Bharat Coking Coal Ltd.
(A Subsidiary of Coal India Limited)
Office of the General Manager, Katras Area
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Dated- 30/11/2019

To
The Director,
Ministry of environment, forest and climate charge
Regional office (ECZ)
Bungalow office no.42, Shyamali colony
Ranchi-834002

Sub:-Six monthly EC compliance report on implementation of environmental measures for the period from April 2019 to Sept 2019

Dear Sir
Kindly find enclosed herewith the six monthly EC compliance report on implementation of environmental measures for the period from April 2019 to Sept 2019 in respect of cluster IV group of mines under Katras Area, BCCL.

Sir, This is for your kind information and necessary action please.
Hope you will find in order.

Enclosed:-As Above.

Yours Faithfully

General Manager
Cluster-IV, BCCL

Copy:-
1.The Director,IA Monitoring cell,Paryavaran Bhawan,CGO Complex, New Delhi-110003
2. Central Pollution Control Board, Parivesh Bhawan, CBD-cum-Office Complex East Arjun Nagar, DELHI - 110 032, INDIA
3. The Director,(S) Ministry of Environment & Forest,Govt.of India –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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SL. No.	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. **Annexure 3- Pic of Mobile water tanker 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.	Application for obtaining approval of CGWA for use of groundwater for mining operations has been made.
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-** Distribution list of PPE.
11	The fire dealing operations by excavating out fire should be expedited.	It is being complied. **Annexure 5-** Pic of fire dealing operation.

1	Mining shall be carried out under strict adherence to provisions of the Mines Act, 1952 and subordinate legislations made there-under as applicable.	It is being Complied.
2	Mining shall be carried out as per the approved mining plan(including Mine Closure Plan) abiding by mining laws related to coal mining and the relevant circulars issued by Directorate General Mines Safety (DGMS).	It is being Complied. Mining Plans of mines of Cluster-IV approved on 03.08.2017 on 333th Board Meeting. **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 and 2018. **Annexure 8– Last Time-series map of 2018**
2	The surface drainage plan including surface water conservation plan for the area of influence affected by the said mining operations, considering the presence of river/rivulet/pond/lake etc, shall be prepared and implemented by the project proponent. The surface drainage plan and/or any diversion of natural water courses shall be as per the approved Mining Plan/EIAIEMP report and with due approval of the concerned State/Go I Authority. The construction of embankment to prevent any danger against inrush of surface water into the mine should be as per the approved Mining Plan and as per the permission of DGMS or any other authority as prescribed by the law.	The surface drainage plan is attached herewith. No diversion of natural water courses has been done . The construction of embankment to prevent any danger against inrush of surface water into the mine has been constructed. **Annexure- 9-** surface drainage plan

3	The final mine void depth should preferably be as per the approved Mine Closure Plan, and in case it exceeds 40 m, adequate engineering interventions shall be provided for sustenance of aquatic life therein. The remaining area shall be backfilled and covered with thick and alive top soil. Post-mining land be rendered usable for agricultural/forestry purposes and shall be diverted. Further action will be treated as specified in the guidelines for preparation of Mine Closure Plan issued by the Ministry of Coal dated 2th August, 2009.	The final mine void depth will preferably be as per the approved Mine Closure Plan. At the end of mining all the remaining excavated area will be leveled and reclaimed physically as well as Biologically.
4	The entire excavated area, backfilling, external OB dumping (including top soil) and afforestation plan shall be in conformity with the "during mining"/"post mining" land-use pattern, which is an integral part of the approved Mining Plan and the EIA/EMP submitted to this Ministry. Progressive compliance status vis-a-vis the post mining land use pattern shall be submitted to the MOEFCC/RO.	The entire excavated area, backfilling, external OB dumping (including 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-2018. **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 thevegetation becomes self-sustaining. Compliance status shall be submitted to the Ministry.	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-2018.
7	Post-mining land shall be rendered usable for agricultural/forestry purposes and handed over to the respective State Government, as specified in the Ministry of Coal Guidelines dated 27th August, 2009 for Preparation of Mine Closure Plan.	It will be complied. **Annexure 11- Approval copy of Mine closer plan.**

8	Regular monitoring of subsidence movement on the surface over and around the working areas and its impact on natural drainage pattern, water bodies, vegetation, structure, roads and surroundings shall be continued till movement ceases completely. In case of observation of any high rate of subsidence beyond the limit prescribed, appropriate effective mitigation measures shall be taken to avoid loss of life and materials. Cracks should be effectively plugged in with ballast and clay soil/suitable material.	No depillaring in underground mine is going on hence no mining induced subsidence is taking place. Regular monitoring of subsidence is being done by subsidence monitoring committee of the area.
9	A separate team for subsidence monitoring and surface mitigation measures shall be constituted and continuous monitoring & implementation of mitigation measures be carried out.	It is being complied. A Certificate of Project Officers and General Manager of the Cluster IV, indicating no subsidence due to mining operation is being attached. **Annexure 12- Certificate Regarding no subsidence due to mining operation.**
10	Thorough inspection of the mine lease area for any cracks developed at the surface due to mining activities below ground shall be carried out to prevent inrush of water in the mine.	It is being complied.
11	Native tree species shall be selected and planted over areas affected by subsidence.	Plants like seesam, Gamhar, Aam, Peepal,Bargad, Sagwan, Kathal etc. has been planted over areas likely to be affected by subsidence.
	Emissions, effluents, and waste disposal	
1	Transportation of coal, to the extent permitted by road, shall becarried out by covered trucks/conveyors. Effective control measures such as regular water/mist sprinkling/rain gun etc shall be carried out in critical areas prone to air pollution (with higher values of PM1Q/PM2.s)such as haul road, loading/unloading and transfer points. Fugitive dust emissionsfrom all sourcesshall be controlled regularly. It shall be ensured that the Ambient Air Quality parameters confirm to the norms prescribed by the Central/State Pollution Control Board.	Vehicular emission is kept under control by proper maintenance of vehicles. Vehicular emissions are being monitored in every prescribed period. Only those vehicles are being allowed to run having PUC. In addition to the above coal transportation is done by tarpaulins covered and optimally loaded vehicles. The project authorities are regularly checking all the loaded trucks/dumpers coming inside the plant about their valid PUC. Total 40nos of mobile water sprinkler at haul road has been deployed for control to air pollution. In addition to that 45 no of fixed sprinkler installed along the siding/CHP, throwing approx 10-12m and distance between sprinkler is about 10-15m. **Annexure 13- PUC certificate**

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.	Plantation is being carried out in available spaces for creation 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. 600 nos of bamboo gabion plantation has been done in current 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 15 Ha over OB dump. **Annexure 14 - Pic of plantation carried out**
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 15- 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. In addition to that 45 no of fixed sprinkler installed along the siding/CHP, throwing range approx 10-12m and distance between sprinkler is about 10-15m.

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 purposei.e fire dealing ,watering the mine area, roads, green belt development etc. Regular monitoring of ground water level and quality are being monitored by CMPDIL, Ranchi. Rain water Harvesting arrangement has been made. **Annexure 16- Ground water monitoring report** **Annexure 17- 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. **Annexure 18- Pic of toe wall made along OB dump.** **Annexure 19- 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	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

	pressure preventing any chance of mine inundation.	water flow and prevent mine inundation. Construction of concrete embankment at critical patch of nallah/Jore has been done. Total length of constructed embankment is 3000 m. **Annexure 20-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 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.	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 21- 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 22- 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 23- 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 24- 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 25- IME/PME report**
2	Personnel working in core zone shall wear protective respiratory devices and shall also be provided with adequate training and information on safety and health aspects.	Training and awareness programmes are being given to all the personnel working in dusty areas. Dust masks have been provided to the personnel working in dusty areas. **Annexure 26- Dust mask distribution register**
	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.	Ecological restoration are being done in consultation with FRI, dehradun. Road Map of Ecological restoration has been made. **Annexure 27- 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. **Annexure 28- List of activities undertaken in and around the mine in pursuance of CSR policy.**

3	The project proponent shall follow the mitigation measures provided in this Ministry's OM NO.Z-11013/5712014-IA.11 (M) dated 29th October, 2014, titled 'Impact of mining activities on habitations-issues related to the mining projects wherein habitations and villages are the part of mine lease areas or habitations and villages are surrounded by the mine lease area'.	It is being complied.
4	The project proponent shall make necessary alternative arrangements, if grazing land is involved in core zone, in consultation with the State government to provide alternate areas for livestock grazing, if any. In this context, the project proponent shall implement the directions of Hon'ble Supreme Court with regard to acquiring grazing land.	No grazing land is involved in core zone.
	Corporate environment responsibility	
1	The Company shall have a well laid down environment policy duly approved by Board of Directors. The environment policy should prescribe for standard operating procedures to have proper checks and balances and to bring into focus any infringements/deviation/violation of the environmental or forest norms/conditions. Also, the company shall have a defined system of reporting of non-compliances/violations of environmental norms to the Board of Directors and/or shareholders/stakeholders.	It is being complied. Corporate Environmental policy has been made, approved by CMD of M/s BCCL and it is being implemented. Environment management cell has also been made to ensure implementation of environmental management plan. **Annexure 29- CSR expenditure details**
2	The project proponent shall comply with the provisions contained in this Ministry's OM dated 1st May, 2018, as applicable, regarding Corporate Environment Responsibility.	It is being complied. Corporate Environmental policy has been made, approved by CMD of M/s BCCL and it is being implemented.
3	A separate environmental management cell both at the project and company headquarter level, with suitable qualified personnel shall be set-up under the control of a Senior Executive, who will report directly to the Board level executive/Head of the Organization.	A full-fledged Environment Department, headed by a HoD (Environment) along with a suitable qualified multidisciplinary team of executives has been established at the Headquarters. At the area level, one Executive in each area has been nominated as Nodal Officer (Environment). Management Trainees/Asst. Managers (Environment) have also been deputed at area level. The activities are monitored on regular basis at Area and at Headquarters levels. DGM (Environment) at head quarter level, co-ordinates with all the Areas and reports to the Director (Technical) and in turn he reports to the CMD of the company.

4	Action plan for implementing EMP and environmental conditions along with responsibility matrix of the company shall be prepared and shall be duly approved by competent authority. The year wise funds earmarked for environmental protection measures shall be kept in separate account and not to be diverted for any other purpose. Year wise progress of implementation of action plan shall be reported to the Ministry/Regional Office along with the Six Monthly Compliance Report.	It is being complied. Action plan has been made, work is being done accordingly. Year wise funds earmarked for environmental protection measure has been kept separately. **Annexure 30- 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.	It is being Complied. Application has been made to CGWA.
3	The Environmental clearance shall be subject to orders of Hon'ble Supreme Court of India, Hon'ble High Courts, NGT and any other Court of Law, from time to time, and as applicable to the project.	It is being complied.
4	The project proponent shall obtain Consent to Establish/Operate under the Air (Prevention &Control of Pollution) Act, 1981 and the Water (Prevention & Control of Pollution) Act, 1974 from concerned SPCB.	It is being complied.
	Monitoring of project	

1	Continuous ambient air quality monitoring stations as prescribed in the statue be established in the core zone as well as in the buffer zone for monitoring of pollutants, namely PM1o, PM2.5, S02 and NOx. Location of the stations shall be decided based on the meteorological data, topographical features and environmentally and ecologically sensitive targets in consultation with the State Pollution Control Board. Online ambient air quality monitoring stations may also be installed in addition to the regular monitoring stations as per the requirement and/or in consultation with the SPCB. Monitoring of heavy metals such as Hg, As, Ni, Cd, Cr, etc to be carried out at least once in six months.	Location of Monitoring station in the Jharia Coal Field have been finalized with the Jharkhand State Pollution Control Board. Four ambient air quality monitoring station has been established at AARC agent office (Ramkanali), Mine office - Kooridih OCP, Mine office- Nichitpur and RudhiBasti. Presently we are doing air quality monitoring at five locations namely KatrasChatudih, AARC agent office (Ramkanali), Mine office - Kooridih OCP, Mine office- Nichitpur and RudhiBasti. 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. **Annexure 31- Monitoring station location details**
2	The Ambient Air Quality monitoring in the core zone shall be carried out to ensure the Coal Industry Standards notified vide GSR 742 (E) dated 25.9.2000 and as amended from time to time by the Central Pollution Control Board. Data on ambient air quality and heavy metals such as Hg, As, Ni, Cd, Cr and other monitoring data shall be regularly reported to the Ministry/Regional Office and to the CPCB/SPCB.	It is being complied. CMPDIL has been engaged for Air Quality monitoring as well as heavy metals. **Annexure 32- Ambient Air quality monitoring report**
3	The effluent discharge (mine waste water, workshop effluent) shall be monitored in terms of the parameters notified under the Water Act, 1974 Coal Industry Standards vide GSR 742 (E) dated zs" September, 2000 and as amended from time to time by the Central Pollution Control Board.	Monitoring of River water are being done by CMPDIL regularly in Upstream and Downstream. **Annexure 33- Monitoring Report**
4	The monitoring data shall be uploaded on the company's website and displayed at the project site at a suitable location. The circular No. J-20012/1/2006-IA.11 (M) dated 27th May, 2009 issued by the Ministry shall also be referred in this regard for compliance.	It is being complied.
5	Regular monitoring of ground water level and quality shall be carried out in and around the mine lease area by establishing a network of existing wells and constructing new piezometers during the mining operations. The monitoring of ground water levels shall be carried out four times a year i.e. pre-monsoon, monsoon, post-monsoon and winter and water quality once a year, and the data thus collected shall be sent regularly to MoEFCC/RO.	It is in progress. Tendering for establishing a network of existing wells and constructing new piezometers during the mining operations has been done, but no bidder qualified. **Annexure 34- E-Tendering copy**

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 35- Water quality Monitoring Report**
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 36-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. Installation of 2 no of Solar tree of 5 KW capacity is in line.
2	The project authorities shall inform to the Regional Office of the MOEFCC regarding commencement of mining operations.	Complied.
3	A copy of the environmental clearance shall be marked to concerned Panchayat. A copy of the same shall also be sent to the concerned State Pollution Control Board, Regional Office of the MOEFCC, District Industries Centre and Collector's Office/Tehsildar Office for information in public domain within 30 days.	complied.
4	The EC shall be uploaded on the company's website. The compliance status of the stipulated EC conditions shall also be uploaded by the project authorities on their website and updated at least once every six months so as to bring the same in public domain.	It is being Complied. EC has uploaded on the company's website. Six monthly compliance status are also being uploaded on company's website.
5	The project authorities shall advertise at least in two local newspapers widely circulated, one of which shall be in the vernacular language of the locality concerned, within 7 days of the issue of the clearance letter informing that the project has been accorded environmental clearance and a copy of the clearance letter is available with the State Pollution Control Board and also at web site of this Ministry at www.environmentclearance.nic.in and a copy of the same shall be forwarded to the Regional Office.	Complied. **Annexure 37- 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 Pollution Control Board. Monitoring of heavy metals such as Hg, As, Ni, Cd, Cr, etc. to be carried out at least once in six months. Online ambient air quality monitoring station/stations may also be installed in addition to the regular air monitoring stations as per the requirement and/or in consultation with the SPCB.	Location of Monitoring station in the Jharia Coal Field have been finalized with the Jharkhand State Pollution Control Board. Four ambient air quality monitoring station has been established at AARC agent office (Ramkanali), Mine office - Kooridih OCP, Mine office- Nichitpur and RudhiBasti. Presently we are doing air quality monitoring at five locations namely KatrasChatudih, AARC agent office (Ramkanali), Mine office - Kooridih OCP, Mine office- Nichitpur and RudhiBasti. 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 11/11
Cluster IV, BCCL
Ritesh Kumar

Scanned by CamScanner

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 (E&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/20227/2013 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	Linkagee	
		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)				
		Plantation	Water Body	Public Use	Undisturbed	TOTAL
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.I1 (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, Deptt of Environment & Forests, Govt of Jharkhand, Secretariat, Ranchi
3. The Additional PCCF, Regional office (ECZ), Ministry of Environment Forests and Climate Change, Bungalow No. A-2, Shyamali Colony, Ranchi - 834002
4. The Member Secretary, Jharkhand State Pollution Control Board, TA Building, HEC Complex, PO Dhurwa, Ranchi
5. The Member Secretary, Central Pollution Control Board, CBD-cum-Office Complex, East Arjun Nagar, Delhi - 32
6. The Member Secretary, Central Ground Water Authority, Ministry of Water Resources, Curzon Road Barracks, A-2, W-3 Kasturba Gandhi Marg, New Delhi
7. The Advisor, Coal India Ltd, SCOPE Minar, Core-I, 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	Katras Choitudih 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	Gaslitand 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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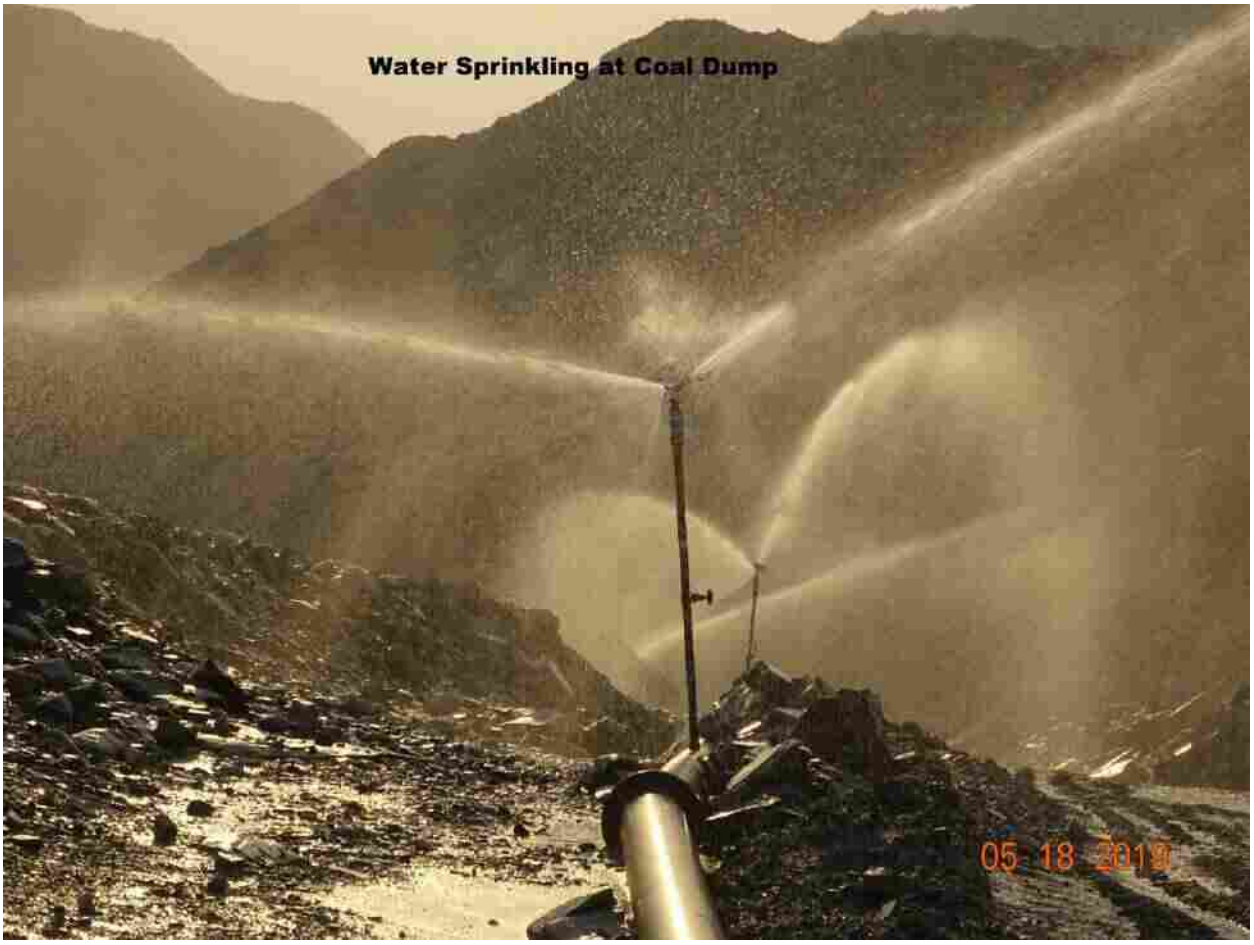



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Water Sprinkling at Coal Dump
05 18 2019


TATA



Materials Management System

Area Item Details

Bharat Coking Coal Limited

Item Details

Item Code	UOM	Item Type	Consumable Type	Consumable Desc
92060210231	No	CONSUMABLE	NOT AVAILABLE	SAFETY EQUIPMENT

Area Details

Store Id	Store Name	Item Desc	Part No	Uom	Stock	Rate	Current Value	Last Purchase Rate	Last Rcvd Date	Last Issue Date
4	Katras Regional Store	DUST MASK(DGMS APPROVED)	null	No	260	115	29900	115	16-03-2017	16-05-2019
5	Regional Store Area-5	DUST MASK DGMS APP. VENUS YELLOW		No	0	67.035185	.0037	64	14-08-2015	14-06-2017
6	Regional Store Area-6	DUST MASK	null	No	505	6.5	3282.5	6.5	02-01-2019	13-03-2019
9	Regional Store Area-9	DUST RESPIRATOR	null	No	0	101	0	101	12-12-2018	19-02-2019
10	Regional Store Area-10	DUST RESPIRATOR	null	No	0	0	0	0	N/A	N/A
12	Regional Store Area-12	DUST/MUSK RESPIRATOR	null	No	0	52	0	52	28-03-2019	29-03-2019
49	Mahuda Washery Store	DUST MASK DGMS APPROVED	null	No	54	50	2700	0	07-11-2015	13-08-2019
50	Bhojudih Washery Store	DUST MASK	null	No	0	35.7	0	0	15-10-2008	28-03-2016

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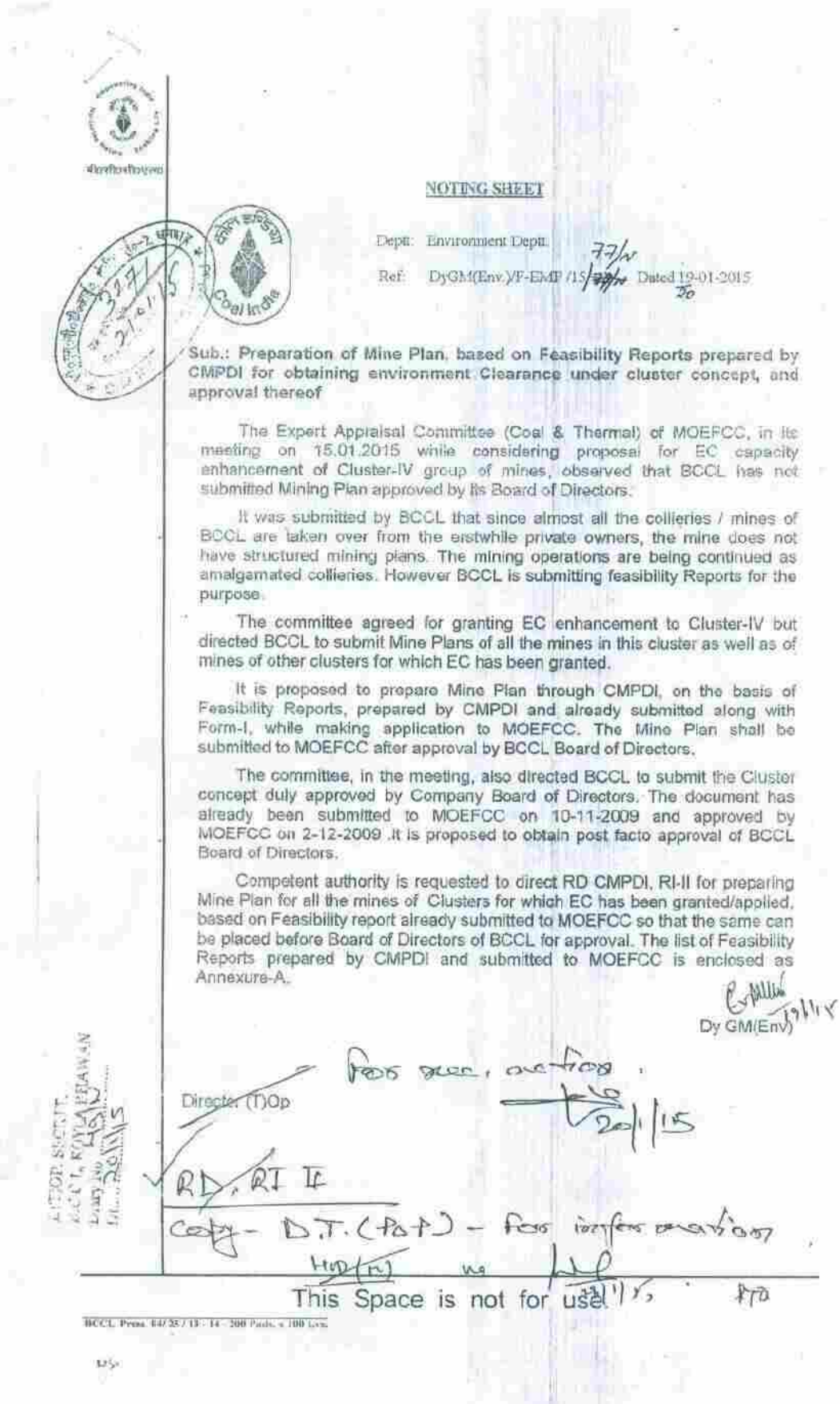

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Annexure - I



NOTING SHEET

Dept: 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) 19/1/15

Director (T)Op

For discussion.

20/1/15

RD, RI II

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

HOD(Fn) 20/1/15

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BCCL Press 84/25/13 - 14 - 200 Pads, x 100 Leaves

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	Nichitpur 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	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
		Kendwadih 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
		Muruhidih 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
		Godhur 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
		Simlabahal 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	
		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/ 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.)/फ-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 & 3.706 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
254/11

सेवा में,
महाप्रबंधक - योजना एवं परियोजना
भा0को0को0लि0 ,धनबाद ।

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

महोदय,

For EC capacity enhancement of Cluster-IV (Katras Area) from existing 3.706 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-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) 19/1/15

Director (T)Op

For perusal and for post facto approval. 20/1/15

RD, RI II

Copy - D.T. (P&P) - for information and necessary action

HOD(Tr) 20/1/15

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BCCL Press 64/28/13 - 14 - 300 Pads. x 100 Lvs.

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	Nichitpur 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	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
		Kendwadih 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
		Godhur 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
		Sintlabahal 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	
		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
		Basaree (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.)/फ-76/16/ 194 **Dated-28.03.2016**

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

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

संदर्भ: Letter No. BCCL/KA-IV/GM/2016/1289 dated 09.03.2016.

महोदय,

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

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

संलग्नक: यथोपरि

भवदीय
(सुबीर घोष)
महाप्रबंधक (योजना एवं परियोजना)

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

D:\BCCL\Letter-16 77

Annexure-III

A

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

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

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

क्षेत्रीय संस्थान-II सी0एम0पी0डी0आई0 स 3532 दि-नांक- 22/01/17 कोयला नगर/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 & 3.706 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
254/11

सेवा में,
महाप्रबंधक - योजना एवं परियोजना
भा0को0को0लि0 ,धनबाद ।

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

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- 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-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

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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.

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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) 19/1/15

Director (T)Op

For kind action.

20/1/15

RD, RI II

Copy - D.T. (P&P) - for information

This Space is not for use.

Annexure-II

18

BCCL

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

सन्दर्भ : भा०को०को०लि०/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) 19/1/15

Director (T)Op — For kind perusal and action. 20/1/15

RD, RI II

Copy - D.T. (P&T) - for information and necessary action

This Space is not for use.

BCCL Print 64/25/11-14-200 Pads. x 100 Lvs.

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ANNEXURE - II (1/2)

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/ 129 **Dated**-31.03.2015

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

सी.एम.पी.डी.आई०, क्षेत्रीय सं०-2, धनबाद
C. M. P. D. I., R.I.-2, Dhanbad

विषय: Draft Mining Plan for Katras Choitodih 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

31/3/15

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

संलग्नक: यथोपरि

प्रतिलिपि:
श्री एस के अग्रवाल, वरीय प्रबंधक(खनन), योजना एवं परियोजना.

1/4/2015

D:\BCCL\Letter-15

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ANNEXURE-II (2/2)

(9)

BHARAT COKING COAL LIMITED

(A subsidiary of coal India limited)

Office of General Manager

Katras Area IV

PO: Sijua, Dhanbad – 828121

Ref : KA/GM/HQ(Mining Plan)/15/A-2/ 1197 Dated 30.03.015

To

The General Manager (P&P)

Koyla Bhawan, BCCL

Dhanbad

Sub : Draft Mining Plan for Katras Choitodih Colliery

Dear Sir,

The draft Mining Plan sent by you, has been checked from our side. The relevant mining data with respect to Katras Choitodih Mine seems to be in order.

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

Yours Faithfully

General Manager

Katras Area

Scanned by CamScanner

Annexure - I

NOTING SHEET

Dept: 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) 19/1/15

Director (T)Op

For kind perusal and favour.

20/1/15

RD, RI II

Copy - D.T. (P&P) - For information and

HoD(Env) ms

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BCCL Press 84/35/13 - 14 - 500 Pads, x 100 Leaves

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	Nichitpur 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	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
		Kendwadih 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
		Godhur 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
		Sintlabahal 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	
		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
		Basaree (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-15/15/51 Dated-07.04.2015

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

105
18-04-15

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

संलग्नक: यथोपरि

7/4/15

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

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.)/फ-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 & 3.706 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
254/11

सेवा में,
महाप्रबंधक - योजना एवं परियोजना
भा0को0को0लि0 ,धनबाद ।

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

महोदय,

For EC capacity enhancement of Cluster-IV (Katras Area) from existing 3.706 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 ।

BHARAT COKING COAL LIMITED
(A Subsidiary of Coal India Limited)
Office of the General Manager
Katras Area.
CIN U10101JH19/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	रकवा	किस्म	बंदोबस्त / हस्तांतरित / लीज भूमि की विवरणी			की विवरणी (7–9)			अभियुक्ति
								खाता	प्लॉट	रकवा	खाता	प्लॉट	रकवा	
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	घोराठी		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 ,671,889,898,1064 ,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	आमडीह		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	लालचक		207		142,119,88,87,80,78,74,402	14.47								
25	बागदाहा		217		2163,2940,2970,2966,2967,2968,2960,2971,2975,2980,2935,2063,2331,2324,3452	60.12								
			217		3434,3433,3421,3231,3230,3227,3216,3208									

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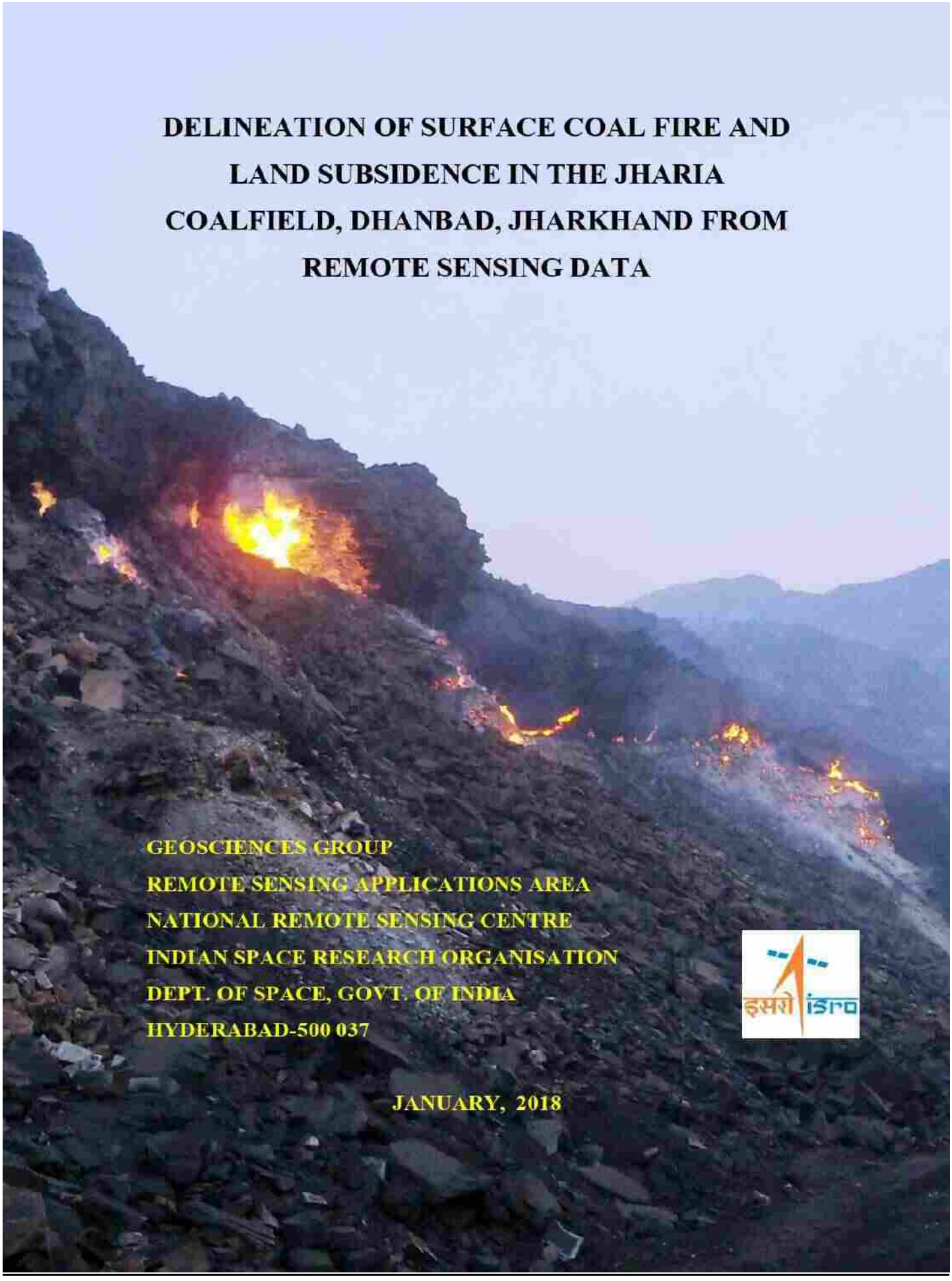
क्रमांक	अंचल	मौजा	थाना नं0	खाता	प्लॉट	रकवा	किस्म	बंदोबस्त/हस्तांतरित/लीज भूमि की विवरणी			की विवरणी (7–9)			अभियुक्ति
								खाता	प्लॉट	रकवा	खाता	प्लॉट	रकवा	
1	2	3	4	5	6	7	8	9			10			11
			217		3203,3436,3215,2972,2946 , 1482									
26	बौआकला		228		1,11,2326,2715,2400,2420, 2711,2712,2794,78,	85.34								
27	महतोटांड		180		3,40	18.8								
28	तिलाटांड		213		369,383,395,1387,1,2,3,4,7 , 65,77,78,89,80,81,82,132,1 38, 134,135,383,384,385	132.11								
29	फाटामाडुल		222		137,148,626,1833,1954	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		17,28,32,83,1604,2294, 2078,3278	59.96								

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क्रमांक	अंचल	मौजा	थाना नं0	खाता	प्लॉट	एकवा	किस्म	बंदोबस्त / हस्तांतरित / लीज भूमि की विवरणी			की विवरणी (7–9)			अभियुक्ति
								खाता	प्लॉट	रकवा	खाता	प्लॉट	रकवा	
1	2	3	4	5	6	7	8	9			10			11
38	तेलमच्चों		320		2782,2796,2755,2943,2962 , 2942,2754,2797,2807	102.9								
39	कुजी		321		1,3,25,754,26,435,131,135, 142,436,434,650,614,612,7 01 ,800,801,751,695,794,255, 739,	167.48								
40	तारगा		305		1352,1676,1411,	68.96								
					कुल	3678.35								

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DELINEATION OF SURFACE COAL FIRE AND LAND SUBSIDENCE IN THE JHARIA COALFIELD, DHANBAD, JHARKHAND FROM REMOTE SENSING DATA



GEOSCIENCES GROUP

REMOTE SENSING APPLICATIONS AREA

NATIONAL REMOTE SENSING CENTRE

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DEPT. OF SPACE, GOVT. OF INDIA

HYDERABAD-500 037

JANUARY, 2018

NRSC/RSAA/GSG/BCCL/Project Report/JAN2018

DELINEATION OF SURFACE COAL FIRE **AND** LAND SUBSIDENCE IN THE JHARIA COALFIELD, DHANBAD, JHARKHAND FROM REMOTE SENSING DATA

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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HYDERABAD-500 037

JANUARY, 2018

PROJECT TEAM

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EXECUTIVE SUMMARY

Coal fire is a serious problem in Jharia coal field, where high ranking coals are gradually burnt due to these fires. The combined effect of surface and sub-surface fires and mining related subsidence has endangered 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 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, 2017 have been used. The band 10 (10.60-11.19 μm) of Landsat-8 data is used to derive the relative radiant temperature. Further ALOS-PALSAR 2, L band microwave data has been used to delineate zone of probable land subsidence (using differential interferometry) due to mining. The study reflects that, compared to 2012, the eastern flanks (Lodna and Tisra) show a larger fire area. The western flank (Nadkhurkee and Shatabdi) and the northern flank (Katras and Gaslitand) show isolated fire pockets in active mines as well as OB dumps. Among all the colliery areas, Kusunda and Lodna area is most affected by coal mine fire. The current fire area mapped is 3.28 sq.km. Apart from this, five distinctive areas of land subsidence have been identified using interferometric method. These are primarily caused by older or active underground mining. The Moonidih Project is most affected by subsidence. The coal mine fire and subsidence areas are further verified on the ground. The final coal mine fire and subsidence map of Jharia coal field is 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. In view of the past experiences, based on the letter (Ref. no. NRSC/16/76) from Director (Tech.), Operations, BCCL addressed to Director, NRSC on 01 February 2016. 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 23rd of Dec, 2016.

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 2016-17 time period.

II. To compare the change in the coal fire distribution in the Jharia coalfield within the period of 2012 and 2016-17.

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 roughly within latitudes 23° 42' N and 23° 50'N and longitudes 86° 09'E and 86° 30'E.

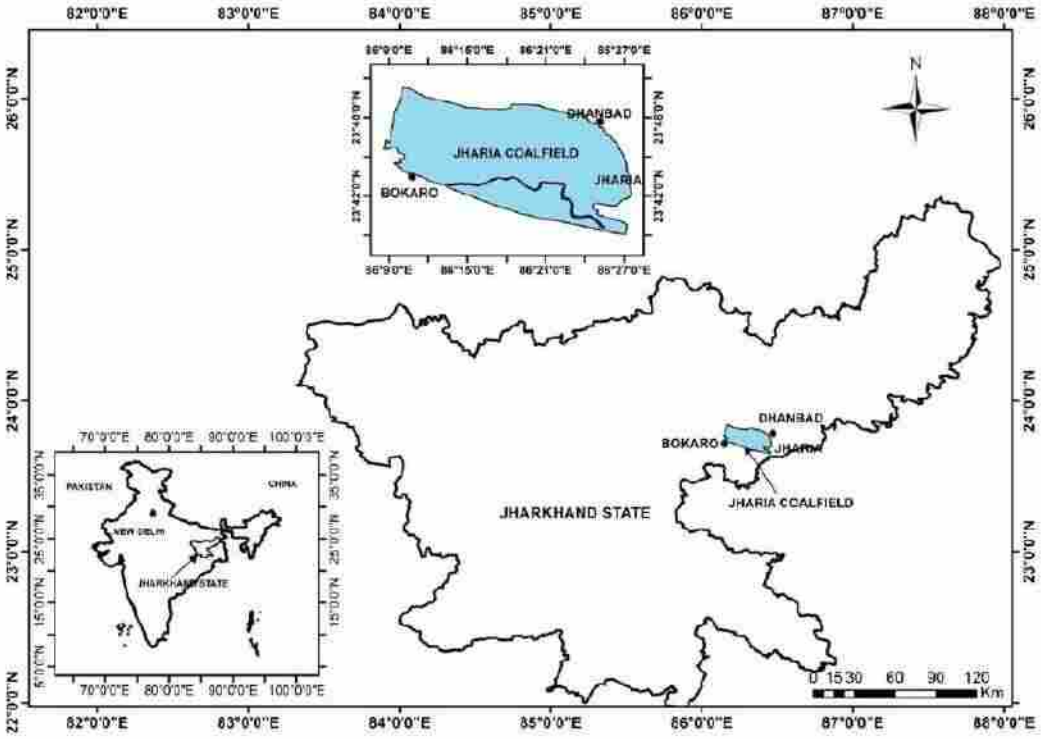


Figure 1: Study area map of Jharia Coalfied, Jharkhand

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 <10° C in the month of December – January and maximum temperature is >50° 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.

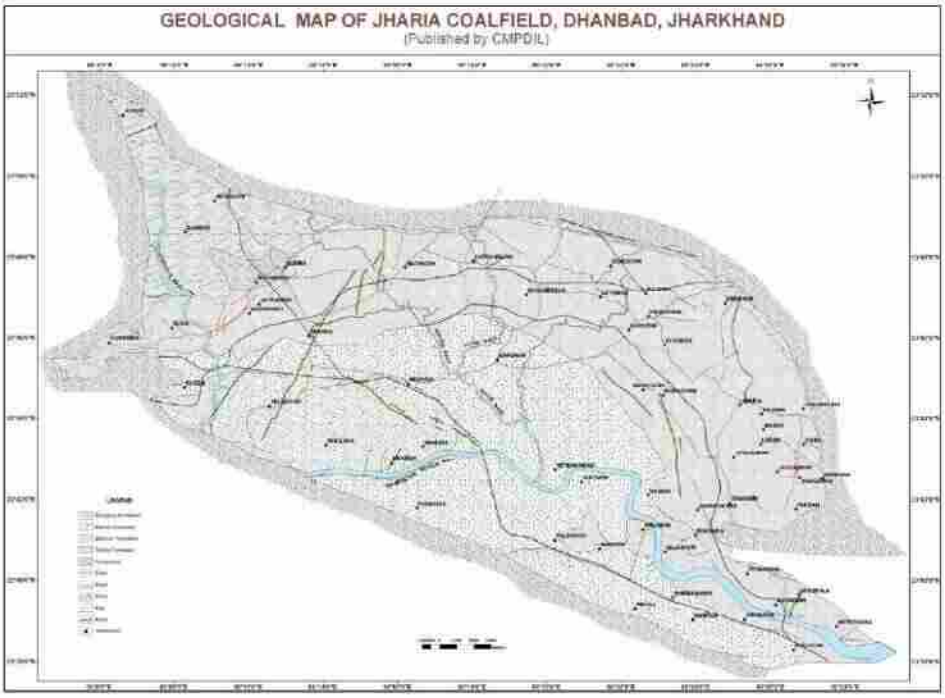


Figure 2 : Geological map of Jharia coal field, Dhanbad, Jharkhand (published by CMPIDL)

CHAPTER III

DATA REQUIREMENTS

3.1 Remote Sensing Data

The most recent available thermal satellite data was used in conjunction with the fieldwork for mapping coal fire in JCF. A coal fire map generated from the same, would serve as a reference for the fieldwork, as the observations can be verified in the field. For this purpose, a coal fire map was created from LANDSAT 8 TIRS data of 14-May 2017 .

Further, the coal fire map of 2012 prepared by NRSC (NRSC, 2012) from ASTER data was used as a reference to identify the changes that has occurred in the extent and disposition of the fires from 2012 to 2017.

For the land subsidence study, L-band microwave data from ALOS-PALSAR satellite (JAXA) were used. Five scenes of "Fine mode" SLC data were taken from PALSAR-2 archives over a period from October, 2014 to February, 2017. 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.

Sl. No	Satellite	Sensor	Time	Date	Data source
1	LANDSAT-8	TIRS	Daytime	14 May 2017	USGS, USA
2	ALOS-PALSAR-2 (Fine mode)	PALSAR-2	-	4 October. 2014	JAXA, Japan
3				3 October, 2015	
4				20 February. 2016	
5				01 October, 2016	
6				18 February. 2017	

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 is 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. In present study, band 10 of TIRS sensor (acquired on 14 May, 2017) has been used coal fire mapping (Gangopadhyay et al. 2012). 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.

$$L_\lambda = M_L Q_{cal} + A_L \ldots\ldots\ldots (1)$$

Where:

L_λ = Spectral radiance (Watts/ (m2 * 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 (Lλ) for ASTER Band 13 and 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 literatures (Gupta, 2003).

$$T_R = K_2 / \ln ((K_1 / L_\lambda) + 1) \ldots\ldots\ldots (2)$$

T_R = Radiant (brightness) temperature,

K_1 = Calibration constant (1260.56 K),

K_2 = Calibration constant (666.09 watts/ (m2 *ster*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 (Roy et al. 2015). 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 39°C (Figure 4). Based on this cut-offs, regional coal fire map was prepared (Figure 5).

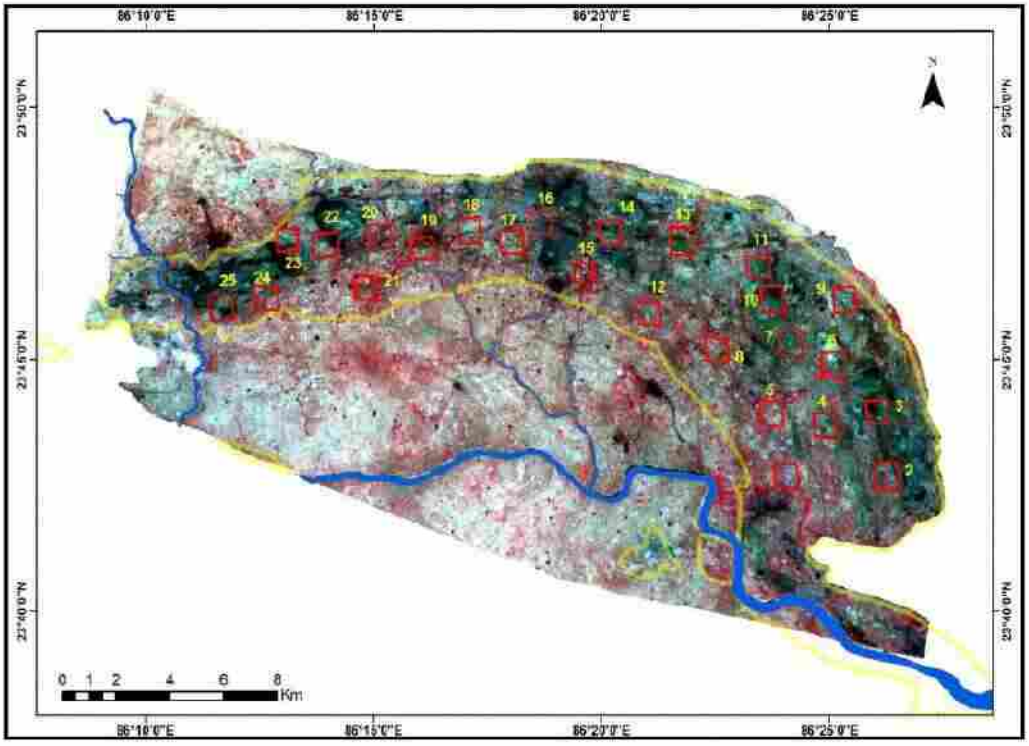


Figure 3. False colour composite image of Jharia Coalfield, with subset blocks (in red boxes) to obtain temperature values (from radiant temperature image) within the Barakar formation across the Jharia coalfield.

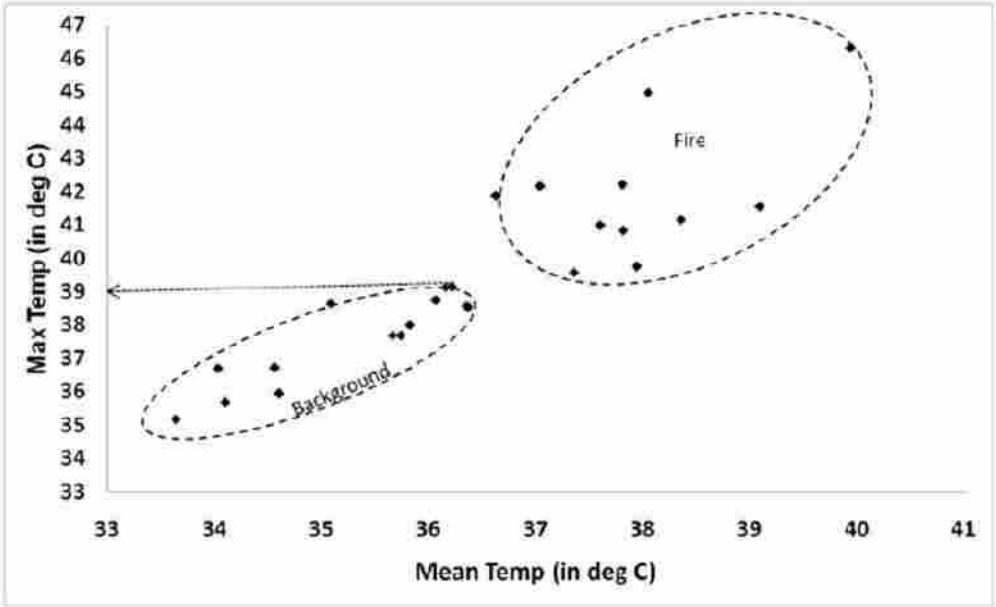


Figure 4. Maximum temperature plotted against mean temperature for various locations; cluster separation observed around 39 °C (marked with arrow)

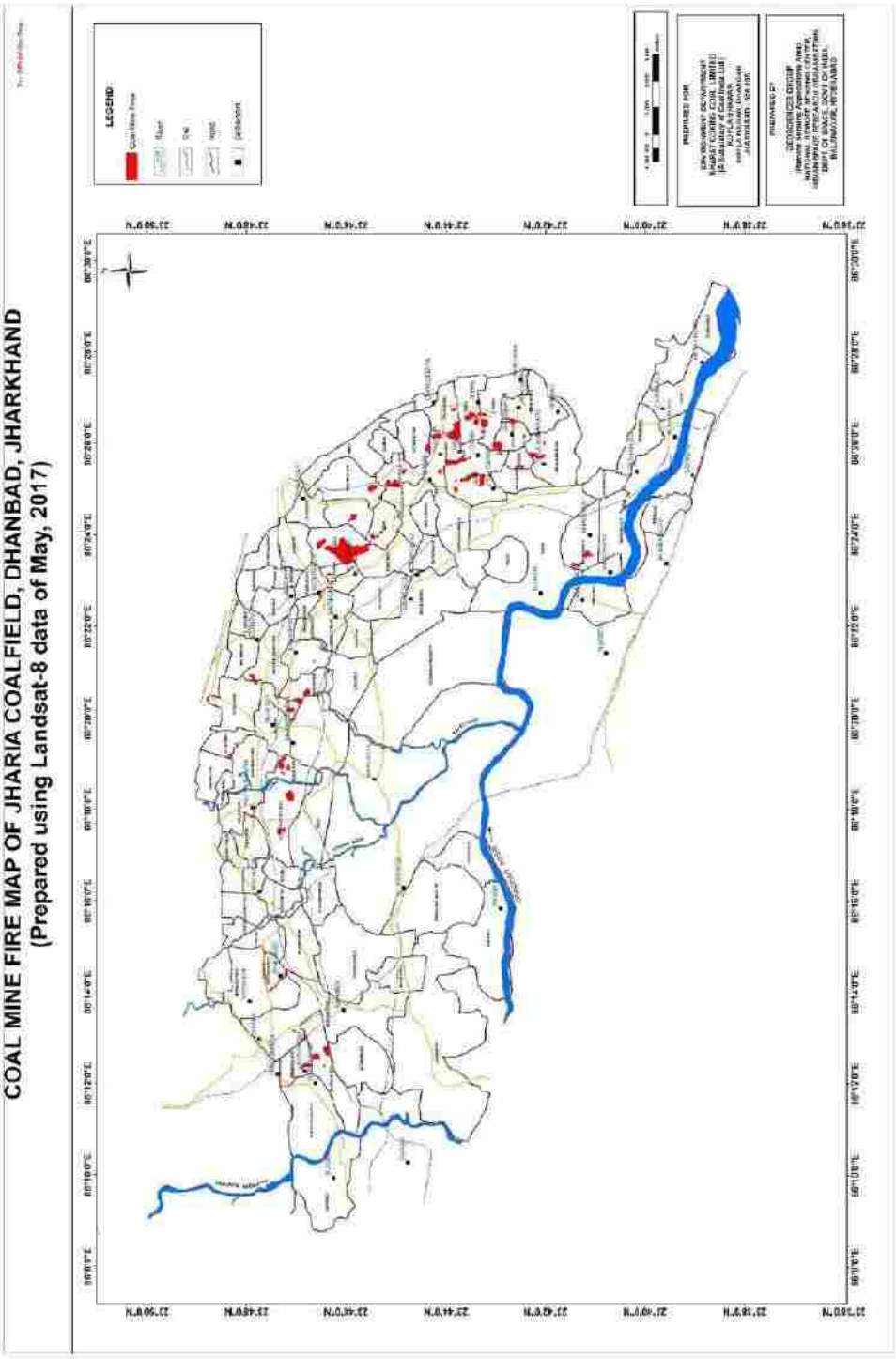


Figure 5: Coal mine fire map (May, 2017) of Jharia coal field, Dhanbad. The fire areas shown in this map have been verified in the field as per field points in figure 13.

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).

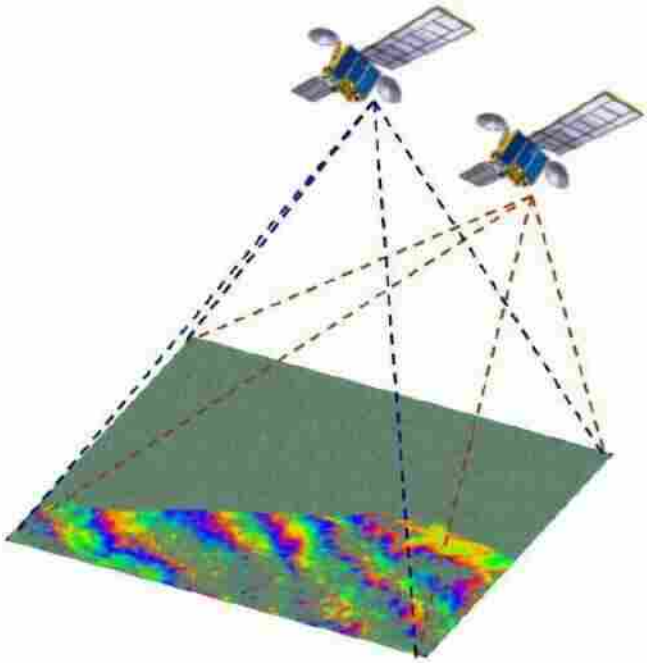


Figure 6. DInSAR acquisition scheme.

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.

$$\Delta\Phi dif = \Phi ErrorTopo + \Phi Mov + \Phi Atm + \Phi Noise \qquad (ii)$$

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 (Ferretti et al 2001; Hooper et al 2004; Kampes, 2006; Lanari et al 2004; Mora et al 2003;Werner et al 2003).

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

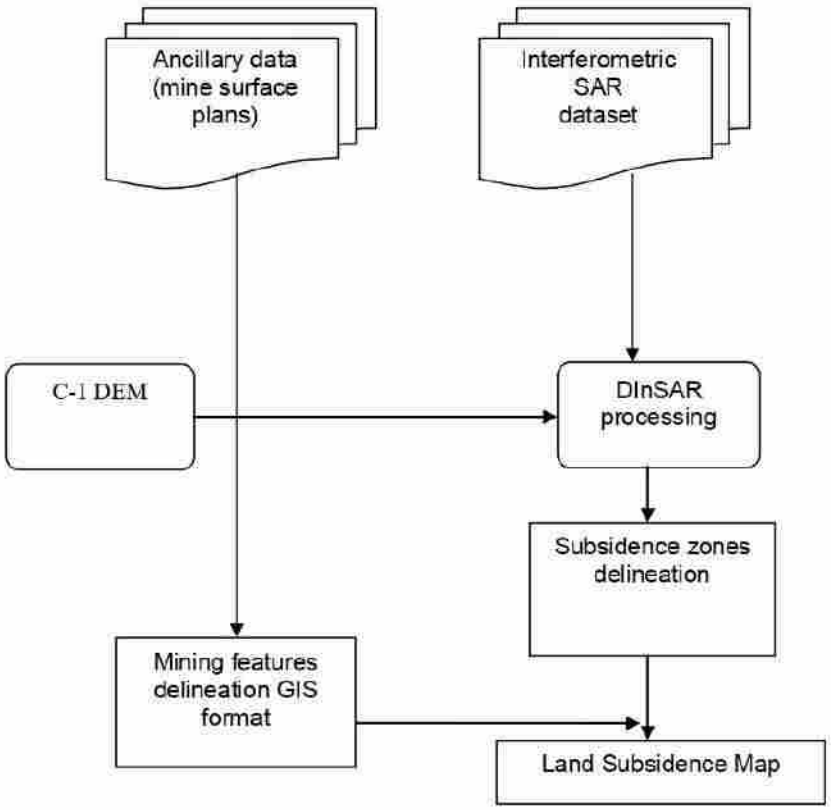


Figure 7. Work flow diagram for generating land subsidence map using DInSAR technique.

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 baseslines include master slave pairs of time difference of six months or less, whereas long temporal baselines include data pairs of time difference of one year or more. This has been illustrated in figure 8.

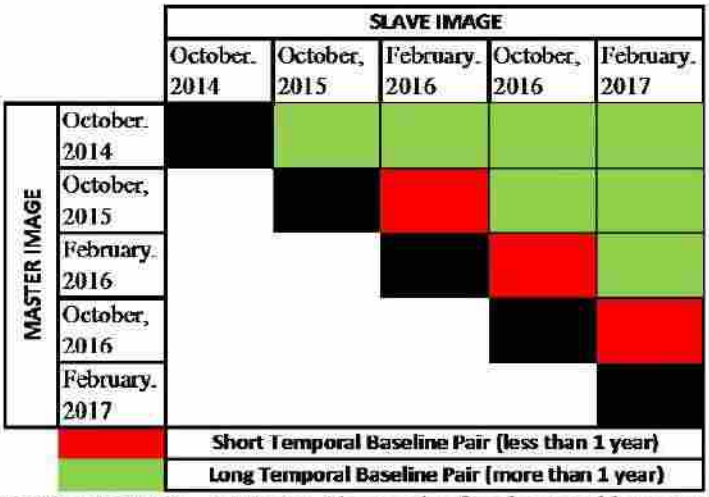


Figure 8. ALOS-PALSAR - 2 Master-Slave pairs for short and long temporal base line processing

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).

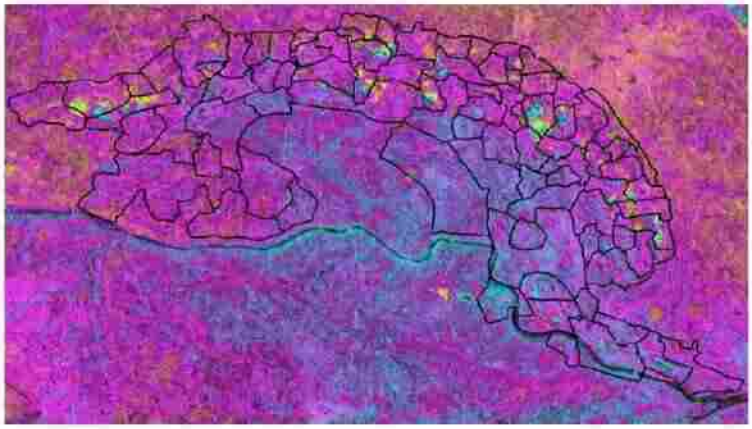


Figure 9. Fringe patterns generated from short baseline processing (e.g. Master: Oct, 16, Slave: Feb, 17).

On the other hand, master-slave pairs of long temporal baseline (one year or more, 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 (figure 10).

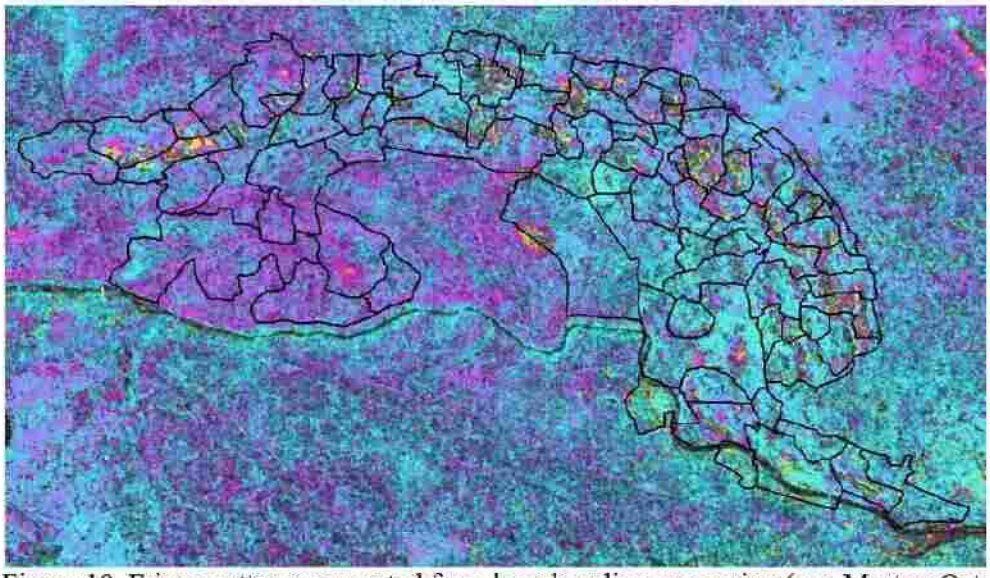


Figure 10. Fringe patterns generated from long baseline processing (e.g. Master: Oct, 15, Slave: Feb, 17).

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 terrain change

map of the Jharia Coalfield was generated demarcating terrain changes due to mining activities and subsidence areas (Figure 11).

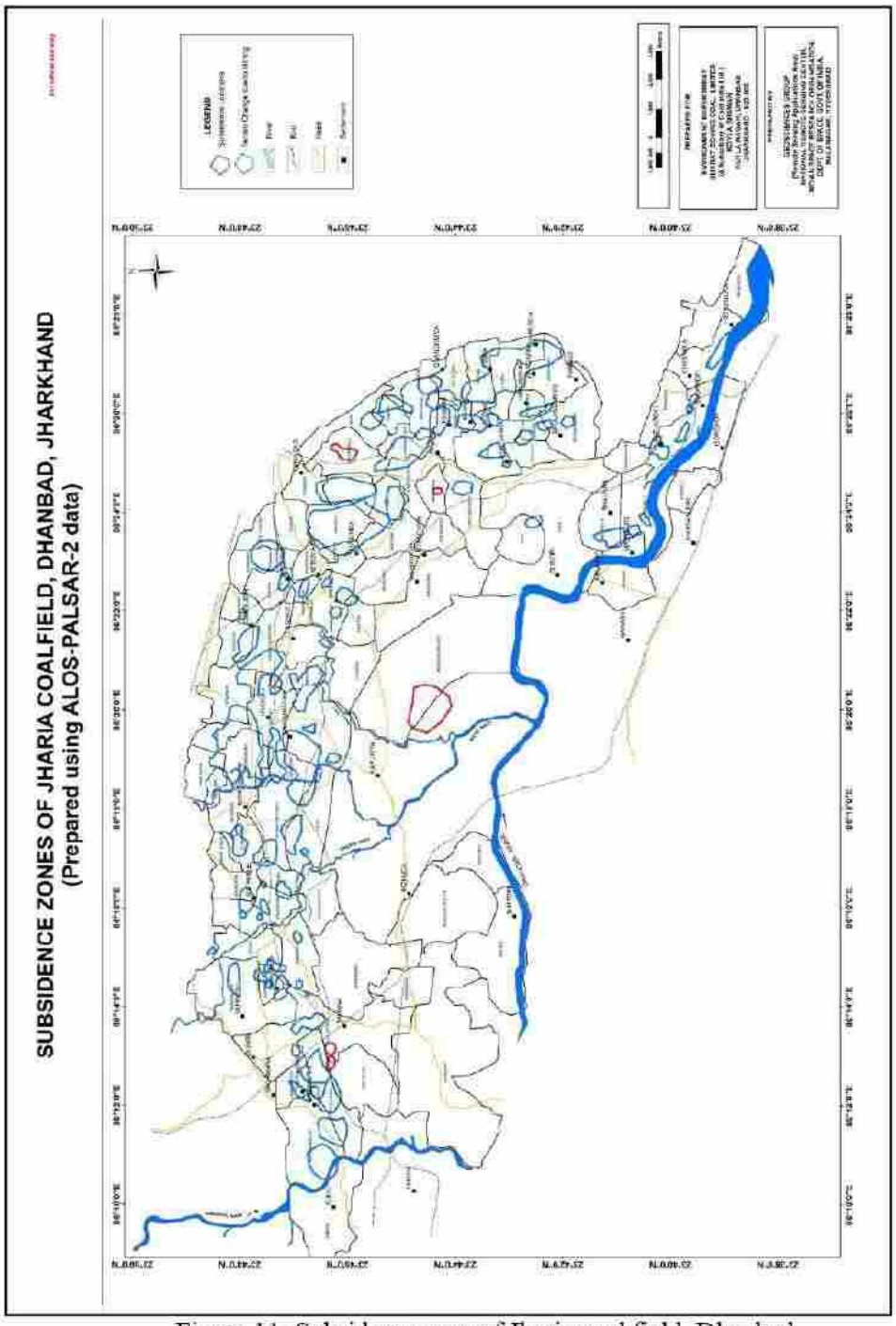


Figure 11: Subsidence map of Jharia coal field, Dhanbad.

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 in December, 2017. A total of 53 coal fire points and 37 land subsidence locations were identified from the satellite data analysis. The locations of these points along with geographic coordinates were given to BCCL prior to the December, 2017 field work for their feedback on the status of these points. Out of the 53 coal fire locations identified, 52 points were confirmed to be fire bearing as per the present masterplan of the Jharia coalfield created by BCCL Both the coal fire and the subsidence locations were further independently verified by NRSC during the fieldwork in December, 2017. The locations and the observations are coal fire and subsidence are provided in annexure 1 and annexure 2 of this report respectively.

The salient overview of the field observations are as follows:

Coal-fire observations:

1. The coal fires as observed identified by the Landsat-8 data are mostly accurately delineated. Fires have been identified in the western, northern and eastern flank of the coalfield with considerable accuracy in the spatial locations.
2. In the eastern flank, the main fire affected mines are Kusunda, Lodna and Tisra. Active fires area present in the mines and fumes can be seen from the OB dumps. The Bhowra and Bhulanbarari mines also show presence of fire, however, the extent of the fire area appears to be underestimated in the data. Similarly, the extent of fires in Lodna and Tisra appears to have been overestimated in the data. The largest extent of fire in the single mine block is that in Kusunda.
3. In the northern flank, the main fire bearing mines are Katras, Gaslitand and Mudidih, However, it is seen that in these areas, the fires appears in pockets and are not pervasively present. The spatial extent of the fires on the ground and as estimated in the data can be correlated.

4. In the western flank, the Block II OCP is the primary fire affected region. However, it is seen that the Shatabdi OCP also bears fire pockets along semi-vertical mine walls, This is not identified in the data.

Subsidence location observations:

1. Subsidence locations as identified by the data area 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 37 identified subsidence locations from the microwave data, it is seen that 32 are due to terrain changes resulting from mining activities like ongoing excavations or formation of new mining dump. These decrease or increase in elevations has resulted in forming of interferometric fringes in the data thus creating false positives.
3. Five areas were firmly established as subsidence zones. Out of these, 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 ground cracks are observed in the area.
4. Two adjacent locations are observed south of the Block II OCP and in Phularitand mining block. This may be resulted due to older underground mining in the area. Signatures such as sagging of ground is seen.
5. Another minor subsidence region was identified around the Simlabahal underground mining project. This is again due to active underground mining in the area. A similar region was also observed in the northern part of the Bastacolla mines where active underground mining is ongoing.

In lieu of the observations in field on the fire and subsidence locations, few post field work correction in the coal fire and subsidence maps was necessitated and has been discussed in the next chapter.

CHAPTER VI

POST FIELDWORK ANALYSIS

As observed in the fieldwork, there were certain mine areas where the presence of fire was not detected by the satellite data. For example in Shatabdi and Bhulanbarari mine areas, the fire appears in small pockets on mine faces and was possibly not detected by the threshold temperature calculated for the entire mine area. On the other hand, in the Bhowra, Lodna and Tisra mine areas, the spatial extent of fire appears to have been overestimated by the regional threshold temperature use to separate the fire and the background areas.

Therefore, mine specific threshold temperature analysis was carried out for Shatabdi, Bhulanbarari, Bhowra, Lodna and Tisra mine areas to correctly depict the fire areas on the ground. The threshold temperature selected from each of these mine areas are given in Table 3.

Table 3: Threshold temperature for fire area estimation of individual mines.

Name of the Mine Block	Threshold Temperature (in °C)
Bhowra	38.5
Tisra (north and south)	North : 41; South : 40.5
Lodna	41
Bhulanbarari	38.5
Shatabdi	38

Using the threshold temperatures as mentioned in the table 3, the previously undetected fire areas in the Shatabdi and Bhulanbarari mines were detected. Further the spatial extent of the fire areas in Bhowra, Lodna and Tisra mines were changed to adequately represent the actual extent of the fire on the ground. These were incorporated in the coalfire map shown in figure 5.

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 2017. Landsat-8 data of May, 2012 was used to prepare the coal mine fire map (Figure 5) for the year 2017. 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 2017 when compared to map of 2012 (NRSC, 2014) 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 2017 (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 Lodna and Tisra (North and South) is the highest fire affected mining blocks and Bhowra, Bhulanbarari, Kujama and Jharia are also affected by multiple smaller fire pockets. The fire in the areas is mostly manifested by high temperature fume cracks with occasional presence of active flames especially the the Lodna-Tisra area. Further, towards the north east, in Ena 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 Shyambazar (Figure 5 & 6). These are related to the mining areas of Katras, Gaslitand, Mudidih and Kankanee. Mining activity, over the last few of years has exposed new, isolated and discontinuous fires in these regions.

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. These again are surfacialy manifested in the

form of fume cracks with smoke emanating from them. The Shatabdi OCP are also affected but fire is manifested in the along vertical mining wall sections.

Comparison of the 2017 coal fire map with that of 2012 (NRSC, 2014) 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 2012, the 2017 map shows that the emergence/re-emergence of fires in the eastern flank, namely Kujama, Tisra, Lodna and Jharia etc. The entire zone has been affected by multiple fire occurrences. The spatial disposition of fires in Bastacolla, Jharia and Bhulanbarari appear to have a minor increase.
ii. The areal extent of major fire zone around Kusunda/Kenduadih and Ena appears to remain the same, though here again the spatial location of the anomalies has changed. This is probably due to the mitigation and active 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. There has been a considerable reduction in fire areas in and around the Shatabdi OCP.
iv. The spatial disposition of fire areas around Katras, Gaslitand and Mudidih show minor change. In 2012, a number of small fire pockets were seen, however presently those fire pockets have given away to a few fire zones of moderate disposition.
v. It needs to be noted that the 2012 study was carried out using ASTER data whereas the present study is carried out using Landsat-8 data. Therefore, the difference of sensor sensitivities will have a influence on the way the fires are sensed on the ground. Difference of sensor sensitivities will influence the number of fires identified as well as the areal extent of the fires in the data.

In summary, there is a change in the areal disposition of the fires from 2012 to 2017. Observations suggest the emergence/re-emergence of new areas in the eastern flanks in areas around Lodna and Tisra. Concurrently, there is a decrease in extent of fire areas Shatabdi, Nadkhurkee area in the western flank from 2012 to 2017. A quantitative comparison of the 2012 and 2017 data was carried out. As compared

2012, when the total fire affected extent of about 2.18 km^2; in 2017 total fire affected extent is about 3.28 km^2. The colliery wise break-up of change in fire area from 2012 to 2017 is given in Annexure III.

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 2014 to 2017 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 5 prominent subsidence areas. 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 four areas are south of Block II OCP, Simlabahal and Bastacolla. No quantitative estimates of the subsidence has 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 2017 and in comparison with the previous study done in 2012, there has been a change in areal extent and disposition of the fire affected areas.
2. Compared to 2012, the eastern flanks (Lodna, Tisra areas) show considerable increase in fire disposition and the western flank (Shatabdi and Block II area) show diminished fire presence.
3. The major new fire areas are observed in the northern flank in the areas around Lodna and Tisra etc. These areas were not mapped as fire in the 2012 study.
4. The mines in Kenduadih and Lodna remain to be the worst affected with maximum presence of active fires.
5. There is a increase in areal extent of the fire (Figure 12) from 2012 to 2017.

Note: *Estimations of fire extent (in terms of sq.km.) both in 2012 and in the present 2017 study are pixel based. They do not represent 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.*

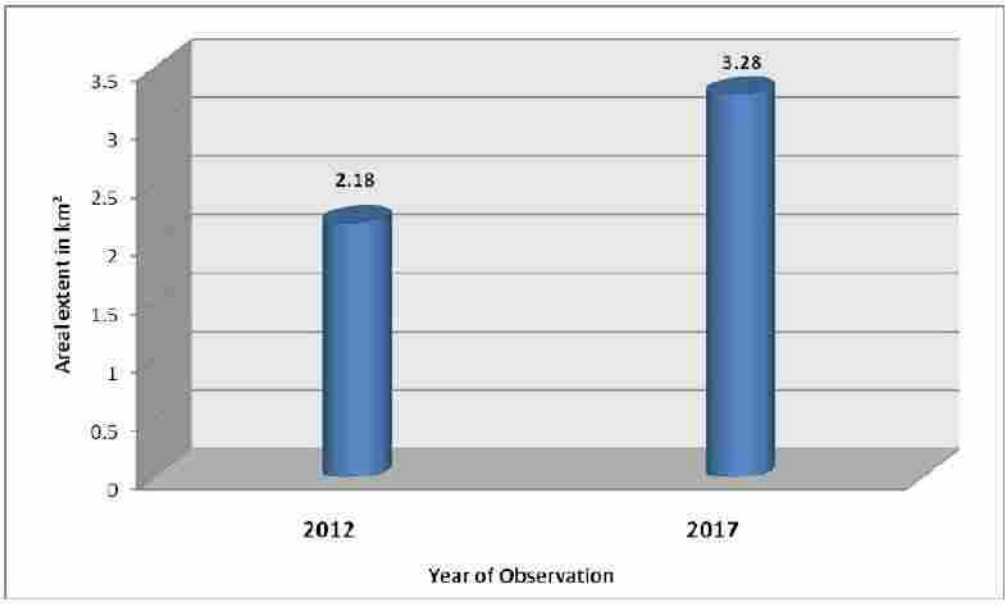


Figure 12: Total fire area statistics

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 4.2.1, 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 is 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.

5) Generally, a constant threshold temperature is estimated over the entire study area, and the same is applied to delineate the fire areas from those of non-fire. However, it is seen that the application of such global thresholding may mask fires which are in turn seen in the field and that the threshold temperature value may vary locally. In the current scenario, it is seen that the fire locations as verified in the fieldwork at Bhulanbarari and Shatabdi were not identified in the data on application of a global threshold of 39°C. However, a subset of the data within the Bulanbarari area only, is analyzed with a lower threshold of 38.5°C, the fire pixels are manifested in the data. Hence, the appropriateness of a singular thresholding temperature value may need to be relooked upon. Future studies can be carried out using colliery wise statistical local thresholding to create a composite coal fire map.

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) 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.

References

1. Gangopadhyay, P.K., Lahiri-dutt, K., Saha, K. (2005): "Application of remote Sensing to identify coal fires in the Raniganj coal belt, India." *Int. Jour of Applied Earth Observation and Geoinformation.*
2. Gangopadhyay, P.K., Malthuis.B, Van Dink (2005): "Aster Derived emissivity and coal-fire related surface temperature anomaly a case study in Wuda, North China," *Int. Jour. of Remote Sensing*, vol-26, No.-24, pp-5555-5571.
3. Schmugge, T., French, Ritchie, J.C., Rango, A., Pelgrum, H. (2002): "Temperature and emissivity separation from multispectral thermal infrared observation," *Remote Sensing of Environment*, 79, pp-189-198.
4. Saraf A.K., Prakash A., Sengupta, S., Gupta, R.P (1995): "Landsat-TM data for estimating ground temperature and depth of sub-surface coal fire in the Jharia coalfiled, India," *Int. Jour. Remote sensing vol-16, no-12*, 2111-2124.
5. Gangopadhyay P.K., (2003): "Coalfire detection and monitoring in Wuda, North China, A multispectral and multi-sensor approach:-Ph.D. Thesis, ITC Netherland.
6. Gupta, R.P. (2003): "Remote Sensing Geology", *Springer-Verlag.Third ed.*pp-183-216.
7. Kealey, P.S and Hook S.J(1993): "Separating temperature and emissivity in thermal infrared Multispectral Scanner Data: Implication for recovering land surface temperatures", *IEE Transaction on Geoscience and Remote Sensing,vol,31,no-6*,pp-1155-1164
8. Zhang, J., Wagner, W., Prakash, A., Mehl,H. and Voigt,S.(2004): "Detecting coal fires using remote sensing techniques," *Int. Jour. Remote sensing, vol-25, no-6,* pp3193-3220.
9. Bhattacharya, A. and Reddy, C.S.S. (1995): Inventory and monitoring of underground and surface coal mine fire in Jharia coalfield, Bihar using thematic mapper thermal IR data: *Geosciences Group, Official report, NRSA.*
10. Coal mine fire delineation and surface features mapping using satellite data in Jharia coal field, Dhanbad, Jharkhand. Geology and Geophysics division. *Official report, NRSA, 2006*
11. Coal mine fire delineation and surface features mapping using satellite data in Jharia coal field, Dhanbad, Jharkhand. Geosciences Group. *Official report, NRSC, 2014*

Annexure –I

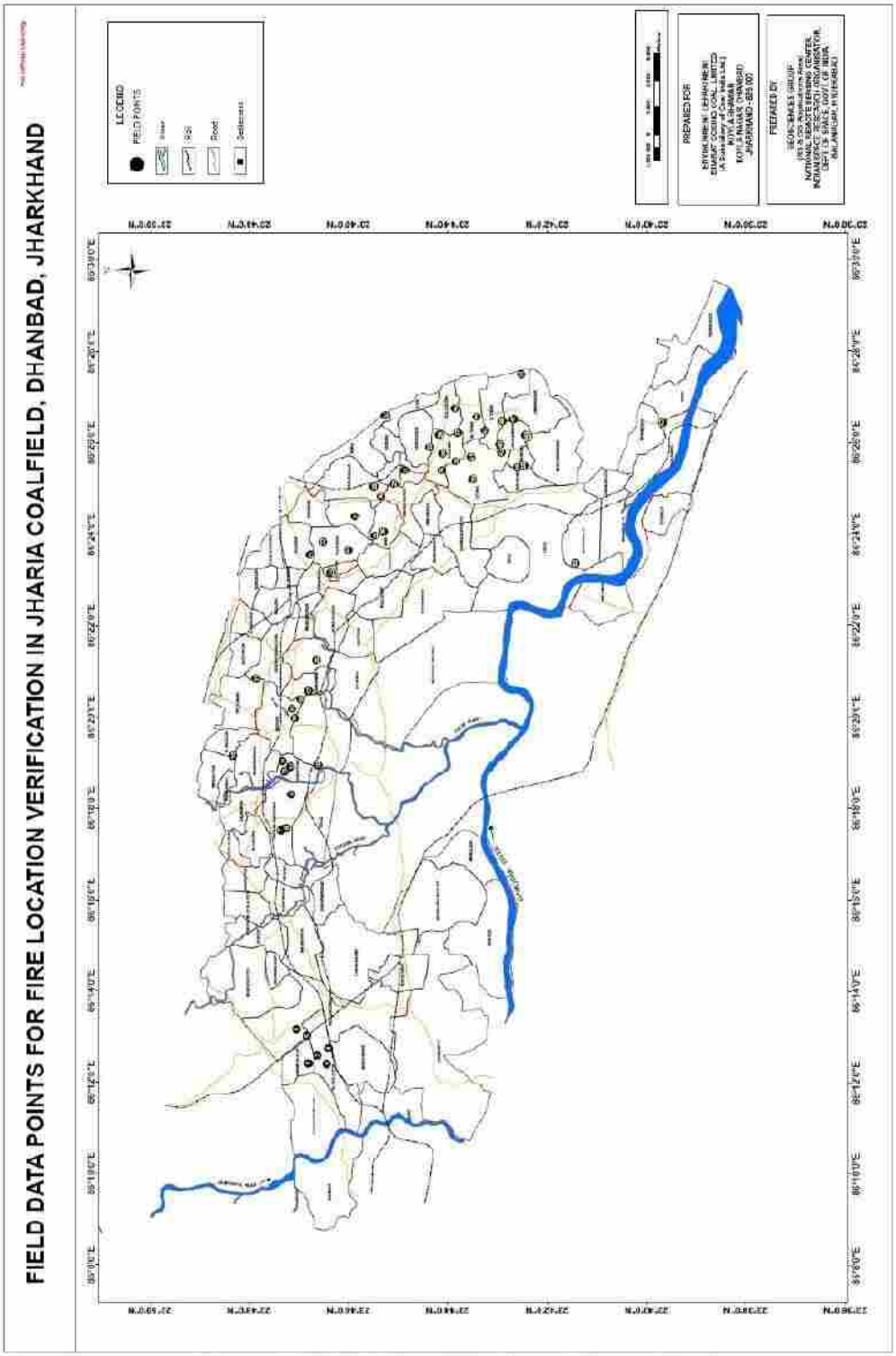


Figure 13. Field data points for coal fire verification

Table – 4: Coal Fire observations during fieldwork (see figure 13 for reference)

SL. No.	Point of Observations		Comments		
	Latitude	Longitude	Type of Mining Activity	Presence of Coal Fire	Mine name and Any other Comments
1	23.7801	86.2068	OB Dump	Fire	ABOCP
2	23.7771	86.2097	Active Mine	Fire	ABOCP
3	23.7739	86.2066	Active Mine	Fire	ABOCP
4	23.7733	86.2124	OB Dump	Fire	ABOCP
5	23.7806	86.2168	No Working	Fire	ABOCP
6	23.7841	86.2192	No Working	Fire	Phularitand
7	23.7893	86.2919	No Working	Fire	Katras Chatudih
8	23.7875	86.2926	No Working	Fire	Katras Chatudih
9	23.7857	86.3049	Working	Fire	Gaslitand
10	23.7768	86.3157	Outside Jharia Mines		Tata
11	23.7887	86.3170	OB Dump	Fire	Gaslitand
12	23.7862	86.3151	OB Dump	Fire	Gaslitand
13	23.7880	86.3133	OB Dump	Fire	Gaslitand
14	23.8054	86.3191	Working	Fire	AKWMC
15	23.7855	86.3363	OB Dump	Fire	Mudidh
16	23.7826	86.3397	Working	Fire	Kankanee
17	23.7800	86.3427	Working	Fire	Kankanee
18	23.7848	86.3327	OB Dump	Fire	Mudidih
19	23.7977	86.3473	OB Dump	Fire	Sendra Bansjora
20	23.7775	86.3540	OB Dump	Fire	Loyabad
21	23.7793	86.3924	No Working	No fire	Kusunda (Domestic coal burning)
22	23.7753	86.3970	Working	Fire	Kusunda
23	23.7724	86.3858	Working	Fire	Kusunda
24	23.7669	86.3940	OB Dump	Fire	Kusunda
25	23.7578	86.3993	OB Dump	Fire	Ena
26	23.7550	86.4009	OB Dump	Fire	Ena
27	23.7645	86.4065	Working	Fire	ADIC
28	23.7580	86.4172	Old Quarry	Fire	ROCP
29	23.7515	86.4184	OB Dump	Fire	ROCP
30	23.7559	86.4137	OB Dump	Fire	ROCP
31	23.7476	86.4232	Working	Fire	ROCP
32	23.7543	86.4431	Outside Jharia Mines		Unknown site (Out side of Kuya)
33	23.7394	86.4317	Active Mine	Fire	Ghanoodih
34	23.7360	86.4362	OB dump	Fire	Goluckdih
35	23.7349	86.4293	OB Dump	Fire	Kujama
36	23.7354	86.4232	No Working	Fire	Kujama
37	23.7301	86.4369	Working	Fire	NT-ST
38	23.7305	86.4265	OB dump	Fire	Kujama
39	23.7249	86.4200	No Working	Fire	Lodna
40	23.7159	86.4327	Working	Fire	Joyrampur
41	23.7254	86.4280	No Working	No fire	Lodna
42	23.7209	86.4376	Working	Fire	NT-ST
43	23.7154	86.4296	Working	Fire	Lodna
44	23.7238	86.4427	Working	Fire	NT-ST
45	23.7309	86.4457	OB dump	Fire	NT-ST
46	23.7151	86.4412	Active Mine	Yes	NT-ST
47	23.7114	86.4419	OB Dump	Fire	NT-ST
48	23.7073	86.4360	Active Mine	Fire	Joyrampur
49	23.7097	86.4243	Working	Fire	Bagdigi/Joyrampur
50	23.7079	86.4249	Active Mine	Fire	Bagdigi/Joyrampur
51	23.7086	86.4582	Outside Jharia Mines		Unknown site (Out side of NT-ST)
52	23.6614	86.4404	Outside Jharia Mines		Chasnala
53	23.6906	86.3892	OB dump	Fire	Bhowrah (North)

Annexure –II

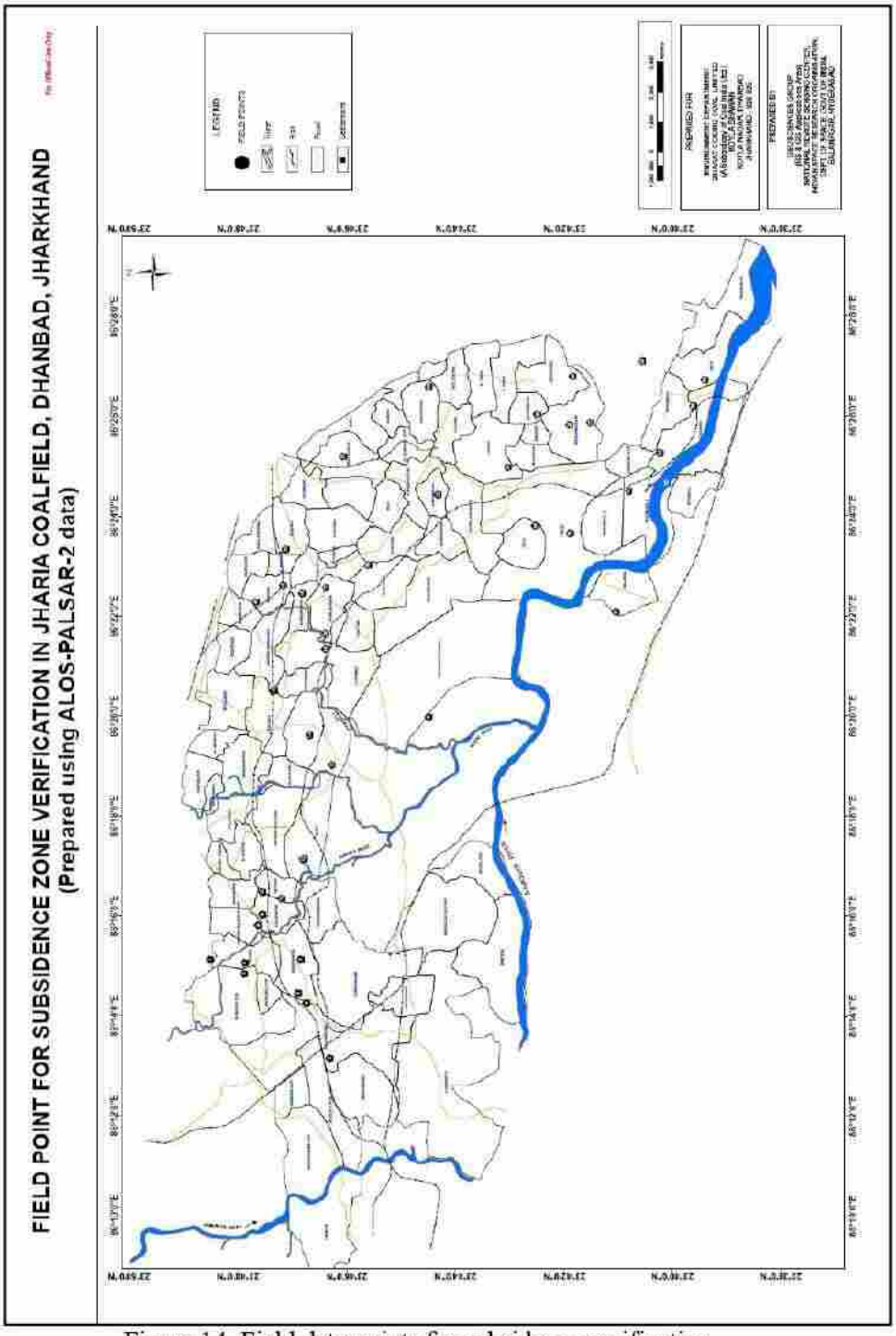


Figure 14. Field data points for subsidence verification

Table – 5: Coal Fire observations during fieldwork (see figure 14 for reference)

	Point of Observations		Comments	
Sr. no.	Latitude	Longitude	Mine name and Any other Comments	Signs of Subsidence (crack on building/ground crack etc.)
0	23.7416	86.3338	Moonidih UG Project	Sagged area, Building damage
1	23.7722	86.2192	South of Block II (2 areas)	Cracks on the ground
2	23.7817	86.2409	Terrain Change due to mining	
3	23.7811	86.2521	Terrain Change due to mining	
4	23.7792	86.2376	Terrain Change due to mining	
5	23.7983	86.2473	Terrain Change due to mining	
6	23.7981	86.2510	Terrain Change due to mining	
7	23.8088	86.2521	Terrain Change due to mining	
8	23.7941	86.2636	Terrain Change due to mining	
9	23.7926	86.2671	Terrain Change due to mining	
10	23.7868	86.2724	Terrain Change due to mining	
11	23.7928	86.2746	Terrain Change due to mining	
12	23.7800	86.2857	Terrain Change due to mining	
13	23.7713	86.3171	Terrain Change due to mining	
14	23.7783	86.3270	Terrain Change due to mining	
15	23.7893	86.3419	Terrain Change due to mining	
16	23.7734	86.3556	Terrain Change due to mining	
17	23.7734	86.3762	Terrain Change due to mining	
18	23.7804	86.3742	Terrain Change due to mining	
19	23.7865	86.3769	Terrain Change due to mining	
20	23.7855	86.3890	Terrain Change due to mining	
21	23.7679	86.4199	Bastacolla	Sagged areas
22	23.7390	86.4071	Simlabahal UG	Sagged areas
23	23.7417	86.4431	Terrain Change due to mining	
24	23.7176	86.4163	Terrain Change due to mining	
25	23.7085	86.4339	Terrain Change due to mining	
26	23.6986	86.4304	Terrain Change due to mining	
27	23.6923	86.4312	Terrain Change due to mining	
28	23.6977	86.4466	Terrain Change due to mining	
29	23.7092	86.3967	Terrain Change due to mining	
30	23.6985	86.3942	Terrain Change due to mining	
31	23.6845	86.3681	Terrain Change due to mining	
32	23.6804	86.4083	Terrain Change due to mining	
33	23.6685	86.4110	Terrain Change due to mining	
34	23.6706	86.4211	Terrain Change due to mining	
35	23.6603	86.4366	Terrain Change due to mining	
36	23.6568	86.4454	Terrain Change due to mining	
37	23.6760	86.4516	Terrain Change due to mining	
38	23.7603	86.3836	Terrain Change due to mining	
39	23.7734	86.3609	Terrain Change due to mining	
40	23.7948	86.3715	Terrain Change due to mining	

Annexure –III

SL. NO.	COLLIERY AREA NAME	FIRE AREA 2012 (SQ. KM.)	FIRE AREA 2017 (SQ. KM.)	AREA CHANGE (SQ. KM.)	Increase/Decrease
1	DAMODA	0.0000	0.0000	0.000	NO FIRE
2	TISCO (west)	0.0000	0.0000	0.000	NO FIRE
3	IISCO	0.0000	0.0000	0.000	NO FIRE
4	TISCO (north)	0.0885	0.0153	-0.073	DECREASE
5	NUDKHURKEE OCP	0.0000	0.0000	0.000	NO FIRE
6	BENEDIH OCP	0.0530	0.0453	-0.008	DECREASE
7	BLOCK-II OCP	0.0530	0.1353	0.082	INCREASE
8	MURAIDIH OCP	0.1478	0.0022	-0.146	DECREASE
9	SHATABDI OCP	0.0378	0.0361	-0.002	DECREASE
10	TETURIA	0.0000	0.0000	0.000	NO FIRE
11	S.GOVINDPUR	0.0000	0.0000	0.000	NO FIRE
12	KORIDIH BLOCK-IV OCP	0.0000	0.0000	0.000	NO FIRE
13	JOGIDIH	0.0000	0.0000	0.000	NO FIRE
14	DHARAMABAND	0.0000	0.0000	0.000	NO FIRE
15	MAHESHPUR	0.0000	0.0000	0.000	NO FIRE
16	PHULARITAND	0.0133	0.0205	0.007	INCREASE
17	MADHUBAND	0.0000	0.0000	0.000	NO FIRE
18	AKASH KINARI	0.0000	0.0000	0.000	NO FIRE
19	GOVINDPUR	0.0000	0.0000	0.000	NO FIRE
20	E. KATRAS	0.0133	0.0000	-0.013	DECREASE
21	KATRAS-CHOITUDIH	0.1021	0.1368	0.035	INCREASE
22	KESHALPUR	0.0000	0.0013	0.001	INCREASE
23	RAMKANALI	0.0000	0.0000	0.000	NO FIRE
24	NICHITPUR	0.0000	0.0000	0.000	NO FIRE
25	E. BASURIA	0.0000	0.0000	0.000	NO FIRE
26	KHAS KUSUNDA	0.0000	0.0000	0.000	NO FIRE
27	GONDUDIH	0.0000	0.0000	0.000	NO FIRE
28	W. GODHAR	0.0012	0.0000	-0.001	DECREASE
29	BASURIA	0.0000	0.0000	0.000	NO FIRE
30	TETULMARI	0.0223	0.0220	0.000	DECREASE
31	DHANSAR	0.0000	0.0000	0.000	NO FIRE
32	GODHAR	0.1073	0.0000	-0.107	DECREASE
33	INDUSTRY	0.0119	0.0513	0.039	INCREASE
34	KUSUNDA	0.4243	0.7398	0.315	INCREASE
35	SENDRA-BANSJORA	0.0796	0.0275	-0.052	DECREASE
36	BASTACOLLA	0.0663	0.0810	0.015	INCREASE
37	BERA	0.0000	0.0000	0.000	NO FIRE
38	KUYA	0.0000	0.0000	0.000	NO FIRE
39	GOLUCKDIH	0.0301	0.1122	0.082	INCREASE
40	KUJAMA	0.0398	0.2404	0.201	INCREASE

41	S. JHARIA-R. OCP	0.0244	0.1118	0.087	INCREASE
42	DOBARI	0.0000	0.0000	0.000	NO FIRE
43	GONHOODIH	0.0398	0.0322	-0.008	DECREASE
44	SIMLABAHAL	0.0000	0.0000	0.000	NO FIRE
45	HURRILADIH&STD	0.0000	0.0000	0.000	NO FIRE
46	ENA	0.0918	0.0432	-0.049	DECREASE
47	BURRAGARH	0.0000	0.0000	0.000	NO FIRE
48	N. TISRA	0.0098	0.1802	0.170	INCREASE
49	LODNA	0.0000	0.3527	0.353	INCREASE
50	S. TISRA	0.0000	0.1015	0.102	INCREASE
51	BARAREE	0.1037	0.1074	0.004	INCREASE
52	AMLABAD	0.0000	0.0000	0.000	NO FIRE
53	PATHERDIH	0.0000	0.0000	0.000	NO FIRE
54	SUDAMDIH	0.0000	0.0000	0.000	NO FIRE
55	SITANALA	0.0000	0.0000	0.000	NO FIRE
56	MURULIDIH 20/21 PIT	0.0000	0.0000	0.000	NO FIRE
57	MURULIDIH	0.0000	0.0000	0.000	NO FIRE
58	BHATDIH	0.0000	0.0000	0.000	NO FIRE
59	LOHAPATTY	0.0000	0.0000	0.000	NO FIRE
60	IISCO	0.0000	0.0000	0.000	NO FIRE
61	TASRA-IISCO	0.0000	0.0000	0.000	NO FIRE
62	KENDUADIH	0.0610	0.0000	-0.061	DECREASE
63	BULLIHARY	0.0000	0.0000	0.000	NO FIRE
64	GOPALICHUCK	0.0000	0.0000	0.000	NO FIRE
65	POOTKEE	0.0000	0.0000	0.000	NO FIRE
66	BHURUNGIA	0.0000	0.0000	0.000	NO FIRE
67	KHARKHAREE	0.0000	0.0000	0.000	NO FIRE
68	GASLITAND	0.1194	0.1215	0.002	INCREASE
69	KANKANEE	0.0530	0.0525	-0.001	DECREASE
70	MUDIDIH	0.1141	0.1104	-0.004	DECREASE
71	W. MUDIDIH	0.0171	0.0000	-0.017	DECREASE
72	LOYABAD	0.0133	0.0063	-0.007	DECREASE
73	BHAGABAND	0.0000	0.0000	0.000	NO FIRE
74	MOONIDIH PROJECT	0.0000	0.0000	0.000	NO FIRE
75	E.BHUGGATDIH	0.0022	0.0214	0.019	INCREASE
76	ALKUSHA	0.0326	0.0294	-0.003	DECREASE
77	KUSTORE	0.0524	0.0463	-0.006	DECREASE
78	ANGARAPATRA	0.1331	0.0149	-0.118	DECREASE
79	SALANPUR	0.0000	0.0000	0.000	NO FIRE
80	BHOWRAH. N	0.0133	0.0980	0.085	INCREASE
81	BHOWRAH. S	0.0000	0.0000	0.000	NO FIRE
82	BAGDIGI	0.0000	0.0209	0.021	INCREASE
83	JEALGORA	0.0000	0.0067	0.007	INCREASE
84	JEENAGORA	0.0000	0.0470	0.047	NO FIRE

85	JOYRAMPUR	0.0099	0.1042	0.094	INCREASE
86	CHANDAN OCP	0.0000	0.0000	0.000	NO FIRE
87	BANSDEOPUR	0.0000	0.0000	0.000	NO FIRE
	TOTAL AREA	**2.18**	**3.28**	**1.10**	INCREASE

Table 6: Colliery wise break-up of change in fire area from 2012 to 2017

Note:
1) "**NO FIRE**" implicates that the fire has not been identified satellite data *(either absent or below sensor resolution)*
2) "**INCREASE**" implies, increase in fire area OR emergence of fire areas not identified in 2012 study.
3) "**DECREASE**" implies, decrease in fire area OR fire areas of 2012, which are not identified in present study *(either absent or below sensor resolution)*.
4) Estimations of fire extent (in terms of sq.km.) both 2012 and in present 2017 study are pixel based. They do not represent 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.

Annexure –IV



Figure 15: Fume cracks in Lodna-Tisra Area. (point 39 in figure 13 and table 4)



Figure 16: Burnt area near OB dump in Lodna area (point 41 in figure 13 and table 4)



Figure 17: Coalfries in active seams in Kusunda (point 23 in figure 13 and table 4)



Figure 18: Sagged area due to subsidence, south of Block II OCP. (point 1 in figure 14 and table 5)

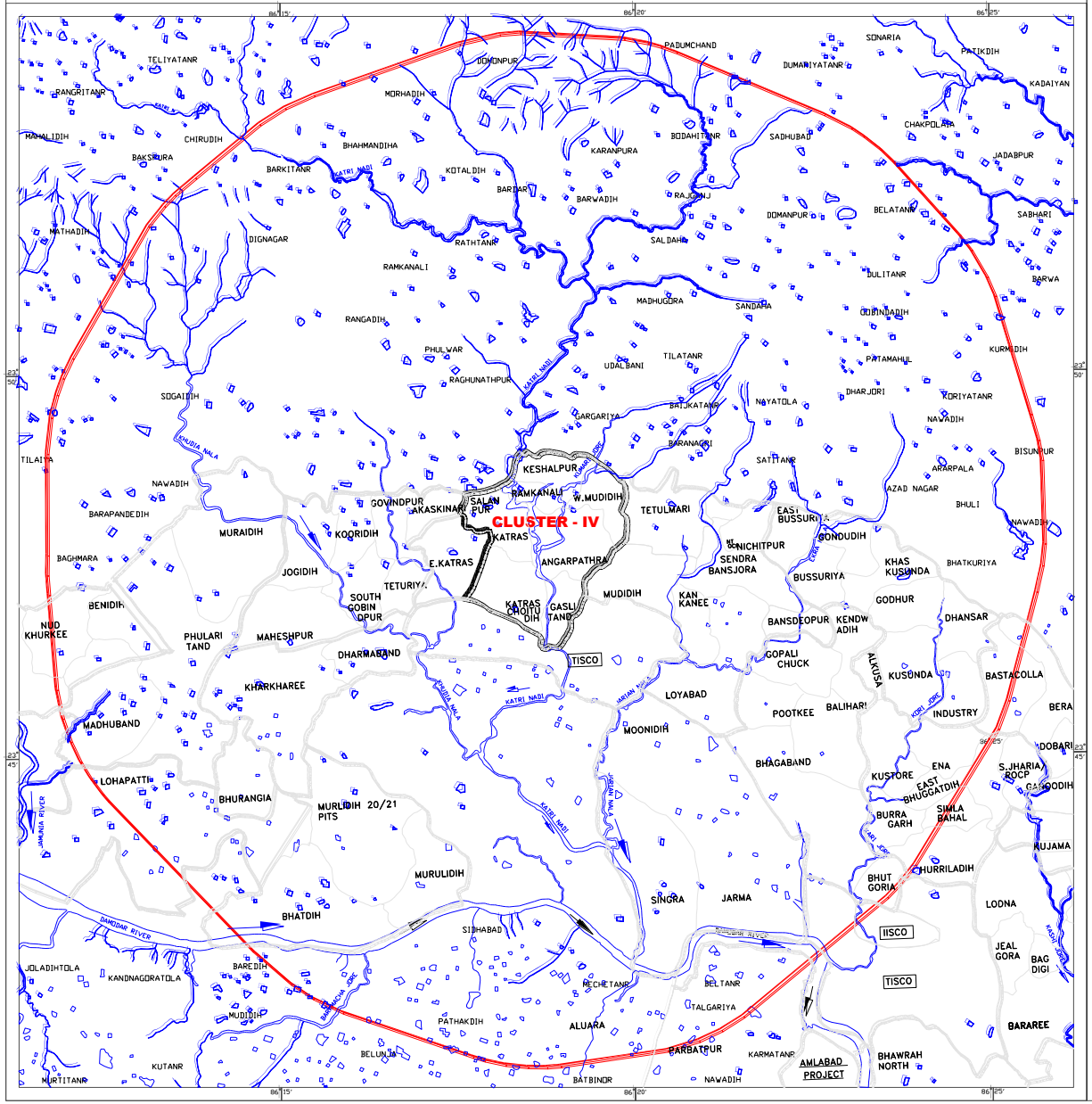


Figure 19: Fire in OB dumps in Kusunda area. (point 24 in figure 13 and table 4)



Figure 20: Fume cracks in the Bhulanbarari area.

STUDY AREA MAP OF CLUSTER - IV
SHOWING HYDROLOGICAL FEATURES



INDEX

POND

RIVER

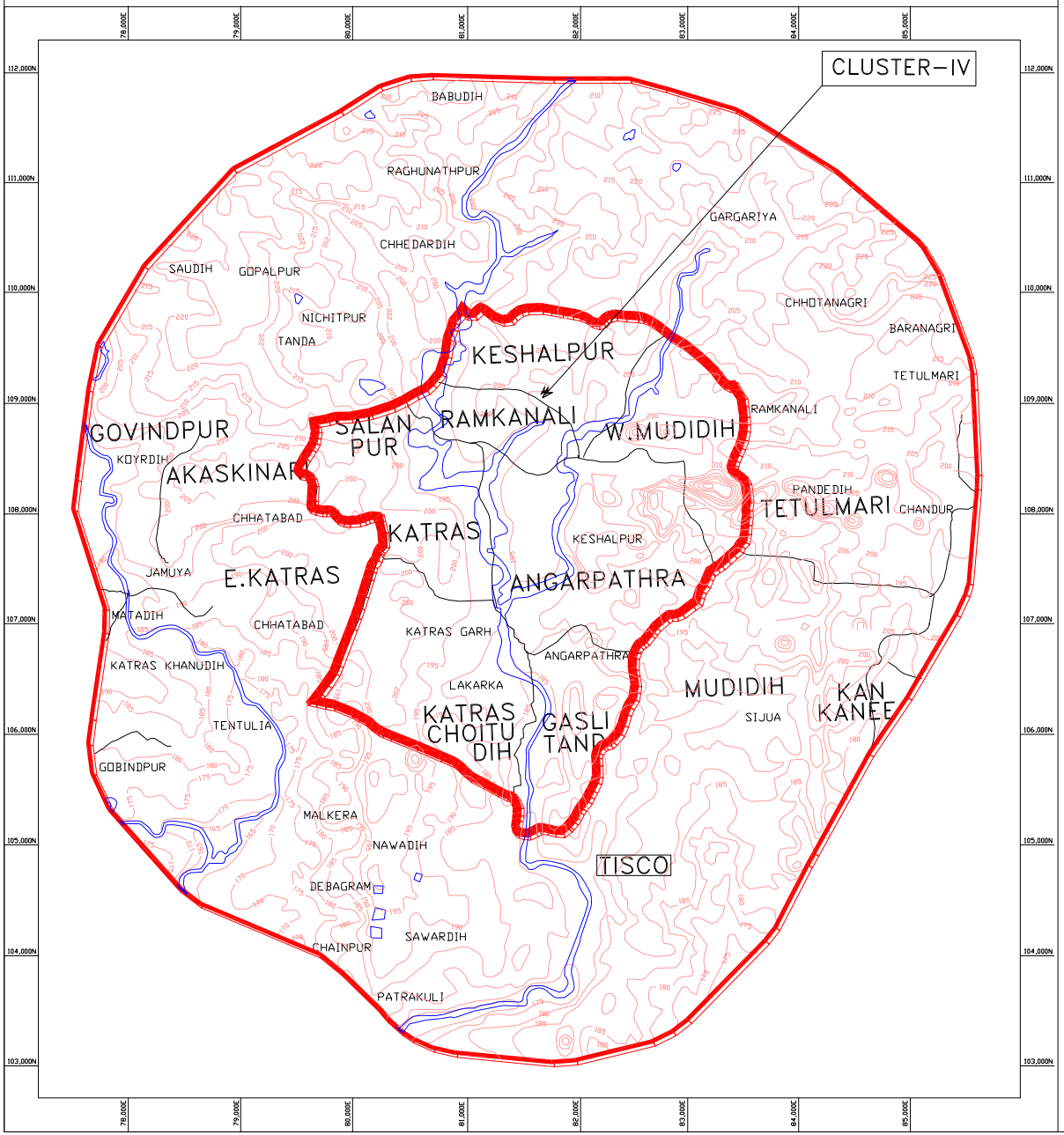
PROPOSED PROJECT (CORE ZONE)

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)

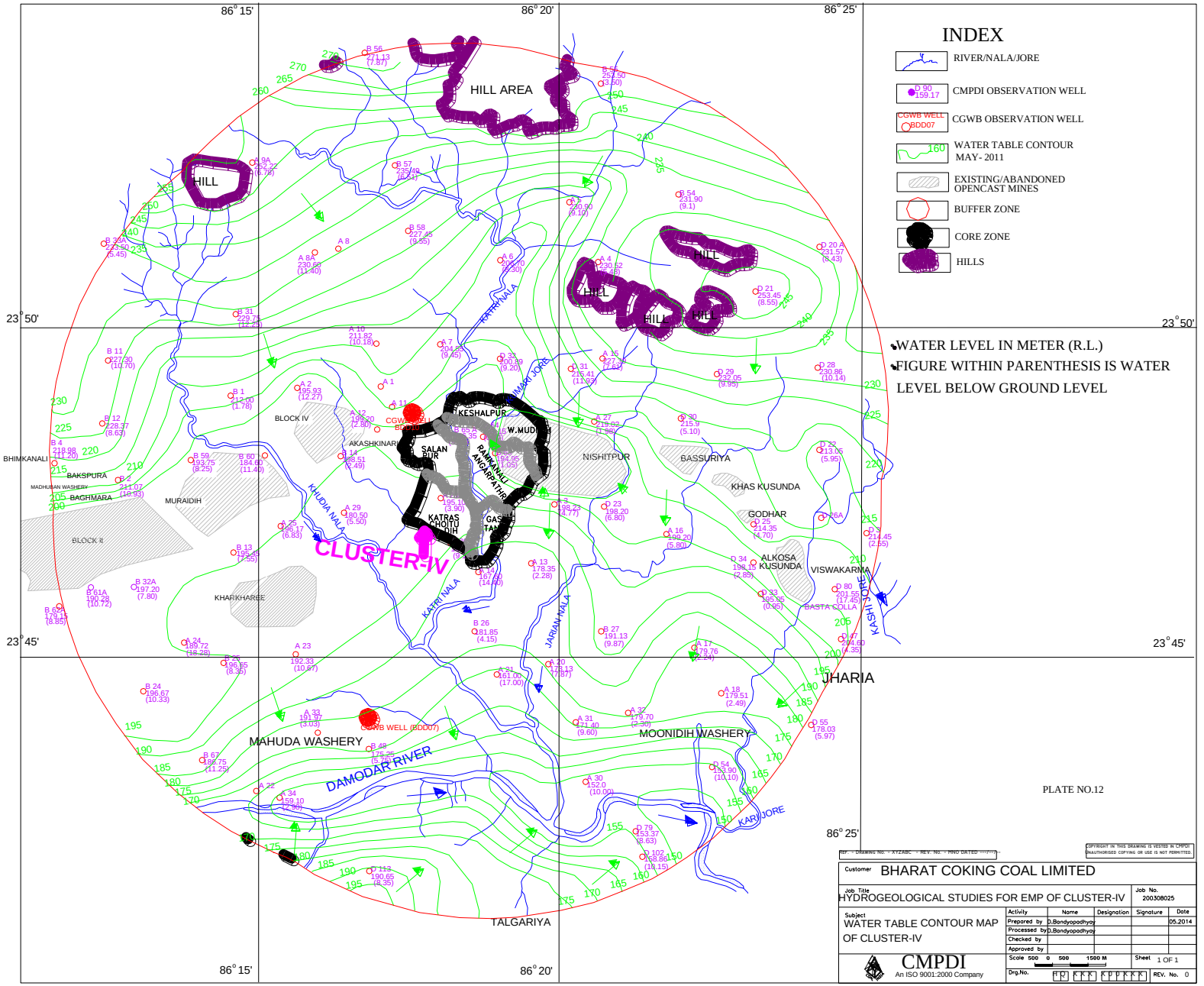
2 KM. ZONE

CONTOUR(m)

PLATE NO -11

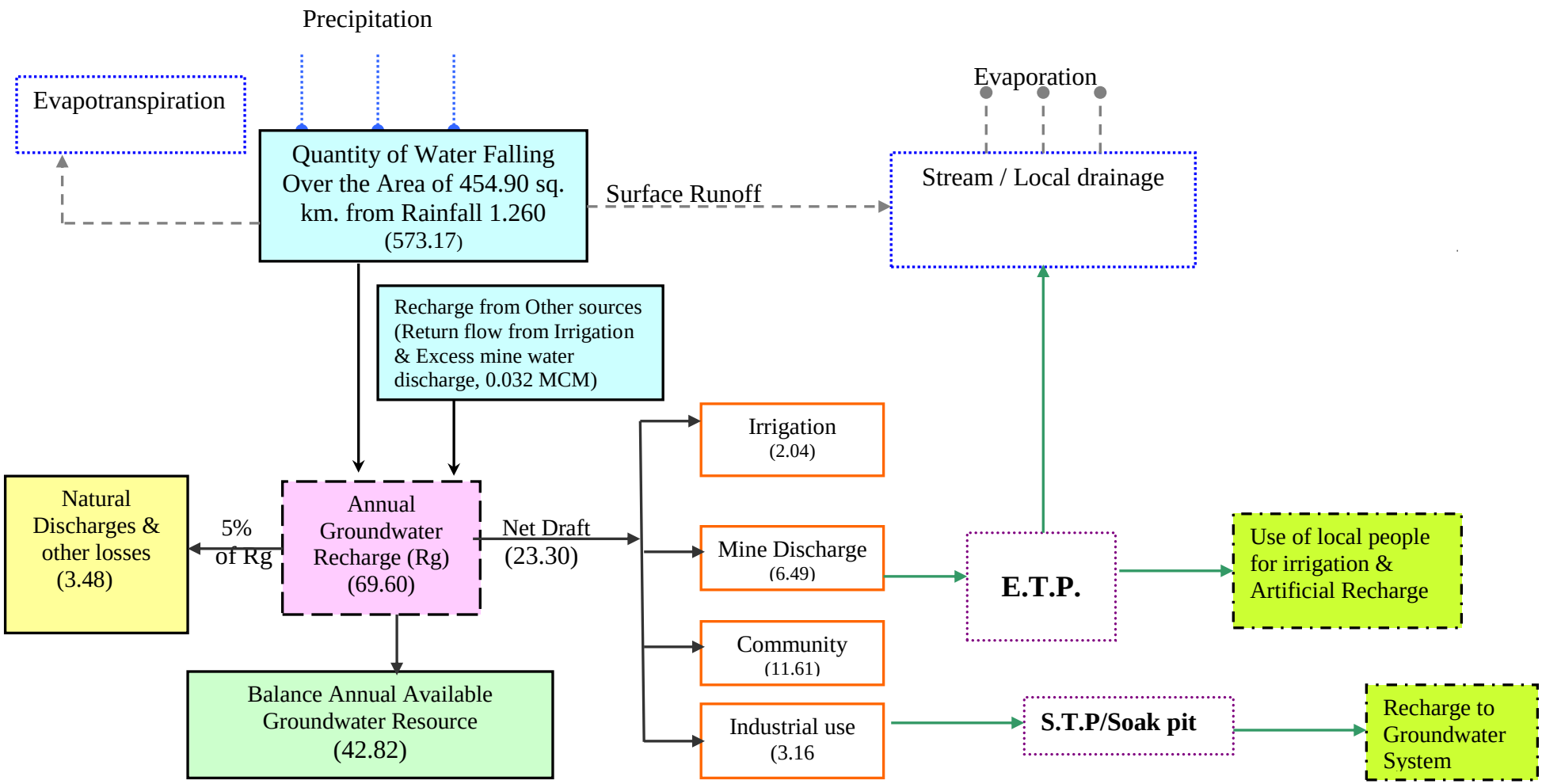
A/C No.:- D\CLUSTER_IV\
\CLUSTER_IV DRAINAGE CONTOUR

WATER TABLE CONTOUR MAP OF CLUSTER-IV



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)

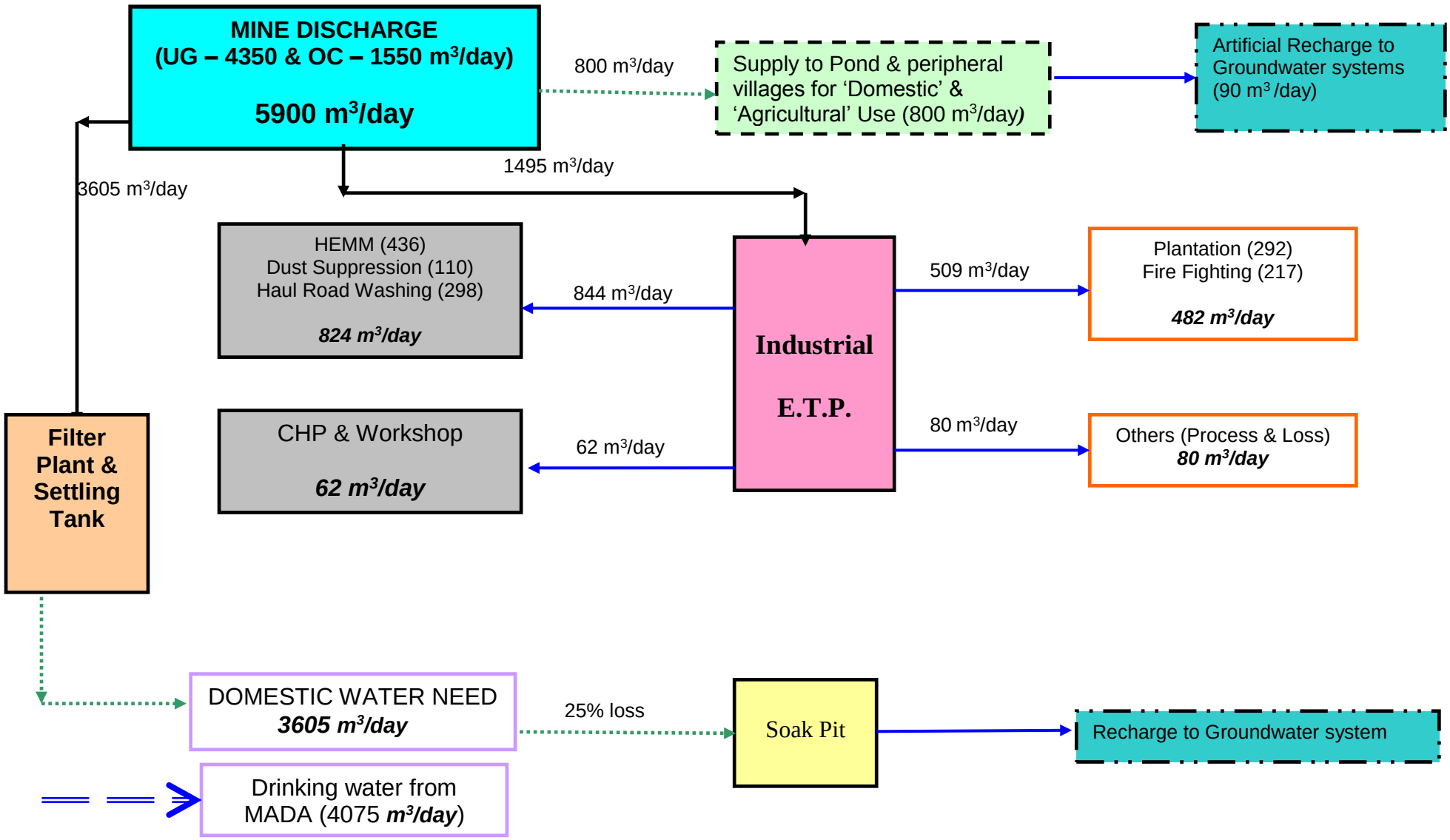


PLATE NO: 14

JOB NO - 200308025

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

Net ground water Recharge 66.12

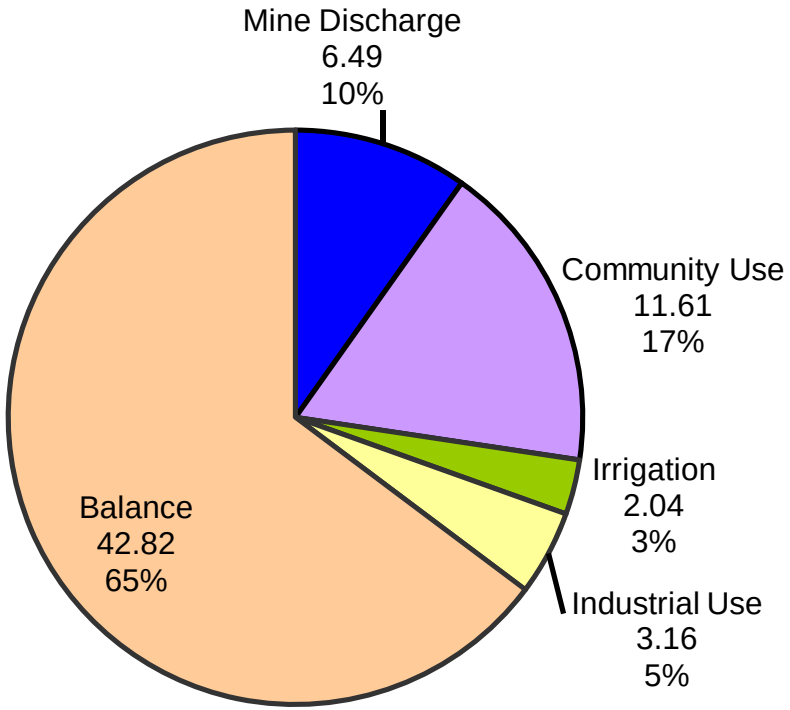
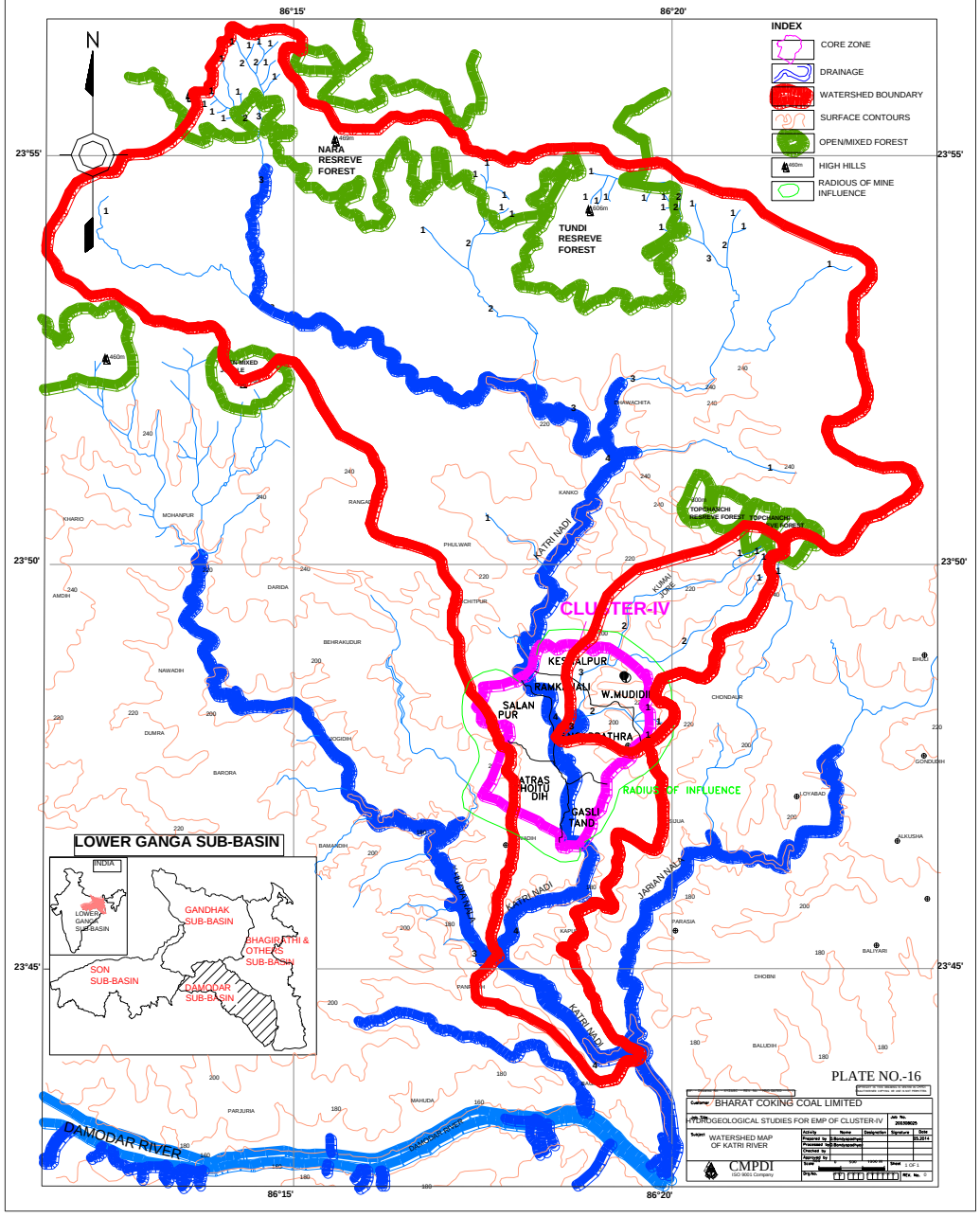


PLATE NO-15

WATERSHED MAP OF CLUSTER IV



DRAINAGE MAP OF THE CLUSTER-IV

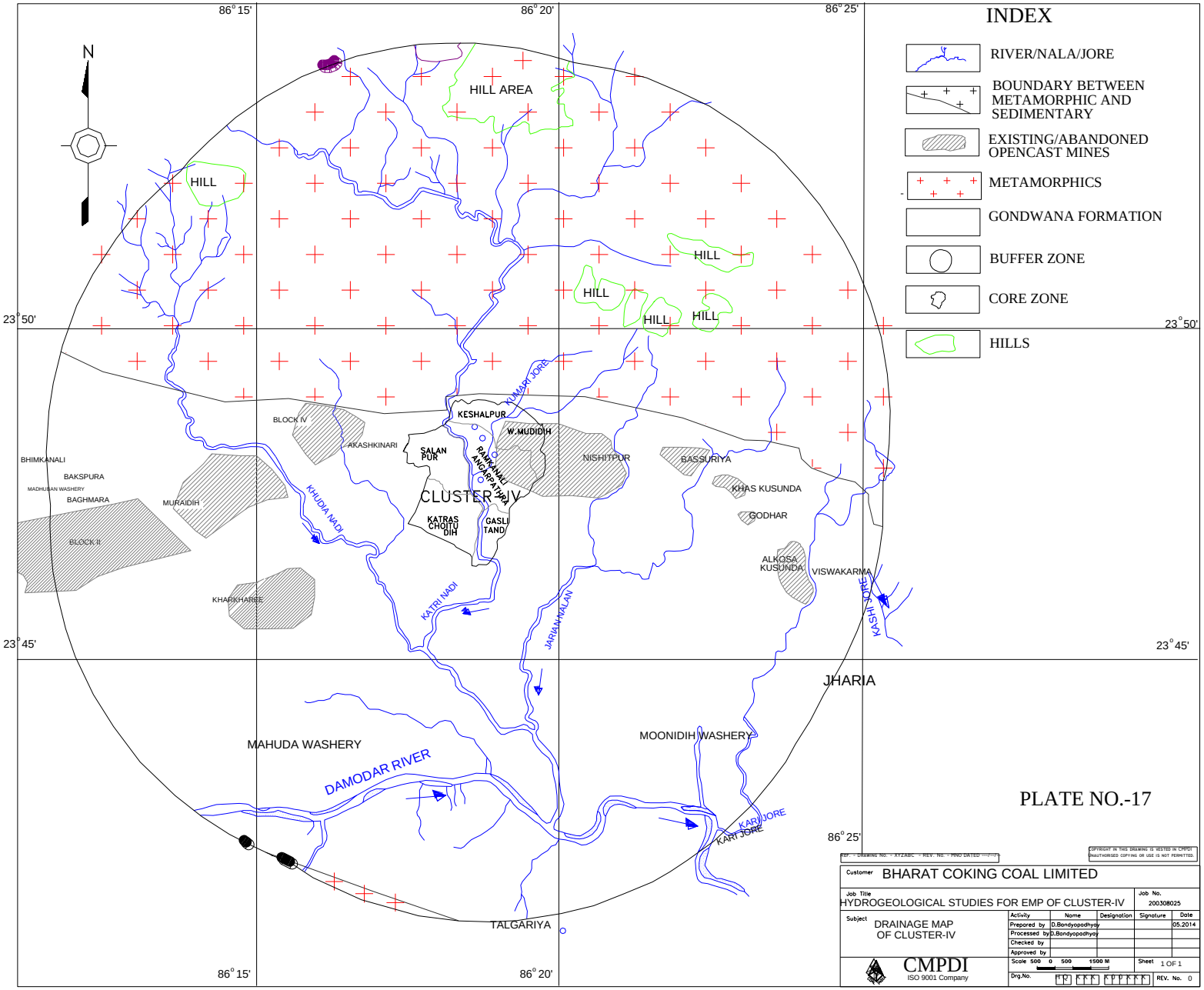


PLATE NO.-17

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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				

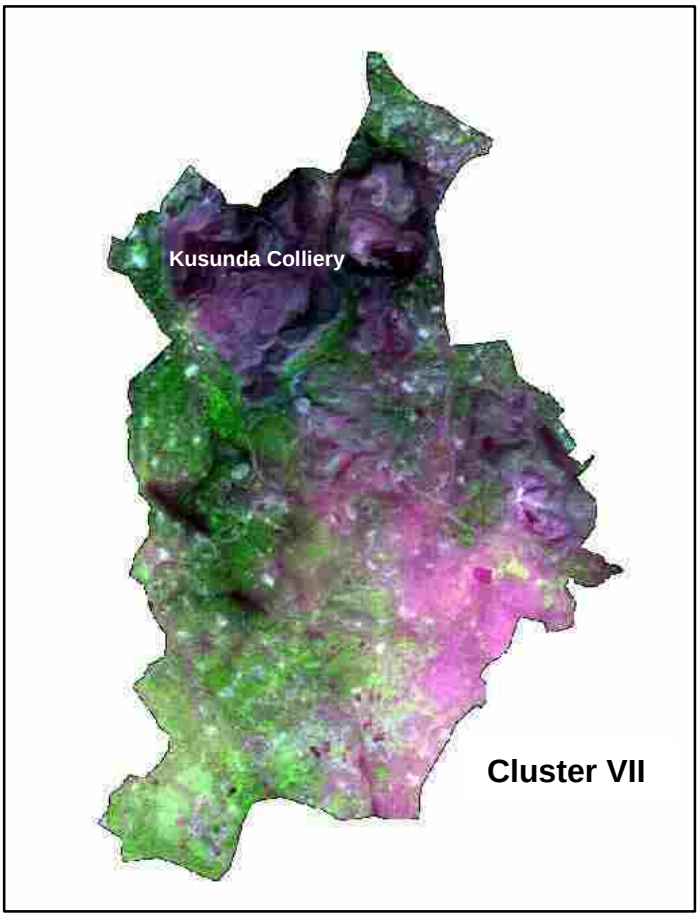
Scale 500 0 500 1500 M

Sheet 1 OF 1

Drg.No. REV. No. 0

CMPDI
ISO 9001 Company

Land Restoration / Reclamation Monitoring of Clusters of (Opencast + Underground) Coal Mines of Bharat Coking Coal Limited based on Satellite Data for the Year 2018



Submitted to

Bharat Coking Coal Limited

cmpdi
A Mini-Ratna Company

Land Restoration / Reclamation Monitoring of Clusters of (Opencast + Underground) Coal Mines of Bharat Coking Coal Limited based on Satellite Data for the Year 2018

March-2019

Remote Sensing Cell
Geomatics Division
CMPDI, Ranchi

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Executive Summary

1. Project

Land restoration / reclamation monitoring of 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 the land restoration / reclamation monitoring is to assess the area of backfilled, plantation, social forestry, active mining area, water bodies, and 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

- Four Clusters viz. I, IV, VII, X were selected in 2018-19 for land reclamation/restoration monitoring. These clusters consist of mainly opencast mines.

- Out of the total leasehold area of 5883.96 Ha., total mined out area is only 1075.76 Ha., belonging to the OC mines.

- It is evident from the analysis that 58.11% of excavated area is under technical reclamation and 35.02% of the excavated area is under active mining. Cluster wise details are given in Table-1 & Fig-1.

- 13.61% of total leasehold area has come under plantation (% green cover)

- Study reveals that out of total mine leasehold area of 5883.96 Ha. of the above mentioned 04 nos. clusters of BCCL taken up for the land reclamation monitoring during the year 2018-19; total excavated area is 1075.76 Ha. (18.28%) out of which 73.92 Ha. (6.87%) has been planted *(Biologically Reclaimed)*, 625.15 Ha. (58.11%) is under backfilling *(Technical Reclamation)* and

balance 376.69 Ha. (35.02%) is under active mining

- This report and the findings will act as the basis for further monitoring and reclamation related activities.

- Out of the four clusters of BCCL, maximum land reclamation has been done in Cluster VII (76.09%) followed by Cluster X (71.00%).

Table 1

Land Reclamation Status in Clusters of (Underground + Opencast) Projects of BCCL based on Satellite Data of the Year 2018

1	2	3	4	5	6	7	8	9 (=4+5+8)	10 (=5+6+7)	11(=4+5)
1	Cluster I	575.00	22.08%	15.91%			62.00%		14.05%	38.00%
2	Cluster IV	1123.79	46.90%	0.00%			53.10%		17.10%	46.90%
3	Cluster VII	2127.70	68.76%	7.33%			23.91%		13.71%	76.09%
4	Cluster X	2057.47	56.76%	14.23%			29.00%		11.47%	71.00%
	TOTAL	**5883.96**	**58.11%**	**6.87%**			**35.02%**	**18.28%**	**13.61%**	**64.98%**

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

Note: In reference of the above Table, different parameters are classified as follows:

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

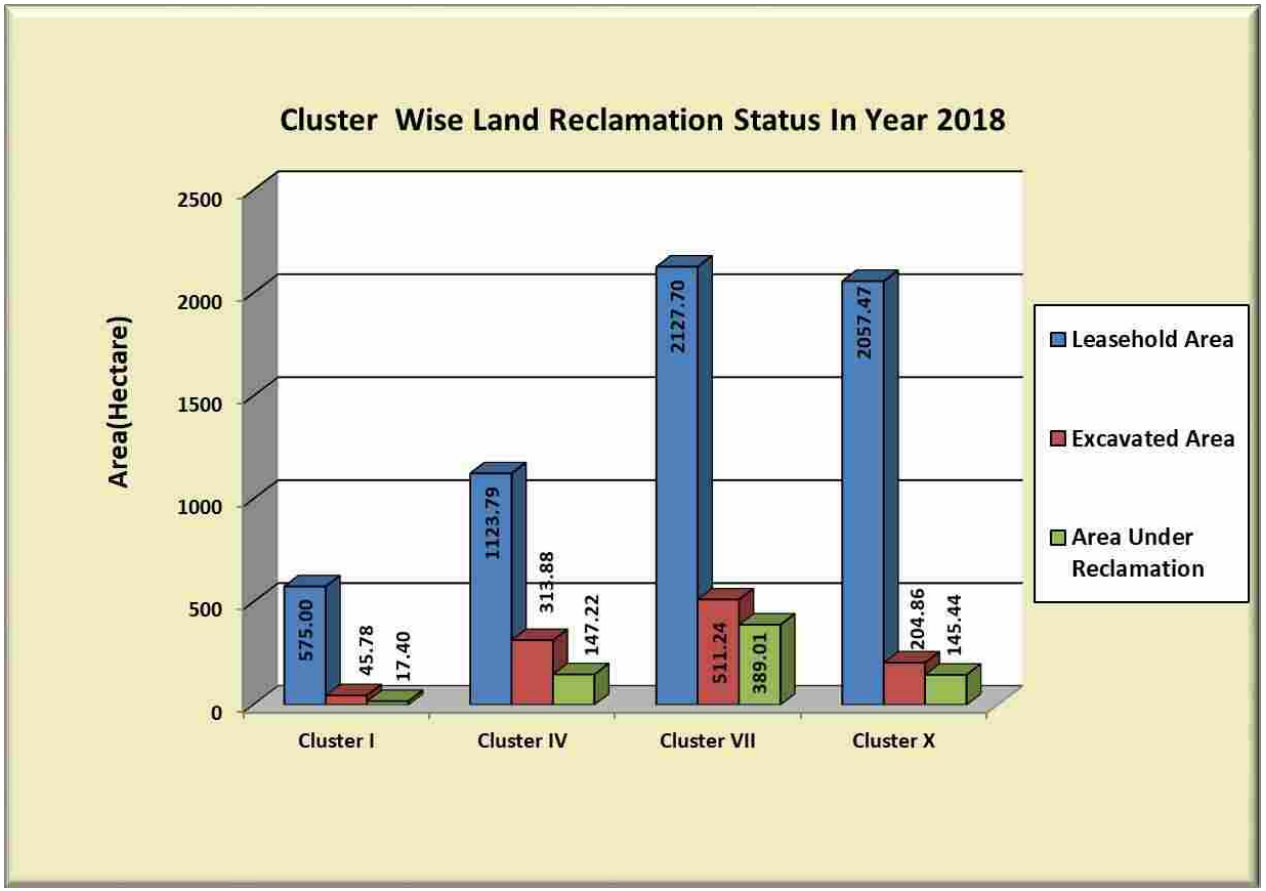


Fig. 1: Cluster wise Land Reclamation Status-2018 (BCCL)

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 2018 the same will be carried out cluster wise for mines of ECL & 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 (MoEF). 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 2018 carried out for four 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:

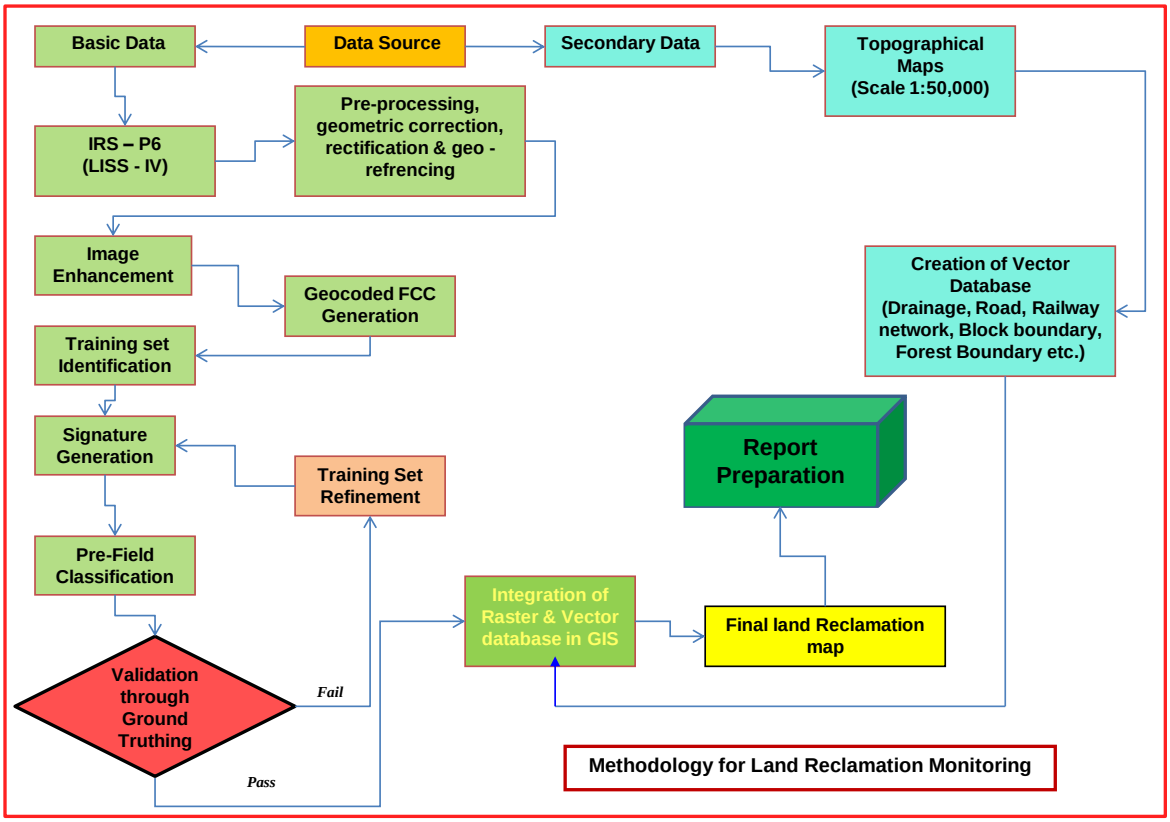


Fig. 2: Methodology of Land Reclamation Monitoring

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 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 to 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.

4. Land Reclamation Status in Bharat Coking Coal Ltd.

4.1 In BCCL, a total of twelve clusters of mines are selected for land reclamation monitoring. Following four clusters of mines comprising both underground and OC projects of Bharat Coking Coal Ltd. have been taken up for land reclamation monitoring in 2018.

- Cluster I (Damoda OCP)
- Cluster IV (Salanpur Colliery, Katras Choitudih Colliery, Gaslitand Colliery, Amalgamated Keshalpur West Mudidih Colliery, Angarpathra Colliery & Ramkanali Colliery)
- Cluster VII (Amalgamated East Bhuggatdih Simlabahal Colliery, Ena OC, Vishwakarma OCP, Kustore OCP)
- Cluster X (Bhowrah North, Bhowrah South, Patherdih)

4.2 All the four above clusters, have been mapped during the year 2018 for assessing the progress of land reclamation.

4.3 Area statistics of different land use classes present in OC projects till the year 2018 is given in Table 2. Land use maps derived from the satellite data are given in Plate nos.1, 2, 3 & 4. The land use status are shown in Fig. 3, 4, 5 & 6.

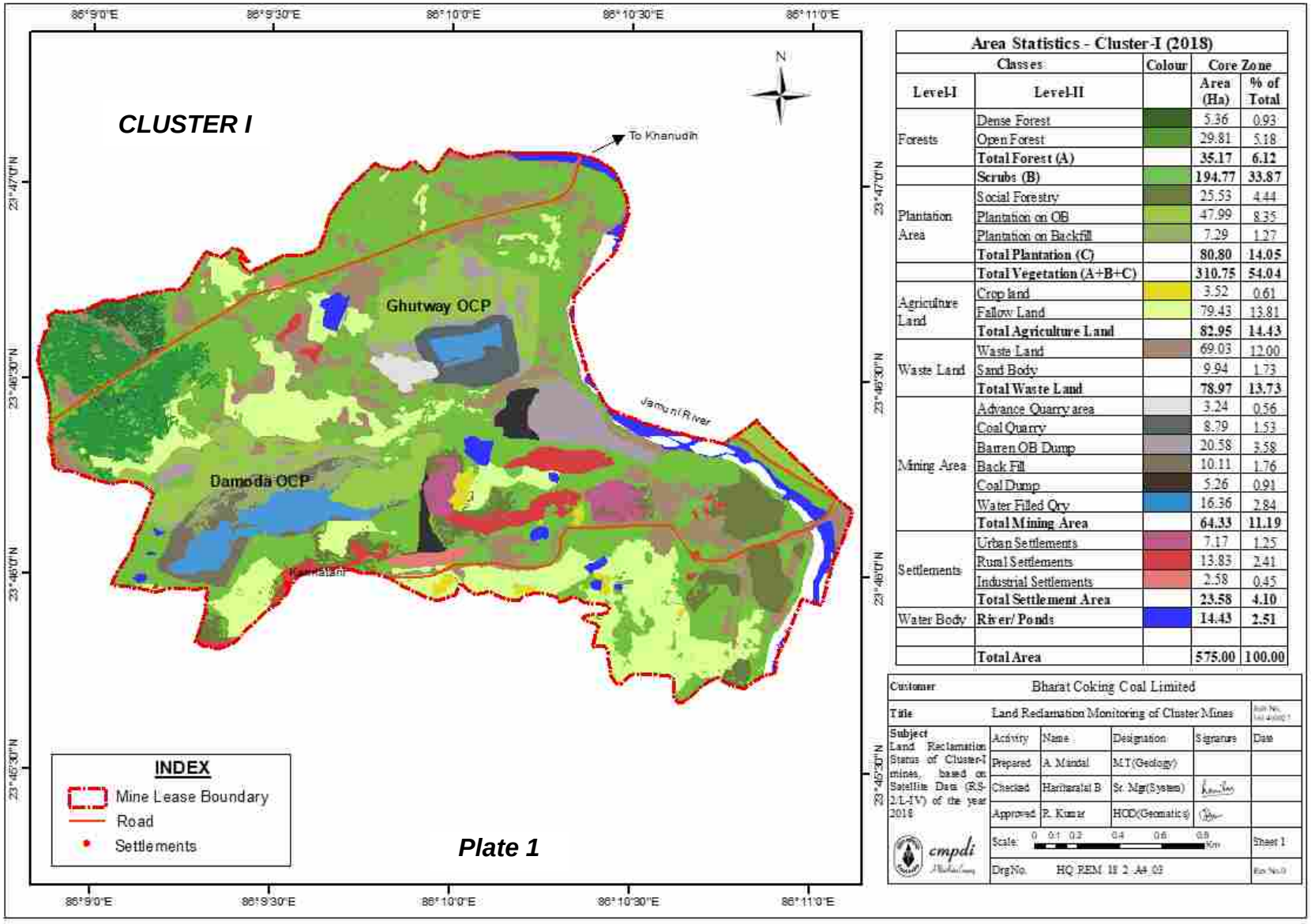
4.4 Study reveals that majority of the mines under the clusters considered for monitoring are of opencast type. 35.02% of excavated area is under active mining in the opencast mines. 58.11% of the excavated area have come under technical reclamation till 2018

Table 2

Status of Land Use/Reclamation Status in Clusters of (OC + Underground) mines of Bharat Coking Coal Limited based on Satellite Data of the year 2018

(Area in Hectare)

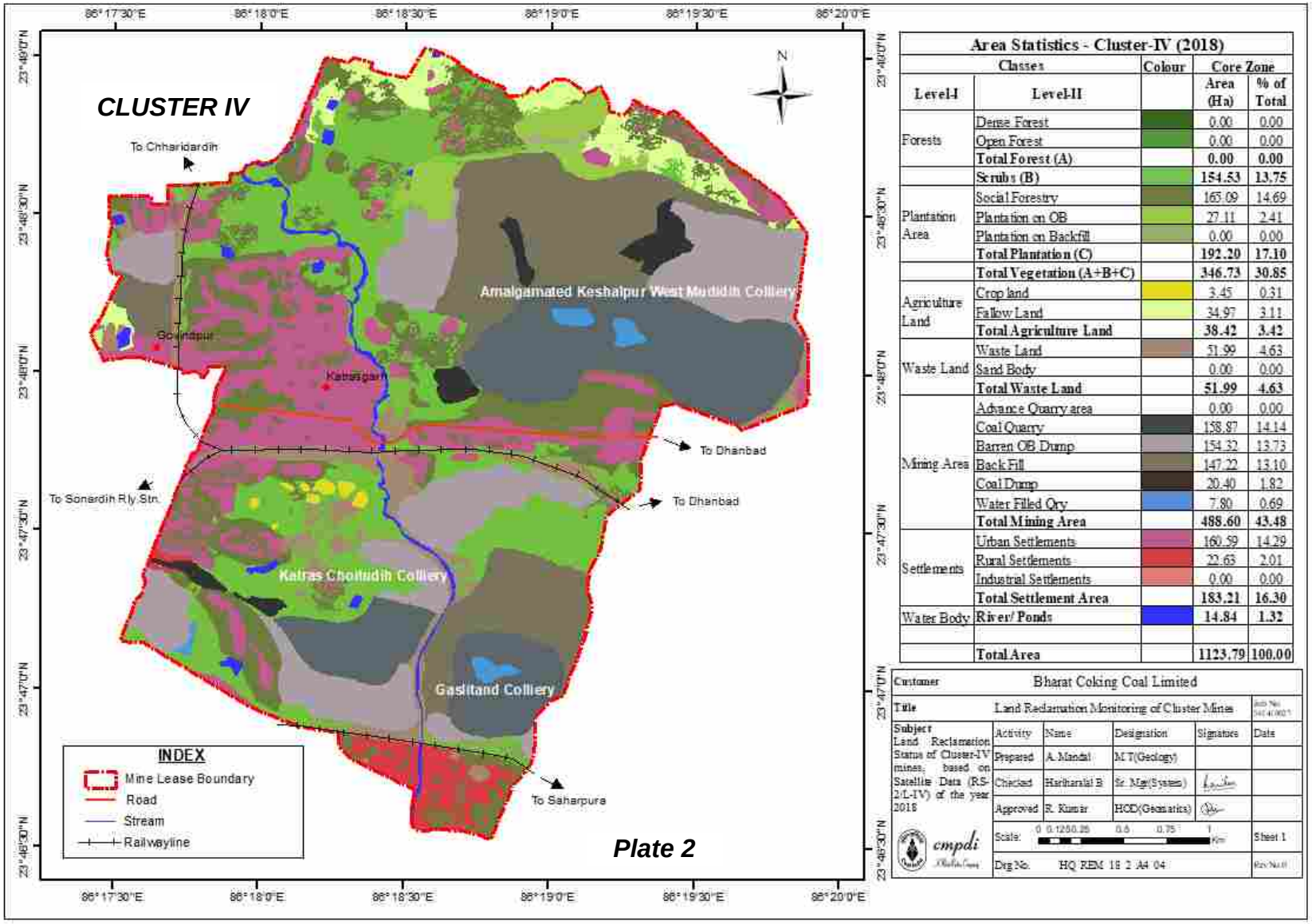
		CLUSTER I		CLUSTER IV		CLUSTER VII		CLUSTER X		TOTAL	
		Area	%	Area	%	Area	%	Area	%	Area	%
FORESTS	Dense Forest	5.36	0.93	0.00	0.00	0.00	0.00	0.00	0.00	5.36	0.09
	Open Forest	29.81	5.18	0.00	0.00	0.00	0.00	180.80	8.79	210.61	3.58
	Total Forest	35.17	6.12	0.00	0.00	0.00	0.00	180.80	8.79	215.97	3.67
SCRUBS	Scrubs	194.77	33.87	154.53	13.75	618.49	29.07	559.57	27.20	1527.35	25.96
PLANTATION	Social Forestry/Avenue Plantation	25.53	4.44	165.09	14.69	238.67	11.22	140.75	6.84	570.04	9.69
	Plantation on OB Dump	47.99	8.35	27.11	2.41	15.52	0.73	66.09	3.21	156.71	2.66
	Plantation on Backfill (Biological Reclamation)	7.29	1.27	0.00	0.00	37.47	1.76	29.16	1.42	73.92	1.26
	Total Plantation	80.80	14.05	192.20	17.10	291.67	13.71	236.00	11.47	800.66	13.61
	Total Vegetation	**310.75**	**54.04**	**346.73**	**30.85**	**910.15**	**42.78**	**976.37**	**47.45**	**2543.99**	**43.24**
	Coal Dump	5.26	0.91	20.40	1.82	16.03	0.75	2.84	0.14	44.53	0.76
ACTIVE MINING	Coal Quarry	8.79	1.53	158.87	14.14	119.18	5.60	46.10	2.24	332.94	5.66
	Advance Quarry Site	3.24	0.56	0.00	0.00	0.00	0.00	0.00	0.00	3.24	0.06
	Quarry Filled With Water	16.36	2.84	7.80	0.69	3.05	0.14	13.31	0.65	40.52	0.69
	Total Area under *Active Mining*	**28.39**	**4.93**	**166.67**	**14.83**	**122.23**	**5.74**	**59.41**	**2.89**	**376.69**	**6.40**
	Barren OB Dump	20.58	3.58	154.32	13.73	75.79	3.56	89.57	4.35	340.25	5.78
RECLAIMED	Area Under Backfilling (Technical Reclamation)	10.11	1.76	147.22	13.10	351.54	16.52	116.28	5.65	625.15	10.62
	Total Area under *Technical Reclamation*	**10.11**	**1.76**	**147.22**	**13.10**	**351.54**	**16.52**	**116.28**	**5.65**	**625.15**	**10.62**
	Total Area under Mine Operation	**64.33**	**11.19**	**488.60**	**43.48**	**565.59**	**26.58**	**268.10**	**13.03**	**1386.62**	**23.57**
WASTELAND	Waste Lands	69.03	12.00	51.99	4.63	162.76	7.65	153.62	7.47	437.40	7.43
	Fly Ash Pond / Sand Body	9.94	1.73	0.00	0.00	0.00	0.00	44.69	2.17	54.63	0.93
	Total Wasteland	**78.97**	**13.73**	**51.99**	**4.63**	**162.76**	**7.65**	**198.30**	**9.64**	**492.02**	**8.36**
WATERBODIES	Reservoir, nallah, ponds	14.43	2.51	14.84	1.32	18.39	0.86	194.65	9.46	242.30	4.12
	Total Waterbodies	**14.43**	**2.51**	**14.84**	**1.32**	**18.39**	**0.86**	**194.65**	**9.46**	**242.30**	**4.12**
AGRICULTURE	Crop Lands	3.52	0.61	3.45	0.31	37.65	1.77	18.29	0.89	62.91	1.07
	Fallow Lands	79.43	13.81	34.97	3.11	20.73	0.97	91.05	4.43	226.18	3.84
	Total Agriculture	**82.95**	**14.43**	**38.42**	**3.42**	**58.37**	**2.74**	**109.35**	**5.31**	**289.09**	**4.91**
SETTLEMENTS	Urban Settlement	7.17	1.25	160.59	14.29	380.73	17.89	228.39	11.10	776.88	13.20
	Rural Settlement	13.83	2.41	22.63	2.01	9.93	0.47	57.90	2.81	104.29	1.77
	Industrial Settlement	2.58	0.45	0.00	0.00	21.79	1.02	24.42	1.19	48.80	0.83
	Total Settlement	**23.58**	**4.10**	**183.21**	**16.30**	**412.45**	**19.38**	**310.71**	**15.10**	**929.96**	**15.80**
	Grand Total	**575.00**	**100.00**	**1123.79**	**100.00**	**2127.70**	**100.00**	**2057.47**	**100.00**	**5883.96**	**100.00**



Area Statistics - Cluster-I (2018)

Classes		Colour	Core Zone	
Level-I	Level-II		Area (Ha)	% of Total
Forests	Dense Forest		5.36	0.93
	Open Forest		29.81	5.18
	Total Forest (A)		**35.17**	**6.12**
	Scrubs (B)		**194.77**	**33.87**
Plantation Area	Social Forestry		25.53	4.44
	Plantation on OB		47.99	8.35
	Plantation on Backfill		7.29	1.27
	Total Plantation (C)		**80.80**	**14.05**
	Total Vegetation (A+B+C)		**310.75**	**54.04**
Agriculture Land	Crop land		3.52	0.61
	Fallow Land		79.43	13.81
	Total Agriculture Land		**82.95**	**14.43**
Waste Land	Waste Land		69.03	12.00
	Sand Body		9.94	1.73
	Total Waste Land		**78.97**	**13.73**
Mining Area	Advance Quarry area		3.24	0.56
	Coal Quarry		8.79	1.53
	Barren OB Dump		20.58	3.58
	Back Fill		10.11	1.76
	Coal Dump		5.26	0.91
	Water Filled Qry		16.36	2.84
	Total Mining Area		**64.33**	**11.19**
Settlements	Urban Settlements		7.17	1.25
	Rural Settlements		13.83	2.41
	Industrial Settlements		2.58	0.45
	Total Settlement Area		**23.58**	**4.10**
Water Body	**River/ Ponds**		**14.43**	**2.51**
	Total Area		**575.00**	**100.00**

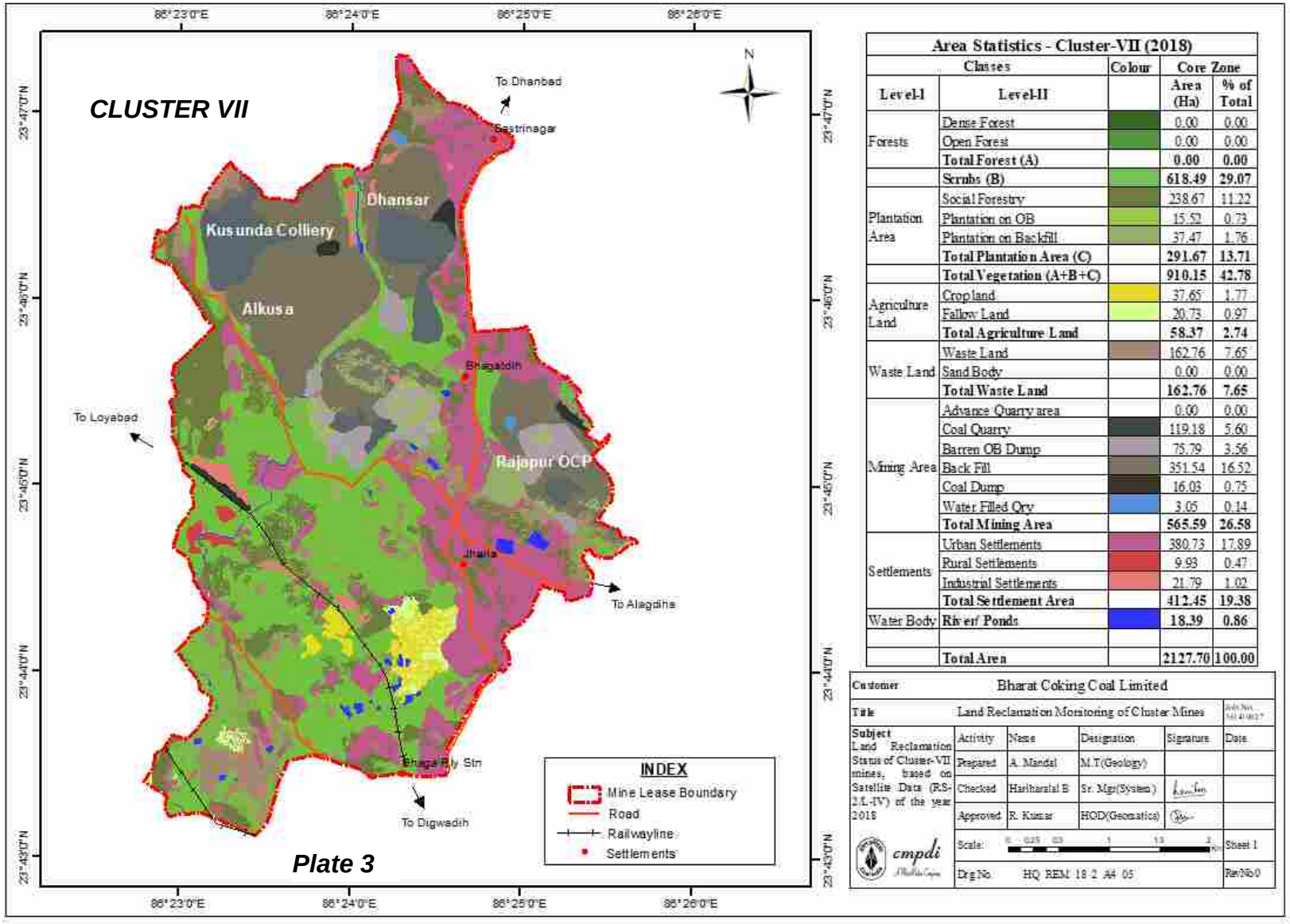
Customer	Bharat Coking Coal Limited				
Title	Land Reclamation Monitoring of Cluster Mines				Sub No. 561410027/1
Subject: Land Reclamation Status of Cluster-I mines, based on Satellite Data (RS-2/L-IV) of the year 2018	Activity	Name	Designation	Signature	Date
	Prepared	A. Mandal	M.T.(Geology)		
	Checked	Hariharalal B.	Sr. Mgr(System)		
	Approved	P. Kumar	HOD(Geomatics)		
cmpdi	Scale: 0 0.1 0.2 0.4 0.6 0.8 Km				Sheet 1
	Drg No. HQ REM 18 2 A4 02				Rev No.0



Area Statistics - Cluster-IV (2018)

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)		**154.53**	**13.75**
Plantation Area	Social Forestry		165.09	14.69
	Plantation on OB		27.11	2.41
	Plantation on Backfill		0.00	0.00
	Total Plantation (C)		**192.20**	**17.10**
	Total Vegetation (A+B+C)		**346.73**	**30.85**
Agriculture Land	Crop land		3.45	0.31
	Fallow Land		34.97	3.11
	Total Agriculture Land		**38.42**	**3.42**
Waste Land	Waste Land		51.99	4.63
	Sand Body		0.00	0.00
	Total Waste Land		**51.99**	**4.63**
Mining Area	Advance Quarry area		0.00	0.00
	Coal Quarry		158.87	14.14
	Barren OB Dump		154.32	13.73
	Back Fill		147.22	13.10
	Coal Dump		20.40	1.82
	Water Filled Qry		7.80	0.69
	Total Mining Area		**488.60**	**43.48**
Settlements	Urban Settlements		160.59	14.29
	Rural Settlements		22.63	2.01
	Industrial Settlements		0.00	0.00
	Total Settlement Area		**183.21**	**16.30**
Water Body	**River/ Ponds**		**14.84**	**1.32**
	Total Area		**1123.79**	**100.00**

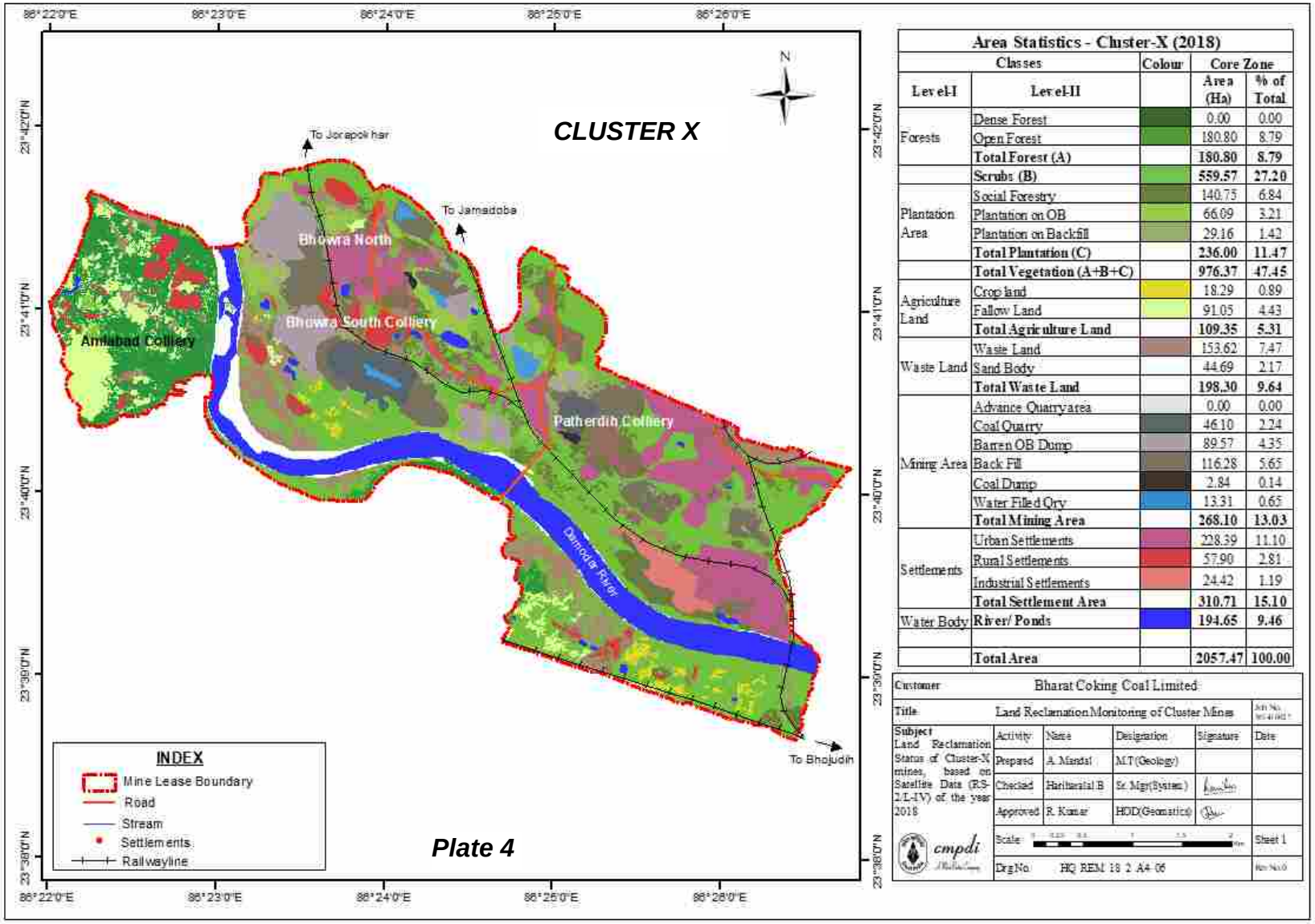
Customer	Bharat Coking Coal Limited				
Title	Land Reclamation Monitoring of Cluster Mines				Job No 561410027
Subject: Land Reclamation Status of Cluster-IV mines, based on Satellite Data (RS-2/L-IV) of the year 2018	Activity	Name	Designation	Signature	Date
	Prepared	A. Mandal	M.T(Geology)		
	Checked	Hariharalal B	Sr. Mgr(System)		
	Approved	R. Kumar	HOD(Geomatics)		
cmpdi	Scale:	0 0.125 0.25 0.5 0.75 1 Km			Sheet 1
	Drg No.	HQ REM 18 2 A4 04			Rev No 0



Area Statistics - Cluster-VII (2018)

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)		**618.49**	**29.07**
Plantation Area	Social Forestry		238.67	11.22
	Plantation on OB		15.52	0.73
	Plantation on Backfill		37.47	1.76
	Total Plantation Area (C)		**291.67**	**13.71**
	Total Vegetation (A+B+C)		**910.15**	**42.78**
Agriculture Land	Crop land		37.65	1.77
	Fallow Land		20.73	0.97
	Total Agriculture Land		**58.37**	**2.74**
Waste Land	Waste Land		162.76	7.65
	Sand Body		0.00	0.00
	Total Waste Land		**162.76**	**7.65**
Mining Area	Advance Quarry area		0.00	0.00
	Coal Quarry		119.18	5.60
	Barren OB Dump		75.79	3.56
	Back Fill		351.54	16.52
	Coal Dump		16.03	0.75
	Water Filled Qry		3.05	0.14
	Total Mining Area		**565.59**	**26.58**
Settlements	Urban Settlements		380.73	17.89
	Rural Settlements		9.93	0.47
	Industrial Settlements		21.79	1.02
	Total Settlement Area		**412.45**	**19.38**
Water Body	**River/ Ponds**		**18.39**	**0.86**
	Total Area		**2127.70**	**100.00**

Customer	Bharat Coking Coal Limited				
Title	Land Reclamation Monitoring of Cluster Mines				Job No. 561410027
Subject: Land Reclamation Status of Cluster-VII mines, based on Satellite Data (R.S-2/L-IV) of the year 2018	Activity	Name	Designation	Signature	Date
	Prepared	A. Mandal	M.T(Geology)		
	Checked	Hariharalal B	Sr. Mgr(System)		
	Approved	R. Kumar	HOD(Geomatics)		
cmpdi	Scale:	0 0.25 0.5 1 1.5 2 Km			Sheet 1
	Drg No.	HQ REM 18 2 A4 05			Rev No 0



Area Statistics - Cluster-X (2018)

Classes		Colour	Core Zone	
Level-I	Level-II		Area (Ha)	% of Total
Forests	Dense Forest		0.00	0.00
	Open Forest		180.80	8.79
	Total Forest (A)		**180.80**	**8.79**
	Scrubs (B)		**559.57**	**27.20**
Plantation Area	Social Forestry		140.75	6.84
	Plantation on OB		66.09	3.21
	Plantation on Backfill		29.16	1.42
	Total Plantation (C)		**236.00**	**11.47**
	Total Vegetation (A+B+C)		**976.37**	**47.45**
Agriculture Land	Crop land		18.29	0.89
	Fallow Land		91.05	4.43
	Total Agriculture Land		**109.35**	**5.31**
Waste Land	Waste Land		153.62	7.47
	Sand Body		44.69	2.17
	Total Waste Land		**198.30**	**9.64**
Mining Area	Advance Quarry area		0.00	0.00
	Coal Quarry		46.10	2.24
	Barren OB Dump		89.57	4.35
	Back Fill		116.28	5.65
	Coal Dump		2.84	0.14
	Water Filled Qry		13.31	0.65
	Total Mining Area		**268.10**	**13.03**
Settlements	Urban Settlements		228.39	11.10
	Rural Settlements		57.90	2.81
	Industrial Settlements		24.42	1.19
	Total Settlement Area		**310.71**	**15.10**
Water Body	**River/ Ponds**		**194.65**	**9.46**
	Total Area		**2057.47**	**100.00**

Customer	Bharat Coking Coal Limited				
Title	Land Reclamation Monitoring of Cluster Mines				Job No.
Subject: Land Reclamation Status of Cluster-X mines, based on Satellite Data (RS-2/L4V) of the year 2018	Activity	Name	Designation	Signature	Date
	Prepared	A. Mandal	M.T (Geology)		
	Checked	Harikesital B	Sr. Mgr(System.)		
	Approved	R. Kumar	HOD(Geomatics)		
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	Drg No.	HQ/ REM/ 18/ 2/ A4/ 06			Rev No.0

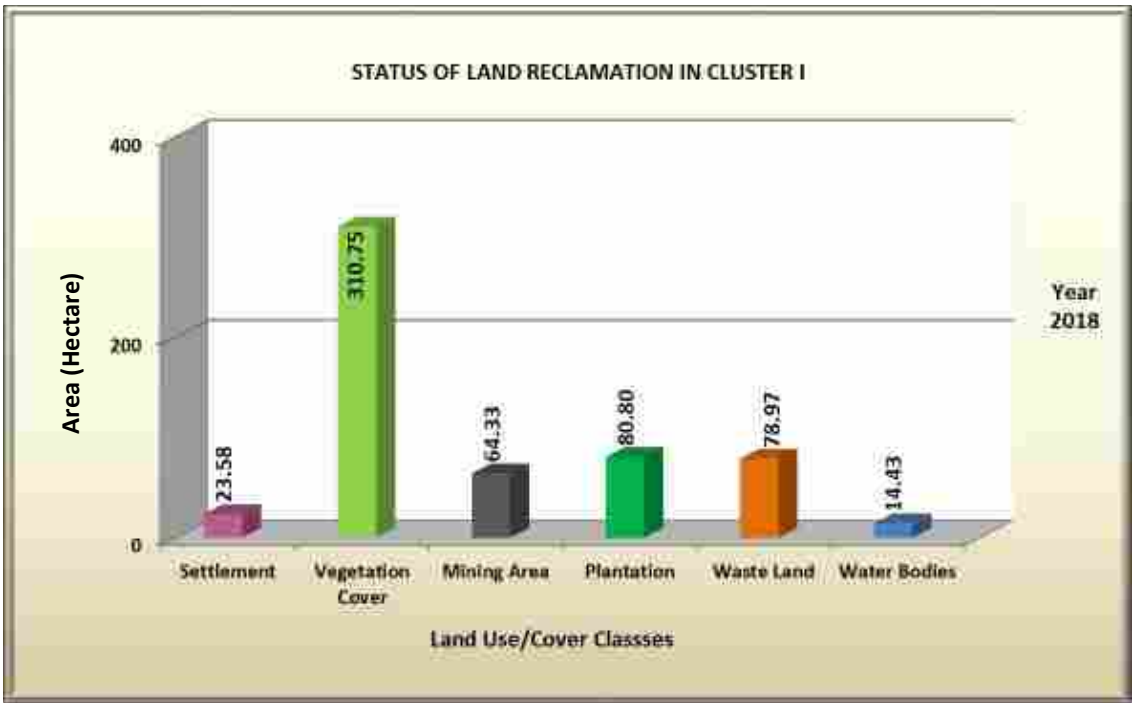


Fig. 3: Land Reclamation status of Cluster I

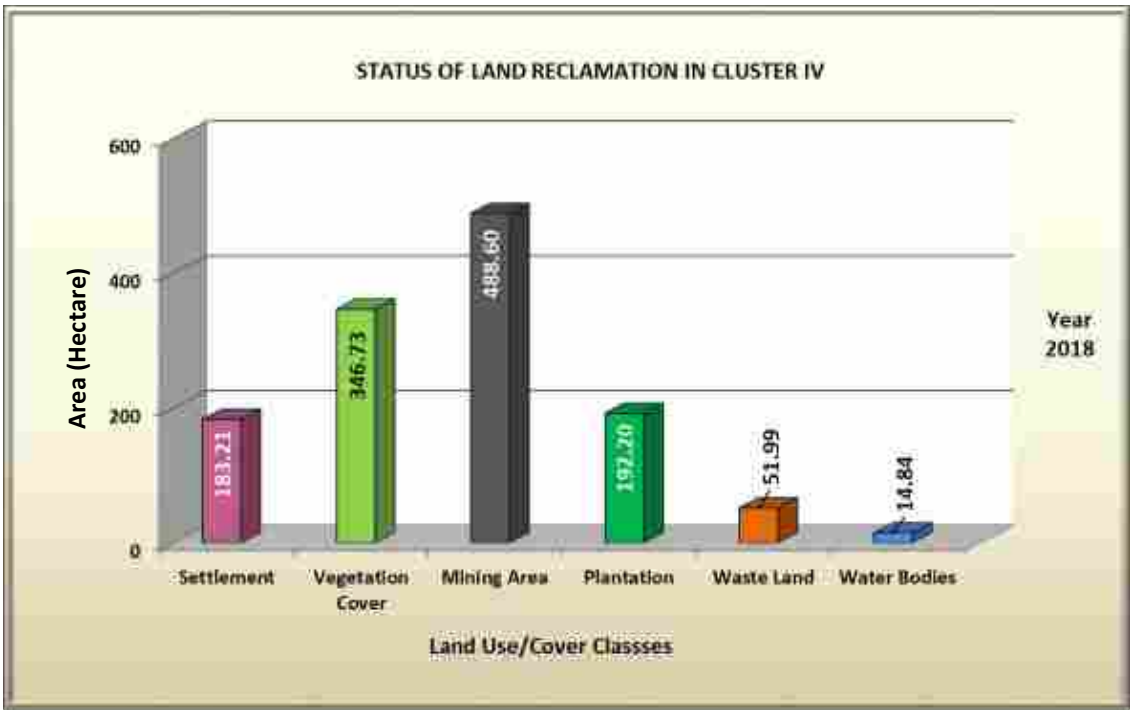


Fig. 4: Land Reclamation status of Cluster IV

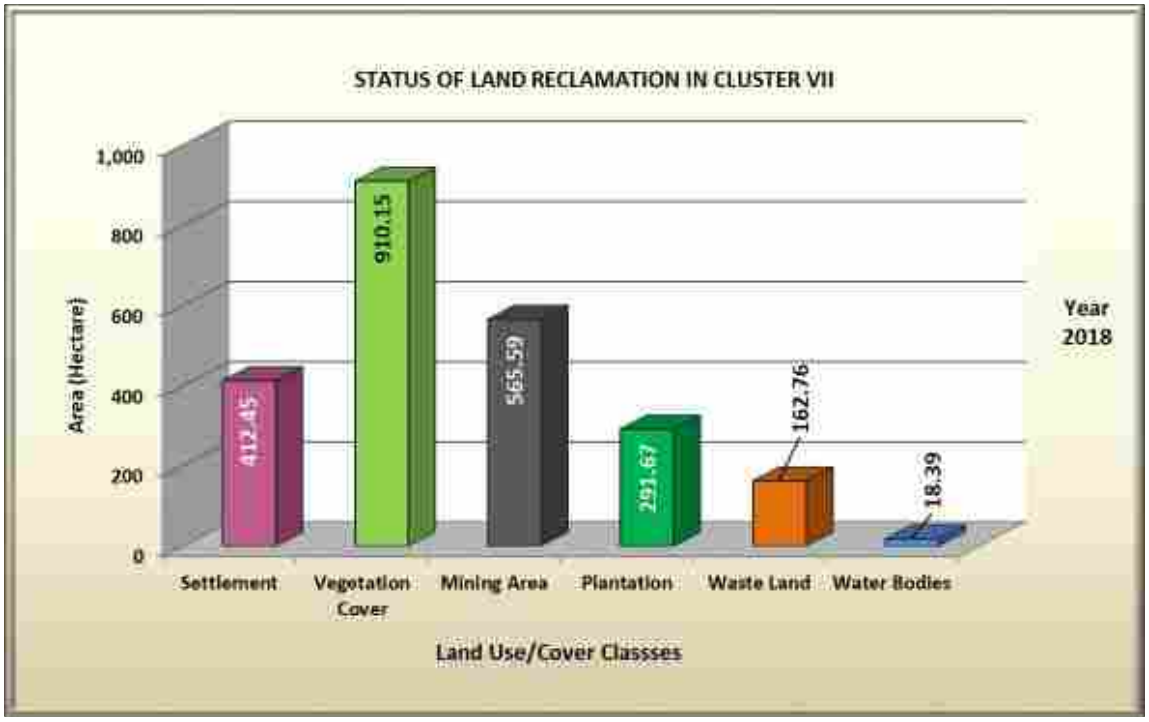


Fig. 5: Land Reclamation status of Cluster VII

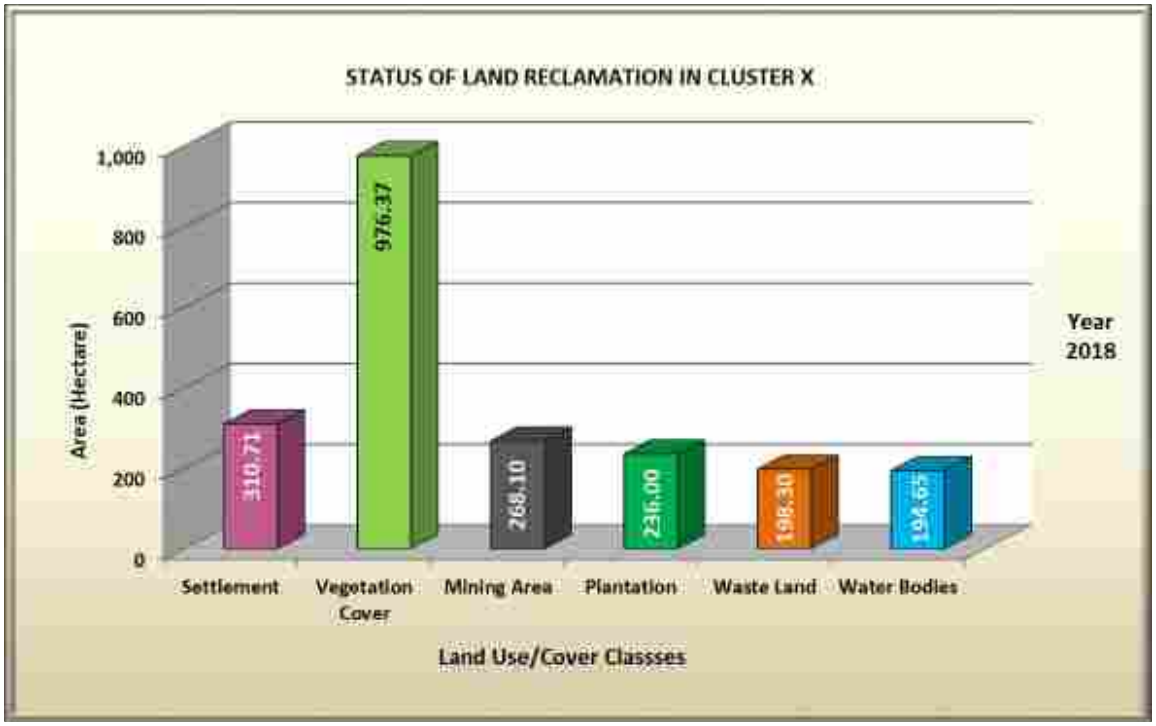


Fig. 6: Land Reclamation status of Cluster X



Photo 1: Ecological Restoration Site, Damoda Colliery, Cluster I



Photo 2: Ecological Restoration Site in Cluster IV



Photo 3: Ecological Restoration Site in Cluster VII



Photo 4: Plantation on OB in Cluster X

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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.

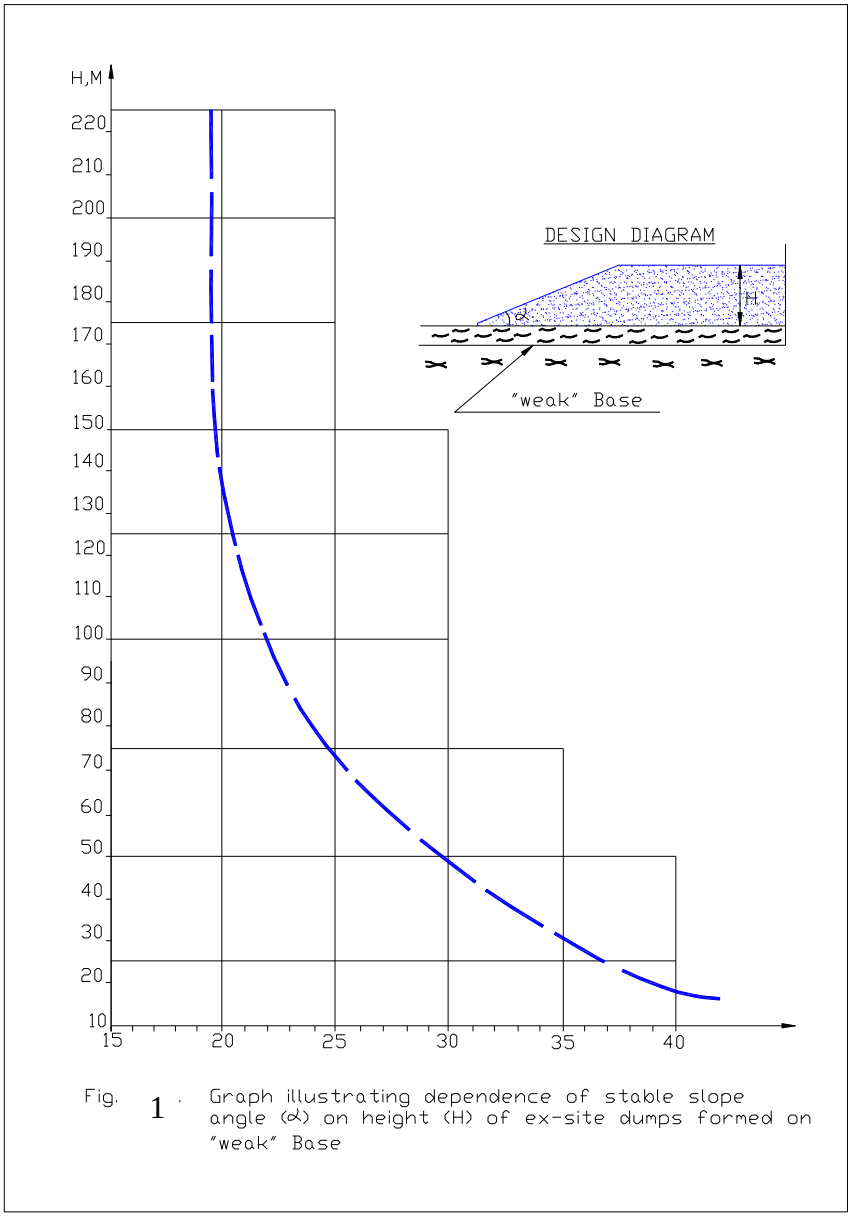


Fig. 1 . Graph illustrating dependence of stable slope angle (α) on height (H) of ex-site dumps formed on "weak" Base

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:

- To allow a productive and sustainable after-use of the site which is acceptable to the mine owner and the regulatory authority;
- To protect public health and safety;
- To alleviate or eliminate environmental damage and thereby encourage environmental sustainability;
- To minimize adverse socio-economic impacts.

12.2 DIFFERENT ASPECTS OF MINE CLOSURE PLANNING

The mine closure planning broadly involves the following aspects:

(a) Technical aspects;

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

- **Safety hazards including management of fire and subsidence**: In the mine closure plan, action for control of likely fire areas of the mines will be discussed.

  Action will also be suggested to cover all the safety aspects.

  Following steps will be taken as precaution against fire and subsidence while mining:-

  i. Panel size will be so designed so that depillaring with caving will be completed within the incubation period of the coal seam.
  ii. Panel will be isolated in proper fashion before depillaring takes place.
  iii. Surface will be properly dozed and leveled wherever there are cracks and fissures so that air does not breathe in through surface.

- **Management of Pit Slopes**: As per the available records, there are 8 nos. of small quarries in the area which are proposed to be filled upto the required depth. Hence after the closure of the mine, there is little likelihood of any slope failure.
- **Management of hydrology and hydro-geology**: In the mine closure plan, the surface flow pattern of precipitation and mine water would be clearly developed and water channel suitably laid down so that it does not disturb the general hydrology of the area.

  Mining operation may reduce the water table of the area. To recharge the water table, it is proposed that the mine water during operation will be discharged into surface water settling tank over flow of settled water from the tank will be used for water sprinkling, plantation, domestic purpose, etc. Therefore, the excess over flow water will be discharged into the nearby river. After closure of the mine vegetation will be grown on the entire vacant area.
- **Details of decommissioning of the infrastructures:** The decommissioning of the various infrastructures developed for the mine like office complex, roads, pipelines and transmission line etc. shall be planned in details so that the land occupied by these infrastructures are released. However, before such decommissioning, the possibility of re-use of these infrastructures for the neighbouring mines shall be explored.

- **Closure of entry to the open-cast mine:** Not applicable.

(b) Environmental aspects

This would include the following:

- **Management of final voids**: In the mine closure plan, voids due to mining are to be dealt and the final land use plan will include filling of the voids for land reclamation where possible and for hydro reclamation where feasible.

- **Reclamation of forests/vegetation:** It is to be ensured that in the final land use plan, all vacant land acquired for the project is afforested.

- **Channelisation of available water:** If the mine is having sufficient water and if on closure, the mine water flows into the surface water courses, channelising this water for surrounding community for their irrigational/domestic uses may be taken up. This can be planned by providing structures involving one time costing

- **Management of Recharge Areas**: The pre-mining and post mining scenario on the hydrogeological recharge system would be included in the closure plan.

- **Acceptable Surface and Ground Water Flows**: In the final closure plan of the mine, wherever the mine water is likely to flow out to surface and meet the surface water sources; the quality of water from such mines would be assessed and flow pattern designed in the final plan.

(c) Social aspects;

The social aspects of land use planning relating to mine closure would include the following:

- **Re-deployment of Workforce:** The company employees will be gainfully engaged in the neighbouring projects after cessation of mining activities.
- **Management of Community Facilities:** In view of the short life of the project no new community facility will be created. However, the existing facilities of adjoining areas will be strengthened.

(d) Financial aspects.

There are two types of Closure, namely, Progressive Mine Closure (Concurrent) and Final Mine Closure.

The Final Mine closure cost has to deal with the following:

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

12.3 MINE CLOSURE OBLIGATIONS

There is need to define the liabilities, responsibilities and authorities of the mine management, other regulatory bodies, Central and State Governments after mine closure. Some obligations relating to the Mine Management Companies are as follows:

(a) **Health & Safety:** Regulation Nos. 6, 61, 106, 112 of Coal Mines Regulations, 1957 and its related DGMS Circulars;

(b) **Environment :** Water (Prevention & Control of Pollution) Act, 1974; Air (Prevention & Control of Pollution) Act, 1981; Environmental (Protection) Act, 1986 and Environmental Protection (Amendment) Rule, 2000; DGMS Directives on Noise & Ground Vibration;

(c) **Forest:**
Forest (Conservation) Act, 1980.

(d) **Rehabilitation:**
CIL's policy, however, applicable for land oustees only.

(e) Decommissioning/asset disposal, etc**.**

12.4 IMPACT ASSESSMENT REMEDIAL MEASURES

Environmental Impact on Landscape, Water Source, air and noise pollution during mine life has been discussed earlier. It is imperative that the environmental monitoring may be continued for 3 years after closure of UG in order to assess corrective measures to be implemented to sustain pre-mining ecosystem and environment in the core and buffer zone (to the extent possible).

12.5 STAKEHOLDERS INVOLVEMENT

Various stakeholders effected due to mine closure need to be identified and they may be as follows:

The Company : Employees, Management & Stakeholders

The Community : Local business and service providers, landholders, neighbours and nearby residents, local Government and NGOs and Community Groups.

The State	:	The State Government. The Central Government and concerned Government Agencies.

There is need of regular consultations between the stakeholders to evolve the needs of the stakeholders and their involvement in the process.

12.6 CLOSURE ACTION PLAN

Closure planning is a whole-of-life exercise that begins at the start of a mine and continues till post-closure. The dynamic nature of closure planning requires regular and critical review to reflect changing circumstances as a result of any operational change, new regulation, and new technology and remain flexible enough to cope with unexpected events.

The following steps have to be undertaken in relation to Mine Closure Planning:

- Prior to the surface demolition/restoration a surface audit should be undertaken on all surface structures, spoil heaps, lagoons, etc. to assess whether there are any hazardous materials that could cause problems; viz. explosives, chemicals, etc. A list of surface assets should be prepared and made available to potential purchasers, prospective purchasers could be invited and asked to submit sealed bids, this could ensure that the sale of assets give better financial gain.
- In order to identify potential impact, necessary hydro-geological studies into post-mining ground water recharge have to be done.
- Work force on roll of BCCL may be re-deployed for gainful utilization in the same or other mines of BCCL.
- As a detailed component of the Closure Plan, a Decommissioning Plan is to be developed towards the final stages preferably 5 years prior to tentative closure of the mine. Once established, it may be updated annually.

12.7 PROTECTIVE MEASURES TO BE TAKEN

Protective measures must include the following:

- The protection of mine Entries , building and other structure on the project site against access by unauthorized persons;
- The maintenance of all mechanical, hydraulic and waste management system;
- The continuation of all monitoring programmes;
- The control of all contaminated effluents;
- The securing of all petroleum products, chemicals and waste
- The rendering of all tailings, dams and piles of earth, rock and waste resulting from work done on the project site in a stable and safe condition.

12.8 CLOSURE COSTS

As per MOC guidelines, a corpus escrow account @ ₹ 1.0 lakhs (August, 2009 Price Level) per Ha (for UG) and @ ₹ 6.0 lakhs (for OC) of the project area shall be opened with the coal controller organization to meet the expenses of mine closure. The current Guidelines read as:

"It has been estimated that typically closure cost for an opencast mine will come around Rs. 6.00 lakh per Hectare of the project area and it would be Rs. 1.00 lakh per Hectare for underground mine project area at current price levels (August, 2009) and these rates will stand modified based on Wholesale Price Index as notified by Government of India from time to time".

There is already a mine closure plan approved by the 305th BCCL Board, Dated 12.03.2014. According to the approved mine closure plan the total life of the mine was considered to be 13 years and total mine closure cost up to the considered life of the mine was calculated to be Rs 361.094 Lakhs. As per the directives Rs.112.46 Lakhs (Principal amount) were deposited in to the Escrow Account Number 150100009053 by 31st March 2017. **Further, the same escrow account shall be continued for AAR Colliery.**

A revised mine closure plan is prepared incorporating all the major current and proposed changes in the mining activities. As per the data furnished by the mine/area, the project area and leasehold area in respect of AAR Colliery differs and is given below and the closure cost is calculated accordingly. The mine closure cost for the revised mine closure plan is calculated in following way:

In AAR colliery, the existing leasehold area is 254.64 Ha. As per data furnished by the mine, the present Project area is 175.57 Ha excluding the area falling under DC Railway line, DB road and River and Barrier (79.07 Ha). **An area of 91.34 Ha is required for opencast operations** in the leasehold of AARC. Based on the land use of TOR, 64 Ha is abandoned, not backfilled quarry. However, as per the data furnished by the mine/area, only **1.56 Ha** of the Project Area is now abandoned quarry which is not backfilled at present. **Thus, out of the project area of 175.57 Ha, 92.90 (91.34+1.56) Ha area has been considered for the calculation of closure cost as per Open cast norms and the remaining 82.67 Ha has been considered for the calculation of closure cost of the area as per Underground norms.**

The overlapping area (where UG & OC operations have been done in different vertical levels) has been considered for calculation of closure cost as per opencast norms.

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

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

12.11.1 Thus, total amount that shall be further deposited for mine closure activities of **AAR Colliery** in case of underground workings during the considered period of 21 years stands out to be **₹ 64.83 lakhs** and in case of opencast workings during the considered period of 8 years stands out to be **₹ 903.250 lakhs** as per the present status of the mine.

Table No. 12.1 Break-Up cost of Mine Closure of AAR Colliery

Year	UG Section	OC Section	Total
1	1.815	95.45	97.265
2	1.906	100.223	102.129
3	2.001	105.234	107.235
4	2.101	110.496	112.597
5	2.206	116.02	118.226
6	2.316	121.821	124.137
7	2.432	127.912	130.344
8	2.554	134.308	136.862
9	2.682		2.682
10	2.816		2.816
11	2.956		2.956
12	3.104		3.104
13	3.259		3.259
14	3.422		3.422
15	3.594		3.594
16	3.773		3.773
17	3.962		3.962
18	4.160		4.16
19	4.368		4.368
20	4.586		4.586
21	4.816		4.816
	64.830	**911.464**	**976.294**

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

Table No. 12.2 Total Amount available for Mine Closure Activities of AAR Colliery

	Amount (in ₹ lakhs)	
	UG Section	**OC Section**
Amount Already Deposited in Escrow Account	79.958	32.500
Amount to be Deposited in the Escrow Account in the Future	64.830	911.464
Total Amount available for Mine Closure Activities	**144.788**	**943.964**

12.11.2 Based on the existing mine closure planning norms, the above calculated cost at Final WPI of January 2017 on mine closure may be tentatively grouped under different heads as given in Table No. 12.3 A and 12.3 B for underground and opencast respectively, as per guidelines of CMPDI(HQ).

Table 12.3 A Break up costs of Mine Closure Activities for AAR Colliery (Underground)

Sl. No.	Activity	Mine Closure Cost (₹ in Lakhs)
A	**Dismantling of Structures**	
	Service Buildings	5.068
	Residential Buildings	15.319
	Industrial Structures like CHP, Workshop, field sub-station, cap lamp room, haulage, fan installation etc.	9.165
B	**Permanent Sealing of mine entries(incline mouth and air shaft)**	
	Sealing of incline mouths and air shafts	7.703
C	***Subsidence Management**	6.877
D	**LANDSCAPING**	
	Landscaping of the cleared land for improving its esthetic	12.741
E	***Plantation**	
	Plantation over the cleared area obtained after dismantling and on other barren spaces	18.822
F	**Monitoring/Testing of parameters for three years**	
	Air Quality	9.889
	Water Quality	9.180
G	***Enterpreneuship Development(Vocational/skill development training for sustainable income of affected people**	11.076
H	***Miscellaneous and other mitigative measures**	21.139
I	**Manpower Cost for Supervision**	17.809
	TOTAL	**144.788**

Note: * : To be covered under Progressive Mine Closure activities also

Table 12.3 B Break up costs of Mine Closure Activities for AAR Colliery (Opencast)

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

Note: * : To be covered under Progressive Mine Closure activities also

12.8.3 Progressive Closure Costs

The break up costs of Progressive Closure Activities undertaken by BCCL in AAR Colliery as per earlier approved Mine Closure Plan is given in the following table:

Table 12.4 Break up costs of Mine Closure Activities for AAR Colliery (earlier approved) and Expenditure incurred during Progressive Closure Activities

Sl. No.	Activity	Mine Closure Cost (₹ in Lakhs)	Amount Claimed (Lakhs) (2014-15)	Amount Claimed (Lakhs) (2015-16)
A	**Dismantling of Structures**			
	Service Buildings	11.501		4.2
	Residential Buildings	34.765		
	Industrial Structures like CHP, Workshop, field sub-station, cap lamp room, haulage, fan installation etc.	20.8		
B	**Permanent Sealing of mine entries(incline mouth and air shaft)**			
	Sealing of incline mouths and air shafts	17.481		
C	**Subsidence Management**	15.608	2.69877	2.55357
D	**LANDSCAPING**			
	Landscaping of the cleared land for improving its esthetic	28.916		66.08629
E	**Plantation**			
	Plantation over the cleared area obtained after dismantling and on other barren spaces	42.717		
F	**Monitoring/Testing of parameters for three years**			
	Air Quality	22.443		
	Water Quality	20.833		
G	**Enterpreneuship Development(Vocational/skill development training for sustainable income of affected people**	25.137	74.94412	8.69345
H	**Miscellaneous and other mitigative measures**	47.975		
I	**Manpower Cost for Supervision**	40.417		
J	**Reclamation of Abandoned Quarry**	32.5		
	TOTAL	**361.094**	**77.64289**	**81.53331**

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

CHAPTER - XII

PROGRESSIVE AND FINAL MINE CLOSURE PLAN

12.0 MINE CLOSURE PLANNING

12.1 OBJECTIVES OF CLOSURE PLANNING

Mine closure planning has to be carried out at the starting of the mine and needs periodic reviewing and revision during its life cycle to cope with the geo-technical constraints, safety and economic risks, social and environmental challenges. Various other objectives are as follows:

- To allow a productive and sustainable after-use of the site which is acceptable to the mine owner and the regulatory authority;
- To protect public health and safety;
- To alleviate or eliminate environmental damage and thereby encourage environmental sustainability;
- To minimize adverse socio-economic impacts.

12.2 DIFFERENT ASPECTS OF MINE CLOSURE PLANNING

The mine closure planning broadly involves the following aspects :

(a) Technical aspects;

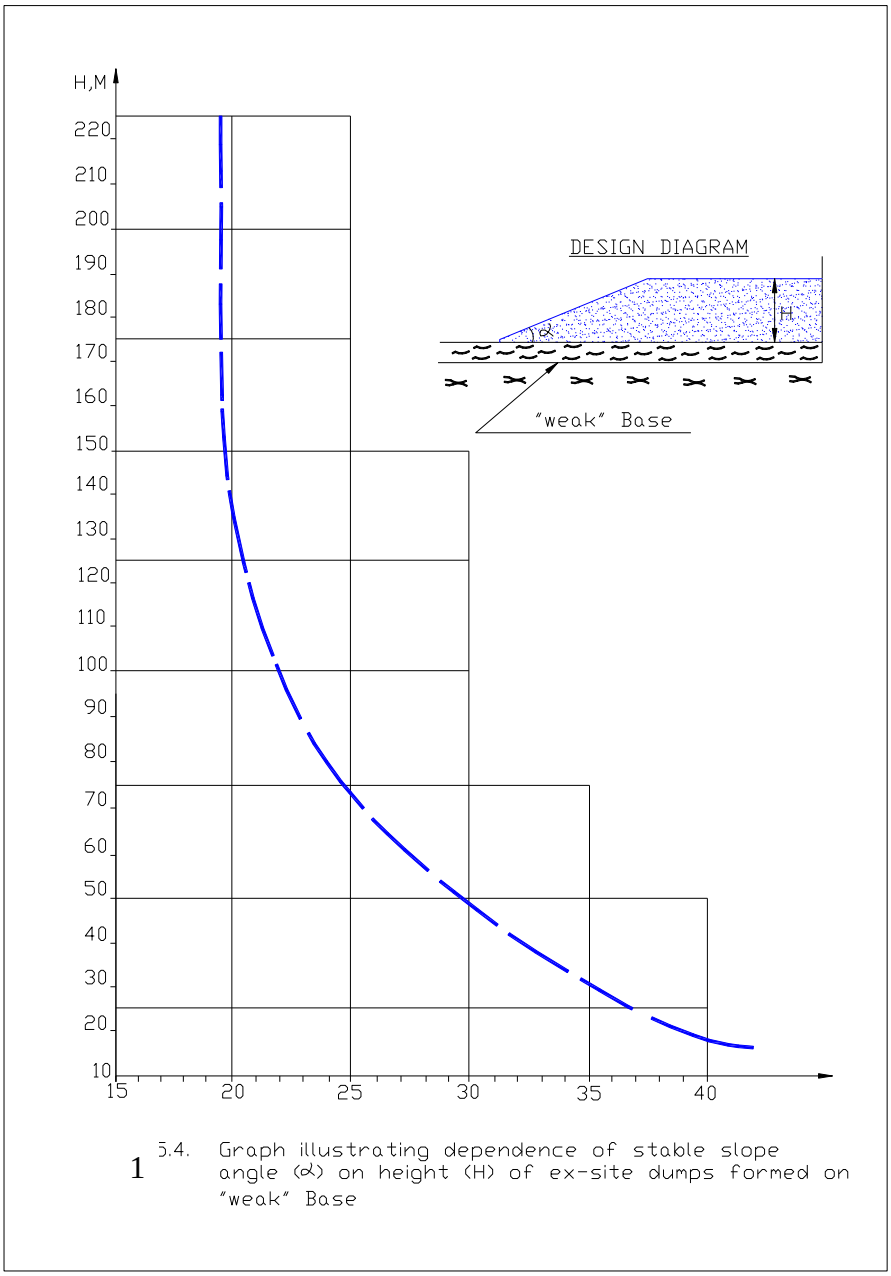
The following technical aspects would be reviewed in the final mine closure planning. Details can be worked in closure plans envisaged to be prepared.

Safety hazards including management of fire and subsidence: In the mine closure plan, action will be taken to cover all the safety aspects including management of fire & subsidence and mine inundation.

Management of Pit Slopes: During operation of the mine, overall slope will be maintained at an angle not exceeding 22^0-28^0. Vegetation cover will also be provided along the slopes to arrest any failure.

As regards stability of back-filled dumps, the final level of reclaimed backfill will be matched with the levels of surrounding areas leaving a final residual void which will serve as a lagoon which may be utilised as water reservoir for the locality.

During operation, the external and internal OB dump will be developed with 40 m berm width and maximum height of 60m in case of external OB dump and the overall dump slope shall not exceed 22 to 28 degrees. The waste dumps will be provided with toe wall and garland drains. The dump will be technically reclaimed and vegetation will be grown after spreading the top soil. The above measures will prevent slope failure and improve the aesthetic value.



1 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 - XII

PROGRESSIVE AND FINAL MINE CLOSURE PLAN

12.0 MINE CLOSURE PLANNING

12.1 OBJECTIVES OF CLOSURE PLANNING

As discussed at the outset, this Mining Plan deals with the working of OC Patch-A only. The project area for OC Patch-A is 83.72 Ha. which covers 49.60 Ha of excavation area and other area of about 34.12 Ha for OB Dump, coal Dump etc. After exhaustion of extractable reserve of OC Patch-A, the mine will be left with enough extractable reserve to carry out mining operation in future as per the production requirement of the Mine. As such, the mine will not finally be closed after exhaustion of OC Patch-A. The final Closure Plan of Katras Choitodih Colliery will be prepared when Mining Plan for all the seams is prepared. However, essential activities required to make area safe during extraction and after exhaustion of OC Patch-A has been discussed in this chapter.

Mine closure planning has to be carried out at the starting of the mine and needs periodic reviewing and revision during its life cycle to cope with the geo-technical constraints, safety and economic risks, social and environmental challenges. Various other objectives are as follows:

- To allow a productive and sustainable after-use of the site which is acceptable to the mine owner and the regulatory authority;
- To protect public health and safety;
- To alleviate or eliminate environmental damage and thereby encourage environmental sustainability;
- To minimize adverse socio-economic impacts.

12.2 DIFFERENT ASPECTS OF MINE CLOSURE PLANNING

The mine closure planning broadly involves the following aspects:

(a) Technical aspects;

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

- **Safety hazards including management of fire and subsidence**:

In the mine closure plan, action for control of likely fire areas of the mines will be discussed.

Action will also be suggested to cover all the safety aspects.

- **Management of Pit Slopes**:

As per the available records, there are 8 nos. of small quarries in the area. Some of the abandoned quarries are already filled/ party filled. The partly filled quarries are proposed to be filled upto the required depth. Hence after the closure of the OC Patch-A, there is little likelihood of any slope failure.

- **Management of hydrology and hydro-geology**:

In the mine closure plan, the surface flow pattern of precipitation and mine water would be clearly developed and water channel suitably laid down so that it does not disturb the general hydrology of the area.

Mining operation may reduce the water table of the area. To recharge the water table, it is proposed that the mine water during operation will be discharged into surface water settling tank over flow of settled water from the tank will be used for water sprinkling, plantation, domestic purpose, etc. Therefore, the excess over flow water will be discharged into the nearby river. After closure of the mine, vegetation will be grown on the entire vacant area.

- **Details of decommissioning of the infrastructures:**

The decommissioning of the various infrastructures developed for the mine like office complex, roads, pipelines and transmission line etc. shall be planned in details so that the land occupied by these infrastructures are released. However, before such decommissioning, the possibility of re-use of these infrastructures for the neighbouring mines shall be explored.

- **Closure of entry to the open-cast mine:**

The exposed/excavated area of the proposed open cast shall be back filled as far as possible. The area at the final stage that remains unfilled will be converted into water pond with regulated entry to this pond. The edge of the water pond shall be properly fenced to guard against inadvertent entry of stray animals. The pond water may be used for domestic requirement or for fishery.

(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 with and the final land use plan will include filling of the voids for land reclamation where ever possible and for hydro reclamation where ever 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 at Katras Choitodih Colliery.

- **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 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 a 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 R&R 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 the mine 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 from beginning of the project 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 changing requirement of mine.

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/prospective purchasers so that they could be invited and asked to submit sealed bids in this regard. This could ensure sale of assets yielding 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 structures on the project site/mine premises 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;
- 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

12.8.1 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 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 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.

There is already a mine closure plan for Katras Choitodih Colliery approved by the 312th BCCL Board, Dated 13.12.2014. As per the approved Mine Closure Plan, the total life of the mine was considered to be 23 years and total mine closure cost up to the considered life of the mine was calculated to be Rs 3402.219 Lakhs. As per the directives, Rs 168.34 Lakhs has been deposited in to the Escrow Account Number 150100010086 by the year 2016.

Further, the same escrow account shall be continued for Katras Choitodih Colliery and the amount already accrued shall be adjusted against the new closure cost calculated.

A modified Mine Closure Plan for Katras Choitodih Colliery (Recast) is being prepared incorporating all the major changes in the mining activities of the mine. The mine closure cost for Katras Choitodih Colliery (Recast) is calculated in following way:

The existing leasehold area of Katras Choitodih Colliery is 228 Ha. Out of total area of 228 Ha, only 83.72 Ha pertaining to mining of OC Patch-A has been considered as project area for the calculation of mine closure cost as per Open cast norms.

As the underground section of Katras Choitodih Colliery is currently not in operation, therefore, it is not considered in the project area.

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

12.8.2 As per the guidelines for calculation of closure cost, the rates will stand modified based on Whole Sale Price Index (WPI) as notified by Government of India from time to time. Thus the total expenditure on this front has been calculated in following manner:

- The total amount for mine closure activities in respect of Katras Choitodih Colliery = 83.72 Ha X `6 Lakh X 1.41667 = ` 711.62 lakhs

*** The amount has been escalated based on WPI (Final/actual) of October 2016 (183.6) vis-à-vis WPI of August '09 (129.6).**

12.8.3 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."*

Jharia Coalfield is characterized by occurrence of a number of working coal horizons, giving a leverage of extended working life of the mines. Some more seams can come in the lap of workable horizons due to improvement in mining technology in times to come. The underground mines in leasehold of

JCF are generally small capacity mines, giving a false impression of very long lives due to small level of current production level. There may be a strategy in future to amalgamate the mines for higher production level to attain the economics of scale. The existing OC Mines working at shallow depth may be worked upto a greater depth in future. In such a situation, the life of the mine arrived at with current level of production for the balance reserve may not be correct in the long run. **In such a situation, it is envisaged that a Revised Mine Closure Plan should be prepared as per relevant guidelines and submitted for approval of the competent authority as per the requirement.**

At present UG production from Katras Choitodih Colliery is kept under suspension (since 15.06.2012) on account of safety concerns (waterlogged overlying seams within 60 m) .The mine was being worked in VIIIA seam through 5 Pit @ 200 TPD with 2 SDLs at the time of production suspension. The production from OC Patch-A has been started since Feb. 2015. The normative production capacity of OC Patch-A was 0.5 MTY and the life was for 6 years. In 2014-15, there was no coal production from the patch and only OB removal was done. However, the coal production during 2015-16 and 2016-17 (upto dec. 2016) was 0.581 and 0.375 MT respectively. Thus, the balance life of the mine is 4 years.

12.8.4 As per the data available from the mine, ` 168.34 lakhs has already been accrued in the escrow account. This amount has been considered to arrive at the balance amount to be deposited in the Escrow Account of Katras Choitodih Colliery. Thus, the balance amount required to be deposited will be ` 711.62 lakhs - ` 168.34 lakhs = ` 543.28 lakhs.

To arrive at the annual cost to be deposited in each year in an escrow account, **the mine closure cost for OC Patch-A** has been divided by 4. The annual closure cost for subsequent years are as given follows:

- Amount to deposited in 1st year will be the--- ` 135.82 lakhs
- Amount to be deposited in 2nd year will be— ` 135.82 (1 + 5%)^1 lakhs
- Amount to be deposited in nth year will be---- ` 135.82 (1 + 5%)^(n-1) lakhs

12.8.5 Thus, total Mine closure cost has been arrived at by adding existing amount available (` 168.34 lakhs) in Escrow Account and additional amount ( `**585.40** lakhs**)** to be deposited in phased manner. The total amount for final mine closure activities of **Katras Choitodih OC Patch-A** thus estimated is ` **753.74** lakhs**.**

The year-wise phasing of closure cost of Katras Choitodih Colliery is as below:

Year	**Amount (` in lakhs)**
Amount deposited for the year 2014-15 and 2015-16.	168.34
1St Year	135.82

2ND Year	142.61
3RD Year	149.74
4TH Year	157.23
Total	**753.74**

12.8.6 Based on the existing mine closure planning norms, the above calculated cost at WPI of Oct. 2016 on mine closure may be tentatively grouped under different heads as given in Table No. 12.1 as per the guidelines of CMPDI(HQ), Ranchi.

Table No. 12.1

Break up of Cost of Mine Closure of Katras Choitodih Colliery (Recast)

(OC Patch-A)

Sl. No.	Activity	Mine Closure Cost (` in Lakhs)
A	**Dismantling of Structures**	
	Service Buildings	1.51
	Residential Buildings	20.12
	Industrial Structures like CHP, Workshop, field sub-station, etc.	2.26
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	11.31
C	**Grading of Highwall slopes**	
	Levelling and grading of highwall slopes	13.34
D	***OB Dump Reclamation**	
	Handling/Dozing of external OB Dump into mine void	668.27
	Bio-Reclamation including soil spreading, plantation and maintenance	3.01
E	***LANDSCAPING**	
	Landscaping of the cleared land for improving its esthetic	2.26
F	***Plantation**	
	Plantation over area obtained after dismantling	3.77
	Plantation around fencing	1.51
	Plantation over the cleared external OB Dump	0.15
G	**Monitoring/Testing of parameters for three years**	

Sl. No.	Activity	Mine Closure Cost (` in Lakhs)
	Air Quality	1.66
	Water Quality	1.51
H	***Entrepreneurship Development(Vocational/ skill development training for sustainable income of affected people**	1.96
I	***Miscellaneous and other mitigative measures**	15.07
J	**Manpower Cost for Supervision**	6.03
	TOTAL	**753.74**

Note: *: To be covered under Progressive Mine Closure activities also

12.8.7 Thus, total amount that shall be deposited for final mine closure activities **Katras Choitodih Mine (Recast)** during the period of 4 years has been estimated as ` **585.40 lakhs**.

12.8.8 *The break up costs of Progressive Closure Activities undertaken by BCCL in Katras Choitodih Colliery is shown the following table:*

Table 12.2

Break up costs of Mine Closure Activities for Katras Choitodih Colliery and Expenditure incurred during Progressive Closure Activities (As per data furnished from BCCL)

Sl. No.	Activity	Total Expenditure (Lakhs) (2014-15)	Total Expenditure (Lakhs) (2015-16)
A	Dismantling of infrastructure	0	0
	service building	8.70603	0
	Residential building	0	0
	Industrial structure CHP,W/S, substation	0	0
B	Permanent fencing	0	0
C	levelling & grading of highwall slopes		
D	OB dump reclamation	0	0
	Handling/dozing of OB dump & Backfilling	0	0
	Handling/dozing of OB dump & Backfilling	0	0
	Technical and bio reclamation including plantation and post care		
E	Landscaping	0	0
	Landscaping of open space in LH area for improving aesthetics and eco values		
F	Plantation	0	0
	Plantation over cleared area obtained after dismantling	0	0

Sl. No.	Activity	Total Expenditure (Lakhs) (2014-15)	Total Expenditure (Lakhs) (2015-16)
	Plantation around quarry area and in safety zone	0	0
	Plantation over external OB dump		
G	Post closure Environment monitoring	0	0
	Air Quality	0	0
	Water Quality	0	5.745
H	Entrepreneurship development for sustainable income of affected people	0	0
	Sub-Total(OC Part)	0	0
	GRAND TOTAL	**8.70603**	**5.745**

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 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

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POLLUTION UNDER CONTROL CERTIFICATE

Govt. Of Jharkhand
Transport Dep.

Licence No.: 590/ 2017
ALL INDIA VALID

Computerized Emission Test Certificate
(Rule 163E (6) of BMV Rule 1992)

RUDRA ENTERPRISES

JAMUATAND, HIRAK ROAD, BAGHMARA, DHANBAD(JH) 18-SEP-2019

Puccno: A-590/2017029526
Reg No.: JH 10AH 3209
Make: TATA
Model: TIPPER

Reg. Year : 05 JAN 2013
Fuel : DIESEL
Eng. No.: NA
Chasis No: NA

Test Date : 00:00:00
Test Time :
Category : GOODS CARRIER (HGV)



FLUSH	CYCLE			
		AVERAGE		
	RPM Min	RPM Max	Oil Temp	
	910	W	78	
		DETAILS		
RPM Min	RPM Max	Temp	HSU	K Value
870	4880	9	52.93	1.75
940	4890	65	57.08	1.97
920	4890	69	50.63	1.64
MEAN			53.66	1.78
RESULT				

नियंत्रित प्रदूषण
प्राधिकृत
Valid upto 17-MAR-2020
जमुआटांड़ धनबाद (झारखण्ड)
परिवहन विभाग, झारखण्ड सरकार

This vehicle meets the standard prescribed by rule 115 (2) of central Motor Vehicle Rule 1989.
This Cetificate is valid for six Months only.

Seal of Testing Centre

Test Station Code : 590/2017

Authorized Signatory

Scanned by CamScanner

POLLUTION UNDER CONTROL CERTIFICATE

Govt Jharkhand
Transport Dep.

Computerized Emission Test Certificate
(Rule 163E (6) of BMV Rule 1992)

Licence No.: 590/ 2017
ALL INDIA VALID

RUDRA ENTERPRISES
JAMUATAND, HIRAK ROAD, BAGHMARA, DHANBAD(JH)

20-JUN-2019
00:00:00

Puccno: A-590/20170000[illegible]
Reg No.: JH 10AN 9675
Make: TATA
Model: LPK 2518 TIPPER

20 MAR 2014

Reg. Year :
Fuel : DIESEL
Eng. No.: NA
Chasis No:

Test Date :
Test Time :
Category : GOODS CARRIER (HGV)



19 DEC 2019

FLUSH	CYCLE			
		AVERAGE		
	RPM Min	RPM Max	Oil Temp	
	910	4910	78	
		DETAILS		
RPM Min	RPM Max	Temp	HSU	K Value
870	4880	69	52.93	1.75
940	4890	65	57.08	1.97
920	4890	69	50.63	1.64
MEAN			53.66	1.78
RESULT				

Valid upto :
This vehicle meets the standard prescribed by rule 115 (2) of central Motor Vehicle Rule 1989.
This Cetificate is valid for six Months only.

Details of Testing Centre

Test Station Code : 590/2017

Authorized Signatory

Scanned by CamScanner

POLLUTION UNDER CONTROL CERTIFICATE

Govt. Of Jharkhand
Transport Dep.

Computerized Emission Test Certificate
(Rule 103E (6) of BMV Rule 1992)

Licence No : 590/ 2017
ALL INDIA VALID

RUDRA ENTERPRISES

A-590/20170002404 AMUATAND, HIRAK ROAD, RAGHMARA, DHANBAD(JH) 16-JUL-2019
27-SEP-2016 00:00:00

ucene: JH 10BB 2322 Reg. Year : DIESEL Test Date : GOODS CARRIER (HGV)
eg No.: TATA MOTORS LTD Fuel : NA Test Time :
ake: LPK 2518 TIPPER Eng. No. : NA Category :
odel : Chasis No : NA



FLUSH	CYCLE			
		AVERAGE		
	RPM Min	RPM Max	Oil Temp	
	910	4910	78	
		DETAILS		
RPM Min	RPM Max	Temp	HSU	K Value
870	4880	69	52.93	1175
940	4890	65	57.08	1197
920	4890	69	50.63	1164
MEAN			53.66	1178
RESULT				

15-JAN-2020

lid upto :
is vehicle meets the standard prescribed by rule 115 (2) of central Motor Vehicle Rule 1989.
is Cetificate is valid for six Months only.

ils of Testing Centre

Test Station Code : 590/2017

Authorized Signatory

Scanned by CamScanner

POLLUTION UNDER CONTROL CERTIFICATE

Govt. of Jharkhand
Transport Dep.

Computerized Emission Test Certificate
(Rule 163E (6) of BMV Rule 1992)

License No.42 /2018
ALL INDIA VALID

KATRAS POLLUTION TESTING CENTRE

NAYA MORE, TETULMARI, SIJUA (JH)

Puccno:	42/201800001810	**Reg. Year:**	2013	**Test Date:**	01:35 PM
Reg. No:	JH10AJ 0359	**Fuel:**	DIESEL	**Test Time:**	29-7-2019
Make:	TATA MOTORS	**EngNo:**	07672	**Owner Name:**	GOPAL KUMAR CHOUDHARY
Model:	LPK 2518	**ChassisNo:**	01403		
Category:	TIPPER	**Engstroke:**			



FLUSH	CYCLE			
		AVERAGE		
	RPM Min	RPM Max	Oil Tmp	
	0910	2200	72	
		DETAIL		
RPM Min	RPM Max	Temp	HSU	K value
940	2220	60	33.09	0.93
930	2190	62	33.39	0.94
940	2210	62	29.71	0.82
MEAN			32.06	0.90
RESULT		PASS		

Valid upto: 28-1-2020 **Result: Pass**

This vehicle meets the standard prescribed By Rule 115(2) of Central Motor Vehicle Rule 1989.

This Certificate is valid for Six Months only.

प्राधिकृत
मे० कतरास पॉल्यूशन
टेस्टिंग सेन्टर
42/2018
नया मोड़ तेतुलमारी,
सिजुआ, जोगता धनबाद
(झारखण्ड)
परिवहन विभाग, झारखण्ड सरकार

★ Seal of Testing Centre ★

Test Station Code:42/2018

Ravindra Nath.
Authorized Signatory

Scanned by CamScanner

POLLUTION POLLUTION FREE INDIA

UNDER CONTROL HEALTHY INDIA

ALL INDIA VALID

Lic No.383/18-1967 परिवहन विभाग झारखंड सरकार

TRANSPORT DEPARTMENT

Govt of Jharkhand

Vehicle No. JH02AE 6241

Type of Vehicle Othersheeler

ABHA POLLUTION TESTING CENTRE ★ POLLUTION UNDER CONTROL ★ Baramuri, Hirak Road, Dhanbad

DATE OF ISSUE 28 Aug 2019

VALID UPTO 27 Feb 2020

प्रपत्र पी.सी.

झारखंड मोटर वाहन नियमावली, 2001 के नियम 252 च देखें।

प्रदूषण नियंत्रण के अन्तर्गत प्रमाण–पत्र

प्रदूषण स्तर प्रमाण पत्र

VEHICLE PASSED



SL No: 735

लाइसेंस संख्या 383/18-1967

क्रम संख्या : JH0002019735

वाहन संख्या JH02AE 6241

पंजीकरण के वर्ष 2014

ओडोमीटर नंबर .

ईंधन : DIESEL

तारीख 28 Aug 2019

समय : 3:37:04 PM

वाहन का प्रकार : Othersheeler

वाहन का स्ट्रोक : 4 Stroke

बनावट TATA MOTOR

माडेल LPK 2518

इंजन संख्या 63402700

चेसिस नंबर : 1K17982

ग्राहक का नाम : NIRANJAN KUMAR

ग्राहक का पता : S/O SURESH RAM TETULMARI MAINEING HOSTAL, CHHOTANAGRI,DHANBAD,JHARKHAND

Flush Mean	Flush Min Rpm	Max Rpm			
	0754	2787			
Trial	Min Rpm	Max Rpm	K Val	Hsb	Oil Temp
1	757	2806	1.82	54.28	70
2	779	2859	2.13	59.58	70
3	803	2792	1.37	44.52	69
4	763	2992	1.64	52.69	69
5	757	3011	1.21	40.57	72
6	778	3037	1.18	39.79	72
7	768	3034	1.23	41.05	72
8	772	2859	1.21	40.57	72
9					
10					
11	RESULT=	PASSED			
12		Avg	1.21	40.50	

ग्रेड

परीक्षण शुल्क

समाप्ति तिथि 27 Feb 2020

इस वाहन केंद्रीय मोटर वाहन नियम 1989 के नियम 115 (2) के तहत निर्धारित उत्सर्जन मानकों को परा करती है.

परीक्षण स्टेशन की मुहर

अधिकृत हस्ताक्षरकर्ता

नोट: यह प्रमाण पत्र निर्गत की तिथि से छ: माह तक वैध है।

ALL INDIA VALID

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Govt. of Jharkhand
Transport Dep.

POLLUTION UNDER CONTROL CERTIFICATE

Computerized Emission Test Certificate (Rule 16.1C (6) of BMV Rule 1992)

License No:42 /2018

ALL INDIA VALID

KATRAS POLLUTION TESTING CENTRE

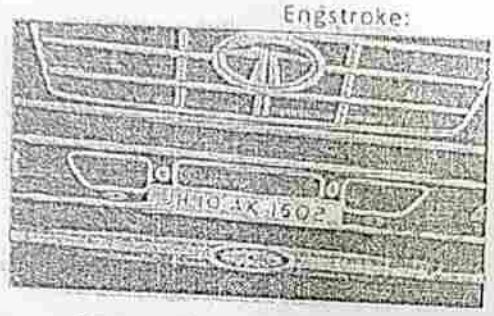
NAYA MORE, TETULMARI, SIUDIH

Puccno:	42/2018000001581	Reg. Year:	2013
Reg. No:	JH10AK1502	Fuel:	DIESEL
Make:	TATA MOTORS	EngNo:	18570
Model:	LPK 2518	ChassisNo:	04019
Category:	TIPPER	Engstroke:	

Test Date: 07:08 PM 25-10-2018

Test Time:

Owner Name: GOPAL CHOUDHARY



24-04-2020

FLUSH CYCLE				
	AVERAGE			
	RPM Min	RPM Max	Oil Tmp	
	0870	4520	55	
	DETAIL			
RPM Min	RPM Max	Temp	HSU	K value
830	4570	54	19 39	0 59
830	4600	54	21 50	0 57
820	4600	52	24 25	0 65
MEAN			21 75	0 57
RESULT		PASS		

Test Fee - 150

Valid upto:

Result: Pass

This vehicle meets the standard prescribed By Rule 115(2) of Central Motor Vehicle Rule 1989.

This certificate is valid for Six Months only.

Seal of Testing Centre

Test Station Code:42/2019

Authorized Signatory

Scanned by CamScanner

POLLUTION UNDER CONTROL CERTIFICATE

Govt. of Jharkhand
Transport Dep.

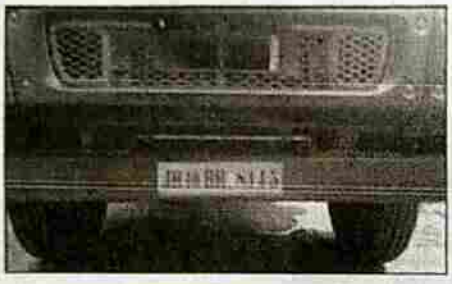
Computerized Emission Test Certificate
(Rule 163E (6) of BMV Rule 1992)

License No.42 /2018
ALL INDIA VALID

KATRAS POLLUTION TESTING CENTRE

NAYA MORE, TETULMARI, SIJUA (JH)

Puccno:	42/201800002142	**Reg. Year:**	2018	**Test Date:**	10:33 AM
Reg. No:	JH10BR 8145	**Fuel:**	DIESEL	**Test Time:**	16-10-2019
Make:	TATA MOTORS	**EngNo:**	41049	**Owner Name:**	RAJENDRA PRASAD MAHATO
Model:	2518 CRE BS IV	**ChassisNo:**	25217		
Category:	TIPPER	**Engstroke:**			



FLUSH	CYCLE			
		AVERAGE		
	RPM Min	RPM Max	Oil Tmp	
	0680	2300	50	
		DETAIL		
RPM Min	RPM Max	Temp	HSU	K value
700	2330	69	29.25	0.80
720	2320	67	28.16	0.77
690	2290	68	30.58	0.85
MEAN			29.33	0.81
RESULT		PASS		

Valid upto: 15-4-2020 **Result:** Pass

Test Fee - 300

This vehicle meets the standard prescribed By Rule 115(2) of Central Motor Vehicle Rule 1989.

This Certificate is valid for Six Months only.

Seal of Testing Centre

Test Station Code:42/2018

Authorized Signatory

Scanned by CamScanner

POLLUTION UNDER CONTROL

DATE OF ISSUE
20/06/2019

VALID UP
20/12/2019

Sl. No..... 1952

Licence No.- 10/2019

COMPUTERISED EMISSION TEST CERTIFICATE

AUTHORISED BY **M/S SRI RAM AUTO POLLUTION CENTER**

TRANSPORT DEPT. GOVT. OF JHARKHAND

BHIKHRAJPUR, KONARTAND

BALIAPUR, DHANBAD, JHARKHAND

झारखण्ड सरकार

Vehicle Registration No.: JH10BT 7807

Year of Registration : 2014

Date : 20/06/2019

Vehicle Make : TATA MOTORS

Type of Vehicle : TIPPER

Vehicle Model : 2014

Valid Upto : 20/12/2019

Vehicle Colour :



Test Result : IDLING DIESEL

Validity : 6 Months

CO	
HC	

HSU	51%
KVAL	

Permissible Limits of CO (Petrol) 3% Vo. for the new four Wheelers and 4.5% Vol. for Vehicles Five Years old or 80000 Kms whichever is earlier. Permissible Limited of CO for petrol 2-3 wheelers are 4.5% Vol.

From P.C.

(See Rule 252 of J.M.V. Rules, 2002)

ALL INDIA VALID

Name of Authorised Signature

M/S SRI RAM AUTO POLLUTION CENTRE-D
JHARKHAND
BALIAPUR DHANBAD

Seal of Testing Centre

ALL INDIA VALID

Scanned by CamScanner

POLLUTION UNDER CONTROL CERTIFICATE

Govt. of Jharkhand
Transport Dep.

Computerized Emission Test Certificate
(Rule 163E (6) of BMV Rule 1992)

License No.42 /2018

ALL INDIA VALID

KATRAS POLLUTION TESTING CENTRE
NAYA MORE, TETULMARI, SIJUA (JH)

Puccno:	42/201800002143	**Reg. Year:**	2018	**Test Date:**	10:36 AM
Reg. No:	JH10BR 9671	**Fuel:**	DIESEL	**Test Time:**	16-10-2019
Make:	TATA MOTORS	**EngNo:**	21329	**Owner Name:**	RAJENDRA PRASAD MAHATO
Model:	2518 CRE BS IV	**ChassisNo:**	21518		
Category:	TIPPER	**Engstroke:**			



FLUSH	CYCLE			
		AVERAGE		
	RPM Min	RPM Max	Oil Tmp	
	0920	2820	75	
		DETAIL		
RPM Min	RPM Max	Temp	HSU	K value
920	2820	57	29 39	0 81
960	2810	55	28 02	0.76
870	2780	54	28 83	0 79
MEAN			28 75	0 79
RESULT		PASS		

Valid upto: 15-4-2020 **Result:** Pass

Test Fee - 300

This vehicle meets the standard prescribed By Rule 115(2) of Central Motor Vehicle Rule 1989.

This Certificate is valid for Six Months only.

Seal of Testing Centre

Test Station Code:42/2018

Authorized Signatory

Scanned by CamScanner

GOVERNMENT OF JHARKHAND

State Transport Department
All India Valid

POLLUTION UNDER CONTROL CERTIFICATE

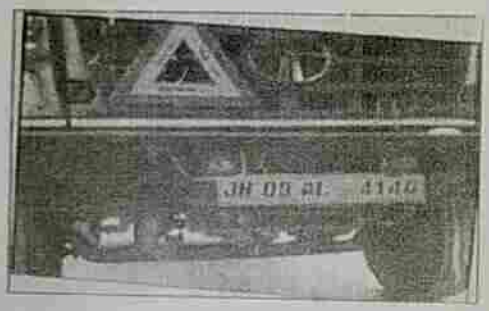
Computerized Emission Test Certificate
(Rule 163E (6) of BMV Rule 1992)

License No.590/2017
ALL INDIA VALID

RUDRA ENTERPRISES

JAMUATAND, HIRAK ROAD, BAGHMARA DHANBAD (JH)

Puccno:	590/201700002467	**Reg. Year:**	2013	**Test Date:**	09:50 AM
Reg. No:	JH09AL 4140	**Fuel:**	DIESEL	**Test Time:**	27-7-2019
Make:	TATA MOTORS	**EngNo:**	30555	**Owner Name**	RAJU KUMAR SHARMA
Model:	TIPPER	**ChassisNo:**	09711		
Category:	TIPPER	**Engstroke:**			



FLUSH	CYCLE			
	AVERAGE			
	RPM Min	RPM Max	Oil Tmp	
	0650	2560	51	
	DETAIL			
RPM Min	RPM Max	Temp	HSU	K value
650	2600	74	16.73	0.43
630	2590	73	17.13	0.44
660	2510	76	18.18	0.47
MEAN			17.35	0.44
RESULT		PASS		

Test Fee - 300

Valid up to: 26-1-2020

Scanned by CamScanner

GOVERNMENT OF JHARKHAND

State Transport Department
All India Valid

POLLUTION UNDER CONTROL CERTIFICATE

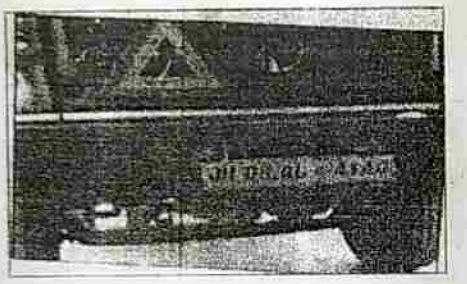
Computerized Emission Test Certificate
(Rule 163E (6) of BMV Rule 1992)

License No.590/2017
ALL INDIA VALID

RUDRA ENTERPRISES

JAMUATAND, HIRAK ROAD, BAGHMARA DHANBAD (JH)

Puccno:	590/201700002467	Reg. Year:	2013	Test Date:	09:50 AM
Reg. No:	JH09AL 4140	Fuel:	DIESEL	Test Time:	27-7-2019
Make:	TATA MOTORS	EngNo:	30555	Owner Name	RAJU KUMAR SHARMA
Model:	TIPPER	ChassisNo:	09711		
Category:	TIPPER	Engstroke:			



FLUSH CYCLE

AVERAGE			
RPM Min	RPM Max	Oil Tmp	
0650	2560	51	
DETAIL			
RPM Min	RPM Max	Temp	HSU	K value
650	2600	74	16.73	0.43
630	2590	73	17.13	0.44
660	2510	75	18.13	0.47
MEAN			17.33	0.44
RESULT		PASS		

Test Fee - 300

Valid up to: 26-1-2020

Scanned by CamScanner

परिवहन विभाग

LUTION UNDER CONTROL CERTIFICATE

Computerized Emission Test Certificate

CHAL VAHAN PRADUSHAN JANCH KENDRA License No: 284/2016

OURKEN BAZAR, KUSUNDA, DHANBAD

KOYLANCHAL VAHAN PRADUSHAN JANCH KENDRA * AUTH. BY GOVT. OF JHARKHAND * KUSUNDA, DHANBAD

Sl. No:		Reg's Date:	2019	Test Time:	03:25 PM
Vehicle No:	00000777	Fuel:	DIESEL	Odometer:	NA
Make:	JH10BV0569	Engine No:	65533	Owner Name:	
Model:	DAIMLER BAZAR, KUSUNDA	Chassis No:	66469	Remark:	
Category:	BHATAR BENZ 2523C HYVA	Test Date:	28-7-2019		



FLUSH	CYCLE			
		AVERAGE		
	RPM Min	RPM Max	Oil Tmp	
	0940	3830	45	
		DETAIL		
RPM Min	RPM Max	Temp.	HSU	K value
940	3810	42	25.08	0.67
940	3850	41	29.92	0.83
940	3870	45	31.51	0.88
MEAN			28.84	0.79
RESULT		PASS		

Result: Pass **Valid Up To:** 27-1-2020

This Vehicle Meets the Emission Standards Prescribed By Rule 115 (2) of Central Motor Vehicle Rule 1989.
This Certificate is Valid for Six Months Only

KOYLANCHAL VAHAN PRADUSHAN JANCH KENDRA * AUTH. BY GOVT. JHARKHAND * KUSUNDA, DHANBAD

Seal of Testing Centre **Test Station Code: 284/2016** **Authorized Signatory**

Scanned by CamScanner

POLLUTION POLLUTION FREE INDIA

UNDER CONTROL HEALTHY INDIA

BHAGWATI POLLUTION CHECKING CENTRE

NIRSA KANTA,G.T.ROAD,DHANBAD,JHARKHAND-828205

TRANSPORT DEPARTMENT GOVT. OF JHARKHAND

झारखण्ड सरकार

Vehicle No.: JH02AW8910
License No-23/2017
PUC No-0000148
Fuel: Diesel
Complaint-BS- IV
Spedeometer- 7769
Owner- MONOHAR GORAI

Chassis Number- 18216
Engine Number- 07728
Vehicle Model: TIPPER
Year Of Reg- 2018

Type Of Engine: 6S

Test Date: 24-Jul-2019
Vehicles Make: TATA
Test Times: 11:19:22 AM
Type Of Vehicle: 10W
Test Fee: Rs 100/-
Valid Up To : **23-Jan-2020**

JH-02AW
8910

Test Result: IDLING **Validity: 6 Months**

	MinRpm	MaxRpm	K_val	HSU_VAlue	OilTemp
`11	910	2570	1.10	37.69	63.0
2	900	2580	1.20	40.31	64.0
3	920	2560	1.00	34.95	64.0
4	910.00	2570.00	1.10	37.69	

This Vehicle is Under Emission Prescribed Rule 115(2) of Central Motor Vehicle Rule 1989.

POLLUTION TESTING CENTRE BHAGWATI

Name of Authorise Signatory With Seal Of Testing Center

Result:- Pass

ALL INDIA VALID

Scanned by CamScanner

POLLUTION POLLUTION FREE INDIA

UNDER CONTROL HEALTHY INDIA

BHAGWATI POLLUTION CHECKING CENTRE

NIRSA KANTA,G.T.ROAD,DHANBAD,JHARKHAND-828205

TRANSPORT DEPARTMENT GOVT. OF JHARKHAND

झारखण्ड सरकार

Vehicle No.: JH10AY0905
License No-23/2017
PUC No-0000156
Fuel: Diesel
Complaint-BS- III
Spedeometer- 84867
Owner- RAJESH YADAV

Chassis Number- 07634
Engine Number- 06294
Vehicle Model: TIPPER
Year Of Reg- 2016

Type Of Engine: 6S

Test Date: 25-Jul-2019
Vehicles Make: TATA
Test Times: 11:13:20 AM
Type Of Vehicle: 10W
Test Fee: Rs 100/-
Valid Up To : **24-Jan-2020**

Test Result: IDLING

Validity: 6 Months

	MinRpm	MaxRpm	K_val .	HSU_VAlue	OilTemp
11	910	2570	1.10	37.69	63.0
2	900	2580	1.20	40.31	64.0
3	920	2560	1.00	34.95	64.0
4	910.00	2570.00	1.10	37.69	

This Vehicle is Under Emission Prescribed Rule 115(2) of Central Motor Vehicle Rule 1989.

POLLUTION TESTING CENTRE

Name of Authorise Signatory
With Seal Of Testing Center

Result:- Pass

ALL INDIA VALID

Scanned by CamScanner

POLLUTION FREE INDIA

UNDER CONTROL HEALTHY INDIA

TRANSPORT DEPARTMENT GOVT. OF JHARKHAND

झारखण्ड सरकार

Vehicle No.: JH10BP8950
License No-23/2017
PUC No-000065
Fuel: Diesel
Complaint-BS-IV
Speedometer- 42386
Owner- BIPLAB MONDAL

Chassis Number- 17921
Engine Number- 07115
Vehicle Model: TIPPER
Year Of Reg- 2018

Type Of Engine: 6S

Test Date: 9-Jun-2019
Vehicles Make: TATA
Test Times: 10:33:52 AM
Type Of Vehicle: 10W
Test Fee: Rs 100/-
Valid Up To : 08-Dec-2019

JH 10 BP 8950

Test Result: IDLING

Validity: 6 Months

	MinRpm	MaxRpm	K_val	HSU_VAlue	OilTemp
1	910	2570	1.10	37.69	63.0
2	900	2580	1.20	40.31	64.0
3	920	2560	1.00	34.95	64.0
4	910.00	2570.00	1.10	37.69	

POLLUTION TESTING CENTRE BHS-38

Name of Authorise Signatory
With Seal Of Testing Center

Result:- Pass

ALL INDIA VALID

Scanned by CamScanner

POLLUTION UNDER CONTROL

DATE OF ISSUE 19/09/2019

VALID UP 20/03/2020

Sl. No. 3079 Licence No.- 10/2019

झारखण्ड सरकार

COMPUTERISED EMISSION TEST CERTIFICATE

AUTHORISED BY : **M/S SRI RAM AUTO POLLUTION CENTER**

TRANSPORT DEPT. GOVT. OF JHARKHAND
BHIKHRAJPUR, KONARTAND
BALIAPUR, DHANBAD, JHARKHAND

Vehicle Registration No.: JH10AL 0870

Year of Registration : 2013

Date : 19/09/2019

Vehicle Make : ASHOK LEYLAND

Type of Vehicle : TIPPER

Vehicle Model : 2013

Valid Upto : 20/03/2020

Vehicle Colo



Test Result : IDLING DIESEL

Validity : 6 Months

CO	
HC	

HSU	55%
KVAL	

Permissible Limits of CO (Petrol) 3% Vo. for the new four Wheelers and 4.5% Vol. for Vehicles Five Years old or 80000 Kms. whichever is earlier. Permissible Limited of CO for petrol 2-3 wheelers are 4.5% Vol.

From P.C.

(See Rule 252 of J.M.V. Rules, 2002)

ALL INDIA VALID

Name of Authorised Signature

Seal of Testing Centre

Scanned by CamScanner

POLLUTION UNDER CONTROL

TRANSPORT DEPTT. GOVT. OF JHARKHAND

Under Rule 252 (2) of Centre motor Vehicle

DATE OF ISSUE 19/09/2019

VALID UPTO 20/03/2020

JHDAN 0905

प्रपत्र पी. सी.

झारखंड मोटर वाहन नियमावली, 2001 के नियम 252 ट। 2 । देखें

प्रदूषण नियंत्रण के अन्तर्गत निर्गत प्रमाण पत्र

प्रदूषण स्तर प्रमाण –पत्र

जाँच केन्द्र का नाम

JHARKHAND AUTO EMISSION TEST CENTRE
DEBIANA GATE, NIRSHA, DHANBAD(JHARKHAND)

अनुज्ञप्ति संख्या : Lic No. 2552 DATED : 21/07/04

मोटर वाहन संख्या : JH 10AN 0905 D.O. Reg - A344 .

मेक : TATA

मोडल: 2014

निर्गत की तिथि : 21/02/2014 19/09/2019

वाहन का प्रकार : TIPPER HYVA

निरस्सरण स्तर की जाँच एवं निम्न पटन पाया –

पेट्रोल / एल.पी.जी. वाहन

CMVR 1989 के नियम 115 । 21 के अन्तर्गत निर्धारित मापदण्ड
CO :- 0-5%-4.5%
HC :- 750-9000

गैस का नाम CO :- HC :- वास्तविक पटन

डीजल वाहन

CMVR 1989 के नियम 115 । 21 के अन्तर्गत निर्धारित मापदण्ड
H.S.U-65
फुल लोड
फ्री एक्सीलरेशन -

गैस का नाम 54.4 वास्तविक पटन

झारखण्ड सरकार

EMISSION TEST CENTRE L No. 2552 Dated. 21/07/04 JHARKHAND

115 । 21 के अन्तर्गत निर्धारित निस्सरण मापदण्ड को पूरा करता है/नहीं करता है।

प्राधिकृत हस्ताक्षर

यह प्रमाण पत्र निर्गत की तिथि से छह माह तक वैध है, तथा देशभर में मान्य है।

Scanned by CamScanner

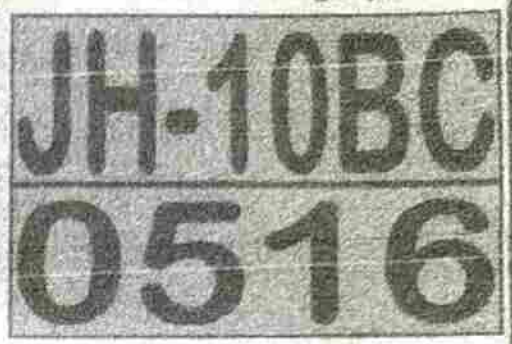
POLLUTION UNDER CONTROL CERTIFICATE

COMUPERIZED EMISSION TEST CERTIFICATE

TRANSPORT DEPARTMENT, GOVT OF JHARKHAND

Owner Name : P.KUMAR
Owner Add : NIRSA DHANBAD

Vehicle Photograph



io :	3110
.e Date :	13-Mar-2019
alid Upto :	19-MEC-2019
Vehicle No :	JH10BC-0516
Vehicle Type :	LOADER
Engine No :	57785
Chassis No :	25070
Vehicle Make :	TML
Vehicle Model :	LPK2518
Mfg Year :	2017
uel Type :	Diesel
rade :	A+

#	HSU	KM
1	48.0	2.40
2	50.0	2.50
3	50.0	2.50
4	46.0	2.30
5	46.0	2.30
6		
7		
8		
9	RESULT	PASS
10	48.0	2.40

rtified that this Vehicle's smoke emission confirms to the standard prescribed under rule 5(2) & 116(5) of Central Motor Vehicle Rules 1989.

A GOVT. AUTHORIZED CENTER
vironmental & Motor Vehicles Authorised Testing Station
rak Road, Bhelatand, Dhanbad, Jharkhand
A. No : 1099 Dated : 04-Aug-2017

Authorized Signatory & Seal

Scanned by CamScanner

Govt. of Jharkhand
Transport Department

झारखण्ड सरकार

POLLUTION UNDER CONTROL CERTIFICATE

License No: 981/2015

Copmuterized Emission Test Certificate
See Under Rule 252/01 Jharkhand (MVR)

KING'S PETROLEUM
NH-2 G.T. ROAD, KASHI TAND, BARWADDA
DHANBAD (JHARKHAND)

Vehicle Pass Certificate

PUCC No:	981/ 2015000871	Result:	Pass	CO	4.5
Reg. No:	JH10AF0781	Chassis No	74829	HC	4500
Make	TATA	Engine No	71648	CO2	
Model	LPK2518			O2	
Category	TRUCK				
Engstorke	4S				
OdoMeter	NA				
Reg Year	12.06.2014				
Enorms					
Fuel:	DESIEL				
Test Date	17/07/2019				
Test Time	Wednesday, July 17, 2019				
Owner Name	KARAN CHOURASIA				

झारखण्ड सरकार



M/S KING'S PETROLEUM

6 Month Validity

Valid Up To: 16/01/2020

This Vehicle Meets the Emission Standards Precribed By Rule 115 (2) of Cental Motor Vehicle Rule 1989.

This Certificate is Valid for Six Months Only

ALL INDIA VALID

Kashitand Barwadda NH2 G T Road L/No. 981 2015-20

Seal of Testing Centre

Test Station Code: 981/2005

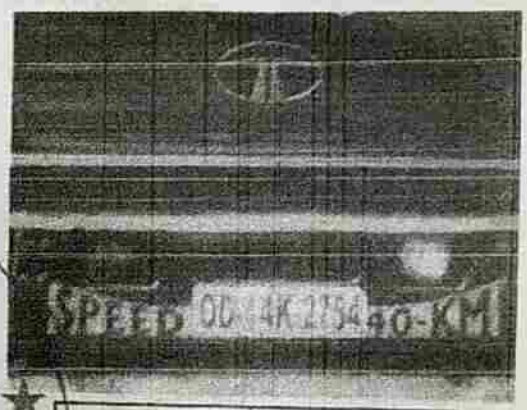
Authorized Signatory

Scanned by CamScanner

VALID IN ALL OVER INDIA
POLLUTION UNDER CONTROL CERTIFICATE
AUTHORISED BY TRANSPORT COMMISSIONER GOVT OF JHARKHAND

VALID UPTO - 07/MAR/2020

31890 : 4291/31890
Vehicle No. : OD 14K 2754
Make : TATAMT
Model : LPK2518
Category : TIPPER
Registration YEAR : 15/04/2017
Fuel : DIESEL
Engine NO. : 88833
Chassis No. : 08718
Test Date : 08/09/2019
Test Time : 05:20:56 PM



OWNER NAME : AKHILESH KUMAR

STANDARD	ACTUAL
4.5%	
65%	36.62%

नियंत्रित प्रदूषण
झारखण्ड सरकार
प्राधिकृत
Jai Maa Auto Emmission
Testing Centre
Jodhadih More, Chas (JH.)
L. Code- 4291 / 04
परिवहन विभाग, झारखण्ड सरकार

SEAL OF TESTING CENTRE

AUTHORISED SIGNATORY

Scanned by CamScanner

परिवहन विभाग

POLLUTION UNDER CONTROL CERTIFICATE

Computerized Emission Test Certificate

KOYLANCHAL VAHAN PRADUSHAN JANCH KENDRA — **License No: 31/2018**

BALAJI FUELS STATION, BHUIPHORE, DHANBAD

Sl. No:	31/201800001961	Regis Date:	2008	Test Time:	11:07 AM
Vehicle No:	JH05BV3326	Fuel:	DIESEL	Odometer:	
Make:	TATA MOTORS	Engine No:	58990	Owner Name:	PANKAJ KR. GUPTA
Model:	LPK 2518	Chassis No:	15837	Remark:	
Category:	OTHERS	Test Date:	21-9-2019		

FLUSH CYCLE

AVERAGE

RPM Min	RPM Max	Oil Tmp
0600	2630	51

DETAIL

RPM Min	RPM Max	Temp	HSU	K value
580	2650	51	43.21	1.32
560	2630	51	42.40	1.28
630	2600	51	39.82	1.18
MEAN			41.81	1.26

RESULT PASS



Result: Pass **Valid Up To:** 20-3-2020

This Vehicle Meets the Emission Standards Prescribed By Rule 115 (2) of Central Motor Vehicle Rule 1989.
This Certificate is Valid for Six Months Only

AUTH. BY GOVT. OF JHARKHAND

KOYLANCHAL VAHAN PRADUSHAN JANCH KENDRA ★ BALAJI FUELS STATION, BHUIPHORE, DHANBAD

Seal of Testing Centre

Test Station Code: 31/2018

Authorized Signatory

Scanned by CamScanner

GOVERNMENT OF JHARKHAND

State Transport Department
All India Valid

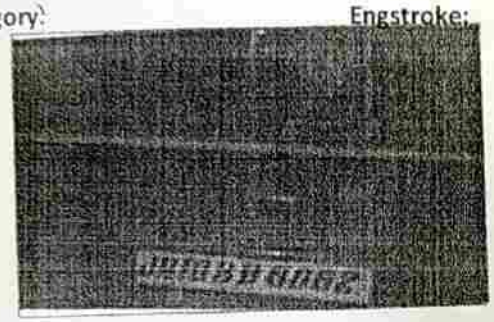
ALL INDIA VALID

590/20170000302B
JH10BB 8082
TATA MOTORS
2516
TIPPER
2016
DIESEL
29004
5516

Puccno:
Reg. No:
Make:
Model:
Category:

Reg. Year:
Fuel:
EngNo:
ChassisNo:
Engstroke:

Test Date: 22-9-2019
Test Time: 01:17 PM
Owner Name: NA



PLUS- CYCLE

AVERAGE

RPM Min	RPM Max	Diesel
0750	3330	69

DETAIL

RPM Min	RPM Max	Temp	Diesel	K value
750	3320	60	3.81	1.26
730	3370	64	36.77	1.24
760	3320	61	36.62	1.22
[illegible]			36.67	1.24

RESULT PASS

Test Fee - 300

21-3-2020

Valid up to:

This vehicle meets the standard prescribed By Rule 115(2) of Central Motor Vehicle Rule 1989.
This Certificate is valid for Six Months only.

Seal of Testing Centre

Test Station Code: 590/2017

Authorized Signatory





Scanned by CamScanner

POLLUTION UNDER CONTROL

DATE OF ISSUE 19/09/2019

VALID UP 20/03/2020

Sl. No. 3079

Licence No.- 10/2019

झारखण्ड सरकार

COMPUTERISED EMISSION TEST CERTIFICATE

AUTHORISED BY : **M/S SRI RAM AUTO POLLUTION CENTER**

TRANSPORT DEPT. GOVT. OF JHARKHAND

BHIKHRAJPUR, KONARTAND

BALIAPUR, DHANBAD, JHARKHAND

Vehicle Registration No.: JH10AL 0870

Year of Registration : 2013

Date : 19/09/2019

Vehicle Make : ASHOK LEYLAND

Type of Vehicle : TIPPER

Vehicle Model : 2013

Valid Upto : 20/03/2020

Vehicle Colo



Test Result : IDLING DIESEL

Validity : 6 Months

CO	
HC	

HSU	55%
KVAL	

Permissible Limits of CO (Petrol) 3% Vo. for the new four Wheelers and 4.5% Vol. for Vehicles Five Years old or 80000 Kms. whichever is earlier. Permissible Limited of CO for petrol 2-3 wheelers are 4.5% Vol.

From P.C.

(See Rule 252 of J.M.V. Rules, 2002)

ALL INDIA VALID

M/S SRI RAM AUTO POLLUTION CENTRE JHARKHAND BALIAPUR DHANBAD

Name of Authorised Signature

Seal of Testing Centre

ALL INDIA VALID

Scanned by CamScanner

POLLUTION UNDER CONTROL

DATE OF ISSUE: 13/10/2019

VALID UP: 12/04/2020

Sl. No. 23467

Licence No.- 76/2016

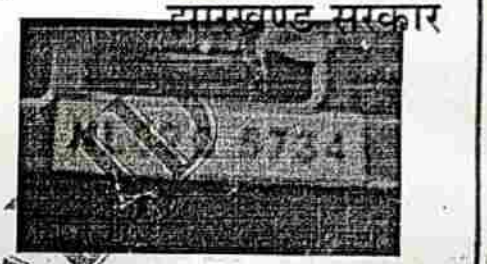
COMPUTERISED EMISSION TEST CERTIFICATE

AUTHORISED BY **SHRI RAM ENGINEERING**

TRANSPORT DEPT. GOVT. OF JHARKHAND

GOBINDPUR UPPER BAZAR

NEAR DURGA MANDIR, DHANBAD, JHARKHAND



Vehicle Registration No.: NL02Q 5734

Year of Registration : 2012

Date : 13/10/2019

Vehicle Make : TATA MOTORS

Type of Vehicle : LPK 2518

Vehicle Model : 2012

Valid Upto : 12/04/2020

Vehicle Colour : NA

ALL INDIA VALID

Test Result : IDLING PETROL Validity : 6 Months

CO	
HC	

HSU	32.05%
KVAL	

Permissible Limits of CO (Petrol) 3% Vo. for the new four Wheelers and 4.5% Vol. for Vehicles Five Years old or 80000 Kms whichever is earlier. Permissible Limited of CO for petrol 2-3 wheelers are 4.5% Vol.

From P.C.

(See Rule 252 of J.M.V. Rules, 2002)

ALL INDIA VALID

Name of Authorised Signature

Seal of Testing Centre

SHRI RAM ENGINEERING

Scanned by CamScanner

POLLUTION UNDER CONTROL

DATE OF ISSUE: 23/06/2019

VALID UP: 23/12/2019

Sl. No. 17832

Licence No.- 76/2016

COMPUTERISED EMISSION TEST CERTIFICATE

AUTHORISED BY **SHRI RAM ENGINEERING**

TRANSPORT DEPT. GOVT. OF JHARKHAND

GOBINDPUR UPPER BAZAR

NEAR DURGA MANDIR, DHANBAD, JHARKHAND

झारखण्ड सरकार



Vehicle Registration No.: NL02Q 4268

Year of Registration: 2013

Date: 23/06/2019

Vehicle Make: TATA MOTORS

Type of Vehicle: TIPPER LPT 2518

Vehicle Model: 2013

Valid Upto: 23/12/2019

Vehicle Colour: NA

Test Result: IDLING

DIESEL

Validity : 6 Months

CO	
HC	

HSU	42.05
KVAL	1.03

Permissible Limits of CO (Petrol) 3% Vo. for the new four Wheelers and 4.5% Vol. for Vehicles Five Years old or 80000 Kms whichever is earlier. Permissible Limited of CO for petrol 2-3 wheelers are 4.5% Vol.

From P.C.

(See Rule 252 of J.M.V. Rules, 2002)

ALL INDIA VALID

SHRI RAM ENGINEERING

Scanned by CamScanner


पारसनाथ
उद्यान (कलाकुंज)
2019.11.25 10:55


Vivo V11Pro
AI Dual Camera
2019.11.25 10:56








भारत कोकिंग कोल लिमिटेड
(मिनीरत्न कम्पनी)
कतरास क्षेत्र सं.-IV
COAL INDIA
स्नेह स्मृति उपवन
पूर्वजो को समर्पित
फलदार वृक्षोंका उपवन


P.M.PRASAD
C.M.D
B.C.C.L


Vivo V11Pro
AI Dual Camera



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:

GROUNDWATER LEVEL & QUALITY REPORT

FOR CLUSTER OF MINES, BCCL

(Assessment year – 2018-19)

[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 – 2019

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1.2 Geomorphology 2

1.3 Drainage 3

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F. Monitoring of Ground Water Levels of Cluster-VI 15

G. Monitoring of Ground Water Levels of Cluster-VII 16

H. Monitoring of Ground Water Levels of Cluster-VIII 17

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6.	Groundwater sample quality analysis	Annexure-V (A-D)
7.	Hydrographs of Cluster-I to XVI	Annexure-VI

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*	*Jharkhand State – 1264.0 mm (2016)* *Dhanbad District - 1271.60 mm (2016)* *Normal Rainfall – 1296.30 mm* *(Source: Rainfall Statistics of India-2016, IMD, Ministry of Earth Sciences)*
5	*Geological Formations*	*Gondwana Formation* *(Talchir Formation, Barakar Formation, Barren Measure & Raniganj Formation)*
6	*Aquifer System*	*Top Unconfined/Phreatic Aquifer – average thickness 25 m* *Semi-confined to confined Aquifer – average thickness 50–200 m*
7	*Hydrogeological properties*	*Unconfined Aquifer (Damoda BJ Section & Block-III):* *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 254 no 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 is 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 – 1.20 to 14.58 m (Avg. 5.55 m bgl) in '2018* *Post-monsoon – 0.40 to 07.17 m (Avg. 2.83 m bgl) in '2018* *RCF area (part):* *Pre-monsoon – 2.34 to 8.70 m (Avg. 4.35 m bgl) in '2018* *Post-monsoon – 1.75 to 5.70 m (Avg. 2.75 m bgl) in '2018*
10	*Groundwater Quality*	*Potable (Annexure- IV)*
11	*Proposed Piezometers*	*New piezometers (23 nos.) have been proposed to monitor impact of coal mining on groundwater regime within the coalfield area (JCF & part of RCF) for maximum depth upto 290 m to monitor deeper aquifers.*
12	*Stage of Groundwater Development (CGWB)*	*Dhanbad District – 77%* *(GWRE-2013)*

1.0 INTRODUCTION

1.1 CLIMATE, TEMPERATURE & RAINFALL

The Jharia Coalfield (JCF) and part of Raniganj Coalfield (RCF) area in Dhanbad District belongs to sub-humid tropical climatic region. The maximum temperature during summer shoots upto 45^{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.

The annual rainfall in the Dhanbad District is 1271.60 mm (Rainfall Statistics of India-2016, IMD (Ministry of Earth Sciences), has been considered. The non-monsoon rainfall in the District is 93.60 mm (Winter-19.5 mm, Pre-monsoon-48.8 mm and Post-monsoon-25.3 mm) and the monsoon rainfall is 1178.10 mm of total annual rainfall. Monsoon Rainfall is around 92.65% of total annual rainfall in 2016 in Dhanbad District. Rainfall is the primary source of groundwater recharge. The normal rainfall of Jharkhand is 1296.30 mm (2015) as documented in MOSPI, Govt. of India.

1.2 GEOMORPHOLOGY

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

1.3 DRAINAGE

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 south easterly 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 (**Figure No-1**). 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 are distributed in and around JCF, out of which one prominent lake is located at Topchanchi in the north-west part. Two reservoirs, Maithon dam in Barakar River and Panchet dam in Damodar River near to Chanch Victoria Area of BCCL (part of RCF) are the main source of water supply to the nearby area. Jharia Water Board, Damodar Water Supply Scheme and Mineral Area Development Authority (MADA) are supplying water to the various coalfield area from Maithon dam, Damodar River, Jamunia River, Topchachi Lake, etc.

2.0 GROUNDWATER SYSTEM

2.1 GEOLOGY OF THE AREA

The Jharia Coalfield covers an area of 453 sq. km. 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 which overlies the Talchir is covering the most part of the Jharia Coalfield and having an area of 218 sq. km. This is successively overlain by the non-coal bearing Barren 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-western part of the Coalfield and covers an area of 54 sq. km.

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

2.2 HYDROGEOLOGY OF THE STUDY AREA

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 are constituted of fine to coarse grained sandstone having primary porosity of intergranular void space. The secondary porosity formed due to presence of faults, fracture, joints, etc. Sandstone of Gondwana formations in JCF and RCF are very hard, compact and cemented sandstone and forming less potential aquifer, particularly the deeper aquifer system. The secondary porosity along with primary porosity forms a conduit system making these formations good aquifers for movement and storage of ground water.

2.3 AQUIFER DISPOSITION

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 varies from few meters to 50 m. This un-confined aquifer is more potential than deep seated semi-confined to confined aquifer.

SEMI-CONFINED TO CONFINED AQUIFER

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

2.4 AQUIFER PARAMETERS

PHREATIC/UN-CONFINED AQUIFER – *The wells are 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 – *Below the un-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 been 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.*

Aquifer Type	***Hydraulic Conductivity (m/day)***	***Transmissivity (m^2 /day)***	***Remarks***
Unconfined	*0.50*	*10.68 – 41.48*	*Site: Damuda (BJ Section) and Block-III area*
Semi-confined	*0.0006 – 1.44 (1)* *0.0027 – 0.05 (2)*	*-*	*Site: (1): Sitanala Block* *(2): Kumari Block*

3.0 GROUNDWATER LEVEL MONITORING

To collect the representative groundwater levels in the study area, CMPDI has established a monitoring network of total 254 monitoring stations out of which 64 located within core zone and rest comes within Buffer zone. 60 dug wells within JCF and 04 dug wells within RCF (part) area (Details of the Hydrograph stations & water level are given in ***Annexure-I, IIA*** *&* ***IIB****) spread over the entire BCCL leasehold area,* ***Figure No-1****. Water level monitoring in 254 hydrograph stations has been done in pre-monsoon as well as in post monsoon whereas in 64 stations monitoring done in quarterly (March, May, August and November month of 2018) basis.*

Depth to water level of the water table depict the inequalities in the position of water table with respect to ground surface and is useful in delineating recharge / discharge areas, planning of artificial recharge structure and shows the overall status of the groundwater level in the area. Historical groundwater level (GWL) of entire JCF and part of RCF with fluctuation, GWL of Non-mining / Mining areas and GWL of the Cluster of Mines of BCCL are shown in this report to assess the effect of Coal mining activity in the groundwater regime in and around the Coalfield area.

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

*Construction of piezometers within Jharia Coalfield and part of Raniganj Coalfield to monitor groundwater level of deeper aquifers is already in progress.

3.1 HISTORICAL GROUNDWATER LEVEL

Historical GWL of JCF and part of RCF are given from 2005 to 2018 of CMPDI monitoring stations (total 66 stations within Coalfield area). Pre-monsoon and Post-monsoon GWL with Fluctuation has been mentioned below in the table.

Table No – 1: 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*
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*

3.2 GROUNDWATER LEVEL SCENARIO IN NON-MINING/MINING AREA

Depth to water level (DTW) range in different formations with respect of mining and non-mining areas is summarized in the Table No-2.

Table No – 2: Depth to water table

Formation	**Area**		**DTW (bgl, m) [Year-2018]**		**Average GWL (m)**	
			Pre-monsoon (Apr/May)	**Post-monsoon (Nov/Dec)**	**Pre-monsoon**	**Post-monsoon**
Sedimentary (Gondwana)	*Non-mining*		*1.85-9.65*	*0.85-3.70*	*5.47*	*2.49*
	Mining	*OC*	*1.59-10.93*	*0.45-7.10*	*5.00*	*2.57*
		UG	*1.20-14.58*	*0.60-7.17*	*6.52*	*3.28*
Metamorphics	*Peripheral part of the Coalfield*		*0.75-13.68*	*0.45-8.00*	*7.12*	*3.90*

The study revealed that water table is in shallow depth and there is no significant stress in the water table due to coal mining activity. Mining and Non-mining areas shows barely any difference in water table condition in the JCF and RCF (part) area. The average hydraulic gradient of the water table within mining and non-mining areas is given in Table No-3. There is no significant change in hydraulic gradient has been observed. Relatively steep gradient near active opencast mining areas w.r.t., Non-Mining, Underground mines and Metamorphics areas is observed.

Table No – 3: Average hydraulic gradient

Sl. No	**Formation**	**Area**		**Average hydraulic gradient**
1	*Sedimentary (Gondwana)*	*Non-Mining*		*1.5 X 10^{-3} to 2.0 X 10^{-3}*
2		*Mining*	*OC*	*5.0X 10^{-2} to 4.0 X 10^{-3}*
3			*UG*	*2.0 X 10^{-2} to 3.0 X 10^{-3}*
4	*Metamorphics*	*Peripheral part of the Coalfield*		*1.0 X 10^{-3} to 2.0 X 10^{-3}*

3.3 QUARTERLY GROUNDWATER LEVEL, CLUATER OF MINES (BCCL)

3.3 A Monitoring of Ground Water Levels of Cluster-I

Cluster-I (Damuda Group of Mines) consisting of Damoda (BJ and Gutway section) UG, Damoda (Albion section) OCP, proposed Damoda (B.J.section) OCP and Closed Gutway OCP of Barora Area of BCCL. It is located in the extreme western part of JCF in Bokaro district of Jharkhand.

The present leasehold area of Cluster-I is 575 Ha. The Damoda block area is 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.

*4 hydrograph 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 been done in the months of February, April and August & November'2018 and the Ground water level data is enclosed in the table below:*

Sl No.	Well No.	Location	Water level (bgl in meters)			
			Feb'18	Apr'18	Aug'18	Nov'18
1	B-15	Bera Basti	1.56	1.85	0.75	0.85
2	B-21A	Dugdha	6.73	9.65	3.45	2.65
3	B-51	Taranga	3.00	5.02	2.25	2.42
4	B-53	Karmatanr	2.52	3.92	1.62	1.42
Average WL (bgl)			3.45	5.11	2.02	1.84

Ground Water Level (in bgl) varies from 1.56 to 6.73 m during February, 1.85 to 9.65 m during April, 0.75 to 3.45 m during August and 0.85 to 2.65 m during November within the Core Zone of Cluster-I area.

3.3 B Monitoring of Ground Water Levels of Cluster-II

Cluster-II consists of seven mines namely; Block-II mixed mine (OCP & UGP), Jamunia OCP, Shatabdi OCP, Muraidih mixed mine (OCP & UGP) and Phularitand OCP is under administrative control of Block-II Area and Barora Area of BCCL. It is located in the extreme western part of Jharia Coalfield in Dhanbad district of Jharkhand.

The present leasehold area of Cluster-II is 2025.71 Ha. The Damoda block area is 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.

*5 hydrograph 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 been done in the months of February, April, August & November'2018 and the Ground water level data is enclosed in the table below:*

Sl No.	Well No.	Location	Water level (bgl in meters)			
			Feb'18	Apr'18	Aug'18	Nov'18
1	B-1	Muraidih	1.68	2.88	1.48	2.08
2	B-59	Khodovaly	1.38	5.47	0.90	1.10
3	B-60	Bahiyardih	8.21	13.68	3.13	4.23
4	B-61A	Kesargora	1.27	2.57	2.62	2.02
5	B-62A	Sadiyardih	5.87	8.27	4.00	4.78
Average WL (bgl)			3.68	6.57	2.43	2.84

Ground Water Level (in bgl) varies from 1.27 to 8.21 m during February, 2.57 to 13.68 m during April, 0.90 to 4.00 m during August and 1.10 to 4.78 m during November within the Core Zone of Cluster-II area.

3.3 C Monitoring of Ground Water Levels of Cluster-III

Cluster-III consists of nine mines namely, Jogidih UG, Maheshpur UG, South Govindpur UG, Teturiya UG, Govindpur UG, New Akashkinaree mixed mine (OC & UG) and Kooridih/Block-IV mixed mine (OC & UG) under the administrative control of Govindpur Area of BCCL. This Cluster of mines is located in western part of Jharia Coalfield in Dhanbad district of Jharkhand.

The present leasehold area of Cluster-III is 1420.0 Ha. The area is plain with gentle undulation with RL varies from 160 m to 208.80 m AMSL. The general slope of the area is towards south. Khudia River, Baghdihi Jore, Katri River and its tributaries are controlling the drainage system of the area. The area comes under the watershed of Khudia River.

*5 hydrograph 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 February, April, August & November'2018 and the Ground water level data is enclosed in the table below:*

Sl No.	Well No.	Location	Water level (bgl in meters)			
			Feb'18	Apr'18	Aug'18	Nov'18
1	A-12	Jamua	1.20	2.80	0.40	1.0
2	A-25	Sinidih	4.88	6.63	2.88	3.13
3	A-29	Dharmaband	3.25	6.45	2.86	2.10
4	B-14	Mathadih	1.69	3.64	1.22	2.84
5	B-60	Sonardih	8.21	13.68	3.13	4.23
Average WL (bgl)			3.85	6.64	2.12	2.64

Ground Water Level (in bgl) varies from 1.20 to 8.21 m during February, 2.73 to 13.68 m during April, 0.40 to 3.13 m during August and 1.0 to 4.23 m during November within the Core Zone of Cluster-III area.

3.3 D Monitoring of Ground Water Levels of Cluster-IV

Cluster-IV consists of six mines namely, Salanpur UG, Katras-Choitudih UG, Amalgamated Keshalpur & West Mudidih OC, Amalgamated Keshalpur & West Mudidih UG, Amalgamated Angarpathra & Ramkanali UG and closed Gaslitand UG of Katras Area of BCCL. It is located in the north-central part of Jharia Coalfield in Dhanbad district of Jharkhand.

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

*4 hydrograph 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 February, April, August & November'2018 and the Ground water level data is enclosed in the table below:*

Sl No.	Well No.	Location	Water level (bgl in meters)			
			Feb'18	Apr'18	Aug'18	Nov'18
1	A-26	Malkhera	4.75	6.23	3.58	3.88
2	A28A	Lakarka	2.22	4.15	2.00	2.51
3	B-64	Keshalpur	1.42	2.15	0.55	1.85
4	B-65A	Jhinjipahari	4.18	10.03	2.10	2.40
Average WL (bgl)			3.14	5.64	2.16	2.66

Ground Water Level (in bgl) varies from 1.42 to 4.75 m during February, 2.15 to 10.03 m during April, 0.55 to 3.58 m during August and 1.85 to 3.88 m during November within the Core Zone of Cluster-IV area.

3.3 E Monitoring of Ground Water Levels of Cluster-V

Cluster-V consists of twelve mines namely; Tetulmari OC & UG mine, Mudidih OC & UG mine, Nichitpur OC, Sendra Bansjora OC & UG, Bansdeopur OCP (proposed) & UG, Kankanee OC & UG and closed Loyabad UG under the administrative control of Sijua Area of BCCL. This Cluster of mines is located in northern part of Jharia Coalfield in Dhanbad district of Jharkhand.

The present leasehold area of Cluster-V is 1957.08 Ha. The area has a general undulating topography, with an overall gentle south westerly slope. The RL varies from 210 m to 170 m AMSL. Jarian Nala, Nagri Jore, Ekra Jore and its tributaries are controlling the drainage pattern of the area. The area comes under the watershed of Jarian Nala and Ekra Jore.

*4 hydrograph 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 February, April, August & November'2018 and the Ground water level data is enclosed in the table below:*

Sl No.	Well No.	Location	Water level (bgl in meters)			
			Feb'18	Apr'18	Aug'18	Nov'18
1	A-3	Sijua	0.77	1.27	0.37	0.47
2	A-16	Ekra	2.60	4.30	2.05	3.65
3	A-27	Tetulmari	1.90	2.90	1.49	1.00
4	D-23	Jogta	2.70	4.40	2.60	3.40
Average WL (bgl)			1.99	3.22	1.63	2.13

Ground Water Level (in bgl) varies from 0.77 to 2.70 m during February, 1.27 to 4.40 m during April, 0.37 to 2.60 m during August and 0.47 to 3.65 m during November within the Core Zone of Cluster-V area.

3.3 F Monitoring of Ground Water Levels of Cluster-VI

Cluster–VI consists of four coal mines; East Bassuriya OC, Bassuriya UG, Gondudih Khas-Kusunda OC, Godhur Mixed Mines (OC and UG) are under the administrative control of Kusunda Area of BCCL. This Cluster of mines is located in central part of Jharia Coalfield in Dhanbad district of Jharkhand.

The present leasehold area of Cluster-VI is 876.55 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.

*2 hydrograph 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 February, April, August & November'2018 and the Ground water level data is enclosed in the table below:*

Sl No.	Well No.	Location	Water level (bgl in meters)			
			Feb'18	Apr'18	Aug'18	Nov'18
1	D-25	Godhur	0.50	2.60	0.60	2.40
2	D-30	Borkiboa	2.60	4.58	1.00	1.10
Average WL (bgl)			**1.55**	**3.59**	**0.80**	**1.75**

3.3 G Monitoring of Ground Water Levels of Cluster-VII

Cluster-VII consists of fourteen mines namely; Dhansar mixed mine, Kusunda OCP, Viswakarma OCP, Industry UG (closed), Alkusa UG, Ena OCP, S.Jharia/Rajapur OCP, Burragarh UG, Simlabahal UG, Hurriladih UG, Bhutgoria UG, Kustore UG (closed) and E.Bhuggatdih UG (closed) under the administrative control of Kusunda Area and Kustore Area of BCCL. This Cluster of mines is located in east central part of Jharia Coalfield in Dhanbad district of Jharkhand.

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

*7 hydrograph 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 February, April, August & November'2018 and the Ground water level data is enclosed in the table below:*

Sl No.	Well No.	Location	Water level (bgl in meters)			
			Feb'18	Apr'18	Aug'18	Nov'18
1	D-3	Dhansar	1.65	3.43	1.50	2.45
2	D-4	Jharia	1.21	1.91	0.91	1.56
3	D-33	Kustore	0.55	2.85	0.55	0.95
4	D-34	Kusunda	0.60	2.80	0.45	0.70
5	D-47	Parastanr	3.55	5.33	2.55	3.65

6	*D-55*	*Hariladih*	*4.42*	*8.42*	*1.57*	*4.02*
7	*D-80*	*Bastacolla*	*4.35*	*9.35*	*3.28*	*4.20*
Average WL (bgl)			*2.33*	*4.87*	*1.54*	*2.50*

Ground Water Level (in bgl) varies from 0.55 to 4.42 m during February, 1.91 to 9.35 m during April, 0.45 to 3.28 m during August and 0.70 to 4.20 m during November within the Core Zone of Cluster-VII area.

3.3 H Monitoring of Ground Water Levels of Cluster-VIII

Cluster-VIII consists of ten mines namely; Bastacolla mixed mines (OC & UG), Bera mixed mines (OC & UG), Dobari UG, Kuya mixed (OC & UG), proposed Goluckdih (NC) OC, Ghanoodih OC and Kujama OC under the administrative control of Bastacolla Area of BCCL. This Cluster of mines is located in eastern part of Jharia Coalfield in Dhanbad district of Jharkhand.

The present leasehold area of Cluster-VIII is 1200.41 Ha. The area has a general undulating topography with general slope towards south and south-west. The ground elevation in the area ranges from 175 m to 221 m AMSL. Chatkari Jore, Tisra Jore and its tributaries controlling the drainage pattern of the area. The area comes under the watershed of Chatkari Jore.

*4 hydrograph 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 February, April, August & November'2018 and the Ground water level data is enclosed in the table below:*

Sl No.	*Well No.*	*Location*	*Water level (bgl in meters)*			
			Feb'18	*Apr'18*	*Aug'18*	*Nov'18*
1	*D-8*	*Alokdiha*	*3.20*	*5.65*	*1.65*	*1.85*
2	*D-43*	*Alagdih*	*3.05*	*7.15*	*2.90*	*3.45*
3	*D-49*	*Galucdih*	*1.98*	*3.45*	*1.45*	*2.45*
4	*D-51*	*Chankuiya*	*8.26*	*10.93*	*4.80*	*7.10*
Average WL (bgl)			*4.12*	*6.80*	*2.70*	*3.71*

Ground Water Level (in bgl) varies from 1.98 to 8.26 m during February, 3.45 to 10.93 m during April, 1.45 to 4.80 m during August and 1.85 to 7.10 m during November within the Core Zone of Cluster-VIII area.

3.3 I Monitoring of Ground Water Levels of Cluster-IX

Cluster-IX consists of eight mines namely; North Tisra/South Tisra Expansion OCP, Lodna UG, Bagdigi UG, Bararee UG and Joyrampur UG and Jealgora UG (closed) are under the administrative control of Lodna Area of BCCL. This Cluster of mines is located in eastern part of Jharia Coalfield in Dhanbad district of Jharkhand.

The present leasehold area of Cluster-IX is 1942.12 Ha. The topography of the area is undulating with gentle slope towards south. The RL varies from 221 m to 188.44 m AMSL. Chatkari Jore, Tisra Jore, Sulunga Jore and its tributaries controlling the drainage pattern of the area. The area comes under the watershed of Chatkari Jore.

*6 hydrograph 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 February, April, August & November'2018 and the Ground water level data is enclosed in the table below:*

Sl No.	Well No.	Location	Water level (bgl in meters)			
			Feb'18	Apr'18	Aug'18	Nov'18
1	D-5	Jiyalgora	5.80	7.80	4.39	5.30
2	D-7	Golden Pahari	5.15	7.53	2.23	2.83
3	D-39	Tilaboni	3.18	4.95	2.50	4.35
4	D-40A	Khapa Dhawra	1.70	2.10	1.10	1.40
5	D-41	Joyrampur	1.30	1.59	1.08	1.32
6	D-74	Bhulan Bararee	5.80	8.60	3.40	4.80
Average WL (bgl)			3.82	5.43	2.45	3.33

Ground Water Level (in bgl) varies from 1.30 to 5.80 m during February, 1.59 to 8.60 m during April, 1.08 to 4.39 m during August and 1.32 to 5.30 m during November within the Core Zone of Cluster-IX area.

3.3 J Monitoring of Ground Water Levels of Cluster-X

Cluster-X consists of ten coal mines and one coal Washery namely; Bhowrah North mixed mines (UG & OC), Bhowrah South mixed mines (UG, 3 Pit OCP, Chandan OCP), Patherdih Mixed mines (UG, Chandan OCP), Sudamdih incline UG mine, Sudamdih Shaft UG mine, Amlabad UG (Closed) and Sudamdih Coal Washery under the administrative control of Eastern Jharia Area of BCCL. This cluster of mines is located in the eastern part of Jharia Coalfield in Dhanbad district of Jharkhand.

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.

*4 hydrograph 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 February, April, August & November'2018 and the Ground water level data is enclosed in the table below:*

Sl No.	Well No.	Location	Water level (bgl in meters)			
			Feb'18	Apr'18	Aug'18	Nov'18
1	A-19	Bhowrah	2.95	5.55	1.85	2.45
2	D-35	Patherdih	6.58	8.40	3.58	4.45
3	D-36	Sudamdih	1.00	1.20	0.45	0.60
4	D-77	Amlabad	3.63	6.30	4.00	5.20
Average WL (bgl)			3.54	5.36	2.47	3.18

Ground Water Level (in bgl) varies from 1.00 to 6.58 m during February, 1.20 to 8.40 m during April, 0.45 to 4.0 m during August and 0.60 to 5.20 m during November within the Core Zone of Cluster-X area.

3.3 K Monitoring of Ground Water Levels of Cluster-XI

Cluster–XI consists of eight coal mines and one coal Washery namely; Gopalichak UG Project, Kachi Balihari 10/12 Pit UG, Pootkee Balihari Project UG, Bhagaband UG, Kendwadih UG (closed), Pootkee UG (closed), Kachi Balihari 5/6 Pit UG (closed) are under the administrative control of Pootkee Balihari Area and Moonidih UG & Moonidih Washery are under the administrative control of Western Jharia Area of BCCL. This Cluster of mines is located in central part of Jharia Coalfield in Dhanbad district of Jharkhand.

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.

*5 hydrograph stations (**A-17, A-18, A-20, A-32 and D-34**) are located in the core zone of the mine area. Water level monitoring in these monitoring stations has been done in the months of February, April, August & November'2018 and the Ground water level data is enclosed in the table below:*

Sl No.	Well No.	Location	Water below (bgl in meters)			
			Feb'18	Apr'18	Aug'18	Nov'18
1	A-17	Kachi Balihari	2.07	3.34	1.64	2.84
2	A-18	Baghaband	0.89	1.24	1.34	0.99
3	A-20	Gorbudih	3.59	4.57	1.92	2.57
4	A-32	Baludih	0.60	2.80	0.45	0.70
Average GW (bgl)			2.26	3.20	1.64	2.16

Ground Water Level (in bgl) varies from 0.60 to 3.59 m during February, 1.24 to 4.57 m during April, 0.45 to 1.92 m during August and 0.70 to 2.84 m during November within the Core Zone of Cluster-XI area.

3.3 L Monitoring of Ground Water Levels of Cluster-XIII

Cluster-XIII consists of one operating mine i.e. Murulidih 20/21 pits UG mine and six abandoned mines (Bhurungiya Colliery, Muchraidih colliery, Hantoodih colliery, Padugora colliery, Murulidih colliery, Bhatdee colliery) of Western Jharia Area of BCCL. It is located in the south-western part of Jharia Coalfield in Dhanbad district of Jharkhand.

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.

*6 hydrograph 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 February, April, August & November'2018 and the Ground water level data is enclosed in the table below:*

Sl No.	Well No.	Location	Water level (bgl in meters)			
			Feb'18	Apr'18	Aug'18	Nov'18
1	A-22A	Nagdah Basti	1.70	3.35	1.10	1.30
2	A-23	Machhayara	8.92	11.15	6.46	7.17
3	A-33	Mahuda Washery	2.24	4.07	1.26	2.35
4	A-34	Mahuda Mosque	5.32	9.45	4.75	5.35
5	B-25	Mahuda More	3.68	5.90	2.90	3.70
6	B-48	Mahuda	3.55	7.33	2.95	3.97
Average GW (bgl)			4.24	6.88	3.24	3.97

Ground Water Level (in bgl) varies from 1.70 to 8.92 m during February, 3.35 to 11.15 m during April, 1.10 to 6.46 m during August and 2.35 to 7.17 m during November within the Core Zone of Cluster-XIII area.

3.3 M Monitoring of Ground Water Levels of Cluster-XIV

Cluster-XIV consists of two mines namely; Lohapatty UG and Lohapatty Opencast Patch (proposed). These are under the administrative control of Western Jharia of BCCL. This Cluster of mines is located in western part of Jharia Coalfield in Dhanbad district of Jharkhand.

The present leasehold area of Cluster-XIV is 1577.22 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.

*3 hydrograph 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 February, April, August & November'2018 and the Ground water level data is enclosed in the table below:*

Sl No.	Well No.	Location	Water level (bgl in meters)			
			Feb'18	Apr'18	Aug'18	Nov'18
1	B-23	Lohapatti	3.04	6.64	1.74	2.14
2	B-24	Telmuchu	6.43	9.28	3.31	4.33
3	B-67	Simatanr	6.50	9.55	3.60	4.00
Average GW (bgl)			5.32	8.49	2.88	3.49

Ground Water Level (in bgl) varies from 3.04 to 6.50 m during February, 6.64 to 9.55 m during April, 1.74 to 3.60 m during August and 2.14 to 4.00 m during November within the Core Zone of Cluster-XIV area.

3.3 N Monitoring of Ground Water Levels of Cluster-XV

Cluster–XV consists of four coal mines; Kharkharee UG and Dharmaband UG are under the administrative control of Govindpur Area and Madhuband UG & Phularitand UG are under the administrative control of Barora Area of BCCL. This Cluster of mines is located in western part of Jharia Coalfield in Dhanbad district of Jharkhand.

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.

*3 hydrograph 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 February, April, August & November'2018 and the Ground water level data is enclosed in the table below:*

Sl No.	Well No.	Location	Water level (bgl in meters)			
			Feb'18	Apr'18	Aug'18	Nov'18
1	A-24	Pipratanr	11.68	14.58	5.78	6.88
2	B-32A	Madhuband	3.23	6.75	2.80	3.90
3	B-61A	Kesargora	1.27	2.57	2.0	2.02
Average GW (bgl)			5.39	7.97	3.63	4.27

Ground Water Level (bgl) varies from 1.27 to 11.68 m during February, 2.57 to 14.58 m during April, 2.0 to 5.78 m during August and 2.02 to 6.88 m during November within the Core Zone of Cluster-XV area.

3.3 O Monitoring of Ground Water Levels of Cluster-XVI

Cluster-XVI consists of five mines namely, Dahibari-Basantimata OC, Basantimata UG, New Laikidih OC, Laikdih Deep UG and Chunch UG under the administrative control of Chanch-Victoria Area of BCCL. This cluster of mines is located in the western part of Raniganj Coalfield in Dhanbad district of Jharkhand.

The present leasehold area of Cluster-XVI is 1964.21 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.

*4 hydrograph stations (**DB-22, DB-23, DB-24 and 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 February, April, August & November'2018 and the Ground water level data is enclosed in the table below:*

Sl No.	Well No.	Location	Water level (bgl in meters)			
			Feb'18	Apr'18	Aug'18	Nov'18
1	DB-22	Dahibari, Niche Basti	1.98	2.34	1.35	1.93
2	DB-23	Dahibari OC	2.00	2.85	1.20	1.75
3	DB-24	Dahibari	8.70	8.25	4.43	5.70
4	DB-25	Palasya	3.23	3.93	1.41	1.63
Average GW Level			3.98	4.34	2.10	2.75

Ground Water Level (in bgl) varies from 1.98 to 8.70 m during February, 2.34 to 8.25 m during April, 1.20 to 4.43 m during August and 1.63 to 5.70 m during November within the Core Zone of Cluster-XVI area.

4.0 GROUNDWATER LEVEL SCENARIO

During the month of February'2018 the depth to water level (in bgl) within 15 nos Cluster of mines varies from 0.50 m to 11.68 m with an average varies from of 1.55 m to 5.39 m. During the month of April'2018 the depth to water level varies from 1.20 m to 14.58 m with an average varies from 3.12 m to 8.50 m. During the month of August'2018 the depth to water level varies from 0.80 m to 6.47 m with an average varies from 0.80 m to 3.73 m. During the month of November'2018 the depth to water level varies from 0.40 m to 7.17 m with an average varies from 1.75 m to 4.26 m. The summarized water level data of all clusters are given in ***Table No – 4****.*

Depth to water level (in bgl) values described that water level goes down to maximum 14.58 m during pre-monsoon'2018 and maximum upto 8.50 m during post-monsoon'2018. Un-confined aquifer is affected around 20 m to 30 m maximum close to active opencast mining areas, showing steep gradient towards mine void. Other than that, there is no mining effect in the water level within JCF area and RCF area (part). Historical water level data and hydrograph of permanent observation stations from CGWB shown in ***Annexure–III****.*

*Monitoring groundwater (quantity & quality) to assess the present condition and resource has been done regularly in the coalfield areas. Well hydrographs (****Annexure–III and VI****) are prepared and studied to identify potentially adverse trends so that appropriate action can be taken to protect groundwater resource. According to the hydrograph trend analysis of CGWB monitoring wells and CMPDI observation wells, there are decline trends in both Pre and Post-monsoon GW level trends (max. upto 0.50 cm/year in Patherdih/D-35) but no significant decline trend (>1.0 m/year) of water level is noticed in any particular area for the last 10 years within the coalfield area. Regarding quality monitoring, the water sample location map (****Figure No–2****) with collection points details (dug wells) are given in* ***Annexure–IV*** *and Quality is given in* ***Annexure–V****.*

Table No–4: Groundwater level data Cluster-wise

Sl. No.	***Cluster of BCCL***	***No. of Monitoring Wells***	***Water level fluctuation Below ground level (Feb, Apr, Aug & Nov'18)***	***Formation***
1	*I*	*4 nos.*	*0.75 to 9.65 m*	*Barakar*
2	*II*	*5 nos.*	*0.90 to 13.68 m*	*Barakar*
3	*III*	*5 nos.*	*0.40 to 6.63 m*	*Barakar*
4	*IV*	*4 nos.*	*0.55 to 10.03 m*	*Barakar*
5	*V*	*4 nos.*	*0.37 to 4.40 m*	*Barakar*
6	*VI*	*2 nos.*	*0.50 to 4.58 m*	*Barakar*
7	*VII*	*7 nos.*	*0.45 to 9.35 m*	*Barakar*
8	*VIII*	*4 nos.*	*1.45 to 10.93 m*	*Barakar*
9	*IX*	*6 nos.*	*1.08 to 8.60 m*	*Barakar*
10	*X*	*4 nos.*	*0.45 to 8.40 m*	*Barakar*
11	*XI*	*5 nos.*	*1.0 to 3.65 m*	*Barakar & Barren Measure*
12	*XIII*	*6 nos.*	*1.10 to 11.15 m*	*Raniganj*
13	*XIV*	*3 nos.*	*1.74 to 9.55 m*	*Raniganj*
14	*XV*	*3 nos.*	*1.27 to 14.58 m*	*Barakar & Barren Measure*
15	*XVI*	*4 nos.*	*1.20 to 8.70 m*	*Barakar*

5.0 GROUNDWATER QUALITY

The ground water sample of the study area (15 nos. of Cluster of mines, BCCL) have been collected from dug wells and analysed. Fifteen ground water samples (GW-1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 13, 14, 15 & 16) were analysed quarterly (March, May, August and November'2018) at CMPDI, RI-II, Dhanbad. The water sampling details are given in ***Annexure–IV*** *and Water sample locations are shown in* ***Figure No-2****. The water quality data are enclosed in* ***Annexure–VA, VB, VC and VD****.*

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

During the month of March, May, August and December'2018:

The pH of the groundwater samples varies between 7.45 to 7.92 in March'18, 7.19 to 8.11 in May'18, 7.71 to 8.23 in August'18 and 7.14 to 8.24 in December'18. The pH is within the ISI limit of drinking water standard.

During the month of March, May, August and December'2018:

The mineral constituents dissolved in water constitute the dissolved solids. The total dissolve solids varies from 188 to 485 mg/l in March'18, from 286 to 566 in May'18, from 320 to 1060 in August'18 and from 132 to 830 in December'2018. The TDS values are above the IS 10500 standards of drinking water.

During the month of March, May, August and December'2018:

During the month of March'18 the alkalinity of the water samples varies from 64 to 132 mg/l and are within the stipulated standard of (200 mg/l) drinking water. The concentrations of calcium in the water samples vary from 30 to 46 mg/l and are within the permissible limit (75 mg/l) of drinking water standards. The total hardness ranges between 68 to 196 mg/l and the value of total hardness in water samples are within the permissible limit (200 mg/l). The sulphate ranges between 08 to 96 mg/l 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 are found to be below the upper ISI limits for drinking water.

During the month of May'18 the alkalinity of the water samples varies from 70 to 188 mg/l and are within the stipulated standard of (200 mg/l) drinking water. The concentrations of calcium in the water samples vary from 29 to 58 mg/l and are within the permissible limit (75 mg/l) of drinking water standards. The total hardness ranges between 132 to 326 mg/l and the value of total hardness in water samples are **above** *the permissible limit (200 mg/l). The sulphate ranges between 65 to 180 mg/l 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 are found to be below the upper ISI limits for drinking water.*

During the month of August'18 the alkalinity of the water samples varies from 45 to 152 mg/l and are within the stipulated standard of (200 mg/l) drinking water. The concentrations of calcium in the water samples vary from 30 to 194 mg/l and are above the permissible limit (75 mg/l) of drinking water standards. The total hardness ranges between 130 to 740 mg/l and the value of total hardness in water samples are above the permissible limit (200 mg/l). The sulphate ranges between 34 to 228 mg/l and the value of sulphate in water sample are **slightly above** *the permissible limit (200 mg/l). The Iron (***slightly above the limit***), Copper, Manganese, Lead, Zinc and Chromium concentration in the water samples are found to be below the upper ISI limits for drinking water.*

During the month of December'18 the alkalinity of the water samples varies from 112 to 212 mg/l and are **slightly above** *the stipulated standard of (200 mg/l) drinking water. The concentrations of calcium in the water samples vary from 12 to 28 mg/l and are within the permissible limit (75 mg/l) of drinking water standards. The total hardness ranges between 286 to 602 mg/l and the value of total hardness in water samples are* **above** *the permissible limit (200 mg/l). The sulphate ranges between 48 to 84 mg/l and the value of sulphate in water sample are within the permissible limit (200 mg/l). The Iron, Manganese (***slightly above the limit***), Copper, Lead, Zinc and Chromium concentration in the water samples are found to be below the upper ISI limits for drinking water.*

6.0 STAGE OF GROUNDWATER DEVELOPMENT

The groundwater is mainly utilized for domestic needs and for irrigation purposes. The groundwater abstraction is mainly through dug wells and bore wells. The stage of groundwater development in Dhanbad District is 77%. The highest stage of development is in Jharia Block (127.0%) & Dhanbad Block (107.50%) and lowest stage of development is in Baliapur Block (78.24%). The Gondwana sandstones in general, are 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 done by Central Ground Water Board (CGWB), Patna in 2013, the Block wise data of Dhanbad District is given below:

Table No–5: Block-wise Stage of Groundwater development

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

- ***Dynamic Groundwater Resource Assessment (as on 31st March, 2013), CGWB***

Table No–6: Cluster-wise Groundwater development scenario

Cluster/ Area	Adminis-trative Blocks/Stage Of GW Develo-Pment (SOD)	Total Water demand (Lakh cum/year)				Avg. GW level (bgl in m) 2018		GW level declining trend 2005-2018		Quantity Recharge/ future use (Lakh Cum/ Year)
		Mine Discharge (GW + Rainwater)	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)	9.56	NIL	7.42	2.14	5.11	1.84	YES	YES	NIL
Cluster-II	Baghmara (SOD: Critical)	170.17	Jamunia river	22.55	23.83	6.57	2.84	YES	NO	123.75
Cluster-III		58.18	NIL	2.58	12.65	6.64	2.64	NO	YES	42.95
Cluster-IV		68.84	MADA (Damodar river)	18.47	12.31	5.64	2.66	NO	NO	38.06
Cluster-V		127.29	MADA	77.92	31.02	3.22	2.13	YES	YES	18.35
Cluster-VI	Dhanbad (SOD: Over-exploited)	3.86	MADA (Damodar river)	3.69	0.0	3.60	1.75	YES	YES	NIL (loss due to FF)
Cluster-VII		93.33	MADA	27.70	6.87	4.87	2.50	YES	NO	58.76
Cluster-VIII	Jharia (SOD: Over-exploited)	29.27	MADA	24.04	1.18	6.80	3.71	NO	NO	4.05
Cluster-IX		310.34	MADA	160.28	45.05	5.43	3.33	NO	NO	105.01
Cluster-X		59.38	Damodar river	11.47	0.0	5.36	3.18	YES	NO	47.91

Cluster-XI	*Dhanbad (SOD: Over-exploited)*	*249.67*	*MADA & DVC*	*19.86*	*43.92*	*3.20*	*2.16*	*YES*	*YES*	*185.89*
Cluster-XIII	*Baghmara (SOD: Critical)*	*64.61*	*Damodar river*	*10.09*	*9.86*	*6.88*	*3.97*	*YES*	*YES*	*44.66*
Cluster-XIV		*NA*	*NA*	*NA*	*NA*	*8.49*	*3.49*	*NO*	*NO*	*NA*
Cluster-XV		*5.11*	*Jamunia river*	*0.0*	*5.11*	*7.97*	*4.27*	*NO*	*YES*	*0.0*
Cluster-XVI	*Nirsa (SOD:Safe)*	*29.78*	*DVC (Barakar river)*	*14.60*	*6.57*	*4.34*	*2.75*	*NO*	*NO*	*8.61*

7.0 CONSERVATION MEASURES & FUTURE STRATEGY

- *BCCL has installed 25 Pressure Filter Plant of total capacity of 4.16 MGD to meet drinking water requirement nearby the area. At present 63 Water Treatment Plants are operational having capacity of 16.16 MGD within Jharia Coalfield area. Further installation of 28 more Pressure Filter Plants with the capacity of 5.84 MGD are in progress.*

- *BCCL participated in development of low cost technology for drinking water in a CSIR project along with CIMFR, Dhanbad and a pilot plant of 4000 Liters/hour is functional at PB Project site of BCCL. Similar plant has been proposed at other sites of BCCL.*

- *A scheme entitled 'Scheme for multi-purpose utilization of surplus mine water of Barora Area, Block II and Govindpur Area of BCCL' was prepared with a view to harness the excess water discharge to take care of the persistence problem of water scarcity in the nearby villages. In the scheme, two water reservoirs of capacity 27 MG and 17 MG have been proposed in the non-coal bearing area for storage of 3250 GPM and 2000 GPM surplus mine water which will be fed through pipe line by mine discharge at mines of Barora, Block-II and Govindpur Area.*

- *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 and around 13150 cum/annum of water is going to be recharged the nearby groundwater system through RWH structures. Proposal already made to facilitate this kind of RWH structure at suitable locations i.e. Lodna Area, Kusunda Area (Jawahar*

Nagar, Matkuria, Coal Board Colony), Sijua Area (Nichitpur and Tetulmari Colony) within Jharia Coalfield to augment groundwater recharge.

- *After cessation of mining, with plenty rainfall and abundant ground water recharge, the water levels will recoup and attain normalcy. Thus, the impact of mining on groundwater system may 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 through connecting pipeline to abandoned dug wells. Utilization of mine water for irrigation use will also enhance the ground water recharge potential through artificial recharge in the area.*

- *Increase vegetative cover by plantation in the mine area under land amelioration measures. This will contain the surface run-off and increase the groundwater recharge.*

- *Creation of awareness among workers and local peoples about Rain water harvesting and artificial recharge will be given priority. This aspect is usually covered during the Environmental Week celebrated every year (5 to 12 June).*

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

Annexure – I

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-63***	*Abandoned due to OCP*	
A-12	*23^{0}48'20.31" N*	*86^{0}16'51.64" E*	***B-64***	*23^{0}48'43.14" N*	*86^{0}18'44.25" E*
A-16	*23^{0}46'57.00" N*	*86^{0}21'38.57" E*	***B-65A***	*23^{0}48'53.65" N*	*86^{0}18'11.82" 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}41'12.86" N*	*86^{0}23'55.27" E*	***D-4***	*23^{0}44'29.37" N*	*86^{0}24'42.88" E*
A-20	*23^{0}44'56.64" N*	*86^{0}19'55.35" E*	***D-5***	*23^{0}42'20.05" N*	*86^{0}24'86.06" E*
A-22	*23^{0}43'06.65" N*	*86^{0}14'48.53" E*	***D-7***	*23^{0}43'12.08" N*	*86^{0}27'11.89" E*
A-23	*23^{0}45'06.38" N*	*86^{0}15'12.69" E*	***D-8***	*23^{0}44'06.13" N*	*86^{0}27'20.72" E*
A-24	*23^{0}45'20.44" N*	*86^{0}13'45.12" E*	***D-23***	*23^{0}47'20.89" N*	*86^{0}20'09.96" E*
A-25	*23^{0}47'06.20" N*	*86^{0}15'27.79" E*	***D-25***	*23^{0}47'03.28" N*	*86^{0}23'29.56" E*
A-26	*23^{0}46'49.24" N*	*86^{0}18'12.12" E*	***D-30***	*23^{0}48'36.10" N*	*86^{0}21'50.07" E*
A-27	*23^{0}48'42.55" N*	*86^{0}20'21.80" E*	***D-33***	*23^{0}45'34.62" N*	*86^{0}23'18.50" E*
A-28A	*23^{0}47'34.74" N*	*86^{0}18'04.18" E*	***D-34***	*23^{0}45'36.50" N*	*86^{0}23'02.45" E*
A-29	*23^{0}47'08.02" N*	*86^{0}16'02.72" E*	***D-35***	*23^{0}40'46.54" N*	*86^{0}25'46.33" E*
A-32	*23^{0}44'15.56" N*	*86^{0}20'43.80" E*	***D-36***	*23^{0}40'19.26" N*	*86^{0}25'18.98" E*
A-33	*23^{0}44'32.58" N*	*86^{0}16'58.28" E*	***D-39***	*23^{0}43'28.50" N*	*86^{0}26'0.10" E*
A-34	*23^{0}42'58.63" N*	*86^{0}15'19.31" E*	***D-40A***	*23^{0}43'20.18" N*	*86^{0}25'45.70" E*
B-1	*23^{0}48'48.06" N*	*86^{0}14'16.87" E*	***D-41***	*23^{0}42'40.00" N*	*86^{0}26'17.20" E*
B-14	*23^{0}48'00.81" N*	*86^{0}16'25.88" E*	***D-43****	*NA*	*NA*
B-15	*23^{0}46'06.92" N*	*86^{0}08'59.30" E*	***D-47***	*23^{0}45'20.59" N*	*86^{0}24'34.86" E*
B-21A	*23^{0}45'10.50" N*	*86^{0}09'36.38" E*	***D-49***	*23^{0}44'08.96" N*	*86^{0}26'32.71" E*
B-23	*23^{0}44'13.05" N*	*86^{0}11'46.56" E*	***D-51***	*23^{0}44'20.86" N*	*86^{0}27'11.37" E*
B-24	*23^{0}44'26.80" N*	*86^{0}13'09.38" E*	***D-55***	*23^{0}43'58.37" N*	*86^{0}24'07.45" E*
B-25	*23^{0}44'44.98" N*	*86^{0}13'57.80" E*	***D-74***	*23^{0}41'33.66" N*	*86^{0}25'06.10" E*
B-32A	*23^{0}45'49.18" N*	*86^{0}13'03.64" E*	***D-77***	*23^{0}41'00.74" N*	*86^{0}22'25.55" E*

B-48	*23^{03}4'35.09" N*	*86^{0}16'38.30" E*	***D-80***	*23^{0}46'09.46" N*	*86^{0}24'33.08" E*
B-51	*23^{0}47'40.20" N*	*86^{0}09'11.90" E*	***DB-22***	*23^{0}43'38.81" N*	*86^{0}45'09.00" E*
B-53	*23^{0}45'55.25" N*	*86^{0}09'35.44" E*	***DB-23***	*23^{0}43'44.24" N*	*86^{0}45'06.39" E*
B-53A	*-*	*-*	***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*			
B-62A	*23^{0}45'44.15" N*	*86^{0}11'27.80" E*			

Annexure – IIA

Details of Hydrograph Stations (Dug Wells)

Well No	***Location***	***M.P. (agl) in m***	***Well Dia in m***	***Well Depth (m bmp)***	***R.L. (G.L) (m)***	***Formation***	***Owner***	***Utility***
A-3	*Sijua*	*0.53*	*3.00*	*5.20*	*203*	*Barakar*	*Govt.*	*Domestic*
A-12	*Jamua*	*0.80*	*1.90*	*3.30*	*202*	*Barakar*	*Govt.*	*Domestic*
A-16	*Ekra, Kalali More*	*0.45*	*3.10*	*6.50*	*205*	*Barakar*	*Govt.*	*Domestic*
A-17	*Kachi Balihari*	*0.56*	*1.60*	*5.30*	*182*	*Barakar*	*Govt.*	*Domestic*
A-18	*Bhagabandh*	*0.61*	*1.45*	*3.37*	*182*	*Barakar*	*Govt.*	*Domestic*
A-19	*Bhaura*	*0.54*	*3.15*	*11.65*	*162*	*Barakar*	*Govt.*	*Domestic*
A-20	*Gorbhudih*	*0.43*	*3.30*	*8.30*	*181*	*BM*	*Govt.*	*Domestic*
A-22	*Nagdah, Niche tola*	*0.00*	*1.40*	*9.50*	*171*	*Raniganj*	*Govt*	*Irrigation*
A-23	*Machhyara*	*0.43*	*1.85*	*12.40*	*203*	*Raniganj*	*Govt*	*Domestic*
A-24	*Pipra Tanr*	*0.22*	*1.80*	*19.55*	*208*	*Raniganj*	*Govt*	*Domestic*
A-25	*Sinidih*	*0.22*	*2.00*	*11.30*	*203*	*Barakar*	*Govt*	*Domestic*
A-26	*Pasitanr (Malkera)*	*0.32*	*1.80*	*9.65*	*198*	*Barakar*	*Govt*	*Domestic*
A-27	*Chandor*	*0.60*	*2.50*	*5.50*	*221*	*Barakar*	*Govt*	*Domestic*
A-28A	*Lakarka 6 no.*	*0.65*	*1.30*	*5.25*	*199*	*Barakar*	*BCCL*	*Domestic*
A-29	*Aambagan (Gobindpur)*	*0.10*	*2.60*	*9.15*	*186*	*Barakar*	*Govt*	*Domestic*
A-32	*Baludih*	*0.55*	*2.30*	*6.85*	*182*	*BM*	*Govt*	*Domestic*
A-33	*Mahuda*	*0.75*	*2.00*	*10.80*	*195*	*BM*	*BCCL*	*Domestic*
A-34	*Bhatdih*	*0.55*	*3.50*	*24.50*	*162*	*Raniganj*	*BCCL*	*Domestic*
B-1	*Muraidih*	*0.47*	*1.80*	*5.35*	*212*	*Talchir*	*Govt*	*Domestic*
B-14	*Mathadih*	*0.76*	*2.15*	*3.75*	*201*	*Barakar*	*Govt*	*Domestic*
B-15	*Bera Basti*	*0.55*	*1.60*	*2.50*	*221*	*Talchir*	*Dhanu Roy*	*Domestic*
B-21A	*Dugdha*	*0.55*	*2.10*	*10.35*	*220*	*Metamorphics*	*Govt*	*Domestic*

B-23	*Lohapati*	*0.26*	*3.60*	*10.85*	*204*	*Raniganj*	*Govt*	*Domestic*
B-24	*Telmuchu*	*0.67*	*4.35*	*10.83*	*207*	*Raniganj*	*Govt*	*Domestic*
B-25	*Mahuda More*	*0.10*	*2.45*	*8.45*	*205*	*Raniganj*	*Govt*	*Domestic*
B-32A	*Madhuband*	*0.80*	*4.30*	*8.60*	*205*	*Barakar*	*BCCL*	*Domestic*
B-48	*Mahuda*	*0.65*	*2.10*	*11.50*	*181*	*Raniganj*	*Mosque*	*Domestic*
B-51	*Taranga*	*0.00*	*2.50*	*5.75*	*215*	*Metamorphics*	*Bisun*	*Irrigation*
B-53	*Karmatanr*	*0.58*	*2.70*	*13.25*	*195*	*Barakar*	*Govt*	*Domestic*
B-53A	*Karmatanr-Damoda OCP*							
B-59	*Khodovaly*	*0.60*	*2.40*	*9.30*	*202*	*Barakar*	*BCCL*	*Domestic*
B-60	*Bahiyardih*	*0.77*	*3.00*	*15.60*	*196*	*Barakar*	*BCCL*	*Domestic*
B-61A	*Kesargora*	*0.48*	*2.00*	*11.20*	*201*	*Barakar*	*BCCL*	*Domestic*
B-62A	*Sadariyadih*	*0.15*	*3.10*	*9.50*	*188*	*Barakar*	*Govt*	*Domestic*

Annexure – IIA

Details of Hydrograph Stations (Dug Wells)

Well No	***Location***	***M.P. (agl) in m***	***Well Dia in m***	***Well Depth (m bmp)***	***R.L. (G.L) (m)***	***Formation***	***Owner***	***Utility***
B-63	*West Mudidih*	*0.60*	*1.70*	*3.35*	*196*	*Barakar*	*BCCL*	*Domestic*
B-64	*Keshalpur*	*0.65*	*1.10*	*3.40*	*195*	*Barakar*	*BCCL*	*Domestic*
B-65A	*Jhinjipahari*	*0.95*	*2.20*	*12.40*	*196*	*Barakar*	*Shiv Temple*	*Domestic*
B-67	*Simatanr*	*0.55*	*2.20*	*11.80*	*198*	*Raniganj*	*Govt*	*Domestic*
D-3	*Dhansar*	*0.60*	*1.70*	*8.70*	*217*	*Barakar*	*Govt*	*Domestic*
D-4	*Jharia*	*0.59*	*1.90*	*5.73*	*218*	*Barakar*	*Govt*	*Domestic*
D-5	*Jiyalgora*	*0.70*	*2.80*	*10.55*	*183*	*Barakar*	*Govt*	*Domestic*
D-7	*Golden Pahari*	*0.67*	*2.85*	*10.05*	*201*	*Barakar*	*BCCL*	*Domestic*
D-8	*Alokdiha*	*0.35*	*1.75*	*7.57*	*201*	*Metamorphics*	*BCCL*	*Domestic*
D-23	*Jogta (Sindra)*	*0.40*	*3.10*	*7.25*	*205*	*Barakar*	*BCCL*	*Domestic*
D-25	*Godhar More*	*0.60*	*2.75*	*5.60*	*219*	*Barakar*	*Govt*	*Domestic*
D-30	*Borkiboa*	*0.70*	*2.00*	*5.60*	*221*	*Talchir*	*H.Kumbhakar*	*Domestic*
D-33	*Kustore-4*	*0.55*	*1.85*	*3.45*	*196*	*Barakar*	*BCCL*	*Domestic*
D-34	*Kusunda-7*	*0.60*	*1.50*	*3.45*	*201*	*Barakar*	*BCCL*	*Domestic*
D-35	*Patherdih*	*0.40*	*2.00*	*11.20*	*160*	*Barakar*	*BCCL*	*Domestic*
D-36	*Sudamdih*	*0.90*	*2.00*	*6.20*	*141*	*Barakar*	*BCCL*	*Domestic*
D-39	*Tilabani*	*0.85*	*2.00*	*5.90*	*178*	*Barakar*	*BCCL*	*Domestic*
D-40A	*Khapra Dhaora*	*0.55*	*1.95*	*3.70*	*180*	*Barakar*	*Panchayat*	*Domestic*
D-41	*Joyrampur*	*0.50*	*1.80*	*4.00*	*180*	*Barakar*	*BCCL*	*Domestic*
D-43	*Alagdih*	*0.45*	*2.20*	*8.90*	*200*	*Metamorphics*	*Govt*	*Domestic*
D-47	*Parastanr*	*0.45*	*3.20*	*23.80*	*206*	*Barakar*	*BCCL*	*Domestic*
D-49	*Goluckdih*	*0.55*	*1.80*	*6.15*	*192*	*Barakar*	*BCCL*	*Domestic*
D-51	*Chankuiya*	*0.55*	*3.70*	*11.90*	*197*	*Barakar*	*BCCL*	*Domestic*

D-55	*Hariladih*	*0.48*	*2.80*	*11.80*	*184*	*Barakar*	*Govt*	*Domestic*
D-74	*Bhulan Barari*	*0.10*	*1.60*	*12.80*	*173*	*Barakar*	*Govt*	*Domestic*
D-77	*Rohoniatanr*	*0.40*	*3.15*	*6.70*	*156*	*Barakar*	*Govt*	*Domestic*
D-80	*Bastacolla*	*0.70*	*2.50*	*24.95*	*219*	*Barakar*	*Govt*	*Domestic*
DB-22	*Nichebasti*	*0.67*	*2.40*	*10.65*	*121*	*Barakar*	*Govt*	*Domestic*
DB-23	*Dahibari OC*	*0.70*	*2.30*	*8.00*	*-*	*Barakar*	*BCCL*	*Domestic*
DB-24	*Dahibari*	*0.60*	*3.60*	*13.70*	*125*	*Barakar*	*BCCL*	*Domestic*
DB-25	*Palasya*	*0.37*	*1.55*	*5.25*	*127*	*Barakar*	*Govt*	*Domestic*

MP: Measuring Point ***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 – IIB

Historical Water Level data of Hydrograph Stations

Well No	Water level below ground level (bgl) in meters														
	May, 11	May, 12	Nov, 12	May, 13	Nov, 13	May, 14	Nov, 14	May, 15	Nov, 15	May, 16	Nov, 16	May, 17	Nov, 17	May, 18	Nov, 18
A-3	*4.77*	*4.25*	*1.87*	*4.47*	*4.45*	*4.67*	*2.37*	*3.70*	*3.42*	*4.87*	*0.47*	*0.67*	*0.77*	*1.27*	*0.47*
A-12	*2.80*	*2.80*	*1.30*	*3.00*	*1.17*	*2.45*	*1.4*	*3.00*	*2.68*	*2.50*	*0.70*	*2.55*	*0.85*	*2.80*	*1.0*
A-16	*5.80*	*3.53*	*1.60*	*3.80*	*3.35*	*5.5*	*2.9*	*5.55*	*4.17*	*5.85*	*3.15*	*3.65*	*2.20*	*4.30*	*3.65*
A-17	*2.24*	*2.52*	*2.34*	*2.32*	*1.54*	*2.19*	*1.91*	*3.79*	*2.64*	*2.44*	*2.69*	*2.44*	*2.24*	*3.34*	*2.84*
A-18	*2.49*	*2.59*	*0.90*	*2.87*	*0.91*	*1.76*	*1.19*	*2.84*	*1.29*	*1.14*	*0.89*	*1.29*	*0.99*	*1.24*	*0.99*
A19		*9.61*	*2.46*	*7.46*	*4.46*	*3.00*	*2.75*	*3.05*	*2.75*	*7.81*	*4.11*	*6.37*	*2.45*	*5.55*	*2.45*
A-20	*7.87*	*7.17*	*1.57*	*6.47*	*0.67*	*3.97*	*2.55*	*4.59*	*2.93*	*7.49*	*3.50*	*4.27*	*1.77*	*4.57*	*2.57*
A22A		*1.90*	*1.05*	*1.79*	*1.00*	*1.50*	*2.0*	*3.20*	*1.96*	*3.25*	*1.75*	*4.27*	*1.77*	*3.35*	*1.30*
A-23	*11.92*	*9.87*	*4.75*	*10.57*	*5.82*	*8.76*	*6.82*	*11.3*	*9.37*	*11.87*	*8.13*	*6.40*	*1.50*	*11.15*	*7.17*
A-24	*18.28*	*18.68*	*5.23*	*16.01*	*3.25*	*16.28*	*14.98*	*17.2*	*14.5*	*16.62*	*12.43*	*11.87*	*6.97*	*14.58*	*6.88*
A-25	*6.83*	*10.23*	*4.43*	*10.23*	*2.98*	*7.03*	*5.28*	*7.78*	*5.85*	*7.43*	*4.58*	*6.38*	*2.88*	*6.63*	*3.13*
A-26	*9.18*	*8.76*	*4.28*	*7.56*	*4.28*	*7.71*	*4.58*	*7.73*	*3.18*	*8.93*	*4.48*	*5.28*	*2.53*	*6.23*	*3.88*
A-27	*3.00*	*2.13*	*1.10*	*1.62*	*1.25*	*1.63*	*1.55*	*4.40*	*3.95*	*4.85*	*1.80*	*2.90*	*1.25*	*2.90*	*1.0*
A28A	*3.90*	*2.90*	*2.45*	*3.35*	*2.45*	*3.29*	*1.91*	*4.35*	*3.60*	*3.35*	*1.47*	*4.30*	*1.55*	*4.15*	*2.51*
A-29	*5.50*	*9.30*	*1.42*	*6.95*	*1.67*	*3.3*	*2.35*	*4.55*	*4.60*	*5.92*	*6.96*	*4.40*	*1.30*	*6.45*	*2.10*
A-32	*2.30*	*2.19*	*1.10*	*2.45*	*1.95*	*3.15*	*2.45*	*4.41*	*2.13*	*4.75*	*2.10*	*3.15*	*1.55*	*2.80*	*0.70*
A-33	*3.07*	*5.25*	*1.25*	*4.13*	*1.80*	*4.08*	*1.57*	*4.91*	*1.97*	*5.75*	*2.60*	*6.45*	*1.55*	*4.07*	*2.35*
A-34	*2.90*	*6.95*	*2.90*	*6.21*	*2.50*	*4.45*	*4.45*	*8.40*	*4.81*	*4.75*	*4.45*	*12.45*	*4.45*	*5.90*	*3.70*
B-1	*1.78*	*2.08*	*1.73*	*1.53*	*1.83*	*2.43*	*1.81*	*3.28*	*2.75*	*3.58*	*1.93*	*2.33*	*0.85*	*2.88*	*2.08*
B-14	*2.49*	*1.34*	*1.42*	*1.74*	*1.45*	*3.24*	*4.44*	*2.94*	*2.29*	*2.44*	*0.47*	*2.94*	*1.84*	*3.64*	*2.84*
B-15	*1.37*	*1.27*	*0.45*	*1.20*	*0.55*	*0.95*	*1.45*	*1.50*	*0.45*	*1.85*	*0.55*	*4.85*	*0.15*	*1.85*	*0.85*
B21A	*7.60*	*9.00*	*5.05*	*8.01*	*4.95*	*9.54*	*3.7*	*7.37*	*4.65*	*5.55*	*4.50*	*8.85*	*5.65*	*9.65*	*2.65*
B-23	*9.14*	*3.71*	*1.74*	*5.27*	*1.39*	*6.57*	*2.74*	*7.86*	*4.29*	*6.81*	*2.41*	*7.74*	*2.14*	*6.64*	*2.14*
B-24	*10.33*	*-*	*3.09*	*8.88*	*2.83*	*9.40*	*2.21*	*10.0*	*5.78*	*10.63*	*4.28*	*10.03*	*4.03*	*9.28*	*4.33*
B-25	*8.35*	*8.35*	*2.60*	*7.08*	*2.15*	*5.82*	*5.15*	*6.88*	*-*	*7.05*	*1.70*	*6.70*	*1.40*	*5.90*	*3.70*
B32A	*7.80*	*7.75*	*3.22*	*6.25*	*2.68*	*8.33*	*2.05*	*7.55*	*3.32*	*6.95*	*3.07*	*6.95*	*2.80*	*6.75*	*3.90*
B-48	*5.75*	*5.43*	*3.85*	*4.69*	*3.20*	*6.38*	*4.35*	*7.90*	*5.42*	*9.35*	*4.60*	*7.70*	*4.15*	*7.33*	*3.97*
B-51	*3.95*	*3.60*	*2.05*	*3.35*	*2.49*	*2.09*	*1.98*	*4.65*	*3.40*	*4.90*	*3.18*	*4.98*	*2.55*	*5.02*	*2.42*

B-53	*1.67*	*6.97*	*1.42*	*4.15*	*1.12*	*3.39*	*-*	*5.58*	*2.82*	*4.70*	*1.45*	*4.02*	*1.92*	*3.92*	*1.42*
B-59	*8.25*	*6.90*	*0.60*	*7.56*	*0.30*	*2.65*	*1.0*	*4.12*	*1.60*	*4.40*	*0.50*	*5.40*	*0.60*	*5.47*	*1.10*
B-60	*11.44*	*10.18*	*5.13*	*11.29*	*5.23*	*9.82*	*4.59*	*9.21*	*5.28*	*10.33*	*5.03*	*13.23*	*3.18*	*13.68*	*4.23*
B61A	*10.72*	*5.42*	*2.40*	*8.17*	*2.02*	*6.93*	*3.57*	*6.15*	*4.52*	*6.58*	*3.87*	*2.57*	*0.82*	*2.57*	*2.02*
B62A	*8.85*	*7.85*	*4.90*	*7.73*	*4.63*	*8.83*	*5.85*	*9.10*	*5.21*	*9.30*	*4.95*	*8.15*	*4.35*	*8.27*	*4.78*

Annexure – IIB

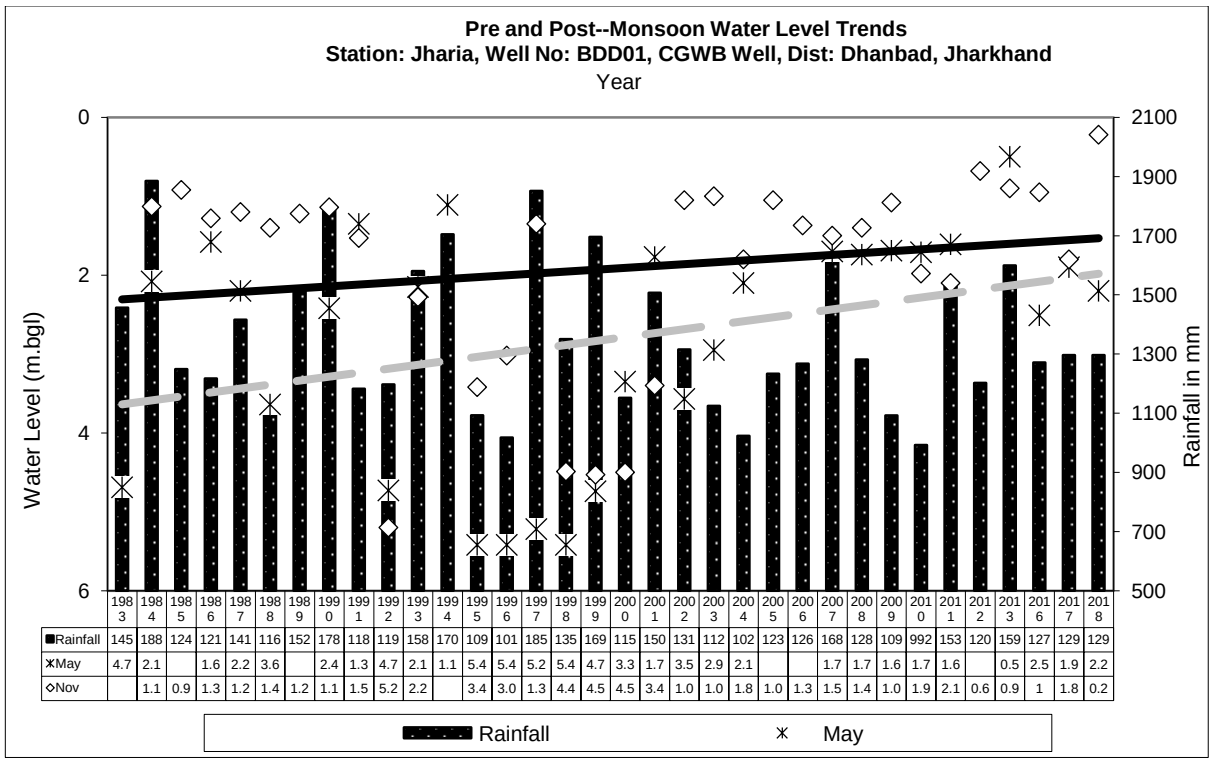
Historical Water Level data of Hydrograph Stations

Well No	Water level below ground level (bgl) in meters														
	May, 11	**May, 12**	**Nov, 12**	**May, 13**	**Nov, 13**	**May, 14**	**Nov, 14**	**May, 15**	**Nov, 15**	**May, 16**	**Nov, 16**	**May, 17**	**Nov, 17**	**May, 18**	**Nov, 18**
B-64	*0.85*	*1.05*	*1.00*	*1.35*	*0.85*	*0.7*	*1.15*	*1.38*	*0.95*	*2.35*	*0.55*	*1.25*	*0.85*	*2.15*	*1.85*
B65A	*9.65*	*11.45*	*1.73*	*10.11*	*1.82*	*10.45*	*2.4*	*7.82*	*5.87*	*7.15*	*2.68*	*9.05*	*1.25*	*10.03*	*2.40*
B-67	*11.25*	*8.55*	*6.50*	*9.73*	*5.31*	*9.80*	*3.72*	*9.23*	*5.53*	*9.53*	*4.30*	*10.00*	*2.15*	*9.55*	*4.0*
D-3	*2.55*	*2.93*	*1.80*	*3.45*	*1.68*	*2.54*	*2.11*	*4.25*	*2.25*	*2.35*	*1.90*	*2.15*	*2.30*	*3.43*	*2.45*
D-4	*1.51*	*1.94*	*0.91*	*2.41*	*0.98*	*1.23*	*0.91*	*2.41*	*1.27*	*1.21*	*1.36*	*1.21*	*1.46*	*1.91*	*1.56*
D-5	*9.05*	*9.50*	*6.45*	*9.32*	*4.59*	*9.0*	*7.8*	*9.37*	*8.33*	*9.40*	*6.40*	*7.90*	*5.20*	*7.80*	*5.30*
D-7	*9.33*	*6.08*	*5.83*	*7.19*	*4.63*	*5.28*	*5.53*	*8.25*	*5.61*	*7.53*	*4.03*	*7.33*	*2.88*	*7.53*	*2.83*
D-8	*7.75*	*6.15*	*3.75*	*6.65*	*2.85*	*7.73*	*-*	*6.24*	*4.38*	*8.00*	*3.43*	*5.15*	*1.85*	*5.65*	*1.85*
D-23	*6.80*	*6.00*	*3.30*	*6.60*	*1.20*	*6.38*	*2.4*	*6.55*	*3.48*	*5.70*	*1.63*	*2.80*	*2.98*	*4.40*	*3.40*
D-25	*4.70*	*5.20*	*3.65*	*4.26*	*3.45*	*4.42*	*2.9*	*4.48*	*2.45*	*2.40*	*1.90*	*2.40*	*1.20*	*2.60*	*2.40*
D-30	*5.10*	*3.88*	*1.80*	*4.38*	*3.08*	*4.17*	*3.3*	*4.55*	*3.15*	*4.45*	*3.20*	*4.40*	*1.25*	*4.58*	*1.10*
D-33	*0.95*	*2.85*	*0.35*	*1.80*	*0.45*	*1.72*	*0.35*	*2.25*	*1.10*	*2.50*	*1.95*	*0.75*	*0.75*	*2.85*	*0.95*
D-34	*2.85*	*2.35*	*2.50*	*2.50*	*2.13*	*2.80*	*0.30*	*2.55*	*1.45*	*2.30*	*0.30*	*0.80*	*0.55*	*2.80*	*0.45*
D-35	*8.20*	*8.05*	*5.55*	*7.70*	*4.10*	*6.94*	*6.15*	*9.80*	*7.90*	*9.52*	*6.45*	*8.80*	*3.60*	*8.40*	*4.45*
D-36	*1.95*	*1.55*	*0.15*	*1.28*	*0.80*	*1.82*	*0.75*	*1.66*	*1.13*	*0.78*	*0.95*	*1.30*	*0.70*	*1.20*	*0.60*
D-39	*5.05*	*5.05*	*3.65*	*3.98*	*2.50*	*5.03*	*2.25*	*5.00*	*2.61*	*2.18*	*2.65*	*6.17*	*4.75*	*4.95*	*4.35*
D40A	*1.95*	*2.45*	*1.70*		*2.25*	*2.35*	*2.45*	*3.07*	*2.45*	*1.40*	*0.85*	*1.45*	*1.35*	*2.10*	*1.40*
D-41	*1.55*	*1.50*	*1.50*	*1.72*	*1.35*	*3.20*	*1.35*	*2.65*	*2.32*	*1.30*	*1.52*	*1.40*	*1.20*	*1.59*	*1.32*
D-43	*7.65*	*7.05*	*4.00*	*6.23*	*4.05*	*6.0*	*4.75*	*6.61*	*5.05*	*8.20*	*3.35*	*7.50*	*3.60*	*7.15*	*3.45*
D-47	*4.35*	*1.95*	*2.12*	*2.60*	*2.97*	*8.0*	*2.37*	*9.60*	*3.60*	*3.18*	*2.95*	*3.15*	*2.85*	*5.33*	*2.55*
D-49	*1.55*	*1.60*	*1.65*	*1.30*	*1.45*	*2.51*	*1.65*	*3.55*	*2.35*	*2.45*	*1.72*	*2.70*	*2.05*	*3.45*	*2.45*
D-51	*10.85*	*10.00*	*7.85*	*8.94*	*8.35*	*9.60*	*9.05*	*10.48*	*9.15*	*11.15*	*6.45*	*10.45*	*5.43*	*10.93*	*7.10*
D-55	*5.97*	*1.93*	*1.82*	*3.90*	*1.45*	*1.95*	*2.07*	*6.15*	*1.57*	*2.52*	*3.62*	*6.42*	*2.37*	*8.42*	*1.57*
D-74	*4.05*	*4.95*	*3.60*	*4.55*	*3.41*	*5.0*	*4.0*	*10.05*	*7.20*	*7.73*	*5.00*	*9.25*	*3.85*	*8.60*	*4.80*
D-77	*6.30*	*6.50*	*4.75*	*4.79*	*5.10*	*6.23*	*6.0*	*6.44*	*5.60*	*4.60*	*2.90*	*6.50*	*4.90*	*6.30*	*5.20*
D-80	*17.45*	*14.20*	*3.35*	*15.25*	*3.32*	*13.3*	*3.15*	*10.97*	*3.35*	*6.55*	*4.15*	*8.65*	*3.70*	*9.35*	*4.20*
RCF (part)		**May, 12**	**Nov, 12**	**May, 13**	**Nov, 13**	**May, 14**	**Nov, 14**	**May, 15**	**Nov, 15**	**May, 16**	**Nov, 16**	**May, 17**	**Nov, 17**	**May, 18**	**Nov, 18**

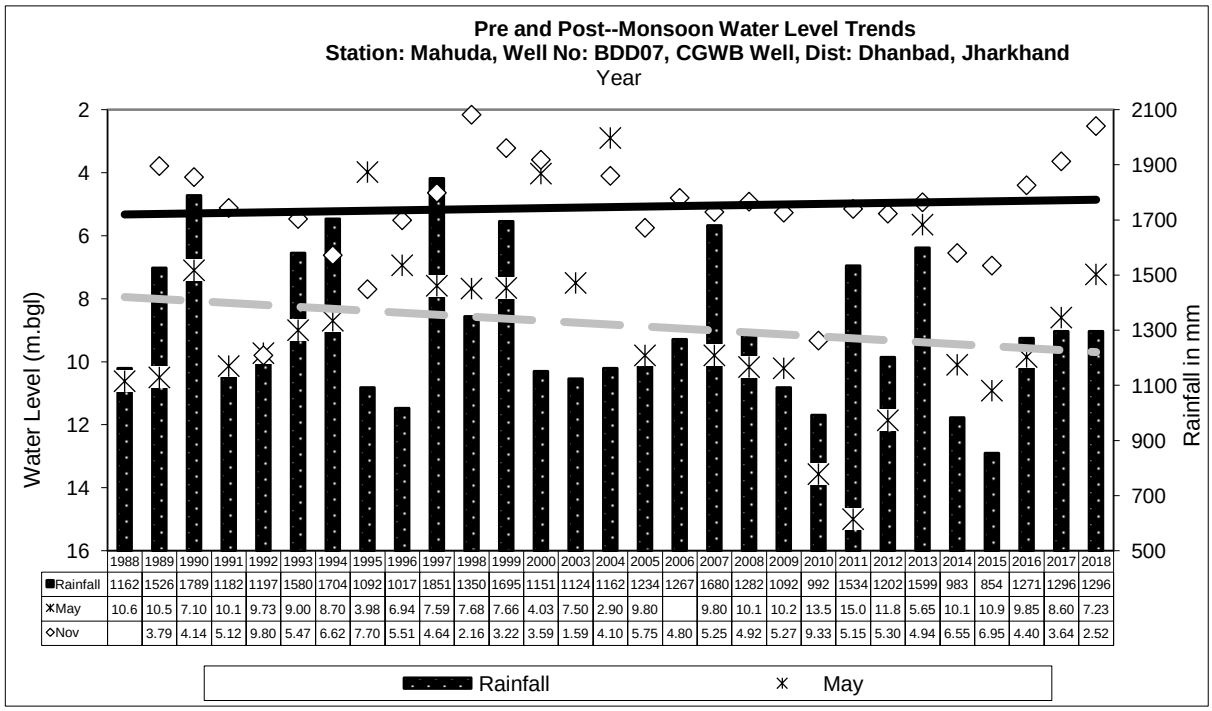
DB22		*2.43*	*2.38*	*8.18*	*2.64*	*6.48*	*3.03*	*4.59*	*3.53*	*5.38*	*3.33*	*1.93*	*1.63*	*2.34*	*1.93*
DB23		*2.90*	*2.33*	*5.05*	*3.10*	*3.95*	*2.13*	*3.38*	*6.04*	*5.30*	*0.90*	*2.05*	*1.90*	*2.85*	*1.75*
DB24		*-*	*-*	*-*	*8.25*	*-*	*8.45*	*9.52*	*8.20*	*10.65*	*6.50*	*5.80*	*3.78*	*8.25*	*5.70*
DB25		*3.96*	*1.18*	*1.33*	*2.53*	*3.27*	*2.73*	*3.83*	*2.68*	*3.61*	*1.98*	*3.23*	*2.58*	*3.93*	*1.63*

Annexure – III

HYDROGRAPHS OF CGWB PERMANENT OBSERVATION STATIONS



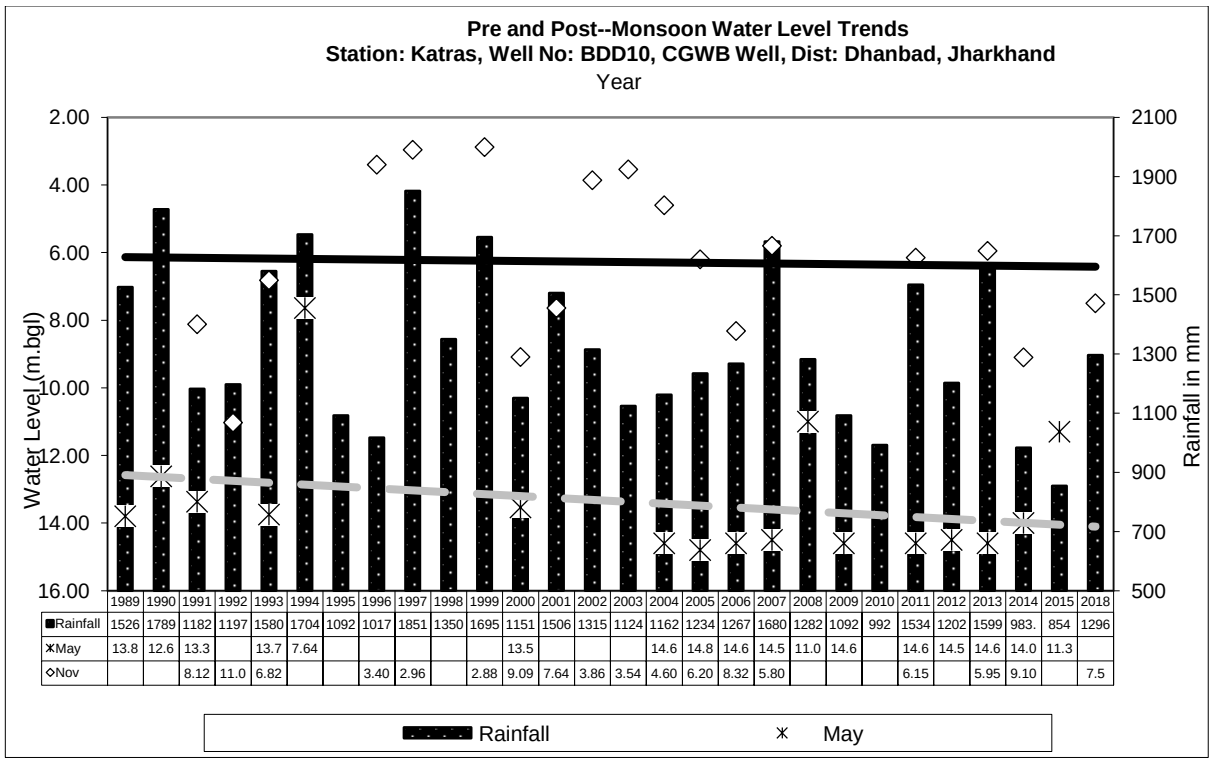
	1983	1984	1985	1986	1987	1988	1989	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018
Rainfall	145	188	124	121	141	116	152	178	118	119	158	170	109	101	185	135	169	115	150	131	112	102	123	126	168	128	109	992	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		



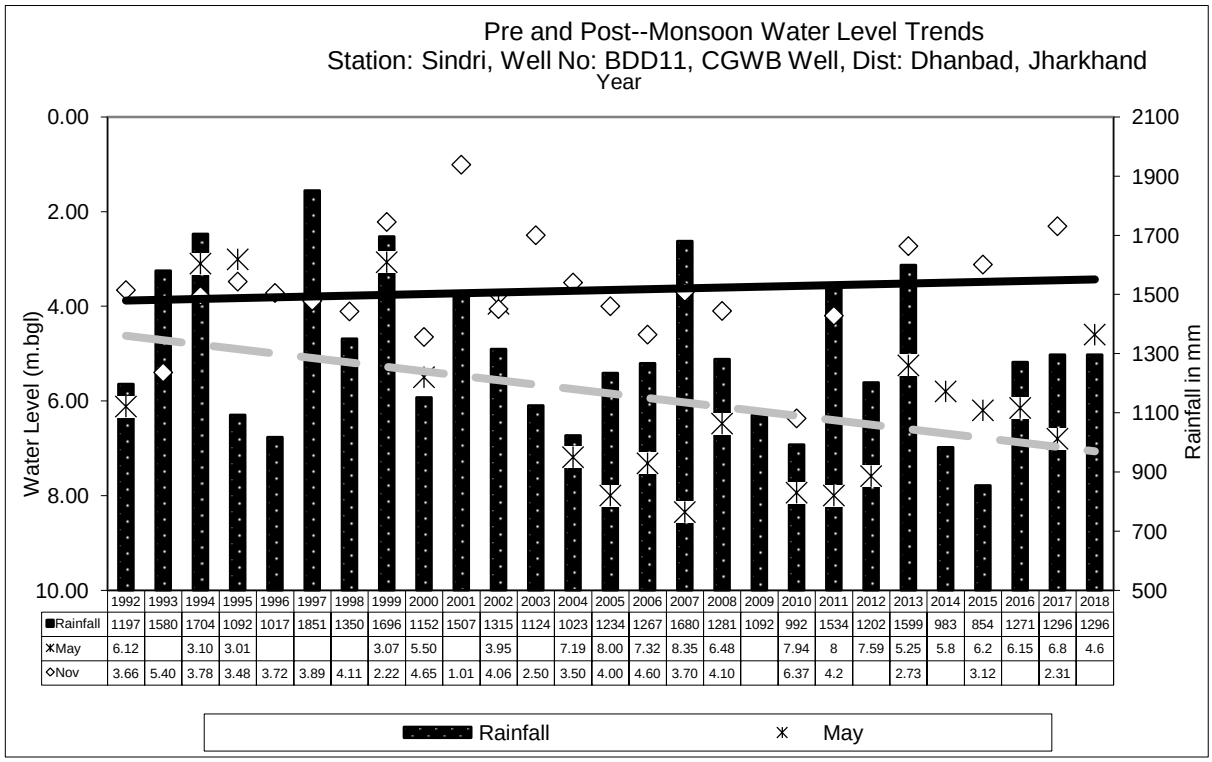
	1988	1989	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018
Rainfall	1162	1526	1789	1182	1197	1580	1704	1092	1017	1851	1350	1695	1151	1124	1162	1234	1267	1680	1282	1092	992	1534	1202	1599	983	854	1271	1296	1296
May	10.6	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

Annexure – III

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 – IV

GROUNDWATER SAMPLE LOCATION DETAILS

Sampling month: *March, May, August & December month of assessment year'2018*

Sl No	***Name of Cluster***	***Ground Water Sample***	***Dug well (CMPDI)***	***Location***	***Sampling Date***			
					March'18	***May'18***	***Aug'18***	***Dec'18***
1	*CLUSTER-I*	*GW-1*	*B-15*	*BERA VILLAGE*	*08.03.18*	*30.05.18*	*16.08.18*	*10.12.18*
2	*CLUSTER-II*	*GW-2*	*B-59*	*KHODOVALY VILLAGE*	*08.03.18*	*30.05.18*	*16.08.18*	*10.12.18*
3	*CLUSTER-III*	*GW-3*	*A-29*	*GOVINDPUR,AMBAGAN VILLAGE*	*08.03.18*	*30.05.18*	*16.08.18*	*10.12.18*
4	*CLUSTER-IV*	*GW-4*	*B-63*	*KESHALPUR, BATIGHAR*	*08.03.18*	*30.05.18*	*16.08.18*	*10.12.18*
5	*CLUSTER-V*	*GW-5*	*D-30*	*BORKIBOA VILLAGE*	*08.03.18*	*30.05.18*	*16.08.18*	*10.12.18*
6	*CLUSTER-VI*	*GW-6*	*D-25*	*GODHUR MORE*	*08.03.18*	*30.05.18*	*16.08.18*	*11.12.18*
7	*CLUSTER-VII*	*GW-7*	*D-80*	*DHANSAR MINE RESCUE STN.*	*07.03.18*	*31.05.18*	*17.08.18*	*11.12.18*
8	*CLUSTER-VIII*	*GW-8*	*D-49*	*NEAR GHANOODIH OC*	*07.03.18*	*31.05.18*	*17.08.18*	*11.12.18*
9	*CLUSTER-IX*	*GW-9*	*D-5*	*JEALGORA, NEAR P.O.*	*07.03.18*	*31.05.18*	*17.08.18*	*11.12.18*
10	*CLUSTER-X*	*GW-10*	*D-35*	*PATHERDIH RLY. COLONY*	*07.03.18*	*31.05.18*	*17.08.18*	*11.12.18*
11	*CLUSTER-XI*	*GW-11*	*A-32*	*MONNIDIH BAZAR*	*08.03.18*	*30.05.18*	*18.08.18*	*10.12.18*
12	*CLUSTER-XIII*	*GW-13*	*A-23*	*MACHHAYARA*	*08.03.18*	*30.05.18*	*18.08.18*	*10.12.18*
13	*CLUSTER-XIV*	*GW-14*	*B-23*	*LOHAPATTI VILLAGE*	*08.03.18*	*30.05.18*	*18.08.18*	*10.12.18*
14	*CLUSTER-XV*	*GW-15*	*B-32A*	*MADHUBAND VILLAGE*	*08.03.18*	*30.05.18*	*18.08.18*	*10.12.18*
15	*CLUSTER-XVI*	*GW-16*	*D-22*	*DAHIBARI,NICHE BASTI*	*07.03.18*	*31.05.18*	*17.08.18*	*11.12.18*

Annexure – VA

GROUNDWATER QUALITY DATA (DUG WELLS)

Month: March'2018

Stations: 4. Cluster-IV (GW-4), Keshalpur Village, Date: 08/03/2018

5. Cluster-V (GW-5), Borkiboa village, Date: 08/03/2018

6. Cluster-VI (GW-6), Godhur, Date: 08/03/2018

Sl. No	Parameter	*Sampling Stations*			Detection Limit	IS:10500 Drinking Water Standards	Standard / Test Method
		4	*5*	*6*			
1	Boron (as B), mg/l, Max	*<0.20*	*<0.20*	*<0.20*	0.20	*0.5*	APHA, 22nd Edition ,Carmine
2	Colour,in Hazen Units	*03*	*03*	*1.0*	1	*5*	APHA, 22nd Edition ,Pt.-Co. Method
3	Calcium (as Ca), mg/l, Max	*32*	*46*	*34*	1.60	*75*	IS-3025/40:1991, EDTA
4	Chloride (as Cl), mg/l, Max	*24*	*38*	*48*	2.00	*250*	IS-3025/32:1988, R-2007, Argentometric
5	Copper (as Cu), mg/l, Max	*<0.001*	*<0.001*	*<0.001*	0.03	*0.05*	*IS 3025/42 : 1992 R : 2009, AAS-Flame*
6	Fluoride (as F) mg/l, Max	*0.19*	*0.32*	*0.45*	0.02	*1.0*	APHA, 22nd Edition , SPADNS
7	Free Residual Chlorine, mg/l, Min	*<0.02*	*<0.02*	*<0.02*	0.02	*0.2*	APHA, 22nd Edition, DPD
8	Iron (as Fe), mg/l, Max	*0.14*	*0.06*	*0.12*	0.06	*0.3*	*IS 3025 /53 : 2003,* R : 2009 , AAS-Flame
9	Lead (as Pb), mg/l, Max	*<0.005*	*<0.005*	*<0.005*	0.005	*0.01*	APHA, 22nd Edition, AAS-GTA
10	Manganese (as Mn), mg/l, Max	*<0.02*	*<0.02*	*<0.02*	0.02	*0.1*	*IS-3025/59:2006, AAS-Flame*
11	Nitrate (as NO_3), mg/l, Max	14.10	15.10	3.9	0.5	*45*	*APHA, 22nd Edition,* UV-Spectrphotometric
12	Odour	*Agreeable*	*Agreeable*	*Agreeable*	Qualitative	*Agreeable*	IS 3025 /05:1983, R-2012, Qualitative
13	pH value	*7.81*	*7.69*	*7.54*	0.2	*6.5 to 8.5*	IS-3025/11:1983, R-1996, Electrometric
14	Phenolic compounds (as C_6H_5OH), mg/l, Max	*<0.001*	*<0.001*	*<0.001*	0.001	*0.001*	APHA, 22nd Edition,4-Amino Autipyrine
15	Selenium (as Se), mg/l, Max	<0.002	<0.002	<0.002	0.002	*0.01*	APHA, 22nd Edition, AAS-GTA
16	Sulphate (as SO_4) mg/l, Max	64.0	78.0	82	2.00	*200*	APHA, 22nd Edition. Turbidity
17	Taste	Acceptable	Acceptable	Acceptable	Qualitat-ive	*Acceptable*	APHA, 22nd Edition. Taste
18	Total Alkalinity (c_aco_3),, mg/l, Max	104	94.0	88.0	4.00	*200*	IS-3025/23:1986, Titration

19	Total Arsenic (as As), mg/l, Max	<0.002	<0.002	<0.002	0.002	*0.01*	*IS 3025/ 37:1988* R : 2003, AAS-VGA
20	Total Chromium (as Cr), mg/l, Max	<0.04	<0.04	<0.04	0.04	*0.05*	*IS-3025/52:2003, AAS-Flame*
21	Total Dissolved Solids, mg/l, Max	459	456	485	25.00	*500*	*IS 3025 /16:1984* R : 2006, Gravimetric
22	Total Hardness ($c_a co_3$), mg/l, Max	186	168	192	4.00	*200*	IS-3025/21:1983, R-2002, EDTA
23	Turbidity, NTU, Max	4.0	2.0	1.0	1.0	*1*	IS-3025/10:1984 R-1996, Nephelometric
24	Zinc (as Zn), mg/l, Max	<0.01	<0.01	<0.01	0.01	*5.0*	*IS 3025/ 49 : 1994,* R : 2009, AAS-Flame
25	Nickel as Ni, mg/l max	<0.005	<0.005	<0.005	0.01	*5.0*	*IS 3025/ 49 : 1994,* *R : 2009, AAS-Flame*

*****_Sampling location details and sampling date has been given in **Annexure-IV**._

Annexure – VB

GROUNDWATER QUALITY DATA (DUG WELLS)

Month: May'2018

Stations: 4. Cluster-IV (GW-4), Keshalpur Village, Date: 30/05/2018

5. Cluster-V (GW-5), Borkiboa village, Date: 30/05/2018

6. Cluster-VI (GW-6), Godhur, Date: 30/05/2018

Sl. No	Parameter	*Sampling Stations*			Detection Limit	IS:10500 Drinking Water Standards	Standard / Test Method
		4	*5*	*6*			
1	Boron (as B), mg/l, Max	*<0.20*	*<0.20*	*<0.20*	0.20	*0.5*	APHA, 22nd Edition ,Carmine
2	Colour,in Hazen Units	*04*	*03*	*05*	1	*5*	APHA, 22nd Edition ,Pt.-Co. Method
3	Calcium (as Ca), mg/l, Max	*43.2*	*41.6*	*48*	1.60	*75*	IS-3025/40:1991, EDTA
4	Chloride (as Cl), mg/l, Max	*48*	*80*	*72*	2.00	*250*	IS-3025/32:1988, R-2007, Argentometric
5	Copper (as Cu), mg/l, Max	*<0.001*	*0.001*	*<0.001*	0.03	*0.05*	*IS 3025/42 : 1992 R : 2009, AAS-Flame*
6	Fluoride (as F) mg/l, Max	*0.12*	*0.17*	*0.38*	0.02	*1.0*	APHA, 22nd Edition , SPADNS
7	Free Residual Chlorine, mg/l, Min	*0.02*	*0.03*	*0.02*	0.02	*0.2*	APHA, 22nd Edition, DPD
8	Iron (as Fe), mg/l, Max	*0.06*	*0.08*	*0.06*	0.06	*0.3*	*IS 3025 /53 : 2003,* R : 2009 , AAS-Flame
9	Lead (as Pb), mg/l, Max	*<0.005*	*<0.005*	*<0.005*	0.005	*0.01*	APHA, 22nd Edition, AAS-GTA
10	Manganese (as Mn), mg/l, Max	*<0.02*	*<0.02*	*<0.02*	0.02	*0.1*	*IS-3025/59:2006, AAS-Flame*
11	Nitrate (as NO_3), mg/l, Max	13.6	12.80	4.7	0.5	*45*	*APHA, 22nd Edition,* UV-Spectrphotometric
12	Odour	*Agreeable*	*Agreeable*	*Agreeable*	Qualitative	*Agreeable*	IS 3025 /05:1983, R-2012, Qualitative
13	pH value	*7.38*	*7.21*	*8.07*	0.2	*6.5 to 8.5*	IS-3025/11:1983, R-1996, Electrometric
14	Phenolic compounds (as C_6H_5OH), mg/l, Max	*<0.001*	*<0.001*	*<0.001*	0.001	*0.001*	APHA, 22nd Edition,4-Amino Autipyrine
15	Selenium (as Se), mg/l, Max	<0.002	<0.002	<0.002	0.002	*0.01*	APHA, 22nd Edition, AAS-GTA
16	Sulphate (as SO_4) mg/l, Max	132	153	172	2.00	*200*	APHA, 22nd Edition. Turbidity
17	Taste	Acceptable	Acceptable	Acceptable	Qualitat-ive	*Acceptable*	APHA, 22nd Edition. Taste
18	Total Alkalinity (c_aco_3),, mg/l, Max	108	92	172	4.00	*200*	IS-3025/23:1986, Titration

19	Total Arsenic (as As), mg/l, Max	<0.002	<0.002	<0.002	0.002	*0.01*	*IS 3025/ 37:1988* R : 2003, AAS-VGA
20	Total Chromium (as Cr), mg/l, Max	<0.04	<0.04	<0.04	0.04	*0.05*	*IS-3025/52:2003, AAS-Flame*
21	Total Dissolved Solids, mg/l, Max	470	454	490	25.00	*500*	*IS 3025 /16:1984* R : 2006, Gravimetric
22	Total Hardness (c_aco_3), mg/l, Max	188	180	196	4.00	*200*	IS-3025/21:1983, R-2002, EDTA
23	Turbidity, NTU, Max	2.0	1.0	3.0	1.0	*1*	IS-3025/10:1984 R-1996, Nephelometric
24	Zinc (as Zn), mg/l, Max	<0.01	<0.01	<0.01	0.01	*5.0*	*IS 3025/ 49 : 1994,* R : 2009, AAS-Flame
25	Nickel as Ni, mg/l max	<0.005	<0.005	<0.005	0.01	*5.0*	*IS 3025/ 49 : 1994,* *R : 2009, AAS-Flame*

*****_Sampling location details and sampling date has been given in **Annexure-IV**._

Annexure – VC

GROUNDWATER QUALITY DATA (DUG WELLS)

Month: August'2018

Stations: 4. Cluster-IV (GW-4), Keshalpur Village, Date: 16/08/2018

5. Cluster-V (GW-5), Borkiboa village, Date: 16/08/2018

6. Cluster-VI (GW-6), Godhur, Date: 16/08/2018

Sl. No	Parameter	*Sampling Stations*			Detection Limit	IS:10500 Drinking Water Standards	Standard / Test Method
		4	*5*	*6*			
1	Boron (as B), mg/l, Max	*<0.2*	*<0.2*	*<0.2*	0.20	*0.5*	APHA, 22nd Edition ,Carmine
2	Colour,in Hazen Units	*3*	*4*	*4*	1	*5*	APHA, 22nd Edition ,Pt.-Co. Method
3	Calcium (as Ca), mg/l, Max	*40*	*177.6*	*59.2*	1.60	*75*	IS-3025/40:1991, EDTA
4	Chloride (as Cl), mg/l, Max	*24*	*104*	*30*	2.00	*250*	IS-3025/32:1988, R-2007, Argentometric
5	Copper (as Cu), mg/l, Max	*0.02*	*0.02*	*0.02*	0.03	*0.05*	*IS 3025/42 : 1992 R : 2009, AAS-Flame*
6	Fluoride (as F) mg/l, Max	*0.22*	*0.53*	*0.15*	0.02	*1.0*	APHA, 22nd Edition , SPADNS
7	Free Residual Chlorine, mg/l, Min	*<0.02*	*<0.02*	*<0.02*	0.02	*0.2*	APHA, 22nd Edition, DPD
8	Iron (as Fe), mg/l, Max	*<0.06*	*0.01*	*<0.06*	0.06	*0.3*	*IS 3025 /53 : 2003,* R : 2009 , AAS-Flame
9	Lead (as Pb), mg/l, Max	*0.01*	*0.009*	*0.008*	0.005	*0.01*	APHA, 22nd Edition, AAS-GTA
10	Manganese (as Mn), mg/l, Max	*<0.02*	*<0.02*	*<0.02*	0.02	*0.1*	*IS-3025/59:2006, AAS-Flame*
11	Nitrate (as NO_3), mg/l, Max	0.40	*4.83*	*7.50*	0.5	*45*	*APHA, 22nd Edition,* UV-Spectrphotometric
12	Odour	*Agreeable*	*Agreeable*	*Agreeable*	Qualitative	*Agreeable*	IS 3025 /05:1983, R-2012, Qualitative
13	pH value	*8.12*	*7.73*	*8.07*	0.2	*6.5 to 8.5*	IS-3025/11:1983, R-1996, Electrometric
14	Phenolic compounds (as C_6H_5OH), mg/l, Max	*<0.001*	*<0.001*	*<0.001*	0.001	*0.001*	APHA, 22nd Edition,4-Amino Autipyrine
15	Selenium (as Se), mg/l, Max	<0.002	*<0.002*	*<0.002*	0.002	*0.01*	APHA, 22nd Edition, AAS-GTA
16	Sulphate (as SO_4) mg/l, Max	40	*228*	*85*	2.00	*200*	APHA, 22nd Edition. Turbidity
17	Taste	Acceptable	*Acceptable*	*Acceptable*	Qualitative	*Acceptable*	APHA, 22nd Edition. Taste
18	Total Alkalinity (c_ac_3),, mg/l, Max	152	*95*	*105*	4.00	*200*	IS-3025/23:1986, Titration

19	Total Arsenic (as As), mg/l, Max	<0.002	*<0.002*	*<0.002*	0.002	*0.01*	*IS 3025/ 37:1988* R : 2003, AAS-VGA
20	Total Chromium (as Cr), mg/l, Max	0.1	*0.1*	*0.2*	0.04	*0.05*	*IS-3025/52:2003, AAS-Flame*
21	Total Dissolved Solids, mg/l, Max	144	*830*	*204*	25.00	*500*	*IS 3025 /16:1984* R : 2006, Gravimetric
22	Total Hardness (c_aco_3), mg/l, Max	130	*740*	*192*	4.00	*200*	IS-3025/21:1983, R-2002, EDTA
23	Turbidity, NTU, Max	1	*<1*	*<1*	1.0	*1*	IS-3025/10:1984 R-1996, Nephelometric
24	Zinc (as Zn), mg/l, Max	<0.01	*<0.01*	*<0.01*	0.01	*5.0*	*IS 3025/ 49 : 1994,* R : 2009, AAS-Flame
25	Nickel as Ni, mg/l max	<0.005	*<0.005*	*<0.005*	0.01	*5.0*	*IS 3025/ 49 : 1994,* *R : 2009, AAS-Flame*

*****_Sampling location details and sampling date has been given in_ ***Annexure-IV***.

Annexure – VD

GROUNDWATER QUALITY DATA (DUG WELLS)

Month: December'2018

Stations: 4. Cluster-IV (GW-4), Keshalpur Village, Date: 10/12/2018

5. Cluster-V (GW-5), Borkiboa village, Date: 10/12/2018

6. Cluster-VI (GW-6), Godhur, Date: 11/12/2018

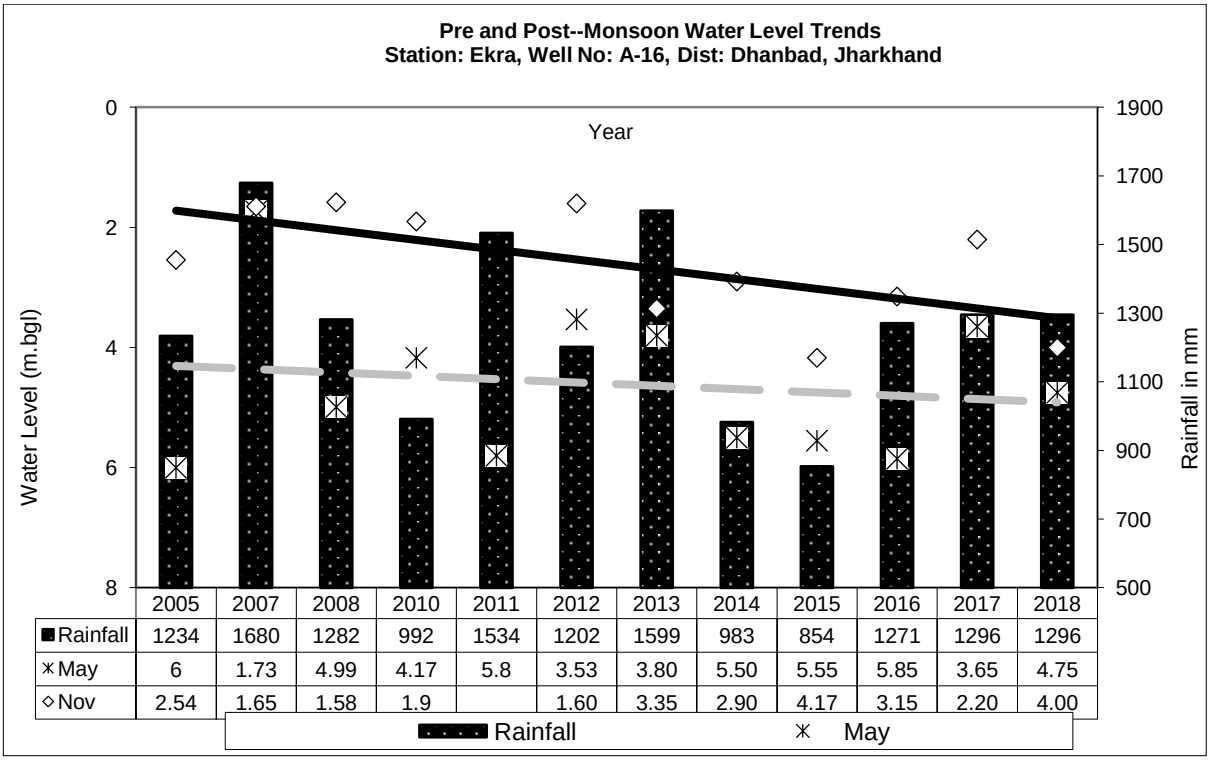
Sl. No	Parameter	*Sampling Stations*			Detection Limit	IS:10500 Drinking Water Standards	Standard / Test Method
		4	*5*	*6*			
1	Boron (as B), mg/l, Max	*<0.2*	*<0.2*	*<0.2*	0.20	*0.5*	APHA, 22nd Edition ,Carmine
2	Colour,in Hazen Units	*4*	*2*	*3*	1	*5*	APHA, 22nd Edition ,Pt.-Co. Method
3	Calcium (as Ca), mg/l, Max	*20*	*16*	*28*	1.60	*75*	IS-3025/40:1991, EDTA
4	Chloride (as Cl), mg/l, Max	*26*	*24*	*34*	2.00	*250*	IS-3025/32:1988, R-2007, Argentometric
5	Copper (as Cu), mg/l, Max	*<0.001*	*<0.001*	*<0.001*	0.03	*0.05*	*IS 3025/42 : 1992 R : 2009, AAS-Flame*
6	Fluoride (as F) mg/l, Max	*0.33*	*0.29*	*0.18*	0.02	*1.0*	APHA, 22nd Edition , SPADNS
7	Free Residual Chlorine, mg/l, Min	*<0.02*	*<0.02*	*<0.02*	0.02	*0.2*	APHA, 22nd Edition, DPD
8	Iron (as Fe), mg/l, Max	*0.5*	*<0.06*	*0.47*	0.06	*0.3*	*IS 3025 /53 : 2003,* R : 2009 , AAS-Flame
9	Lead (as Pb), mg/l, Max	*<0.005*	*0.009*	*<0.005*	0.005	*0.01*	APHA, 22nd Edition, AAS-GTA
10	Manganese (as Mn), mg/l, Max	*0.08*	*<0.02*	*0.13*	0.02	*0.1*	*IS-3025/59:2006, AAS-Flame*
11	Nitrate (as NO_3), mg/l, Max	22.6	*10.4*	*16.7*	0.5	*45*	*APHA, 22nd Edition,* UV-Spectrphotometric
12	Odour	*Agreeable*	*Agreeable*	*Agreeable*	Qualitative	*Agreeable*	IS 3025 /05:1983, R-2012, Qualitative
13	pH value	*8.08*	*8.12*	*7.96*	0.2	*6.5 to 8.5*	IS-3025/11:1983, R-1996, Electrometric
14	Phenolic compounds (as C_6H_5OH), mg/l, Max	*<0.001*	*<0.001*	*<0.001*	0.001	*0.001*	APHA, 22nd Edition,4-Amino Autipyrine
15	Selenium (as Se), mg/l, Max	<0.002	*<0.002*	*<0.002*	0.002	*0.01*	APHA, 22nd Edition, AAS-GTA
16	Sulphate (as SO_4) mg/l, Max	68	*56*	*84*	2.00	*200*	APHA, 22nd Edition. Turbidity
17	Taste	Acceptable	*Acceptable*	*Acceptable*	Qualitat-ive	*Acceptable*	APHA, 22nd Edition. Taste
18	Total Alkalinity (c_aco_3),, mg/l, Max	165	*212*	*190*	4.00	*200*	IS-3025/23:1986, Titration

19	Total Arsenic (as As), mg/l, Max	<0.002	*<0.002*	*<0.002*	0.002	*0.01*	*IS 3025/ 37:1988* R : 2003, AAS-VGA
20	Total Chromium (as Cr), mg/l, Max	<0.04	*<0.04*	*<0.04*	0.04	*0.05*	*IS-3025/52:2003, AAS-Flame*
21	Total Dissolved Solids, mg/l, Max	832	*764*	*592*	25.00	*500*	*IS 3025 /16:1984* R : 2006, Gravimetric
22	Total Hardness (c_aco_3), mg/l, Max	532	*602*	*338*	4.00	*200*	IS-3025/21:1983, R-2002, EDTA
23	Turbidity, NTU, Max	5	*4*	*1*	1.0	*1*	IS-3025/10:1984 R-1996, Nephelometric
24	Zinc (as Zn), mg/l, Max	<0.01	*<0.01*	*<0.01*	0.01	*5.0*	*IS 3025/ 49 : 1994,* R : 2009, AAS-Flame
25	Nickel as Ni, mg/l max	<0.005	*<0.005*	*<0.005*	0.01	*5.0*	*IS 3025/ 49 : 1994,* *R : 2009, AAS-Flame*

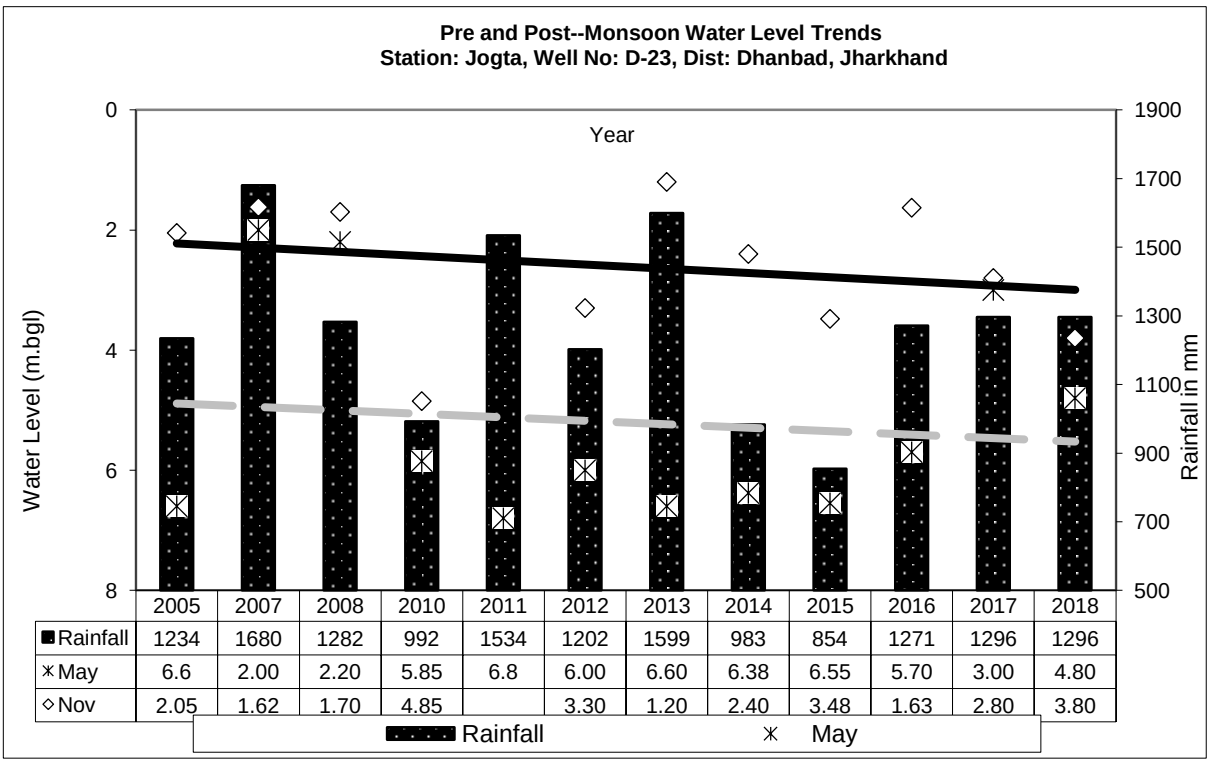
*****_Sampling location details and sampling date has been given in **Annexure-IV**._

Annexure – VI

HYDROGRAPHS OF CLUSTER-V



	2005	2007	2008	2010	2011	2012	2013	2014	2015	2016	2017	2018
Rainfall	1234	1680	1282	992	1534	1202	1599	983	854	1271	1296	1296
May	6	1.73	4.99	4.17	5.8	3.53	3.80	5.50	5.55	5.85	3.65	4.75
Nov	2.54	1.65	1.58	1.9		1.60	3.35	2.90	4.17	3.15	2.20	4.00



	2005	2007	2008	2010	2011	2012	2013	2014	2015	2016	2017	2018
Rainfall	1234	1680	1282	992	1534	1202	1599	983	854	1271	1296	1296
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
Nov	2.05	1.62	1.70	4.85		3.30	1.20	2.40	3.48	1.63	2.80	3.80

Abbreviations

AMSL: Above mean sea level

Avg.: Average

APT: Aquifer Pumping Test

BCCL: Bharat Coking Coal Ltd.

bgl: Below Ground Level

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

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

CMPDI: Central Mine Plan & Design Institute

DVC: Damodar Valley Corporation

DTW: Depth to water level

GW: Groundwater

IMD: Indian Meteorological Division

JCF: Jharia Coalfield

RCF: Raniganj Coalfield

MADA: Mineral Area Development Authority

MCM: Million Cubic Meter

MGD: Million Gallon per day

NTU: Nephlometric Turbidity unit

OC / UG: Opencast / Underground

OCP / UGP: Opencast Project / Underground Project

RL: Reduced Level

RWH: Rainwater Harvesting

FF: Fire Fighting

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).



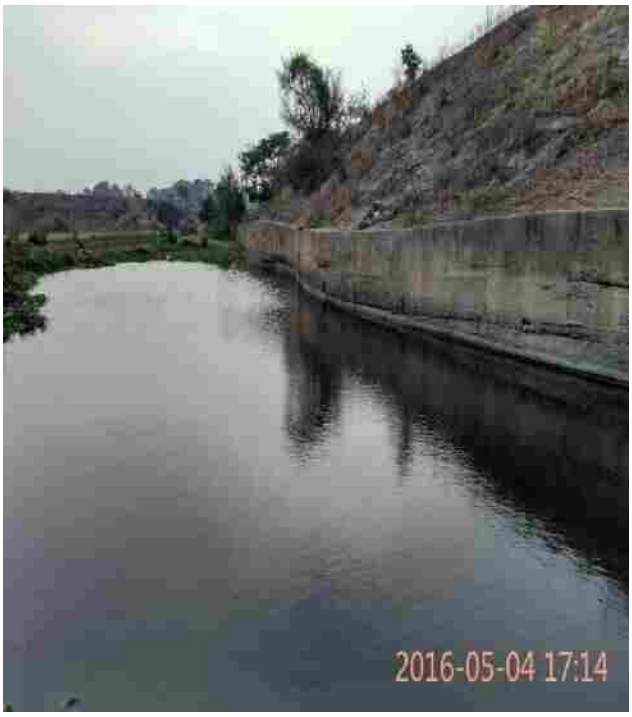
Rain Water Harvesting Pond at Green Park,Cluster-IV


Vivo V11Pro
AI Dual Camera
2019.11.20 09:20


Vivo V11Pro
AI Dual Camera



Water Harvesting at Cluster IV



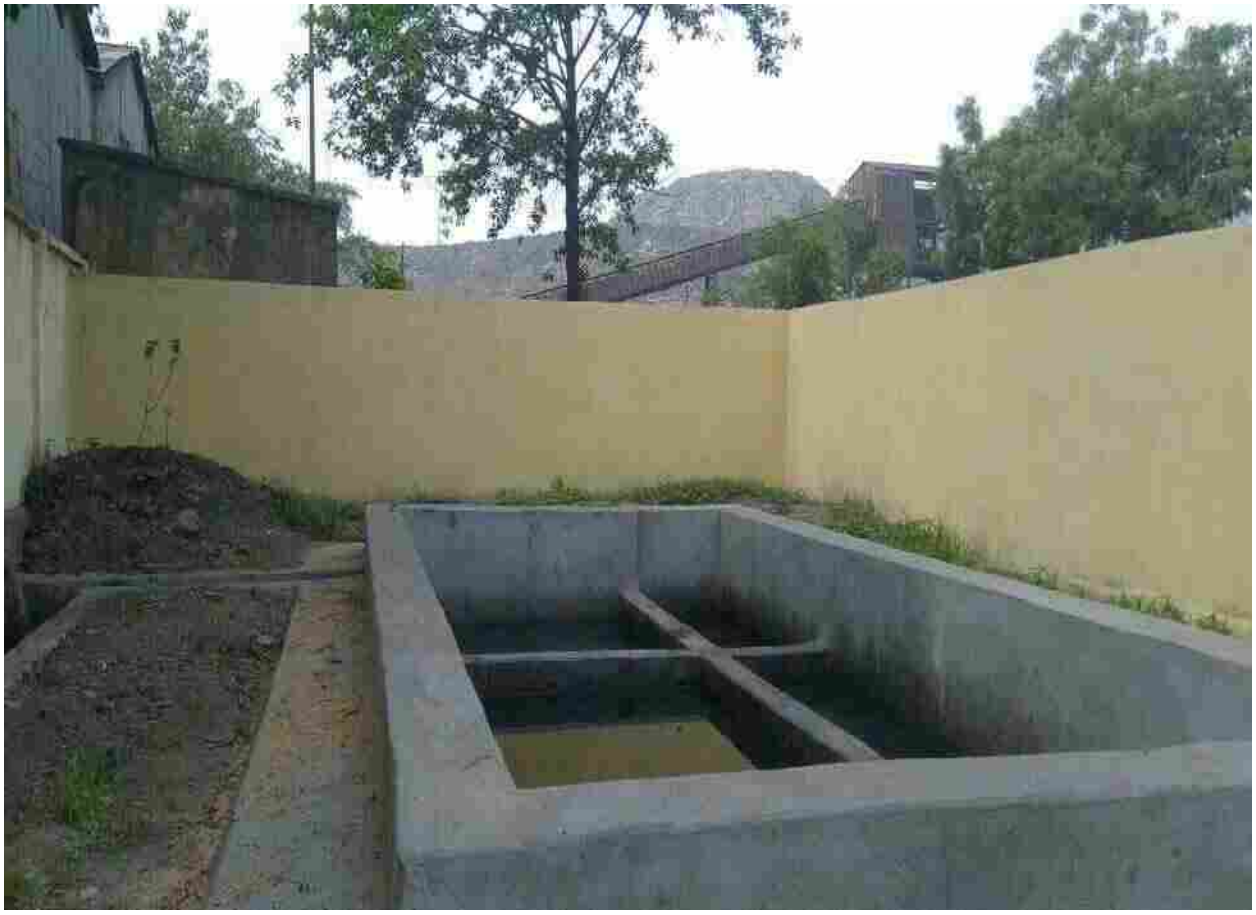




Toe wall and Embankment at Cluster IV

Oil and Grease Trap (48 KL)

AKWMC WORKSHOP, Katras Area




OIL AND GREASE TRAP
AUTO WORKSHOP
CLUSTER-IV, KATRAS AREA

Illumination Survey (OCP)

Dt. - 03.09.13

Sl. No.	Place of Illumination	Height of light Source in (m)	Distance of light Source in (m)	Standard of Illumination	Illumination obtained	Types of light provided	Remarks
02.	From OB dump to Tyre Curve Junction						
	Pole -01	10	15	H = 10	H = 12	LED (90W)	From pole to North Side
	Pole -02	10	30	H = 10	H = 08	LED -	"
03.	Tyre Curve Junction						
	i) At the Centre of bolt pole	12	at centre of bolt pole - 8m	H = 10	H = 22	H.P.S.V 1) 400W x 3 1 Fuse 2) 400W x 2 400W x 1	Two towers light provided 1 pole west Side (within 10 m) Edge of Road
	(ii) From Centre pole to North Side	12	30	H = 10	H = 15		
	(iii) From Centre pole to east Side	12	50	H = 10	H = 05		In Transport Road)
	(iv) From Edge pole to haul Road of mine.	12	50	H = 10	H = 12		(Mine Entry)

Safety Officer

Colliery Engineer

Manager

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Illumination Survey at Transporting Road cum Working Area of Departmental Patch

Dt. - 21.10.19

Date - 21.10.19

Sl. No	Place of Illumination	Height of light source in (m)	Distance of light source in (m)	Standard of Illumination	Illumination obtained	Types of light provided	Remarks
01.	Type Curve to working Area						
(A)	Haul Road (Pole-01)	10	20	H = 10	12	LED (90W)	
	Pole - 02	10	30	"	10	"	
	Pole - 03	10	30	"	12	"	
	Pole - 04	10	20	"	13	"	
02.	Near 577 - EKG Shovel	12	70	H = 15 V = 25	H = 12 V = 18	One Tower light Provided 400x2/4x3 No.	
	At Front side of EKG - 577 shovel	08	10	"	H = 14 V = 16	400W x 4 Nos. Machine light	at Bucket Rest
03.	Near 10 m^3 - 523 Shovel	08	10	"	H = 15 V = 19	Machine light	At bucket rest.

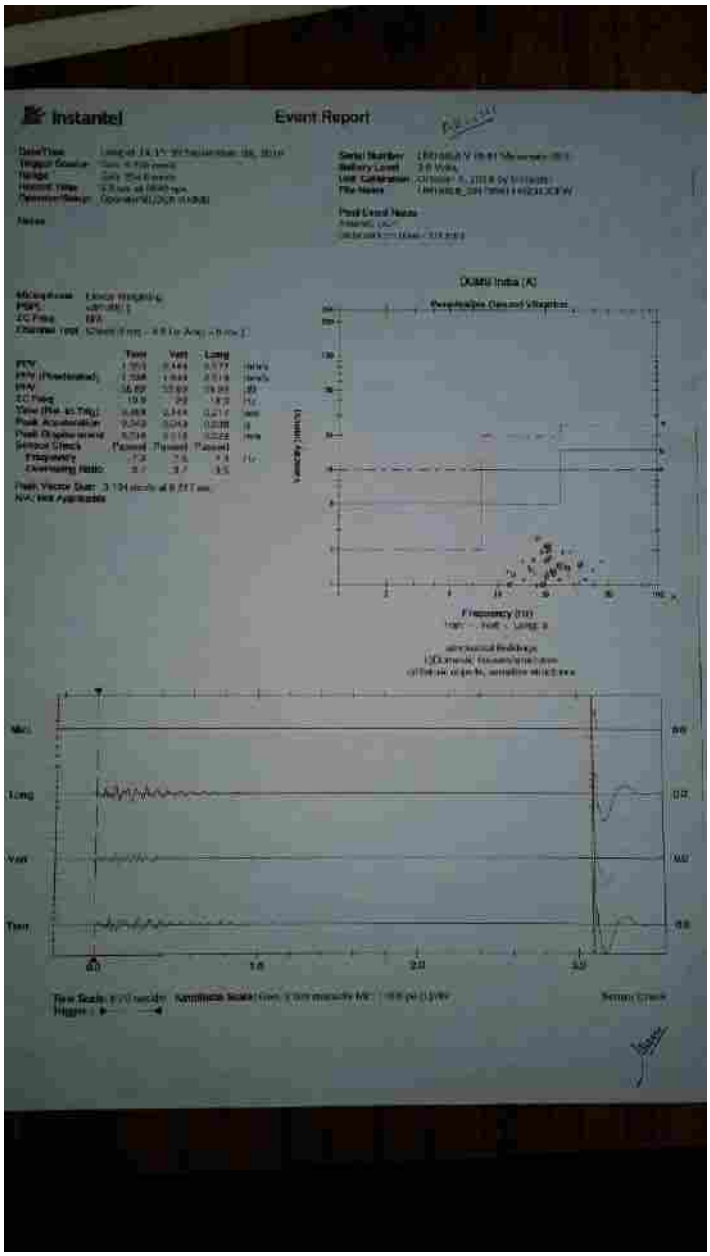
Safety Officer

Colly. Engineer

Manager

P.T.O.

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Instantel

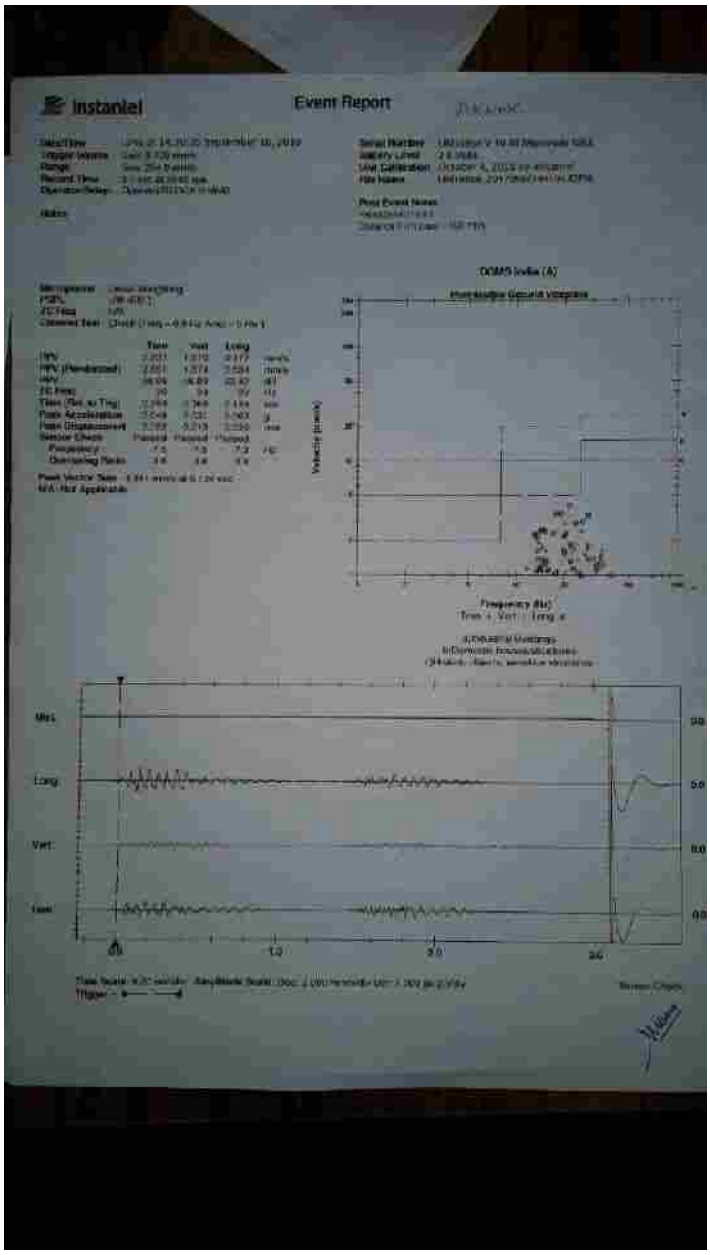
Event Report

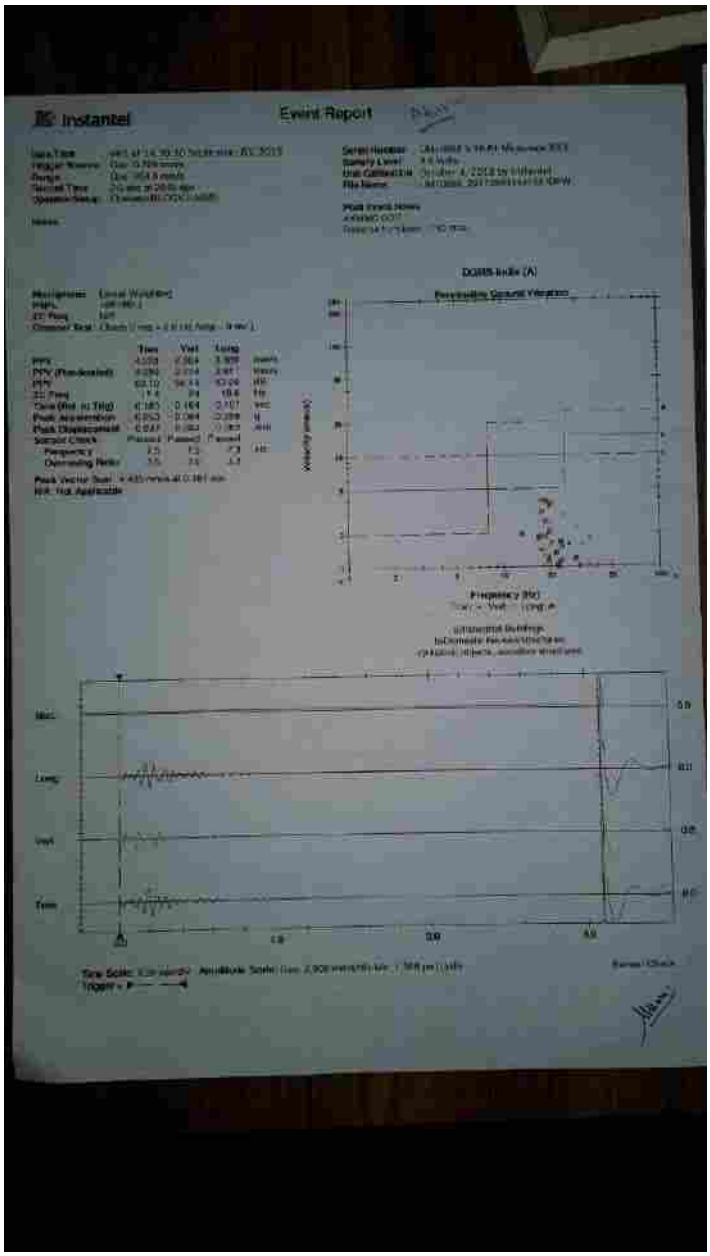
DGMS India (A)

Tran Vert Long

Time Scale:

Trigger:


Instantel
Event Report
USBM Index (A)
Frequency (Hz)
Tran + Vert Long +
Mic
Long
Vert
Tran


Instantel
Event Report
DS85 Info (A)
Peak Particle Velocity Versus Frequency
Velocity (mm/s)
Frequency (Hz)
Tran
Vert
Long
Mic

NOISE LEVEL QUALITY MONITORING

4.1Location of sampling sites

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

4.2 Methodology of sampling and analysis

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

4.3 Results & Interpretations

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

NOISE LEVEL DATA

Name of the Project: **Cluster -IV**			Month: **AUG 2019**		
Sl. No.	**Station Name/Code**	**Category of area**	**Date**	**Noise level dB(A)LEQ**	***Permissible Limit of Noise level in dB(A)***
1	**Block IV**	**Industrial area**	07.08.19	55.7	*75*
2	**Block IV**	**Industrial area**	20.08.19	53.7	*75*
3	**Govindpur Village**	**Industrial area**	08.08.19	63.3	*75*
4	**Govindpur Village**	**Industrial area**	19.08.19	61.6	*75*
5	**Nichitpur**	**Industrial area**	09.08.19	60.2	*75*
6	**Nichitpur**	**Industrial area**	30.08.19	60.2	*75*
7	**Katras Chotudih**	**Industrial area**	08.08.19	58.2	*75*
8	**Katras Chotudih**	**Industrial area**	19.08.19	49.3	*75*
9	**Rudhi Basti**	**Residential area**	12.08.19	46.5	*55*
10	**Rudhi Basti**	**Residential area**	29.08.19	47.8	*55*

Permissible limits of Noise Level as per MOEF Gazette Notification No. GSR 742(E) dt. 25.09.2000 Standards for Coal Mines and Noise Pollution (Regulation and Control) Rules, 2000.
*** Day Time: 6.00 AM to 10.00 PM,**

Analysed By
JSA/SA/SSA

Checked By
Lab In Charge
RI-2, CMPDI, Dhanbad

Approved By
HOD(Mining/Environment)
RI-2, CMPDI, Dhanbad

PME Center Tilatand:-

S. No.	Equipments	On Roll	In Order	Out of Order	Remarks
1	ECG Machine	02	01	01	Under Repair
2	Spirometer	NIL	NIL	NIL	NIL
3	X-ray Machine	02	02	No	Working
4	Blood Testing arrangements	Available			
5	Urine Testing	Available			

PME REPORT

UNIT	TARGET 2015	PME DONE 2015	TARGET 2016	PME DONE 2016	Present Unit	TARGET 2017	PME DONE 2017	TARGET 2018	PME DONE 2018	TARGET 2019	PME DONE 2019 upto oct
AREA ROLL	207	98	180	66		250	176	251	188	235	122
SALANPUR	306	302	285	288	SPC	260	255	265	246	240	160
AARC & GTC	381	385	350	308	AKWMC	1040	1030	989	851	947	769
AKWMC	735	733	725	669							
R/HOSPITAL	24	10	20	-		20	13	22	50	15	01
KATRAS CHOITUDIH	77	65	75	30	AGKCC	80	92	88	104	75	50
TOTAL	**1730**	**1593**	**1635**	**1338**		**1650**	**1566**	**1615**	**1439**	**1512**	**1102**

Ritesh Acharya
AM (ENV.)
Katras Area

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Materials Management System

Area Item Details

11/29/19
CoalNetPROD

Bharat Coking Coal Limited

Item Details

Item Code	UOM	Item Type	Consumable Type	Consumable Desc
92060210231	No	CONSUMABLE	NOT AVAILABLE	SAFETY EQUIPMENT

Area Details

Store Id	Store Name	Item Desc	Part No	Uom	Stock	Rate	Current Value	Last Purchase Rate	Last Rcvd Date	Last Issue Date
4	Katras Regional Store	DUST MASK(DGMS APPROVED)	null	No	260	115	29900	115	16-03-2017	16-05-2019
5	Regional Store Area-5	DUST MASK DGMS APP. VENUS YELLOW		No	0	67.035185	.0037	64	14-08-2015	14-06-2017
6	Regional Store Area-6	DUST MASK	null	No	505	6.5	3282.5	6.5	02-01-2019	13-03-2019
9	Regional Store Area-9	DUST RESPIRATOR	null	No	0	101	0	101	12-12-2018	19-02-2019
10	Regional Store Area-10	DUST RESPIRATOR	null	No	0	0	0	0	N/A	N/A
12	Regional Store Area-12	DUST/MUSK RESPIRATOR	null	No	0	52	0	52	28-03-2019	29-03-2019
49	Mahuda Washery Store	DUST MASK DGMS APPROVED	null	No	54	50	2700	0	07-11-2015	13-08-2019
50	Bhojudih Washery Store	DUST MASK	null	No	0	35.7	0	0	15-10-2008	28-03-2016

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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**

Bharat Coking Coal Ltd.
(A Subsidiary of Coal India Limited)
Office of the General Manager, Katras Area
P.O. Sijua, P.S.- Jogta, Dhanbad-828121
CIN: U1010JH1972GOI000918
Phone/Fax No.: 0326-2371213
Email ID: cgmkatras@bccl.gov.in

Certificate

It is certify here that the following CSR activity was undertaken in cluster IV during FY 18-19

1. **Water supply in nearby villages.**
2. **Erection of street light.**
3. **Education facility.**
4. **Providing club facilities for weeding ceremony, seminar etc to the local habitants.**
5. **Cleaning of drain.**
6. **Cleaning and deepening of water reservoirs.**
7. **Laying of Pipeline.**
8. **Proving of sports kit.**
9. **Organizing of sports tournament.**
10. **Making of water kiosk.**
11. **Providing of Medical facilities.**
12. **Providing of mobile medical van.**
13. **Distribution of saplings.**
14. **Construction/Renovation of local community centre.**
15. **Construction/Renovation/Repairing of Road.**
16. **Making of Playground.**
17. **providing of education to engineering aspirants through BCCL Ke LAAL/BCCL Ki Laadli programme.**
18. **Arrangements of swings in park.**

Ritesh Kr 7
22/6/19
AM(Env)
Katras Area

General Manager
Katras Area (cluster-IV)
BCCL

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Bharat Coking Coal Ltd.
(A Subsidiary of Coal India Limited)
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CIN: U1010JH1972GOI000918
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CSR Expenditure In respect to Cluster IV Group of Mines (Katras Area)

CSR expenditure has not been dealt at Cluster/Area level, expenditure was allotted and made at corporate level i.e. M/S BCCL level and Cluster IV is contributor for the same.

Details of last three Years (FY 16-17 to FY 18-19) CSR expenditure of whole BCCL are enclosed as **Annexure-1.**

Ritesh Kr
16/5/19

AM(Env)
Katras Area

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भारत कोकिंग कोल लिमिटेड
(कोल इण्डिया लिमिटेड का एक अंग)
BHARAT COKING COAL LIMITED
(A Subsidiary of Coal India Limited)

टिप्पणी–पत्र
Noting – Sheet

विभाग / Department : कॉर्पोरेट मुख्य.
अधिकारी का नाम / Name of Officer : डॉ. मो. यूसुफ, महाप्रबंधक (सी.एस.आर.)
संदर्भ Ref. : BCL/CSR/2019-20/73(H) दिनांक Date : 16.5.19 17

विषय / Subject :-

वित्तीय वर्ष 2018-19 में किये गए सी.एस.आर. कार्यों पर रिपोर्ट- वार्षिक निदेशकों की रिपोर्ट के तहत

कम्पनीज (निगमित सामाजिक दायित्व नीति) (Corporate Social Responsibility Policy) नियमों, 2014 के तहत सी.एस.आर. कार्यों पर वार्षिक रिपोर्ट बी.सी.सी.एल. निदेशकों की वार्षिक रिपोर्ट में निर्धारित प्रारूप में शामिल करना होता है।

अतः, वित्तीय वर्ष 2018-19 में किये गए सी.एस.आर. कार्यों पर रिपोर्ट निर्धारित प्रारूप में आपके अवलोकन एवं अनुमोदन हेतु प्रस्तुत की जा रही है।

संलग्नक- यथोपरि।

16.5.19
महाप्रबंधक (सी.एस.आर.)

निदेशक (कार्मिक) 17/5

GM (CSR) 17.5.19

G. Roy

Contd. .....

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ANNUAL REPORT ON CSR ACTIVITIES

In the world's current business scenario, business organizations make their strategies for improving their images as socially responsible business organizations inter alia various profit earning avenues because well-beings of an organization depends upon the well-being of the society in which it operates its business. Coal India Limited, being the largest coal producing company in the world and operating with its subsidiary companies in various states of India, strides contributing a lot to the Nation and the society at large by focusing on improving the quality of life of the people residing in and around the Coal mining areas with a focal point on the well-being of underprivileged en masse.

Keeping in mind the above, CIL Board has approved a community development based CSR policy which is unequivocally applicable to CIL and its subsidiary companies. The concurrent policy on Corporate Social Responsibility of CIL has been framed after incorporating the features of the Company Act 2013 and as per notifications issued by Ministry of Corporate Affairs, Govt. of India on 27.02.2014 as well as DPEs guidelines and broadly covers the following:

1. Eradicating hunger, poverty and malnutrition, promoting health care including preventive health care and sanitation including contribution to the Swach Bharat Kosh set-up by the Central Government for the promotion of sanitation and making available safe drinking water.
2. Promoting education, including special education and employment enhancing vocation skills especially among children, women, elderly, and differently abled and livelihood enhancement projects.
3. Promoting gender equality, empowering women, setting up homes and hostels for women and orphans, setting up old age homes, day care centres and such other facilities for senior citizens and measures for reducing inequalities faced by socially and economically backward groups.
4. Ensuring environmental sustainability, ecological balance, protection of Flora and Fauna, animal welfare, agro-forestry, conservation of natural resources and maintaining quality of soil, air and water including contribution to the Clean Ganga Fund setup by the Central Government for rejuvenation of river Ganga.
5. Protection of national heritage, art and culture including restoration of buildings and sites of historical importance and works of art; setting up public libraries, promotion and development of traditional arts and handicrafts.
6. Measures for the benefit of armed forces veterans, war widows and their dependents.
7. Training to promote rural sports, nationally recognized sports, Paralympics sports and Olympic sports.
8. Contribution to the Prime Minister's National Relief Fund or any other fund set up by the Central Government for socio-economic development and relief

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and welfare of the Scheduled Castes, the Scheduled Tribes, other backward classes, minorities and women.

9. Contributions or funds provided to technology incubators located within academic institutions which are approved by the Central Government.
10. Rural development projects.
11. Slum area development.

Policy on CSR

CIL has well defined CSR policy framed on DPE's guideline and on the Companies Act, 2013. The policy has CIL Board's approval. The Budget on CSR is allocated based on 2% on the average net profit of the Company during the three immediate preceding financial years or ₹ 2.00 per tonne of coal produced in the previous year whichever is higher.

Modalities/Mechanism of implementation of CSR

CIL not only covers the underprivileged populace residing in and around the mining areas in different states of the country where CIL is operating its works but the CSR activities of CIL cover the areas which are beyond jurisdiction of subsidiary companies also.

In respect of subsidiary companies, the CSR Policy is operational within 25 KM radius of the project/mines and areas including headquarters for which 80% of the budget is allocated. Balance 20% is spent within the state/states in which the subsidiary companies operate.

Some of the major CSR initiatives undertaken by BCCL as per the CSR Policy under various heads during the financial year 2017-18 are as under:

1. Rural Development Projects
   a) Construction of Green Haat and Community Centre under Govindpur Block, Dhanbad district.
2. Sanitation
   a) Swachhta Pakhwada, sapling plantation and other activities were conducted to spread awareness about cleanliness
3. Promoting education including special education & employment enhancing vocation skills
   a) BCCL-Ke-Laal/BCCL-Ki-Laadli
   b) Providing 100 nos. of sewing machines for training towards empowering SGH women through Jharkhand State Livelihood Promotion Society
   c) Training Scheme for preparing "Trainees" for Mining Sirdars
4. Environment
   a) Deepening/renovation of ponds in different villages of Dhanbad district.

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Expenditure For FY 18-19

Composition of BCCL Board level CSR Committee.

(a)	Dr. H.S. Yadav, Independent Director, BCCL	Chairman
(b)	Dr. A. K. Lomas, Independent Director, BCCL	Member
(c)	Shri Bishnu Prasad Das, Independent Director, BCCL	Member
(d)	Dr. K.S. Khobragade, Independent Director, BCCL	Member
(e)	Shri S.K. Jha, Director Technical (OP), BCCL	Member
(f)	Shri R.S. Mahapatra, Director (P), BCCL	Member
(g)	Sri. K.S. Rajashekar, Director (F)	Invitee

- Average net profit of the company for the last three financial year being ₹ (594.22) crores, ₹ 2.00 per tonne of coal production is applicable for prescribed CSR Expenditure calculation.
- Prescribed CSR Expenditure (as per ₹ 2.00 per tonne of coal production of 32.61 Mte as per policy on CSR) is ₹ **6.52 crores.**
- Details of CSR spent during the financial year:
  - **a)** Total amount to be spent for the financial year : ₹ **6.52 crores**
  - **b)** Actual amount spent: **₹1.43 crores**
  - **c)** Amount unspent, if any: **₹5.09 crores**
  - **d)** The Reason for amount of CSR being unspent:
    - **I.** Vide letter no. 08 dt. 03/08/2018, Vice President, Chirkunda City Council, Dhanbad, had demanded for an amount of ₹ 3.08 crores for Construction of houses for 137 families affected from flash flood of Jhilia river in Chirkunda Nagar Parishad, under CV Area. Budgetary provision was made for the same, which till date remains unspent.
    - **II.** Balance amount of ₹ 2.01 has budget concurrence for
      1. Construction of multipurpose hall at Ratanpur Panchayat of Govindpur Block
      2. BCCL Ke LAAL/BCCL Ki LAADLI
      3. Multiple works at RBB High School, Rajganj such as classroom, auditorium etc.

      These works are to be completed in FY 2019-20.
  - **e)** Manner in which the amount spent during the financial year as: As per **Annexure 'A'**

BCCL has carried out its CSR Activity, its implementation and Monitoring in compliance with the Companies (Corporate Social Responsibility Policy) Rules 2014, CSR Objective and Policy of the Company.

Shri Shekhar Saran CMD, BCCL	Dr. H. S. Yadav Chairman, CSR Committee	Person specified under clause (d) of sub section (1) of section 380 of the Companies Act.

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Annexure 'A'

Sl No	CSR Projects identified	Sector	State and district of Project coverage		Project wise amount outlay(budget) (₹ lakhs)	Amt. spent (Rs. lakhs)		Cumulative expenditure upto the reporting period (₹ lakhs)	Direct or through agency
			District	State		Direct Exp	Overheads		
Ensuring environmental sustainability, ecological balance, protection of flora and fauna, animal welfare, agroforestry, conservation of natural resources and maintaining quality of soil, air and water including contribution to the Clean Ganga Fund set-up by the Central Government for rejuvination of river Ganga (04 nos. of pond projects)									
1	Deepening/renovation including construction of steps/ghats for pond at Belardih ,East tundi	Ensuring environmental sustainability, ecological balance, protection of flora and fauna, animal welfare, agroforestry, conservation of natural resources and maintaining quality of soil, air and water including contribution to the Clean Ganga Fund set-up by the Central Government for rejuvination of river Ganga	Dhanbad	Jharkhand	35.13	4.22	--	4.22	Direct
2	Deepening/renovation including construction of steps/ghats at Aam Bandh Sindurpur (Khairabani) village under Sindurpur Panchayat in Baliapur Block	Ensuring environmental sustainability, ecological balance, protection of flora and fauna, animal welfare, agroforestry, conservation of natural resources and maintaining quality of soil, air and water including contribution to the Clean Ganga Fund set-up by the Central Government for rejuvination of river Ganga	Dhanbad	Jharkhand	11.43	6.06	--	6.06	Direct
3	Deepening/renovation including construction of steps/ghats at Aam Bandh at Dardaha village under Dolabhar Panchayat in Baliapur Block	Ensuring environmental sustainability, ecological balance, protection of flora and fauna, animal welfare, agroforestry, conservation of natural resources and maintaining quality of soil, air and water including contribution to the Clean Ganga Fund set-up by the Central Government for rejuvination of river Ganga	Dhanbad	Jharkhand	7.55	7.09	--	7.09	Direct
4	Deepening/Renovation including Construction of steps/ghat for Khas Bandh Pond at Latani under East Tundi by BCCL	Ensuring environmental sustainability, ecological balance, protection of flora and fauna, animal welfare, agroforestry, conservation of natural resources and maintaining quality of soil, air and water including contribution to the Clean Ganga Fund set-up by the Central Government for rejuvination of river Ganga	Dhanbad	Jharkhand	57.7	0.60	--	56.7	Direct
Eradicating hunger, poverty and malnutrition, promoting health care including preventive health care and sanitation including contribution to Swach Bharat Kosh set-up by the Central Government for the promotion of sanitation and making available safe drinking water (Medical camps & Swachhta Pakhwada under sanitation)									
5	Medical camps held under CSR	Eradicating hunger, poverty and malnutrition, promoting health care including preventive health care and sanitation including contribution to Swach Bharat Kosh set-up by the Central Government for the promotion of sanitation and making available safe drinking water	Dhanbad	Jharkhand	1.68	1.68	--	1.68	Direct

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6	Swachhta Marathon (run for cleanliness) to promote awareness about Swachhta under Swachhta Pakhwada (held under under Ministry instructions)	Eradicating hunger, poverty and malnutrition, promoting health care including preventive health care and sanitation including contribution to Swach Bharat Kosh set-up by the Central Government for the promotion of sanitation and making available safe drinking water	Dhanbad	Jharkhand	2.21	2.21	--	2.21	Direct
7	Arrangements for Swachhta Pakhwada (held under under Ministry instructions)	Eradicating hunger, poverty and malnutrition, promoting health care including preventive health care and sanitation including contribution to Swach Bharat Kosh set-up by the Central Government for the promotion of sanitation and making available safe drinking water	Dhanbad	Jharkhand	0.18	0.18	--	0.18	Direct
8	05 shows of Nukkad Natak held towards promotion of cleanliness under Swachhta pakhwada (held under under Ministry instructions)	Eradicating hunger, poverty and malnutrition, promoting health care including preventive health care and sanitation including contribution to Swach Bharat Kosh set-up by the Central Government for the promotion of sanitation and making available safe drinking water	Dhanbad	Jharkhand	0.50	0.50	--	0.50	Direct
Promoting education,including special education & employment enhancing vocation skills especially among children,women,elderly,and the differently abled & livelihood enhancement projects (03 nos. of projects)									
9	BCCL Le LAAL/BCCL Ki LAALDI	Promoting education,including special education & employment enhancing vocation skills especially among children,women,elderly,and the differently abled & livelihood enhancement projects	Dhanbad	Jharkhand	57.92	26.12	--	26.12	Direct
10	Skill development: Providing 100 nos. of sewing machines for training towards empowering SGH women through Jharkhand State Livelihood Promotion Society	Promoting education,including special education & employment enhancing vocation skills especially among children,women,elderly,and the differently abled & livelihood enhancement projects	Dhanbad	Jharkhand	5.00	5.00	--	5.00	Indirect; through Jharkhand State Livelihood Promotion Society
11	Training Scheme for preparing "Trainees" for Mining Sirdars	Promoting education,including special education & employment enhancing vocation skills especially among children,women,elderly,and the differently abled & livelihood enhancement projects	Dhanbad	Jharkhand	42.33	16.03	--	16.03	Direct
Rural development projects (02 nos. of projects)									
12	Construction of bamboo huts with thatched roof in Barwa village under Green Haat Project	Rural development projects	Dhanbad	Jharkhand	2.42	2.05	--	2.05	Direct
13	Construction of Community Centre at Jiramuri village, Ratanpura panchayat under Govindpur Block, Dhanbad	Rural development projects	Dhanbad	Jharkhand	17.89	16.18	--	16.18	Direct
Others (Monthly expenditure incurred towards HR expenses of NCSR Hub TISS as per its MoU)									

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14	Payment to NCSR Hub TISS Mumbai towards human resource expenses	Others	Dhanbad	Jharkhand	2.29	2.29	--	2.29	Direct
Liability									
15	NCSR Hub, TISS Liability for impact assessment study	Rural development projects	Dhanbad	Jharkhand	6.22	3.94	--	6.22	Direct
16	BCCL Ke LAAL/BCCL Ki Laadli liability	Promoting education,including special education & employment enhancing vocation skills especially among children,women,elderly,and the differently abled & livelihood enhancement projects	Dhanbad	Jharkhand	157.6	23.44	--	58.84	Direct
17	Others including liabilities of CSR works (Swachhta Pakhwada, installation of hand pumps, Various construction works at RBB High School, Rajganj etc.)	Sanitation, safe drinking water, promoting education	Dhanbad	Jharkhand	156.7	25.09	--	25.09	Direct
	Total				**522.4**	**142.69**	--	**236.47**	--

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Expenditure For FY 17-18

Policy on CSR

CIL has well defined CSR policy framed on DPE's guideline and on the Companies Act, 2013. The policy has CIL Board's approval. The Budget on CSR is allocated based on 2% on the average net profit of the Company during the three immediate preceding financial years or Rs.2.00 per tonne of coal produced in the previous year whichever is higher.

Modalities/Mechanism of implementation of CSR

CIL not only covers the underprivileged populace residing in and around the mining areas in different states of the country where CIL is operating its works but the CSR activities of CIL cover the areas which are beyond jurisdiction of subsidiary companies also.

In respect of subsidiary companies, the CSR Policy is operational within 25 KM radius of the project/mines and areas including headquarters for which 80% of the budget is allocated. Balance 20% is spent within the state/states in which the subsidiary companies operate.

Some of the major CSR initiatives undertaken by BCCL as per the CSR Policy under various heads during the financial year 2017-18 are as under:

1.Rural Development Projects

a) Construction of PCC Roads at different locations in Dhanbad district.

2.Medical facilities, Health awareness programme/medical camps

a) Jyoti Abhiyan

3.Promoting education including skill development and livelihood enhancement

a) BCCL-Ke-Laal/BCCL-Ki-Laadli

b) Handloom weaving and training project under CSR/Sustainable Development(SD)

4. Environment

a) Deepening/renovation of ponds in different villages of Dhanbad district.

Composition of BCCL Board level CSR Committee:

(a)	Dr. H.S. Yadav, Independent Director, BCCL	Chairman
(b)	Dr. A. K. Lomas, Independent Director, BCCL	Member
(c)	Shri D. Gangopadhyay, Director (T) OP, BCCL	Member
(d)	Shri Bishnu Prasad Das, Independent Director, BCCL	Member
(e)	Shri R.S. Mahapatra, Director (P), BCCL	Member
(f)	Sri. K.S. Rajashekar, Director (F)	Invitee

- Average net profit of the company for the last three financial year is **₹ 498.94 crores**
- Prescribed CSR Expenditure (two percent of the amount as in item 3 above) is **₹ 9.98 crores**.
- Details of CSR spent during the financial year:

  a) Total amount to be spent for the financial year :**₹ 9.98 crore (as per 2% calculation)**

  b) Actual amount spent: **₹ 2.74 Crore**

  c) Amount unspent, if any: **₹ 7.24 Crore**

d) The Reason for amount of CSR being unspent: The unspent amount is primarily due to non-starting of maintenance work of toilets constructed under Swachh Vidyalaya Abhiyan which amounts to an approximate cost of ₹15 Crore per year.

The non-starting of maintenance work of toilets is due to following reasons:

- The contract has a provision of drilling 150 mm dia. borehole & installation of submersible pump in all the schools where toilets were being constructed. A major problem has been encountered i.e. non availability of electrical power in more than 95 % schools. For this reason the work related to water supply arrangement could not be taken up in all schools. This has hindered starting of maintenance work.

- State Govt. was appraised about this situation. Different correspondences have been made with state authorities and an alternate model of water supply has been worked out having 4" dia. borehole suitable hand pump arrangement on elevated platform & a masonry water tank for continuous water supply to the toilets. The contractors have been appraised about the same and requested for their consent for alternate arrangement. Contractors provided a conditional consent with requirement of two additional man powers, which will raise the cost significantly, while there would be a considerable saving if the maintenance job had been awarded to State Govt. authorities.
- Hence a proposal was initiated "To provide running water in the toilets of schools constructed in different districts of Jharkhand by BCCL and its maintenance through State Govt. on depository mode.

- Meanwhile, question has arisen whether at the present situation/circumstances, the maintenance portion of the work is to be carried out by BCCL or not, which is in built in the agreements for the above contracts. Communications had been made with CIL in this regard and as per reply received from GM (CSR), CIL, matter is placed for the perusal and discussion of higher authorities.

- At present the matter is being discussed/perused at two levels-

  1) Appropriate decision from CIL is awaited.
  2) Proposal to provide running water in toilets through State Govt. on depository mode is still under pipeline.

- Suitable arrangement for water availability in constructed toilets might be made after finalization of above proposal or suitable decision by competent authority.

e) Manner in which the amount spent during the financial year as: As per **Annexure 'A'**

BCCL has carried out its CSR Activity, its implementation and Monitoring in compliance with the Companies (Corporate Social Responsibility Policy) Rules 2014, CSR Objective and Policy of the Company.

Sd/- Sri A. K. Singh CMD, BCCL	Sd/- Dr. H. S. Yadav Chairman, CSR Committee	Sd/- Person specified under clause (d) of sub section (1) of section 380 of the Companies Act.

Sl No.	CSR Projects identified	Sector	State and district of Project coverage		Project wise amount outlay (budget) (₹ lakhs)	Amt. spent (₹ lakhs)		Cumulative expenditure upto the reporting period (Rs. lakhs)	Direct or through agency
			District	State		Direct Exp	Overheads		
Ensuring environmental sustainability, ecological balance, protection of flora and fauna, animal welfare, agroforestry, conservation of natural resources and maintaining quality of soil, air and water including contribution to the Clean Ganga Fund set-up by the Central Government for rejuvination of river Ganga (07 nos. of pond projects)									
1	Construction of steps/ ghats for purana bandh and bagjobra pond at mairwatand, east Tundi	Ensuring environmental sustainability, ecological balance, protection of flora and fauna, animal welfare, agroforestry, conservation of natural resources and maintaining quality of soil, air and water including contribution to the Clean Ganga Fund set-up by the Central Government for rejuvination of river Ganga	Dhanbad	Jharkhand	16.6	4.2	-	13.5	Direct
2	Deepening/ Renovation including const of steps/Ghat for pond at Duma under East Tundi by Bccl	Ensuring environmental sustainability, ecological balance, protection of flora and fauna, animal welfare, agroforestry,	Dhanbad	Jharkhand	4.8	0.1	-	4.2	Direct

		conservation of natural resources and maintaining quality of soil, air and water including contribution to the Clean Ganga Fund set-up by the Central Government for rejuvination of river Ganga							
3	Deepening/ Renovation including const of steps/Ghat for Talbandh & Pokharia at east tundi by BCCL	Ensuring environmental sustainability, ecological balance, protection of flora and fauna, animal welfare, agroforestry, conservation of natural resources and maintaining quality of soil, air and water including contribution to the Clean Ganga Fund set-up by the Central Government for rejuvination of river Ganga	Dhanbad	Jharkhand	13.9	0.4	-	12.7	Direct
4	Deepening/ Renovation including Construction of steps/ ghat for Khas Bandh (Bara Bandh) Pond at Latani under East Tundi by BCCL	Ensuring environmental sustainability, ecological balance, protection of flora and fauna, animal welfare, agroforestry, conservation of natural resources	Dhanbad	Jharkhand	57.7	1.2	-	56.1	Direct

		and maintaining quality of soil, air and water including contribution to the Clean Ganga Fund set-up by the Central Government for rejuvination of river Ganga							
5	Deepening/ Renovation including Construction of Stair/ghat at Maira Bandh and Bara Bandh Raghunathpur in East Tundi Circle by BCCL under CSR	Ensuring environmental sustainability, ecological balance, protection of flora and fauna, animal welfare, agroforestry, conservation of natural resources and maintaining quality of soil, air and water including contribution to the Clean Ganga Fund set-up by the Central Government for rejuvination of river Ganga	Dhanbad	Jharkhand	38.5	2.4	-	37.7	Direct
6	Deepening/ Renovation and Constructio n of steps and ghat at Khash Bandh (Bara Bandh) Belardih East Tundi by BCCL under CSR	Ensuring environmental sustainability, ecological balance, protection of flora and fauna, animal welfare, agroforestry, conservation of natural resources and maintaining	Dhanbad	Jharkhand	33.5	0.6	-	34.5	Direct

		quality of soil, air and water including contribution to the Clean Ganga Fund set-up by the Central Government for rejuvination of river Ganga							
7	Deepening/ Renovation including Construction of steps/ghat for Bandh arrh Pond at Katania under Tundi Circle.	Ensuring environmental sustainability, ecological balance, protection of flora and fauna, animal welfare, agroforestry, conservation of natural resources and maintaining quality of soil, air and water including contribution to the Clean Ganga Fund set-up by the Central Government for rejuvination of river Ganga	Dhanbad	Jharkhand	29.2	3.0	-	32.2	Direct
Eradicating hunger, poverty and malnutrition, promoting health care including preventive health care and sanitation including contribution to Swach Bharat Kosh set-up by the Central Government for the promotion of sanitation and making available safe drinking water (Toilets in 8 districts & 4 nos. of other projects)									
1	Construction of toilets in various Schools in 08 Districts of Jharkhand under SVA	Eradicating hunger, poverty and malnutrition, promoting health care including preventive health care and sanitation including contribution to	Dhanbad, Paschimi Singhbhum ,Bokaro, Dumka, Gumla, Simdega, Purbi Singhbhum , Koderma	Jharkhand	12105.2	165.6	-	4549.2	Direct

		Swach Bharat Kosh set-up by the Central Government for the promotion of sanitation and making available safe drinking water							
2	Construction of Toilets at SSLNT Mahila Mahavidyalaya Dhanbad	Eradicating hunger, poverty and malnutrition, promoting health care including preventive health care and sanitation including contribution to Swach Bharat Kosh set-up by the Central Government for the promotion of sanitation and making available safe drinking water	Dhanbad	Jharkhand	22.8	14.2	-	21.3	Direct
3	Const of 8 No. Toilets at Bhatinda & Pootki Sri nagar,Near community hall building dhanbad	Eradicating hunger, poverty and malnutrition, promoting health care including preventive health care and sanitation including contribution to Swach Bharat Kosh set-up by the Central Government for the promotion of sanitation and making available safe drinking water	Dhanbad	Jharkhand	5.0	0.1	-	4.4	Direct

4	Arrangement for Prabhat Pheri to conclude Swachhata Pakhwada 2017	Eradicating hunger, poverty and malnutrition, promoting health care including preventive health care and sanitation including contribution to Swach Bharat Kosh set-up by the Central Government for the promotion of sanitation and making available safe drinking water	Dhanbad	Jharkhand	0.3	0.3	-	0.3	Direct
5	Eye camps	Eradicating hunger, poverty and malnutrition, promoting health care including preventive health care and sanitation including contribution to Swach Bharat Kosh set-up by the Central Government for the promotion of sanitation and making available safe drinking water	Dhanbad	Jharkhand	9.6	2.2	-	2.2	Direct
Promoting education,including special education & employment enhancing vocation skills especially among children, women, elderly, and the differently abled & livelihood enhancement projects (02 nos. of projects)									
1	BCCL ke LAAL/BCCL Ki LAALDI	Promoting education, including special education & employment enhancing vocation skills especially among	Dhanbad	Jharkhand	193.6	35.4	-	35.5	Direct

		children, women, elderly, and the differently abled & livelihood enhancement projects							
2	Skill development on handloom weaving training of villagers in peripheral villages of BCCL	Promoting education, including special education & employment enhancing vocation skills especially among children, women, elderly, and the differently abled & livelihood enhancement projects	Dhanbad	Jharkhand	40.9	6.0	-	21.6	Direct
Rural development projects (6 nos. of projects)									
1	Construction of Community Hall at Johar Asthan, Hirapur, Dhanbad	Rural development projects	Dhanbad	Jharkhand	10.1	0.4	-	10.6	Direct
2	Construction of PCC Road Shrirampur Panchayat at Topchanchi Block (I) Hirapur Sonariya Tand path to Dignagar Via Manpur (ii) At Barki tand Village. Under CSR Programme by BCCL	Rural development projects	Dhanbad	Jharkhand	37.3	0.3	-	21.9	Direct

3	Construction of PCC Road from house of Basudev Singh to Telodih Kalimandir, House of Saryug Thakur to house of Shuklal Mohli at Telodih village, Dasaitand Harijan tolla to Dulhandih Middle School via Bara Pond, from house of Hamir Raj Pandey to Pool at Pandeydih in Singdaha Panchayat (Topchanchi Block) by BCCL under CSR.	Rural development projects	Dhanbad	Jharkhand	59.9	1.0	-	57.6	Direct
4	Construction of PCC road from house of Madan Mandal at Tulshidih village to house of Janki Singh at Mamodarpur village in Khario and Ramakunda Panchayat of Topchanchi block Under CSR Programme by BCCL	Rural development projects	Dhanbad	Jharkhand	40.6	1.2	-	41.2	Direct

5	Construction of PCC road in (i) Khurdih Village from Primary School to Pond (ii) from house of Lal Mohan Singh, Neemdih to Dhowatand Primary School, in Dhowatand Village (iii) from house of Wakil Gope to Katri River bridge at Bans Pahar village in Nero Panchayat (Topchachi Block) by BCCL under CSR.	Rural development projects	Dhanbad	Jharkhand	102.4	0.5	-	99.7	Direct
6	Construction of PCC road from Katri River bridge to PCC Road and Shukhdeo Gope house to Lewatand PCC Road at Rath tand village, from Sukhdeo Tiwari house to Chunilal Tiwari house, Vikash Tiwari house to Pawan Tiwari house, Jay Prakash Tiwari house to Katri River at Rowam village; and Rowam Harijan tolla to Kharni Vida Ramkanali More Paneydih in Dhangi Panchayat at (Topchanchi Block) by BCCL under CSR	Rural development projects	Dhanbad	Jharkhand	46.5	1.4	-	43.8	Direct

Protection of national heritage, art & culture including restoration of buildings & sites of historical importance & works of art; setting up public libraries; Promoting & development of traditional arts & handicrafts (01 project)									
1	Repair and Maintenance including fixing of Ladder at Shramik Chowck near Railway Station, Dhanbad	Protection of national heritage,art & culture including restoration of buildings & sites of historical importance & works of art;setting up public libraries; Promoting & development of traditional arts & handicrafts	Dhanbad	Jharkhand	0.2	0.2	-	0.2	Direct
Others (1 no. of project and monthly expenditure incurred towards HR expenses of NCSR Hub TISS as per its MoU)									
1	Board for display of CSR Activities of BCCL on Retro Vinyl	Others	Dhanbad	Jharkhand	2.9	2.8	-	2.8	Direct
2	NCSR Hub TISS Mumbai towards human resource	Others	-	-	5.8	5.8	-	5.8	Direct
Liability									
1	Liability reversed (rural)	Rural development projects	-	-	-	(16.4)	-	-	-
2	Liability reversed (sanitation)	Eradicating hunger, poverty and malnutrition, promoting health care including preventive health care and sanitation including contribution to Swach Bharat Kosh set-up by the Central Government for the promotion of sanitation and making available safe drinking water	-	-	-	(17.0)	-	-	-

3	SVA liability	Eradicating hunger, poverty and malnutrition, promoting health care including preventive health care and sanitation including contribution to Swach Bharat Kosh set-up by the Central Government for the promotion of sanitation and making available safe drinking water	-	-	-	672.6	-	-	-
4	SVA liability reversal	Eradicating hunger, poverty and malnutrition, promoting health care including preventive health care and sanitation including contribution to Swach Bharat Kosh set-up by the Central Government for the promotion of sanitation and making available safe drinking water	-	-	-	(737.9)	-	-	-
5	BCCL Ke LAAL/BCCL Ki Laadli liability	Promoting education, including special education & employment enhancing vocation skills especially among children, women, elderly, and the differently abled & livelihood enhancement projects	Dhanbad						
	Total				**12877.3**	**273.9**	-	**5109.0**	-

Expenditure For FY16-17

Company during the three immediate preceding financial years or 2.00 per tonne of coal produced in the previous year whichever is higher.

Modalities/Mechanism of implementation of CSR

CIL not only covers the underprivileged populace residing in and around the mining areas in different states of the country where CIL is operating its works but the CSR activities of CIL cover the areas which are beyond jurisdiction of subsidiary companies also.

In respect of subsidiary companies, the CSR Policy is operational within 25 KM radius of the project/mines and areas including headquarters for which 80% of the budget is allocated. Balance 20% is spent within the state/states in which the subsidiary companies operate.

Some of the major CSR initiatives undertaken by BCCL as per the CSR Policy under various heads during the financial year 2016-17 are as under:

1. Rural Development Projects
   a) Construction of PCC Roads at different locations in Dhanbad district.
2. Medical facilities, Health awareness programme/medical camps
   a) Organizing medical camps
3. Promoting education including skill development and livelihood enhancement
   a) Handloom weaving and training project under CSR/Sustainable Development(SD)
4. Sanitation
   a) Construction of Toilet at SSLNT Mahila Maha Vidyalaya Dhanbad By BCCL under CSR
   b) Procurement of dust bin/waste bin for collection of day to day waste in Dhanbad under CSR activity
5. Environment
   a) Deepening/renovation of ponds in different villages of Dhanbad district.

Composition of BCCL Board level CSR Committee.

(a)	Dr. H.S. Yadav, Independent Director, BCCL	Chairman
(b)	Dr. A. K. Lomas, Independent Director, BCCL	Member
(c)	Sri. B.K. Panda, Director (Personnel)	Member
(d)	Sri D. Gangopadhyay, Director (Tech) Project & Planning	Member

- Average net profit of the company for the last three financial year is **₹1342.33 crores**
- Prescribed CSR Expenditure (two percent of the amount as in item 3 above) is **₹26.85 crores**.
- Details of CSR spent during the financial year.

a) Total amount to be spent for the financial year : **₹26.85 crore**
b) Actual amount spent: **₹11.45 Crore**
c) Amount unspent, if any: **₹15.4 Crore**
d) Manner in which the amount spent during the financial year as: As per **Annexure 'A'**

BCCL has carried out its CSR Activity, its implementation and Monitoring in compliance with the Companies (Corporate Social Responsibility Policy) Rules 2014, CSR Objective and Policy of the Company.

Sd/-	Sd/-	
Gopal Singh	Dr. H. S. Yadav	Person specified under clause (d)
CMD, BCCL	Chairman, CSR Committee	of sub section (1) of section 380
		of the Companies Act.

Annexure A

1	2	3	4		5	6		7	8
Sl No.	CSR project or activity identified	Sector in which the project is covered	Project or programs		Amount outlay (budget) project or program wise (₹ lakhs)	Amount spent on the project or programs (during FY 2016-17) (₹ lakhs)		Cumulative expenditure upto the reporting period (₹ lakhs)	Amount spent: direct or through implementing agency
			1) Local area or other	2) Specify the state and district where projects or programs were undertaken		1) Direct expenditure on projects or programs	2) Overheads		
1	9 nos. of projects	Ensuring environmental sustainability, ecological balance, protection of flora and fauna, animal welfare, agroforestry, conservation of natural resources and maintaining quality of soil, air and water including contribution to the Clean Ganga Fund set-up by the Central Government for rejuvination of river Ganga	local	Jharkhand, Dhanbad	265.21	188.68	0.00	242.46	Direct
2	13 nos. of projects	Eradicating hunger, poverty and malnutrition, promoting health care including preventive health care and sanitation including contribution to Swach Bharat Kosh set-up by the Central Government for the promotion of sanitation and making available safe drinking water	local	Jharkhand, Dhanbad,Paschimi Singhbhum, Bokaro,Dumka,Gumla,Simdega,Purbi Singhbhum, Koderma	1220 6.55	716.13	3.00	4998.14	Direct

3	2 nos. of projects	Promoting education,including special education & employment enhancing vocation skills especially among children,women,elderly,and the differently abled & livelihood enhancement projects	local	Jharkhand, Dhanbad	52.52	21.89	0.00	32.50	Direct
4	1 no. of project	Protection of national heritage,art & culture including restoration of buildings & sites of historical importance & works of art;setting up public libraries; Promoting & development of traditional arts & handicrafts	local	Jharkhand, Dhanbad	0.18	0.18	0.00	0.18	Direct
5	7 nos. of projects	Rural development projects	local	Jharkhand, Dhanbad	333.07	199.31	0.00	270.33	Direct
6	1 no. of project	Training to promote rural sports, nationally recognized sports, Paralympics sports and Olympic sports	local	Jharkhand, Dhanbad	0.07	0.07	0.00	0.07	JSSPS
7	4 no. of projects	Others	local	Jharkhand, Dhanbad	16.98	15.11	0.18	12.05	Direct

Major Environmental measures cost for the year 2018-19

Sl. No.	Activity (18-19)	Cost Incurred (In Lakhs)
1	Environmental Monitoring (Air, water and noise)	20
2	FRI Dehradun Monitoring Cost	0.89
3	Ecological Restoration/Block Plantation/Green Park	230.5
4	Fire covering/blanketing/fighting	255
5	Water Sprinkling	262
6	Water treatment plant	172.6
7	Avenue Plantation (Bamboo Gabion)	5.10
8	Construction of Toe wall along OB DUMP	1.99
9	Construction of siltation pond (Kachha)	1.5
10	Top soil Management	2.8
11	source apportionment study (NEERI)	8.29
Total Cost Incurred (Manpower cost and Diesel cost is included)		**960.67**

Apart from above mentioned environment measures cost 6.48 Crore has been deposited into Escrow account till 2018-19.

AM(Env)
Katras Area

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Major Environmental measures cost for the year 2016-17

Sl. No.	Major Environment Activity (16-17)	Cost Incurred (In Lakhs)
1	Environmental Monitoring (Air, water and noise)	12
2	FRI Dehradun Monitoring Cost	0.89
3	Ecological Restoration/Block Plantation/Green Park	98.8
4	Avenue Plantation(Bamboo Gabion)	30.7
5	Fire covering/blanketing/fighting	310
6	Water Sprinkling	252
7	Water treatment plant	124
8	Top Soil Management	2.5
Total Cost Incurred (Manpower cost and Diesel cost is included)		**830.89**

Apart from above mentioned environment measures cost Rs. 4.42 Crore has been deposited into Escrow account till 2016-17.

AM(Env)
Katras Area

Scanned by CamScanner

Major Environmental Measure cost for the year 2017-18

Sl.No	Activity	Cost in Lakhs
1	Ecological Restoration/Block Plantation/Green Park	253.00
2	Water Sprinkling	260.5
3	FRI Monitoring	0.89
4	Environment monitoring (Air , Water and Noise)	20.5
5	Water Treatment Plant	169.3
6	Oil & Grease trap	10.00
7	Rain Water Harvesting	4.702
8	Fire Covering / blanketing / fighting	276.54
9	Top soil Management	2.2
	Total Cost Incurred(man power cost included)	**997.632**

Apart from above mentioned Environmental Measure cost Rs. 5.85 Crore has been deposited in Escrow account till FY 2017-18.

AM(Env)
Katras Area

Scanned by CamScanner

(7)

Ph: 0326-2204933

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

Letter No. 2650 Dated 6/7/13

From,

Regional Officer,
Dhanbad

To,

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

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

Sir,

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

Encl-A/a.

Your's faithfully,

6/7/13

(Dinesh Prasad Singh)
Regional Officer.

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

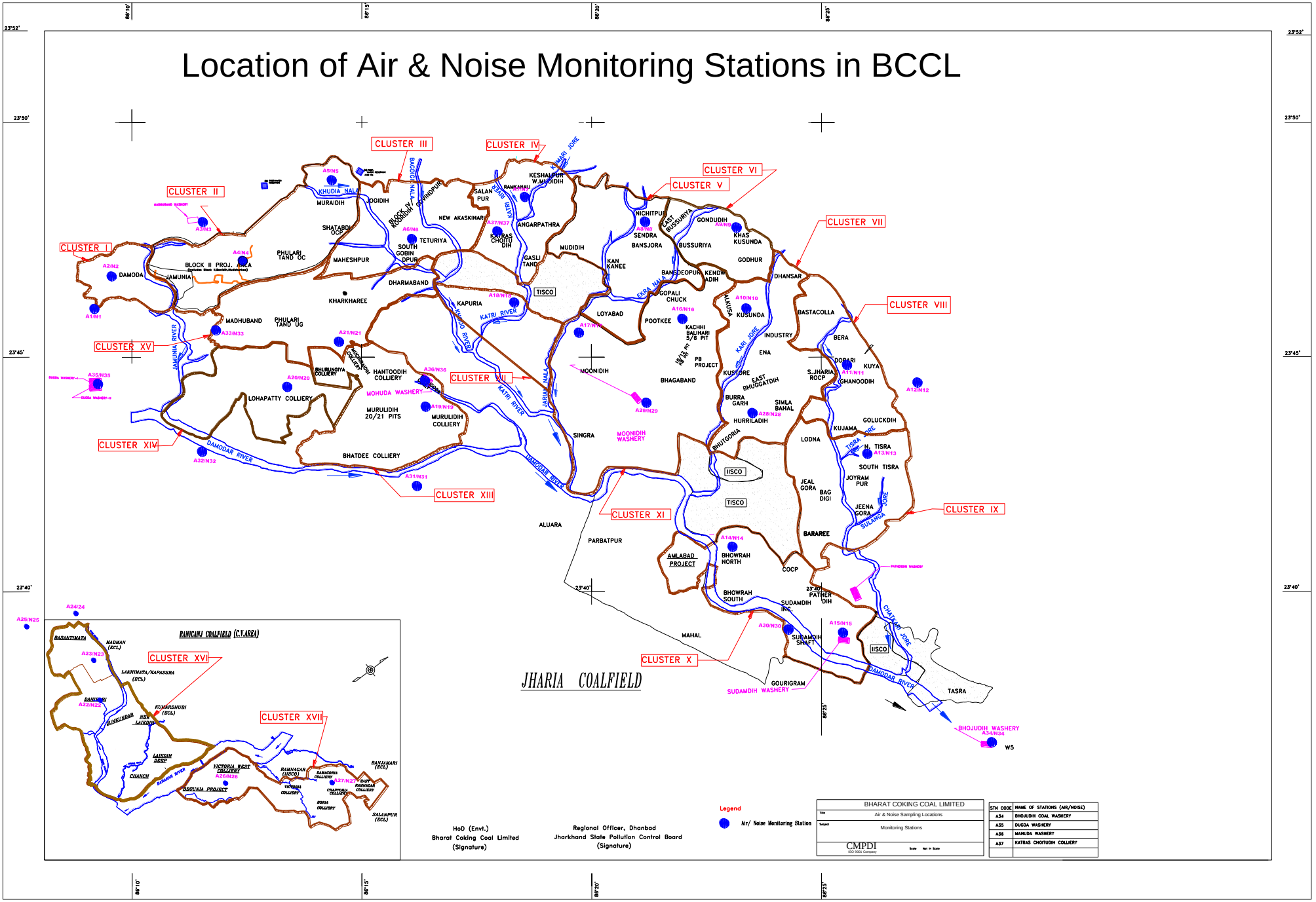
Copy to: The Member Secretary, Jharkhand State Pollution Control Board for information & enclose a copy of the map for necessary action.

Encl-A/a.

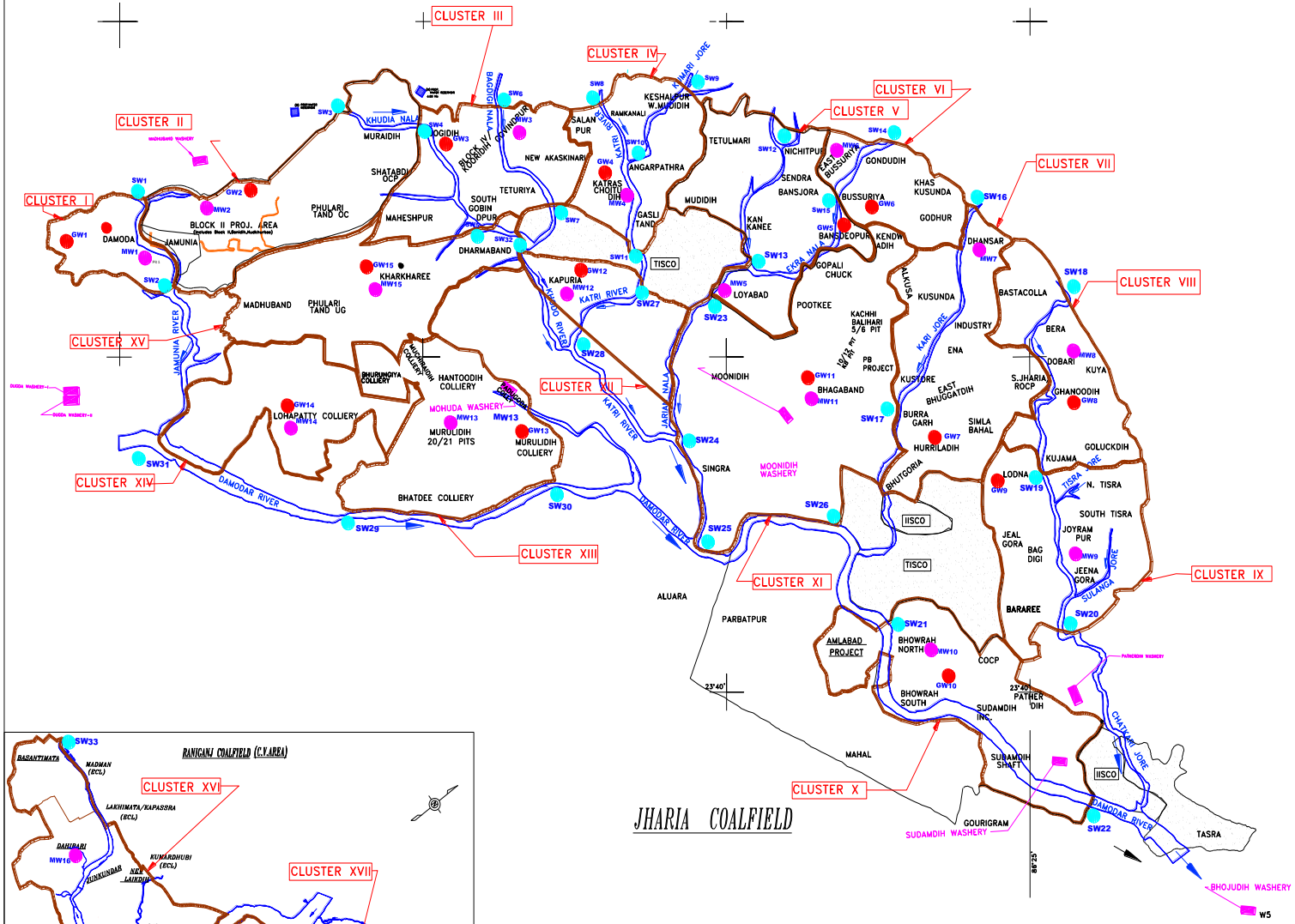
(Dinesh Pd. Singh)
Regional Officer.

Printed by Sandip

Location of Air & Noise Monitoring Stations in BCCL



Water Sampling Locations 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 (C.V.AREA)
KHUDIA NALA
BAGDIGI NALA
GOVINDPUR
JOGIDIH
MURAIDIH
SHATABDI OCP
BLOCK IV COMPLEX
NEW AKASKINARI
SALANPUR
KESHALPUR W. MUDIDIH
RAMKANALI
ANGARPATHRA
TETULMARI
NICHITPUR
EAST BUSSURIYA
GONDUDIH
KHAS KUSUNDA
BUSSURIYA
SENDRA
BANSJORA
BANSDEOPUR
KENDWADIH
GODHUR
DHANSAR
BASTACOLLA
BERA
DOBARI
KUYA
GHANOODIH
GOLUCKDIH
KUJAMA
LODNA
N. TISRA
SOUTH TISRA
JOYRAM PUR
JEENA GORA
BARAREE
JEAL GORA
BAG DIGI
BHOWRAH NORTH
BHOWRAH SOUTH
COCP
PATHER DIH
SUDAMDIH INC.
SUDAMDIH SHAFT
GOURIGRAM
TASRA
BHOJUDIH WASHERY
SUDAMDIH WASHERY
PANCHDIH WASHERY
MOHUDA WASHERY
MADHUBAND WASHERY
DUDDA WASHERY-I
DUDDA WASHERY-II
DAMODAR RIVER
JAMUNIA RIVER
KATRI RIVER
KARO RIVER
KARI JORE
JARIAN NALA
EKRA NALA
CHYHARI JORE
SULANGA JORE
TISRA JORE
BARAKAR RIVER
DAMODAR RIVER
DAMODAR RIVER
DAMOD

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

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

(FOR THE MONTH SEPTEMBER, 2019)

E. C. no. J-11015/212/2010-IA.II (M) dated 06.02.2013.

CMPDI
ISO 9001 Company
Regional Institute-II
Dhanbad, Jharkhand

CONTENTS

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2.	CHAPTER-II	INTRODUCTION	6
3.	CHAPTER-III	RESULTS	7-11
4.	CHAPTER-IV	STANDARDS AND PLANS	12-15

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 SalanpurOCP, KatrasChoitodihUG, Amalgamated Keshalpur – West Mudidih OCP & UG Mines, Amalgamated Ramkanali – Angarpathra OCP & UG mines, Gaslitand UG. The cluster– IV is situated about 25 - 30kms from Dhanbad Railway Station. The mines of this cluster- IV are operating since pre nationalization period (prior to 1972-73). It is connected by both Railway and Road. The drainage of the area is governed by KatriRiver and KumariJore.

The Project has Environmental Clearance from Ministry of Environment, Forest and Climate Change (MoEF&CC) for a rated capacity of 2.851 Mtpa (normative) and 3.706 Mtpa peak capacity of coal production vide letter no. J-11015/212/2010-IA.II (M) dated 06th February, 2013.

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.

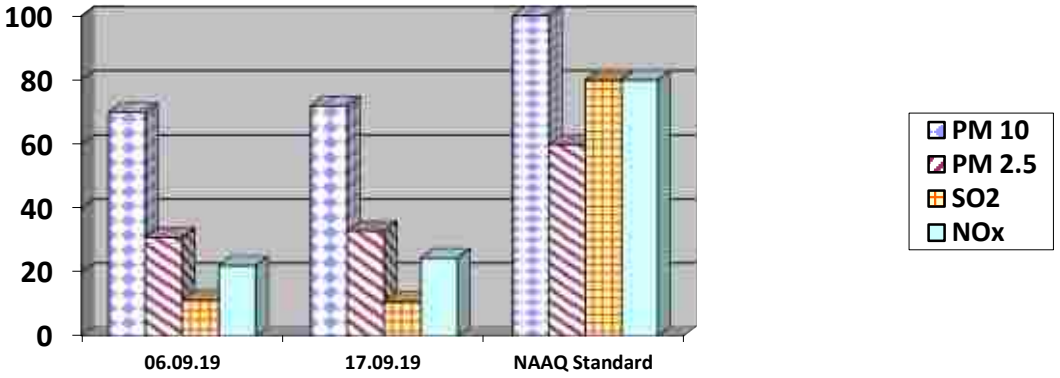
iii) Rudhi Basti(A18): **Residential Area**

The sampler was placed at a height of 1.5 m above the ground level at Rudhi Basti.

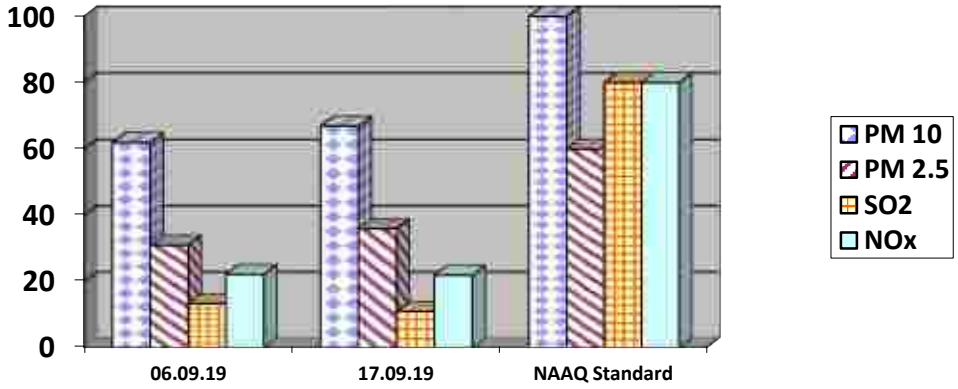
AMBIENT AIR QUALITY DATA

Cluster – IV, Bharat Coking Coal limited Month: **SEPT. 2019** **Year**: **2019-20.**

Station Name: A7, Govindpur		**Zone: Core**		**Category: Industrial**	
Sl. No.	**Dates of sampling**	**PM 10**	**PM 2.5**	**SO_2**	**NO_X**
1	06.09.19	70	31	11.42	22.16
2	17.09.19	72	33	10.89	24.53
	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**	**SO_2**	**NO_X**
1	06.09.19	62	31	13.37	22.21
2	17.09.19	67	36	11.03	21.97
	NAAQ Standard	100	60	80	80

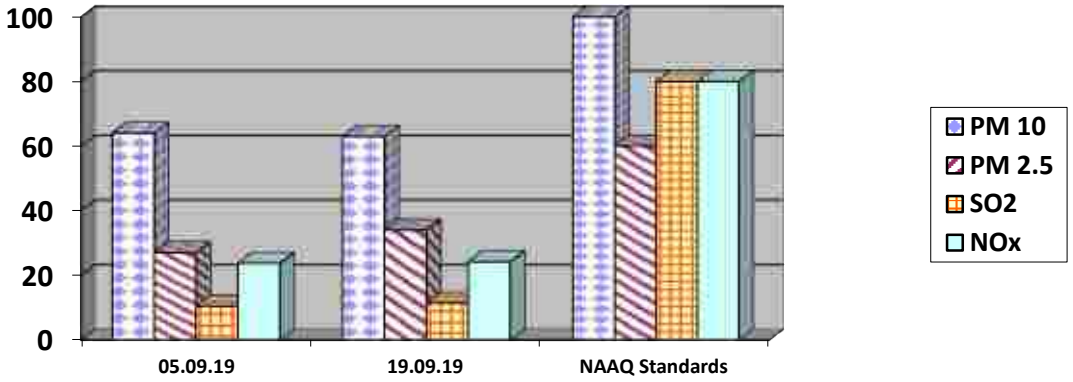


Analysed By
JSA/SA/SSA

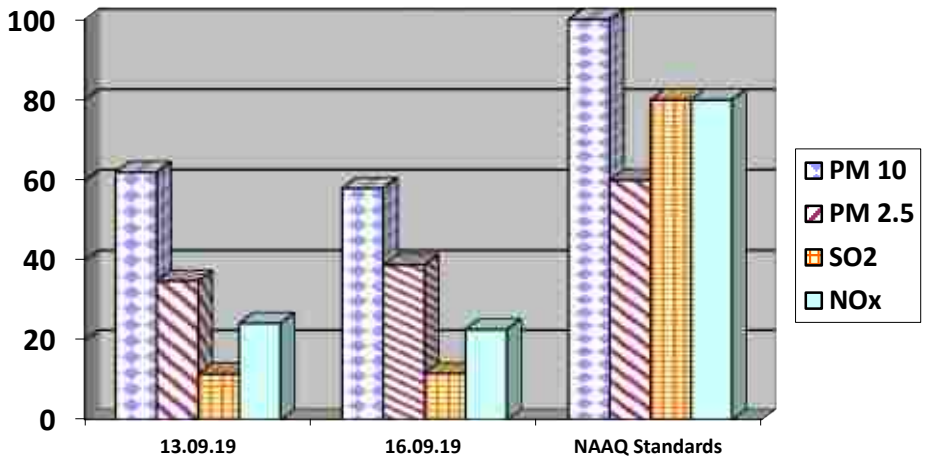
Checked By
Lab In Charge
RI-2, CMPDI, Dhanbad

Approved By
HOD(Mining/Environment)
RI-2, CMPDI, Dhanbad

Station Name: A6,Block IV		Zone: Buffer		Category: Industrial	
Sl. No.	Dates of sampling	PM 10	PM 2.5	SO2	NOx
1	05.09.19	64	27	10.47	23.76
2	19.09.19	63	34	11.38	24.24
	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	13.09.19	62	35	11.59	24.36
2	16.09.19	58	39	11.72	22.80
	NAAQ Standards	100	60	80	80

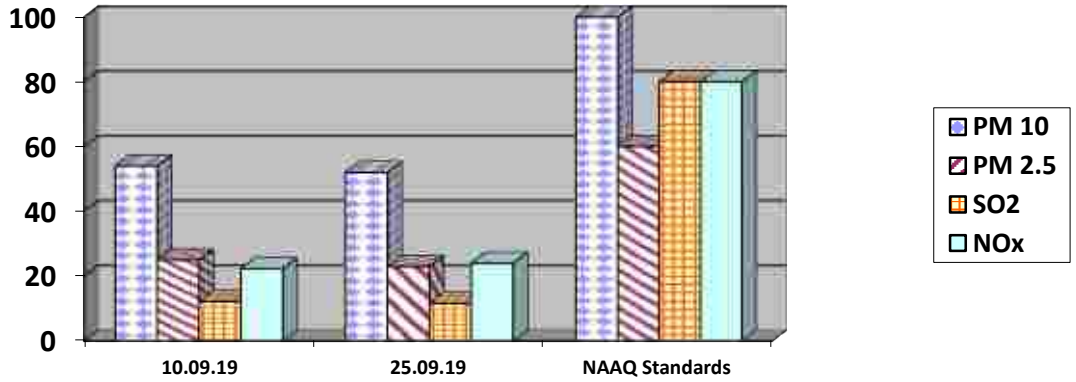


Analysed By
JSA/SA/SSA

Checked By
Lab In Charge
RI-2, CMPDI, Dhanbad

Approved By
HOD(Mining/Environment)
RI-2, CMPDI, Dhanbad

Station Name: A18,Rudhi Basti		Zone: Buffer		Category: Industrial	
Sl. No.	**Dates of sampling**	**PM 10**	**PM 2.5**	**SO2**	**NOx**
1	10.09.19	54	25	12.20	22.35
2	25.09.19	52	23	11.65	23.95
	NAAQ Standards	100	60	80	80



- *All values are expressed in microgram per cubic meter.*
- *24 hours duration*

Analysed By
JSA/SA/SSA

Checked By
Lab In Charge
RI-2, CMPDI, Dhanbad

Approved By
HOD(Mining/Environment)
RI-2, CMPDI, Dhanbad

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 River and Kumari 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.

WATER QUALITY DATA

(EFFLUENT WATER- FOUR PARAMETERS)

Name of the Cluster: **Cluster -IV**		Month: **SEPT. 2019**	Name of the Station: **Mine Discharge of Chotudih**	
Sl. No.	**Parameters**	**MW4** First Fortnight	**MW4** Second Fortnight	**As per MOEF General Standards for schedule VI**
		13.09.2019	18.09.2019	
1	Total Suspended Solids	54	56	*100 (Max)*
2	pH	7.81	7.88	*5.5 - 9.0*
3	Oil & Grease	<2.0	<2.0	*10 (Max)*
4	COD	56	36	*250 (Max)*

All values are expressed in mg/lit unless specified.

Analysed By
JSA/SA/SSA

Checked By
Lab In Charge
RI-2, CMPDI, Dhanbad

Approved By
HOD(Mining/Environment)
RI-2, CMPDI, Dhanbad

NOISE LEVEL QUALITY MONITORING

4.1Location of sampling sites

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

4.2 Methodology of sampling and analysis

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

4.3 Results & Interpretations

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

NOISE LEVEL DATA

Name of the Project: **Cluster -IV**			Month: **SEPT. 2019**		
Sl. No.	**Station Name/Code**	**Category of area**	**Date**	**Noise level dB(A)LEQ**	***Permissible Limit of Noise level in dB(A)***
1	**Block IV(N6)**	**Industrial area**	05.09.19	50.1	*75*
2	**Block IV**	**Industrial area**	19.09.19	52.4	*75*
3	**Govindpur Village(N7)**	**Industrial area**	06.09.19	60.1	*75*
4	**Govindpur Village**	**Industrial area**	17.09.19	61.2	*75*
5	**Nichitpur(N8)**	**Industrial area**	13.09.19	57.6	*75*
6	**Nichitpur**	**Industrial area**	16.09.19	61.1	*75*
7	**Katras Chotudih(N37)**	**Industrial area**	06.09.19	63.8	*75*
8	**Katras Chotudih**	**Industrial area**	17.09.19	51.7	*75*
9	**Rudhi Basti(N18)**	**Residential area**	10.09.19	50.6	*55*
10	**Rudhi Basti**	**Residential area**	25.09.19	48.3	*55*

Permissible limits of Noise Level as per MOEF Gazette Notification No. GSR 742(E) dt. 25.09.2000 Standards for Coal Mines and Noise Pollution (Regulation and Control) Rules, 2000.
*** Day Time: 6.00 AM to 10.00 PM,**

Analysed By
JSA/SA/SSA

Checked By
Lab In Charge
RI-2, CMPDI, Dhanbad

Approved By
HOD(Mining/Environment)
RI-2, CMPDI, Dhanbad

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/8hourlyvaluesshallbemet92%ofthetimeinayear.However,8% of the time it may exceed but not on two consecutivedays.

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 October 1998, the Central Pollution Control Board hereby notify the National Ambient Air Quality Standards with immediate effect.

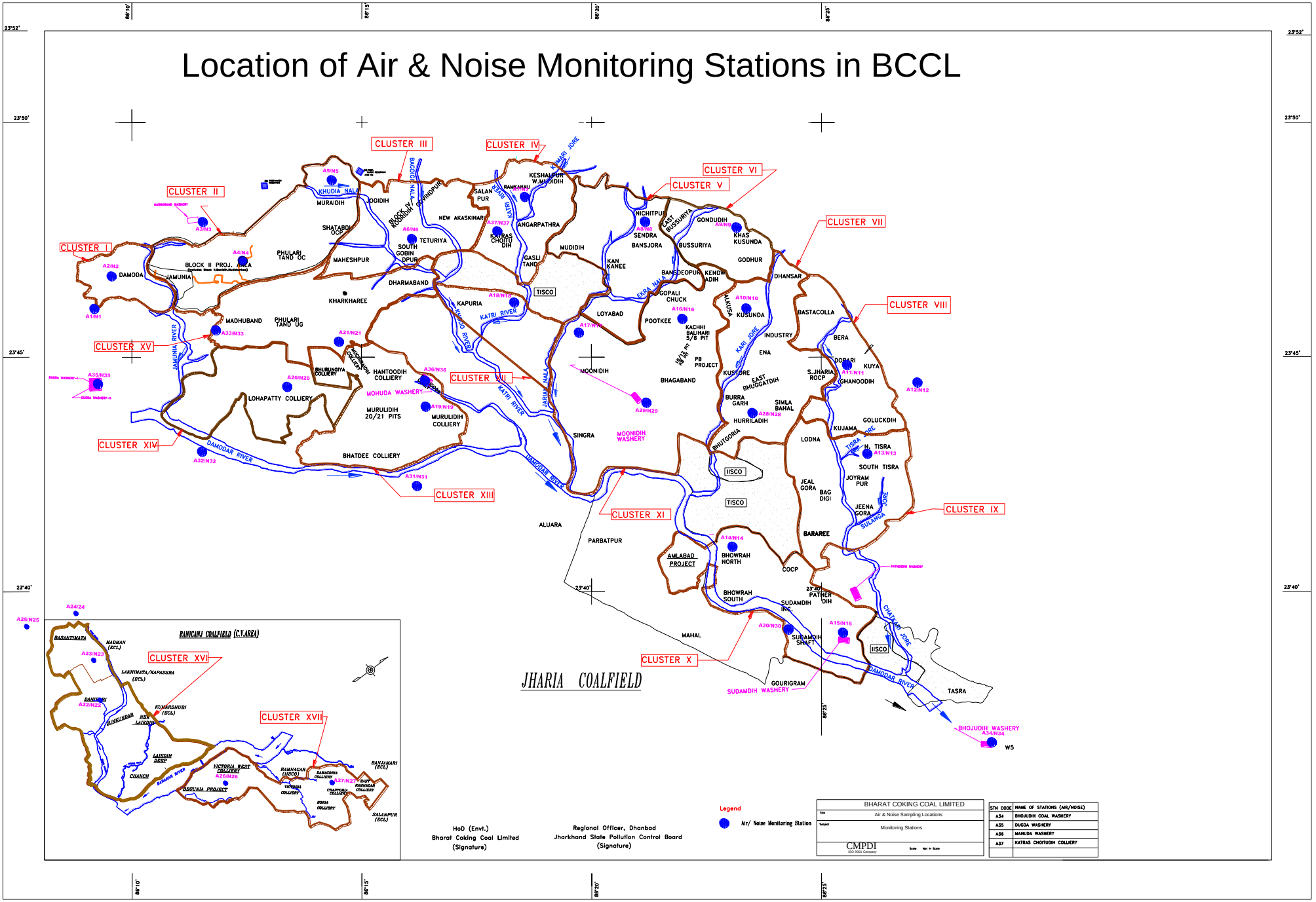
Pollutant	Time Weighted Average	Concentration in Ambient Air		Methods of Measurement
		Industrial, Residential, Rural and other Areas	Ecologically Sensitive Area (Notified by Central Government)	
Sulphur Dioxide (SO_2), µg/m³	Annual * 24 Hours **	50 80	20 80	-Improved West and Gaeke Method -Ultraviolet 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.

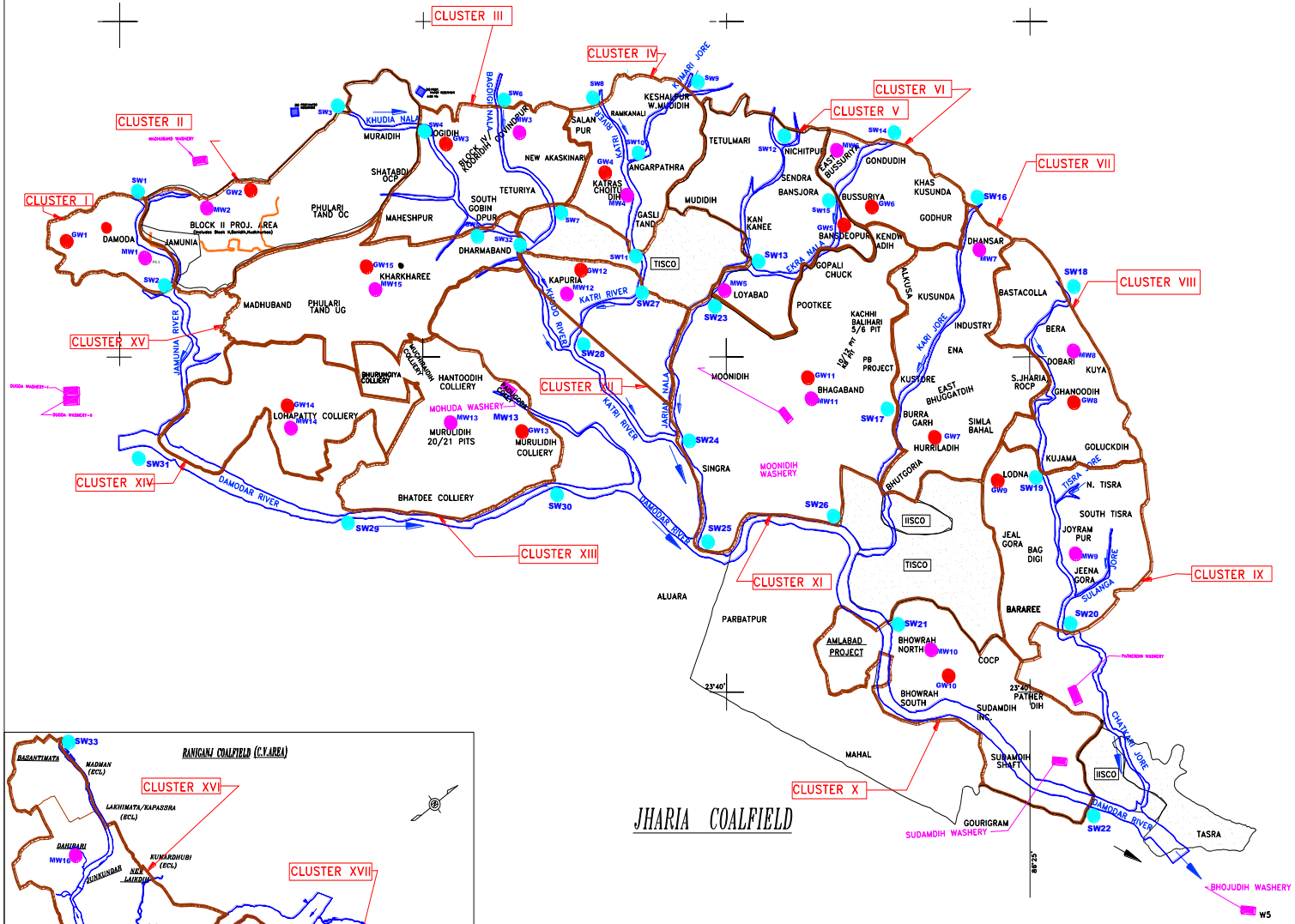
** 24 hourly or 8 hourly or 1 hourly monitored values, as applicable, shall be complied with 98% of the time in a year. 2% of the time, they may exceed the limits but not on two consecutive days of monitoring.

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



Water Sampling Locations 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 (C.V.AREA)
KHUDIA NALA
BAGDIGI NALA
GOVINDPUR
JOGIDIH
MURAIDIH
SHATABDI OCP
BLOCK IV COMPLEX
NEW AKASKINARI
SALANPUR
KESHALPUR W. MUDIDIH
RAMKANALI
ANGARPATHRA
TETULMARI
NICHITPUR
EAST BUSSURIYA
GONDUDIH
KHAS KUSUNDA
BUSSURIYA
SENDRA
BANSJORA
BANSDEOPUR
KENDWADIH
GODHUR
DHANSAR
BASTACOLLA
BERA
DOBARI
KUYA
GHANOODIH
GOLUCKDIH
KUJAMA
LODNA
N. TISRA
SOUTH TISRA
JOYRAM PUR
JEENA GORA
BARAREE
JEAL GORA
BAG DIGI
BHOWRAH NORTH
BHOWRAH SOUTH
COCP
PATHER DIH
SUDAMDIH INC.
SUDAMDIH SHAFT
GOURIGRAM
TASRA
BHOJUDIH WASHERY
SUDAMDIH WASHERY
PANCHDIH WASHERY
MOHUDA WASHERY
MADHUBAND WASHERY
DUDDA WASHERY-I
DUDDA WASHERY-II
DAMODAR RIVER
JAMUNIA RIVER
KATRI RIVER
KARO RIVER
KARI JORE
JARIAN NALA
EKRA NALA
CHYHARI JORE
SULANGA JORE
TISRA JORE
BARAKAR RIVER
DAMODAR RIVER
DAMODAR RIVER
DAMOD

भारत कोकिंग कोल लिमिटेड
(पीएसयू कोल इंडिया का एक अंग)
BHARAT COKING COAL LIMITED
(A Subsidiary of Coal India Limited)
Corporate Identity No. (CIN): U10101JH1972GOI000918
Civil Engineering Department, Koyla Nagar, Dhanbad – 826 005 (JH), India.
Phone: 0326-2230328, FAX: 0326-2230328, e-mail: gmcivil@bccl.gov.in

NIT Ref. No.: BCCL/CED/TC/eNIT-20/2018-19 /1098 Date: 14.02.2019

E – Tender Notice

Open E-Tender invited vide BCCL/CED/TC/eNIT-20/2018-19/ dated: 14.02.2019 for the work of "Drilling for establishment of 23 nos. Piezometric wells for cluster of mines of BCCL Command Area for Ground Water Monitoring."

Estimated cost: ₹ 48,93,151.75 **EMD: ₹ 61,200.00** **Period of Work: 180 days**

The tender documents can be downloaded from 01.03.2019 to 12.03.2019. All prospective bidders are advised to visit website https://coalindiatenders.nic.in for further details and to participate against this tender. Full details of this tender are also available on website "cpptcare.gov.in".

(Shiv Raj)
Asst. Manager (Civil), TC

Copy to:
1) CVO, D.(T), P&P, D.(P), BCCL.
2) Prof.(Dr.) L.C. Singh, IAS (Retd.), C-28, Third Floor, Kailash Colony, New Delhi - 110048. ——— for kind information.
3) Shri Pramod Dayalal Sadhukar, IAS (Retd.), A-202, Sadhu Pasl Apartments, C-30/24, Sector-C, Nigdi (UP) - 201301.
4) CGMs/GMs of all Areas of BCCL.
5) GM (System), Koyla Bhawan.
6) General Manager (Civil), CHQ (HQ).
7) HOD (Civil), BCCL, Koyla Bhawan.
8) HOD (Finance), For Services, Koyla Bhawan.
9) Builders Association of India, Central Administrative Kantri, Katras Circle, Dhanbad-828129.
10) CMO, BCCL – with 5 copies for wide publication in the following abridged NIT in Hindi Paper as per BCCL norms vide mail dated 01.03.2019.
11) Notice Board.

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WATER QUALITY REPORT
OF
BHARAT COKING COAL LIMITED,
CLUSTER – IV

(FOR THE Q.E. MARCH, 2019)

E. C. no. J-11015/212/2010-IA.II(M) dated 06.02.2013.

CMPDI

ISO 9001 Company

Regional Institute-II

Dhanbad, Jharkhand

CLUSTER - IV

(FOR THE Q.E. MARCH, 2019)

CONTENTS

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

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EXECUTIVE SUMMARY

1.0 Introduction

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

Bharat Coking Coal Limited (BCCL), a Subsidiary company of Coal India Limited is operating Underground and Opencast Mines in Jharia Coalfield (JCF) is a part of Gondwana Coalfields located in Dhanbad district of Jharkhand, the JCF is bounded by $23^0$37' N to $23^0$52' N latitudes and $86^0$09' E to $86^0$30' E longitude occupying an area of 450 Sq.km. BCCL has awarded Environmental monitoring work of Jharia Coalfield (JCF) to Central Mine Planning & Design Institute Limited (CMPDIL). The environmental monitoring has been carried out as per the conditions laid down by the MoEF&CC while granting environmental clearance of project, consent letter issued by the respective SPCB, and other statutory requirements.

2.0 Sampling location and rationale

2.1 Water sampling stations

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

3.0 Methodology of sampling and analysis

3.1 Water quality

Water samples were collected as per standard practice. Effluent samples were analyzed for 25 parameters on quarterly basis. The drinking and Surface water samples were collected and analyzed for 25 and 17 parameters respectively, on quarterly basis. Thereafter the samples were preserved and analyzed at the Environmental Laboratory at CMPDI (HQ), Ranchi.

4.0 Results and interpretations

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, IS.10500/2012 (Drinking water) and IS: 2296 (Surface water), are with in permissible limits.

CHAPTER - I

INTRODUCTION

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

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

Bharat Coking Coal has awarded Environmental Monitoring work of all Projects, Cluster wise, to Central Mine Planning & Design Institute Limited (CMPDIL). The environmental monitoring has been carried out as per conditions laid down by 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.

1.1 The cluster IV is in the Northern part of the Jharia coalfield. It includes Salanpur OCP, Katras Choitodih UG, Amalgamated Keshalpur – west Mudidih OCP & UG Mines, Amalgamated Ramkanali – Angarpathra OCP & UG mines, Gaslitand UG. 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 River and Kumari Jore.

1.2 The cluster IV is designed to produce 2.851 Mtpa (normative) and 3.706 Mtpa peak capacity of coal. The average grade of coal W – I to IV.

The Project has Environmental Clearance from Ministry of Environment, Forest and Climate Change (MoEF&CC) for a rated capacity of 2.851 Mtpa (normative) and 3.706 Mtpa peak capacity of coal production vide letter no. J-11015/212/2010-IA.II (M) dated 06th February, 2013.

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

CHAPTER – II

WATER QUALITY MONITORING

3.1 Location of sampling sites

(Refer **Plate No. - I**)

i) Drinking water quality at **Mine Discharge of AKWMC**

ii) Drinking water quality at **Mine Discharge of Salanpur**

iii) Drinking water quality at **Mine Discharge of AARC**

iv) Drinking water quality at **Mine Discharge of Katras Chotudih**

v) Drinking water quality at **Mine Discharge of Gaslitand**

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 drinking and Surface water samples were collected and analyzed for 25 and 17 parameters respectively, on quarterly basis. Thereafter the samples were preserved and analyzed at the Environmental Laboratory at CMPDI (HQ), Ranchi.

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.

WATER QUALITY

(MINE EFFLUENT- 25 PARAMETERS)

Name of the Company: **Bharat Coking Coal Limited** Year : **2018-19.**

Name of the Cluster : **Cluster -IV** PERIOD: **Q. E. MARCH- 2019.**

Type of Sample: Mine Discharge Water Sample Name of Mine AKWMC

Testing Protocol: As per DW Standards (IS- 10500) Date of Sampling: 16.03.19

Sl. No	Parameter	Test Result	Detection Limit	Permissible Limit	Method of Testing
1	Boron (as B), mg/l, Max	<0.02	0.02	0.5	APHA, 22nd Edition ,Carmine
2	Colour,in Hazen Units	1	1	5	APHA, 22nd Edition ,Pt.-Co. Method
3	Calcium (as Ca), mg/l, Max	32	1.60	75	IS-3025/40:1991, EDTA
4	Chloride (as Cl), mg/l, Max	42	2.00	250	IS-3025/32:1988, R-2007, Argentometric
5	Copper (as Cu), mg/l, Max	<0.03	0.001	0.05	IS 3025/42 : 1992 R : 2009, AAS-Flame
6	Fluoride (as F) mg/l, Max	0.44	0.02	1.0	APHA, 22nd Edition , SPADNS
7	Free Residual Chlorine, mg/l, Min	<0.02	0.02	0.2	APHA, 22nd Edition, DPD
8	Iron (as Fe), mg/l, Max	0.11	0.06	0.3	IS 3025 /53 : 2003, R : 2009 , AAS-Flame
9	Lead (as Pb), mg/l, Max	<0.005	0.005	0.01	APHA, 22nd Edition, AAS-GTA
10	Manganese (as Mn), mg/l, Max	<0.02	0.02	0.1	IS-3025/59:2006, AAS-Flame
11	Nitrate (as NO_3), mg/l, Max	13.39	0.5	45	APHA, 22nd Edition, UV-Spectrphotometric
12	Odour	Agreeable	Qualitative	Agreeable	IS 3025 /05:1983, R-2012, Qualitative
13	pH value	7.34	2.5	6.5 to 8.5	IS-3025/11:1983, R-1996, Electrometric
14	Phenolic compounds (as C_6H_5OH), mg/l, Max	<0.001	0.001	0.001	APHA, 22nd Edition,4-Amino Autipyrine
15	Selenium (as Se), mg/l, Max	<0.002	0.002	0.01	IS 3025/56:2003, AAS-VGA
16	Sulphate (as SO_4) mg/l, Max	92	2.00	200	APHA, 22nd Edition. Turbidity
17	Taste	Acceptable	Qualitative	Acceptable	APHA, 22nd Edition. Taste
18	Total Alkalinity (c_aco_3),, mg/l, Max	110	4.00	200	IS-3025/23:1986, Titration
19	Total Arsenic (as As), mg/l, Max	<0.002	0.002	0.01	IS 3025/ 37:1988 R : 2003, AAS-VGA
20	Total Chromium (as Cr), mg/l, Max	<0.04	0.04	0.05	IS-3025/52:2003, AAS-Flame
21	Total Dissolved Solids, mg/l, Max	658	25.00	500	IS 3025 /16:1984 R : 2006, Gravimetric
22	Total Hardness (c_aco_3), mg/l, Max	380	4.00	200	IS-3025/21:1983, R-2002, EDTA
23	Turbidity, NTU, Max	1	1.0	1	IS-3025/10:1984 R-1996, Nephelometric
24	Zinc (as Zn), mg/l, Max	0.01	0.01	5.0	IS 3025/ 49 : 1994, R : 2009, AAS-Flame
25	Nickel as Ni, mg/l Max	<0.005	0.005	0.02	IS 3025/ 49 : 1994, R : 2009, AAS-Flame

All values are expressed in mg/lit unless specified.

Analysed By
JSA/SA/SSA

Checked By
Lab In Charge
RI-2, CMPDI, Dhanbad

Approved By
HOD(Mining/Environment)
RI-2, CMPDI, Dhanbad

WATER QUALITY

(MINE EFFLUENT- 25 PARAMETERS)

Name of the Company: **Bharat Coking Coal Limited** Year : **2018-19.**

Name of the Cluster : **Cluster -IV** PERIOD: **Q. E. MARCH- 2019.**

Type of Sample:	Mine Discharge Water Sample	Name of Mine	SALANPUR
Testing Protocol:	As per DW Standards (IS- 10500)	Date of Sampling:	15.03.19

Sl. No	Parameter	Test Result	Detection Limit	Permissible Limit	Method of Testing
1	Boron (as B), mg/l, Max	<0.02	0.02	0.5	APHA, 22nd Edition ,Carmine
2	Colour,in Hazen Units	1	1	5	APHA, 22nd Edition ,Pt.-Co. Method
3	Calcium (as Ca), mg/l, Max	38	1.60	75	IS-3025/40:1991, EDTA
4	Chloride (as Cl), mg/l, Max	40	2.00	250	IS-3025/32:1988, R-2007, Argentometric
5	Copper (as Cu), mg/l, Max	0.03	0.001	0.05	IS 3025/42 : 1992 R : 2009, AAS-Flame
6	Fluoride (as F) mg/l, Max	0.50	0.02	1.0	APHA, 22nd Edition , SPADNS
7	Free Residual Chlorine, mg/l, Min	<0.02	0.02	0.2	APHA, 22nd Edition, DPD
8	Iron (as Fe), mg/l, Max	0.07	0.06	0.3	IS 3025 /53 : 2003, R : 2009 , AAS-Flame
9	Lead (as Pb), mg/l, Max	<0.005	0.005	0.01	APHA, 22nd Edition, AAS-GTA
10	Manganese (as Mn), mg/l, Max	<0.02	0.02	0.1	IS-3025/59:2006, AAS-Flame
11	Nitrate (as NO_3), mg/l, Max	18.05	0.5	45	APHA, 22nd Edition, UV-Spectrphotometric
12	Odour	Agreeable	Qualitative	Agreeable	IS 3025 /05:1983, R-2012, Qualitative
13	pH value	7.62	2.5	6.5 to 8.5	IS-3025/11:1983, R-1996, Electrometric
14	Phenolic compounds (as C_6H_5OH), mg/l, Max	<0.001	0.001	0.001	APHA, 22nd Edition,4-Amino Autipyrine
15	Selenium (as Se), mg/l, Max	<0.002	0.002	0.01	IS 3025/56:2003, AAS-VGA
16	Sulphate (as SO_4) mg/l, Max	114	2.00	200	APHA, 22nd Edition. Turbidity
17	Taste	Acceptable	Qualitative	Acceptable	APHA, 22nd Edition. Taste
18	Total Alkalinity (c_ac_{03}),, mg/l, Max	84	4.00	200	IS-3025/23:1986, Titration
19	Total Arsenic (as As), mg/l, Max	<0.002	0.002	0.01	IS 3025/ 37:1988 R : 2003, AAS-VGA
20	Total Chromium (as Cr), mg/l, Max	<0.04	0.04	0.05	IS-3025/52:2003, AAS-Flame
21	Total Dissolved Solids, mg/l, Max	734	25.00	500	IS 3025 /16:1984 R : 2006, Gravimetric
22	Total Hardness (c_ac_{03}), mg/l, Max	468	4.00	200	IS-3025/21:1983, R-2002, EDTA
23	Turbidity, NTU, Max	2	1.0	1	IS-3025/10:1984 R-1996, Nephelometric
24	Zinc (as Zn), mg/l, Max	<0.01	0.01	5.0	IS 3025/ 49 : 1994, R : 2009, AAS-Flame
25	Nickel as Ni, mg/l Max	<0.005	0.005	0.02	IS 3025/ 49 : 1994, R : 2009, AAS-Flame

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Analysed By
JSA/SA/SSA

Checked By
Lab In Charge
RI-2, CMPDI, Dhanbad

Approved By
HOD(Mining/Environment)
RI-2, CMPDI, Dhanbad

WATER QUALITY

(MINE EFFLUENT- 25 PARAMETERS)

Name of the Company: **Bharat Coking Coal Limited** Year : **2018-19.**

Name of the Cluster : **Cluster -IV** PERIOD: **Q. E. MARCH- 2019.**

Type of Sample: Mine Discharge Water Sample Name of Mine **AARC**

Testing Protocol: As per DW Standards (IS- 10500) Date of Sampling: 30.03.19

Sl. No	Parameter	Test Result	Detection Limit	Permissible Limit	Method of Testing
1	Boron (as B), mg/l, Max	<0.02	0.02	0.5	APHA, 22nd Edition ,Carmine
2	Colour,in Hazen Units	2	1	5	APHA, 22nd Edition ,Pt.-Co. Method
3	Calcium (as Ca), mg/l, Max	50	1.60	75	IS-3025/40:1991, EDTA
4	Chloride (as Cl), mg/l, Max	64	2.00	250	IS-3025/32:1988, R-2007, Argentometric
5	Copper (as Cu), mg/l, Max	<0.03	0.001	0.05	IS 3025/42 : 1992 R : 2009, AAS-Flame
6	Fluoride (as F) mg/l, Max	0.58	0.02	1.0	APHA, 22nd Edition , SPADNS
7	Free Residual Chlorine, mg/l, Min	<0.02	0.02	0.2	APHA, 22nd Edition, DPD
8	Iron (as Fe), mg/l, Max	0.09	0.06	0.3	IS 3025 /53 : 2003, R : 2009 , AAS-Flame
9	Lead (as Pb), mg/l, Max	<0.005	0.005	0.01	APHA, 22nd Edition, AAS-GTA
10	Manganese (as Mn), mg/l, Max	<0.02	0.02	0.1	IS-3025/59:2006, AAS-Flame
11	Nitrate (as NO_3), mg/l, Max	15.50	0.5	45	APHA, 22nd Edition, UV-Spectrphotometric
12	Odour	Agreeable	Qualitative	Agreeable	IS 3025 /05:1983, R-2012, Qualitative
13	pH value	7.43	2.5	6.5 to 8.5	IS-3025/11:1983, R-1996, Electrometric
14	Phenolic compounds (as C_6H_5OH), mg/l, Max	<0.001	0.001	0.001	APHA, 22nd Edition,4-Amino Autipyrine
15	Selenium (as Se), mg/l, Max	<0.002	0.002	0.01	IS 3025/56:2003, AAS-VGA
16	Sulphate (as SO_4) mg/l, Max	74	2.00	200	APHA, 22nd Edition. Turbidity
17	Taste	Acceptable	Qualitative	Acceptable	APHA, 22nd Edition. Taste
18	Total Alkalinity (c_aco_3),, mg/l, Max	116	4.00	200	IS-3025/23:1986, Titration
19	Total Arsenic (as As), mg/l, Max	<0.002	0.002	0.01	IS 3025/ 37:1988 R : 2003, AAS-VGA
20	Total Chromium (as Cr), mg/l, Max	<0.04	0.04	0.05	IS-3025/52:2003, AAS-Flame
21	Total Dissolved Solids, mg/l, Max	640	25.00	500	IS 3025 /16:1984 R : 2006, Gravimetric
22	Total Hardness (c_aco_3), mg/l, Max	434	4.00	200	IS-3025/21:1983, R-2002, EDTA
23	Turbidity, NTU, Max	1	1.0	1	IS-3025/10:1984 R-1996, Nephelometric
24	Zinc (as Zn), mg/l, Max	0.03	0.01	5.0	IS 3025/ 49 : 1994, R : 2009, AAS-Flame
25	Nickel as Ni, mg/l Max	<0.005	0.005	0.02	IS 3025/ 49 : 1994, R : 2009, AAS-Flame

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RI-2, CMPDI, Dhanbad

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HOD(Mining/Environment)
RI-2, CMPDI, Dhanbad

WATER QUALITY

(MINE EFFLUENT- 25 PARAMETERS)

Name of the Company: **Bharat Coking Coal Limited** Year : **2018-19.**

Name of the Cluster : **Cluster -IV** PERIOD: **Q. E. MARCH- 2019.**

Type of Sample: Mine Discharge Water Sample Name of Mine Katras Chotudih

Testing Protocol: As per DW Standards (IS- 10500) Date of Sampling: 25.03.19

Sl. No	Parameter	Test Result	Detection Limit	Permissible Limit	Method of Testing
1	Boron (as B), mg/l, Max	<0.02	0.02	0.5	APHA, 22nd Edition ,Carmine
2	Colour,in Hazen Units	1	1	5	APHA, 22nd Edition ,Pt.-Co. Method
3	Calcium (as Ca), mg/l, Max	38	1.60	75	IS-3025/40:1991, EDTA
4	Chloride (as Cl), mg/l, Max	56	2.00	250	IS-3025/32:1988, R-2007, Argentometric
5	Copper (as Cu), mg/l, Max	<0.03	0.001	0.05	IS 3025/42 : 1992 R : 2009, AAS-Flame
6	Fluoride (as F) mg/l, Max	0.52	0.02	1.0	APHA, 22nd Edition , SPADNS
7	Free Residual Chlorine, mg/l, Min	<0.02	0.02	0.2	APHA, 22nd Edition, DPD
8	Iron (as Fe), mg/l, Max	0.23	0.06	0.3	IS 3025 /53 : 2003, R : 2009 , AAS-Flame
9	Lead (as Pb), mg/l, Max	<0.005	0.005	0.01	APHA, 22nd Edition, AAS-GTA
10	Manganese (as Mn), mg/l, Max	<0.02	0.02	0.1	IS-3025/59:2006, AAS-Flame
11	Nitrate (as NO_3), mg/l, Max	13.81	0.5	45	APHA, 22nd Edition, UV-Spectrphotometric
12	Odour	Agreeable	Qualitative	Agreeable	IS 3025 /05:1983, R-2012, Qualitative
13	pH value	7.99	2.5	6.5 to 8.5	IS-3025/11:1983, R-1996, Electrometric
14	Phenolic compounds (as C_6H_5OH), mg/l, Max	<0.001	0.001	0.001	APHA, 22nd Edition,4-Amino Autipyrine
15	Selenium (as Se), mg/l, Max	<0.002	0.002	0.01	IS 3025/56:2003, AAS-VGA
16	Sulphate (as SO_4) mg/l, Max	108	2.00	200	APHA, 22nd Edition. Turbidity
17	Taste	Acceptable	Qualitative	Acceptable	APHA, 22nd Edition. Taste
18	Total Alkalinity (c_aco_3),, mg/l, Max	102	4.00	200	IS-3025/23:1986, Titration
19	Total Arsenic (as As), mg/l, Max	<0.002	0.002	0.01	IS 3025/ 37:1988 R : 2003, AAS-VGA
20	Total Chromium (as Cr), mg/l, Max	<0.04	0.04	0.05	IS-3025/52:2003, AAS-Flame
21	Total Dissolved Solids, mg/l, Max	544	25.00	500	IS 3025 /16:1984 R : 2006, Gravimetric
22	Total Hardness (c_aco_3), mg/l, Max	382	4.00	200	IS-3025/21:1983, R-2002, EDTA
23	Turbidity, NTU, Max	1	1.0	1	IS-3025/10:1984 R-1996, Nephelometric
24	Zinc (as Zn), mg/l, Max	0.02	0.01	5.0	IS 3025/ 49 : 1994, R : 2009, AAS-Flame
25	Nickel as Ni, mg/l Max	<0.005	0.005	0.02	IS 3025/ 49 : 1994, R : 2009, AAS-Flame

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JSA/SA/SSA

Checked By
Lab In Charge
RI-2, CMPDI, Dhanbad

Approved By
HOD(Mining/Environment)
RI-2, CMPDI, Dhanbad

WATER QUALITY

(MINE EFFLUENT- 25 PARAMETERS)

Name of the Company: **Bharat Coking Coal Limited** Year : **2018-19.**

Name of the Cluster : **Cluster -IV** PERIOD: **Q. E. MARCH- 2019.**

Type of Sample: Mine Discharge Water Sample Name of Mine GASLITAND

Testing Protocol: As per DW Standards (IS- 10500) Date of Sampling: 05.03.19

Sl. No	Parameter	Test Result	Detection Limit	Permissible Limit	Method of Testing
1	Boron (as B), mg/l, Max	<0.02	0.02	0.5	APHA, 22nd Edition ,Carmine
2	Colour,in Hazen Units	3	1	5	APHA, 22nd Edition ,Pt.-Co. Method
3	Calcium (as Ca), mg/l, Max	44	1.60	75	IS-3025/40:1991, EDTA
4	Chloride (as Cl), mg/l, Max	42	2.00	250	IS-3025/32:1988, R-2007, Argentometric
5	Copper (as Cu), mg/l, Max	<0.03	0.001	0.05	IS 3025/42 : 1992 R : 2009, AAS-Flame
6	Fluoride (as F) mg/l, Max	0.71	0.02	1.0	APHA, 22nd Edition , SPADNS
7	Free Residual Chlorine, mg/l, Min	<0.02	0.02	0.2	APHA, 22nd Edition, DPD
8	Iron (as Fe), mg/l, Max	0.06	0.06	0.3	IS 3025 /53 : 2003, R : 2009 , AAS-Flame
9	Lead (as Pb), mg/l, Max	<0.005	0.005	0.01	APHA, 22nd Edition, AAS-GTA
10	Manganese (as Mn), mg/l, Max	<0.02	0.02	0.1	IS-3025/59:2006, AAS-Flame
11	Nitrate (as NO_3), mg/l, Max	14.52	0.5	45	APHA, 22nd Edition, UV-Spectrphotometric
12	Odour	Agreeable	Qualitative	Agreeable	IS 3025 /05:1983, R-2012, Qualitative
13	pH value	7.27	2.5	6.5 to 8.5	IS-3025/11:1983, R-1996, Electrometric
14	Phenolic compounds (as C_6H_5OH), mg/l, Max	<0.001	0.001	0.001	APHA, 22nd Edition,4-Amino Autipyrine
15	Selenium (as Se), mg/l, Max	<0.002	0.002	0.01	IS 3025/56:2003, AAS-VGA
16	Sulphate (as SO_4) mg/l, Max	100	2.00	200	APHA, 22nd Edition. Turbidity
17	Taste	Acceptable	Qualitative	Acceptable	APHA, 22nd Edition. Taste
18	Total Alkalinity (c_aco_3),, mg/l, Max	96	4.00	200	IS-3025/23:1986, Titration
19	Total Arsenic (as As), mg/l, Max	<0.002	0.002	0.01	IS 3025/ 37:1988 R : 2003, AAS-VGA
20	Total Chromium (as Cr), mg/l, Max	<0.04	0.04	0.05	IS-3025/52:2003, AAS-Flame
21	Total Dissolved Solids, mg/l, Max	974	25.00	500	IS 3025 /16:1984 R : 2006, Gravimetric
22	Total Hardness (c_aco_3), mg/l, Max	640	4.00	200	IS-3025/21:1983, R-2002, EDTA
23	Turbidity, NTU, Max	2	1.0	1	IS-3025/10:1984 R-1996, Nephelometric
24	Zinc (as Zn), mg/l, Max	<0.01	0.01	5.0	IS 3025/ 49 : 1994, R : 2009, AAS-Flame
25	Nickel as Ni, mg/l Max	<0.005	0.005	0.02	IS 3025/ 49 : 1994, R : 2009, AAS-Flame

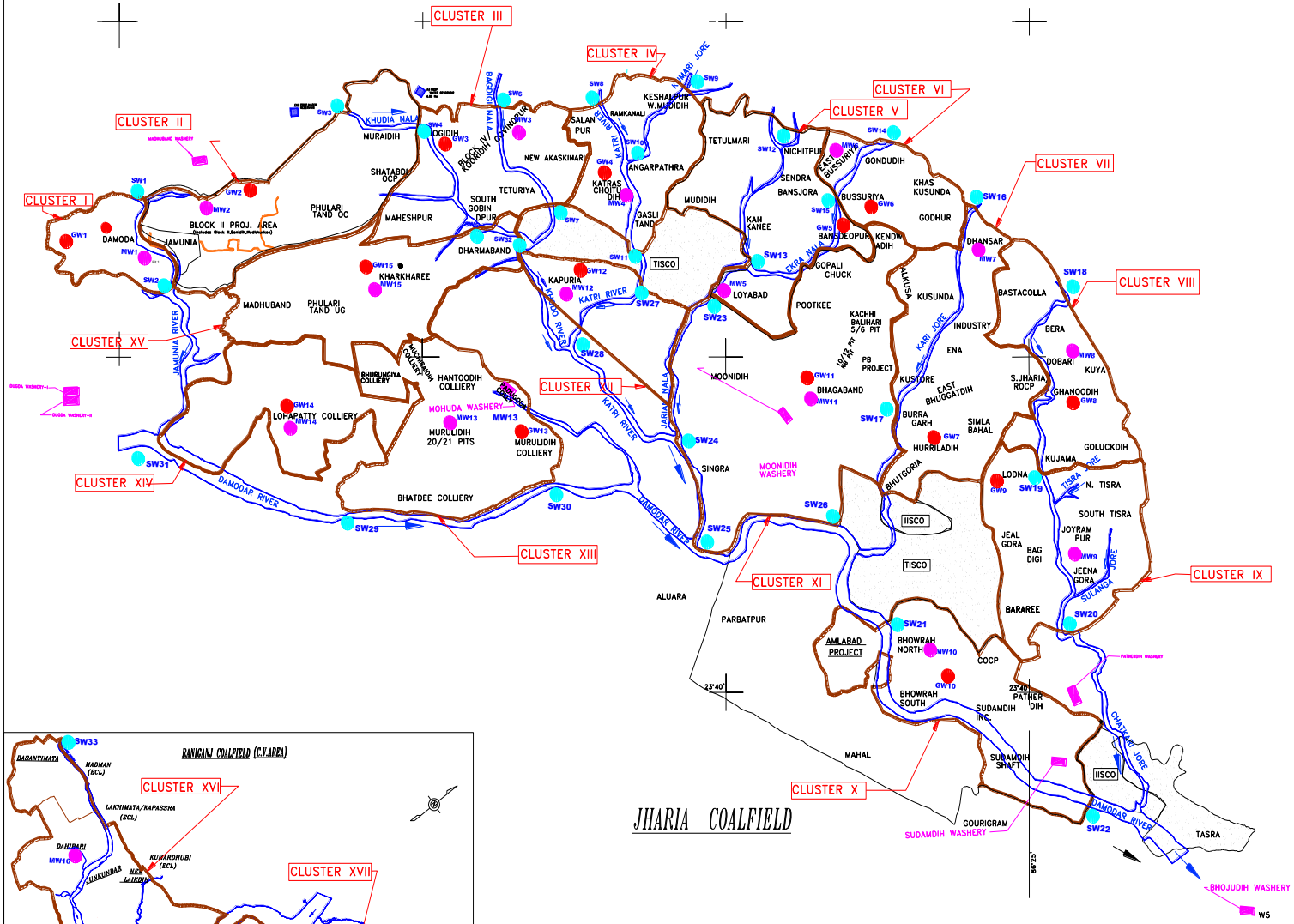
All values are expressed in mg/lit unless specified.

Analysed By
JSA/SA/SSA

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HOD(Mining/Environment)
RI-2, CMPDI, Dhanbad

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

Bharat Coking Coal Ltd.
(A Subsidiary of Coal India Limited)
Office of the General Manager, Katras Area
P.O. Sijua, P.S.- Jogta, Dhanbad-828121
CIN: U1010JH1972GOI000918
Phone/Fax No.: 0326-2371213
Email ID: cgmkatras@bccl.gov.in

Ref. No.-BCCL/ IV/2019/ 484

Dated- 19/06/2019

To
The Director,
Ministry of environment, forest and climate charge
Regional office (ECZ)
Bungalow office no.42, Shyamali colony
Ranchi-834002

Sub:-six monthly compliance report on implementation of environmental measures for the period from Oct 2018 to March 2019

Dear Sir

Kindly find enclosed herewith the six monthly compliance report on implementation of environmental measures for the period from Oct 2018 to March 2019 in respect of cluster IV group of mines under Katras Area, BCCL.

Hope you will find in order.

Enclosed:-As Above.

Yours Faithfully

19/06/19

Area Manager(ENV)
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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भारत कोकिंग कोल लिमिटेड

'एक मिनीरत्न कम्पनी'

(कोल इण्डिया लिमिटेड का एक अंग)

सभी संबन्धित व्यक्तियों को यह सूचित किया जाता है की 'क्लस्टर चार' जो बीसीसीएल के 5 मिश्रित खदानों का समूह है, को पर्यावरण वन एवं जलवायु परिवर्तन मंत्रालय (Ministry of Environment Forest & Climate Change) द्वारा पर्यावरणीय स्वीकृति (Environment Clearance) प्राप्त हुई है। विवरण निम्न है :।

समूह (Cluster) का नाम	स्वीकृत आदेश संख्या एवं तिथि
क्लस्टर चार– (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, गजलीटांड़ कोलियरी) जिसका कुल क्षेत्र 1123.79 हैक्टेयर है और बढ़ी हुई सामान्य क्षमता 7.34 एमटीपीए है और अधिकतम क्षमता 9.55 एमटीपीए है।	ज–11015/372/2013 – आईए–II (एम) दिनाक 16th जुलाई 2018

पर्यावरण स्वीकृती की प्रतिलिपि झारखंड राज्य प्रदूषण नियंत्रण विभाग के पास उपलब्ध है एवं पर्यावरण वन एवं जलवायु परिवर्तन मंत्रालय की वैबसाइट www.environmentclearance.nic.in एवं कपनी की वैबसाइट www.bcclweb.in पर भी उपलब्ध है।

26.07.2018.

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

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PR-188890 (Health Med Edu and Family Welfare) 2018-19