre Golai Junction	20m	20m	H=10	H= 26	Towerlight (LED)	
3.	Coal Dump 33 9	12m	25m	H=15 V=15	H= 23 V=34	Towerlight LED	
	- Centre	10 m	15m		H=24 V= 31	— do —	
	- Junction point	12 m	10 m		H=25 V= 33	— do —	
4.	Haul road pole 1	20m	15m	H= 10	H= 12	2× LED light	
	pole 2	20m	15m	H= 10	H= 13	— do —	
	pole 3	20m	15m	H= 10	H= 14	— do —	
	pole 4	20m	15m	H= 10	H= 12	— do —	
	pole 5	20m	15m	H= 10	H= 11	— do —	

Manager
AKUMC

Colliery Engineer
AKUMC

Safety officer
AKUMC

Illumination Survey of Department O.C.P on 27.06.2024

Sl.No	Place of illumination obtained	Height of light source	Distance of light source	Standard of illumination	Illumination obtained	Types of light provided	Remarks
5.	Shovel no. 523	Machine Height	10m from the front side	H=15 V=25	H=19 V=32	Machine light + metal highlight	
			20m from the front side		H=16 V=28	— do —	
6.	Shovel no 524	Machine Height	10m from the front side	H=15 V=25	H=21 V=34	Machine light + metal Highlight	
			20m from the front side		H=19 V=29	— do —	
7.	Shovel >1000-8	Machine Height	10m from the front side	H=15 V=25	H=23 V=37	Machine light + metal Highlight	
			20m from the front side		H=20 V=34	— do —	

Manager
AKWMC

Colliery Engineer
AKWMC

Safety officer
AKWMC

Illumination Survey of Departmented OCP, On 24.07.2021

SLNO	Place of illumination obtained	Height of light Source	Distance of light Source	Standard of illumination	Illumination obtained	Types of light Provided.	Remarks.
1.	Coal Dump 33A	12 m	30m.	H=15, V=15	H=15, V=20	Tower light LED	
	Center	10m	20m		H=20, V=25	LED Light	
	Junction Point -	12m	10m		H=20, V=20	Tower light LED	
2.	Haul Road						
	Pole no - 1	12m	10m	H = 10	H=12	LED Light	
	Pole no - 2	12m	10m	H = 10	H = 12	- do -	
	Pole no - 3	12 m	10 m	H = 10	H = 11	- do -	
	Pole no - 4	12 m	10m	H = 10	H = 13	- do -	
	Pole no - 5	12 m	10m	H = 10	H = 12	- do -	
	Pole no - 6	12 m.	10 m	H = 10	H = 10	- do -	

Manager
AKWMC

Colliery Engineer
AKWMC

Safety Officer
AKWMC

CamScanner

Illumination Survey of Departmental OCP on 24.07.2024

SL.NO	Place of Illumination Obtained	Height of light Source	Distance of light Source	Sandard of Illumination	Illumination Obtained	Types of light Provided	Remarks
3.	Shovel No-523	Machine Height	10m From the Front Side	H=15, V=25	H=22, V=31	Matel Highlight	
		— do —	20m From the Front Side	H=15, V=25	H=24, V=30	— do —	
4.	Shovel-1200	Machine Height	10m From the Front Side.	H=15, V=25	H=20, V=30	Machine light + Matel light	
		— do —	20m From the Front Side.		H=20 V=28	— do —	
5.	Shovel No-524	Machine Height	10m From the Front Side.	H=15, V=25	H=24, V=28	Machine light + Matel light.	
		— do —	20m From the Front Side.		H=22, V=30	— do —	

Manager
AKWMC

Colliery Engineer
AKWMC

Safety Officer
AKWMC

CamScanner

Illumination Survey of AMPL Hired O.C.P. on :- 25.07.2024

SL NO	Place of Illumination obtained	Height of light source	Distance of light source	Standard of Illumination	Illumination obtained	Types of light Provided	Remarks
1.	Volvo 480 VIII A Seam	machine Height	10m From the Front Side.	H=15, V=25	H=25, V=32	Machin light.	
			20m From the Front Side.	H=15, V=25	H=22, V=33	—do—	
2.	Volvo 480 VIII - B Seam.	Machine Height	10m From the Front Side.	H=15, V=25	H=27, V=32	Machin light	
			20m From the Front Side.	H=15, V=25	H=21, V=25	— do—	
3.	Haul Road.	20m	20m From the Side	H=10	H=14	LED Light	

Manager
AKWMC

Colliery Engineer.
AKWMC

Safety Officer
AKWMC

CamScanner

Illumination Survey of AMPL Hired

Q.C.P. On - 25.07.2024

SL.NO	Place of illumination obtained	Height of light Souree	Distance of light Souree	Standrad of illumination	Illumination obtained.	Types of light Provided	Remarks
4.	Volvo 480 VII-Seam top	Machine Height.	10m From the Front Side	H=15, V=25	H=19, V=28	Machine light.	
		—do—	20m From the Front side.	H=15, V=25	H=18, V=26	—do—	
5.	At Pumping Stn.	12m	20m	H=40	H=180	Tower light + Mobil High light.	
		—do—	40m.		H=120	—do—	
		—do—	50m.		H=100	—do—	
6.	Volvo 480 I Seam.	Machine Height.	10m From the Front Side.	H=15, V=25	H=27, V=32	Machine light.	
			20m From the Front Side.	H=15, V=25	H=25, V=30	—do—	

Manager
AKWMC

Colliery Engineer
AKWMC

Safety Officer
AKWMC.

Illumination Survey of Department — OCP on 22.08.2024

Sl No	Place of illumination obtained	Height of light Source	Distance of light Source	Standard of illumination	Illumination obtained	Types of light Provided.	Remarks.
1.	Haul Road						
	Pole no-1	12 m	10m	H = 10	11	LED light	
	Pole no-2	12 m	10m	H = 10	12	"	
	Pole no-3	12 m	10m	H = 10	10	"	
	Pole no-4	12 m	10m	H1 = 10	13	"	
	Pole no-5	12m	10m	H = 10	11	"	
	Pole no-6	12 m	10m	H = 10	12	"	
2.	Shovel No-523	Machine Height	10m From the Front Side	H=15, V=25	H=25, V=34	Mated High light.	
		— do —	20m From the Front Side.	H=15, V=25	H=24, V=30	— do —	
		— do —	25 m From the Front Side	H=15, V=25	H=17, V=25	— do —	

Manager
AKWMC

Colliery Engineer
AKWMC

Safety officer.
AKWMC

Illumination Survey of Department OCP on 22.08.2024

SL No.	Place of illumination obtained	Height of light Source	Distance of light Source	Standard of illumination	illumination obtained	Types of light Provided	Remarks.
3.	Shovel 524	Machine Hight.	10m From the Front Side.	H=15, V=25	H=22, V=32	Machine light + Matel light.	
		— do —	20m From the Front-Side	H=15, V=25	H=23, V=30	— do —	
4.	Shovel 1200	Machine Hight.	10m From the Front Side.	H=15, V=25	H=20, V=30	Machine light + Matel light.	
		— do —	20m From the Front Side.	H=15, V=25	H=18, V=27	— do —	
5.	Coal Dump 33A	12m	25	H=15, V=15	H=18, V=17		
	center	10m	20		H=15, V=16		
	Junction Point	12m	20		H=20, V=18		

Manager
AKWMC

Colliery Engineer.
AKWMC

Safety officer.
AKWMC.

CamScanner

Illumination Survey of AMPL Hired OCP. on - 23.8.24

SL No.	Place of Illumination obtained.	Height of light Source.	Distance of light Source.	Standard of Illumination.	Illumination obtained.	Types of light Provided.	Remarks.
1.	Haul Road. (Top Bench)	20m	20m From the Side.	H = 10	H = 12	LED Light	
2.	Haul Road (5 Seam Bench)	30m	10m From the Side.	H = 10	H = 11	LED Light.	
3.	Volvo 480 VIII A Seam	Machine Hight	10m From the Front Side.	H=15, V=25	H=22, V=31	Machine Light.	
4.	Volvo 480 VIII - B Seam.	Machine Hight	10m From the Front Side	H=15, V=25	H=25, V=35	Machine light.	
5,	Volvo 480 VII - Seam top	Mchine Hight.	10m From the Front Side	H=15, V=25	H=20, V=30	Machine light	

Manager
AKWMC

Colliery Engineer.
AKWMC.

Safety Officer
AKWMC.

Illumination Survey of AMPL Hired

Ocp. on - 23.08.24

Sl.No	Place of Illumination obtained	Height of light Source.	Distance of light Source.	Standard of Illumination	Illumination obtained.	Types of light Provied	Remarks.
6.	At. Pumping Stn.	12 m	20m	H=40	H = 170	Tower light + Mated Highlight	
	- do -	do	30m	H=40	H= 150	-do-	
	- do -	do	40m	H=40	H = 140	-do-	
7.	Volvo 480 ∇ Seam	Machine Hight	10m From the Front Side.	H=15, V=25	H=22, V=32	Machine light.	
			20m From the Front Side	H=15, V=25,	H=18, V=27	Machine light.	

Manager
AKWMC

Colliery Engineer
AKWMC

Safety Officer
AKWMC

Illumination Survey of Departmental OCP

Dated on 24.09.24

Sl. NO.	Place of Illumination obtained	Height of light Source	Distance of light Source	Standard of Illumination	Illumination Obtained	Types of light Provied	Remarks.
1.	Haul Road						
	Pole no-1	12 m	10m	H = 10	12	LED light	
	Pole no- 2	12 m	10m	H = 10	14	"	
	Pole no- 3	12 m	10m	H = 10	11	"	
	Pole no- 4	12 m	10m	H = 10	07	"	LED Bulb maybe Fuse.
	Pole no- 5	12 m	10m	H = 10	13	"	
	Pole no- 6	12 m	10m	H = 10	12	"	
2.	Shovel NO-523	Machine Height	10m From the Front side.	H=15, V=25	H=22 V=35	Mafel High light	
		- do -	20m From the Front Side	H=15 V=25	H=20 V=30	- do -	
			25m From the Front side.	H=15 V=25	H=18 V=28	- do -	

Manager
AKWMC

Colly. Engr
Colliery Eng.
AKWMC

Safety Officer
AKWMC

Illumination Survey of Departmental OCP

Dated on- 24.09.24

SL.NO.	Place of Illumination Obtained	Height of light Source	Distance of light Source	Standard of Illumination	Illumination Obtained	Types of light Provided	Remarks
3.	Shovel 1000-6	Machine Hight	10m From the Front side.	H=15 V=25	H=15 V=25	Machine light-	
		- do -	15m From the Front Side	H=15 V=25	H=12 V=20	- do -	
4.	Shovel 1200	Machine-Hight	10m From the Front Side	H=15 V=25	H=22 V=30	- do -	
5.	Shovel 524	Machine Hight	10m From the Front side	H=15 V=25	H=25 V=35	- do -	

Manager
AKWMC

Colliery Engg
AKWMC

Safety Officer
AKWMC

Illumination Survey of AMPL

Hired Patch on – 25.09.24

Sl. No.	Place of Illumination obtained	Hight of light Source	Distance of light Source	Standard of Illumination	Illumination obtained	Types of light Provided.	Remarks.
1.	Haul Road Top Bench	20m	20m From the Side	H = 10	H = 15	LED light	
2.	Haul Road (5 Seam Bench)	30m	15 m From the Side	H = 10	H = 12	LED light	
3.	Haul Road (7 Seam Bench)	20m	15m From the Side.	H = 10	H = 16	LED light	
4.	Volvo 480 VIII - Seam (A)	Machine Hight.	10m From the Front Side.	H = 15 V = 25	H = 21 V = 30	Machine light.	
5.	Volvo 480 VIII - Seam (B)	Machine Hight	10m From the Front Side.	H = 15 V = 25	H = 18 V = 28	Machine light	
6.	Volvo 480 VII - Seam top	Machine Hight.	10m From the Front Side	H = 15 V = 25	H = 19 V = 30	Machine light.	

Manager
AKWMC

Colliery Eng.
AKWMC

Safety officer
AKWMC

CamScanner

Illumination Survey of AMPL Hired Patch on- 25.09.24

SL.NO.	Place of Illumination obtained	Hight of light Source	Distance of light Source.	Standard of Illumination	Illumination obtained	Types of light Provided	Remarks.
1.	At. Pumping Stn.	12m	20m	H=40	130	Twon light + Mated Highlight.	
	- do -	- do -	25m	H=40	128	- do -	
	- do -	- do -	30m	H=40	125	- do -	
	- do -	- do -	40m	H=40	120	- do -	

Manager
AKWMC

Colliery Engr.
AKWMC

Safety Officer
AKWMC.

Illumination survey of Tatulmari Hired Patch on – 26.09.24

S.L.No.	Place of Illumination obtaind	Hight of light Source	Distance of light Source	Standard of illumination	Illumination obtained	Types of light Provied	Remarks
1.	Hitachi - 470 VII Seam.	Machine Hight.	10m From the Front Side.	H = 15 V = 25	H = 20 V = 28	Machine light.	
2.	Hitachi- 470 Top Bench.	Machine Hight	10m From the Front Side.	H = 15 V = 25	H = 18 V = 30	Machine light.	
3.	O.B. Dump.	~~15~~ 5m.	15m From the Front Side	H = 15 V = 15	H = 25 V = 32	DG light. LED.	

Manager
AKWMC

Colliery Engr.
AKWMC.

Safety Officer.
AKWMC.

Annexure-22

REPORT ON A BLAST INDUCED GROUND VIBRATION CONDUCTED BY IOCL AT KANTAPAHARI HIRED - BCCL

Date:-30.05.2024

INTRODUCTION

The Kantapahari hired mine is situated in Katras area of BCCL. The ground vibration monitoring is determined to know the safety of nearby structure. For measuring of ground vibration micromate of series UM10858 of make Instantel is being used.

OBJECTIVE OF THE STUDY

The primary objective of the ground vibration is the monitoring of PPV levels at the neighboring areas including villages affected by the blast induced ground vibrations.

METHODOLOGY

1. For the purpose of measuring vibrations, a Micromate seismograph named 'Instantel Micromate' is being used. The instrument has a geophone for sensing ground vibrations in the three planes viz. longitudinal, transverse and vertical. The highest of the three vibrations is recorded as the peak particle velocity measured in mm/sec.
2. For recording the PPV the instrument was placed on firm ground and the sensor was directed towards the site of blast and instrument was set continuous shot modes. Based on the trigger level, the instrument recorded the waveform including the PPV at its frequency during the blast.
3. The distance to the site of blast and the maximum charge per delay deployed were separately noted for the blast.

OBSERVATIONS

The reading was taken near to bast (Daventi pasti & Angarpathra) situated at a distance of approx 100-140mtr from the current working bench. Summarized statement of the levels of PPV, and frequency recorded during the blast and its distances from blast point are as follow

CamScanner

Sl.no	Date	PPV(mm/s)	Frequency (Hz)	Charge/ hole(kg)	Maximum charge/ delay(kg)	Distance from blast site to structure(m)	Distance from structure(m)	Remarks
1	01.05.2024	2.522	4.4	30-35	35	120	50	within the limit
2	06.05.2024	1.505	4.7	40-45	45	130	40	within the limit
3	11.05.2024	2.073	10.1	40	40	140	10	within the limit
4	17.05.2024	3.035	8.1	35	35	110	50	within the limit
5	22.05.2024	3.287	8.8	40	40	100	50	within the limit
6	29.05.2024	2.688	5.0	35	35	120	40	within the limit

CONCLUSION

In the view of above readings of ground vibration the PPVs obtained were within the permissible limit as per DGMS norms, which is safe for the nearby structure.

IOCL Representative

Blasting Officer (Kantapahari hired)

CamScanner

इंडियन ऑयल कॉर्पोरेशन लिमिटेड
मौजा-माटीगढ़ा, पो.आ.-नदखुरकी
जिला-धनबाद (झारखण्ड) पिन कोड:828307

IndianOil

Indian Oil Corporation Limited
Mouza-Matigarha, P.O.-Nadkhurkee
District-Dhanbad (Jharkhand) 828307
Phone:0326-2828235/334/365/375/39

व्यवसाय विकास समुह (एक्सप्लोसिव्स)
Business Development Group (Explosives)

IOCL/BDG/KANTAPAHARI HIRED/PPV REPORTS/MAY-2024
Date. - 30.05.2024

To,

The Blasting In charge
Kantapahari Hired
Katras Area, BCCL

Subject: - Submission of Ground vibration monitoring reports for May 2024.

Dear Sir,

We have enclosed the blast induced ground vibration monitored in the month of May 2024. The Brief summary of vibration reports are furnished in below table.

1.Sl .No	Mine Name	Date	PPV (mm/s)			ZC Frequency(HZ)			PVS(mm/s)	Dist.(Mtr)
			Tran	Vert	Long	Tran	Vert	Long		
1	Kantapahari Hired	01.05.2024	1.663	2.522	1.513	4.5	4.4	5.5	2.730	120
2	Kantapahari Hired	06.05.2024	1.505	1.009	0.725	4.7	17.4	5.1	1.560	130
3	Kantapahari Hired	11.05.2024	1.419	1.395	2.073	7.2	57	10.1	2.101	140
4	Kantapahari Hired	17.05.2024	2.128	1.947	3.035	11.1	6.3	8.1	3.518	110
5	Kantapahari Hired	22.05.2024	3.287	2.215	2.688	8.8	6.9	6.9	4.003	100
6	Kantapahari Hired	29.05.2024	2.546	1.316	2.688	3.6	7.0	5.0	3.149	120

As per your requirement the above reading has been monitored during the blasting and the copies of reports are submitted for your information and assessment.

Thanking you and assuring you of our best attention and services at all times.

Yours faithfully
For Indian Oil Corporation Limited,

Viraj
Officer (Marketing)

CamScanner

Instantel

Event Report

Trig Time	Tran at 14:42:48 May 1, 2024
Trigger Source	Geo: 0.700 mm/s, Mic: 68.95 pa.(L)
Range	Geo: 254.0 mm/s
Record Time	3.0 sec at 2048 sps
Operator Setup	Operator factory MMB

Notes
Location
Client
User Name
Seriano

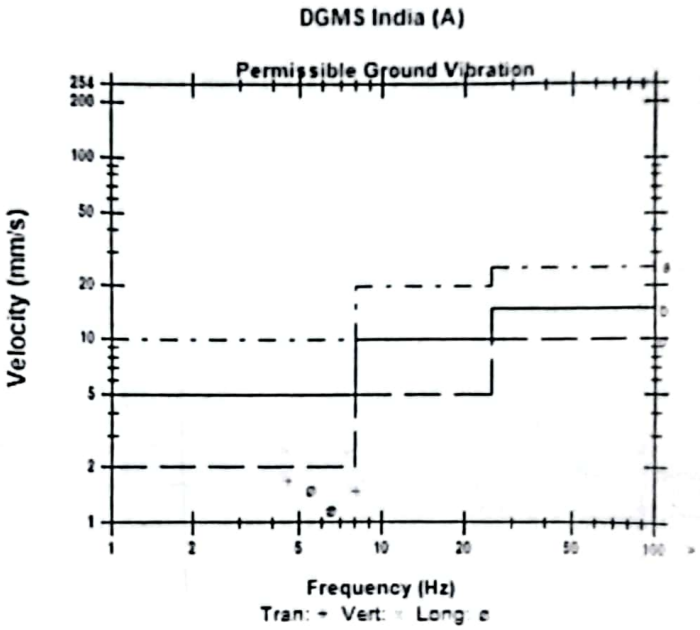
Serial Number	UM10858 V 10-77 Micromate ISEE
Battery Level	3.8 Volts
Unit Calibration	January 18, 2024 by CIMFR Dhanbad
File Name	UM10858_20230617141426.IDFW

Post Event Notes
Kantapahari hired
Distance from blasting-120mtr

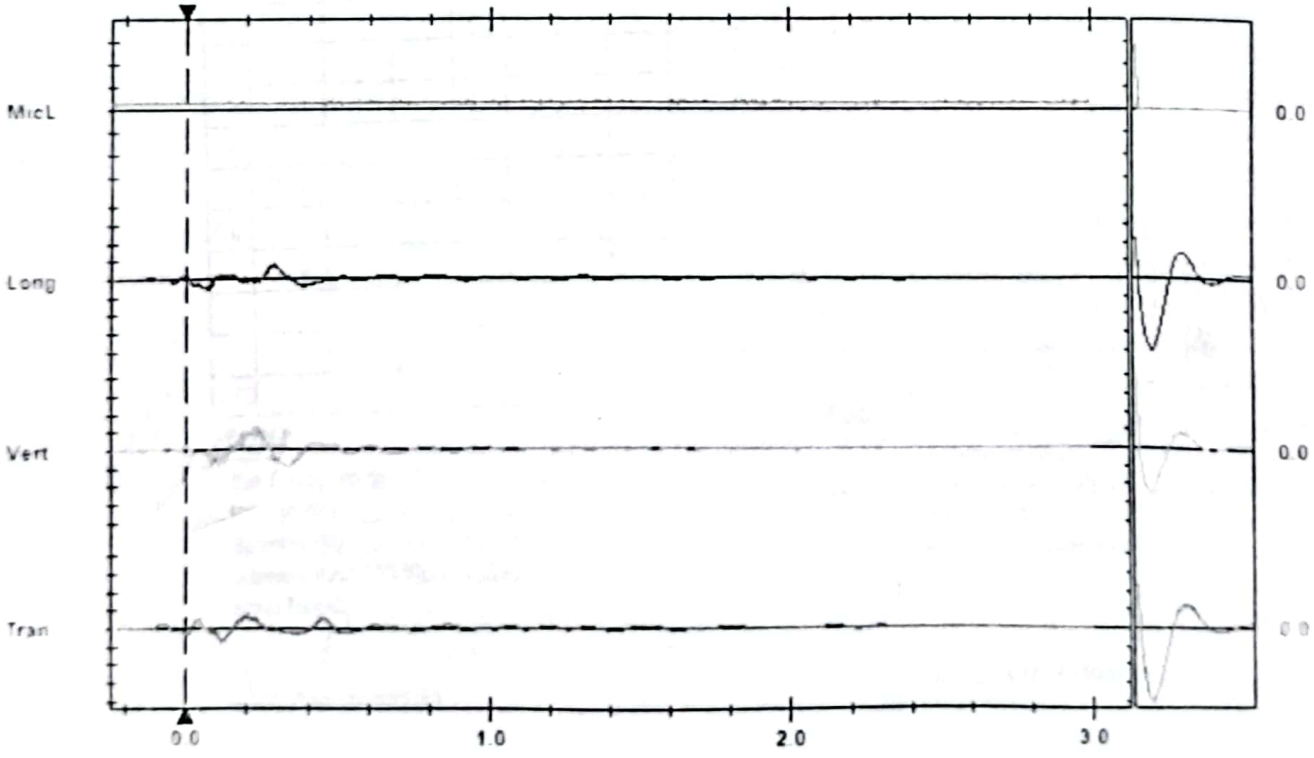
Microphone	Linear Weighting
PSPL	<0.500 pa.(L)
ZC Freq	N.A.
Channel Test	Check (Freq = 0.0 Hz Amp = 0 mv)

	Tran	Vert	Long	
PPV	1.663	2.522	1.513	mm/s
ZC Freq	4.6	4.4	5.6	Hz
Time (Rel. to Trig)	0.201	0.221	0.282	sec
Peak Acceleration	0.039	0.076	0.046	g
Peak Displacement	0.044	0.076	0.037	mm
Sensor Check	Passed	Check	Passed	
Frequency	7.5	8.2	7.7	Hz
Overswing Ratio	3.4	3.0	3.0	

Peak Vector Sum 2.730 mm/s at 0.220 sec
N.A. Not Applicable



a)Industrial Buildings
b)Domestic houses/structures
c)Historic objects, sensitive structures



Time Scale: 0.20 sec/div Amplitude Scale: Geo: 2.000 mm/s div Mic: 1.000 pa (L)/div Sensor Check

REPORT ON A BLAST INDUCED GROUND VIBRATION CONDUCTED BY IOCL AT KANTAPAHARI HIRED - BCCL

Date:-30.05.2024

INTRODUCTION

The Kantapahari hired mine is situated in Katras area of BCCL. The ground vibration monitoring is determined to know the safety of nearby structure. For measuring of ground vibration micromate of series UM10858 of make Instantel is being used.

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1. For the purpose of measuring vibrations, a Micromate seismograph named 'Instantel Micromate' is being used. The instrument has a geophone for sensing ground vibrations in the three planes viz. longitudinal, transverse and vertical. The highest of the three vibrations is recorded as the peak particle velocity measured in mm/sec.
2. For recording the PPV the instrument was placed on firm ground and the sensor was directed towards the site of blast and instrument was set continuous shot modes. Based on the trigger level, the instrument recorded the waveform including the PPV at its frequency during the blast.
3. The distance to the site of blast and the maximum charge per delay deployed were separately noted for the blast.

OBSERVATIONS

The reading was taken near to bast (Daventi pasti & Angarpathra) situated at a distance of approx 100-140mtr from the current working bench. Summarized statement of the levels of PPV, and frequency recorded during the blast and its distances from blast point are as follow

CamScanner

Sl.no	Date	PPV(mm/s)	Frequency (Hz)	Charge/ hole(kg)	Maximum charge/ delay(kg)	Distance from blast site to structure(m)	Distance from structure(m)	Remarks
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2	06.05.2024	1.505	4.7	40-45	45	130	40	within the limit
3	11.05.2024	2.073	10.1	40	40	140	10	within the limit
4	17.05.2024	3.035	8.1	35	35	110	50	within the limit
5	22.05.2024	3.287	8.8	40	40	100	50	within the limit
6	29.05.2024	2.688	5.0	35	35	120	40	within the limit

CONCLUSION

In the view of above readings of ground vibration the PPVs obtained were within the permissible limit as per DGMS norms, which is safe for the nearby structure.

IOCL Representative

Blasting Officer (Kantapahari hired)

CamScanner

इंडियन ऑयल कॉर्पोरेशन लिमिटेड
मौजा-माटीगढ़ा, पो.आ.-नदखुरकी
जिला-धनबाद (झारखण्ड) पिन कोड:828307
Indian Oil Corporation Limited
Mouza-Matigarha, P.O.-Nadkhurkee
District-Dhanbad (Jharkhand) 828307
Phone:0326-2828235/334/365/375/39

IndianOil
व्यवसाय विकास समूह (एक्सप्लोसिव्स)
Business Development Group (Explosives)

IOCL/BDG/KANTAPAHARI HIRED/PPV REPORTS/MAY-2024
Date - 30.05.2024

To,

The Blasting In charge
Kantapahari Hired
Katras Area, BCCL

Subject: - Submission of Ground vibration monitoring reports for May 2024.

Dear Sir,

We have enclosed the blast induced ground vibration monitored in the month of May 2024. The Brief summary of vibration reports are furnished in below table.

1.Sl .No	Mine Name	Date	PPV (mm/s)			ZC Frequency(HZ)			PVS(mm/s)	Dist.(Mtr)
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2	Kantapahari Hired	06.05.2024	1.505	1.009	0.725	4.7	17.4	5.1	1.560	130
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4	Kantapahari Hired	17.05.2024	2.128	1.947	3.035	11.1	6.3	8.1	3.518	110
5	Kantapahari Hired	22.05.2024	3.287	2.215	2.688	8.8	6.9	6.9	4.003	100
6	Kantapahari Hired	29.05.2024	2.546	1.316	2.688	3.6	7.0	5.0	3.149	120

As per your requirement the above reading has been monitored during the blasting and the copies of reports are submitted for your information and assessment.

Thanking you and assuring you of our best attention and services at all times.

Yours faithfully
For Indian Oil Corporation Limited,

Viraj
Officer (Marketing)

CamScanner

Event Report

Time	Tran at 14:42:48 May 1, 2024
Trigger Source	Geo: 0.700 mm/s, Mic: 68.96 pa (L)
Range	Geo: 254.0 mm/s
Record Time	3.0 sec at 2048 sps
Operator/Setup	Operator factory MMB

Notes
Location
Client
User Name
Seria

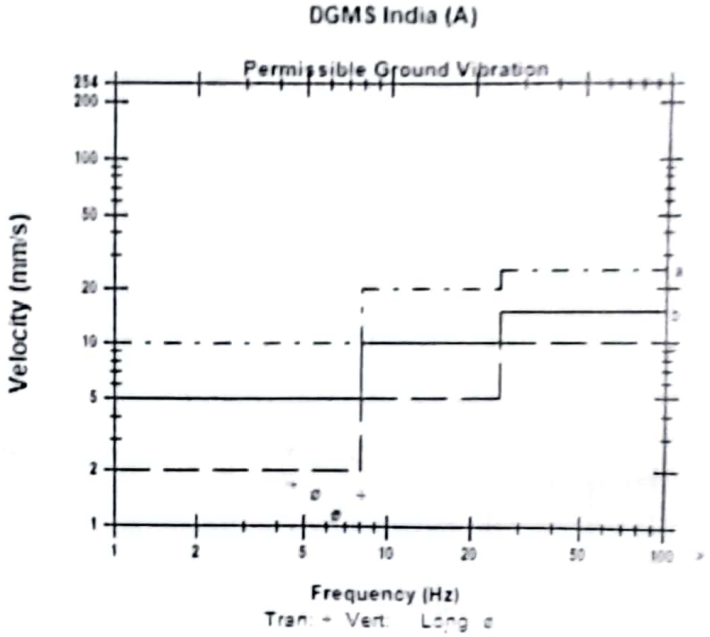
Serial Number	UM10858 V 10-77 Micromate ISEE
Battery Level	3.8 Volts
Unit Calibration	January 16, 2024 by CMRR Dhanbad
File Name	UM10858_20230617141425.IDFX

Post Event Notes
Kantapahari hired
Distance from blasting-120mtr

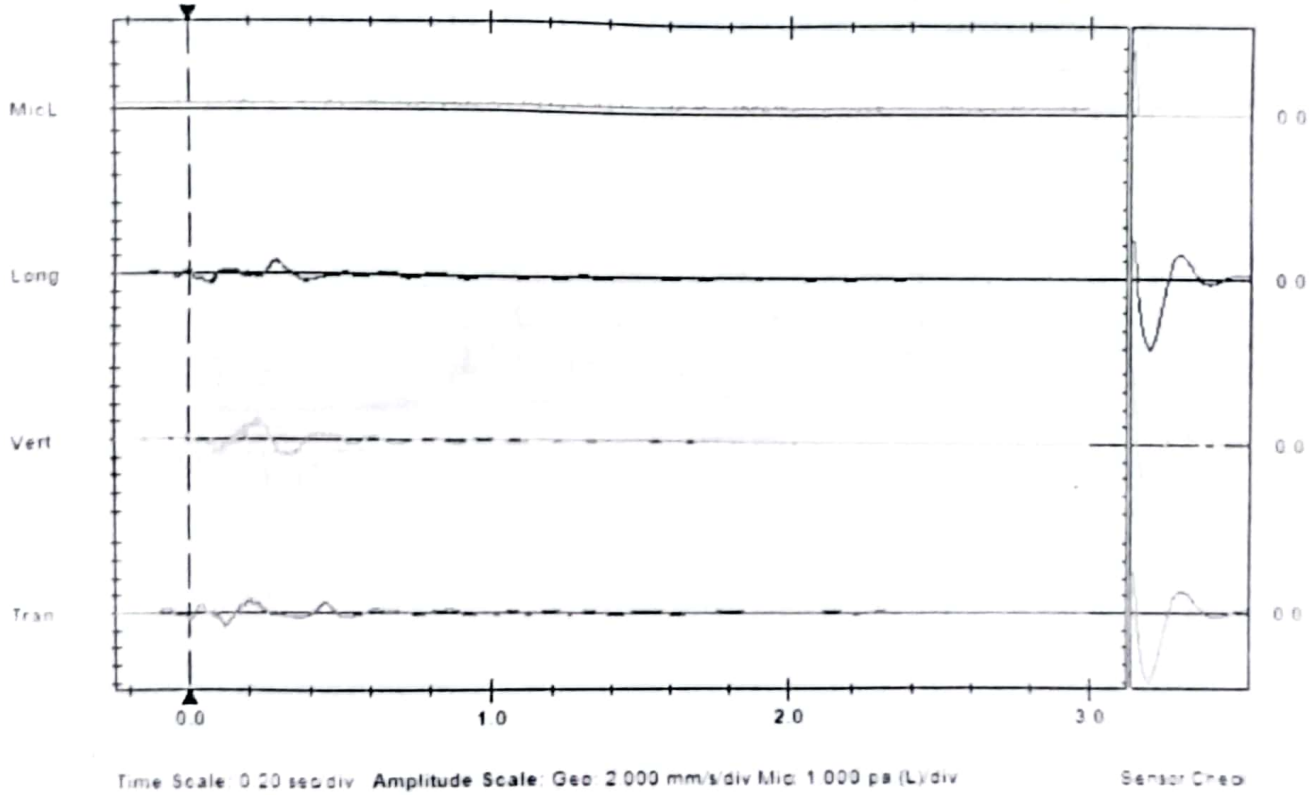
Microphone	Linear Weighting
PSPL	<0.500 pa (L)
ZC Freq	N.A.
Channel Test	Check (Freq = 0.0 Hz Amp = 0 mv)

	Tran	Vert	Long	
PPV	1.663	2.622	1.513	mm/s
ZC Freq	4.5	4.4	5.5	Hz
Time (Rel. to Trig)	0.201	0.221	0.283	sec
Peak Acceleration	0.039	0.076	0.046	g
Peak Displacement	0.044	0.076	0.037	mm
Sensor Check	Passed	Check	Passed	
Frequency	7.5	8.2	7.7	Hz
Overswing Ratio	3.4	3.0	3.0	

Peak Vector Sum: 2.730 mm/s at 0.220 sec
N.A. Not Applicable



a)Industrial Buildings
b)Domestic houses structures
c)Historic objects, sensitive structures



Time Scale: 0.20 sec/div **Amplitude Scale**: Geo: 2.000 mm/s/div Mic: 1.000 pa (L)/div Sensor Check

CamScanner

INDIAN OIL CORPORATION LIMITED

BG (Explosives), NADKHURKEE-828307

NAME OF MINE : _____ DATE : _____

BMD VEHICLE NO. _____ LOCATION : _____

DIA OF HOLE: _____ STRATA CONDITION : _____

Sl. No.	Depth (M)	Water Level (M)	Hole Temp (C)	Explosive quantity (KG)	Deck	Total	Stem Hight (M)	Sl No.	Depth (M)	Water Level (M)	Hole Temp (C)	Explosive quantity (KG)	Deck	Total	Stem Hight (M)
1															
2															
3															
4															
5															
6															
7															
8															
9															
10															
11															
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16															
17															
18															
19															
20															
21															
22															
23															
24															
25															
26															
27															
28															
29															
30															

TOTAL **TOTAL** 39 holes – 1350

Bulk Cup Density (gm/cc) _____

Burden (M) _____

Spacing (M) _____

Volume of Patch (W*L*H) _____

Blast Result _____

Booster qty (kg) _____

Total Explosive qty (kg) _____

Powder Factor (m3/kg) _____

Blasting Accessories used _____

IOCL Representatives

BCCL Representatives

CamScanner

Event Report

Time	Vert at 14:20:20 May 6, 2024
Trigger Source	Geo: 0.700 mm/s, Mic: 68.95 pa (L)
Range	Geo: 254.0 mm/s
Record Time	3.0 sec at 2048 sps
Operator/Setup	Operator/factory MMB

Notes
Location
Client
User Name
Serial #

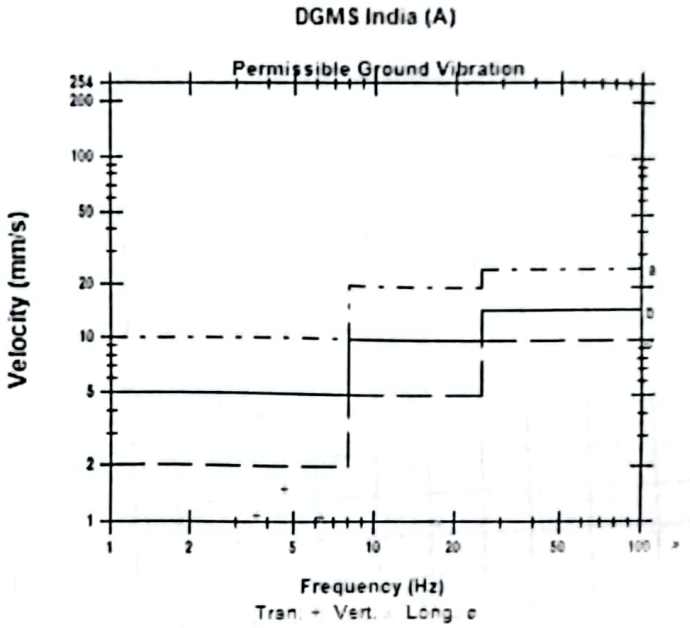
Serial Number	UM10858 V 10-77 Micromate ISEE
Battery Level	3.9 Volts
Unit Calibration	January 18, 2024 by CIMFR Dhanbad
File Name	UM10858_20230621150944.IDFW

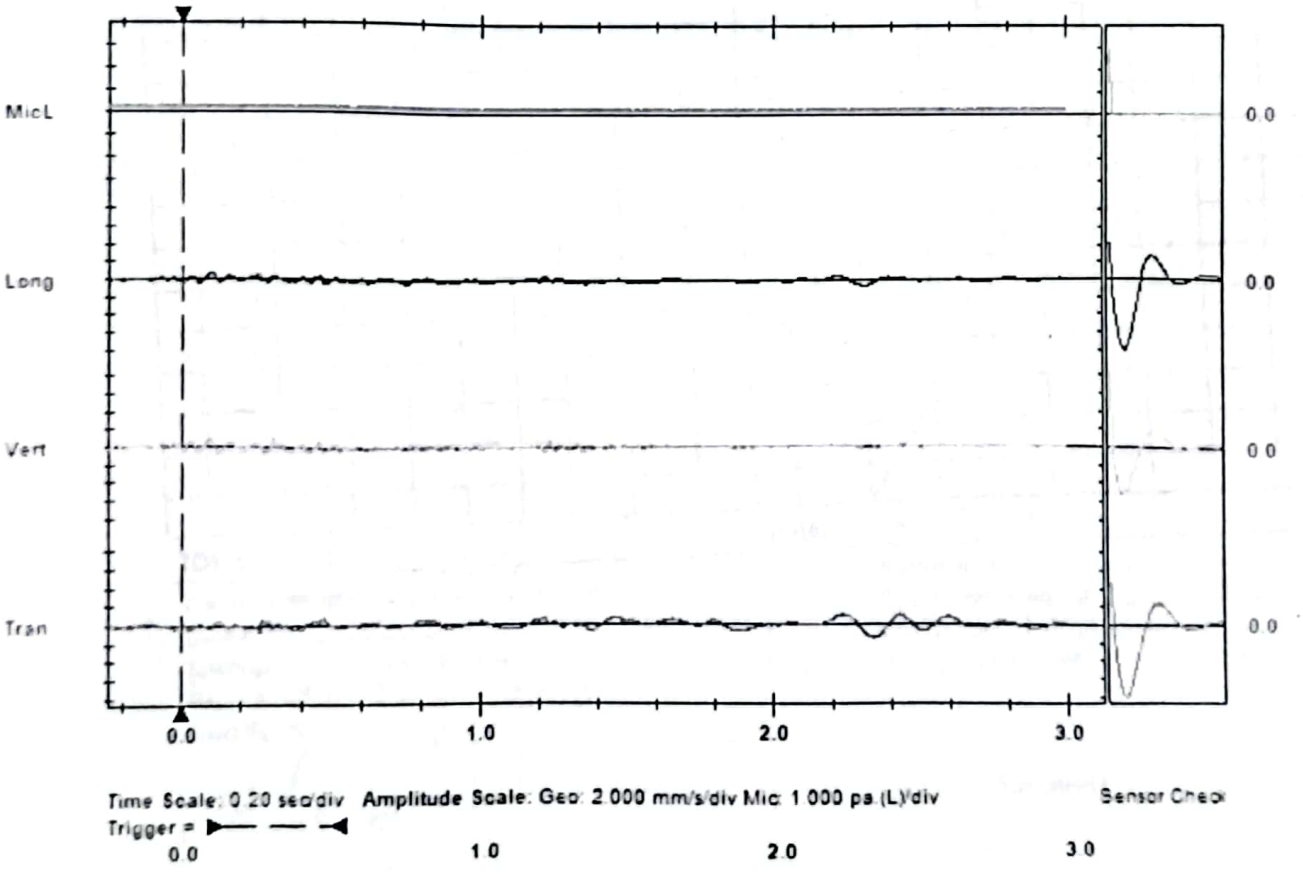
Post Event Notes
Kantapahari hired
Distance from blasting-130mtr

Microphone	Linear Weighting
PSPL	<0.600 pa (L)
ZC Freq	N.A.
Channel Test	Check (Freq = 0.0 Hz Amp = 0 mv)

	Tran	Vert	Long	
PPV	1.505	1.009	0.725	mm/s
ZC Freq	4.7	17.4	5.1	Hz
Time (Rel. to Trig)	2.339	0.274	2.314	sec
Peak Acceleration	0.026	0.030	0.018	g
Peak Displacement	0.050	0.009	0.020	mm
Sensor Check	Passed	Check	Passed	
Frequency	7.5	8.2	8.2	Hz
Overswing Ratio	3.5	3.1	3.1	

Peak Vector Sum 1.560 mm/s at 2.339 sec
N.A. Not Applicable





CamScanner

BG (E)/B-II/FORM/...

LOADING SHEET

INDIAN OIL CORPORATION LIMITED

BG (Explosives), NADKHURKEE-828307

NAME OF MINE : _____ DATE : _____

BMD VEHICLE NO. _____ LOCATION : _____

DIA OF HOLE : _____ STRATA CONDITION : _____

Sl. No.	Depth (M)	Water Level (M)	Hole Temp (C)	Explosive quantity (KG)	Deck	Total	Stem Hight (M)	Sl No	Depth (M)	Water Level (M)	Hole Temp (C)	Explosive quantity (KG)	Deck	Total	Stem Hight (M)
1								1							
2								2							
3								3							
4								4							
5								5							
6								6							
7								7							
8								8							
9								9							
10								10							
11								11							
12								12							
13								13							
14								14							
15								15							
16								16							
17								17							
18								18							
19								19							
20								20							
21								21							
22								22							
23								23							
24								24							
25								25							
26								26							
27								27							
28															

TOTAL 28 Holes — 1,160 TOTAL 27 Holes — 1110

Bulk Cup Density (gm/cc) _____

Burden (M) _____

Spacing (M) _____

Volume of Patch (W*L*H) _____

Blast Result

Booster qty (kg) _____

Total Explosive qty (kg) _____

Powder Factor (m3/kg) _____

Blasting Accessories used _____

Representatives

BCCL Representatives

CamScanner

REPORT ON A BLAST INDUCED GROUND VIBRATION CONDUCTED BY IOCL AT A K W M C - BCCL

Date: 30.05.2024

INTRODUCTION

The A K W M C mine is situated in Katras area of BCCL. The ground vibration monitoring is determined to know the safety of nearby structure. For measuring of ground vibration micromate of series UM10858 of make Instantel is being used.

OBJECTIVE OF THE STUDY

The primary objective of the ground vibration is the monitoring of PPV levels at the neighboring areas including villages affected by the blast induced ground vibrations.

METHODOLOGY

1. For the purpose of measuring vibrations, a Micromate seismograph named 'Instantel Micromate' is being used. The instrument has a geophone for sensing ground vibrations in the three planes viz. longitudinal, transverse and vertical. The highest of the three vibrations is recorded as the peak particle velocity measured in mm/sec.
2. For recording the PPV the instrument was placed on firm ground and the sensor was directed towards the site of blast and instrument was set continuous shot modes. Based on the trigger level, the instrument recorded the waveform including the PPV at its frequency during the blast.
3. The distance to the site of blast and the maximum charge per delay deployed were separately noted for the blast.

OBSERVATIONS

The reading was taken near to bast (Sijua more & Angarpathra) situated at a distance of approx 100-140mtr from the current working bench. Summarized statement of the levels of PPV, and frequency recorded during the blast and its distances from blast point are as follow

CamScanner

Sl no	Date	PPV(mm/s)	Frequency (Hz)	Charge/ hole(kg)	Maximum charge/ delay(kg)	Distance from blast site to structure(m)	Distance from structure(m)	Remarks
1	01.05.2024	1.356	33	50	50	140	10	within the limit
2	09.05.2024	1.671	13.1	170	170	130	20	within the limit
3	15.05.2024	2.286	13.8	100	100	130	20	within the limit
4	21.05.2024	2.782	7.4	90-95	95	120	30	within the limit
5	28.05.2024	2.278	10.3	160-165	165	140	10	within the limit
6	30.05.2024	1.821	4.6	180	180	100	50	within the limit

CONCLUSION

In the view of above readings of ground vibration the PPVs obtained were within the permissible limit as per DGMS norms, which is safe for the nearby structure.

IOCL Representative

Blasting Officer (A K W M C)

CamScanner

इंडियन ऑयल कॉर्पोरेशन लिमिटेड
मौजा-माटीगढ़ा, पो.आ.-नदखुरकी
जिला-धनबाद (झारखण्ड) पिन कोड:828307
Indian Oil Corporation Limited
Mouza-Matigarha, P.O.-Nadkhurkee
District-Dhanbad (Jharkhand) 828307
IndianOil
व्यवसाय विकास समूह (एक्सप्लोसिव्स)
Business Development Group (Explosives) Phone:0326-2828235/334/365/375/39

IOCL/BDG/A K W M C/PPV REPORTS/MAY-2024
Date - 30 05 2024

To,

The Blasting In charge
A K W M C
Katras Area, BCCL

Subject: - Submission of Ground vibration monitoring reports for May 2024.

Dear Sir,

We have enclosed the blast induced ground vibration monitored in the month of May 2024. The Brief summary of vibration reports are furnished in below table.

1.Sl .No	Mine Name	Date	PPV (mm/s)			ZC Frequency(HZ)			PVS(mm/s)	Dist.(Mtr)
			Tran	Vert	Long	Tran	Vert	Long		
1	A K W M C	01.05.2024	1.127	1.143	1.356	38	33	33	1.514	140
2	A K W M C	09.05.2024	1.198	0.812	1.671	12.5	8.5	13.1	1.847	130
3	A K W M C	15.05.2024	1.174	1.687	2.286	13.5	33	13.8	2.325	130
4	A K W M C	21.05.2024	2.782	1.364	1.805	7.5	12.8	8.1	3.082	120
5	A K W M C	28.05.2024	1.245	0.095	2.278	11.3	27	10.3	2.479	140
6	A K W M C	30.05.2024	1.159	0.914	1.821	7.1	11.6	4.6	2.082	100

As per your requirement the above reading has been monitored during the blasting and the copies of reports are submitted for your information and assessment.

Thanking you and assuring you of our best attention and services at all times.

Yours faithfully
For Indian Oil Corporation Limited,

Viraj
Officer (Marketing)

CamScanner

Instantel Event Report

Date/Time	Long at 14:20:34 May 1, 2024
Trigger Source	Geo: 0.700 mm/s, Mic: 68.96 pa (L)
Range	Geo: 254.0 mm/s
Record Time	3.0 sec at 2048 sps
Operator/Setup	Operator/factory MMB

Notes
Location
Client
User Name
Serial #

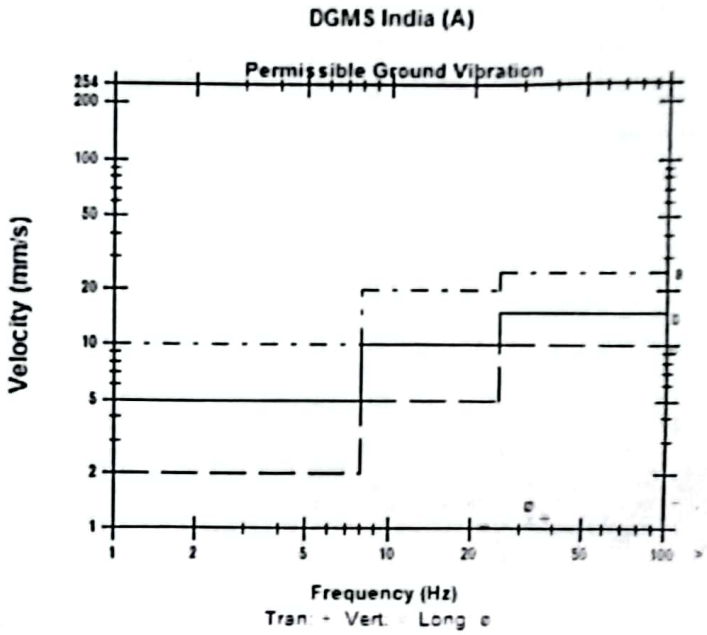
Serial Number	UM10868 V 10-77 Micromate ISEE
Battery Level	3.8 Volts
Unit Calibration	January 18, 2024 by CIMFR Dhanbad
File Name	UM10868_20230614152118.IDFW

Post Event Notes
A K W M C
Distance from blasting-140mtr

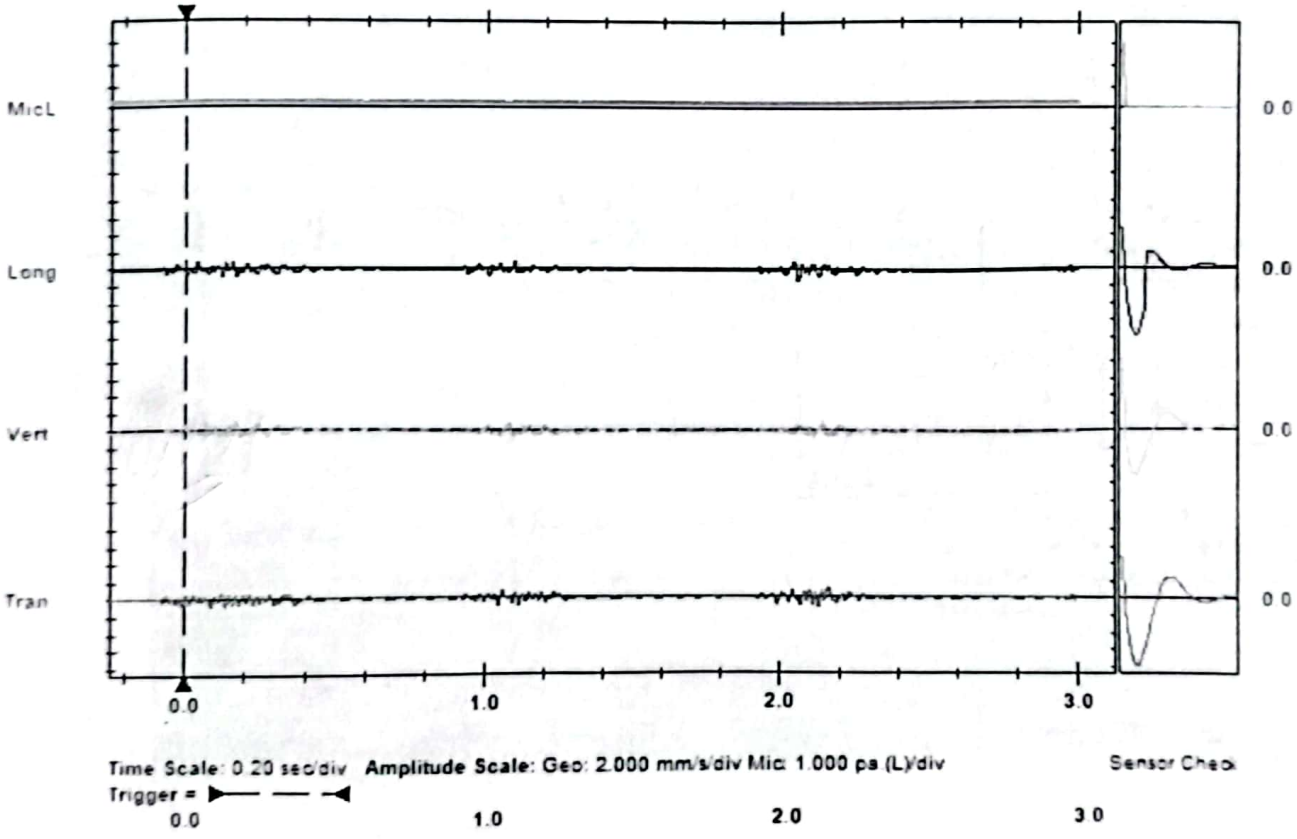
Microphone	Linear Weighting
PSPL	<0.500 pa (L)
ZC Freq	N/A
Channel Test	Check (Freq = 0.0 Hz Amp = 0 mv)

	Tran	Vert	Long	
PPV	1.127	1.143	1.356	mm/s
ZC Freq	35	33	33	Hz
Time (Rel. to Trig)	2.130	0.168	2.057	sec
Peak Acceleration	0.033	0.026	0.039	g
Peak Displacement	0.007	0.007	0.006	mm
Sensor Check	Passed	Check	Check	
Frequency	7.5	8.2	11.0	Hz
Overswing Ratio	3.4	3.0	4.4	

Peak Vector Sum 1.514 mm/s at 0.168 sec
N/A Not Applicable



a)Industrial Buildings
b)Domestic houses/structures
c)Historic objects, sensitive structures



CamScanner

LOADING SHEET
INDIAN OIL CORPORATION LIMITED
BG (Explosives), NADKHURKEE-828307

IndianOil

E OF MINE: AKWMC OCP
D VEHICLE NO: JH10BJ4098
MA OF HOLE: 110mm

DATE: 2 01/05/24
LOCATION: Jhanel Road
STRATA CONDITION: O.B

Sl. No.	Depth (M)	Water Level (M)	Hole Temp (C)	Explosive quantity (KG)	Deck	Total	Stem. Hight (M)	Sl. No.	Depth (M)	Water Level (M)	Hole Temp (C)	Explosive quantity (KG)	Deck	Total	Stem. Hight (M)
1	6.0			50											
2	6.0			50											
3	5.9			50											
4	6.0			50											
5	6.0			50											
6	5.9			50											
7	6.0			50											
8	6.0			50											
9	5.9			50											
10	6.0			50											
11	6.0			50											
12	5.9			50											
13	6.0			50											
14	6.0			50											
15	6.0			50											
16	5.9			50											
17	6.0			50											
18	6.0			50											
19	6.0			50											
20	6.0			50											
21	5.9			50											
22	6.0			50											
				1100 kg											

TOTAL **TOTAL**

Bulk Cup Density (gm/cc) 1.12gm/cc
Burden (M) 4m
Spacing (M) 4.5m
Volume of Patch (W*L*H)
Blast Result
TA3

Booster qty (kg) 2.2 kg
Total Explosive qty (kg) 1100 kg
Powder Factor (m3/kg)
Blasting Accessories used

IOCL Representatives

BCCL Representatives

CamScanner

REPORT ON A BLAST INDUCED GROUND VIBRATION CONDUCTED BY IOCL AT A K W M C - BCCL

Date - 30.05.2024

INTRODUCTION

The A K W M C mine is situated in Katras area of BCCL. The ground vibration monitoring is determined to know the safety of nearby structure. For measuring of ground vibration micromate of series UM10858 of make Instantel is being used.

OBJECTIVE OF THE STUDY

The primary objective of the ground vibration is the monitoring of PPV levels at the neighboring areas including villages affected by the blast induced ground vibrations.

METHODOLOGY

1. For the purpose of measuring vibrations, a Micromate seismograph named 'Instantel Micromate' is being used. The instrument has a geophone for sensing ground vibrations in the three planes viz. longitudinal, transverse and vertical. The highest of the three vibrations is recorded as the peak particle velocity measured in mm/sec.
2. For recording the PPV the instrument was placed on firm ground and the sensor was directed towards the site of blast and instrument was set continuous shot modes. Based on the trigger level, the instrument recorded the waveform including the PPV at its frequency during the blast.
3. The distance to the site of blast and the maximum charge per delay deployed were separately noted for the blast.

OBSERVATIONS

The reading was taken near to bast (Sijua more & Angarpathra) situated at a distance of approx 100-140mtr from the current working bench. Summarized statement of the levels of PPV, and frequency recorded during the blast and its distances from blast point are as follow

CamScanner

Sl.no	Date	PPV(mm/s)	Frequency (Hz)	Charge/ hole(kg)	Maximum charge/ delay(kg)	Distance from blast site to structure(m)	Distance from structure(m)	Remarks
1	01.05.2024	1.356	33	50	50	140	10	within the limit
2	09.05.2024	1.671	13.1	170	170	130	20	within the limit
3	15.05.2024	2.286	13.8	100	100	130	20	within the limit
4	21.05.2024	2.782	7.4	90-95	95	120	30	within the limit
5	28.05.2024	2.278	10.3	160-165	165	140	10	within the limit
6	30.05.2024	1.821	4.6	180	180	100	50	within the limit

CONCLUSION

In the view of above readings of ground vibration the PPVs obtained were within the permissible limit as per DGMS norms, which is safe for the nearby structure.

IOCL Representative

Blasting Officer (A K W M C)

CamScanner

इंडियन ऑयल कॉर्पोरेशन लिमिटेड
मौजा-माटीगढ़ा, पो.आ.-नदखुरकी
जिला-धनबाद (झारखण्ड) पिन कोड:828307

IndianOil

Indian Oil Corporation Limited
Mouza-Matigarha, P.O.-Nadkhurkee
District-Dhanbad (Jharkhand) 828307
Phone:0326-2828235/334/365/375/39

व्यवसाय विकास समूह (एक्सप्लोसिव्स)
Business Development Group (Explosives)

IOCL/BDG/A K W M C/PPV REPORTS/MAY-2024
Date - 30 05 2024

To,

The Blasting In charge
A K W M C
Katras Area, BCCL

Subject: - Submission of Ground vibration monitoring reports for May 2024.

Dear Sir,

We have enclosed the blast induced ground vibration monitored in the month of May 2024. The Brief summary of vibration reports are furnished in below table.

1.Sl .No	Mine Name	Date	PPV (mm/s)			ZC Frequency(HZ)			PVS(m m/s)	Dist.(Mtr)
			Tran	Vert	Long	Tran	Vert	Long		
1	A K W M C	01.05.2024	1.127	1.143	1.356	38	33	33	1.514	140
2	A K W M C	09.05.2024	1.198	0.812	1.671	12.5	8.5	13.1	1.847	130
3	A K W M C	15.05.2024	1.174	1.687	2.286	13.5	33	13.8	2.325	130
4	A K W M C	21.05.2024	2.782	1.364	1.805	7.5	12.8	8.1	3.082	120
5	A K W M C	28.05.2024	1.245	0.095	2.278	11.3	27	10.3	2.479	140
6	A K W M C	30.05.2024	1.159	0.914	1.821	7.1	11.6	4.6	2.082	100

As per your requirement the above reading has been monitored during the blasting and the copies of reports are submitted for your information and assessment.

Thanking you and assuring you of our best attention and services at all times.

Yours faithfully
For Indian Oil Corporation Limited,

Vijay
Officer (Marketing)

CamScanner

Event Report

Time	Long at 14:20:34 May 1, 2024
Trigger Source	Geo: 0.700 mm/s, Mic: 68.95 pa (L)
Range	Geo: 254.0 mm/s
Record Time	3.0 sec at 2048 sps
Operator/Setup	Operator factory MMB

Notes
Location
Client
User Name
General

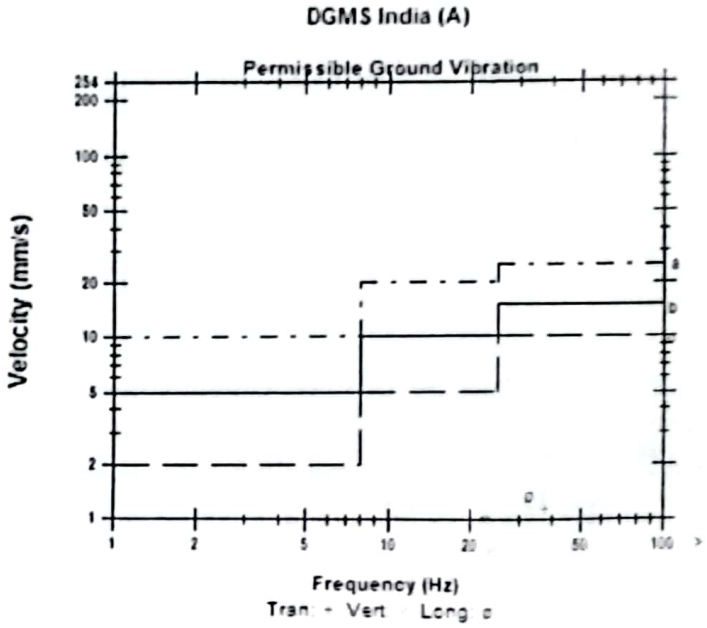
Serial Number	UM10858 V 10-77 Micromate ISEE
Battery Level	3.8 Volts
Unit Calibration	January 18, 2024 by CIMFR Dhanbad
File Name	UM10858_20230514152118.IDFW

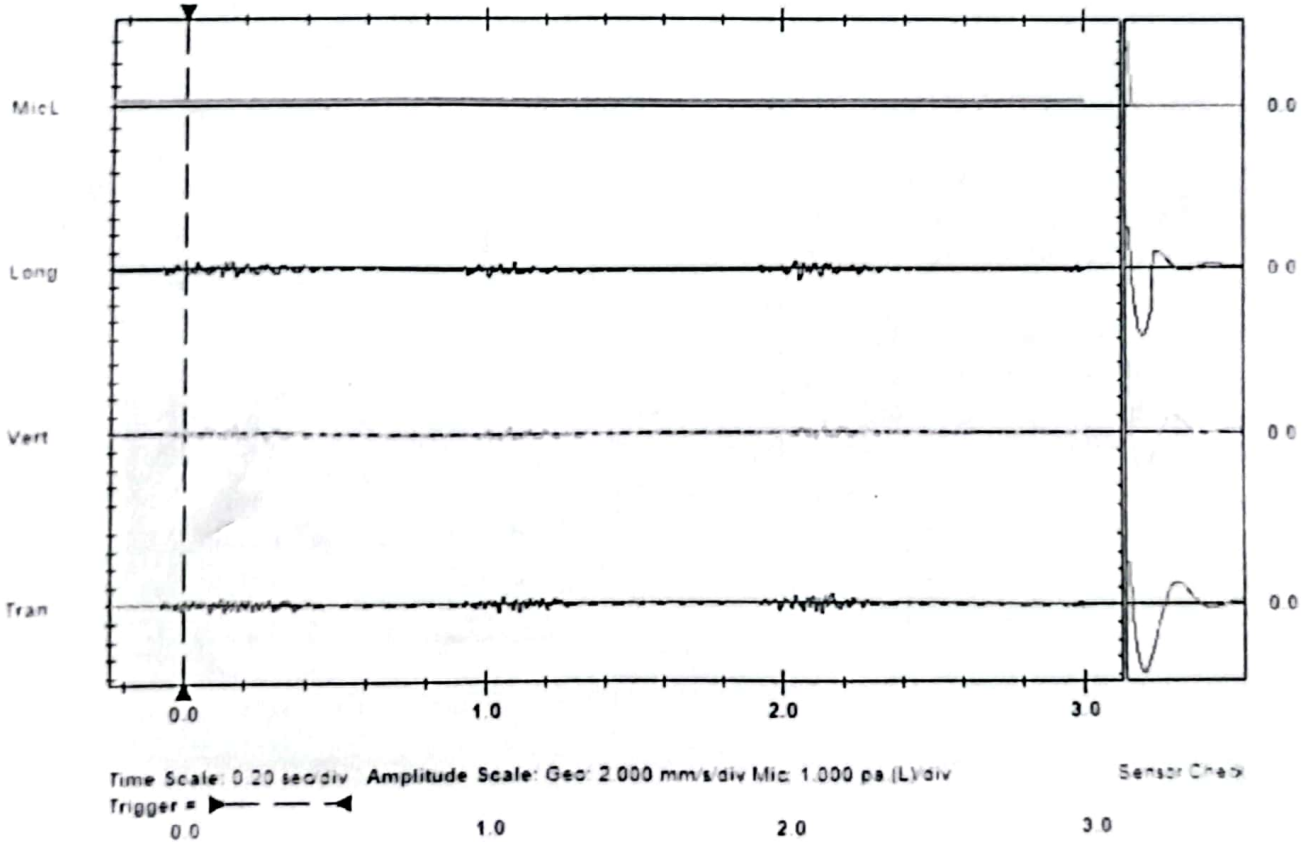
Post Event Notes
A K W M C
Distance from blasting-140mtr

Microphone	Linear Weighting
PSPL	<0.500 pa (L)
ZC Freq	N.A.
Channel Test	Check (Freq = 0.0 Hz Amp = 0 mv)

	Tran	Vert	Long	
PPV	1.127	1.143	1.356	mm/s
ZC Freq	38	33	33	Hz
Time (Rel. to Trig.)	2.130	0.168	2.057	sec
Peak Acceleration	0.033	0.026	0.039	g
Peak Displacement	0.007	0.007	0.006	mm
Sensor Check	Passed	Check	Check	
Frequency	7.5	8.2	11.0	Hz
Overswing Ratio	2.4	3.0	4.4	

Peak Vector Sum: 1.514 mm/s at 0.168 sec
N.A. Not Applicable





CamScanner

LOADING SHEET
INDIAN OIL CORPORATION LIMITED
BG (Explosives), NADKHURKEE-828307

IndianOil

E OF MINE: NAVOMI OCP
DATE: 2 01/05/24
D VEHICLE NO: MH10BJ4079
LOCATION: Shovel Bench
MA OF HOLE: 150mm
STRATA CONDITION: O.B

Sl. No.	Depth (M)	Water Level (M)	Hole Temp (C)	Explosive quantity (KG)	Deck	Total	Stem. Hight (M)	Sl. No.	Depth (M)	Water Level (M)	Hole Temp (C)	Explosive quantity (KG)	Deck	Total	Stem. Hight (M)
1	6.0			50											
2	6.0			50											
3	5.9			50											
4	6.0			50											
5	6.0			50											
6	5.9			50											
7	6.0			50											
8	6.0			50											
9	5.9			50											
10	6.0			50											
11	6.0			50											
12	5.9			50											
13	6.0			50											
14	6.0			50											
15	6.0			50											
16	5.9			50											
17	6.0			50											
18	6.0			50											
19	6.0			50											
20	6.0			50											
21	5.9			50											
22	6.0			50											
				1100 kg											

TOTAL **TOTAL**

Bulk Cup Density (gm/cc) 1.12gm/cc
Burden (M) 4m
Spacing (M) 4.5m
Volume of Patch (W*L*H)
Blast Result
TA3

Booster qty (kg) 2.2 kg
Total Explosive qty (kg) 1100 kg
Powder Factor (m3/kg)
Blasting Accessories used

IOCL Representatives

BCCL Representatives

CamScanner

REPORT ON A BLAST INDUCED GROUND VIBRATION CONDUCTED BY IOCL AT KANTAPAHARI HIRED - BCCL

Date - 30.06.2024

INTRODUCTION

The Kantapahari hired mine is situated in Katras area of BCCL. The ground vibration monitoring is determined to know the safety of nearby structure. For measuring of ground vibration micromate of series UM10858 of make Instantel is being used.

OBJECTIVE OF THE STUDY

The primary objective of the ground vibration is the monitoring of PPV levels at the neighboring areas including villages affected by the blast induced ground vibrations.

METHODOLOGY

1. For the purpose of measuring vibrations, a Micromate seismograph named 'Instantel Micromate' is being used. The instrument has a geophone for sensing ground vibrations in the three planes viz. longitudinal, transverse and vertical. The highest of the three vibrations is recorded as the peak particle velocity measured in mm/sec.
2. For recording the PPV the instrument was placed on firm ground and the sensor was directed towards the site of blast and instrument was set continuous shot modes. Based on the trigger level, the instrument recorded the waveform including the PPV at its frequency during the blast.
3. The distance to the site of blast and the maximum charge per delay deployed were separately noted for the blast .

OBSERVATIONS

The reading was taken near to basti (Angarpathra basti, kumahar basti,kacha basti) situated at a distance of approx 120-150mtr from the current working bench. Summarized statement of the levels of PPV, and frequency recorded during the blast and its distances from blast point are as follow

CamScanner

Sl.no	Date	PPV(mm/s)	Frequency (Hz)	Charge/ hole(kg)	Maximum charge/ delay(kg)	Distance from blast site to structure(m)	Distance from structure(m)	Remarks
1	02.06.2024	2.916	7.9	30-40	40	140	10	within the limit
2	05.06.2024	2.538	3.8	30	30	140	20	within the limit
3	09.06.2024	2.719	128	30-40	40	120	30	within the limit
4	12.06.2024	2.428	3.6	30	30	140	20	within the limit
5	16.06.2024	2.830	7.5	30	30	150	10	within the limit
6	22.06.2024	2.380	11.6	40-45	45	130	20	within the limit
7	27.06.2024	2.081	16.3	40-45	45	130	20	within the limit
8	30.06.2024	2.459	13.5	35-40	40	120	30	within the limit

CONCLUSION

In the view of above readings of ground vibration the PPVs obtained were within the permissible limit as per DGMS norms, which is safe for the nearby structure.

IOCL Representative

Blasting Officer (Kantapahari Hired)

CamScanner

इंडियन ऑयल कॉर्पोरेशन लिमिटेड
मौजा-माटीगढ़ा, पो.आ.-नदखुरकी
जिला-धनबाद (झारखण्ड) पिन कोड:828307
Indian Oil Corporation Limited
Mouza-Matigarha, P.O.-Nadkhurkee
District-Dhanbad (Jharkhand) 828307
Phone:0326-2828235/334/365/375/39

IndianOil
व्यवसाय विकास समूह (एक्सप्लोसिव्स)
Business Development Group (Explosives)

IOCL/BDG/KANTAPAHARI HIRED/PPV REPORTS/JUNE-2024
Date : 30.06.2024

To,

The Blasting In charge
Kantapahari Hired
Katras Area, BCCL

Subject: - Submission of Ground vibration monitoring reports for June 2024.

Dear Sir,

We have enclosed the blast induced ground vibration monitored in the month of June 2024. The Brief summary of vibration reports are furnished in below table.

1.Sl .No	Mine Name	Date	PPV (mm/s)			ZC Frequency(HZ)			PVS(mm/s)	Dist.(Mtr)
			Tran	Vert	Long	Tran	Vert	Long		
1	Kantapahari Hired	02.06.2024	1.907	0.292	2.916	8.2	4.6	7.9	3.435	140
2	Kantapahari Hired	05.06.2024	1.915	0.788	2.538	4.3	4.4	3.8	2.558	140
3	Kantapahari Hired	09.06.2024	1.521	2.719	1.632	102	128	30	2.846	120
4	Kantapahari Hired	12.06.2024	0.063	2.428	1.726	28	3.6	3.4	2.583	140
5	Kantapahari Hired	16.06.2024	2.830	0.221	1.797	7.5	114	11.0	3.230	150
6	Kantapahari Hired	22.06.2024	1.773	2.380	1.513	11.6	11.6	9.3	2.942	130
7	Kantapahari Hired	27.06.2024	1.900	2.049	2.081	18.3	8.8	16.3	2.684	130
8	Kantapahari Hired	30.06.2024	1.403	1.868	2.459	106	9.9	13.5	2.826	120

As per your requirement the above reading has been monitored during the blasting and the copies of reports are submitted for your information and assessment.

Thanking you and assuring you of our best attention and services at all times.

Yours faithfully
For Indian Oil Corporation Limited,

Suraj
Officer (Marketing)

CamScanner

Instantel

Event Report

Date/Time: Long at 14:20:44 June 2, 2024
Trigger Source: Geo: 0.700 mm/s
Range: Geo: 254.0 mm/s
Record Time: 3.0 sec at 2048 sps
Operator/Setup: Operator factory.MMB

Notes
Location:
Client:
User Name:
Details:

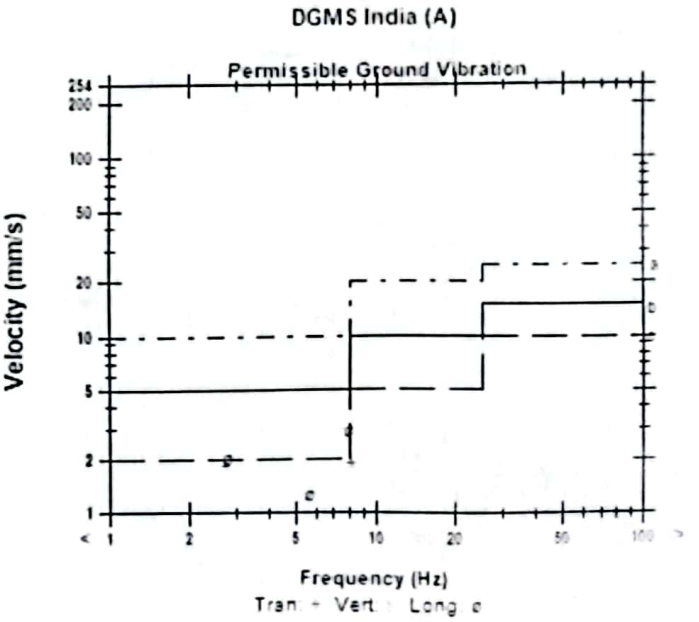
Serial Number UM16971 V 10-69 Micromate ISEE
Battery Level 3.8 Volts
Unit Calibration October 21, 2024. by UES New Delhi
File Name UM16971_20210823132043.IDFW

Post Event Notes
Kantapahari hired
Distance from blasting-140mtr

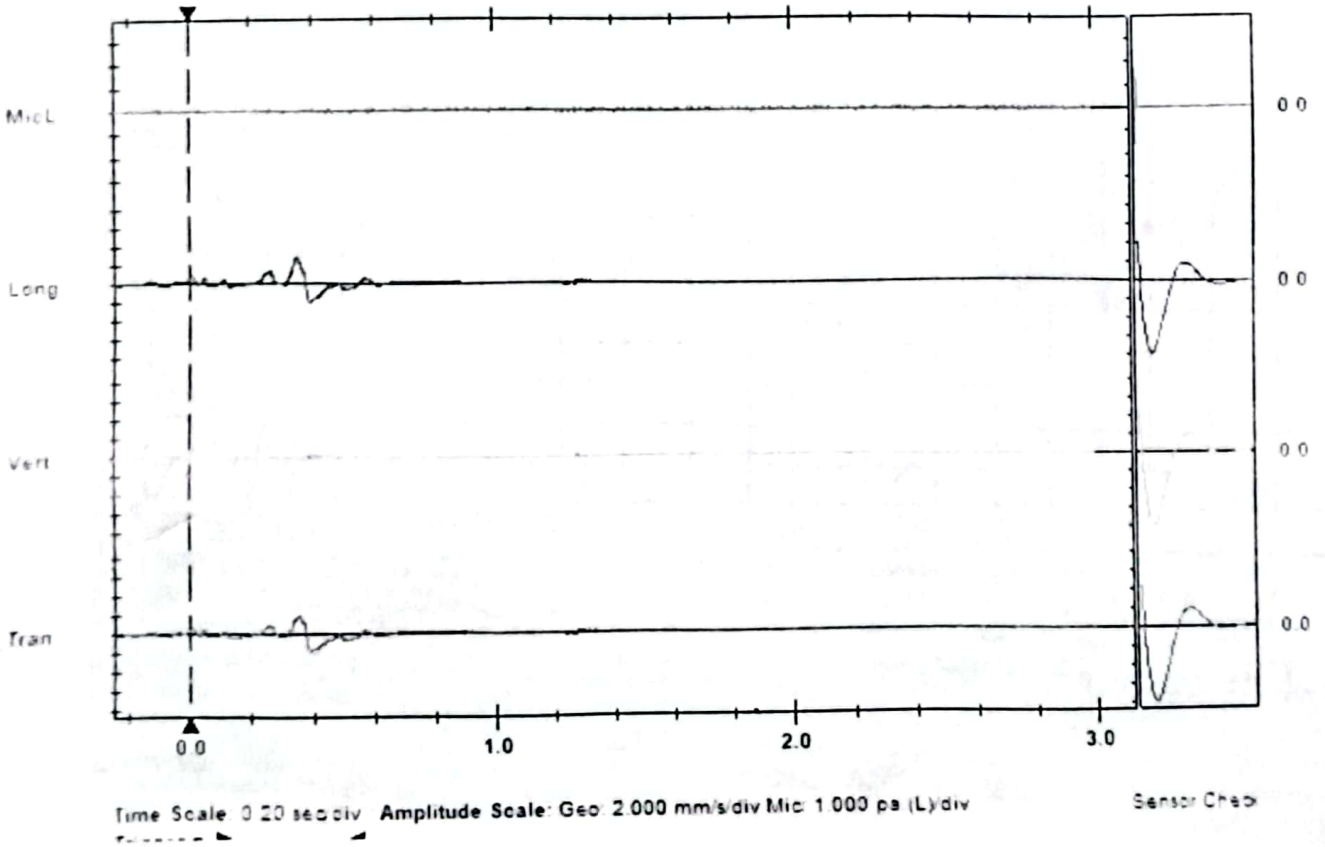
Microphone: Linear Weighting
PSPL: <0.500 pa (L)
ZC Freq: >200 Hz
Channel Test: Check (Freq = 0.0 Hz Amp = 0 mv)

	Tran	Vert	Long	
PPV	1.907	0.292	2.916	mm/s
ZC Freq	8.2	4.6	7.9	Hz
Time (Rel. to Trig)	0.355	0.465	0.348	sec
Peak Acceleration	0.031	0.016	0.031	g
Peak Displacement	0.071	0.014	0.065	mm
Sensor Check	Passed	Passed	Passed	
Frequency	7.3	7.3	7.5	Hz
Overswing Ratio	4.3	4.7	4.6	

Peak Vector Sum: 3.435 mm/s at 0.348 sec
N/A: Not Applicable



a)Industrial Buildings
b)Domestic houses structures
c)Historic objects, sensitive structures



Time Scale: 0.20 sec/div Amplitude Scale: Geo: 2.000 mm/s/div Mic: 1.000 pa (L)/div Sensor Chec

LOADING SHEET
INDIAN OIL CORPORATION LIMITED
BG (Explosives), NADKHURKEE-828307

IndianOil

NAME OF MINE : Kandhalari Hill
DATE : 11/07/24
BMD VEHICLE NO: TN 10 BY 0879
LOCATION : Blast Mark
DIA OF HOLE: 150MM
STRATA CONDITION : Hard

Sl. No.	Depth (M)	Water Level (M)	Hole Temp (C)	Explosive quantity (KG)	Deck	Total	Stem. Hight (M)
1	5.3			40			
2	5.3			40			
3	5.3			40			
4	5.0			40			
5	5.2			40			
6	5.3			40			
7	5.3			40			
8	5.1			40			
9	5.3			40			
10	5.2			40			
11	5.3			40			
12	5.3			40			
13	5.3			40			
14	5.3			40			
15	5.3			40			
16	5.3			40			
17	5.3			40			
18	5.3			40			
19	5.2			40			
20	5.1			40			
21	5.2			40			
22	5.2			40			
23	5.1			40			
24	5.2			40			
25	5.1			40			
26	5.2			40			
27	5.3			40			
28	5.2			40			

TOTAL 28 holes - 1120

Sl. No.	Depth (M)	Water Level (M)	Hole Temp (C)	Explosive quantity (KG)	Deck	Total	Stem. Hight (M)
1	4.5			30			
2	4.5			30			
3	4.5			30			
4	4.5			30			
5	5.0			30			
6	5.0			30			
7	4.5			30			
8	5.0			30			
9	4.5			30			
10	5.0			30			
11	4.5			30			
12	4.5			30			
13	5.0			30			
14	5.0			30			
15	4.5			30			
16	5.0			30			
17	5.0			30			
18	4.5			30			
19	5.0			30			
20	5.0			30			
21	4.5			30			
22	5.0			30			
23	4.5			30			
24	4.5			30			
25	5.0			30			
26	5.0			30			
27	5.0			30			

TOTAL 27 holes - 810

Bulk Cup Density (gm/cc) 1.14gm/cc
Burden (M) 2.5
Spacing (M) 2.5
Volume of Patch (W*L*H)
Blast Result Good

Booster qty (kg)
Total Explosive qty (kg) 1930
Powder Factor (m3/kg)
Blasting Accessories used ED, Boosters

IOCL Representatives

BCCL Representatives

CamScanner

REPORT ON A BLAST INDUCED GROUND VIBRATION CONDUCTED BY IOCL AT A K W M C - BCCL

Date: 30.06.2024

INTRODUCTION

The A K W M C mine is situated in Katras area of BCCL. The ground vibration monitoring is determined to know the safety of nearby structure. For measuring of ground vibration micromate of series UM10858 of make Instantel is being used.

OBJECTIVE OF THE STUDY

The primary objective of the ground vibration is the monitoring of PPV levels at the neighboring areas including villages affected by the blast induced ground vibrations.

METHODOLOGY

1. For the purpose of measuring vibrations, a Micromate seismograph named 'Instantel Micromate' is being used. The instrument has a geophone for sensing ground vibrations in the three planes viz. longitudinal, transverse and vertical. The highest of the three vibrations is recorded as the peak particle velocity measured in mm/sec.
2. For recording the PPV the instrument was placed on firm ground and the sensor was directed towards the site of blast and instrument was set continuous shot modes. Based on the trigger level, the instrument recorded the waveform including the PPV at its frequency during the blast.
3. The distance to the site of blast and the maximum charge per delay deployed were separately noted for the blast.

OBSERVATIONS

The reading was taken near to bast (Sijua more & Angarpathra) situated at a distance of approx 110-160mtr from the current working bench. Summarized statement of the levels of PPV, and frequency recorded during the blast and its distances from blast point are as follow

CamScanner

Sl.no	Date	PPV(mm/s)	Frequency (Hz)	Charge/ hole(kg)	Maximum charge/ delay(kg)	Distance from blast site to structure(m)	Distance from structure(m)	Remarks
1	01.06.2024	3.405	10.6	35-40	40	120	30	within the limit
2	10.06.2024	1.970	51	30-35	35	130	20	within the limit
3	14.06.2024	1.789	6.3	185-190	190	160	40	within the limit
4	18.06.2024	3.586	24	50-55	55	130	20	within the limit
5	28.06.2024	1.813	4.7	30-35	35	130	20	within the limit
6	30.06.2024	2.144	7.2	45-50	50	110	40	within the limit

CONCLUSION

In the view of above readings of ground vibration the PPVs obtained were within the permissible limit as per DGMS norms, which is safe for the nearby structure.

IOCL Representative

Blasting Officer (A K W M C)

CamScanner

इंडियन ऑयल कॉर्पोरेशन लिमिटेड
मौजा-माटीगढ़ा, पो.आ.-नदखुरकी
जिला-धनबाद (झारखण्ड) पिन कोड:828307

IndianOil

Indian Oil Corporation Limited
Mouza-Matigarha, P.O.-Nadkhurkee
District-Dhanbad (Jharkhand) 828307
Phone:0326-2828235/334/365/375/39

व्यवसाय विकास समूह (एक्सप्लोसिव्स)
Business Development Group (Explosives)

IOCL/BDG/A K W M C/PPV REPORTS/JUNE-2024
Date - 30.05.2024

To,

The Blasting In charge
A K W M C
Katras Area, BCCL

Subject: - Submission of Ground vibration monitoring reports for June 2024.

Dear Sir,

We have enclosed the blast induced ground vibration monitored in the month of June 2024. The Brief summary of vibration reports are furnished in below table.

1.Sl .No	Mine Name	Date	PPV (mm/s)			ZC Frequency(HZ)			PVS(mm/s)	Dist.(Mtr)
			Tran	Vert	Long	Tran	Vert	Long		
1	A K W M C	01.06.2024	2.514	1.970	3.405	10.2	13.8	10.6	3.708	120
2	A K W M C	10.06.2024	1.450	0.828	1.970	23	31	51	2.115	130
3	A K W M C	14.06.2024	0.063	1.143	1.789	18.6	32	6.3	1.793	160
4	A K W M C	18.06.2024	0.071	3.586	2.948	18.0	24	1.7	3.614	130
5	A K W M C	28.06.2024	1.513	0.126	1.813	9.6	102	4.7	2.392	130
6	A K W M C	30.06.2024	2.144	2.041	2.112	7.2	5.6	8.1	3.233	110

As per your requirement the above reading has been monitored during the blasting and the copies of reports are submitted for your information and assessment.

Thanking you and assuring you of our best attention and services at all times.

Yours faithfully
For Indian Oil Corporation Limited,

Viraj
Officer (Marketing)

CamScanner

Instantel

Event Report

Date Time: Long at 14:16:52 June 1, 2024
Trigger Source: Geo: 0.700 mm/s
Range: Geo: 254.0 mm/s
Record Time: 3.0 sec at 2048 sps
Operator Setup: Operator factory MMB

Notes:
[illegible]

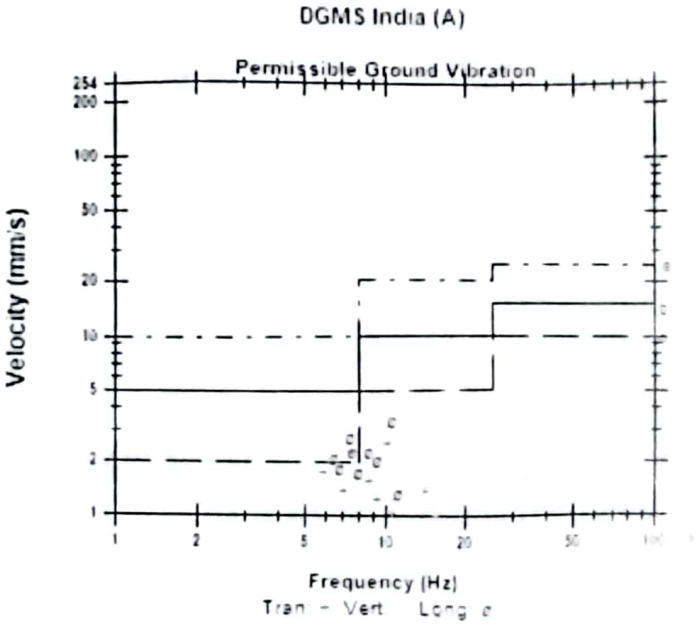
Serial Number: UM16971 V 10.99 Micromate ISEE
Battery Level: 3.8 Volts
Unit Calibration: October 21, 2024 by UES New Delhi
File Name: UM16971_20210828161659.IDFW

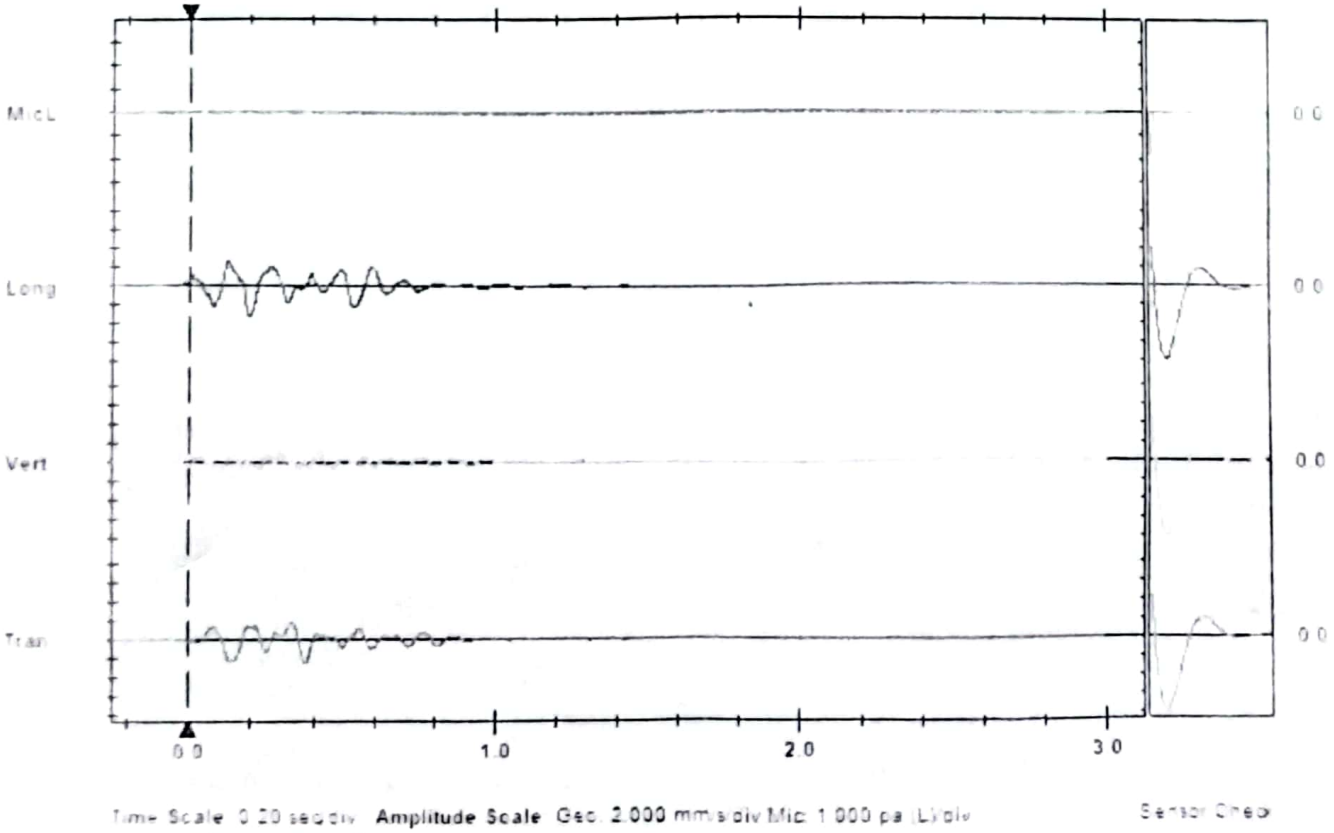
Post Event Notes
A K W M C
Distance from blasting-120mtr

Microphone: Linear Weighting
PSPL: <0.500 pa (L)
ZC Freq: >200 Hz
Channel Test: Check (Freq = 0.0 Hz Amp = 0 mv)

	Tran	Vert	Long	
PPV	2.514	1.970	3.405	mm/s
ZC Freq	10.2	13.8	10.6	Hz
Time (Rel. to Trig)	0.374	0.145	0.188	sec
Peak Acceleration	0.026	0.033	0.049	g
Peak Displacement	0.052	0.019	0.051	mm
Sensor Check	Passed	Passed	Passed	
Frequency	7.3	7.9	7.5	Hz
Overswing Ratio	4.3	4.7	4.7	

Peak Vector Sum: 3.705 mm/s at 0.188 sec
N.A. Not Applicable





Time Scale: 0.20 sec/div Amplitude Scale: Geo: 2.000 mm/s/div Mic: 1.000 pa (L)/div Sensor Check

CamScanner

BG (E)/B-II/FORM/7.5/MKT 001

LOADING SHEET

INDIAN OIL CORPORATION LIMITED

BG (Explosives), NADKHURKEE-828307

IndianOil

NAME OF MINE : AKWMC OCP

DATE : 01/06/24

BMD VEHICLE NO: MH10 BY 4116

LOCATION : Shovel Bench

DIA OF HOLE: 150 mm

STRATA CONDITION : O.B

Sl. No.	Depth (M)	Water Level (M)	Hole Temp (C)	Explosive quantity (KG)	Deck	Total	Stem. Hight (M)	Sl. No.	Depth (M)	Water Level (M)	Hole Temp (C)	Explosive quantity (KG)	Deck	Total	Stem. Hight (M)
1	6.0			40				1	6.0			40			
2	6.0			40				2	6.0			40			
3	5.9			40				3	6.0			40			
4	6.0			40				4	5.9			40			
5	6.0			40				5	6.0			40			
6	5.9			35				6	6.0			40			
7	6.0			40				7	5.9			40			
8	6.0			40				8	6.0			40			
9	5.9			40				9	6.0			40			
10	6.0			40				10	6.0			40			
11	6.0			40				11	5.9			40			
12	6.0			40				12	6.0			40			
13	5.9			40				13	6.0			40			
14	5.9			35				14	6.0			40			
15	6.0			40				15	5.4			40			
16	6.0			40				16	6.0			40			
17	5.9			40				17	6.0			40			
18	6.0			40				18	5.9			40			
19	6.0			40				19	6.0			40			
20	6.0			40				20	6.0			40			
21	5.9			35				21	6.0			40			
22	6.0			40				22	5.9			40			
23	6.0			40				23	6.0			40			
24	6.0			40				24	6.0			40			
25	5.9			35				25	5.9			40			
26	6.0			40				26	6.0			40			
27	6.0			40											
28	6.0			40								1040 kg			
29	5.0			40											
30	5.9			40											
TOTAL				1190 kg				TOTAL							

Bulk Cup Density (gm/cc) 1.12 gm/cc

Burden (M) 4 m

Spacing (M) 4.2 m

Volume of Patch (W*L*H)

Blast Result

Booster qty (kg) 5.6 kg

Total Explosive qty (kg) 2220 kg

Powder Factor (m3/kg)

Blasting Accessories used

IOCL Representatives

BCCL Representatives

CamScanner

Event Report

Date/Time	Long at 13:56:30 JULY 01,2024
Trigger Source	Geo: 0.700 mm/s Mic: 89.95 pa (L)
Range	Geo: 254.0 mm/s
Record Time	3.0 sec at 2048 sps
Operator Setup	Operator factory MMB

Serial Number	UM10858 V 10-77 Micromate ISEE
Battery Level	9.7 Volts
Unit Calibration	January 18,2024 by CMFR Chennai
File Name	UM10858_20231124135630.IDFW

Post Event Notes
KANTAPAHADI HIRED
DISTANCE FROM BLAST-100M

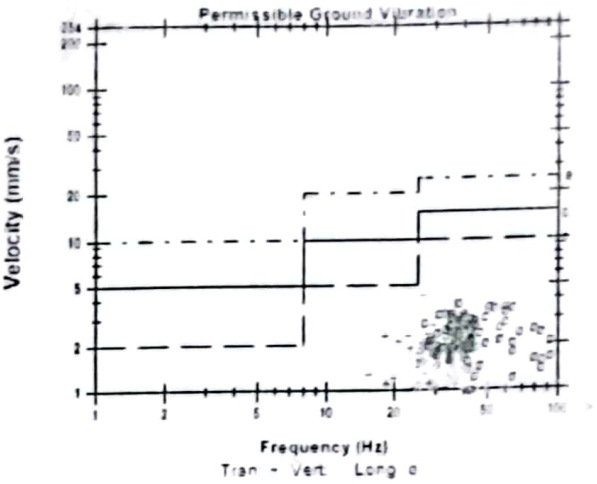
Notes
Location
Client
Job Number
Operator

Microphone Linear weighting
PSPL 40.600 pa (L)
ZC Freq N/A
Channel Test Check Freq = 0.0 Hz Amp = 0 mv

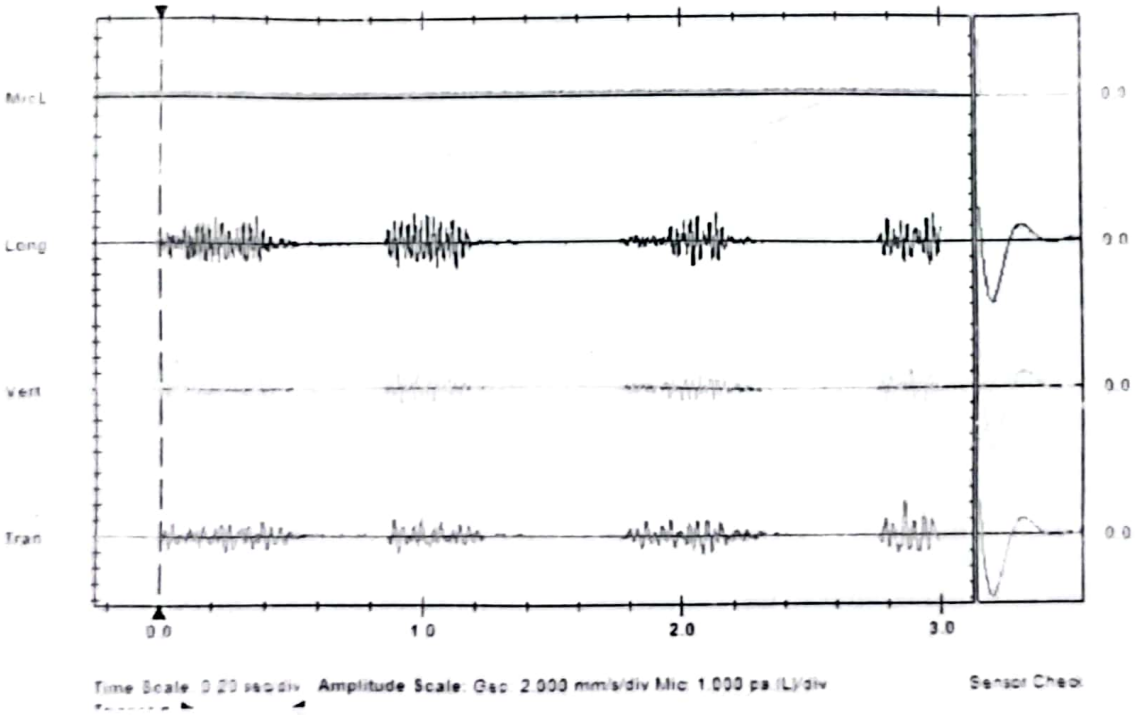
	Tran	Vert	Long	
PPV	4.481	1.630	3.799	mm/s
ZC Freq	26	33	36	Hz
Time (Rel. to Trig)	2.654	2.885	0.975	sec
Peak Acceleration	1.074	0.069	0.212	g
Peak Displacement	0.023	0.012	0.014	mm
Sensor Check	Passed	Passed	Passed	
Frequency	7.3	7.3	7.5	Hz
Overswing Ratio	4.3	4.3	4.0	

Peak Vector Sum 4.512 mm/s at 2.662 sec
N/A Not Applicable

DGMS India (A)



a)Industrial Buildings
b)Domestic houses/structures
c)Historic objects sensitive structures



Time Scale: 0.20 sec/div Amplitude Scale: Geo: 2.000 mm/s/div Mic: 1.000 pa (L)/div Sensor Check

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CamScanner

instantel

Event Report

Date Time	Unit at 14:37:44 JULY 01,2024
Trigger Source	Geo: 0.700 mm/s, Mic: 69.95 pa (L)
Range	Geo: 254.0 mm/s
Record Time	3.0 sec at 2048 sps
Operator Setup	Operator factory MMB

Notes
Client
Client
Unit Name
Serial

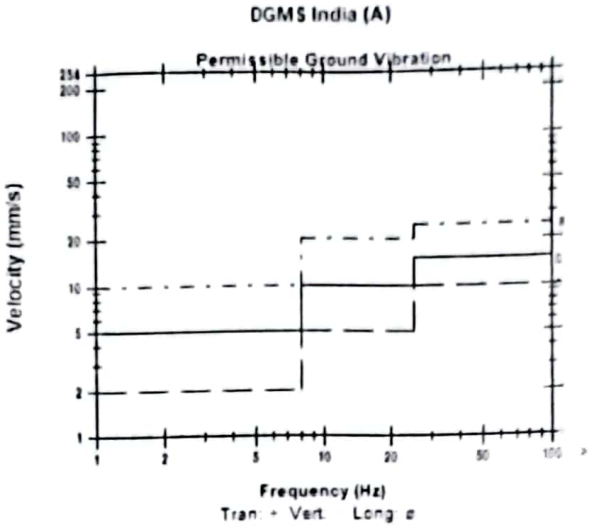
Serial Number	UM10858 V 10.77 Micromate ISEE
Battery Level	3.7 Volts
Unit Calibration	January 18,2024 by CIMFR Dhanbad
File Name	UM10858_20231204143744.IDFW

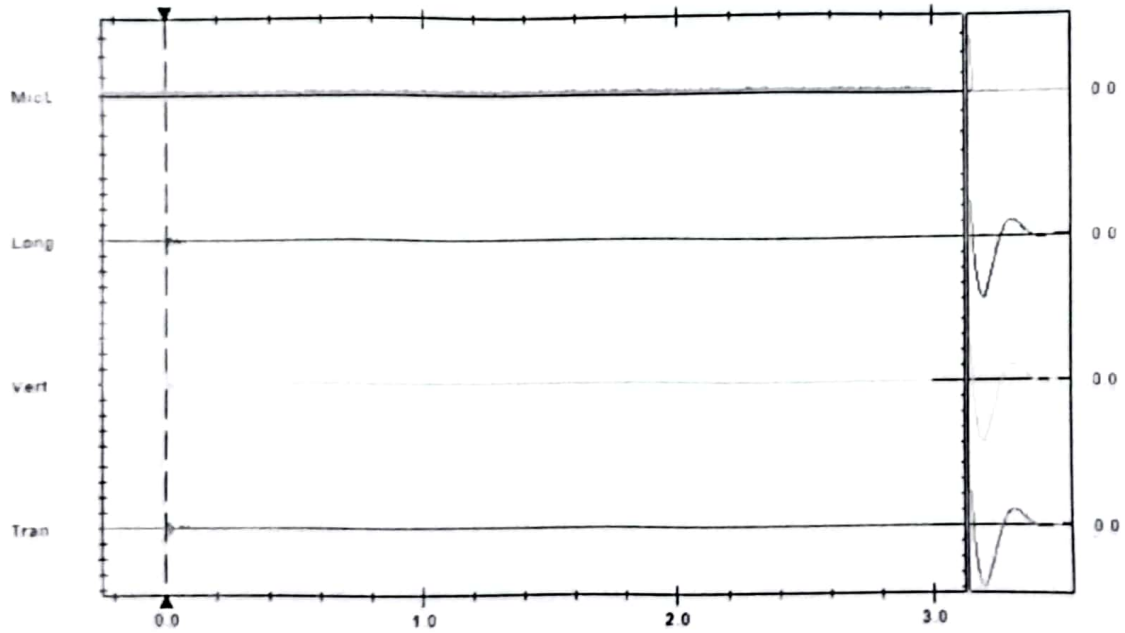
Post Event Notes
KANTAPAHADI HIRED
DISTANCE FROM BLAST- 300M

Microphone	Linear Weighting
PSPL	<0.500 pa (L)
ZC Freq	N.A.
Channel Test	Check Freq = 0.0 Hz Amp = 0 mv)

	Tran	Vert	Long	
PPV	0.938	2.270	0.485	mm/s
ZC Freq	114	>200	99	Hz
Time (Rel. to Trig)	0.005	0.004	0.004	sec
Peak Acceleration	0.089	0.299	0.041	g
Peak Displacement	0.001	0.002	0.001	mm
Sensor Check	Passed	Passed	Passed	
Frequency	7.3	7.5	7.7	Hz
Overswing Ratio	4.4	4.2	4.0	

Peak Vector Sum 2.353 mm/s at 0.004 sec
N.A. Not Applicable





Time Scale: 0.20 sec/div **Amplitude Scale:** Geo: 2.000 mm/s/div Mic: 1.000 pa (L)/div Sensor Check
Trigger =
0.0 1.0 2.0 3.0

Time Scale: 0.20 sec/div **Amplitude Scale:** Geo: 2.000 mm/s/div Mic: 1.000 pa (L)/div Sensor Check
Trigger =

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Instantel

Event Report

Setup Time	Tue at 14:48:02 JULY 01 2024
Trigger Source	Geo: 0.700 mm/s Mic: 88.96 pa (L)
Range	Geo: 254.0 mm/s
Record Time	3.0 sec at 2048 sps
Operator Setup	Operator/factory MMB

Notes
Location
Client
User Name
Serial#

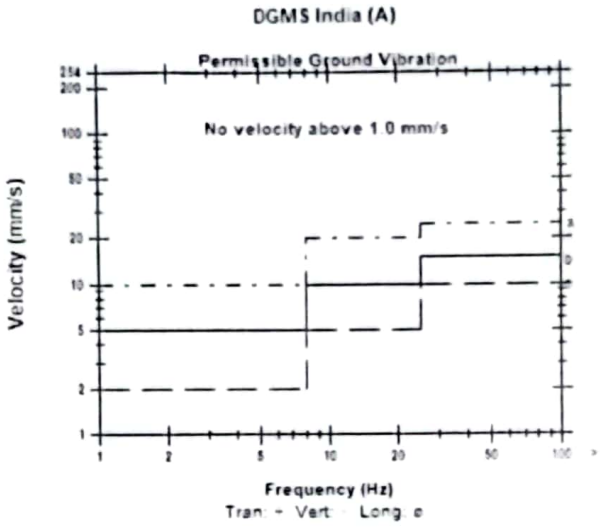
Serial Number	UM10858 V 10.77 Micromate IBEE
Battery Level	3.7 Volts
Unit Calibration	January 18 2024 by CIMFR Dhanbad
File Name	UM10858_20231217144802.IDFW

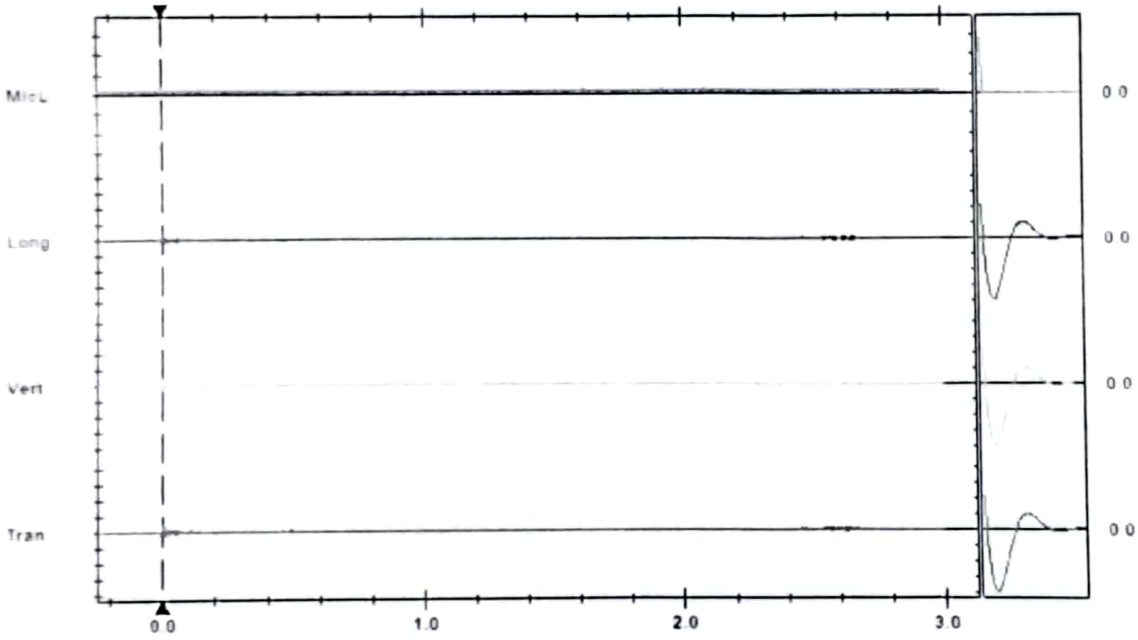
Post Event Notes
KANTAPAHADI HIRED
DISTANCE FROM BLAST- 500M

Microphone	Linear Weighting
PSPL	<0.500 pa (L)
ZC Freq	N/A
Channel Test	Check (Freq = 0.0 Hz Amp = 0 mv)

	Tran	Vert	Long	
PPV	0.820	0.236	0.504	mm/s
ZC Freq	69	114	72	Hz
Time (Rel. to Trig)	0.000	-0.004	-0.003	sec
Peak Acceleration	0.035	0.025	0.029	g
Peak Displacement	0.005	0.000	0.001	mm
Sensor Check	Passed	Passed	Passed	
Frequency	7.3	7.3	7.5	Hz
Overswing Ratio	4.3	4.3	4.1	

Peak Vector Sum 0.854 mm/s at 0.000 sec
N/A Not Applicable





Time Scale: 0.20 sec/div Amplitude Scale: Geo: 2.000 mm/s/div Mic: 1.000 pa (L)/div Sensor Check
Trigger =
0.0 1.0 2.0 3.0

Time Scale: 0.20 sec/div Amplitude Scale: Geo: 2.000 mm/s/div Mic: 1.000 pa (L)/div Sensor Check
Trigger =

CamScanner

REPORT ON A BLAST INDUCED GROUND VIBRATION CONDUCTED BY IOCL AT KANTAPAHARI HIRED - BCCL

Date:-31.07.2024

INTRODUCTION

The Kantapahari hired mine is situated in Katras area of BCCL. The ground vibration monitoring is determined to know the safety of nearby structure. For measuring of ground vibration micromate of series UM10858 of make Instantel is being used.

OBJECTIVE OF THE STUDY

The primary objective of the ground vibration is the monitoring of PPV levels at the neighboring areas including villages affected by the blast induced ground vibrations.

METHODOLOGY

1. For the purpose of measuring vibrations, a Micromate seismograph named 'Instantel Micromate' is being used. The instrument has a geophone for sensing ground vibrations in the three planes viz. longitudinal, transverse and vertical. The highest of the three vibrations is recorded as the peak particle velocity measured in mm/sec.
2. For recording the PPV the instrument was placed on firm ground and the sensor was directed towards the site of blast and instrument was set continuous shot modes. Based on the trigger level, the instrument recorded the waveform including the PPV at its frequency during the blast.

3. The distance to the site of blast and the maximum charge per delay deployed were separately noted for the blast .

OBSERVATIONS

The reading was taken near to basti (Angarpathra basti, kumahar basti,kacha basti) situated at a distance of approx 120-150mtr from the current working bench. Summarized statement of the levels of PPV, and frequency recorded during the blast and its distances from blast point are as follow

CamScanner

Sl.no	Date	PPV(mm/s)	Frequency (Hz)	Charge/ hole(kg)	Maximum charge/ delay(kg)	Distance from blast site to structure(m)	Distance from structure(m)	Remarks
1	01.07.2024	3.225	22	30	30	150	20	within the limit
2	05.07.2024	1.167	5.2	30	30	180	10	within the limit
3	10.07.2024	1.174	6.2	10	10	170	30	within the limit
4	13.07.2024	1.505	26	30	30	120	20	within the limit
5	16.07.2024	1.490	20	15-20	20	140	10	within the limit
6	18.07.2024	2.499	22	10	10	150	20	within the limit
7	27.07.2024	1.773	16.5	25	25	120	20	within the limit
8	31.07.2024	4.745	8.1	20-25	25	140	30	within the limit

CONCLUSION

In the view of above readings of ground vibration the PPVs obtained were within the permissible limit as per DGMS norms, which is safe for the nearby structure.

IOCL Representative

Blasting Officer (Kantapahari Hired)

CamScanner

इंडियन ऑयल कॉर्पोरेशन लिमिटेड
मौजा-माटीगड़ा, पो.आ.-नदखुरकी
जिला-धनबाद (झारखण्ड) पिन कोड:828307
Indian Oil Corporation Limited
Mouza-Matigarha, P.O.-Nadkhurkee
District-Dhanbad (Jharkhand) 828307
व्यवसाय विकास समूह (एक्सप्लोसिव्स) Phone:0326-2828235/334/365/375/39
Business Development Group (Explosives)

IOCL/BDG/KANTAPAHARI HIRED/PPV REPORTS/August-2024
Date : 31.07.2024

To,

The Blasting In charge
Kantapahari Hired
Katras Area, BCCL

Subject: - Submission of Ground vibration monitoring reports for August 2024.

Dear Sir,

We have enclosed the blast induced ground vibration monitored in the month of August 2024. The Brief summary of vibration reports are furnished in below table

1.Sl .No	Mine Name	Date	PPV (mm/s)			ZC Frequency(HZ)			PVS(mm/s)	Dist.(Mtr)
			Tran	Vert	Long	Tran	Vert	Long		
1	Kantapahari Hired	01.07.2024	0.063	2.648	3.255	22	29	22	3.590	150
2	Kantapahari Hired	05.07.2024	0.063	1.167	0.930	11.9	5.2	2.4	1.225	180
3	Kantapahari Hired	10.07.2024	0.899	1.167	1.174	6.6	22	6.2	1.357	170
4	Kantapahari Hired	13.07.2024	1.324	1.505	1.356	6.5	26	4.1	1.892	120
5	Kantapahari Hired	16.07.2024	1.277	1.490	1.419	6.7	20	5.2	1.782	140
6	Kantapahari Hired	18.07.2024	1.458	2.499	0.205	28	22	68	2.499	150
7	Kantapahari Hired	27.07.2024	1.245	1.773	0.181	22	16.5	11.4	1.782	120
8	Kantapahari Hired	31.07.2024	4.745	0.804	1.844	27	8.1	30	4.764	140

As per your requirement the above reading has been monitored during the blasting and the copies of reports are submitted for your information and assessment.

Thanking you and assuring you of our best attention and services at all times.

Yours faithfully
For Indian Oil Corporation Limited,

Officer (Marketing)

CamScanner

Instantel

Event Report

Date/Time Long at 13:47:22 August 01,2024
Trigger Source Geo: 0.200 mm/s
Range Geo: 254.0 mm/s
Record Time 3.0 sec at 2048 sps
Operator/Setup Operator/factory MMB

Notes
Location
Client
User Name
General

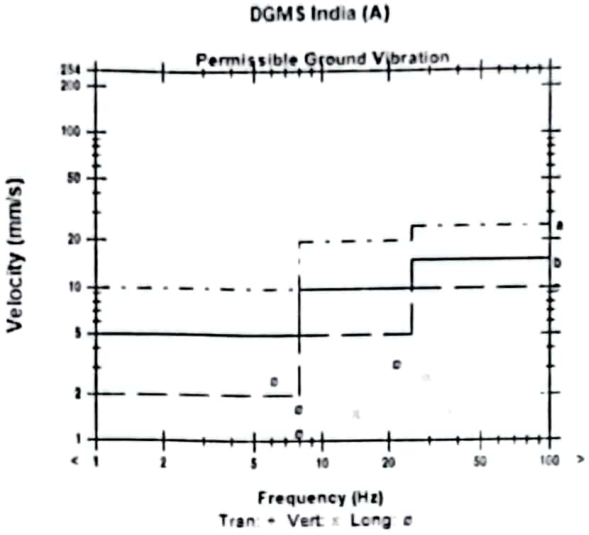
Serial Number UM16871 V 10-89 Micromate ISEE
Battery Level 3.6 Volts
Unit Calibration January 18, 2024 by CIMFR Dhanbad
File Name UM16871_20231102134722.IDFW

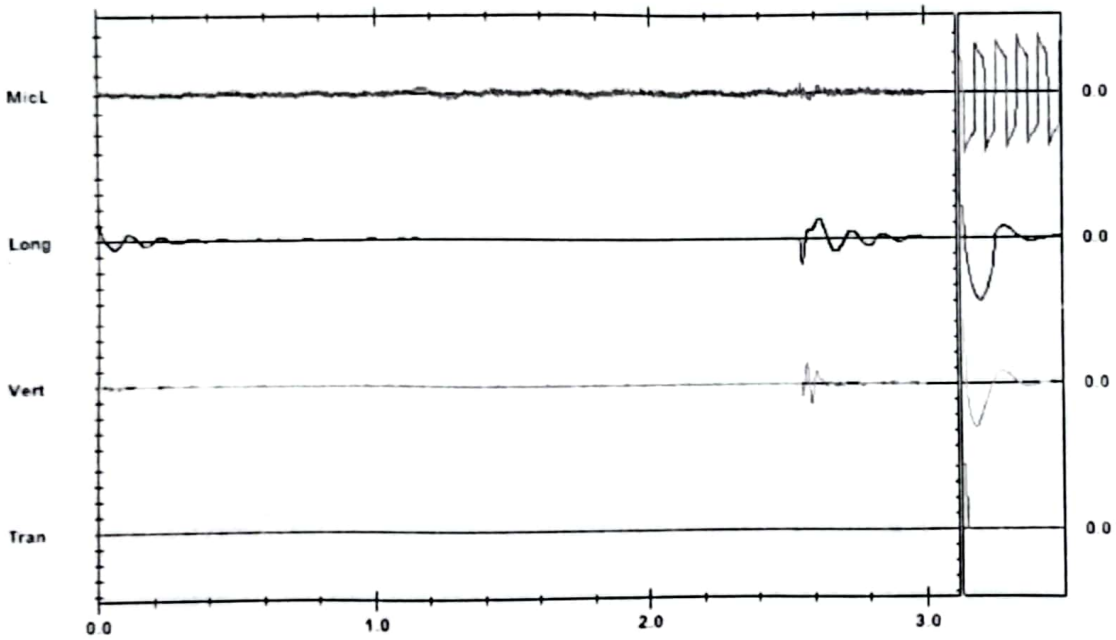
Post Event Notes
Kantapahari hired
Distance from blasting-150mtr

Microphone Linear Weighting
PSPL 0.543 pa (L) at 2.549 sec
ZC Freq 68 Hz
Channel Test Passed (Freq = 19.7 Hz Amp = 1159 mv)

	Tran	Vert	Long	
PPV	0.063	2.648	3.255	mm/s
ZC Freq	22	29	22	Hz
Time (Rel. to Trig)	2.632	2.569	2.555	sec
Peak Acceleration	0.010	0.056	0.048	g
Peak Displacement	0.000	0.059	0.059	mm
Sensor Check	Check	Check	Passed	
Frequency	1024.0	7.9	7.1	Hz
Overswing Ratio	0.0	3.8	5.7	

Peak Vector Sum 3.590 mm/s at 2.555 sec





Time Scale: 0.20 sec/div Amplitude Scale: Geo: 2.000 mm/s/div Mic: 1.000 pa (L)/div Sensor Check

Printed: September 27, 2024 (V 10.72 - 10.72)

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BG (E)/B-II/FORM/7.5/MKT 001

LOADING SHEET

INDIAN OIL CORPORATION LIMITED

BG (Explosives), NADKHURKEE-820307

IndianOil

NAME OF MINE : Kamptee Colliery

BMD VEHICLE NO: TN 19 AY 3992

DIA OF HOLE: 102mm

DATE : 01/07/24

LOCATION : Bharat Bereda

STRATA CONDITION : Hard

Sl. No	Depth (M)	Water Level (M)	Hole Temp (C)	Explosive quantity (KG)	Deck	Total	Stem Hight (M)	Sl. No	Depth (M)	Water Level (M)	Hole Temp (C)	Explosive quantity (KG)	Deck	Total	Stem Hight (M)
1	5.0			30				1	4.9			30			
2	5.0			30				2	5.0			30			
3	5.0			30				3	5.0			30			
4	5.0			30				4	5.0			30			
5	5.0			30				5	5.0			30			
6	4.9			30				6	5.0			30			
7	4.9			30				7	4.9			30			
8	5.0			30				8	4.9			30			
9	5.0			30				9	5.0			30			
10	5.0			30				10	5.0			30			
11	4.8			30				11	4.9			30			
12	4.8			30				12	5.0			30			
13	5.0			30				13	5.0			30			
14	5.0			30				14	5.0			30			
15	4.9			30				15	4.9			30			
16	5.0			30				16	5.0			30			
17	4.9			30				17	5.0			30			
18	5.0			30				18	4.9			30			
19	5.0			30				19	5.0			30			
20	4.9			30				20	5.0			30			
21	5.0			30				21	4.9			30			
22	4.9			30				22	5.0			30			
23	5.0			30				23	5.0			30			
24	4.9			30				24	4.9			30			
25	5.0			30				25	5.0			30			
26	5.0			30				26	5.0			30			
27	4.9			30				27	4.9			30			
28	5.0			30											

TOTAL 28 Holes – 840

TOTAL 27 Holes – 810

Bulk Cup Density (gm/cc) 1 Ample

Burden (M) 2.5

Spacing (M) 2.5

Volume of Patch (W*L*H)

Blast Result Good

Booster qty (kg)

Total Explosive qty (kg) 1650

Powder Factor (m3/kg)

Blasting Accessories used ED, Boosters

IOCL Representatives

BCCL Representatives

CamScanner

REPORT ON A BLAST INDUCED GROUND VIBRATION CONDUCTED BY IOCL AT A K W M C - BCCL

Date : 31.07.2024

INTRODUCTION

The A K W M C mine is situated in Katras area of BCCL. The ground vibration monitoring is determined to know the safety of nearby structure. For measuring of ground vibration micromate of series UM10858 of make Instantel is being used.

OBJECTIVE OF THE STUDY

The primary objective of the ground vibration is the monitoring of PPV levels at the neighboring areas including villages affected by the blast induced ground vibrations.

METHODOLOGY

1. For the purpose of measuring vibrations, a Micromate seismograph named 'Instantel Micromate' is being used. The instrument has a geophone for sensing ground vibrations in the three planes viz. longitudinal, transverse and vertical. The highest of the three vibrations is recorded as the peak particle velocity measured in mm/sec.
2. For recording the PPV the instrument was placed on firm ground and the sensor was directed towards the site of blast and instrument was set continuous shot modes. Based on the trigger level, the instrument recorded the waveform including the PPV at its frequency during the blast

3. The distance to the site of blast and the maximum charge per delay deployed were separately noted for the blast.

OBSERVATIONS

The reading was taken near to bast (Sijua more & Angarpathra) situated at a distance of approx 110-180mtr from the current working bench. Summarized statement of the levels of PPV, and frequency recorded during the blast and its distances from blast point are as follow

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Sl.no	Date	PPV(mm/s)	Frequency (Hz)	Charge/ hole(kg)	Maximum charge/ delay(kg)	Distance from blast site to structure(m)	Distance from structure(m)	Remarks
1	03.07.2024	1.852	49	30-35	35	180	10	within the limit
2	07.07.2024	3.042	2.6	35-60	60	140	40	within the limit
3	11.07.2024	3.003	41	45-50	50	170	10	within the limit
4.	18.07.2024	2.325	7.4	50-55	55	170	10	within the limit
5.	26.07.2024	4.753	6.8	55	55	140	40	within the limit
6	30.07.2024	3.665	7.6	35-40	40	120	20	within the limit

CONCLUSION

In the view of above readings of ground vibration the PPVs obtained were within the permissible limit as per DGMS norms, which is safe for the nearby structure.

ICCL Representative

Blasting Officer (A K W M C)

CamScanner

IndianOil

इंडियन ऑयल कॉर्पोरेशन लिमिटेड
मौजा-माटीगढ़ा, पो.आ.-नदखुरकी
जिला-धनबाद (झारखण्ड) पिन कोड:828307

Indian Oil Corporation Limited
Mouza-Matigarha, P.O.-Nadkhurkee
District-Dhanbad (Jharkhand) 828307
Phone:0326-2828235/334/365/375/39

व्यवसाय विकास समूह (एक्सप्लोसिव्स)
Business Development Group (Explosives)

IOCL/BDG/A K W M C/PPV REPORTS/August-2024
Date: - 31.07.2024

To,

The Blasting In charge
A K W M C
Katras Area, BCCL

Subject: - Submission of Ground vibration monitoring reports for August 2024.

Dear Sir,

We have enclosed the blast induced ground vibration monitored in the month of August 2024. The Brief summary of vibration reports are furnished in below table.

1.Sl.No	Mine Name	Date	PPV (mm/s)			ZC Frequency(HZ)			PVS(mm/s)	Dist.(Mtr)
			Tran	Vert	Long	Tran	Vert	Long		
1	A K W M C	03.07.2024	0.063	1.852	0.717	60	49	79	1.917	180
2	A K W M C	07.07.2024	0.055	3.042	1.592	73	2.6	79	3.047	140
3	A K W M C	11.07.2024	0.063	1.632	3.003	171	45	41	3.285	170
4	A K W M C	18.07.2024	0.055	1.608	2.325	45	29	7.4	2.328	170
5	A K W M C	26.07.2024	0.055	1.434	4.753	33	29	6.8	4.862	140
6	A K W M C	30.07.2024	0.055	1.080	3.665	35	26	7.6	3.705	120

As per your requirement the above reading has been monitored during the blasting and the copies of reports are submitted for your information and assessment.

Thanking you and assuring you of our best attention and services at all times.

Yours faithfully
For Indian Oil Corporation Limited,

Viraj
Officer (Marketing)

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Instantel

Event Report

Date Time	Vert at 14:18:47 August 03, 2024
Trigger Source	Geo: 0.200 mm/s
Range	Geo: 254.0 mm/s
Record Time	3.0 sec at 2048 sps
Operator/Setup	Operator/factory MMB

Notes
Location
Client
User Name
General

Serial Number	UM16971 V 10.69 Micromate ISEE
Battery Level	3.6 Volts
Unit Calibration	January 18 2024 by CIMFR Dhanbad
File Name	UM16971_20231101141847.IDFW

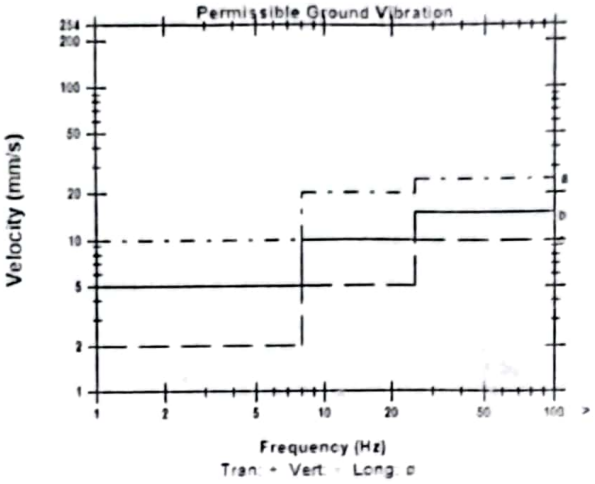
Post Event Notes
AKWMC
DIATANCE FROM BLAST- 180 mtr

Microphone	Linear Weighting
PSPL	1.800 pa (L) at 0.580 sec
ZC Freq	33 Hz
Channel Test	Passed (Freq = 19.7 Hz Amp = 1124 mv)

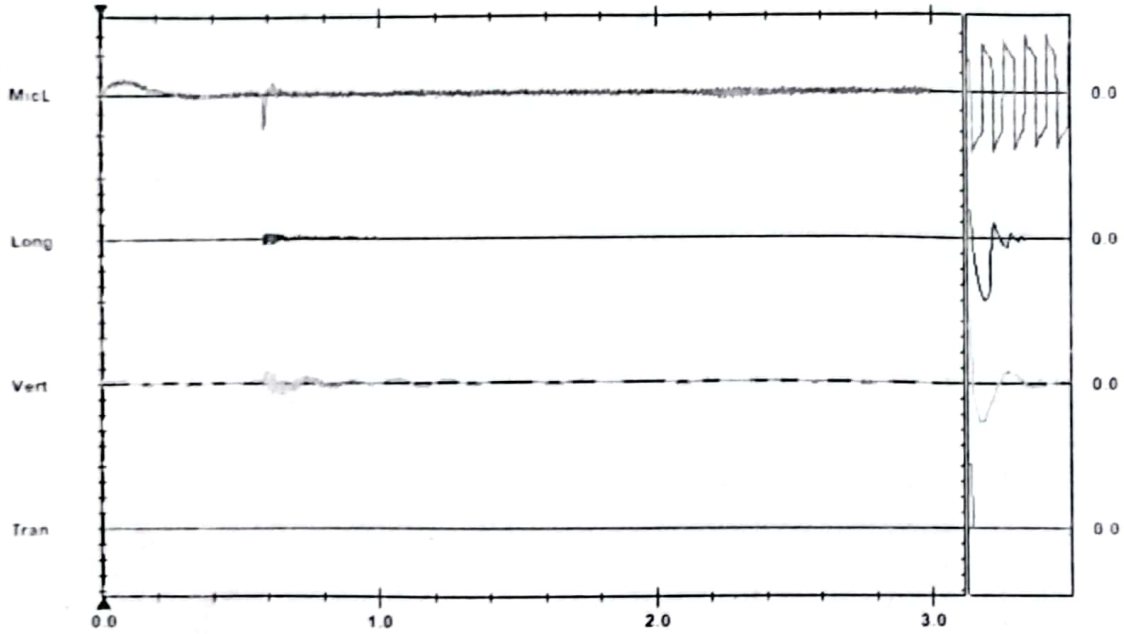
	Tran	Vert	Long	
PPV	0.063	1.852	0.717	mm/s
ZC Freq	60	49	79	Hz
Time (Rel. to Trig)	2.918	0.593	0.615	sec
Peak Acceleration	0.012	0.102	0.117	g
Peak Displacement	0.000	0.020	0.017	mm
Sensor Check	Check	Check	Check	
Frequency	1024.0	7.9	10.6	Hz
Overswing Ratio	0.0	3.6	4.0	

Peak Vector Sum 1.917 mm/s at 0.593 sec

DGMS India (A)



a)Industrial Buildings
b)Domestic houses/structures
c)Historic objects, sensitive structures



Time Scale: 0.20 sec/div Amplitude Scale: Geo 2.000 mm/s/div Mic 1.000 pa (L)/div Sensor Check
Trigger =
0.0 1.0 2.0 3.0

Time Scale: 0.20 sec/div Amplitude Scale: Geo 2.000 mm/s/div Mic 1.000 pa (L)/div Sensor Check
Trigger =

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BG (E)/B-II/FORM/7.5/MKT 001

LOADING SHEET

INDIAN OIL CORPORATION LIMITED

BG (Explosives), NADKHURKEE-828307

IndianOil

NAME OF MINE : JAKHMC OCP

DATE : 03/07/24

BMD VEHICLE NO: JH10BS 6156

LOCATION : Shovel Bench

DIA OF HOLE: 150 mm

STRATA CONDITION : Coal

Sl. No.	Depth (M)	Water Level (M)	Hole Temp (C)	Explosive quantity (KG)			Deck	Total	Stem Hight (M)	Sl. No	Depth (M)	Water Level (M)	Hole Temp (C)	Explosive quantity (KG)			Deck	Total	Stem Hight (M)
1	6.0			30						31	6.0			30					
2	6.0			35						32	5.9			30					
3	5.9			30						33	6.0			30					
4	6.0			30						34	6.0			30					
5	6.0			35						35	5.9			30					
6	5.9			30						36	5.9			20					
7	6.0			30						37	6.0			30					
8	5.9			30						38	5.9			20					
9	6.0			35															
10	6.0			30										1180 kg					
11	5.9			30															
12	5.9			30															
13	6.0			35															
14	6.0			30															
15	5.9			30															
16	5.8			30															
17	6.0			35															
18	6.0			30															
19	5.7			30															
20	6.0			30															
21	5.9			30															
22	6.0			35															
23	6.0			30															
24	5.9			30															
25	6.0			35															
26	6.0			30															
27	5.9			30															
28	6.0			30															
29	6.0			35															
30	6.0			30															
TOTAL										TOTAL									

Bulk Cup Density (gm/cc) 1.12 gm/cc

Burden (M) 5 m

Spacing (M) 5.5 m

Volume of Patch (W*L*H) _____

Blast Result

Booster qty (kg) 3.8 kg

Total Explosive qty (kg) 1180 kg

Powder Factor (m3/kg) _____

Blasting Accessories used

IOCL Representatives

BCCL Representatives

CamScanner

Instantel

Event Report

Date/Time	Vert at 14:19:11 August 07, 2024
Trigger Source	Geo: 0.200 mm/s
Range	Geo: 254.0 mm/s
Record Time	3.0 sec at 2048 sps
Operator/Setup:	Operator/factory MMB

Notes
Location
Client
User Name
General

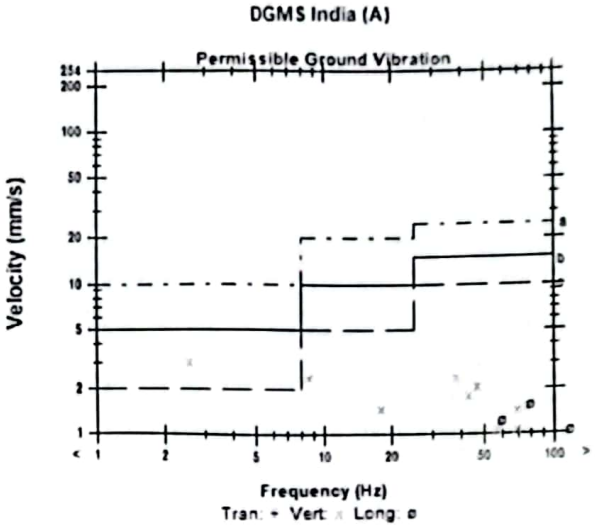
Serial Number	UM16971 V 10-89 Micromate ISEE
Battery Level	3.6 Volts
Unit Calibration	January 18, 2024 by CIMFR Dhanbad
File Name	UM16971_20231101141911.IDFW

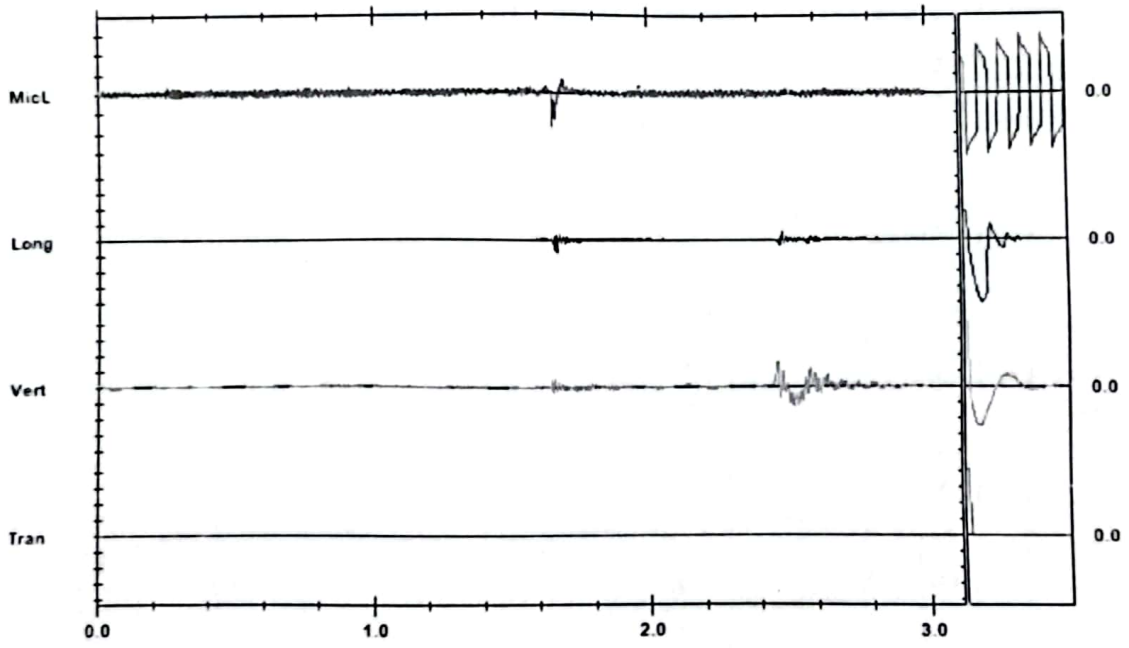
Post Event Notes
AKW/C
Distance from blast - 140 mtrs

Microphone	Linear Weighting
PSPL	1.676 pa (L) at 1.650 sec
ZC Freq	21 Hz
Channel Test	Passed (Freq = 19.7 Hz Amp = 1124 mv)

	Tran	Vert	Long	
PPV	0.055	3.042	1.592	mm/s
ZC Freq	73	2.6	79	Hz
Time (Rel. to Trig)	2.589	2.465	1.665	sec
Peak Acceleration	0.010	0.120	0.191	g
Peak Displacement	0.000	0.042	0.041	mm
Sensor Check	Check	Check	Check	
Frequency	1024.0	7.9	10.6	Hz
Overswing Ratio	0.0	3.6	4.0	

Peak Vector Sum 3.047 mm/s at 2.465 sec





Time Scale: 0.20 sec/div Amplitude Scale: Geo: 2.000 mm/s/div Mic: 1.000 pa (L)/div Sensor Check

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LOADING SHEET

INDIAN OIL CORPORATION LIMITED

BG (Explosives), NADKHURKEE-828307

IndianOil

NAME OF MINE: Akwmc ocp

DATE: 07/07/24

BMD VEHICLE NO: JH10AY7742

LOCATION: SSram

DIA OF HOLE: 150mm

STRATA CONDITION: OB

Sl. No.	Depth (M)	Water Level (M)	Hole Temp (C)	Explosive quantity (KG)	Deck	Total	Stem Hight (M)	Sl. No	Depth (M)	Water Level (M)	Hole Temp (C)	Explosive quantity (KG)	Deck	Total	Stem Hight (M)
1	10.0			60 35		95		1	9.9			60 35		95	
2	10.0			60 35		95		2	10.0			60 35		95	
3	10.1			60 35		95		3	10.0			60 35		95	
4	9.0			60 35		95		4	10.1			60 35		95	
5	9.0			60 35		95		5	9.9			60 35		95	
6	10.0			60 35		95		6	9.9			60 35		95	
7	10.1			60 35		95		7	10.0			60 35		95	
8	10.0			60 35		95		8	10.1			60 35		95	
9	9.9			60 35		95		9	10.0			60 35		95	
10	9.9			60 35		95		10	10.1			60 35		95	
11	9.9			60 35		95		11	9.9			60 35		95	
12	10.1			60 35		95		12	9.9			60 35		95	
13	10.0			60 35		95		13	10.0			60 35		95	
14	10.0			60 35		95		14	10.0			60 35		95	
15	10.1			60 35		95		15	9.9			60 35		95	
16	9.9			60 35		95		16	10.0			60 35		95	
17	10.0			60 35		95		17	10.1			60 35		95	
18	10.0			60 35		95		18	10.0			60 35		95	
19	10.1			60 35		95		19	9.9			60 35		95	
20	9.9			60 35		95		20	10.0			60 35		95	
21	9.9			60 35		95		21	9.9			60 35		95	
22	10.0			60 35		95		22	9.9			60 35		95	
23	10.1			60 35		95		23	10.1			60 35		95	
24	10.0			60 35		95		24	9.9			60 35		95	
4	10.1			60 35		95		25	10.0			60 35		95	
26	9.9			60 35		95		26	10.1			60 35		95	
27	9.9			60 35		95		27	9.9			60 35		95	
28	10.0			60 35		95		28	10.0			60 35		95	
29	10.0			60 35		95		29	10.0			60 35		95	
30	10.0			60 35		95		30	10.1			60 35		95	

TOTAL 2850 kg TOTAL 2850 kg

Bulk Cup Density (gm/cc) 1.12 gm/cc

Burden (M) 4m

Spacing (M) 4.5m

Volume of Patch (M³/H)

Blast Result

Booster qty (kg) 12 kg

Total Explosive qty (kg) 5700 kg

Powder Factor (m3/kg)

Blasting Accessories used

IOCL Representatives

BCCL Representatives

CamScanner

Technical Service Report
AKWMC Mines (Katras Area)

Objective

To study and improve achieved powder factor in AKWMC Mines.

Introduction

The AKWMC Mines is situated in katras area of BCCL having an average consumption of about 100 -110 tons/month. The annual target of mines is 0.9-1.0million metric tons. The benchmark powder factor was set to 1.93 m^3/kg in OB. The mine is located in vicinity of Bhuli Basti. The bucket capacity of lifting shovels deployed at the mines are 5 - 10 cubic metres.



CamScanner

Theory

Powder factor is volume of OB removed/extracted using unit explosive quantity.

Powder factor = Burden X Spacing X Depth (m3)
Explosive charged per hole (Kg)

Due to varying geological conditions, the hole depth in AKWMC Mines is limited to 6-10 meters.

Apart from improving burden and spacing, charge per hole can also be reduced to improve powder factor.

However, the charge per hole has a direct influence on the fragmentation. The mine operates majorly on sandstone and shale strata's hence, reducing charge to improve powder factor thus must be done without affecting the fragmentation of the patch.

In accordance with optimum fragmentation, attempts will be made to achieve benchmark powder factor.

Observation

The following data was observed during the inspection of patch:
Face condition: -

Date	03.10.24
Bench	Shovel bench (OB)
Strata condition	Sandstone
No. of hole	37
Bench height(m)	6.0m approx.
Burden(m)	3.7 m approx.
Spacing(m)	4.2m approx.

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Drill pattern	Rectangle
Charge per hole (Kg)	55 kg (avg)
Firing pattern	Row to Row
Blast result	Good
Charging process	Direct charging
P.F(in-situ)(m^3/kg)	1.72

Trial Blast

After due cooperation from blasting team of AKWMC departmental we were provided with a trail patch with following parameters:

Date	05.10.24
Bench	Shovel bench (OB)
Strata condition	Sandstone
No. of hole	32
Bench height(m)	6.0m approx.
Burden(m)	4.0m approx.
Spacing(m)	4.5m approx.
Drill pattern	Rectangle
Charge per hole (Kg)	56kg (avg)
Firing pattern	Row to Row
Blast result	Good
Charging process	Direct charging
P.F(in-situ)(m^3/kg)	1.95

Fragmentation on 05.10.2024

The fragmentation for an in-situ powder factor of 1.95 m3/kg is good and within the lifting capacity of deployed machinery. There is no sign of overcharging hence charged quantity is sufficient. Considering the hardness of the patch, the blast parameters (burden, spacing, depth) are suitable. Over the next 15 days, 10

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trials will be conducted on different benches of the mines with an attempt to increase the powder factor by reducing charge per hole and improving blasting parameter in accordance with the hardness of patch and other geological factors.



Fig: Post blast fragmentation

Result

Based on observations done on trial blasts, it can concluded that benchmark powder factor has been achieved by reducing charge per hole and improving blast parameters based on type of strata. Trail blast summary is attached. Charging of the patches are to be done in accordance geological factors and hardness of the underlying strata.

25/10/24.

Rohit Kumar Mondal
Officer(Marketing)
IOCL

25/10/24

Blasting Officer
AKWMC Mines

CamScanner

REPORT ON A BLAST INDUCED GROUND VIBRATION CONDUCTED BY IOCL AT KANTAPAHARI HIRED - BCCL

Date:-30.09.2024

INTRODUCTION

The Kantapahari hired mine is situated in Katras area of BCCL. The ground vibration monitoring is determined to know the safety of nearby structure. For measuring of ground vibration micromate of series UM10858 of make Instantel is being used.

OBJECTIVE OF THE STUDY

The primary objective of the ground vibration is the monitoring of PPV levels at the neighboring areas including villages affected by the blast induced ground vibrations.

METHODOLOGY

1. For the purpose of measuring vibrations, a Micromate seismograph named 'Instantel Micromate' is being used. The instrument has a geophone for sensing ground vibrations in the three planes viz. longitudinal, transverse and vertical. The highest of the three vibrations is recorded as the peak particle velocity measured in mm/sec.
2. For recording the PPV the instrument was placed on firm ground and the sensor was directed towards the site of blast and instrument was set continuous shot modes. Based on the trigger level, the instrument recorded the waveform including the PPV at its frequency during the blast.
3. The distance to the site of blast and the maximum charge per delay deployed were separately noted for the blast .

OBSERVATIONS

The reading was taken near to basti (Angarpathra basti, kumahar basti,kacha basti) situated at a distance of approx 120-150mtr from the current working bench. Summarized statement of the levels of PPV, and frequency recorded during the blast and its distances from blast point are as follow

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Sl.no	Date	PPV(mm/s)	Frequency (Hz)	Charge/ hole(kg)	Maximum charge/ delay(kg)	Distance from blast site to structure(m)	Distance from structure(m)	Remarks
1	01.09.2024	1.616	7.2	30	30	140	20	within the limit
2	05.09.2024	2.601	6.7	25	25	140	20	within the limit
3	07.09.2024	2.160	7.4	10	10	130	30	within the limit
4	10.09.2024	1.600	7.1	20	20	150	10	within the limit
5	14.09.2024	2.112	5.8	30	30	150	10	within the limit
6	19.09.2024	0.938	2.2	20	20	150	20	within the limit
7	22.09.2024	0.899	10.1	25-30	30	130	30	within the limit
8	26.09.2024	2.286	7.1	30	30	140	20	within the limit
9	30.09.2024	1.025	32	35	35	130	20	within the limit

CONCLUSION

In the view of above readings of ground vibration the PPVs obtained were within the permissible limit as per DGMS norms, which is safe for the nearby structure.

IOCL Representative

Blasting Officer (Kantapahari Hired)

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इंडियन ऑयल कॉर्पोरेशन लिमिटेड
मौजा-माटीगढा, पो.आ.-नदखुरकी
जिला-धनबाद (झारखण्ड) पिन कोड:828307
Indian Oil Corporation Limited
Mouza-Matigarha, P.O.-Nadkhurkee
District-Dhanbad (Jharkhand) 828307
Phone:0326-2828235/334/365/375/39

IndianOil
व्यवसाय विकास समुह (एक्सप्लोसिव्स)
Business Development Group (Explosives)

IOCL/BDG/KANTAPAHARI HIRED/PPV REPORTS/SEPTEMBER-2024
Date: - 30.09.2024

To,
The Blasting In charge
Kantapahari Hired
Katras Area, BCCL

Subject: - Submission of Ground vibration monitoring reports for September 2024.

Dear Sir,

We have enclosed the blast induced ground vibration monitored in the month of September 2024. The Brief summary of vibration reports are furnished in below table.

1.Sl .No	Mine Name	Date	PPV (mm/s)			ZC Frequency(HZ)			PVS(mm/s)	Dist.(Mtr)
			Tran	Vert	Long	Tran	Vert	Long		
1	Kantapahari Hired	01.09.2024	0.047	1.080	1.616	7.7	9.4	7.2	1.616	140
2	Kantapahari Hired	05.09.2024	0.047	1.505	2.601	3.2	2.7	6.7	2.605	140
3	Kantapahari Hired	07.09.2024	0.047	1.190	2.160	6.6	8.1	7.4	2.165	130
4	Kantapahari Hired	10.09.2024	0.047	0.938	1.600	2.9	8.8	7.1	1.602	150
5	Kantapahari Hired	14.09.2024	0.055	1.198	2.112	6.8	3.2	5.8	2.114	150
6	Kantapahari Hired	19.09.2024	0.047	0.788	0.938	4.5	9.8	2.2	1.152	150
7	Kantapahari Hired	22.09.2024	1.261	0.796	0.899	8.1	22	10.1	1.268	130
8	Kantapahari Hired	26.09.2024	1.750	0.780	2.286	5.3	21	7.1	2.342	140
9	Kantapahari Hired	30.09.2024	0.646	1.025	0.993	2.2	32	6.0	1.070	130

As per your requirement the above reading has been monitored during the blasting and the copies of reports are submitted for your information and assessment.

Thanking you and assuring you of our best attention and services at all times.

Yours faithfully
For Indian Oil Corporation Limited,

Viraj
Officer (Marketing)

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Instantel

Event Report

Date/Time	Long at 13:46:48 September 01,2024
Trigger Source	Geo: 0.200 mm/s
Range	Geo: 254.0 mm/s
Record Time	3.0 sec at 2048 sps
Operator/Setup	Operator/factory MMB

Serial Number	UM16971 V 10-89 Micromate ISEE
Battery Level	3.6 Volts
Unit Calibration	January 18, 2024 by CIMFR Dhanbad
File Name	UM16971_20231102134648.IDFW

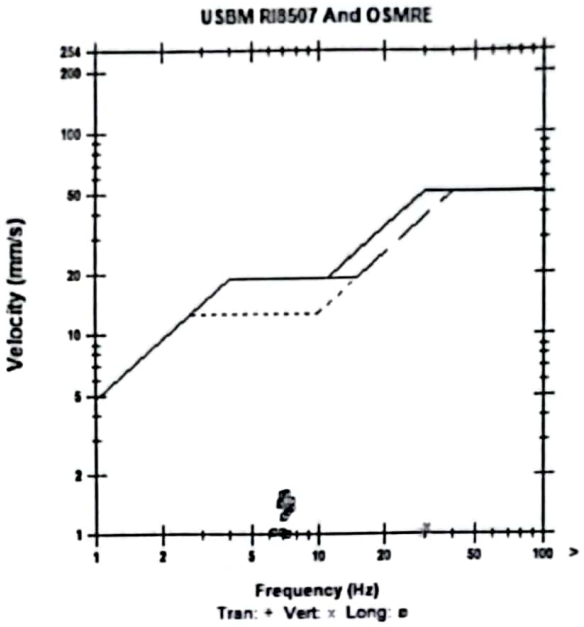
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Location:
Client:
User Name:
General:

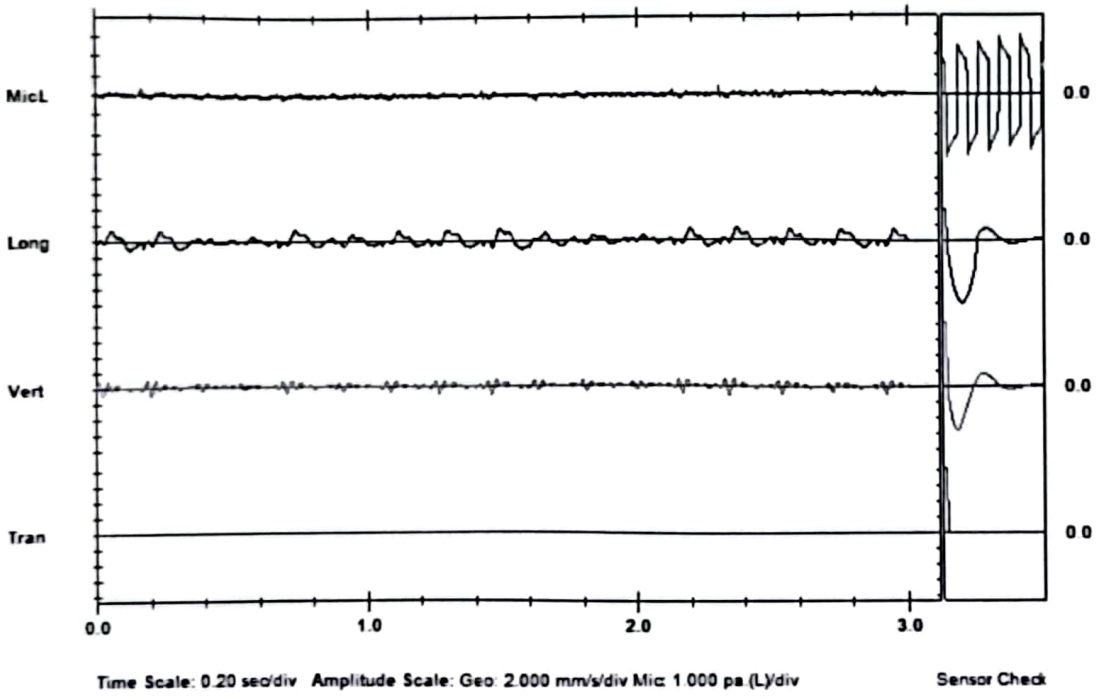
Post Event Notes
Kantapahari hired
Distance from blast - 140 mtr

Microphone	Linear Weighting
PSPL	<0.500 pa.(L)
ZC Freq	41 Hz
Channel Test	Passed (Freq = 19.7 Hz Amp = 1159 mv)

	Tran	Vert	Long	
PPV	0.047	1.080	1.616	mm/s
ZC Freq	7.7	9.4	7.2	Hz
Time (Rel. to Trig)	2.386	2.337	1.486	sec
Peak Acceleration	0.010	0.025	0.018	g
Peak Displacement	0.000	0.006	0.034	mm
Sensor Check	Check	Check	Passed	
Frequency	1024.0	7.9	7.1	Hz
Overswing Ratio	0.0	3.8	5.7	

Peak Vector Sum 1.616 mm/s at 1.487 sec
N/A: Not Applicable





Time Scale: 0.20 sec/div Amplitude Scale: Geo: 2.000 mm/s/div Mic: 1.000 pa (L)/div Sensor Check

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BG (E)/B-II/FORM/7.5/MKT 001

LOADING SHEET

INDIAN OIL CORPORATION LIMITED

BG (Explosives), NADKHURKEE-828307

NAME OF MINE: Kantalpahi Hill | DATE: 01/09/24

BMD VEHICLE NO: JH10AY9175 | LOCATION: Coal Bench

DIA OF HOLE: 150 mm | STRATA CONDITION: Hard Iron

Sl. No.	Depth (M)	Water Level (M)	Hole Temp (C)	Explosive quantity (KG)	Deck	Total	Stem Hight (M)	Sl. No.	Depth (M)	Water Level (M)	Hole Temp (C)	Explosive quantity (KG)	Deck	Total	Stem Hight (M)
1	5.3			30				31	5.2			30			
2	5.2			30				32	5.2			30			
3	5.2			30				33	5.3			30			
4	5.0			30				34	5.2			30			
5	5.0			30				35	5.3			30			
6	5.0			30				36	5.2			30			
7	5.1			30				37	5.1			30			
8	5.1			30											
9	5.2			30											
10	5.1			30											
11	5.2			30											
12	5.2			30											
13	5.3			30											
14	5.3			30											
15	5.3			30											
16	5.3			30											
17	5.2			30											
18	5.2			30											
19	5.3			30											
20	5.3			30											
21	5.2			30											
22	5.1			30											
23	5.2			30											
24	5.1			30											
25	5.2			30											
26	5.2			30											
27	5.3			30											
28	5.2			30											
29	5.2			30											
30	5.1			30											

TOTAL | TOTAL 3710 KG

Bulk Cup Density (gm/cc) 1.1 gm/cc

Burden (M) 4.2

Spacing (M) 4.4

Volume of Patch (W*L*H)

Blast Result Good

IOCL Representatives

Booster qty (kg)

Total Explosive qty (kg) 1110

Powder Factor (m3/kg)

Blasting Accessories used ED 400 MS

CKS

BCCL Representatives

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Instantel

Event Report

Date/Time	Long at 13:48:48 September 05,2024
Trigger Source	Geo: 0.200 mm/s
Range	Geo: 254.0 mm/s
Record Time	3.0 sec at 2048 sps
Operator/Setup:	Operator/factory MMB

Notes
Location:
Client:
User Name:
General:

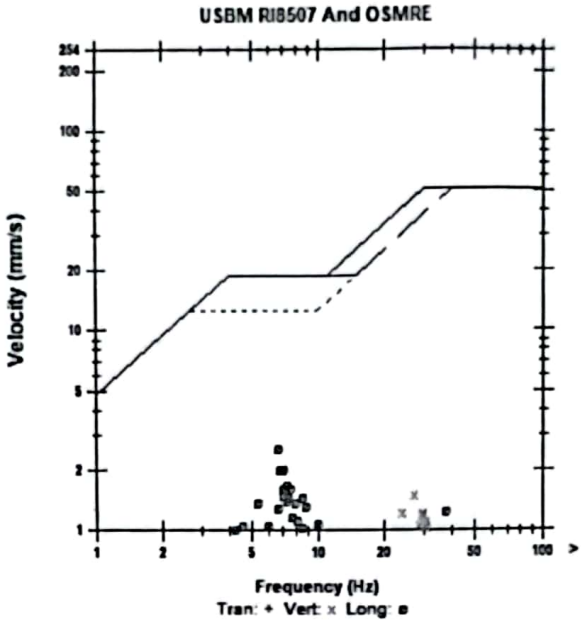
Serial Number	UM16971 V 10-89 Micromate ISEE
Battery Level	3.6 Volts
Unit Calibration	January 18, 2024 by CIMFR Dhanbad
File Name	UM16971_20231102134645.IDFW

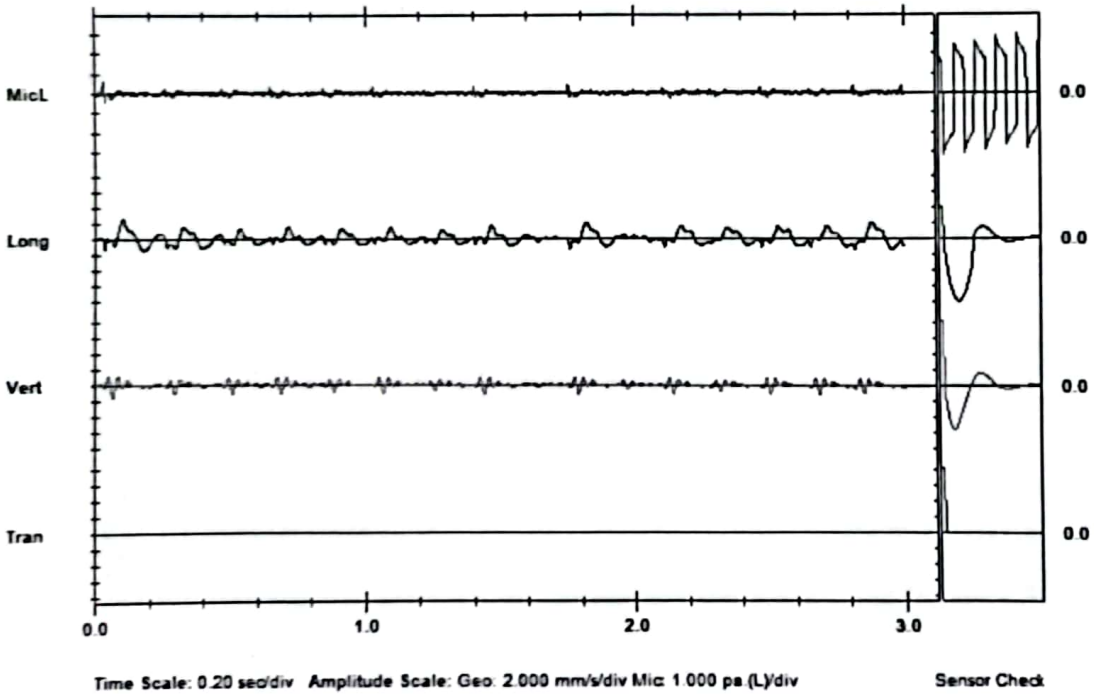
Post Event Notes
Kantapahari hired
Distance from blast - 140 mtr

Microphone	Linear Weighting
PSPL	0.574 pa (L) at 0.030 sec
ZC Freq	47 Hz
Channel Test	Passed (Freq = 19.7 Hz Amp = 1159 mv)

	Tran	Vert	Long	
PPV	0.047	1.505	2.601	mm/s
ZC Freq	3.2	2.7	6.7	Hz
Time (Rel. to Trig)	0.233	0.066	0.100	sec
Peak Acceleration	0.010	0.028	0.028	g
Peak Displacement	0.000	0.009	0.049	mm
Sensor Check	Check	Check	Passed	
Frequency	1024.0	7.9	7.1	Hz
Overswing Ratio	0.0	3.8	5.7	

Peak Vector Sum 2.605 mm/s at 0.100 sec





Time Scale: 0.20 sec/div Amplitude Scale: Geo: 2.000 mm/s/div Mic: 1.000 pa (L)/div Sensor Check

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BG (E)/B-II/FORM/7.5/MK1 00?

LOADING SHEET

INDIAN OIL CORPORATION LIMITED

BG (Explosives), NADKHURKEE-828307

IndianOil

NAME OF MINE: Kantalabad Hill

DATE: 05/09/24

BMD VEHICLE NO: JH10 BS 6152

LOCATION: Level Bench

DIA OF HOLE: 150mm

STRATA CONDITION: M. stone

Sl. No.	Depth (M)	Water Level (M)	Hole Temp (C)	Explosive quantity (KG)	Deck	Total	Stem. Hight (M)	Sl. No.	Depth (M)	Water Level (M)	Hole Temp (C)	Explosive quantity (KG)	Deck	Total	Stem. Hight (M)
1	4.6			25											
2	4.6			25											
3	4.6			25											
4	4.5			25											
5	4.6			25											
6	5.0			25											
7	5.0			25											
8	5.0			25											
9	4.7			25											
10	5.0			25											
11	5.0			25											
12	5.0			25											
13	4.6			25											
14	4.7			25											
15	4.5			25											
16	4.5			25											
17	4.6			25											
18	4.4			25											
19	4.6			25											
20	4.6			25											
21	4.5			25											
22	4.6			25											
23	4.6			25											
24	4.4			25											
25	4.6			25											
26	4.5			25											
27	4.6			25											
28	4.6			25											
29	4.6			25											
30	4.5			25											

TOTAL 30 holes = 1250 TOTAL

Bulk Cup Density (gm/cc) 1.12gm/cc

Burden (M) 4.0

Spacing (M) 4.5

Volume of Patch (W*L*H)

Blast Result Good

Booster qty (kg)

Total Explosive qty (kg) 750

Powder Factor (m3/kg)

Blasting Accessories used ED 1/100+2

IOCL Representatives

BCCL Representatives

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Kantapahari

OB

Month	BMPF	Production	Explosive	APF	IOCL Expl	% dedn	Basic Amount	Invoiced amount	Deduction Amount
Aug-24	1.59	285237	230851.5	1.24	230030	22.29	42.804	9846204.12	21,94,719.00
Sep-24	1.59	286401	197606.6	1.45	197200	8.85	41.871	8256961.2	7,30,741.00
Oct-24	1.59	238088	137960.8	1.73	137120	0.00	40.665	5575984.8	-
Nov-24	1.59					100.00		0	-
Dec-24	1.59					100.00		0	-
Jan-25	1.59					100.00		0	-
Feb-25	1.59					100.00		0	-
Mar-25	1.59					100.00		0	-
Apr-25	1.59					100.00		0	-
May-25	1.59					100.00		0	-
Jun-25	1.59					100.00		0	-
Jul-25	1.59					100.00		0	-
Total	1.59	809726	566418.9	1.43	564350	10.09		23679150.12	23,89,226.00

COAL

Month	BMPF	Production	Explosive	APF	IOCL Expl	% dedn	Basic Amount	Invoiced amount	Deduction Amount
Aug-24	4.61	107760	24561.3	4.39	24480	4.83	42.804	1047841.92	50,611.00
Sep-24	4.61	103380	22024.5	4.69	21970	0.00	41.871	919905.87	-
Oct-24	4.61	91420	18144.6	5.04	18060	0.00	40.665	734409.9	-
Nov-24	4.61					100.00		0	-
Dec-24	4.61					100.00		0	-
Jan-25	4.61					100.00		0	-
Feb-25	4.61					100.00		0	-
Mar-25	4.61					100.00		0	-
Apr-25	4.61					100.00		0	-
May-25	4.61					100.00		0	-
Jun-25	4.61					100.00		0	-
Jul-25	4.61					100.00		0	-
Total	4.61	302560	64730.4	4.67	64510	0.00		2702157.69	-

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AKWMC

OB

Month	BMPF	Production	Explosive	APF	IOCL Expl	% dedn	Basic Amount	Invoiced amount	Deduction Amount
Aug-24	1.93	106652	84825.35	1.26	84640	34.85	42.804	3622930.56	12,62,591.00
Sep-24	1.93	110500	108604.5	1.02	108350	47.28	41.871	4536722.85	21,44,963.00
Oct-24	1.93	106429	96666.2	1.10	96460	42.95	40.665	3922545.9	16,84,733.00
Nov-24	1.93					100.00		0	-
Dec-24	1.93					100.00		0	-
Jan-25	1.93					100.00		0	-
Feb-25	1.93					100.00		0	-
Mar-25	1.93					100.00		0	-
Apr-25	1.93					100.00		0	-
May-25	1.93					100.00		0	-
Jun-25	1.93					100.00		0	-
Jul-25	1.93					100.00		0	-
Total	1.93	323581	290096.05	1.12	289450	42.21		12082199.31	50,99,896.00

COAL

Month	BMPF	Production	Explosive	APF	IOCL Expl	% dedn	Basic Amount	Invoiced amount	Deduction Amount
Aug-24	7.75	74575	9475.5	7.87	9450	0.00	42.804	404497.8	-
Sep-24	7.75	38500	10317.7	3.73	10300	51.85	41.871	431271.3	2,23,614.00
Oct-24	7.75	39050	858.5	45.49	850	0.00	40.665	34565.25	-
Nov-24	7.75					100.00		0	-
Dec-24	7.75					100.00		0	-
Jan-25	7.75					100.00		0	-
Feb-25	7.75					100.00		0	-
Mar-25	7.75					100.00		0	-
Apr-25	7.75					100.00		0	-
May-25	7.75					100.00		0	-
Jun-25	7.75					100.00		0	-
Jul-25	7.75					100.00		0	-
Total	7.75	152125	20651.7	7.37	20600	4.95		870334.35	43,082.00

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TETULMARI HIRED

OB

Month	BMPF	Production	Explosive	APF	IOCL Expl	% dedn	Basic Amount	Invoiced amount	Deduction Amount
Aug-24	1.47	50605	15786.3	3.21	15750	0.00	42.804	674163	
Sep-24	1.47	95527	86617.75	1.10	86420	24.98	41.871	3618491.82	
Oct-24	1.47	122002	122986.25	0.99	122002	32.52	40.665	4961211.33	
Nov-24	1.47					100.00		0	
Dec-24	1.47					100.00		0	
Jan-25	1.47					100.00		0	
Feb-25	1.47					100.00		0	
Mar-25	1.47					100.00		0	
Apr-25	1.47					100.00		0	
May-25	1.47					100.00		0	
Jun-25	1.47					100.00			
Jul-25	1.47					100.00			
Total	1.47	268134	225390.3	1.19	224172	19.07		9253866.15	17,64,712.00

COAL

Month	BMPF	Production	Explosive	APF	IOCL Expl	% dedn	Basic Amount	Invoiced amount	Deduction Amount
Aug-24	NA	0	0	0.00	0	0.00	42.804	0	
Sep-24	NA	40900	6017.2	6.80	6000	0.00	41.871	251226	
Oct-24	NA	72918	8949.9	8.15	8920	0.00	40.665	362731.8	
Nov-24	NA					#VALUE!		0	
Dec-24	NA					#VALUE!		0	
Jan-25	NA					#VALUE!		0	
Feb-25	NA					#VALUE!		0	
Mar-25	NA					#VALUE!		0	
Apr-25	NA					#VALUE!		0	
May-25	NA					#VALUE!			
Jun-25	NA					#VALUE!			
Jul-25	NA					#VALUE!			
Total	NA	113818	14967.1	7.60	14920	0.00		613957.8	-

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AKWMC OCP				
OB Shovel				
	Production	Explosives	APF	IOCL Explosives
Apr-24	187026	91603.9	2.04	91430
May-24	206840	102270.5	2.02	102030
Jun-24	175325	83790	2.09	82350
Jul-24	178500	99306.9	1.80	99090.00
Aug-24	106652	84825.35	1.26	84640
Sep-24	110500	108604.5	1.02	108350
Oct-24	106429	96666.2	1.10	96460
Nov-24				
Dec-24				
Jan-25				
Feb-25				
Mar-25				
Total	1071272	667067.35	1.61	664350
		BMPF	1.93	
		Deviation	-16.58	

AKWMC OCP				
Coal				
	Production	Explosives	APF	IOCL Explosives
Apr-24	68000	8321.4	8.17	8300
May-24	65350	8724.3	7.49	8700
Jun-24	61100	7483.7	8.16	8700
Jul-24	66325	7420.7	8.94	7400
Aug-24	74575	9475.5	7.87	9450
Sep-24	38500	10317.7	3.73	10300
Oct-24	39050	858.5	45.49	850
Nov-24				
Dec-24				
Jan-25				
Feb-25				
Mar-25				
Total	412900	52601.8	7.85	53700
		BMPF	7.75	
		Deviation	1.29	

Kantapahari Hired OCP				
OB				
	Production	Explosives	APF	IOCL Explosives
Apr-24	301497	188279.8	1.60	187670
May-24	216000	156704.7	1.38	156180
Jun-24	278383	179065.2	1.55	160000
Jul-24	230620	175292.5	1.32	174620.00
Aug-24	285237	230851.5	1.24	230030
Sep-24	286401	197606.6	1.45	197200
Oct-24	238088	137960.8	1.73	137120
Nov-24				
Dec-24				
Jan-25				
Feb-25				
Mar-25				
Total	1836226	1265761.1	1.45	1242820
		BMPF	1.59	
		Deviation	-8.81	

Kantapahari Hired OCP				
Coal				
	Production	Explosives	APF	IOCL Explosives
Apr-24	138000	29679.3	4.65	29580
May-24	203460	44502	4.57	44350
Jun-24	163180	35731.8	4.57	54070
Jul-24	150280	33755.6	4.45	33640.00
Aug-24	107760	24561.3	4.39	24480
Sep-24	103380	22024.5	4.69	21970
Oct-24	91420	18144.6	5.04	18060
Nov-24				
Dec-24				
Jan-25				
Feb-25				
Mar-25				
Total	957480	208399.1	4.59	226150
		BMPF	4.61	
		Deviation	-0.43	

Tetulmari Hired				
OB				
	Production	Explosives	APF	IOCL Explosives
Apr-24	0	0	0.00	0
May-24	0	0	0.00	0
Jun-24	0	0	0.00	0
Jul-24	0	0	0.00	0
Aug-24	50605	15786.3	3.21	15750
Sep-24	95527	86617.75	1.10	86420
Oct-24	122002	122986.25	0.99	122002
Nov-24				
Dec-24				
Jan-25				
Feb-25				
Mar-25				
Total	268134	225390.3	1.19	224172
		BMPF	1.47	
		Deviation	0	

Tetulmari Hired				
Coal				
	Production	Explosives	APF	IOCL Explosives
Apr-24	0	0	0.00	0
May-24	0	0	0.00	0
Jun-24	0	0	0.00	0
Jul-24	0	0	0.00	0
Aug-24	0	0	0.00	0
Sep-24	40900	6017.2	6.80	6000
Oct-24	72918	8949.9	8.15	8920
Nov-24				
Dec-24				
Jan-25				
Feb-25				
Mar-25				
Total	113818	14967.1	7.6	14920
		BMPF	0	
		Deviation	0	

April -24

↓

March 25 = Pf = Aug 25 + July 26

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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 SEPTEMBER, 2024)

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 $23^0$37' N to $23^0$52' N latitudes and $86^0$09' E to $86^0$30' E longitude occupying an area of 450 Sq.km. BCCL has awarded Environmental monitoring work of Jharia Coalfield (JCF) to Central Mine Planning & Design Institute Limited (CMPDIL). The environmental monitoring has been carried out as per the conditions laid down by the MoEF&CC while granting environmental clearance of project, consent letter issued by the respective SPCB, and other statutory requirements.

2.0 Sampling location and rationale

2.1 Ambient air sampling locations

The ambient air quality monitoring stations were selected to represent core, buffer zone area. The rationale has been based on the guidelines stipulated by MoEF&CC, consent letter of SPCB, as well as other statutory requirements.

2.2 Water sampling stations

The Water sampling stations were selected for mine sump water.

2.3 Noise level monitoring locations

Noise levels vary depending on the various activities in mining areas. The monitoring of noise level in different locations will be helpful to take appropriate mitigating measures. The rationale has been based on the guidelines stipulated by MoEF&CC, consent letter of SPCB, as well as other statutory requirements.

3.0 Methodology of sampling and analysis

3.1 Ambient air quality

Parameters chosen for assessment of ambient air quality were Particulate Matter (PM_{10}), Fine Particulate Matter ($PM_{2.5}$), Sulphur Di-oxide (SO_2) and Nitrogen Oxides (NO_X). Respirable Dust Samplers (RDS) and Fine Dust

Sampler ($PM_{2.5}$ sampler) were used for sampling of $PM_{10,}$ SO_2, & NO_X and Fine Dust Sampler ($PM_{2.5}$ sampler) were used for sampling of $PM_{2.5}$ at 24 hours interval once in a fortnight and the same for the gaseous pollutants. The samples were analysed in Environmental Laboratory of CMPDI, RI-II, DHanbad.

3.2 Water quality

Water samples were collected as per standard practice. The Mine effluent samples were collected and analysed for four parameters on fortnightly basis. Thereafter the samples were preserved and analysed at the Environmental Laboratory of CMPDI, RI- II, Dhanbad.

3.3 Noise level monitoring

Noise level measurements in form of 'L_{EQ}' were taken using Integrated Data Logging Sound Level Meter. Noise levels were measured in Decibels, 'A' weighted average, i.e. dB (A).

4.0 Results and interpretations

4.1 Air quality

It has been seen from the analysis results that the 24 hours average concentration parameters like $PM_{10,}$ $PM_{2.5}$, SO_2 and NO_X are mostly within the permissible limits in all sampling locations as per MoEF&CC Gazette Notification No. GSR 742(E) dt 25.09.2000 Standards for Coal Mines and National Ambient Air Quality Standard -2009. Sometimes the concentration of PM_{10}& $PM_{2.5}$ exceeds the limits due to heavy public traffic, poor road condition, coke oven plants, burning of coal by surrounding habitants, brick making, municipal waste dumps and industries like Steel Plant, thermal Plants including their fly ash etc.

The following preventive and suppressive mitigative measures can be undertaken to contain the pollution level within prescribed level:-

- Wet drilling and controlled blasting should be practice.
- Explosive used should be optimised to restrict the dust generation.
- Transportation roads should be permanently asphalted free of ruts, potholes etc.
- Water should be sprayed on coal transportation road, service road more frequently and at regular interval.
- Dust from roads should be removed physically or mechanically.
- Greenbelts around industrial sites, service building area besides Avenue plantation along roads should be created.
- Coal dust should be suppressed by using fixed sprinklers.
- Regular maintenance of plant and machinery should be undertaken.

4.2 Water quality

The test results indicate that the major parameters compared with MoEF&CC Gazette Notification No. GSR 742(E) dt 25.09.2000 Standards for Coal Mines, are within permissible limits.

4.3 Noise Level

During the noise level survey it has been observed that the noise level in the sampling locations is within the permissible limits prescribed as per MoEF&CC Gazette Notification No. GSR 742(E) dt 25.09.2000 Standards for Coal Mines for Industrial Area and Noise pollution (Regulation and Control) Rules, 2000.

INTRODUCTION

Any industry and development activities including coal mining is bound to affect environmental attributes. There are positive as well as negative impacts of such operations. For controlling the adverse impacts a regular monitoring is essential. The environmental monitoring is being done as per the guide-lines stipulated by Ministry of Environment, Forest and Climate Change (MoEF&CC), Govt. of India.

The very purpose of environmental monitoring is to assess the quality of various attributes which affects the environment. As per quality of these attributes appropriate strategy is to be developed to control the pollution level within the permissible limits. The three major attributes are air, water and noise level.

Bharat Coking Coal has awarded Environmental Monitoring work of all Projects, Cluster wise, to Central Mine Planning & Design Institute Limited (CMPDIL). The environmental monitoring has been carried out as per conditions laid down by MoEF&CC while granting environmental clearance to different projects. CMPDI has trained manpower and well equipped laboratory to carry out monitoring, analysis and R&D work in the field of environment.

The Cluster IV is in the Northern part of the Jharia coalfield.It includes Salanpur colliery, KatrasChoitodih colliery(OC), Amalgamated Keshalpur – West Mudidih Mixed (OCP & UG) Mines, Amalgamated Ramkanali – Angarpathra UG mines, Gaslitand OC. The cluster– IV is situated about 25 – 30 kms from Dhanbad Railway Station. The mines of this cluster- IV are operating since pre nationalization period (prior to 1972-73). It is connected by both Railway and Road. The drainage of the area is governed by Katri Jore. The Project has Environmental Clearance from Ministry of Environment, Forest and Climate Change (MoEF&CC) for a rated capacity of 7.34 MTPA (normative) and 9.55 MTPA peak capacity of coal production vide letter no. J-11015/372/2013-IA.II (M) dated 23rd October, 2019

Ministry of Environment, Forest and Climate Change while granting environmental clearance has given one of the General conditions that " Four ambient air quality monitoring stations should be established in the core zone as well as in the buffer zone for PM_{10}, $PM_{2.5}$, SO_2, NOx monitoring. Location of the stations should be decided based on the meteorological data, topographical features and environmentally and ecologically sensitive targets, other conditions regarding water / effluent and noise level monitoring in consultation with the State Pollution Control Board."

In compliance of these conditions the Environmental Monitoring has been carried out & report prepared for submission to MoEF&CC& JSPCB and other statutory authorities.

AMBIENT AIR QUALITY MONITORING

2.1 Location of sampling station and their rationale:

(As per G.S.R. 742 (E) dt. 25th December, 2000)

2.1.1 Ambient Air Quality Sampling Locations

I. CORE ZONE Monitoring Location

i) Govindpur Village (A7): Industrial Area

The location of the sampling station is 23^0 48'34" N, 86^0 18'22" E. The sampler was placed at 1.5 m above the ground level at AARC agent Office.

ii) Katras Chotudih (A37): Industrial Area

The location of the sampling station is at the roof top of the Manager Office.

II. BUFFER ZONE Monitoring Location

i) Block IV (A6) : industrial area

The location of the sampling station is 23^0 47.916' N 86^0 15.333' E. The sampler was placed at a height of 1.5 m above the ground level in Safety office of Block IV OCP.

ii) Nichitpur (A8): Industrial Area

The location of the sampling station is 23^0 48'20" N 86^0 21'30" E. The sampler was placed at roof top at Safety office of Nichitpur.

iii) Rudhi Basti(A18): **Residential Area**

The sampler was placed at a height of 1.5 m above the ground level at Rudhi Basti.

AMBIENT AIR QUALITY DATA

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CENTRAL MINE PLANNING AND DESIGN INSTITUTE LIMITED
Environment Laboratory, Regional Institute-II
Ambient Air Quality Test Report

Test Report for Ambient Air Samples

Month & Year	**09/2024**	**Cluster**	**Cluster IV**			**ULR No.**	TC1012224000001149F
Customer	**Environment Department, Bharat Coking Coal Limited (BCCL), Koyla Bhawan, Dhanbad (E-mail: gmenv.bccl@coalindia.in)**					**Date of Issue**	**13.11.2024**
Project	**Govindpur Village**		**Sample Ref. No.**	**REM/BCCL/2024/09**	**Sampling Method**	**CMPDI/RI-II/LPM 11 , (IS 5182)**	
Date of Sampling	06.09.2024		20.09.2024	**Period of Analysis**	05.09.2024 to 25.10.2024	**Zone of Station:**	**Core Zone**

Sl. No.	**Parameter**	**Method of Analysis**	**Observed Values (in µg/m³)**		**Range Of Testing**	**LDL**	**MoEF Standards Notification dated 25th September,2000 (GSR 742 E)**	**NAAQS, 2009**
			1st FN A2636	**2nd FN** A2714				
1	PM_{10}	IS -5182(Part 23):2006, R-2017	84	87	10 µg/m³ - 1000 µg/m³	10 µg/m³	300	100
2	$PM_{2.5}$	IS -5182(Part 24):2019	38	41	10 µg/m³ - 400 µg/m³	10 µg/m³	Not Specified	60
3	SO_2	IS-5182(Part-2): 2001 , R-2017	<10	<10	10 µg/m³ - 1050 µg/m³	10 µg/m³	120	80
4	NO_2	IS-5182 (Part-6): 2006 , R-2017	26	23	06 µg/m³ - 420 µg/m³	06 µg/m³	120	80

***All units are in µg/m3, 24 hourly Average, * LDL indicates Lower Detection Limit,*

ANALYSED BY

(Gaurav Kant)
REVIEWED BY

(Amit Raj Mishra)
Authorised Signatory

***Note**: The results above relate to the samples tested as received. This report can not be reproduced in part or full without the written permission of the HOD(Env) , CMPDI, RI-II.*

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Environment Laboratory, Regional Institute-II
Ambient Air Quality Test Report

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Test Report for Ambient Air Samples

Month & Year	**09/2024**	**Cluster**	**Cluster IV**	**ULR No.**	TC1012224000001149F
Customer	**Environment Department, Bharat Coking Coal Limited (BCCL), Koyla Bhawan, Dhanbad (E-mail: gmenv.bccl@coalindia.in)**			**Date of Issue**	**13.11.2024**
Project	**Katras Chotudih**	**Sample Ref. No.**	**REM/BCCL/2024/09**	**Sampling Method**	**CMPDI/RI-II/LPM 11 , (IS 5182)**
Date of Sampling	06.09.2024	20.09.2024	Period of Analysis	06.09.2024 to 25.10.2024	**Zone of Station:** **Core Zone**

Sl. No.	**Parameter**	**Method of Analysis**	**Observed Values (in µg/m³)**		**Range Of Testing**	**LDL**	**MoEF Standards Notification dated 25th September,2000 (GSR 742 E)**	**NAAQS, 2009**
			1st FN A2635	**2nd FN** A2713				
1	PM_{10}	IS -5182(Part 23):2006, R-2017	92	98	10 µg/m³ - 1000 µg/m³	10 µg/m³	300	100
2	$PM_{2.5}$	IS -5182(Part 24):2019	44	46	10 µg/m³ - 400 µg/m³	10 µg/m³	Not Specified	60
3	SO_2	IS-5182(Part-2): 2001 , R-2017	<10	<10	10 µg/m³ - 1050 µg/m³	10 µg/m³	120	80
4	NO_2	IS-5182 (Part-6): 2006 , R-2017	29	31	06 µg/m³ - 420 µg/m³	06 µg/m³	120	80

***All units are in µg/m3, 24 hourly Average, * LDL indicates Lower Detection Limit,*

ANALYSED BY (Gaurav Kant) ***REVIEWED BY*** (Amit Raj Mishra) ***Authorised Signatory***

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Ambient Air Quality Test Report

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Test Report for Ambient Air Samples

Month & Year	**09/2024**	**Cluster**	**Cluster IV**	**ULR No..**	TC1012224000001149F
Customer	**Environment Department, Bharat Coking Coal Limited (BCCL), Koyla Bhawan, Dhanbad (E-mail: gmenv.bccl@coalindia.in)**			**Date of Issue**	**13.11.2024**
Project	**Block IV**	**Sample Ref. No.**	**REM/BCCL/2024/09**	**Sampling Method**	**CMPDI/RI-II/LPM 11 , (IS 5182)**
Date of Sampling	06.09.2024	20.09.2024	Period of Analysis	06.09.2024 to 25.10.2024	**Zone of Station:** **Buffer Zone**

Sl. No.	**Parameter**	**Method of Analysis**	**Observed Values (in µg/m³)**		**Range Of Testing**	**LDL**	**MoEF Standards Notification dated 25th September,2000 (GSR 742 E)**	**NAAQS, 2009**
			1st FN A2634	**2nd FN** A2712				
1	PM_{10}	IS -5182(Part 23):2006, R-2017	96	85	10 µg/m³ - 1000 µg/m³	10 µg/m³	300	100
2	$PM_{2.5}$	IS -5182(Part 24):2019	46	42	10 µg/m³ - 400 µg/m³	10 µg/m³	Not Specified	60
3	SO_2	IS-5182(Part-2): 2001 , R-2017	11	10	10 µg/m³ - 1050 µg/m³	10 µg/m³	120	80
4	NO_2	IS-5182 (Part-6): 2006 , R-2017	25	28	06 µg/m³ - 420 µg/m³	06 µg/m³	120	80

***All units are in µg/m3, 24 hourly Average, * LDL indicates Lower Detection Limit,*

ANALYSED BY	(Gaurav Kant) ***REVIEWED BY***	(Amit Raj Mishra) ***Authorised Signatory***

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Test Report for Ambient Air Samples

Month & Year	**09/2024**	**Cluster**	**Cluster IV**	**ULR No.**	TC1012224000001149F
Customer	**Environment Department, Bharat Coking Coal Limited (BCCL), Koyla Bhawan, Dhanbad (E-mail: gmenv.bccl@coalindia.in)**			**Date of Issue**	**13.11.2024**
Project	**Nichitpur**	**Sample Ref. No.**	**REM/BCCL/2024/09**	**Sampling Method**	**CMPDI/RI-II/LPM 11 , (IS 5182)**
Date of Sampling	10.09.2024	23.09.2024	Period of Analysis	10.09.2024 to 25.10.2024	**Zone of Station:** **Buffer Zone**

Sl. No.	**Parameter**	**Method of Analysis**	**Observed Values (in µg/m³)**		**Range Of Testing**	**LDL**	**MoEF Standards Notification dated 25th September,2000 (GSR 742 E)**	**NAAQS, 2009**
			1st FN A2642	**2nd FN** A2720				
1	PM_{10}	IS -5182(Part 23):2006, R-2017	61	70	10 µg/m³ - 1000 µg/m³	10 µg/m³	300	100
2	$PM_{2.5}$	IS -5182(Part 24):2019	42	36	10 µg/m³ - 400 µg/m³	10 µg/m³	Not Specified	60
3	SO_2	IS-5182(Part-2): 2001 , R-2017	<10	<10	10 µg/m³ - 1050 µg/m³	10 µg/m³	120	80
4	NO_2	IS-5182 (Part-6): 2006 , R-2017	27	28	06 µg/m³ - 420 µg/m³	06 µg/m³	120	80

** LDL indicates Lower Detection Limit,*

***All units are in µg/m3, 24 hourly Average,*

ANALYSED BY (Gaurav Kant) ***REVIEWED BY*** (Amit Raj Mishra) ***Authorised Signatory***

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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	**09/2024**	**Cluster**	**Cluster IV**			**ULR No.**	TC1012224000001149F
Customer	**Environment Department, Bharat Coking Coal Limited (BCCL), Koyla Bhawan, Dhanbad (E-mail: gmenv.bccl@coalindia.in)**					**Date of Issue**	**13.11.2024**
Project	**Rudhi Basti**		**Sample Ref. No.**	**REM/BCCL/2024/09**	**Sampling Method**	**CMPDI/RI-II/LPM 11 , (IS 5182)**	
Date of Sampling	09.09.2024		23.09.2024	Period of Analysis	09.09.2024 to 25.10.2024	**Zone of Station:**	**Buffer Zone**

Sl. No.	**Parameter**	**Method of Analysis**	**Observed Values (in µg/m³)**		**Range Of Testing**	**LDL**	**MoEF Standards Notification dated 25th September,2000 (GSR 742 E)**	**NAAQS, 2009**
			1st FN A2644	**2nd FN** A2722				
1	PM_{10}	IS -5182(Part 23):2006, R-2017	68	72	10 µg/m³ - 1000 µg/m³	10 µg/m³	300	100
2	$PM_{2.5}$	IS -5182(Part 24):2019	27	37	10 µg/m³ - 400 µg/m³	10 µg/m³	Not Specified	60
3	SO_2	IS-5182(Part-2): 2001 , R-2017	12	10	10 µg/m³ - 1050 µg/m³	10 µg/m³	120	80
4	NO_2	IS-5182 (Part-6): 2006 , R-2017	21	22	06 µg/m³ - 420 µg/m³	06 µg/m³	120	80

***All units are in µg/m3, 24 hourly Average, * LDL indicates Lower Detection Limit,*

ANALYSED BY

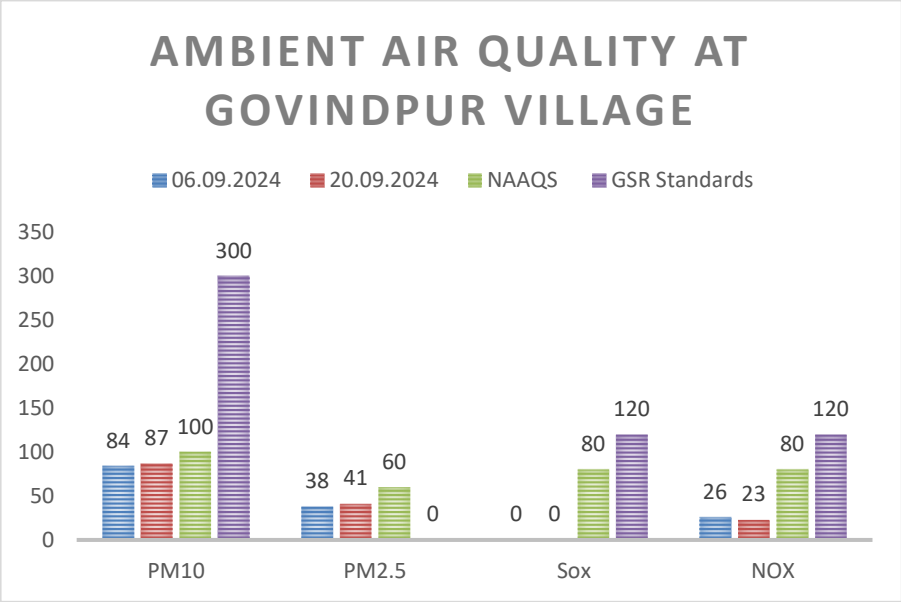
(Gaurav Kant)
REVIEWED BY

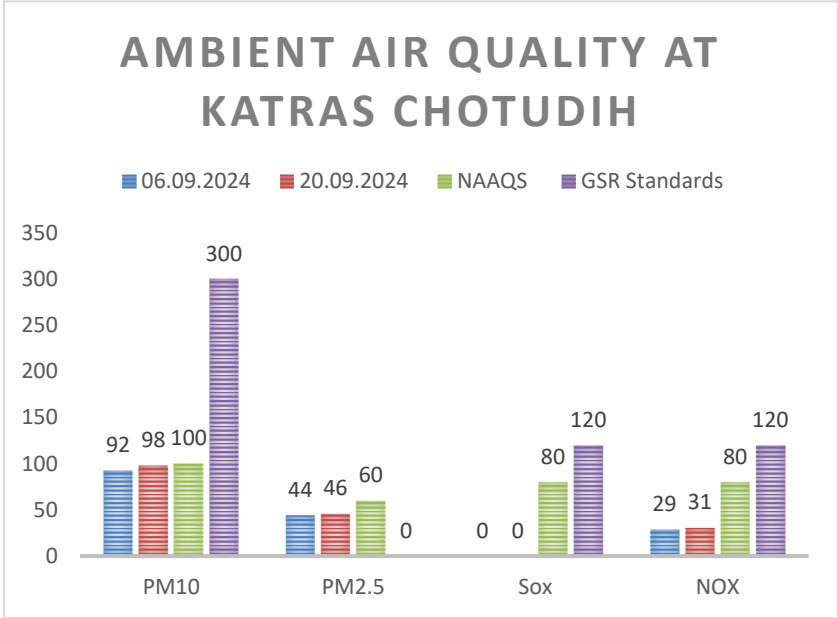
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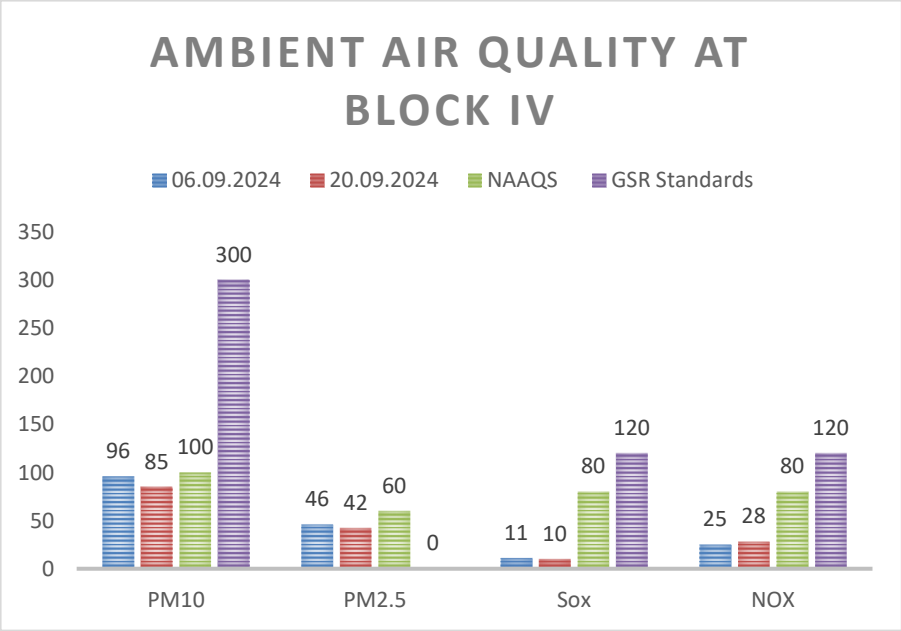
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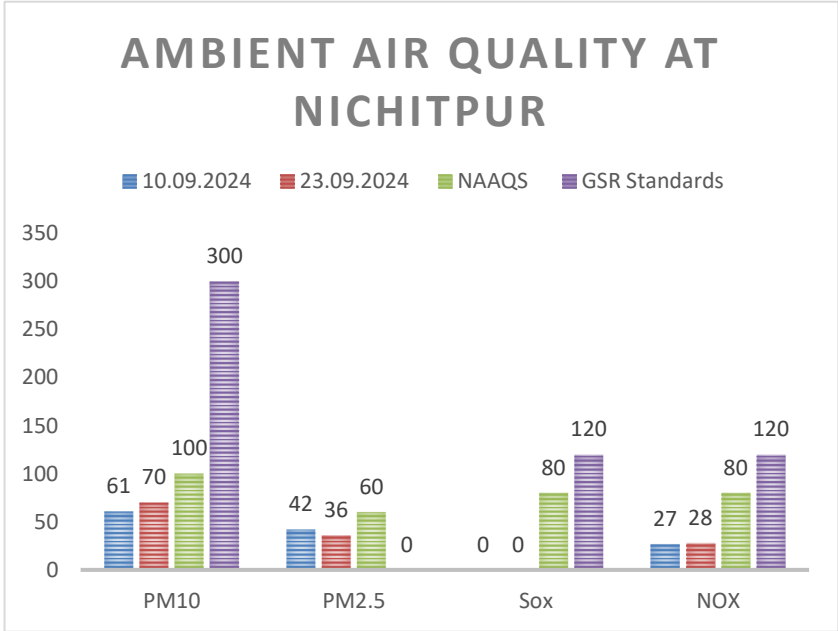
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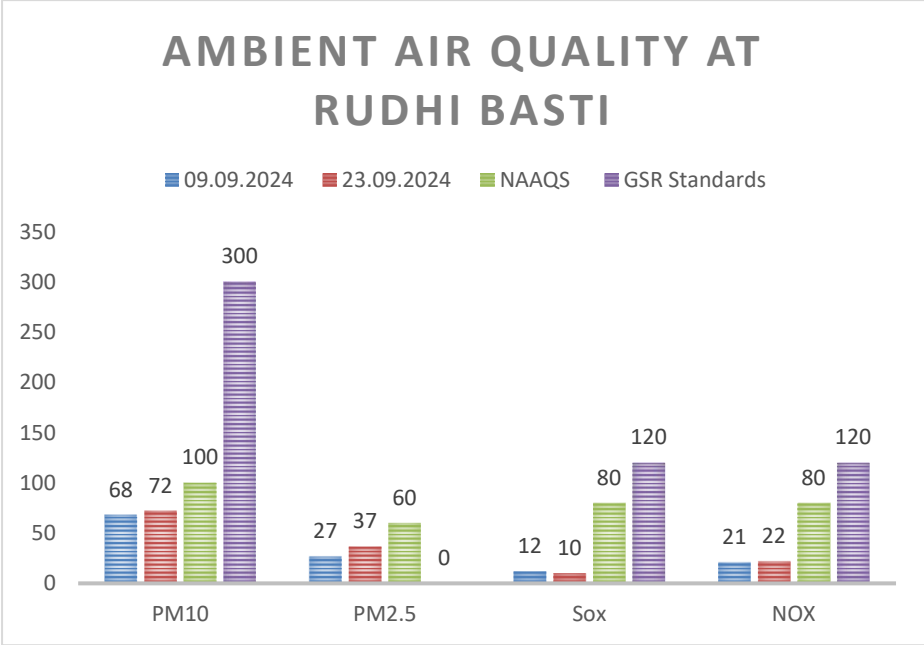
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AMBIENT AIR QUALITY AT GOVINDPUR VILLAGE
06.09.2024
20.09.2024
NAAQS
GSR Standards
350
300
250
200
150
100
50
0
84 87 100 300
38 41 60 0
0 0 80 120
26 23 80 120
PM10
PM2.5
Sox
NOX


AMBIENT AIR QUALITY AT KATRAS CHOTUDIH
06.09.2024
20.09.2024
NAAQS
GSR Standards
350
300
250
200
150
100
50
0
92 98 100 300
44 46 60 0
0 0 80 120
29 31 80 120
PM10
PM2.5
Sox
NOX


AMBIENT AIR QUALITY AT BLOCK IV
06.09.2024
20.09.2024
NAAQS
GSR Standards
350
300
250
200
150
100
50
0
96 85 100 300
46 42 60 0
11 10 80 120
25 28 80 120
PM10
PM2.5
Sox
NOX


AMBIENT AIR QUALITY AT NICHITPUR
10.09.2024
23.09.2024
NAAQS
GSR Standards
350
300
250
200
150
100
50
0
61 70 100 300
42 36 60 0
0 0 80 120
27 28 80 120
PM10
PM2.5
Sox
NOX


AMBIENT AIR QUALITY AT RUDHI BASTI
09.09.2024
23.09.2024
NAAQS
GSR Standards
350
300
250
200
150
100
50
0
68
72
100
300
27
37
60
0
12
10
80
120
21
22
80
120
PM10
PM2.5
Sox
NOX

WATER QUALITY MONITORING

3.1 Location of sampling sites

(Refer **Plate No. – II**)

i) Mine Discharge of Chotudih (MW4)

A sampling point is fixed to assess the effluent quality of Mine discharge. This location is selected to monitor effluent discharge in to Katri jore.

3.2 Methodology of sampling and analysis

Water samples were collected as per standard practice. The effluent samples were collected and analysed for four parameters on fortnightly basis at the Environmental Laboratory of CMPDI RI-II, Dhanbad.

3.3 Results & Interpretations

The results are given in tabular form along with the applicable standards. Results are compared with Schedule - VI, effluent prescribed by MoEF&CC. Results show that most of the parmeters are within the permissible limits.

CENTRAL MINE PLANNING AND DESIGN INSTITUTE LIMITED
Environment Laboratory, Regional Institute-II
MINE EFFLUENT TEST REPORT

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Test Report for Mine Effluent samples

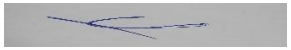
Month & Year	**09/2024**	**Cluster**	**Cluster IV**	**ULR No.**		TC1012224000001167F	
Customer	**Environment Department, Bharat Coking Coal Limited (BCCL), Koyla Bhawan, Dhanbad (E-mail: gmenv.bccl@coalindia.in)**					**Date of Issue**	**13.11.2024**
Project		**Sampling Ref. No.**	**REM/BCCL/2024/09**	**Sampling Method**	**IS 3025 (Part-1) CMPDI/RI-II/LPM 13**		
Period of Analysis	**(i)**	**Chotudih**	**Sample Collected in 2.5 Ltr Jerricane , Color as observed is transparent**			**Period of Analysis**	02.09.2024 to 30.09.2024
			Date of Sampling	02.09.2024	16.09.2024		

Sl. No.	**Parameter**	**Method of Analysis**	**Observed Values**		**STANDARDS FOR COAL MINES (Stipulated by Ministry of Environment and Forests (MoEF), Vide Notification No. GSR 742(E), Dt: 25.09.2000)**	**LDL**
			First Fortnight M1086	**Second Fortnight** M1111		
1	Total Suspended Solids	IS 3025/17:1984, R :2017, Gravimetric	32	34	*100 (Max)*	10
2	pH	IS-3025/11:1983, R-2017, Electrometric	7.43	7.41	*5.5 - 9.0*	0.2
3	Oil & Grease	IS 3025/39:1991, R : 2019, Partition Gravimetric	<4.0	<4.0	*10 (Max)*	2
4	COD	APHA 23rd Edition 5220 C Titrimetric Method	44	36	*250 (Max)*	4

***Grab sampling carried out for water samples. **All units in mg/L unless specified otherwise *LDL indicates Lower Detection Limit & BDL indicates Below Detection Limit,*



ANALYSED BY



(Kumar Vaibhav)
REVIEWED BY



(Amit Raj Mishra)
Authorised Signatory

Note: The results above relate to the samples tested as received. This report can not be reproduced in part or full without the written permission of the HOD(Env) , CMPDI, RI-II.

---- End of Report ----

NOISE LEVEL QUALITY MONITORING

4.1 Location of sampling sites

i) **Basseriya Managers Office (N9)**

ii) **Nichitpur (N8)**

iii) **Kusunda / Dhansar OCP (N10)**

i) **Pootki Balihari Office (N16)**

4.2 Methodology of sampling and analysis

Noise level measurements in form of 'L_{EQ}' were taken using Integrated Data Logging Sound Level Meter during day time & night time. Noise levels were measured for the complete day & night time, the Intergration time taken was one hour or 3600 seconds. Noise levels were measured in Decibels, 'A' weighted average, i.e. dB (A).

4.2 Results & Interpretations

Ambient noise levels were recorded during day time & night time and the observed values were compared with standards prescribed by MoEF&CC. The results of Noise levels recorded during day & night time on fortnightly basis are presented in tabular form along with the applicable standard permissible limits. The observed values in terms of L_{EQ} are presented**.** The observed values at all the monitoring locations are found to be within permissible limits.

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CENTRAL MINE PLANNING AND DESIGN INSTITUTE LIMITED

Environment Laboratory, Regional Institute-II

Ambient Noise Level Test Report

Month & Year	**09/2024**	**Cluster**	**Cluster IV**			**ULR No.**	TC1012224000001183F
Customer	**Environment Department, Bharat Coking Coal Limited (BCCL), Koyla Bhawan, Dhanbad (E-mail: gmenv.bccl@coalindia.in)**					**Date of issue**	**13.11.2024**
Project		**Sample Ref. No.**	**REM/BCCL/2024/09**		**Sampling Method**	**CMPDI/RI-II/LPM 22**	
Sampling Stations	**i**	**Govindpur**	**Date of Sampling**	06.09.2024	20.09.2024	**Zone Category of Station:**	**Core Zone**

Sl. No.	Parameter	Hour / Time of day	Observed Values (in Leq dB(A)) First Fortnight	Observed Values (in Leq dB(A)) Second Fortnight	Method of Analysis	Range Of Testing	LDL	NOISE POLLUTION (REGULATION AND CONTROL) RULES, 2000 Standards Zones	Limits in dB
1	Noise Level dB(A)Leq - Day	06:00 - 07:00	51.2	50.4	CPCB, Protocol for Ambient Level Noise Monitoring - 2015	35 dB-135 dB	35 dB(A)	Industrial Commercial Residential Silence	75 65 55 50
2		07:00 - 08:00	53.9	53.1					
3		08:00 - 09:00	56.5	56.1					
4		09:00 – 10:00	62.7	61.8					
5		10:00 - 11:00	61.2	63.2					
6		11:00 - 12:00	62.7	61.8					
7		12:00 - 13:00	65.8	67.1					
8		13:00 - 14:00	67.2	66.2					
9		14:00 - 15:00	60.3	60.3					
10		15:00 - 16:00	59.3	59.3					
11		16:00 - 17:00	58.8	58.8					
12		17:00 - 18:00	59.2	58.3					
13		18:00 - 19:00	58.3	57.5					
14		19:00 - 20:00	57.3	56.4					
15		20:00 - 21:00	57.3	52.4					
16		21:00 - 22:00	53.1	51.3					
		Leq DAY	61.1	60.9					
1	Noise Level dB(A)Leq -Night	22:00-23:00	51.1	50.4	CPCB, Protocol for Ambient Level Noise Monitoring - 2015	35 dB-135 dB	35 dB(A)	Industrial Commercial Residential Silence	70 55 45 50
2		23:00- 00:00	51	50.2					
3		00:00- 01:00	48	48.1					
4		01.00-02.00	46	45.8					
5		02.00-03.00	45.5	45.5					
6		03.00-04.00	45.5	45.5					
7		04.00-05.00	47.4	47.1					
8		05:00-06:00	48.4	48.2					
		Leq NIGHT	48.4	48.0					

**LDL indicates Lower Detection Limit*

***All noise measurements are integrated for a 01 hour period, All units in dB(A)*

Sampling Assistants
ANALYSED BY

(Gaurav Kant)
REVIEWED BY

(Amit Raj Mishra)
Authorised Signatory

Note: The results above relate to the samples tested as received. This report can not be reproduced in part or full without the written permission of the HOD(Env) , CMPDI, RI-II.

---- End of Report ----

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CENTRAL MINE PLANNING AND DESIGN INSTITUTE LIMITED

Environment Laboratory, Regional Institute-II

Ambient Noise Level Test Report

Month & Year	**09/2024**	**Cluster**	**Cluster IV**			**ULR No.**	TC1012224000001183F
Customer	**Environment Department, Bharat Coking Coal Limited (BCCL), Koyla Bhawan, Dhanbad (E-mail: gmenv.bccl@coalindia.in)**					**Date of Issue**	**13.11.2024**
Project		**Sample Ref. No.**	**REM/BCCL/2024/09**		**Sampling Method**	**CMPDI/RI-II/LPM 22**	
Sampling Stations	**i**	**Katrash Chotudih**	**Date of Sampling**	06.09.2024	20.09.2024	**Zone Category of Station:**	**Core Zone**

Sl. No.	**Parameter**	**Hour / Time of day**	**Observed Values (in Leq dB(A))**	**Observed Values (in Leq dB(A))**	**Method of Analysis**	**Range Of Testing**	**LDL**	**NOISE POLLUTION (REGULATION AND CONTROL) RULES, 2000 Standards**	
			First Fortnight	**Second Fortnight**				**Zones**	**Limits in dB**
1	Noise Level dB(A)Leq - Day	06:00 - 07:00	41.3	41.5	CPCB, Protocol for Ambient Level Noise Monitoring -2015	35 dB-135 dB	35 dB(A)	Industrial Commercial Residential Silence	75 65 55 50
2		07:00 - 08:00	43.6	43					
3		08:00 - 09:00	44.8	44.7					
4		09:00 – 10:00	45.6	45.6					
5		10:00 - 11:00	48.8	48.8					
6		11:00 - 12:00	49.6	50.5					
7		12:00 - 13:00	49.7	50.6					
8		13:00 - 14:00	51.9	52.4					
9		14:00 - 15:00	51.6	51.2					
10		15:00 - 16:00	51.9	51.9					
11		16:00 - 17:00	50.4	49.6					
12		17:00 - 18:00	49.6	48.5					
13		18:00 - 19:00	48.5	47.7					
14		19:00 - 20:00	48.1	47.9					
15		20:00 - 21:00	47	47.1					
16		21:00 - 22:00	46.7	47					
		Leq DAY	48.9	48.9					
1	Noise Level dB(A)Leq -Night	22:00-23:00	46.4	46.2	CPCB, Protocol for Ambient Level Noise Monitoring -2015	35 dB-135 dB	35 dB(A)	Industrial Commercial Residential Silence	70 55 45 50
2		23:00- 00:00	46.3	46.1					
3		00:00- 01:00	46.1	45.7					
4		01.00-02.00	45.7	45.5					
5		02.00-03.00	45.5	45					
6		03.00-04.00	45.5	45.5					
7		04.00-05.00	46.8	45.8					
8		05:00-06:00	47.2	46.5					
		Leq NIGHT	46.2	45.8					

**LDL indicates Lower Detection Limit*

***All noise measurements are integrated for a 01 hour period, All units in dB(A)*

Sampling Assistants
ANALYSED BY

(Gaurav Kant)
REVIEWED BY

(Amit Raj Mishra)
Authorised Signatory

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CENTRAL MINE PLANNING AND DESIGN INSTITUTE LIMITED

Environment Laboratory, Regional Institute-II

Ambient Noise Level Test Report

Month & Year	**09/2024**	**Cluster**	**Cluster IV**			**ULR No.**	TC1012224000001183F
Customer	**Environment Department, Bharat Coking Coal Limited (BCCL), Koyla Bhawan, Dhanbad (E-mail: gmenv.bccl@coalindia.in)**					**Date of Issue**	**13.11.2024**
Project		**Sample Ref. No.**	**REM/BCCL/2024/09**		**Sampling Method**	**CMPDI/RI-II/LPM 22**	
Sampling Stations	**i**	**Block IV**	**Date of Sampling**	06.09.2024	20.09.2024	**Zone Category of Station:**	**Buffer Zone**

Sl. No.	**Parameter**	**Hour / Time of day**	**Observed Values (in Leq dB(A))**	**Observed Values (in Leq dB(A))**	**Method of Analysis**	**Range Of Testing**	**LDL**	**NOISE POLLUTION (REGULATION AND CONTROL) RULES, 2000 Standards**	
			First Fortnight	**Second Fortnight**				**Zones**	**Limits in dB**
1	Noise Level dB(A)Leq - Day	06:00 - 07:00	53.4	52.1	CPCB, Protocol for Ambient Level Noise Monitoring -2015	35 dB-135 dB	35 dB(A)	Industrial Commercial Residential Silence	75 65 55 50
2		07:00 - 08:00	57.5	56.4					
3		08:00 - 09:00	58.3	57.4					
4		09:00 – 10:00	61.7	61					
5		10:00 - 11:00	61.4	60.3					
6		11:00 - 12:00	62.6	62					
7		12:00 - 13:00	62.2	61					
8		13:00 - 14:00	62.5	63.2					
9		14:00 - 15:00	62.9	61.9					
10		15:00 - 16:00	65.8	64					
11		16:00 - 17:00	66.5	66.3					
12		17:00 - 18:00	67.3	67.1					
13		18:00 - 19:00	66.1	64					
14		19:00 - 20:00	65.7	65					
15		20:00 - 21:00	59.2	58.2					
16		21:00 - 22:00	52.4	50.8					
		Leq DAY	63.3	62.5					
1	Noise Level dB(A)Leq -Night	22:00-23:00	50.7	49.4	CPCB, Protocol for Ambient Level Noise Monitoring -2015	35 dB-135 dB	35 dB(A)	Industrial Commercial Residential Silence	70 55 45 50
2		23:00- 00:00	49.9	47.7					
3		00:00- 01:00	48.2	47.2					
4		01.00-02.00	43.2	43.4					
5		02.00-03.00	42.8	43					
6		03.00-04.00	45.8	44.3					
7		04.00-05.00	44	43.3					
8		05:00-06:00	44.3	45.4					
		Leq NIGHT	47.1	46.1					

**LDL indicates Lower Detection Limit*

***All noise measurements are integrated for a 01 hour period, All units in dB(A)*

Sampling Assistants
ANALYSED BY

(Gaurav Kant)
REVIEWED BY

(Amit Raj Mishra)
Authorised Signatory

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Ambient Noise Level Test Report

Month & Year	**09/2024**	**Cluster**	**Cluster IV**			**ULR No.**	TC1012224000001183F
Customer	**Environment Department, Bharat Coking Coal Limited (BCCL), Koyla Bhawan, Dhanbad (E-mail: gmenv.bccl@coalindia.in)**					**Date of Issue**	**13.11.2024**
Project		**Sample Ref. No.**	**REM/BCCL/2024/09**		**Sampling Method**	**CMPDI/RI-II/LPM 22**	
Sampling Stations	**i**	**Nichitpur**	**Date of Sampling**	10.09.2024	23.09.2024	**Zone Category of Station:**	**Buffer Zone**

Sl. No.	**Parameter**	**Hour / Time of day**	**Observed Values (in Leq dB(A)) First Fortnight**	**Observed Values (in Leq dB(A)) Second Fortnight**	**Method of Analysis**	**Range Of Testing**	**LDL**	**NOISE POLLUTION (REGULATION AND CONTROL) RULES, 2000 Standards**	
								Zones	**Limits in dB**
1	Noise Level dB(A)Leq - Day	06:00 - 07:00	40.8	39.5	CPCB, Protocol for Ambient Level Noise Monitoring - 2015	35 dB-135 dB	35 dB(A)	Industrial Commercial Residential Silence	75 65 55 50
2		07:00 - 08:00	42.2	42.7					
3		08:00 - 09:00	47.7	49					
4		09:00 – 10:00	43.9	44.7					
5		10:00 - 11:00	44.1	43.7					
6		11:00 - 12:00	49.3	50.5					
7		12:00 - 13:00	52.1	56.1					
8		13:00 - 14:00	54.8	54.4					
9		14:00 - 15:00	52.7	52.7					
10		15:00 - 16:00	50.4	50.3					
11		16:00 - 17:00	49.6	53.4					
12		17:00 - 18:00	45.2	49.3					
13		18:00 - 19:00	47.7	47.2					
14		19:00 - 20:00	45.7	46					
15		20:00 - 21:00	45.7	46.5					
16		21:00 - 22:00	45.6	45.4					
		Leq DAY	49.0	50.3					
1	Noise Level dB(A)Leq -Night	22:00-23:00	45.3	45.2	CPCB, Protocol for Ambient Level Noise Monitoring - 2015	35 dB-135 dB	35 dB(A)	Industrial Commercial Residential Silence	70 55 45 50
2		23:00- 00:00	45.2	44.7					
3		00:00- 01:00	44.6	44.3					
4		01.00-02.00	44.1	44					
5		02.00-03.00	44	43.9					
6		03.00-04.00	43.8	44.6					
7		04.00-05.00	44.7	45.2					
8		05:00-06:00	45.1	45.2					
		Leq NIGHT	44.6	44.7					

**LDL indicates Lower Detection Limit*

***All noise measurements are integrated for a 01 hour period, All units in dB(A)*

Sampling Assistants
ANALYSED BY

(Gaurav Kant)
REVIEWED BY

(Amit Raj Mishra)
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Ambient Noise Level Test Report

Month & Year	**09/2024**	**Cluster**	**Cluster IV**			**ULR No.**	TC1012224000001183F
Customer	**Environment Department, Bharat Coking Coal Limited (BCCL), Koyla Bhawan, Dhanbad (E-mail: gmenv.bccl@coalindia.in)**					**Date of Issue**	**13.11.2024**
Project		**Sample Ref. No.**	**REM/BCCL/2024/09**		**Sampling Method**	**CMPDI/RI-II/LPM 22**	
Sampling Stations	**i**	**Rudhi Basti**	**Date of Sampling**	09.09.2024	23.09.2024	**Zone Category of Station:**	Buffer Zone

Sl. No.	**Parameter**	**Hour / Time of day**	**Observed Values (in Leq dB(A))**	**Observed Values (in Leq dB(A))**	**Method of Analysis**	**Range Of Testing**	**LDL**	**NOISE POLLUTION (REGULATION AND CONTROL) RULES, 2000 Standards**	
			First Fortnight	**Second Fortnight**				**Zones**	**Limits in dB**
1	Noise Level dB(A)Leq - Day	06:00 - 07:00	44.7	45.8	CPCB, Protocol for Ambient Level Noise Monitoring - 2015	35 dB-135 dB	35 dB(A)	Industrial Commercial Residential Silence	75 65 55 50
2		07:00 - 08:00	48	48.2					
3		08:00 - 09:00	49.1	50.5					
4		09:00 – 10:00	45.4	46.1					
5		10:00 - 11:00	50.5	50.8					
6		11:00 - 12:00	54.2	53.4					
7		12:00 - 13:00	52.1	52.6					
8		13:00 - 14:00	53.4	54					
9		14:00 - 15:00	55.4	54.6					
10		15:00 - 16:00	57.7	57.9					
11		16:00 - 17:00	53.1	52.9					
12		17:00 - 18:00	50.6	50.8					
13		18:00 - 19:00	44.7	45.8					
14		19:00 - 20:00	45.3	45.4					
15		20:00 - 21:00	42.8	43.6					
16		21:00 - 22:00	42.7	43.7					
		Leq DAY	51.6	51.7					
1	Noise Level dB(A)Leq -Night	22:00-23:00	42.5	43.2	CPCB, Protocol for Ambient Level Noise Monitoring - 2015	35 dB-135 dB	35 dB(A)	Industrial Commercial Residential Silence	70 55 45 50
2		23:00- 00:00	42.6	43.2					
3		00:00- 01:00	42	42.1					
4		01.00-02.00	42	41.6					
5		02.00-03.00	41.6	41.4					
6		03.00-04.00	41.8	43					
7		04.00-05.00	41.9	42.9					
8		05:00-06:00	42	42.9					
		Leq NIGHT	42.1	42.6					

**LDL indicates Lower Detection Limit*

***All noise measurements are integrated for a 01 hour period, All units in dB(A)*

Sampling Assistants
ANALYSED BY

(Gaurav Kant)
REVIEWED BY

(Amit Raj Mishra)
Authorised Signatory

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Ambient Air Quality Standards for Jharia Coal Field
As per the Environment (Protection) Amendment Rules, 2000 notified vide notification G.S.R. 742(E), dated 25.9.2000.

Category	Pollutant	Time weighted average	Concentration in Ambient Air	Method of Measurement
1	2	3	4	5
III Coal mines located in the coal fields of • Jharia • Raniganj • Bokaro	Suspended Particulate Matter (SPM)	Annual Average * 24 hours **	500 µg/m^3 700 µg/m^3	- High Volume Sampling (Average flow rate not less than 1.1 m^3
	Respirable Particulate Matter (size less than 10 µm) (RPM)	Annual Average * 24 hours **	250 µg/m^3 300 µg/m^3	Respirable Particulate Matter sampling and analysis
	Sulphur Dioxide (SO_2)	Annual Average * 24 hours **	80 µg/m^3 120 µg/m^3	1.Improvedwest and Gaeke method 2.Ultraviolet fluorescene
	Oxide of Nitrogen as NO_2	Annual Average * 24 hours **	80 µg/m^3 120 µg/m^3	1. Jacob & Hochheiser Modified (Na-Arsenic) Method 2. Gas phase Chemilumine-scence

Note:

* Annual Arithmetic mean for the measurements taken in a year, following the guidelines for frequency of sampling laid down in clause2.

** 24hourly/8hourly values shall be met 92% of the time in a year. However, 8% of the time it may exceed but not on two consecutive days.

NATIONAL AMBIENT AIR QUALITY STANDARDS

New Delhi the 18th November 2009

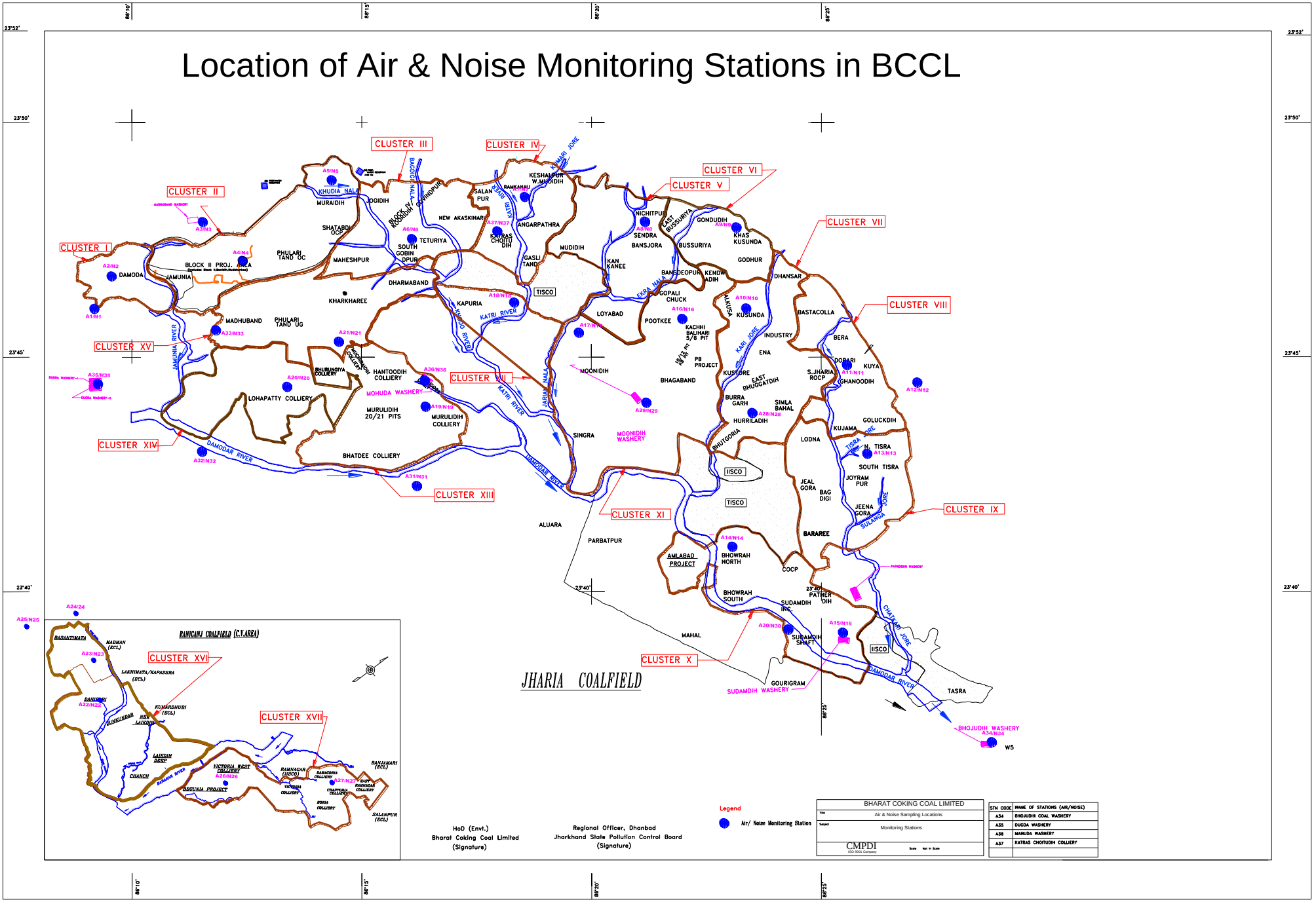
In exercise of the powers conferred by Sub-section (2) (h) of section 16 of the Air (Prevention and Control of Pollution) Act, 1981 (Act No. 14 of 1981), and in supersession of the notification No(s).S.O.384(E), dated 11th April 1994 and S.O.935(E), dated 14th November 1998, the Central Pollution Control Board hereby notify the National Ambient Air Quality Standards with immediate effect.

Pollutant	Time Weighted Average	Concentration in Ambient Air		Methods of Measurement
		Industrial, Residential, Rural and other Areas	Ecologically Sensitive Area (Notified by Central Government)	
Sulphur Dioxide (SO_2), µg/m³	Annual * 24 Hours **	50 80	20 80	-Improved West and Gaeke Method -Ultraviolet Fluorescence
Nitrogendioxide (NO_2), µg/m³	Annual * 24 Hours **	40 80	30 80	-Jacob &Hochheiser modified ($NaOH$-$NaAsO_2$) Method -Gas Phase Chemiluminescence
Particulate Matter (Size less than 10µm) or PM_{10}, µg/m³	Annual * 24 Hours **	60 100	60 100	-Gravimetric -TEOM -Beta attenuation
Particulate Matter (Size less than 2.5µm) or $PM_{2.5}$, µg/m³	Annual * 24 Hours **	40 60	40 60	-Gravimetric -TEOM -Beta attenuation
Ozone (O_3) , µg/m³	8 Hours * 1 Hour **	100 180	100 180	-UV Photometric -Chemiluminescence -Chemical Method
Lead (Pb) , µg/m³	Annual * 24 Hours **	0.50 1.0	0.50 1.0	-AAS/ICP Method after sampling on EPM 2000 or equivalent filter paper -ED-XRF using Teflon filter
Carbon Monoxide (CO), mg/m³	8 Hours ** 1 Hour **	02 04	02 04	-Non dispersive Infrared (NDIR) Spectroscopy
Ammonia (NH_3), µg/m³	Annual * 24 Hours **	100 400	100 400	-Chemiluminescence -Indophenol blue method
Benzene (C_6H_6), µg/m³	Annual *	05	05	-Gas Chromatography (GC) based continuous analyzer -Adsorption and desorption followed by GC analysis
Benzo(a)Pyrene (BaP) Particulate phase only, ng/m³	Annual *	01	01	-Solvent extraction followed byHPLC/GC analysis
Arsenic (As), ng/m³	Annual *	06	06	-AAS/ICP Method after sampling on EPM 2000 or equivalent filter paper
Nickel (Ni), ng/m³	Annual *	20	20	-AAS/ICP Method after sampling on EPM 2000 or equivalent filter paper

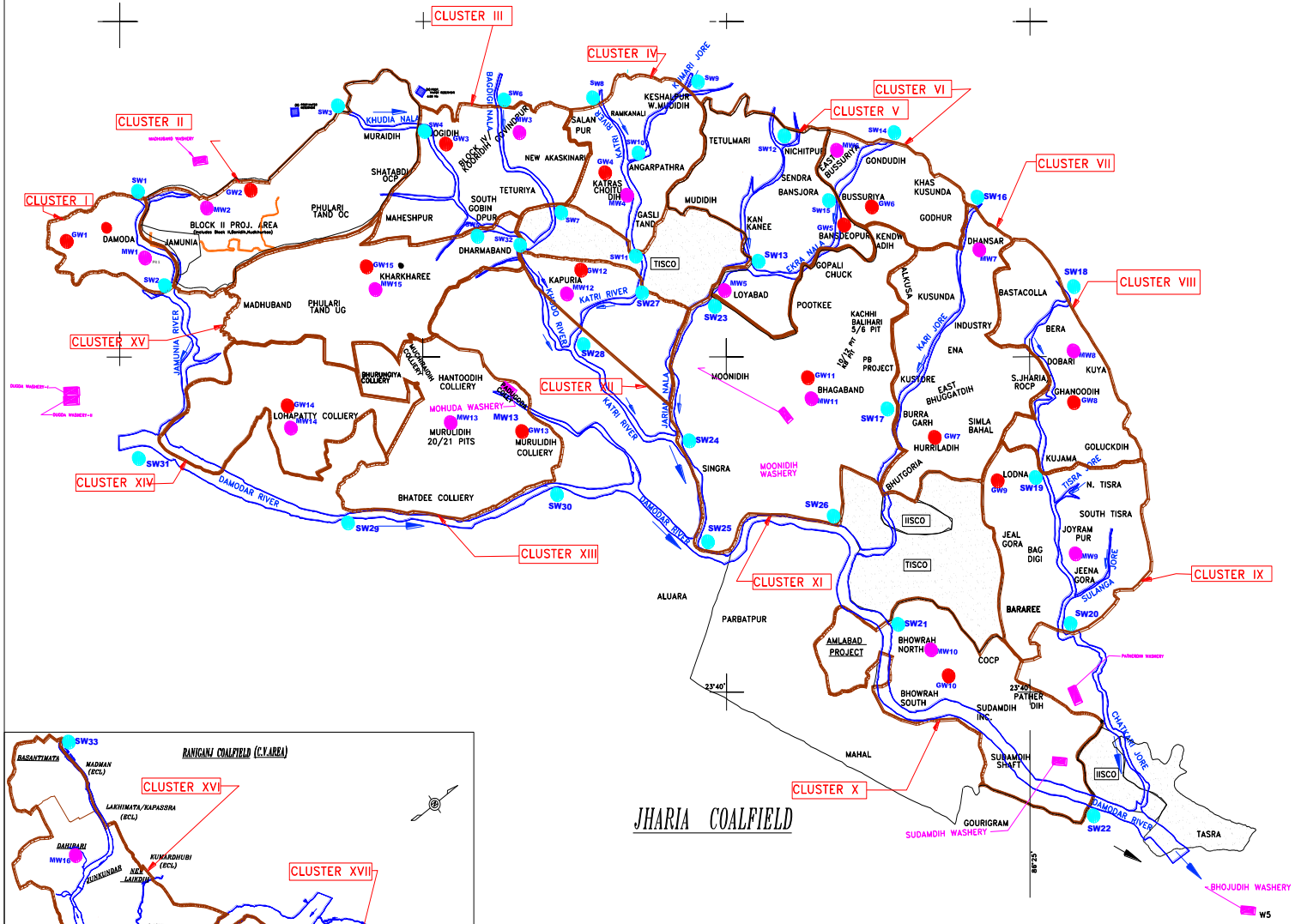
* Annual Arithmetic mean of minimum 104 measurements in a year at a particular site taken twice a week 24 hourly at uniform intervals.

** 24 hourly or 8 hourly or 1 hourly monitored values, as applicable, shall be complied with 98% of the time in a year. 2% of the time, they may exceed the limits but not on two consecutive days of monitoring.

NOTE: Whenever and wherever monitoring results on two consecutive days of monitoring exceed the limits specified above for the respective category, it shall be considered adequate reason to institute regular or continuous monitoring and further investigations.


Location of Air & Noise Monitoring Stations in BCCL
CLUSTER I
CLUSTER II
CLUSTER III
CLUSTER IV
CLUSTER V
CLUSTER VI
CLUSTER VII
CLUSTER VIII
CLUSTER IX
CLUSTER X
CLUSTER XI
CLUSTER XII
CLUSTER XIII
CLUSTER XIV
CLUSTER XV
CLUSTER XVI
CLUSTER XVII
JHARIA COALFIELD
RANIGANJ COALFIELD (CV AREA)
DAMODA
JAMUNIA
BLOCK II PROJ. AREA
PHULARI TAND OC
PHULARI TAND UG
MAHESHPUR
SHATABDI OCP
MURAIDIH
JOGIDIH
KHUDIA NALA
BAGDIGI NALA
BLOCK IV/ KOORIDIH
GOVINDPUR
TETURIYA
SOUTH GOBIN DPUR
NEW AKASKINARI
SALAN PUR
KESHALPUR W.MUDIDIH
RAMKANALI
KATRI RIVER
KHARKHAREE
DHARMABAND
KAPURIA
TISCO
ANGARPATHRA
KHORAO CHOITUDIH
MUDIDIH
GASLI TAND
KAN KANEE
NICHITPUR
SENDRA
BANSJORA
EAST BUSSURIYA
BUSSURIYA
GONDUDIH
KHAS KUSUNDA
GODHUR
DHANSAR
BANSDEOPUR
KENDWADIH
GOPALI CHUCK
LOYABAD
POOTKEE
KACHHI BALIHARI 5/6 PIT
KUSUNDA
ALKUSA
BASTACOLLA
BERA
INDUSTRY
ENA
DOBARI
KUYA
GHANOODIH
S.JHARIA ROCP
PB PROJECT
KUSTORE
EAST BHUGGATDIH
BHAGABAND
BURRA GARH
HURRILADIH
SIMLA BAHAL
MOONIDIH
MOONIDIH WASHERY
SINGRA
BHUTGORIA
LODNA
KUJAMA
GOLUCKDIH
N. TISRA
SOUTH TISRA
JOYRAM PUR
JEAL GORA
BAG DIGI
JEENA GORA
BARAREE
IISCO
COCP
BHOWRAH NORTH
BHOWRAH SOUTH
AMLABAD PROJECT
PARBATPUR
ALUARA
SUDAMDIH INC.
SUDAMDIH SHAFT
SUDAMDIH WASHERY
PATHERDIH
GOURIGRAM
TASRA
MAHAL
MOHUDA WASHERY
LOHAPATTY COLLIERY
MURULIDIH 20/21 PITS
MURULIDIH COLLIERY
BHATDEE COLLIERY
HANTOODIH COLLIERY
BHURUNGIYA COLLIERY
MADHUBAND
DAMODAR RIVER
JAMUNIA RIVER
KARI JORE
CHANAKARI JORE
SULANGA JORE
TISRA JORE
BHOJUDIH WASHERY
W5
BASANTIMATA
MADHAN (ECL)
LAKHIMATA/KAPASSRA (ECL)
DAHIBARI
KUMARDHUBI (ECL)
DUNKUNDAR
NEW LAIKDIH
LAIKDIH DEEP
CHANCH
BARAKAR RIVER
BECUNIA PROJECT
VICTORIA WEST COLLIERY
RAMNAGAR (IISCO)
DAKADORIA COLLIERY
VICTORIA COLLIERY
CHAPTADIH COLLIERY
EAST RAMNAGAR COLLIERY
BORIA COLLIERY
BANJAMARI (ECL)
SALANPUR (ECL)
A1/N1
A2/N2
A3/N3
A4/N4
A5/N5
A6/N6
A7/N7
A8/N8
A9/N9
A10/N10
A11/N11
A12/N12
A13/N13
A14/N14
A15/N15
A16/N16
A17/N17
A18/N18
A19/N19
A20/N20
A21/N21
A22/N22
A23/N23
A24/24
A25/N25
A26/N26
A27/N27
A28/N28
A29/N29
A30/N30
A31/N31
A32/N32
A33/N33
A34/N34
A35/N35
A36/N36
A37/N37
Legend
Air/ Noise Monitoring Station
HoD (Envt.)
Bharat Coking Coal Limited
(Signature)
Regional Officer, Dhanbad
Jharkhand State Pollution Control Board
(Signature)
BHARAT COKING COAL LIMITED
Air & Noise Sampling Locations
Monitoring Stations
CMPDI
STN CODE
NAME OF STATIONS (AIR/NOISE)
A34
BHOJUDIH COAL WASHERY
A35
DUGDA WASHERY
A36
MAHUDA WASHERY
A37
KATRAS CHOITUDIH COLLIERY

Water Sampling Locations in BCCL



INDEX

Cluster	Suface Water (U/S, D/S)	Name of River/ Nala / Jore	Mine/ Effluent Water	Sampling Location	Ground Water	Sampling Location
I	SW1, SW2	Jamunia River	MW1	Damoda Area	GW1	Ghutway Village
II	SW3, SW4	Khudia Nala	MW2	Block II OCP	GW2	Joyrampur Village
III	SW4, SW5, SW6, SW7	Khudia Nala, Bagdigi Nala	MW3	Govindpur Colliery	GW3	Jogidih Village
IV	SW8, SW11, SW9, SW10	Katri River, Kumari Jore	MW4	Chotudih	GW4	Kankanee Village
V	SW12, SW13, SW15	Jarian Nala, Ekra Nala	MW5	Mudidih	GW5	Nichitpur
VI	SW14, SW15	Ekra Nala	MW6	East Bassuria UGP	GW6	Bansjora Borewell
VII	SW16, SW17	Kari Jore	MW7	Dhansar UGP	GW7	Hurriladih
VIII	SW18, SW19	Kashi Jore	MW8	Dobari UGP	GW8	Ghanudih
IX	SW19, SW20	Kashi Jore	MW9	Jeenagora	GW9	Lodna
X	SW21, SW22	Damodar River	MW10	Bhowrah North	GW10	Bhowrah South
XI	SW23, SW24, SW25, SW26	Jarian Nala, Damodar River	MW11	Bhagaband h UGP	GW11	Bhagabandh
XII	SW27, SW28	Katri River	MW12	Kapuria	GW12	Kapuria
XIII	SW29, SW30	Damodar River	MW13	Murulidih (20/21)	GW13	Murilidih
XIV	SW31, SW29	Damodar River	MW14	Lohapatti	GW14	Lohapatti
XV	SW5, SW32	Khudia Nala	MW15	Kharkharee UGP	GW15	Kharkharee
XVI	SW33, SW34	Khudia River	MW16	Dahibari OCP	GW16	Patlabari Village
XVII	SW35, SW36	Barakar River	MW17	Damagoria Colliery	GW17	Chaptoria

HoD (Envt.)
Bharat Coking Coal Limited
(Signature)

Regional Officer, Dhanbad
Jharkhand State Pollution Control Board
(Signature)

Legend
- Sampling Locations of Surface Water (Upstream/ Downstream)
- Sampling Locations of Mine Water
- Sampling Locations of Ground/ Drinking Water

Customer: BHARAT COKING COAL LIMITED
Title: WATER SAMPLING LOCATIONS
Subject: MONITORING STATIONS
CMPDI (ISO 9001 Company)
Scale: Not to Scale

Annexure-24

PME FY 2024-2025			
Name of company	Name of Area	IME/PME Target(Depart. & Contractual)	Achievement
BCCL	KATRAS(Cluster-IV)	Total-732	Total -536
		Departmental- 720	Departmental- 524
		Contractual -12	Contractual -12

Annexure-25



Annexure-26

Table 4.9 : Afforestation programme of the Cluster-IV

	Year	Quarry land (abandoned)		Active Quarry Area		OB dumped out side quarry area		Service Building/ Mine Infrastructure / Coal dump		Green belt around OCP		Barren Land		Total Plantation	Total Area Under Additional Plantation (Ha)	Total Plantation cost @ Rs.55101/Ha (in Rs.Lakhs)
		Area (ha)	Trees/ saplings	Area (ha)	Trees/ saplings	Area (ha)	Trees/ saplings	Area (ha)	Trees/ saplings	Area (ha)	Trees/ saplings	Area (ha)	Trees/ saplings			
During active mining (A)	1	2	5000							2	5000	2	5000	15000	6	3.31
	2	2	5000							2	5000	2	5000	15000	6	3.31
	3	2	5000							2	5000	2	5000	15000	6	3.31
	4	2	5000							2	5000	2	5000	15000	6	3.31
	5	2	5000							2	5000	2	5000	15000	6	3.31
	6	3	7500							2	5000	2	5000	17500	7	3.86
	7	3	7500							2	5000	2	5000	17500	7	3.86
	8	3	7500							2	5000	2	5000	17500	7	3.86
	9	3	7500							2	5000	2	5000	17500	7	3.86
	10	3	7500							2	5000	2	5000	17500	7	3.86
	11	5	12500							2	5000	2	5000	22500	9	4.96
	12	5	12500							2	5000	2	5000	22500	9	4.96
	13	5	12500							2	5000	2	5000	22500	9	4.96
	14	5	12500							2	5000	2	5000	22500	9	4.96
	15	5	12500	5	12500					2	5000	2	5000	35000	14	7.71
	16	5	12500	5	12500					3	7500	3	7500	40000	16	8.82
	17	5	12500	5	12500					3	7500	3	7500	40000	16	8.82
	18	5	12500	5	12500					3	7500	3	7500	40000	16	8.82
	19	4.75	11875	5	12500					3	7500	3	7500	39375	15.75	8.68
	20			5	12500					3	7500	3	7500	27500	11	6.06
	21			5	12500					3	7500	3	7500	27500	11	6.06
	22			5	12500					3	7500	3	7500	27500	11	6.06
	23			5	12500	2	5000			3	7500	3	7500	32500	13	7.16
	24			5	12500	2	5000			3	7500	3	7500	32500	13	7.16
	25			5	12500	2	5000			3	7500	5	12500	37500	15	8.27
	26			10	25000	2	5000			3	7500	5	12500	50000	20	11.02
	27			10	25000	2	5000			3	7500	5	12500	50000	20	11.02
	28			10	25000	2	5000			3	7500	5	12500	50000	20	11.02
	29			10	25000	2	5000			3	7500	5	12500	50000	20	11.02
	30			9.9	24750	2	5000			3	7500	8	20000	57250	22.9	12.62
	Total (A)	**69.75**	**174375**	**104.9**	**262250**	**16**	**40000**	**0**	**0**	**75**	**187500**	**90**	**225000**	**889125**	**355.65**	**195.96671**
Post mining (B)		10	25000	30	75000	4	10000	30	75000	10	25000	20	50000	260000	104	57.31
		10	25000	30	75000	4	10000	30	75000	10	25000	20	50000	260000	104	57.31
		10	25000	30	75000	4.89	12225	32.25	80625	10.55	26375	14.38	35950	255175	102.07	56.24
	Total (B)	**30**	**75000**	**90**	**225000**	**12.89**	**32225**	**92.25**	**230625**	**30.55**	**76375**	**54.38**	**135950**	**775175**	**310.07**	**170.85167**
Grand (A+B)		**99.75**	**249375**	**194.9**	**487250**	**28.89**	**72225**	**92.25**	**230625**	**105.55**	**263875**	**144.38**	**360950**	**1664300**	**665.72**	**366.81838**

CSR Works & Expenditure FY 2020-21*

(CSR Budget - ₹ 5.54 Crore)

Sl No	CSR Projects identified	District and State of Project		Amt. spent (₹ lakhs)		Direct or through agency
		District	State	Direct Exp	Overheads	
A	**Promoting education,including special education & employment enhancing vocation skills especially among children,women,elderly,and the differently abled & livelihood enhancement projects**					
1	Works in RBB School, Rajganj	Dhanbad	Jharkhand	27.57	--	Direct
B	**Rural Development Works**					
1	Construction of marriage hall at Ratanpur panchayat, Govindpur Block	Dhanbad	Jharkhand	3.73	--	Direct
2	Other Civil Works	Dhanbad	Jharkhand	1.69	--	Direct
C	**COVID-19 related initiatives**					
1	Procurement of bleaching powder	Dhanbad	Jharkhand	6.4	--	Direct
2	Procurement of face masks	Dhanbad	Jharkhand	0.16	--	Direct
3	Financial assistance to D.C. Dhanbad to combat COVID-19 situation in Dhanbad	Dhanbad	Jharkhand	200	--	Depository mode of work execution through Dhanbad district administration
	Total			**239.55**	--	

**** Figures unaudited for the FY 2020-21***

CSR Works & Expenditure FY 2020-21*

(CSR Budget - ₹ 5.54 Crore)

Sl No	CSR Projects identified	District and State of Project		Amt. spent (₹ lakhs)		Direct or through agency
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	Total			**239.55**	--	

**** Figures unaudited for the FY 2020-21***




NW
Samsung Triple Camera
Shot with my Galaxy A70





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 pubic consultations for obtaining Environmental Clearance (EC) from MoEF&CC. Similarly, in the existing projects needing enhancementof 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 aview 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 activityfor 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 thesubsidiary 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 incorporatedby 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 Dehradunetc. working in the fields of biodiversity conservation.

6. COAL BENEFICIATION / COALWASHERIES:

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- IAIII 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 CILCorporate Environmental Policy would be reviewed and suitably revised. It will be followed by revision of this policy accordingly.

Place: Dhanbad
Date:

Chairman-cum-Managing Director
21/02/2023

Major Environmental measures cost for the year 2024-25

Sl. No.	Activity (24-25)	Approx Cost Incurred (In Lakhs)
1	Environmental Monitoring (Air, water and noise)	9
2	Ecological Restoration/Block Plantation/Green Park	50.0
3	Water treatment plant	17.00
4	Top soil Management	2
5	Water Sprinkling	45.00

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: (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.

CENTRAL GROUND WATER AUTHORITY

Validity of this NOC shall be subject to compliance of the following conditions:

Mandatory conditions:

1) Installation of tamper proof digital water flow meter with telemetry on all the abstraction structure(s) shall be mandatory for all users seeking No Objection Certificate and intimation regarding their installation shall be communicated to the CGWA within 30 days of grant of No Objection Certificate.

2) Proponents shall mandatorily get water flow meter calibrated from an authorized agency once in a year.

3) Construction of purpose-built observation wells (piezometers) for ground water level monitoring shall be mandatory as per Section 14 of Guidelines. Water level data shall be made available to CGWA through web portal. Detailed guidelines for construction of piezometers are given in Annexure-II of the guidelines.

4) Proponents shall monitor quality of ground water from the abstraction structure(s) once in a year. Water samples from bore wells/ tube wells / dug wells shall be collected during April/May every year and analysed in NABL accredited laboratories for basic parameters (cations and anions), heavy metals, pesticides/ organic compounds etc. Water quality data shall be made available to CGWA through the web portal.

5) In case of mining projects, additional key wells shall be established in consultation with the Regional Director, CGWB for ground water level monitoring four (4) times a year (January, May, August and November) in core as well as buffer zones of the mine.

6) In case of mining project the firm shall submit water quality report of mine discharge/ seepage from Govt. approved/ NABL accredited lab.

7) The firm shall report compliance of the NOC conditions online in the website (www.cgwa-noc.gov.in) within one year from the date of issue of this NOC.

8) Industries abstracting ground water in excess of 100 m 3 /d shall undertake annual water audit through certified auditors and submit audit reports within three months of completion of the same to CGWA. All such industries shall be required to reduce their ground water use by at least 20% over the next three years through appropriate means.

9) Application for renewal can be submitted online from 90 days before the expiry of NOC. Ground water withdrawal, if any, after expiry of NOC shall be illegal & liable for legal action as per provisions of Environment (Protection) Act, 1986.

10) This NOC is subject to prevailing Central/State Government rules/laws/norms or Court orders related to construction of tube well/ground water abstraction structure / recharge or conservation structure/discharge of effluents or any such matter as applicable.

General conditions:

11) No additional ground water abstraction and/or de-watering structures shall be constructed for this purpose without prior approval of the Central Ground Water Authority (CGWA).

12) The proponent shall seek prior permission from CGWA for any increase in quantum of groundwater abstraction (more than that permitted in NOC for specific period).

13) Proponents shall install roof top rain water harvesting in the premise as per the existing building bye laws in the premise.

14) The project proponent shall take all necessary measures to prevent contamination of ground water in the premises failing which the firm shall be responsible for any consequences arising thereupon.

15) In case of industries that are likely to contaminate the ground water, no recharge measures shall be taken up by the firm inside the plant premises. The runoff generated from the rooftop shall be stored and put to beneficial use by the firm.

16) Wherever feasible, requirement of water for greenbelt (horticulture) shall be met from recycled / treated waste water.

17) Wherever the NOC is for abstraction of saline water and the existing wells (s) is /are yielding fresh water, the same shall be sealed and new tubewell(s) tapping saline water zone shall be constructed within 3 months of the issuance of NOC. The firm shall also ensure safe disposal of saline residue, if any.

18) Unexpected variations in inflow of ground water into the mine pit, if any, shall be reported to the concerned Regional Director, Central Ground Water Board.

19) In case of violation of any NOC conditions, the applicant shall be liable to pay the penalties as per Section 16 of Guidelines.

20) This NOC does not absolve the proponents of their obligation / requirement to obtain other statutory and administrative clearances from appropriate authorities.

21) The issue of this NOC does not imply that other statutory / administrative clearances shall be granted to the project by the concerned authorities. Such authorities would consider the project on merits and take decisions independently of the NOC.

22) In case of change of ownership, new owner of the industry will have to apply for incorporation of necessary changes in the No Objection Certificate with documentary proof within 60 days of taking over possession of the premises.

23) This NOC is being issued without any prejudice to the directions of the Hon'ble NGT/court orders in cases related to ground water or any other related matters.

24) Proponents, who have installed/constructed artificial recharge structures in compliance of the NOC granted to them previously and have availed rebate of upto 50% (fifty percent) in the ground water abstraction charges/ground water restoration charges, shall continue to regularly maintain artificial recharge structures.

25) Industries which are likely to cause ground water pollution e.g. Tanning, Slaughter Houses, Dye, Chemical/ Petrochemical, Coal washeries, pharmaceutical, other hazardous units etc. (as per CPCB list) need to undertake necessary well head protection measures to ensure prevention of ground water pollution as per Annexure III of the guidelines.

26) In case of new infrastructure projects having ground water abstraction of more than 20 m3/day, the firm/entity shall ensure implementation of dual water supply system in the projects.

27) In case of infrastructure projects, paved/parking area must be covered with interlocking/perforated tiles or other suitable measures to ensure groundwater infiltration/harvesting.

28) In case of coal and other base metal mining projects, the project proponent shall use the advance dewatering technology (by construction of series of dewatering abstraction structures) to avoid contamination of surface water.

29) The NOC issued is conditional subject to the conditions mentioned in the Public notice dated 27.01.2021 failing which penalty/EC/cancellation of NOC shall be imposed as the case may be.
30) This NOC is issued subject to the clearance of Expert Appraisal Committee (EAC) (if applicable).

(Non-compliance of the conditions mentioned above is likely to result in the cancellation of NOC and legal action against the proponent.)

CENTRAL GROUND WATER AUTHORITY

(7)

Ph: 0326-2204933

झारखण्ड राज्य प्रदूषण नियंत्रण पर्षद्
Jharkhand State Pollution Control Board
HIG-1, Housing Colony, Dhanbad-826001

Letter No. ...2659 Dated ....6/12/13....

From,

Regional Officer,
Dhanbad

To,

HOD (Envt.),
M/s. B.C.C.L.,
Koyla Bhawan, Koyla Nagar,
Dhanbad.

Sub: **Fixing up monitoring station/Sampling location of Air, Water & Noise.**

Sir,

With refercnee to you letter no. GM(Env.)/F-JSPCB/2013/783, dt. 06.07.2013 We have approved Air, Water & Noise monitoring Station/Sampling location after verification and return a copy of the map.

Encl-A/a.

Your's faithfully,

6/12/13

(Dinesh Prasad Singh)
Regional Officer.

Memo..... Dhanbad, dated.....

Copy to: The Member Secretary, Jharkhand State Pollution Control Board for information & enclose a copy of the map for necessary action.

Encl-A/a.

(Dinesh Pd. Singh)
Regional Officer.

Printed by Sandip

Bid Number: GEM/2022/B/2709732
Dated: 09-11-2022

Bid Document

Bid Details	
Bid End Date/Time	30-11-2022 14:00:00
Bid Opening Date/Time	30-11-2022 14:30:00
Bid Offer Validity (From End Date)	90 (Days)
Ministry/State Name	Ministry Of Coal
Department Name	Materials Management
Organisation Name	Bharat Coking Coal Limited
Office Name	Bccl Dhanbad
Total Quantity	11
Item Category	COAAQMS (Q3) , COAAQMS (without pm10) (Q3)
MSE Exemption for Years Of Experience	Yes
Startup Exemption for Years Of Experience	Yes
Document required from seller	Experience Criteria,Certificate (Requested in ATC),OEM Authorization Certificate,Additional Doc 1 (Requested in ATC),Compliance of BoQ specification and supporting document *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
Bid to RA enabled	Yes
RA Qualification Rule	H1-Highest Priced Bid Elimination
Comprehensive Maintenance Charges Required	Yes
Primary product category	COAAQMS (without pm10)
Time allowed for Technical Clarifications during technical evaluation	7 Days
Inspection Required (By Empanelled Inspection Authority / Agencies pre-registered with GeM)	No
Estimated Bid Value	96243945
Payment Timelines	Payments shall be made to the Seller within **21** days of issue of consignee receipt-cum-acceptance certificate (CRAC) and on-line submission of bills (This is in supersession of 10 days time as provided in clause 12 of GeM GTC)
Evaluation Method	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:

Evaluation Schedules	Estimated Value	Item/Category	Quantity
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	Download

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 specfication

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	Download

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 specfication

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 View	List of locations where COAAQMS are to be installed	COAAQMS(5)
2	CAMC Terms View	CAMC terms to be agreed by the bidder	COAAQMS(5)

S.No.	Document Title	Description	Applicable i.r.o. Items
3	Scope of Work View	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:

   a. Copy of PAN Card.

   b. Copy of GSTIN.

   c. Copy of Cancelled Cheque.

   d. 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:
   i) The Seller fails to comply with any material term of the Contract.
   ii) 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.
   iii) 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-imberse 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 includingCMC and then show the inter-se-ranking of the bidders. The following are the variables

(i) Number of years for which CMC required.
(ii) Number of years of product warranty

The formula for calculating total cost including CMC charges shall be as under:

Total Cost for evaluation=

C+C*{(A1/100)/(1.10^n)+(A2/100)/(1.10^n+1)+(A3/100)/(1.10^n+2)+(A4/100)/(1.10^n+3)+(A5/100)/(1.10^n+4)} and so on

C – Cost for equipment quoted and n shall be number of years of product warranty specified.

If 2 year warranty specified, n shall be2 and if 5 year warranty specified, n shall be 5. A1,A2, A3, A4& A5shall depend on how many years CMC selected. For3 yearCMC, only A1,A2 and A3 factors are to be taken into account and A4 and A5 will not be applicable.

8.4.CMC charges offered for each subsequent year should be same or higher than preceding year.

8.5.The CMC charges shall be offered within range of 3 to 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---

STRICTLY RESTRICTED
FOR COMPANY USE ONLY RESTRICTED
The information given in this report is not to be communicated either directly or indirectly to the press or to any person not holding an official position in the CIL / GOVERNMENT.

WATER QUALITY REPORT OF BHARAT COKING COAL LIMITED, CLUSTER – IV

(FOR THE Q.E. JUNE, 2024)

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, 2024)

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SL. NO.	CHAPTER	PARTICULARS
1.		EXECUTIVE SUMMARY
2.	CHAPTER - I	INTRODUCTION
3.	CHAPTER-II	WATER SAMPLING & ANALYSIS
4.	**Plates:** PLATE NO. - I	SURFACE PLAN SHOWING WATER MONITORING LOCATIONS

EXECUTIVE SUMMARY

1.0 Introduction

The purpose of environmental monitoring is to assess the quality of various attributes that affects the environment around us. In accordance with the quality of these attributes appropriate strategy is to be developed to control the pollution level within the permissible limits. One of these major attributes is water.

Bharat Coking Coal Limited (BCCL), a Subsidiary company of Coal India Limited is operating Underground and Opencast Mines in Jharia Coalfield (JCF) is a part of Gondwana Coalfields located in Dhanbad district of Jharkhand, the JCF is bounded by $23^0$37' N to $23^0$52' N latitudes and $86^0$09' E to $86^0$30' E longitude occupying an area of 450 Sq.km. BCCL has awarded Environmental monitoring work of Jharia Coalfield (JCF) to Central Mine Planning & Design Institute Limited (CMPDIL). The environmental monitoring has been carried out as per the conditions laid down by the MoEF&CC while granting environmental clearance of project, consent letter issued by the respective SPCB, and other statutory requirements.

2.0 Sampling location and rationale

2.1 Water sampling stations

The Water sampling stations were selected for mine sump water, Ground water supply, well/ Hand pump water & surface water samples.

3.0 Methodology of sampling and analysis

3.1 Water quality

Water samples were collected as per standard practice. Effluent samples were analyzed for 25 parameters on quarterly basis. The Ground and Surface water samples were collected and analyzed for 25 and 17 parameters respectively, on quarterly basis. Thereafter the samples were preserved and analyzed at the Environmental Laboratory at CMPDI, RI-II, Dhanbad.

4.0 Results and interpretations

4.1 Water quality

The test results indicate that the major parameters compared with MoEF&CC Gazette Notification No. GSR 742(E) dt 25.09.2000 Standards for Coal Mines, IS.10500/2012 (Ground water) and IS: 2296 (Surface water), are with in permissible limits.

CHAPTER - I

INTRODUCTION

1.0 Any industry and development activities including coal mining is bound to affect environmental attributes. There are positive as well as negative impacts of such operations. For controlling the adverse impacts a regular monitoring is essential. The environmental monitoring is being done as per the guide-lines stipulated by Ministry of Environment, Forests and Climate Change (MoEF&CC), Govt. of India.

Bharat Coking Coal Limited (BCCL), a subsidiary company of Coal India Limited (CIL) is operating UG Mines and Opencast Mines in Jharia Coalfield (JCF). The Jharia Coalfield (JCF) having an area of 450 Sq.KM.

Bharat Coking Coal has awarded Environmental Monitoring work of all Projects, Cluster wise, to Central Mine Planning & Design Institute Limited (CMPDIL). The environmental monitoring has been carried out as per conditions laid down by MoEFCC while granting environmental clearance to different projects. CMPDI has trained manpower and well equipped laboratory to carry out monitoring, analysis and R&D work in the field of environment.

The Cluster IV is in the Northern part of the Jharia coalfield.It includes Salanpur OCP, Katras Choitodih OC, Amalgamated Keshalpur – West Mudidih OCP & UG Mines, Amalgamated Ramkanali – Angarpathra OCP & UG mines, Gaslitand OC. The cluster–IV is situated about 25 - 30kms from Dhanbad Railway Station. The mines of this cluster-IV are operating since pre nationalization period (prior to 1972-73). It is connected by both Railway and Road. The drainage of the area is governed by KatriRiver and Kuaprili Jore.

The Project has Environmental Clearance from Ministry of Environment, Forest and Climate Change (MoEF&CC) for a rated capacity of 7.34Mtpa (normative) and 9.55 Mtpa peak capacity of coal production vide letter no. J-11015/372/2013-IA.II (M) dated 23rd October, 2019.

In compliance of these conditions the Environmental Monitoring has been carried out & report prepared for submission to MoEF&CC & SPCB and other statutory authorities.

CHAPTER – III

WATER QUALITY MONITORING

3.1 Location of sampling sites

(Refer **Plate No. - I**)

i) Ground water quality at **Kankanee Village (GW4)**

ii) Surface water quality at **U/S of Katri River (SW8)**

iii) Surface water quality**) U/S of Kumari Jore (SW9)**

iv) Surface water quality at **D/S of Kumari Jore (SW10)**

v) Surface water quality at at **D/S of Katri River (SW11)**

vi) Mine Water Quality at Katras Chotudih Colliery **(MW4)**

vii) Drinking Water at Katras Choitudih Filter Plant **(DW 18)**

viii) Drinking Water at AKWMC Filter Plant **(DW 19)**

ix) Drinking Water at AARC Filter Plant **(DW 20)**

x) Drinking Water at Gaslitand Filter Plant **(DW 21)**

3.2 Methodology of sampling and analysis

Water samples were collected as per standard practice. Effluent samples were analyzed for 25 parameters on quarterly basis. The Ground and Surface water samples were collected and analyzed for 25 and 17 parameters respectively, on quarterly basis. Thereafter the samples were preserved and analyzed at the Environmental Laboratory at CMPDI, RI-II, Dhanbad.

3.3 Results & Interpretations

The results are given in tabular form along with the applicable standards. Results are compared with Schedule - VI, effluent prescribed by MoEF&CC. Results show that most of the parmeters are within the permissible limits.

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 2024**	**Name of Cluster**	**IV**	**ULR No.**	TC10122240000009 05P
Customer	**Environment Department, Bharat Coking Coal Limited (BCCL), Koyla Bhawan, Dhanbad (E-mail: gmenv.bccl@coalindia.in)**			**Date of Issue**	
Project	**Kankanee Village**	**Sample Ref. No.**	**REM/BCCL/24-25/GW**	**Sampling Method**	**CMPDI/RI-II/LPM 13,(IS 3025:Part -1)**
Sampling Stations	**Kankanee Village**	**Date of Sampling**	**27.05.2024**	**Sample Collected in 5 Ltr Jerricane , Color as observed is transparent**	
			Period of Analysis	**27.05.2024 TO 07.08.2024**	

Sl. No.	**Parameter**	**Method of Analysis**	**Observed Values** GW4 G0117	**Range Of Testing**	**LDL**	**IS 10500: 2012 Acceptable Limit (Max)***	**Permissible Limit in the Absence of Alternate Source (Max)**
1	Colour, Hazen unit	APHA, 24th edition ,2120-c-Spectrophotometric Single Wavelength Method ,2023	1	1-500.0	1	5	15
2	Calcium, mg/l	IS 3025, (Part 40): 1991 R:2019,AAS-Flame Method & EDTA Method	72	2.0-800.0	2	75	200
3	Chlorides, mg/l	IS-3025(Part 32):1988, R-2019 , Argentometric Method	22	2.0-1500.0	5	250	1000
4	Fluoride, mg/l	APHA, 24th Edition, SPADNS Method	0.54	0.2-2.00	0.2	1	1.5
5	Iron, mg/l	IS 3025 (Part 53) : 2003, R : 2019 , AAS-Flame Method	<0.2	0.2-10	0.2	1	No relaxation
6	Magnesium	APHA 24th edition, 3500-Mg B: Calculation Method	68	6.0-700	6	30	100
7	Nitrate , mg/l	APHA, 24th edition, UV-Spectrophotometric Method	1.95	0.5-45.0	0.5	45	No relaxation
8	Odour	APHA, 24th Edition, , 2150-C	Agreeable	Qualitative	Qualitative	Agreeable	Agreeable
9	pH value	IS 3025, Part 11 : 1983 R 2023 Electrometric(pH Meter) Method	7.38	1-14	0.1	6.5-8.5	No relaxation
10	Sulphate, mg/l	APHA –24th edition, 4500 S , Turbidity Method	96	10.0-400.0	10	200	400
11	Taste	APHA,24th edition, 2160-C	Acceptable	Qualitative	Qualitative	Acceptable	Agreeable
12	Total Alkalinity (c_ac_{03}), mg/l, Max	IS 3025, Part 23: 1986 R 2019 Titration Method	165	4.0-2000.0	4	200	600
13	Total Dissolved Solids, mg/l	IS 3025, Part 16: 1984 R 2023 Gravimetric method	563	25.0-5000.0	25	500	2000
14	Total Hardness, mg/l	IS 3025, (Part 21): 2019 EDTA Method	460	4.0-2000.0	4	200	600
15	Turbidity, NTU	IS 3025, (Part 10):1984, R-2023 Nephelometric/Turbiditimetric Method	3.0	1-800	0.1	1	5
16	Zinc, mg/l	IS 3025(Part 49) : 1994,R:2019, AAS-Flame Method	<0.1	0.10 – 10.0	0.1	5	15

****All units in mg/L unless specified otherwise,*

***Grab sampling carried out for water samples. *LDL indicates Lower Detection Limit & BDL indicates Below Detection Limit,*

ANALYSED BY

(Kumar Vaibhav)
REVIEWED BY

(Amit Raj Mishra)
Authorised Signatory

Note: The results above relate to the samples tested as received. This report can not be reproduced in part or full without the written permission of the HOD(Env) , CMPDI, RI-II.

---- End of Report ----

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CENTRAL MINE PLANNING AND DESIGN INSTITUTE LIMITED

Environment Laboratory, Regional Institute-II

GROUND WATER ANALYSIS TEST REPORT

Month & Year	**QUARTER ENDING JUNE 2024**	**Name of Cluster**	**CLUSTER IV**		
Customer	**Environment Department, Bharat Coking Coal Limited (BCCL), Koyla Bhawan, Dhanbad (E-mail: gmenv.bccl@coalindia.in)**			**Date of Issue**	**16.08.2024**
Project	**Kankanee Village**	**Sample Ref. No.**	**REM/BCCL/24-25/GW**	**Sampling Method**	**CMPDI/RI-II/LPM 13,(IS 3025:Part -1)**
Sampling Stations	**Kankanee Village**	**Date of Sampling**	**27.05.2024**	**Sample Collected in 5 Ltr Jerricane , Color as observed is transparent**	
			Period of Analysis	**27.05.2024**	**TO** **07.08.2024**

Sl. No.	**Parameter**	**Method of Analysis**	**Observed Values**				**IS 10500: 2012**
			GW4	**Range Of Testing**	**LDL**	**Acceptable Limit (Max)***	**Permissible Limit in the Absence of Alternate Source (Max)**
1	Boron (as B), mg/l, Max	APHA, 24th edition ,Carmine	<0.2	0.2-10	0.2	0.5	1
2	Copper (as Cu), mg/l, Max	IS 3025 Part 42 : 1992 R : 2019, AAS-Flame APHA, 24th edition, AAS-GTA	<0.01	0.01-10.0	0.01	0.05	1.5
3	Free Residual Chlorine, mg/l, Min	APHA, 24th Edition, , 4500-Cl-B. (Iodometric Method-I)	<0.04	0.04-5	0.04	0.2	1
4	Lead (as Pb), mg/l, Max	IS:3025(Part 47):1994 (Reaffirmed 2019) APHA, 24th edition, AAS-GTA	<0.005	0.005-10	0.005	0.01	No relaxation
5	Phenolic compounds (as C6H5OH), mg/l, Max	APHA, 24th Edition,4-Amino Autipyrine	<0.001	0.001-10	0.001	0.002	0.002
6	Selenium, mg/l, Max	APHA 24th edition IS-3025,part 56:2003, R-2019/, AAS-VGA	<0.007	0.007-10	0.007	0.01	No relaxation
7	Total Arsenic (as As), mg/l, Max	IS-3025,part 37:1988, R-2019/ APHA 24th edition AAS-VGA	<0.006	0.006-10	0.006	0.01	0.05
8	Total Chromium (as Cr), mg/l, Max	IS-3025 Part 52:2003, R:2019,AAS-Flame APHA, 24th edition, AAS-GTA	<0.01	0.01-10.0	0.01	0.05	No relaxation
9	Nickel as Ni, mg/l Max	IS 3025 Part 54 : 2003,R : 2019, AAS-Flame APHA, 24th edition, AAS-GTA	<0.005	0.005-10	0.005	0.02	No relaxation
10	Manganese as Mn, mg/l, Max	APHA, 24TH Edition:2023 AAS-GTA Method	<0.02	0.02-10.0	0.02	0.1	0.3

****All units in mg/L unless specified otherwise,*

***Grab sampling carried out for water samples. *LDL indicates Lower Detection Limit & BDL indicates Below Detection Limit,*

ANALYSED BY

(Kumar Vaibhav)
REVIEWED BY

(Amit Raj Mishra)
Authorised Signatory

Note: The results above relate to the samples tested as received. This report can not be reproduced in part or full without the written permission of the HOD(Env) , CMPDI, RI-II.

---- End of Report ----

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CENTRAL MINE PLANNING AND DESIGN INSTITUTE LIMITED
Environment Laboratory, Regional Institute-II
SURFACE WATER ANALYSIS TEST REPORT

Month & Year	QUARTE ENDI NG JUNE 2024	**Name of Cluster**	III&IV	ULR No.	TC101222400000092 5P TC101222400000092 6P
Customer	Environment Department, Bharat Coking Coal Limited (BCCL), Koyla Bhawan, Dhanbad (E-mail: gmenv.bccl@coalindia.in)			Date of Issue	16.08.2024
Project	Sample Ref. No.		REM/BCCL/23-24/SW /	Sampling Method	(IS 3025 , Part-1) CMPDI/RI-II/LPM 13
Sampling Stations	(i) Downstream in Bagdigi Nala(SW7)		Date of Sampling	03.06.2024	Period of Analysis
	(ii) Upstream in Katri River(SW8)		Date of Sampling	03.06.2024	03.06.2024 to 07.08.2024

Sl. No.	Parameter	Method of Analysis	Observed Values (i)	Observed Values (ii)	IS : 2296 INLAND SURFACE WATER [1982] Class 'C	Range of Testing	LDL
1	BOD (3 days 27°C), mg/l	IS 3025 (Part 44) : 1993, R-2019 , 3 day incubation at 27°C	<2.0	<2.0	3	2.00-100.00	2
2	Colour,Hazen Units	APHA 24th edition , 2120-B-:2023	1	1	10	1-500.0	1
3	Chlorides, mg/l	IS-3025(Part 32):1988, R-2019 Argentometric Method	65	26	600	2.0-1500.0	5
4	Copper, mg/l	IS 3025 (Part 42) : 1992 R : 2019, AAS-Flame Method	<0.2	<0.2	1.5	0.2-10.0	0.2
5	Dissolved Oxygen, mg/L	IS 3025 (Part 38) : 1989, R:2003 Winkler Azide Method	6.2	6.2	4	1.0-10.0	0.1
6	Fluoride, mg/l	APHA, 24th edition, SPADNS Method	0.54	0.59	1.5	0.2-2.00	0.2
7	Hexavalent Chromium, mg/l	APHA 24th edition, 1,5-Diphenylcarbohydrazide Method IS 3025 (Part 52) : 2003,R-2019	<0.01	<0.01	0.05	0.01-1.4	0.01
8	Iron, mg/l	IS 3025 (Part 53):2003,R:2019, AAS-Flame Method	<0.2	<0.2	50	0.2-10	0.2
9	Nitrate , mg/l	APHA, 24th edition, UV-Spectrophotometric Method	4.92	7.75	50	0.5-45.0	0.5
10	pH value	IS 3025, (Part 11) : 1983 R-2023 Electrometric (Ph Meter) method	7.86	7.82	6.5-8.5	1.0-14.0	2
11	Sulphate, mg/l	APHA –24th edition,4500- S, Turbidity Method	38	59	400	10.0-400.0	10
12	Total Dissolved Solids, mg/l	IS 3025, (Part 16): 1984 R-2023 Gravimetric method	471	456	1500	25.0-10000.0	25
13	Zinc, mg/l	IS 3025(Part 49) : 1994, R : 2019, AAS-Flame Method	<0.1	<0.1	15	0.10 – 10.0	0.1

***Grab sampling carried out for water samples. *LDL indicates Lower Detection Limit & BDL indicates Below Detection Limit*

****All units in mg/L unless specified otherwise, Sample Collected in 5 Ltr Jerricane , Color as observed is transparent*

(Kumar Vaibhav)
REVIEWED BY

(Amit Raj Mishra)
Authorised Signatory

Analysed by

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CENTRAL MINE PLANNING AND DESIGN INSTITUTE LIMITED
Environment Laboratory, Regional Institute-II
SURFACE WATER ANALYSIS TEST REPORT

CMPDIL, RI-II
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Month & Year	QUARTE ENDI NG JUNE 2024	**Name of Cluster**	III&IV	**Report No.**	
Customer	Environment Department, Bharat Coking Coal Limited (BCCL), Koyla Bhawan, Dhanbad (E-mail: gmenv.bccl@coalindia.in)			Date of Issue	16.08.2024
Project	Sample Ref. No.		REM/BCCL/23-24/SW /	Sampling Method	(IS 3025 , Part-1) CMPDI/RI-II/LPM 13
Sampling Stations	(i)	Downstream in Bagdigi Nala(SW7)	Date of Sampling	03.06.2024	Period of Analysis
	(ii)	Upstream in Katri River(SW8)	Date of Sampling	03.06.2024	03.06.2024 to 07.08.2024

Sl. No.	Parameter	Method of Analysis	Observed Values (i)	Observed Values (ii)	IS : 2296 INLAND SURFACE WATER [1982] Class 'C	Range of Testing	LDL
1	Arsenic (as As), mg/l, Max	IS-3025,Part 37:1988, R-2019/ APHA 24th edition AAS-VGA	<0.006	<0.006	0.2	0.006-10	0.006
2	Lead (as Pb), mg/l, Max	APHA, 24th edition, AAS-GTA	<0.005	<0.005	0.1	0.005-10	0.005
3	Phenolic compounds (as C6H5OH), mg/l, Max	APHA, 24th Edition 4-Amino Antipyrine	<0.002	<0.002	0.005	0.002-10	0.002
4	Selenium, mg/l, Max	IS-3025 ,Part 56:2003, R-2019/ APHA 24th edition, AAS-VGA	<0.007	<0.007	0.05	0.007-10	0.007

***Grab sampling carried out for water samples. *LDL indicates Lower Detection Limit & BDL indicates Below Detection Limit*

****All units in mg/L unless specified otherwise Sample Collected in 5 Ltr Jerricane , Color as observed is transparent*

(Kumar Vaibhav) (Amit Raj Mishra)

Analysed by *REVIEWED BY* *Authorised Signatory*

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CENTRAL MINE PLANNING AND DESIGN INSTITUTE LIMITED
Environment Laboratory, Regional Institute-II
SURFACE WATER ANALYSIS TEST REPORT

CMPDIL, RI-II
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Month & Year	QUARTE ENDI NG JUNE 2024	**Name of Cluster**	IV	ULR No.	TC101222400000092 7P TC101222400000092 8P
Customer	Environment Department, Bharat Coking Coal Limited (BCCL), Koyla Bhawan, Dhanbad (E-mail: gmenv.bccl@coalindia.in)			Date of Issue	16.08.2024
Project	Sample Ref. No.		REM/BCCL/23-24/SW /	Sampling Method	(IS 3025 , Part-1) CMPDI/RI-II/LPM 13
Sampling Stations	(i) Upstream in Kumar Jore(SW9)		Date of Sampling	24.06.2024	Period of Analysis
	(ii) Downstream in Kumar Jore(SW10)		Date of Sampling	24.06.2024	24.06.2024 to 07.08.2024

Sl. No.	Parameter	Method of Analysis	Observed Values (i)	Observed Values (ii)	IS : 2296 INLAND SURFACE WATER [1982] Class 'C	Range of Testing	LDL
1	BOD (3 days 27°C), mg/l	IS 3025 (Part 44) : 1993, R-2019 , 3 day incubation at 27°C	<2.0	<2.0	3	2.00-100.00	2
2	Colour,Hazen Units	APHA 24th edition , 2120-B-:2023	1	3	10	1-500.0	1
3	Chlorides, mg/l	IS-3025(Part 32):1988, R-2019 Argentometric Method	34	38	600	2.0-1500.0	5
4	Copper, mg/l	IS 3025 (Part 42) : 1992 R : 2019, AAS-Flame Method	<0.2	<0.2	1.5	0.2-10.0	0.2
5	Dissolved Oxygen, mg/L	IS 3025 (Part 38) : 1989, R:2003 Winkler Azide Method	6.5	5.9	4	1.0-10.0	0.1
6	Fluoride, mg/l	APHA, 24th edition, SPADNS Method	0.65	0.69	1.5	0.2-2.00	0.2
7	Hexavalent Chromium, mg/l	APHA 24th edition, 1,5-Diphenylcarbohydrazide Method IS 3025 (Part 52) : 2003,R-2019	<0.01	<0.01	0.05	0.01-1.4	0.01
8	Iron, mg/l	IS 3025 (Part 53):2003,R:2019, AAS-Flame Method	<0.2	<0.2	50	0.2-10	0.2
9	Nitrate , mg/l	APHA, 24th edition, UV-Spectrophotometric Method	5.49	9.89	50	0.5-45.0	0.5
10	pH value	IS 3025, (Part 11) : 1983 R-2023 Electrometric (Ph Meter) method	7.66	7.78	6.5-8.5	1.0-14.0	2
11	Sulphate, mg/l	APHA –24th edition,4500- S, Turbidity Method	57	68	400	10.0-400.0	10
12	Total Dissolved Solids, mg/l	IS 3025, (Part 16): 1984 R-2023 Gravimetric method	470	482	1500	25.0-10000.0	25
13	Zinc, mg/l	IS 3025(Part 49) : 1994, R : 2019, AAS-Flame Method	<0.1	<0.1	15	0.10 – 10.0	0.1

***Grab sampling carried out for water samples. *LDL indicates Lower Detection Limit & BDL indicates Below Detection Limit*

****All units in mg/L unless specified otherwise Sample Collected in 5 Ltr Jerricane , Color as observed is transparent*

(Kumar Vaibhav)

(Amit Raj Mishra)

Analysed by *REVIEWED BY* *Authorised Signatory*

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CENTRAL MINE PLANNING AND DESIGN INSTITUTE LIMITED

Environment Laboratory, Regional Institute-II

SURFACE WATER ANALYSIS TEST REPORT

Month & Year	QUARTE ENDI NG JUNE 2024	**Name of Cluster**	IV	**Report No.**	
Customer	Environment Department, Bharat Coking Coal Limited (BCCL), Koyla Bhawan, Dhanbad (E-mail: gmenv.bccl@coalindia.in)			Date of Issue	16.08.2024
Project	Sample Ref. No.		REM/BCCL/23-24/SW /	Sampling Method	(IS 3025 , Part-1) CMPDI/RI-II/LPM 13
Sampling Stations	(i) Upstream in Kumar Jore(SW9)		Date of Sampling	24.06.2024	Period of Analysis
	(ii) Downstream in Kumar Jore(SW10)		Date of Sampling	24.06.2024	24.06.2024 to 07.08.2024

Sl. No.	Parameter	Method of Analysis	Observed Values (i)	Observed Values (ii)	IS : 2296 INLAND SURFACE WATER [1982] Class 'C	Range of Testing	LDL
1	Arsenic (as As), mg/l, Max	IS-3025,Part 37:1988, R-2019/ APHA 24th edition AAS-VGA	<0.006	<0.006	0.2	0.006-10	0.006
2	Lead (as Pb), mg/l, Max	APHA, 24th edition, AAS-GTA	<0.005	<0.005	0.1	0.005-10	0.005
3	Phenolic compounds (as C6H5OH), mg/l, Max	APHA, 24th Edition 4-Amino Antipyrine	<0.002	<0.002	0.005	0.002-10	0.002
4	Selenium, mg/l, Max	IS-3025 ,Part 56:2003, R-2019/ APHA 24th edition, AAS-VGA	<0.007	<0.007	0.05	0.007-10	0.007

***Grab sampling carried out for water samples. *LDL indicates Lower Detection Limit & BDL indicates Below Detection Limit*

****All units in mg/L unless specified otherwise Sample Collected in 5 Ltr Jerricane , Color as observed is transparent*

(Kumar Vaibhav) (Amit Raj Mishra)

Analysed by *REVIEWED BY* *Authorised Signatory*

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CENTRAL MINE PLANNING AND DESIGN INSTITUTE LIMITED
Environment Laboratory, Regional Institute-II
SURFACE WATER ANALYSIS TEST REPORT

Month & Year	QUARTE ENDI NG JUNE 2024	**Name of Cluster**	IV & V	ULR No.	TC101222400000092 9P TC101222400000093 0P
Customer	Environment Department, Bharat Coking Coal Limited (BCCL), Koyla Bhawan, Dhanbad (E-mail: gmenv.bccl@coalindia.in)			Date of Issue	16.08.2024
Project	Sample Ref. No.		REM/BCCL/23-24/SW /	Sampling Method	(IS 3025 , Part-1) CMPDI/RI-II/LPM 13
Sampling Stations	(i) Downstream in Katri River(SW11)		Date of Sampling	24.06.2024	Period of Analysis
	(ii) Upstream in Jarian Nala(SW12)		Date of Sampling	24.06.2024	24.06.2024 to 07.08.2024

Sl. No.	Parameter	Method of Analysis	Observed Values (i)	Observed Values (ii)	IS : 2296 INLAND SURFACE WATER [1982] Class 'C	Range of Testing	LDL
1	BOD (3 days 27°C), mg/l	IS 3025 (Part 44) : 1993, R-2019 , 3 day incubation at 27°C	<2.0	<2.0	3	2.00-100.00	2
2	Colour,Hazen Units	APHA 24th edition , 2120-B-:2023	2	1	10	1-500.0	1
3	Chlorides, mg/l	IS-3025(Part 32):1988, R-2019 Argentometric Method	43	48	600	2.0-1500.0	5
4	Copper, mg/l	IS 3025 (Part 42) : 1992 R : 2019, AAS-Flame Method	<0.2	<0.2	1.5	0.2-10.0	0.2
5	Dissolved Oxygen, mg/L	IS 3025 (Part 38) : 1989, R:2003 Winkler Azide Method	5.7	6.2	4	1.0-10.0	0.1
6	Fluoride, mg/l	APHA, 24th edition, SPADNS Method	0.56	0.63	1.5	0.2-2.00	0.2
7	Hexavalent Chromium, mg/l	APHA 24th edition, 1,5-Diphenylcarbohydrazide Method IS 3025 (Part 52) : 2003,R-2019	<0.01	<0.01	0.05	0.01-1.4	0.01
8	Iron, mg/l	IS 3025 (Part 53):2003,R:2019, AAS-Flame Method	<0.2	<0.2	50	0.2-10	0.2
9	Nitrate , mg/l	APHA, 24th edition, UV-Spectrophotometric Method	11.44	4.98	50	0.5-45.0	0.5
10	pH value	IS 3025, (Part 11) : 1983 R-2023 Electrometric (Ph Meter) method	7.80	7.76	6.5-8.5	1.0-14.0	2
11	Sulphate, mg/l	APHA –24th edition,4500- S, Turbidity Method	72	62	400	10.0-400.0	10
12	Total Dissolved Solids, mg/l	IS 3025, (Part 16): 1984 R-2023 Gravimetric method	512	458	1500	25.0-10000.0	25
13	Zinc, mg/l	IS 3025(Part 49) : 1994, R : 2019, AAS-Flame Method	<0.1	<0.1	15	0.10 – 10.0	0.1

***Grab sampling carried out for water samples. *L<0.1DL 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 *REVIEWED BY* *Authorised Signatory*

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CENTRAL MINE PLANNING AND DESIGN INSTITUTE LIMITED

Environment Laboratory, Regional Institute-II

MINE EFFLUENT ANALYSIS TEST REPORT

Month & Year	**QUARTER ENDING JUNE 2024**	**Name of Cluster**	**CLUSTER IV**	**ULR No.**	TC10126240000 00964P
Customer	**Environment Department, Bharat Coking Coal Limited (BCCL), Koyla Bhawan, Dhanbad (E-mail: gmenv.bccl@coalindia.in)**			**Date of Issue**	**16.08.2024**
Project	**Katras Chotudih Colliery**	**Sample Ref. No.**	**REM/BCCL/24-25/MW/**	**Sampling Method**	**CMPDI/RI-II/LPM 13,(IS 3025:Part -1)**
Sampling Stations	**MW4**	**Date of Sampling**	**17.06.2024**	**Sample Collected in 5 Ltr Jerricane , Color as observed is transparent**	

Period of Analysis **17.06.2024** **TO** **07.08.2024**

Sl. No.	Parameter	Method of Analysis	MW4 M0951	Range Of Testing	LDL	MOEF -SCH-VI STANDARDS Class 'A'
1	B.O.D (3 days 27ºC), mg/l, Max	IS 3025 /44:1993,R:20033 day incubation at 27°C	<2.0	2-10000.0	2	30
2	Colour	APHA,24th edition ,2120-B-:2023	1	1.0-500.0	1	-
3	COD, mg/l, Max	APHA 24th edition 5220 C Titrimetric Method	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	0.085	0.1-5.0	0.1	5
6	Fluoride (as F) mg/l, *Max*	APHA, 24th Edition, Page 4-90 to , 4500 – F- D (SPADNS Method)	0.62	0.2-2.0	0.2	2
7	Hexavalent Chromium, mg/l, Max	IS 3025 (Part 52) : 2003,Reaffirmed 2019	<0.01	0.01-1.40	0.01	0.1
8	Iron (as Fe), mg/l, *Max*	IS 3025 (Part 53) : 2003, R : 2019 , AAS-Flame	<0.2	0.2-10	0.2	3
9	Manganese(as Mn), mg/l, Max	APHA, 24th edition, AAS-Flame	<0.1	0.1-10	0.1	0.1
10	Nickel (as Ni), mg/l, *Max*	IS-3025(Part 54):2003, R:2019 AAS-Flame	<0.1	0.1-10.0	0.1	3
11	Nitrate Nitrogen, mg/l, *Max*	APHA, 24th Edition,UV-Spectrphotometric	0.90	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-2023, Electrometric	7.32	1 -14	0.1	5.5 to 9.0
14	Temperature (°C)	IS-3025/09:1984, Thermometeric	28	1-100	.	Shall not exceed 5º C above the receiving temp.
15	Total Chromium (as Cr), mg/l, *Max*	IS-3025(Part 52):2003, R:2019 AAS-Flame	<0.1	0.1-10.0	0.1	2
16	Total Suspended Solids, mg/l, Max	IS 3025/17:1984, R :2023, Gravimetric	28	10-5000	10	100
17	Zinc (as Zn), mg/l, *Max*	IS 3025 /49 : 1994, R : 2019, AAS-Flame	<0.1	0.1-10.0	0.1	5
18	Odour	APHA, 24th Edition, , 2150-C	Agreeable	Qualitative	Qualitative	Qualitative

****All units in mg/L unless specified otherwise,*

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ANALYSED BY

(Kumar Vaibhav)
REVIEWED BY

(Amit Raj Mishra)
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CENTRAL MINE PLANNING AND DESIGN INSTITUTE LIMITED

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MINE EFFLUENT ANALYSIS TEST REPORT

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Month & Year	**QUARTER ENDING June 2024**	**Name of Cluster**	**CLUSTERIV**	**Report No.**	
Customer	**Environment Department, Bharat Coking Coal Limited (BCCL), Koyla Bhawan, Dhanbad (E-mail: gmenv.bccl@coalindia.in)**			**Date of Issue**	**16.08.2024**
Project	**Katras Chotudih Colliery**	**Sample Ref. No.**	**REM/BCCL/24-25/MW/**	**Sampling Method**	**CMPDI/RI-II/LPM 13,(IS 3025:Part -1)**
Sampling Stations	**MW4**	**Date of Sampling**	**17.06.2024**	**Sample Collected in 5 Ltr Jerricane , Color as observed is transparent**	
				Period of Analysis	**17.06.2024 TO 07.08.2024**

Sl. No.	**Parameter**	**Method of Analysis**	**MW4**	**Range Of Testing**	**LDL**	**MOEF -SCH-VI STANDARDS Class 'A'**
1	Ammonical Nitrogen, mg/l, Max	IS 3025/34:1988,R : 2009, Nessler's	<0.02	0.02-100	0.02	50
2	Arsenic (as As), mg/l, Max	IS-3025,part 37:1988, R-2019/ APHA 24th edition AAS-VGA	<0.006	0.006-5	0.006	0.2
3	Free Ammonia, mg/l, Max	IS:3025/34:1988, Nesseler's	<0.01	0.01-10	0.01	5
4	Lead (as Pb), mg/l, *Max*	IS-3025(Part 59):2006, R 2023 AAS-GTA/APHA, 24th Edition, 3111B, AAS-GTA	<0.005	0.005-10	0.005	2
5	Phenolic compounds	APHA, 24th edition4-Amino Antipyrine	<0.002	0.002-5	0.002	1
6	Selenium, mg/l, Max	IS-3025,part 56:2003, R-2019/ APHA 24th edition, AAS-VGA	<0.007	0.007-5	0.007	0.05
7	Sulphide (as S^{2-}) mg/l Max.	APHA 24th edition Methylene Blue Method	<0.005	0.005-5	0.005	2
8	Total Kjeldahl Nitrogen, mg/l, Max	IS:3025/34:1988, Nesseler's	<1	1-200	1	100
9	Total Residual Chlorine, mg/l, Max	APHA, 24th Edition, , 4500-Cl B. (Iodometric Method-I)	<0.04	0.04-5.00	0.04	1

****All units in mg/L unless specified otherwise,*

***Grab sampling carried out for water samples. *LDL indicates Lower Detection Limit & BDL indicates Below Detection Limit,*

ANALYSED BY

(Kumar Vaibhav)
REVIEWED BY

(Amit Raj Mishra)
Authorised Signatory

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CENTRAL MINE PLANNING AND DESIGN INSTITUTE LIMITED
Environment Laboratory, Regional Institute-II
DRINKING WATER ANALYSIS TEST REPORT

CMPDIL, RI-II
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Month & Year	**QUARTER ENDING JUNE 2024**	**Name of Cluster**	**IV**	**ULR No.**	TC10122240000009 57P
Customer	**Environment Department, Bharat Coking Coal Limited (BCCL), Koyla Bhawan, Dhanbad (E-mail: gmenv.bccl@coalindia.in)**			**Date of Issue**	**16.08.2024**
Project	**Katras Choutudih Filter Plant**	**Sample Ref. No.**	**REM/BCCL/23-24/DW**	**Sampling Method**	**CMPDI/RI-II/LPM 13,(IS 3025:Part -1)**
Sampling Stations	**Katras Choutudih Filter Plant**	**Date of Sampling**	**20.05.2024**	**Sample Collected in 5 Ltr Jerricane , Color as observed is transparent**	
			Period of Analysis	**20.05.2024** **TO**	**07.08.2024**

Sl. No.	**Parameter**	**Method of Analysis**	**Observed Values** DW-1 D0038	**Range Of Testing**	**LDL**	**Acceptable Limit (Max)***	**IS 10500: 2012** Permissible Limit in the Absence of Alternate Source (Max)
	Colour, Hazen unit	APHA, 24th Edition ,2120-c-Spectrophotometric Single Wavelength Method ,2023	1	1-500.0	1	5	15
2	Calcium, mg/l	IS 3025, (Part 40): 1991 R:2019,AAS-Flame Method & EDTA Method	134	2.0-800.0	2	75	200
3	Chlorides, mg/l	IS-3025(Part 32):1988, R-2019 , Argentometric Method	45	2.0-1500.0	5	250	1000
4	Fluoride, mg/l	APHA, 24th Edition, SPADNS Method,2023	0.55	0.2-2.00	0.2	1	1.5
5	Iron, mg/l	IS 3025 (Part 53) : 2003, R : 2019 , AAS-Flame Method	<0.2	0.2-10	0.2	1	No relaxation
6	Magnesium	APHA 24th Edition, 3500-Mg B: Calculation Method,2023	104	6.0-700	6	30	100
7	Nitrate , mg/l	APHA, 24th Edition, UV-Spectrophotometric Method,2023	6.73	0.5-45.0	0.5	45	No relaxation
8	Odour	APHA, 24th Edition, , 2150-C,2023	Agreeable	Qualitative	Qualitative	Agreeable	Agreeable
9	pH value	IS 3025, Part 11 : 1983 R 2023 Electrometric(pH Meter) Method	7.76	1-14	0.1	6.5-8.5	No relaxation
10	Sulphate, mg/l	APHA –24th Edition, 4500 S , Turbidity Method,2023	288	10.0-400.0	10	200	400
11	Taste	APHA,24th Edition, 2160-C,2023	Acceptable	Qualitative	Qualitative	Acceptable	Agreeable
12	Total Alkalinity (c_aco_3), mg/l, Max	IS 3025, Part 23: 1986 R 2019 Titration Method	180	4.0-2000.0	4	200	600
13	Total Dissolved Solids, mg/l	IS 3025, Part 16: 1984 R 2023 Gravimetric method	905	25.0-10000.0	25	500	2000
14	Total Hardness, mg/l	IS 3025, (Part 21): 2019 EDTA Method	765	4.0-2000.0	4	200	600
15	Turbidity, NTU	IS 3025, (Part 10):1984, R-2023 Nephelometric/Turbiditimetric Method	2.1	1-800	0.1	1	5
16	Zinc, mg/l	IS 3025(Part 49) : 1994,R:2019, AAS-Flame Method	<0.1	0.10 – 10.0	0.1	5	15

*17***All units in mg/L unless specified otherwise,*

***Grab sampling carried out for water samples. *LDL indicates Lower Detection Limit & BDL indicates Below Detection Limit,*

ANALYSED BY

(Kumar Vaibhav)
REVIEWED BY

(Amit Raj Mishra)
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CENTRAL MINE PLANNING AND DESIGN INSTITUTE LIMITED

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DRINKING WATER ANALYSIS TEST REPORT

Month & Year	**QUARTER ENDING JUNE 2024**	**Name of Cluster**	**IV**			**ULR No.**	
Customer	**Environment Department, Bharat Coking Coal Limited (BCCL), Koyla Bhawan, Dhanbad (E-mail: gmenv.bccl@coalindia.in)**					**Date of Issue**	**16.08.2024**
Project	**Katras Choutudih Filter Plant**	**Sample Ref. No.**	**REM/BCCL/23-24/DW**	**Sampling Method**	**CMPDI/RI-II/LPM 13,(IS 3025:Part -1)**		
Sampling Stations	**Katras Choutudih Filter Plant**	**Date of Sampling**	**20.05.2024**	**Sample Collected in 5 Ltr Jerricane , Color as observed is transparent**			
			Period of Analysis	**20.05.2024**	**TO**	**07.08.2024**	

Sl. No.	**Parameter**	**Method of Analysis**	**Observed Values**			**IS 10500: 2012**	
			DW-1	**Range Of Testing**	**LDL**	**Acceptable Limit (Max)***	**Permissible Limit in the Absence of Alternate Source (Max)**
1	Boron (as B), mg/l, Max	APHA, 24th Edition ,Carmine	<0.2	0.2-10	0.2	0.5	1
2	Copper (as Cu), mg/l, Max	IS 3025 Part 42 : 1992 R : 2019, AAS-Flame APHA, 24th Edition, AAS-GTA	<0.01	0.01-10	0.01	0.05	1.5
3	Free Residual Chlorine, mg/l, Min	APHA, 24th Edition, , 4500-Cl-B. (Iodometric Method-I)	<0.04	0.04-5	0.04	0.2	1
4	Lead (as Pb), mg/l, Max	IS:3025(Part 47):1994 (Reaffirmed 2019) APHA, 24th Edition, AAS-GTA	<0.005	0.005-10	0.005	0.01	No relaxation
5	Phenolic compounds (as C6H5OH), mg/l, Max	APHA, 24th Edition,4-Amino Autipyrine	<0.001	0.001-10	0.001	0.002	0.002
6	Selenium, mg/l, Max	APHA 24th Edition IS-3025,part 56:2003, R-2019/, AAS-VGA	<0.007	0.007-10	0.007	0.01	No relaxation
7	Total Arsenic (as As), mg/l, Max	IS-3025,part 37:1988, R-2019/ APHA 24th Edition AAS-VGA	<0.006	0.006-10	0.006	0.01	0.05
8	Total Chromium (as Cr), mg/l, Max	IS-3025 Part 52:2003, R:2019,AAS-Flame APHA, 24th Edition, AAS-GTA	<0.01	0.01-10	0.01	0.05	No relaxation
9	Nickel as Ni, mg/l Max	IS 3025 Part 54 : 2003,R : 2019, AAS-Flame APHA, 24th Edition, AAS-GTA	<0.005	0.005-10	0.005	0.02	No relaxation
10	Manganese as Mn, mg/l, Max	APHA,24th edition, AAS-GTA : 2003 AAS-GTA Method	<0.02	0.02-10	0.02	0.1	0.3

****All units in mg/L unless specified otherwise,*

***Grab sampling carried out for water samples. *LDL indicates Lower Detection Limit & BDL indicates Below Detection Limit,*

ANALYSED BY

(Kumar Vaibhav)
REVIEWED BY

(Amit Raj Mishra)
Authorised Signatory

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CENTRAL MINE PLANNING AND DESIGN INSTITUTE LIMITED

Environment Laboratory, Regional Institute-II

DRINKING WATER ANALYSIS TEST REPORT

Month & Year	**QUARTER ENDING JUNE 2024**	**Name of Cluster**	**IV**	**ULR No.**	TC10122240000009 58P
Customer	**Environment Department, Bharat Coking Coal Limited (BCCL), Koyla Bhawan, Dhanbad (E-mail: gmenv.bccl@coalindia.in)**			**Date of Issue**	**16.08.2024**
Project	**AKWMC Filter Plant**	**Sample Ref. No.**	**REM/BCCL/23-24/DW**	**Sampling Method**	**CMPDI/RI-II/LPM 13,(IS 3025:Part -1)**
Sampling Stations	**AKWMC Filter Plant**	**Date of Sampling**	**20.05.2024**	**Sample Collected in 5 Ltr Jerricane , Color as observed is transparent**	
			Period of Analysis	**20.05.2024** **TO**	**07.08.2024**

Sl. No.	**Parameter**	**Method of Analysis**	**Observed Values**			**IS 10500: 2012**	
			DW2 D0039	**Range Of Testing**	**LDL**	**Acceptable Limit (Max)***	**Permissible Limit in the Absence of Alternate Source (Max)**
1	Colour, Hazen unit	APHA, 24th Edition ,2120-c-Spectrophotometric Single Wavelength Method ,2023	1	1-500.0	1	5	15
2	Calcium, mg/l	IS 3025, (Part 40): 1991 R:2019,AAS-Flame Method & EDTA Method	104	2.0-800.0	2	75	200
3	Chlorides, mg/l	IS-3025(Part 32):1988, R-2019 , Argentometric Method	43	2.0-1500.0	5	250	1000
4	Fluoride, mg/l	APHA, 24th Edition, SPADNS Method,2023	0.66	0.2-2.00	0.2	1	1.5
5	Iron, mg/l	IS 3025 (Part 53) : 2003, R : 2019 , AAS-Flame Method	<0.2	0.2-10	0.2	1	No relaxation
6	Magnesium	APHA 24th Edition, 3500-Mg B: Calculation Method,2023	118	6.0-700	6	30	100
7	Nitrate , mg/l	APHA, 24th Edition, UV-Spectrophotometric Method,2023	6.07	0.5-45.0	0.5	45	No relaxation
8	Odour	APHA, 24th Edition, , 2150-C,2023	Agreeable	Qualitative	Qualitative	Agreeable	Agreeable
9	pH value	IS 3025, Part 11 : 1983 R 2023 Electrometric(pH Meter) Method	8.01	1-14	0.1	6.5-8.5	No relaxation
10	Sulphate, mg/l	APHA –24th Edition, 4500 S , Turbidity Method,2023	367	10.0-400.0	10	200	400
11	Taste	APHA,24th Edition, 2160-C,2023	Acceptable	Qualitative	Qualitative	Acceptable	Agreeable
12	Total Alkalinity ($c_ac_{o_3}$), mg/l, Max	IS 3025, Part 23: 1986 R 2019 Titration Method	105	4.0-2000.0	4	200	600
13	Total Dissolved Solids, mg/l	IS 3025, Part 16: 1984 R 2023 Gravimetric method	911	25.0-10000.0	25	500	2000
14	Total Hardness, mg/l	IS 3025, (Part 21): 2019 EDTA Method	745	4.0-2000.0	4	200	600
15	Turbidity, NTU	IS 3025, (Part 10):1984, R-2023 Nephelometric/Turbiditimetric Method	1.6	1-800	0.1	1	5
16	Zinc, mg/l	IS 3025(Part 49) : 1994,R:2019, AAS-Flame Method	<0.1	0.10 – 10.0	0.1	5	15

****All units in mg/L unless specified otherwise,*

***Grab sampling carried out for water samples. *LDL indicates Lower Detection Limit & BDL indicates Below Detection Limit,*

ANALYSED BY

(Kumar Vaibhav)
REVIEWED BY

(Amit Raj Mishra)
Authorised Signatory

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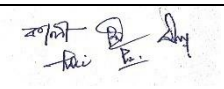
DRINKING WATER ANALYSIS TEST REPORT

Month & Year	**QUARTER ENDING JUNE 2024**	**Name of Cluster**	**IV**			**ULR No.**	
Customer	**Environment Department, Bharat Coking Coal Limited (BCCL), Koyla Bhawan, Dhanbad (E-mail: gmenv.bccl@coalindia.in)**					**Date of Issue**	**16.08.2024**
Project		**Sample Ref. No.**	**REM/BCCL/23-24/DW**		**Sampling Method**	**CMPDI/RI-II/LPM 13,(IS 3025:Part -1)**	
Sampling Stations	**AKWMC Filter Plant**	**Date of Sampling**	**20.05.2024**	**Sample Collected in 5 Ltr Jerricane , Color as observed is transparent**			
			Period of Analysis	**20.05.2024**	**TO**	**07.08.2024**	

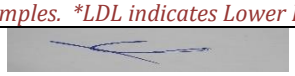
Sl. No.	**Parameter**	**Method of Analysis**	**Observed Values**			**IS 10500: 2012**	
			DW2	**Range Of Testing**	**LDL**	**Acceptable Limit (Max)***	**Permissible Limit in the Absence of Alternate Source (Max)**
1	Boron (as B), mg/l, Max	APHA, 24th Edition ,Carmine	<0.2	0.2-10	0.2	0.5	1
2	Copper (as Cu), mg/l, Max	IS 3025 Part 42 : 1992 R : 2019, AAS-Flame APHA, 24th Edition, AAS-GTA	<0.01	0.01-10	0.01	0.05	1.5
3	Free Residual Chlorine, mg/l, Min	APHA, 24th Edition, , 4500-Cl-B. (Iodometric Method-I)	<0.04	0.04-5	0.04	0.2	1
4	Lead (as Pb), mg/l, Max	IS:3025(Part 47):1994 (Reaffirmed 2019) APHA, 24th Edition, AAS-GTA	<0.005	0.005-10	0.005	0.01	No relaxation
5	Phenolic compounds (as C6H5OH), mg/l, Max	APHA, 24th Edition,4-Amino Autipyrine	<0.001	0.001-10	0.001	0.002	0.002
6	Selenium, mg/l, Max	APHA 24th Edition IS-3025,part 56:2003, R-2019/, AAS-VGA	<0.007	0.007-10	0.007	0.01	No relaxation
7	Total Arsenic (as As), mg/l, Max	IS-3025,part 37:1988, R-2019/ APHA 24th Edition AAS-VGA	<0.006	0.006-10	0.006	0.01	0.05
8	Total Chromium (as Cr), mg/l, Max	IS-3025 Part 52:2003, R:2019,AAS-Flame APHA, 24th Edition, AAS-GTA	<0.01	0.01-10	0.01	0.05	No relaxation
9	Nickel as Ni, mg/l Max	IS 3025 Part 54 : 2003,R : 2019, AAS-Flame APHA, 24th Edition, AAS-GTA	<0.005	0.005-10	0.005	0.02	No relaxation
10	Manganese as Mn, mg/l, Max	APHA,24th edition, AAS-GTA : 2003 AAS-GTA Method	<0.02	0.02-10	0.02	0.1	0.3

****All units in mg/L unless specified otherwise,*

***Grab sampling carried out for water samples. *LDL indicates Lower Detection Limit & BDL indicates Below Detection Limit,*



ANALYSED BY



(Kumar Vaibhav)
REVIEWED BY



(Amit Raj Mishra)
Authorised Signatory

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DRINKING WATER ANALYSIS TEST REPORT

Month & Year	**QUARTER ENDING JUNE 2024**	**Name of Cluster**	**IV**	**ULR No.**	TC101222400000095 9P
Customer	**Environment Department, Bharat Coking Coal Limited (BCCL), Koyla Bhawan, Dhanbad (E-mail: gmenv.bccl@coalindia.in)**			**Date of Issue**	**16.08.2024**
Project	**AARC Filter Plant**	**Sample Ref. No.**	**REM/BCCL/23-24/DW**	**Sampling Method**	**CMPDI/RI-II/LPM 13,(IS 3025:Part -1)**
Sampling Stations	**AARC Filter Plant**	**Date of Sampling**	**20.05.2024**	**Sample Collected in 5 Ltr Jerricane , Color as observed is transparent**	
			Period of Analysis	**20.05.2024** **TO**	**07.08.2024**

Sl. No.	**Parameter**	**Method of Analysis**	**Observed Values** DW3 D0040	**Range Of Testing**	**LDL**	**IS 10500: 2012** Acceptable Limit (Max)*	Permissible Limit in the Absence of Alternate Source (Max)
1	Colour, Hazen unit	APHA, 24th Edition ,2120-c-Spectrophotometric Single Wavelength Method ,2023	1	1-500.0	1	5	15
2	Calcium, mg/l	IS 3025, (Part 40): 1991 R:2019,AAS-Flame Method & EDTA Method	148	2.0-800.0	2	75	200
3	Chlorides, mg/l	IS-3025(Part 32):1988, R-2019 , Argentometric Method	41	2.0-1500.0	5	250	1000
4	Fluoride, mg/l	APHA, 24th Edition, SPADNS Method	0.63	0.2-2.00	0.2	1	1.5
5	Iron, mg/l	IS 3025 (Part 53) : 2003, R : 2019 , AAS-Flame Method	<0.2	0.2-10	0.2	1	No relaxation
6	Magnesium	APHA 24th Edition, 3500-Mg B: Calculation Method	94	6.0-700	6	30	100
7	Nitrate , mg/l	APHA, 24th Edition, UV-Spectrophotometric Method	37.11	0.5-45.0	0.5	45	No relaxation
8	Odour	APHA, 24th Edition, , 2150-C	Agreeable	Qualitative	Qualitative	Agreeable	Agreeable
9	pH value	IS 3025, Part 11 : 1983 R 2023 Electrometric(pH Meter) Method	7.77	1-14	0.1	6.5-8.5	No relaxation
10	Sulphate, mg/l	APHA –24th Edition, 4500 S , Turbidity Method	348	10.0-400.0	10	200	400
11	Taste	APHA,24th Edition, 2160-C	Acceptable	Qualitative	Qualitative	Acceptable	Agreeable
12	Total Alkalinity (c_ac_{03}), mg/l, Max	IS 3025, Part 23: 1986 R 2019 Titration Method	85	4.0-2000.0	4	200	600
13	Total Dissolved Solids, mg/l	IS 3025, Part 16: 1984 R 2023 Gravimetric method	937	25.0-10000.0	25	500	2000
14	Total Hardness, mg/l	IS 3025, (Part 21): 2019 EDTA Method	755	4.0-2000.0	4	200	600
15	Turbidity, NTU	IS 3025, (Part 10):1984, R-2023 Nephelometric/Turbiditimetric Method	2.6	1-800	0.1	1	5
16	Zinc, mg/l	IS 3025(Part 49) : 1994,R:2019, AAS-Flame Method	<0.1	0.10 – 10.0	0.1	5	15

****All units in mg/L unless specified otherwise,*

***Grab sampling carried out for water samples. *LDL indicates Lower Detection Limit & BDL indicates Below Detection Limit,*

ANALYSED BY

(Kumar Vaibhav)
REVIEWED BY

(Amit Raj Mishra)
Authorised Signatory

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DRINKING WATER ANALYSIS TEST REPORT

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Month & Year	**QUARTER ENDING JUNE 2024**	**Name of Cluster**	**IV**			**ULR No.**	
Customer	**Environment Department, Bharat Coking Coal Limited (BCCL), Koyla Bhawan, Dhanbad (E-mail: gmenv.bccl@coalindia.in)**					**Date of Issue**	**16.08.2024**
Project	**AARC Filter Plant**		**Sample Ref. No.**	**REM/BCCL/23-24/DW**	**Sampling Method**	**CMPDI/RI-II/LPM 13,(IS 3025:Part -1)**	
Sampling Stations	**AARC Filter Plant**	**Date of Sampling**	**20.05.2024**	**Sample Collected in 5 Ltr Jerricane , Color as observed is transparent**			
			Period of Analysis	**20.05.2024**	**TO**	**07.08.2024**	

Sl. No.	**Parameter**	**Method of Analysis**	**Observed Values**			**IS 10500: 2012**	
			DW3	**Range Of Testing**	**LDL**	**Acceptable Limit (Max)***	**Permissible Limit in the Absence of Alternate Source (Max)**
1	Boron (as B), mg/l, Max	APHA, 24th Edition ,Carmine	<0.2	0.2-10	0.2	0.5	1
2	Copper (as Cu), mg/l, Max	IS 3025 Part 42 : 1992 R : 2019, AAS-Flame APHA, 24th Edition, AAS-GTA	<0.01	0.01-10	0.01	0.05	1.5
3	Free Residual Chlorine, mg/l, Min	APHA, 24th Edition, , 4500-Cl-B. (Iodometric Method-I)	<0.04	0.04-5	0.04	0.2	1
4	Lead (as Pb), mg/l, Max	IS:3025(Part 47):1994 (Reaffirmed 2019) APHA, 24th Edition, AAS-GTA	<0.005	0.005-10	0.005	0.01	No relaxation
5	Phenolic compounds (as C6H5OH), mg/l, Max	APHA, 24th Edition,4-Amino Autipyrine	<0.001	0.001-10	0.001	0.002	0.002
6	Selenium, mg/l, Max	APHA 24th Edition IS-3025,part 56:2003, R-2019/, AAS-VGA	<0.007	0.007-10	0.007	0.01	No relaxation
7	Total Arsenic (as As), mg/l, Max	IS-3025,part 37:1988, R-2019/ APHA 24th Edition AAS-VGA	<0.006	0.006-10	0.006	0.01	0.05
8	Total Chromium (as Cr), mg/l, Max	IS-3025 Part 52:2003, R:2019,AAS-Flame APHA, 24th Edition, AAS-GTA	<0.01	0.01-10	0.01	0.05	No relaxation
9	Nickel as Ni, mg/l Max	IS 3025 Part 54 : 2003,R : 2019, AAS-Flame APHA, 24th Edition, AAS-GTA	<0.005	0.005-10	0.005	0.02	No relaxation
10	Manganese as Mn, mg/l, Max	APHA,24th edition, AAS-GTA : 2003 AAS-GTA Method	<0.02	0.02-10	0.02	0.1	0.3

****All units in mg/L unless specified otherwise,*

***Grab sampling carried out for water samples. *LDL indicates Lower Detection Limit & BDL indicates Below Detection Limit,*

(Kumar Vaibhav)
REVIEWED BY

(Amit Raj Mishra)
Authorised Signatory

ANALYSED BY

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DRINKING WATER ANALYSIS TEST REPORT

Month & Year	**QUARTER ENDING JUNE 2024**	**Name of Cluster**	**IV**	**ULR No.**	TC10122240000009 60P
Customer	**Environment Department, Bharat Coking Coal Limited (BCCL), Koyla Bhawan, Dhanbad (E-mail: gmenv.bccl@coalindia.in)**			**Date of Issue**	**16.08.2024**
Project	**Gaslitand Filter Plant**	**Sample Ref. No.**	**REM/BCCL/23-24/DW**	**Sampling Method**	**CMPDI/RI-II/LPM 13,(IS 3025:Part -1)**
Sampling Stations	**AARC Filter Plant**	**Date of Sampling**	**20.05.2024**	**Sample Collected in 5 Ltr Jerricane , Color as observed is transparent**	
			Period of Analysis	**20.05.2024** **TO** **07.08.2024**	

Sl. No.	**Parameter**	**Method of Analysis**	**Observed Values**			**IS 10500: 2012**	
			DW4 D0037	**Range Of Testing**	**LDL**	**Acceptable Limit (Max)***	**Permissible Limit in the Absence of Alternate Source (Max)**
1	Colour, Hazen unit	APHA, 24th Edition ,2120-c-Spectrophotometric Single Wavelength Method ,2023	1	1-500.0	1	5	15
2	Calcium, mg/l	IS 3025, (Part 40): 1991 R:2019,AAS-Flame Method & EDTA Method	142	2.0-800.0	2	75	200
3	Chlorides, mg/l	IS-3025(Part 32):1988, R-2019 , Argentometric Method	53	2.0-1500.0	5	250	1000
4	Fluoride, mg/l	APHA, 24th Edition, SPADNS Method	0.56	0.2-2.00	0.2	1	1.5
5	Iron, mg/l	IS 3025 (Part 53) : 2003, R : 2019 , AAS-Flame Method	<0.2	0.2-10	0.2	1	No relaxation
6	Magnesium	APHA 24th Edition, 3500-Mg B: Calculation Method	107	6.0-700	6	30	100
7	Nitrate , mg/l	APHA, 24th Edition, UV-Spectrophotometric Method	34.97	0.5-45.0	0.5	45	No relaxation
8	Odour	APHA, 24th Edition, , 2150-C	Agreeable	Qualitative	Qualitative	Agreeable	Agreeable
9	pH value	IS 3025, Part 11 : 1983 R 2023 Electrometric(pH Meter) Method	7.62	1-14	0.1	6.5-8.5	No relaxation
10	Sulphate, mg/l	APHA –24th Edition, 4500 S , Turbidity Method	310	10.0-400.0	10	200	400
11	Taste	APHA,24th Edition, 2160-C	Acceptable	Qualitative	Qualitative	Acceptable	Agreeable
12	Total Alkalinity ($c_a co_3$), mg/l, Max	IS 3025, Part 23: 1986 R 2019 Titration Method	165	4.0-2000.0	4	200	600
13	Total Dissolved Solids, mg/l	IS 3025, Part 16: 1984 R 2023 Gravimetric method	935	25.0-10000.0	25	500	2000
14	Total Hardness, mg/l	IS 3025, (Part 21): 2019 EDTA Method	795	4.0-2000.0	4	200	600
15	Turbidity, NTU	IS 3025, (Part 10):1984, R-2023 Nephelometric/Turbiditimetric Method	2.5	1-800	0.1	1	5
16	Zinc, mg/l	IS 3025(Part 49) : 1994,R:2019, AAS-Flame Method	<0.1	0.10 – 10.0	0.1	5	15

****All units in mg/L unless specified otherwise,*

***Grab sampling carried out for water samples. *LDL indicates Lower Detection Limit & BDL indicates Below Detection Limit,*

ANALYSED BY

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REVIEWED BY

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CENTRAL MINE PLANNING AND DESIGN INSTITUTE LIMITED

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DRINKING WATER ANALYSIS TEST REPORT

Month & Year	**QUARTER ENDING JUNE 2024**	**Name of Cluster**	**IV**			**ULR No.**	TC1012224000000960P
Customer	**Environment Department, Bharat Coking Coal Limited (BCCL), Koyla Bhawan, Dhanbad (E-mail: gmenv.bccl@coalindia.in)**					**Date of Issue**	**16.08.2024**
Project	**AARC Filter Plant**	**Sample Ref. No.**	**REM/BCCL/23-24/DW**	**Sampling Method**	**CMPDI/RI-II/LPM 13,(IS 3025:Part -1)**		
Sampling Stations	**Gaslitand Filter Plant**	**Date of Sampling**	**20.05.2024**	**Sample Collected in 5 Ltr Jerricane , Color as observed is transparent**			
			Period of Analysis	**20.05.2024**	**TO**	**07.08.2024**	

Sl. No.	**Parameter**	**Method of Analysis**	**Observed Values** DW4 D0040	**Range Of Testing**	**LDL**	**IS 10500: 2012 Acceptable Limit (Max)***	**Permissible Limit in the Absence of Alternate Source (Max)**
1	Boron (as B), mg/l, Max	APHA, 24th Edition ,Carmine	<0.2	0.2-10	0.2	0.5	1
2	Copper (as Cu), mg/l, Max	IS 3025 Part 42 : 1992 R : 2019, AAS-Flame APHA, 24th Edition, AAS-GTA	<0.01	0.01-10	0.01	0.05	1.5
3	Free Residual Chlorine, mg/l, Min	APHA, 24th Edition, , 4500-Cl-B. (Iodometric Method-I)	<0.04	0.04-5	0.04	0.2	1
4	Lead (as Pb), mg/l, Max	IS:3025(Part 47):1994 (Reaffirmed 2019) APHA, 24th Edition, AAS-GTA	<0.005	0.005-10	0.005	0.01	No relaxation
5	Phenolic compounds (as C6H5OH), mg/l, Max	APHA, 24th Edition,4-Amino Autipyrine	<0.001	0.001-10	0.001	0.002	0.002
6	Selenium, mg/l, Max	APHA 24th Edition IS-3025,part 56:2003, R-2019/, AAS-VGA	<0.007	0.007-10	0.007	0.01	No relaxation
7	Total Arsenic (as As), mg/l, Max	IS-3025,part 37:1988, R-2019/ APHA 24th Edition AAS-VGA	<0.006	0.006-10	0.006	0.01	0.05
8	Total Chromium (as Cr), mg/l, Max	IS-3025 Part 52:2003, R:2019,AAS-Flame APHA, 24th Edition, AAS-GTA	<0.01	0.01-10	0.01	0.05	No relaxation
9	Nickel as Ni, mg/l Max	IS 3025 Part 54 : 2003,R : 2019, AAS-Flame APHA, 24th Edition, AAS-GTA	<0.005	0.005-10	0.005	0.02	No relaxation
10	Manganese as Mn, mg/l, Max	APHA,24th edition, AAS-GTA : 2003 AAS-GTA Method	<0.02	0.02-10	0.02	0.1	0.3

****All units in mg/L unless specified otherwise,*

***Grab sampling carried out for water samples. *LDL indicates Lower Detection Limit & BDL indicates Below Detection Limit,*

ANALYSED BY

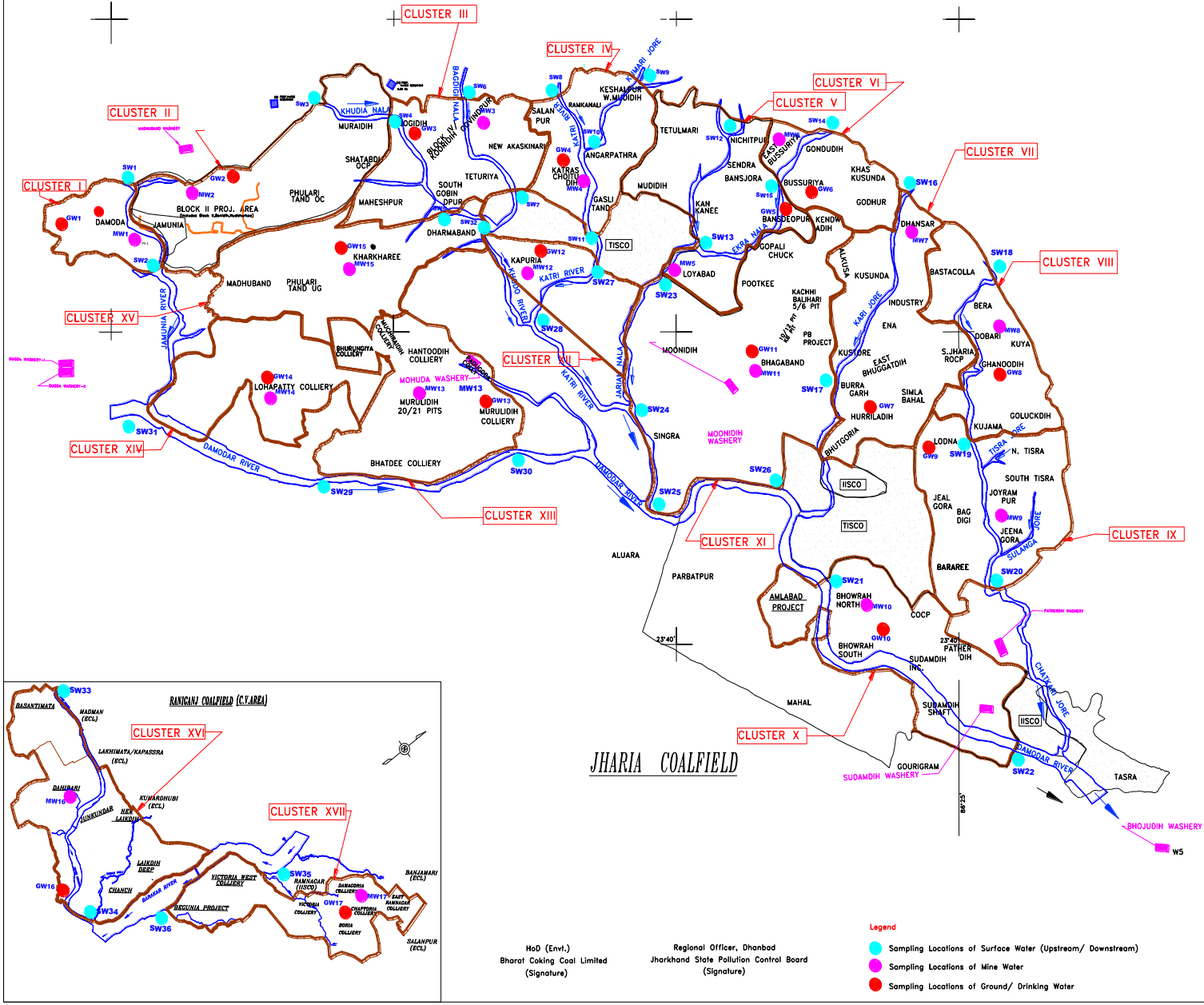
(Kumar Vaibhav)
REVIEWED BY

(Amit Raj Mishra)
Authorised Signatory

Note: The results above relate to the samples tested as received. This report can not be reproduced in part or full without the written permission of the HOD(Env) , CMPDI, RI-II.

---- End of Report ----

Water Sampling Locations in BCCL



INDEX

Cluster	Suface Water (U/S, D/S)	Name of River/ Nala / Jore	Mine/ Effluent	Sampling Location	Ground Water	Sampling Location
I	SW1, SW2	Jamunia River	MW1	Damoda Area	GW1	Ghutway Village
II	SW3, SW4	Khudia Nala	MW2	Block II OCP	GW2	Joyrampur Village
III	SW4, SW5, SW6, SW7	Khudia Nala, Bagdigi Nala	MW3	Govindpur Colliery	GW3	Jogidih Village
IV	SW8, SW11, SW9, SW10	Katri River, Kumari Jore	MW4	Chotudih	GW4	Kankanee Village
V	SW12, SW13, SW15	Jarian Nala, Ekra Nala	MW5	Mudidih	GW5	Nichitpur
VI	SW14, SW15	Ekra Nala	MW6	East Bassuria UGP	GW6	Bansjora Borewell
VII	SW16, SW17	Kari Jore	MW7	Dhansar UGP	GW7	Hurriladih
VIII	SW18, SW19	Kashi Jore	MW8	Dobari UGP	GW8	Ghanudih
IX	SW19, SW20	Kashi Jore	MW9	Jeenagora	GW9	Lodna
X	SW21, SW22	Damodar River	MW10	Bhowrah North	GW10	Bhowrah South
XI	SW23, SW24, SW25, SW26	Jarian Nala, Damodar River	MW11	Bhagaband h UGP	GW11	Bhagabandh
XII	SW27, SW28	Katri River	MW12	Kapuria	GW12	Kapuria
XIII	SW29, SW30	Damodar River	MW13	Murulidih (20/21)	GW13	Murulidih
XIV	SW31, SW29	Damodar River	MW14	Lohapatti	GW14	Lohapatti
XV	SW5, SW32	Khudia Nala	MW15	Kharkharee UGP	GW15	Kharkharee
XVI	SW33, SW34	Khudia River	MW16	Dahibari OCP	GW16	Patlabari Village
XVII	SW35, SW36	Barakar River	MW17	Damagoria Colliery	GW17	Chaptoria

HoD (Envt.)
Bharat Coking Coal Limited
(Signature)

Regional Officer, Dhanbad
Jharkhand State Pollution Control Board
(Signature)

Legend
- Sampling Locations of Surface Water (Upstream/ Downstream)
- Sampling Locations of Mine Water
- Sampling Locations of Ground/ Drinking Water

Customer	BHARAT COKING COAL LIMITED
Title	WATER SAMPLING LOCATIONS
Subject	MONITORING STATIONS
CMPDI (ISO 9001 Company)	Scale: Not to Scale

D/190
30/05/24

Bharat Coking Coal Ltd.
(A Subsidiary of Coal India Limited)
Office of the General Manager, Katras Area
P.O. KATRAS, P.S.- Jogta, Dhanbad-828121
CIN: U1010JH1972GOI000918
Phone/Fax No.: 0326-2371213
Email ID: cgmkatras@bccl.gov.in

Ref- BCCK/KA/IV/GM/

Dated- 30/05/2024

OFFICE OF THE GENERAL MANAGER
F3/218
30/5/24
KATRAS AREA

To
The Director,
Ministry of environment, forest and climate charge
Regional office (ECZ)
Bungalow office no.42, Shyamali colony
Ranchi-834002

Sub:-Six monthly EC compliance report on implementation of environmental measures for the period from OCT 2023 to March 2024

Dear Sir

Kindly find enclosed herewith the six monthly EC compliance report on implementation of environmental measures for the period from OCT 2023 to March 2024 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.

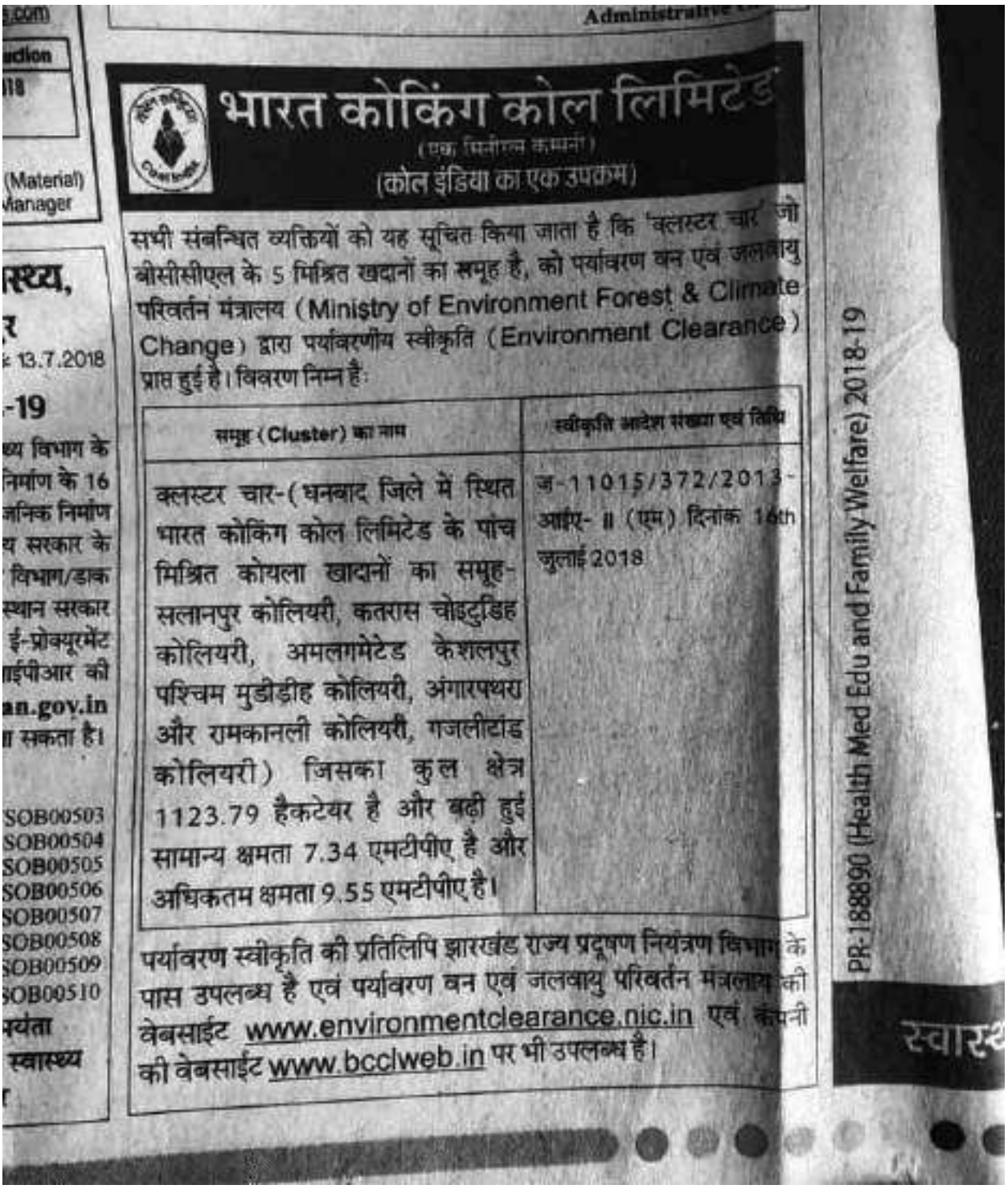
Enclosed:-As Above.

Yours Faithfully

30-5-2024
General Manager
Cluster-IV, BCCL

Copy:-
1.The Director,1A Monitoring cell,Paryavaran Bhawan,CGO Complex, New Delhi-110003
2. Central Pollution Control Board, Parivesh Bhawan, CBD-cum-Office Complex East Arjun Nagar, DELHI - 110 032, INDIA
3. The Director,(S) Ministry of Environment & Forest,Govt.of India –Bhuneshwar751023
4.The Member Secretary, Jharkhand state Pollution Control Board,Ranchi-834004
5. The Regional Officer, Jharkhand state Pollution Board,Dhanabad-826001
6. GM(Min)/HOD(Env), BCCL,Koyla Bhawan,Dhanbad
6.Office Copy

Annexure-36



भारत कोकिंग कोल लिमिटेड

(एक मिनीरत्न कम्पनी)

(कोल इंडिया का एक उपक्रम)

सभी संबन्धित व्यक्तियों को यह सूचित किया जाता है कि 'क्लस्टर चार' जो बीसीसीएल के 5 मिश्रित खदानों का समूह है, को पर्यावरण वन एवं जलवायु परिवर्तन मंत्रालय (Ministry of Environment Forest & Climate Change) द्वारा पर्यावरणीय स्वीकृति (Environment Clearance) प्राप्त हुई है। विवरण निम्न है:

समूह (Cluster) का नाम	स्वीकृति आदेश संख्या एवं तिथि
क्लस्टर चार-(धनबाद जिले में स्थित भारत कोकिंग कोल लिमिटेड के पांच मिश्रित कोयला खादानों का समूह- सलानपुर कोलियरी, कतरास चोइटुडिह कोलियरी, अमलगमेटेड केशलपुर पश्चिम मुडीडीह कोलियरी, अंगारपथरा और रामकानली कोलियरी, गजलीटांड कोलियरी) जिसका कुल क्षेत्र 1123.79 हैकटेयर है और बढ़ी हुई सामान्य क्षमता 7.34 एमटीपीए है और अधिकतम क्षमता 9.55 एमटीपीए है।	ज-11015/372/2013-आईए- II (एम) दिनांक 16th जुलाई 2018

पर्यावरण स्वीकृति की प्रतिलिपि झारखंड राज्य प्रदूषण नियंत्रण विभाग के पास उपलब्ध है एवं पर्यावरण वन एवं जलवायु परिवर्तन मंत्रालय की वेबसाईट www.environmentclearance.nic.in एवं कंपनी की वेबसाईट www.bcclweb.in पर भी उपलब्ध है।

PR-188890 (Health Med Edu and Family Welfare) 2018-19