BHARAT COKING COAL LIMITED
(A Mini Ratna Company)
(A Subsidiary of Coal India Limited – A Maharatna Company)
Regd.Off: Koyla Bhawan, Koyla Nagar, Dhanbad-826005
CIN: U10101JH1972GOI000918
OFFICE OF THE GENERAL MANAGER
SIJUA AREA

Ref.No.-GM/SA/SPA/F-43/2019/54 Date- 31/05/19

To,
The Director(s)
Ministry of Environment, Forest & Climate Change
Govt. of India
Eastern-Central Regional Office (ECZ)
Bunglaw No. A-2, Shyamali Colony
Ranchi-834002

Subject- Half yearly compliance report of Environmental Clearance Conditions for the period from 1st Oct., 2018 to 31st Mar., 2019 in respect of cluster V group of mines of Bharat Coking Coal Limited, Dhanbad

EC Order No. - J-11015/01/2011-IA.II (M) Dated 11.02.2013

Dear Sir,

Please find enclosed herewith the half yearly compliance report of Environmental Clearance Conditions for the period from 1st Oct., 2018 to 31st Mar., 2019 in respect of cluster V group of mines i.e. Sijua Area of Bharat Coking Coal Limited, Dhanbad in soft copy.

Hope you will find the same in order.

31/5

General Manager
Sijua Area

Cc:
1. Director, 1 A Monitoring Cell, Paryavaran Bhawan, CGO Complex, New Delhi-110003
2. Scientist & Incharge, Zonal Office, Central Pollution Control Board, 5th Floor 502, Hous & Conclave, 1582, Rajdanga Main Road, Kolkata-700107
3. Member Secretary, Jharkhand State Pollution Control Board, TA Division Building, H.E.C.,Dhurwa, Ranchi-834004
4. Dy. General Manager (Env.), Koyla Bhawan
5. Addl. General Manager, Sijua Area
6. All Project Officers- Nichitpur, Tetulmari, Kanakanee, Mudidih, Sendra Bansjora, Bansdeopur
7. Asst. Manager (Env.), Sijua Area
8. File

HALF YEARLY COMPLIANCE REPORT

OF

CLUSTER V

BHARAT COKING COAL LIMITED

FOR

THE ENVIRONMENTAL CLEARANCE

GRANTED VIDE EC Order No. J-11015/01/2011-IA.II (M) Dated 11.02.2013

Period: Oct., 2018 - Mar., 2019

S. No.	Specific Condition	
1	*The maximum production shall not exceed beyond that for which the environmental clearance has been granted for the mine of cluster V.*	*The production of coal from cluster V has been within the limit over the years.* ***Annexure 1- Coal Production data of Cluster V from 2013-14 to 2018-19 (Till 31.03.2019)***
2	*The road transportation of coal during phase–I should be by mechanically covered trucks. The road used for coal transportation should be developed with avenue plantation on both sides.*	*Presently, road transportation is being done by covering vehicle with tarpaulin. It has been included in the Transportation agreement with the transporting agency.* *Gabion plantation has been done alongside road on both sides from Shakti Chowk to Mohlidih. Avenue Plantation is also present at Tetulmari Colliery.* ***Plate 1- Avenue Plantation in Cluster V***
3	*The company must give priority to capacity building both within the company and to the local youth, who are motivated to carry out the work in future.*	*Training and awareness regarding ecological restoration and sustainable development activities* ***(Computer Skills, Stitching Skills, Handloom, Jharcraft, etc.)*** *are being imparted within the company and in the nearby population.* *Within Company, Training programs are being conducted at Group Vocational Training Centre, Sendra and HRD, BCCL regularly.* ***Plate 2- Capacity Building activities in Cluster V***
4	*The details of Transportation, CSR, R&R, and Implementation of environmental action plan for each of the 17 clusters should be brought out in a booklet form.*	*Complied.* ***Annexure 2- Transportation Booklet*** ***Annexure 3- CSR Booklet*** ***Annexure 4- R&R Booklet*** Environmental Management Plan has also been prepared for Cluster V and is under implementation.
5	*A study should be initiated to analyze extent of reduction in pollution load every year by reducing road transport.*	The study to analyze extent of reduction in pollution load every year by reducing road transport is being conducted by CMPDIL. **Annexure 5- Report of study on reduction in pollution load by reducing road transport for cluster V**
6	*The expertise available internationally should be utilized for control of fire in Jharia Coalfields and for their reclamation and to further minimize time for*	*A Global EOI was floated for award of work to international experts for control of fire. However, no eligible*

	fire and subsidence control.	*bidder qualified.* *Presently Jharia Master Plan approved by Govt. of India is under implementation for this purpose.*
7	*The abandoned pits and voids should be backfilled with OB and reclaimed with plantation and or may be used for pisciculture.*	*The abandoned pits and voids are being backfilled with OB.* *Some of the abandoned pits are used by the surrounding community as water reservoir and for aquaculture.* **Annexure 6- *Data regarding backfilling and reclamation for Cluster V*** ***Plate 3 –Abandoned voids as reservoir being utilized by the local community for aquaculture***
8	*BCCL may consider setting up a separate management structure for implementing environment policy and socio-economic issues and the capacity building required in this regard.*	*BCCL has established a separate management structure for implementing environment policy and socio-economic issues and the capacity building from the headquarters up to the area and project level. The management structure is being further strengthened.* **Annexure 7- *Environmental Management Structure at BCCL & the list of the personnel involved in environmental management in cluster V***
9	*The locations of monitoring stations in the Jharia Coalfields should be finalized in consultation with the Jharkhand State Pollution Control Board.*	*The locations of monitoring stations in cluster V have been finalized in consultation with the Jharkhand State Pollution Control Board.* ***Annexure 8- Plan and Letter ratified by the Regional Officer, Jharkhand State Pollution Control Board***
10	*The smoke/dust emissions vary from source to source (fuel wood, coal, fly ash from TPPs, silica from natural dust, etc) and a Source Apportionment Study should be carried out for the entire Jharia Coalfield.*	*As per the MoU "Sustainable Coal Mining in Coal India Limited" entered between CIL and NEERI, NEERI Nagpur was approached for conducting Source Apportionment Study. Work order has been awarded. Field data collection is scheduled in Summer 2019.* **Annexure 9- Work Order awarded to NEERI, Nagpur for source apportionment Study**

11	*Mineralogical composition study should be undertaken on the composition of the suspended particulate matter (PM10 and PM 2.5) in Jharia Coalfields and also quantified. These studies would help ascertain source and extent of the air pollution, based on which appropriate mitigative measures could be taken.*	*Mineralogical Composition Study would be carried out as a part of Source Apportionment Study.*
12	*The proponent shall prepare time -series maps of the Jharia Coalfields through NRSA to monitor and prevent fire problems in the Jharia Coalfields by Isothermal mapping /imaging and Monitoring temperatures of the coal seams (whether they are close to spontaneous ignition temperatures) and based on which, areas with potential fire problems shall be identified.*	*Work has been awarded to NRSA. NRSC has carried out the work of iso thermal mapping in 2014 and in 2018. The map showing fire extent and the Results of fire extent is shown in Annexure-10* ***Annexure 10- The map showing fire extent and the Results of fire extent***
13	*Measures to prevent ingress of air (Ventilation) in such areas, to prevent restart fresh/spread fires in other areas including in mines of cluster V shall be undertaken.*	*Action is being taken as specified in EC and as per Jharia Master Plan. Further, fire patches are under operation to dig out the fiery coal to save the coal from burning and to stop further spread of fire.*
14	*Permanent /regular ambient air monitoring is required for CO, CO2, Methane and its homologues. Monitoring station, mobile monitoring, should be established at suitable location as the temp in the mine is high, in the presence of CH4, the coal may catch fire. Presence of Aromatic compounds should be investigated as most of the aromatic compounds are carcinogenic.*	*The samples of CO, CO2, CH4 and its homologues are collected and tested by the Mines Rescue Station/IIT(ISM) regularly.* ***The copy of recent report is attached herewith as Annexure-11***
15	*Local institution/university should be contacted for such type of study. Exact measurement for the presence of above gases and their potential danger/harmful effect on human should be assessed. ISM Dhanbad and any local university could be contacted for monitoring.*	*Local institutions such as IIT (ISM) are engaged for such type of studies.* ***Annexure 11- Report of the analysis done by IIT(ISM), Dhanbad***
16	*The road transportation should be of bigger/high capacity trucks. The road should be strengthened to carry the load of high capacity trucks. Railway siding with silo loading will be completed by December, 2015 as informed by the proponents.*	*The road transportation is being done by high capacity trucks. The road is strengthened* to carry the load of high capacity trucks. *The process of installing Silo loading system is in process.* ***Annexure 12- Copy of the work Order of Installation of Silo Loading***
17	*Master Plan for dealing with fire for next 12 year which is under implementation, Details of same from August 2011 till date year-wise should be provided. An Action Plan which is in progress should be submitted to the Ministry.*	*Govt. of India approved Master Plan and status of action taken is uploaded on the official website of BCCL - www.bcclweb.in.*
18	*Underground mining should be taken up after completion of reclamation of Opencast mine area after 15 years.*	*It shall be complied.*

19	*No mining shall be undertaken where underground fires continue. Measure shall be taken to prevent/ check such fire including in old OB dump areas where the fire could start due to presence of coal /shale with sufficient carbon content.*	*Action is being taken to control mine fires including in old OB dump areas as specified in Jharia Master Plan and the mining is being done as per the guidelines and permissions of Directorate General of Mines Safety (DGMS).* *Fire patches are un*der operation to dig out the fier*y coal to save the coal from burning and to stop further spread of the fire.*
20	*The rejects of washeries in Cluster –V should be sent to FBC based plant.*	*Coal washery does not exist in cluster V at present.*
21	*There shall be no external OB dumps. At the end of the mining there shall be no void and the entire mined out area shall be re-vegetated. Areas where opencast mining was carried out and completed shall be reclaimed immediately thereafter.*	*At the end of the mining, there shall be no void and no external OB Dump and the area will be reclaimed and re-vegetated with the proper eco-restoration techniques suggested by the experts available in BCCL and in external agencies i.e. FRI, Dehradun, CEMDE Delhi, etc.* *Contemporaneous backfilling and reclamation of opencast mined out areas are being progressively done.* **Annexure 13- Data regarding backfilling and reclamation for Cluster V**
22	*There shall be no water body left at the end of mining.*	*It shall be complied.*
23	*A detailed calendar plan of production with plan for OB dumping and backfilling (for OC mines) and reclamation and final mine closure plan for each mine of cluster-V shall be drawn up and implemented.*	*Mining plans consisting of* detailed calendar plan of production with plan for OB dumping and backfilling (for OC mines) and reclamation *for two collieries, Sendra Bansjora and Kankanee, have been prepared and approved by BCCL Board. For the rest of the mines, mining plans are under draft by CMPDIL and will be soon prepared and approved. However, Feasibility reports of all the mines have been prepared.* Progressive Mine closure plans as per the guidelines of Ministry of Coal have been prepared by Central Mine Planning and Design Institute (CMPDI) for six collieries and it is being implemented. For the non-producing Bansdeopur colliery which is being planned for

		reopening, Progressive Mine Closure plan will be drafted soon. **Annexure 13- Data regarding backfilling and reclamation for Cluster V**
24	*The void shall be converted into a water reservoir of a maximum depth of 15-20 m and shall be gently sloped and the upper benches of the reservoir shall be stabilized with plantation and the periphery of the reservoir fenced. The abandoned pits and voids should be backfilled with OB and biologically reclaimed with plantation and or may be used for pisciculture.*	*It will be done at the time of final closure of mining activities.* *Mines in the cluster V are at present active and concurrent backfilling and reclamation is being done.* *The abandoned pits and voids are being backfilled with OB.* *Some of the abandoned pits are used as water reservoir by the surrounding community.*
25	*Mining shall be carried out as per statuette from the streams/nalas flowing within the lease and maintaining a safe distance from the Nalas flowing along the lease boundary. A safety barrier of a minimum 60m width shall be maintained along the nalas/water bodies. The small water bodies in OC shall be protected to the extent feasible and the embankment proposed along water body shall be strengthened with stone pitching.*	*Streams/Nalas, which are seasonal, flowing within the lease, are being protected to the extent feasible through check dams, stone-pitching, embankments, regular cleaning/de-siltation and proper gradient maintenance to keep the natural flow in the monsoon.* *OB dumps are being stabilized biologically so that the erosion of the loose materials can be minimized and the transportation of eroded material in the streams/nalas can be avoided. Three OB dumps of total 32.0 Ha are taken up for biological reclamation through Forest Deptt. Jharkhand.* ***Plate 4- Garland Drain*** ***Plate 5-Stone-pitching*** ***Plate 6-OB dump being biologically stabilized***
26	*Active OB dumps near water bodies and rivers should be re-handled for backfilling abandoned mine voids. However, those which have been biologically reclaimed need not be disturbed.*	*Active OB dumps near nala will be re-handled for backfilling in the mine voids.* *Two OB dumps of 8 ha and 2.3 Ha areas at Tetulmari and One OB dump of 2.8 Ha areas at Nichitpur have been biologically stabilized and will not be disturbed.*
27	*Thick green belt shall be developed along undisturbed areas, mine boundary and in mine reclamation. During post mining stage, a total of 1957.08 ha area would be reclaimed. The total additional area under plantation would be 939.17 ha (green belt of 76 ha, Ext. OB dump 73.07 ha, backfilled area 300.35 ha, other undisturbed area 489.77 ha) by planting 1878380 plants in 939.19 ha*	*Plantation is being carried out in available spaces for creation of thick green belt.* **Annexure 14- Satellite based survey report of Land reclamation and restoration of the year 2017**

	at a total cost Rs 7202.46 lakhs.	***Plate 7- Plantation at Undisturbed area at Loyabad*** ***Plate 8- Plantation on external OB dump at Tetulmari*** ***Plate 9-Plantation near mine working boundary at Sendra Bansjora and Nichitpur*** ***Plate 10- Gabion Plantation in Tetulmari***
28	*The road should be provided with avenue plantation on both sides as trees act as sink of carbon and other pollutant.*	*Gabion plantation has been done alongside road on both sides from Shakti Chowk to Mohlidih.* *Avenue Plantation is also present at Tetulmari Colliery.* ***Annexure 15- Inspection Report of Gabion Plantation from Shakti Chowk to Mohlidih***
29	*Specific mitigative measures identified for the Jharia Coalfields in the Environmental Action Plan prepared for Dhanbad as a critically polluted area and relevant for Cluster V shall be implemented.*	*Cluster V is implementing the guidelines of Dhanbad Action Plan.* *A. Stockyard places and haul roads are dynamic and non-permanent in nature. They are prone to shifting. However, proper dozering and grading is done to maintain these roads to minimize the dust emission from the roads.* *B. Fixed water sprinklers have been provided at the coal handling plant. In haul roads and other dust prone areas, mobile water sprinkler is used for suppression of dust particles.* ***Plate 11- Water Sprinkling on mine roads***
30	*The locations of monitoring stations in the Jharia Coalfields should be finalized in consultation with the Jharkhand State Pollution Control Board. The Committee stated that smoke/dust emission vary from source to source (fuel wood, coal, fly ash from TPPs, silica from natural dust, etc) and a Source Apportionment Study should be got carried out for the entire Jharia Coalfields. Mineralogical composition study should be undertaken on the composition of the suspended particulate matter (PM10 and PM2.5) in Jharia Coalfields and also quantified. These studies would help ascertain source and extent of the air pollution, based on*	*The locations of monitoring stations have been finalized in consultation with the Jharkhand State Pollution Control Board.* *As per the MoU "Sustainable Coal Mining in Coal India Limited" entered between CIL and NEERI, NEERI Nagpur was approached for conducting Source Apportionment Study BCCL for compliance of EC conditions. The work order has been awarded. The work has been started in September 2018. Field*

	which appropriate mitigative measures could be taken.	*data collection is scheduled in Summer 2019.* Mineralogical Composition Study would be carried out as a part of Source Apportionment Study.
31	*No groundwater shall be used for the mining activities. Additional water required, if any, shall be met from mine water or by recycling/reuse of the water from the existing activities and from rainwater harvesting measures. The project authorities shall meet water requirement of nearby village(s) in case the village wells go dry due to dewatering of mine.*	*Groundwater is not being used for mining activities.* *Mine water is being used for industrial purposes (sprinkling on road, firefighting etc.) and for watering of plants.* *Water is also supplied to nearby villages for domestic uses.*
32	*Regular monitoring of groundwater level and quality of the study area shall be carried out by establishing a network of existing wells and construction of new peizometers. The monitoring for quantity shall be done four times a year in pre-monsoon (May), monsoon (August), post-monsoon (November) and winter (January) seasons and for quality including Arsenic and Fluoride during the month of May. Data thus collected shall be submitted to the Ministry of Environment & Forest and to the Central Pollution Control Board/SPCB quarterly within one month of monitoring. Rainwater harvesting measures shall be undertaken in case monitoring of water table indicates a declining trend.*	*Three time Tenders for installation of peizometers has been floated with the latest being done on 01.03.2019. No bidder qualified in the tender. Hence, the tender was cancelled for three times. Re-tendering in process.* ***Annexure 16- Groundwater Monitoring station map*** ***Annexure17- Groundwater Monitoring Report of Cluster V for 2018-19***
33	*Mine discharge water shall be treated to meet prescribed standards before discharge into natural water courses/agriculture. The quality of the water discharged shall be monitored at the outlet points and proper records maintained thereof and uploaded regularly on the company website.*	*Mine water discharge parameters are in compliance with the prescribed standards. The quality is monitored regularly and records maintained thereof.* *It is also uploaded on the company website.* ***Annexure 18- Analysis report of Mine water discharge by CMPDIL at the monitoring point fixed in consultation with JSPCB***
34	*ETP shall also be provided for workshop and CHP, if any. Effluents shall be treated to confirm to prescribed standards in case discharge into the natural water course.*	*Oil & Grease Trap has been Constructed at Nichitpur Workshop to treat workshop effluents.* *Another conventional type Oil & Grease trap has been installed at Tetulmari Workshop.* ***Plate 12- Oil & Grease Trap Installation***
35	*Regular monitoring of subsidence movement on the surface over and around the working area and impact on natural drainage pattern, water bodies,*	*At present only development districts are operational at UG mines in Cluster V and no depillaring district is taken up.*

	vegetation, structure, roads, and surroundings shall be continued till movement ceases completely. In case of observation of any high rate of subsidence movement, appropriate effective corrective measures shall be taken to avoid loss of life and material. Cracks shall be effectively plugged with ballast and clayey soil/suitable material.	*However regular monitoring of subsidence will be undertaken on commencement of depillaring districts.* *Cracks developed due to the fire under earth's surface are filled with soil/suitable material.*
36	*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.*	*Sufficient coal pillars have been left around air shafts as per the statuettes and DGMS guidelines.*
37	*High root density tree species shall be selected and planted over areas likely to be affected by subsidence.*	*Plantation of high root density tree species is being taken up in Cluster V as certified by FRI, Dehradun.* ***Annexure 19- High root density tree plantation certificate by FRI,Dehradun***
38	*Depression due to subsidence resulting in water accumulating within the low lying areas shall be filled up or drained out by cutting drains.*	*It shall be complied.*
39	*Solid barriers shall be left below the roads falling within the blocks to avoid any damage to the roads.*	*Sufficient barriers are left for saving the surface installation and infra structures as per the statute and DGMS guidelines.*
40	*No depillaring operation shall be carried out below the township/colony.*	*It is being complied.*
41	*The Transportation Plan for conveyor cum–rail for Cluster-V should be dovetailed with Jharia Action Plan. Road transportation of coal during Phase–I should be by mechanically covered trucks, which should be introduced at the earliest. The Plan for conveyor-cum–rail for Cluster V should be dovetailed with Jharia Action Plan. The road transportation of coal during phase–I should be by mechanically covered trucks.*	*Presently, road transportation is being done by covering vehicle with tarpaulin. It has been included in the Transportation agreement with the transporting agency.*
42	*A study should be initiated to analyze extent of reduction in pollution load every year by reducing road transport.*	The study to analyze extent of reduction in pollution load every year by reducing road transport is being conducted by CMPDIL. **Annexure 5- Report of study on reduction in pollution load by reducing road transport for cluster V**
43	*R&R of 5835 nos of PAFs involved. They should be rehabilitated at cost of shifting to safe areas at the cost of Rs 104024.9 Lakhs as per the approved Jharia Action Plan.*	Rehabilitation of affected families is being done as per the Jharia Master plan and BCCL R&R Policy.
44	*A detailed CSR Action Plan shall be prepared for Cluster V group of mines. Specific activities shall be identified for CSR the budget of Rs. 242.7 Lakhs per year@ Rs 5/T of coal as recurring expenditure. The*	*Being Complied. However the CSR Action Plan of BCCL as a whole has been prepared.*

	265.25 ha of area within Cluster V ML existing as waste land and not being acquired shall be put to productive use under CSR and developed with fruit bearing and other useful species for the local communities. In addition to afforesting 250.57 ha of are at the post-mining stage, the waste land /barren land within Cluster V ML shall be rehabilitated/reclaimed as forest/agricultural land under CSR Plan in consultation with local communities. Third party evaluation shall be got carried out regularly for the proper implementation of activities undertaken in the project area under CSR. Issue raised in the Public Hearing shall also be integrated with activities being taken up under CSR. The details of CSR undertaken along with budgetary provisions for the village-wise various activities and expenditure thereon shall be uploaded on the company website	*The status of implementation of the issues raised in the public hearing of cluster V is attached as* **Annexure 20.**
45	*Mine Closure Plan of Cluster –V is in draft stage, the same should be submitted to ministry*	*Mine closure plans for six collieries of cluster V have been prepared and approved by the company board.* *Mine closure plan for the remaining colliery- Bansdeopur will be drafted soon.*
46	*For monitoring land use pattern and for post mining land use, a time series of land use maps, based on satellite imagery (on a scale of 1: 50000) of the core zone and buffer zone, from the start of the project until end of mine life shall be prepared once in 3 years (for any one particular season which is consistent in the time series), and the report submitted to MOEF and its Regional office at Bhubaneswar.*	*Land use pattern monitoring based on satellite data is being done by CMPDIL.* ***Annexure 21- Land use pattern monitoring Report of JCF for the year 2016***
47	*A Final Mine Closure Plan along with details of Corpus Fund shall be submitted to the Ministry of Environment & Forests five year before mine closure for approval. Habitat Restoration Plan of the mine area shall be carried out using a mix of native species found in the original ecosystem, which were conserved in-situ and ex-situ in an identified area within the lease for reintroduction in the mine during mine reclamation and at the post mining stage for habitat restoration.*	*Final Mine Closure Plan will be prepared 5 years before final closure of mines. The mines of cluster V have not reached the end stage yet.* *A roadmap for ecological restoration has been prepared by FRI.* ***Annexure 22- Ecological Restoration Roadmap***
48	*A separate environmental management cell with suitable qualified personnel shall be setup under the control of a Senior Executive, who will report directly to the Head of the company for implementing environment policy and socio-economic issues and the capacity building required in this regard.*	*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.* *Further capacity building at both corporate and operating level is being done through regular training programmes conducted within company and at the leading centres and institutes of the country.* List of personnel with designation and qualification looking after the environmental management cell is attached as **Annexure-07**
49	*Implementation of final mine closure plan for Cluster V, subject to obtaining prior approval of the DGMS in regard to mine safety issues*	*It will be Complied at the time of final closure of mines.*
50	*Corporate Environment Responsibility: a) The Company shall have a well laid down Environment Policy approved by the Board of Directors. b) The Environment Policy shall prescribe for standard operating process/procedures to bring into focus any infringements/deviation/violation of the environmental or forest norms/conditions. c) The hierarchical system or Administrative Order of the company to deal with environmental issues and for ensuring compliance with the environmental clearance conditions shall be furnished. d) To have proper checks and balances, the company shall have a well laid down system of reporting of non-compliances/violations of environmental norms to the Board of Directors of the company and/or shareholders or stakeholders at large.*	*A Corporate Environment Policy has been formulated and also uploaded on the website* ***Annexure 23- Corporate Environment Policy***
B	***General Conditions by MOEF:***	
1	*No change in mining technology and scope of working shall be made without prior approval of the Ministry of Environment and Forests*	*It is being complied*
2	*No change in the calendar plan of production for quantum of mineral coal shall be made.*	*It is being complied*
3	*Four ambient air quality monitoring stations shall be established in the core zone as well as in the buffer zone for PM10, PM2.5, SO2 and NOx monitoring. Location of the stations shall be decided*	*Complied.*

	based on the meteorological data, topographical features and environmentally and ecologically sensitive targets in consultation with the State Pollution Control Board. Monitoring of heavy metals such as Hg, As, Ni, Cd, Cr, etc carried out at least once in six months.	
4	*Data on ambient air quality (PM10, PM 2.5, SO2 and NOx) and heavy metals such as Hg, As, Ni, Cd, Cr and other monitoring data shall be regularly submitted to the Ministry including its Regional Office at Bhubaneswar and to the State Pollution Control Board and the Central Pollution Control Board once in six months. Random verification of samples through analysis from independent laboratories recognized under the EPA rules, 1986 shall be furnished as part of compliance report.*	*Complied.* *Monitoring is being done by CMPDIL for Ambient air quality (PM10, PM 2.5, SO2 and NOx) and heavy metals such as Hg, As, Ni, Cd, Cr.* ***Annexure24:- Environment Monitoring Report***
5	*Adequate measures shall be taken for control of noise levels below 85 dBA in the work environment. Workers engaged in blasting and drilling operations, operation of HEMM, etc shall be provided with ear plugs/muffs.*	*Complied.* *Personnel operating near HEMMs, drilling machines are equipped with Personal Protective Equipment.*
6	*Industrial wastewater (workshop and wastewater from the mine) shall be properly collected, treated so as to conform to the standards prescribed under GSR 422 (E) dated 19th May 1993 and 31st December 1993 or as amended from time to time before discharge. Oil and grease trap shall be installed before discharge of workshop effluents.*	*Complied.* *Mine water is being reused in mine for industrial purposes (sprinkling, fire control etc.) and also for domestic usage.* *Oil and grease trap has been installed at the workshop.*
7	*Vehicular emissions shall be kept under control and regularly monitored. Vehicles used for transporting the mineral shall be covered with tarpaulins and optimally loaded.*	*It is being Complied*
8	*Monitoring of environmental quality parameters shall be carried out through establishment of adequate number and type of pollution monitoring and analysis equipment in consultation with the State Pollution Control Board and data got analyzed through a laboratory recognized under EPA Rules, 1986*	*It is being Complied*
9	*Personnel working in dusty areas shall wear protective respiratory devices and they shall also be provided with adequate training and information on safety and health aspects.*	*Complied*
10	*Occupational health surveillance programme of the workers shall be undertaken periodically to observe any contractions due to exposure to dust and to take corrective measures, if needed and records maintained thereof. The quality of environment due to outsourcing and the health and safety issues of the outsourced manpower should be addressed by the company while outsourcing.*	*Complied*

11	*A separate environmental management cell with suitable qualified personnel shall be set up under the control of a Senior Executive, who will report directly to the Head of the company.*	*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. List of personnel with designation and qualification looking after the environmental management cell is attached as **Annexure-07**
12	*The funds earmarked for environmental protection measures shall be kept in separate account and shall not be diverted for other purpose. Year-wise expenditure shall be reported to this Ministry and its Regional Office at Bhubaneswar.*	*Complied.*
13	*The Project authorities shall advertise at least in two local newspapers widely circulated around the project, one of which shall be in the vernacular language of the locality concerned within seven days of the clearance letter informing that the project has been accorded environmental clearance and a copy of the clearance letter is available with the State Pollution control Board and may also be seen at the website of the ministry of Environment & Forests at http://envfor.nic.in.*	*Complied.*
14	*A copy of the environmental clearance letter shall be marked to concern Panchayat/Zila Parishad, Municipal corporation or Urban local body and local NGO, if any, from whom any suggestion /representation has been received while processing the proposal. A copy of the clearance letter shall also be displayed on company's website.*	*Complied.*
15	*A copy of the environmental clearance letter shall also be displayed on the website of the concerned State Pollution Control Board. The EC letter shall also be displayed at the Regional Office, District Industry Sector and Collector's Office/Tehsildar's Office for 30 days.*	*Complied.*

16	*The clearance letter shall be uploaded on the company's website. The compliance status of the stipulated environmental clearance conditions shall also be uploaded by the project authorities on their website and updated at least once every six months so as to bring the same in public domain. The monitoring data of environmental quality parameter (air, water, noise and soil) and critical pollutant such as PM10, PM2.5, SO2 and NOx (ambient) and critical sectoral parameters shall also be displayed at the entrance of the project premises and mine office and in corporate office and on company's website.*	*Complied.* **Attached Company's Website Screenshot of uploaded EC letter as Annexure-25**
17	*The project proponent shall submit six monthly compliance reports on status of compliance of the stipulated environmental clearance conditions (both in hard copy and in e-mail) to the respective Regional Office of the Ministry, respective Zonal Office s of CPCB and the SPCB.*	*Compliance Report is being submitted regularly on time both in hard copy and in soft copy.*
18	*The Regional Office of this Ministry located at Bhubaneswar shall monitor compliance of the stipulated conditions. The Project authorities shall extend full cooperation to the office(s) of the Regional Office by furnishing the requisite data/ information/monitoring reports.*	*Complied*
19	*The Environmental statement for each financial year ending 31 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 by E-mail*	*Complied regularly on time*
C	***Other Conditions by MOEF:***	
1	*The Ministry or any other Competent Authority may stipulate any further condition(s) for environmental protection.*	*Complied.* *Following additional measures as informed by MoEF and JSPCB from time to time*
2	*Failure to comply with any of the conditions mentioned above may result in withdrawal of this clearance and attract the provisions of the Environment (Protection) Act, 1986*	*Agreed*
3	*The above conditions will be enforced inter-alia, under the provisions of the Water (Prevention & Control of Pollution) Act, 1974, the Air (Prevention & Control of Pollution) Act, 1981, the Environment (Protection) Act, 1986 and the Public Liability Insurance Act, 1991 along with their amendments and Rules. The proponent shall ensure to undertake*	*Agreed*

	and provide for the costs incurred for taking up remedial measures in case of soil contamination, contamination of groundwater and surface water, and occupational and other diseases due to the mining operations.	
4	*The Environmental Clearance is subject to the outcome of the Writ Petition filed by M/S Bharat Coking Coal Limited (BCCL) in response to the closure orders issued by the Jharkhand State Pollution Control Board which is pending in the Jharkhand High Court.*	*Agreed b PA*

ANNEXURE-1

COAL PRODUCTION DATA OF CLUSTER V

S.N.	**FINANCIAL YEAR**	**COAL PRODUCTION (In tones)**
1	2013-14	**2687844**
2	2014-15	**2696315**
3	2015-16	**2791806**
4	2016-17	**2963515**
5	2017-18	**2631688**
6	2018-19 (Up to 31.03.2019)	**3333065**

ANNEXURE-2

TRANSPORT BOOKLET OF CLUSTER V

SIJUA AREA

CLUSTER V

2018-19

COAL TRANSPORTATION:

Coal produced in the mines of cluster V is dispatched in two modes-

1. ***Road Transport***
2. ***Rail Transport through Railway Sidings***

1. ***Road Transport:***

   - *Coal from coal dumps is transported to washeries/consumers through road transportation.*
   - *Coal is also transported up to railway sidings via Road route for loading in rakes for onward rail transportation.*

2. ***Rail Transport:***
   - *Coal is transported to power, fertilizer and other consumers from KDS Railway siding.*

Annexure 3- CSR Booklet

CSR BOOKLET

SIJUA AREA

CLUSTER V

2018-19

BHARAT COKING COAL LIMITED (BCCL)

Bharat Coking Coal Limited (BCCL) is a Public Sector Undertaking engaged in mining of coal and allied activities. It occupies an important place in as much as it produces bulk of the coking coal mined in the country. BCCL meets almost 50% of the total prime coking coal requirement of the integrated steel sector. BCCL was incorporated in January, 1972 to operate coking coal mines (214 Nos operating in the Jharia & Raniganj Coalfields, taken over by the Govt. of India on 16th Oct, 1971 to ensure planned development of the scarce coking coal resources in the country.

MAJOR CSR ACTIVITIES OF BCCL

Bharat Coking Coal Limited (BCCL) is committed to good corporate citizenship and makes constant efforts to build and nurture long lasting relationships with members of the society in general and its peripheral communities in particular.

The following activities have been carried out under the Corporation's CSR Programme.

***Drinking Water Facilities**: Provided deep bore wells, tube wells, pumps/motors, open wells, in the peripheral villages of BCCL. Water supply through pipeline, through water tanker is also provided to the villages.*

***Education:** BCCL adopts a multi-pronged approach to promote quality education in backward areas. The measures taken by BCCL comprise Construction, Extension, and Renovation of school buildings etc are done to promote quality education in the nearby villages. BCCL is Extending financial aid for educational facilities to Private Committee Managed schools. Measures are taken to promote women literacy and career development.*

***Health Care**: BCCL Conducts medical/health camps for dwellers of peripheral villages for rendering free medical consultancy. CSR Clinics, wellness clinics, artificial limbs centres are organised for the benefit of the needy section of the society. Mobile medical vans are deployed as special arrangement for medical services.*

AIDS awareness *camps are organized as special drive to develop awareness and to render free consultancy.*

*"*Ek Jagaran Jeevan Shaili*"- A Life style Management Programme is being organised for de-addiction from ill habits of life style such as consuming tobacco, alcohol etc.*

Occupational health awareness programmes are organised.

Other Welfare Activities*: This includes Construction / renovation of Community Halls, construction / repair of roads, construction of Health-sub centres, construction of drain, construction of Chhat Ghat in the ponds, Construction of Boundary wall, providing Choupal for community gatherings, Installation of road side Water Kiosks during summer etc.*

During winter, Blankets are distributed among poor section of the society.

Sports & Cultural*: Various activities are organised to propagate sports and cultures. Sports/games items and instruments are also provided. To promote sports, children parks have been constructed.*

Village adoption: Lahbera, a SC/ST village in Dhanbad has been adopted for its all-round development and a number of development activities have been carried out.

SCOPE

As per **Schedule VII of New Companies Act 2013** the following should be the Scope of Activities under Corporate Social Activities:

i) Eradicating hunger, poverty and malnutrition, promoting healthcare including preventive health care and sanitation and making available safe drinking water.
ii) Promoting education, including special education and employment enhancing vocation skills especially among children, women, elderly, and differently abled and livelihood enhancement projects;
iii) Promoting gender equality, empowering women, setting up homes and hostels for women and orphans, setting up old age homes, day care centres and such other facilities for senior citizens and measures for reducing inequalities faced by socially and economically backward groups;
iv) Ensuring environmental sustainability, ecological balance, protection of Flora and Fauna, animal welfare, agro-forestry, conservation of natural resources and maintaining quality of soil, air and water;
v) Protection of national heritage, art and culture including restoration of buildings and sites of historical importance and works of art; setting up public libraries, promotion and development of traditional arts and handicrafts;

vi) Measures for the benefit of armed forces veterans, war widows and their dependents
vii) Training to promote rural sports, nationally recognized sports, Paralympics sports and Olympic sports;
viii) Contribution to the Prime Minister's National Relief Fund or any other fund set up by the Central Government for socio-economic development and relief and welfare of the Scheduled Castes, the Scheduled Tribes, other backward classes, minorities and women;
ix) Contributions or funds provided to technology incubators located within academic institutions which are approved by the Central Government;
x) Rural development projects

SOURCE OF FUND

The fund for the CSR should be allocated based 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.

ACTION PLAN FOR CORPORATE SOCIAL RESPONSIBILITY

As per the EC Granted to Cluster V:

"A detailed CSR Action Plan shall be prepared for Cluster V group of mines. Specific activities shall be identified for CSR the budget of Rs. 242.7 Lakhs per year@ Rs 5/T of coal as recurring expenditure. The 265.25 ha of area within Cluster V ML existing as waste land and not being acquired shall be put to productive use under CSR and developed with fruit bearing and other useful species for the local communities. In addition to afforesting 250.57 ha of area at the post-mining stage, the waste land /barren land within Cluster V ML shall be rehabilitated/ reclaimed as forest/agricultural land under CSR Plan in consultation with local communities. Third party evaluation shall be got carried out regularly for the proper implementation of activities undertaken in the project area under CSR. Issue raised in the Public Hearing shall also be integrated with activities being taken up under CSR. The details of CSR undertaken along with budgetary provisions for the village-wise various activities and expenditure thereon shall be uploaded on the company website every year. The company must give priority to capacity building both within the company and to the local youth, who are motivated to carry out the work in future. CSR should be Rs 4.6 Lakh for cluster-V for year 2012-13 and thereafter. Social Audit should be carried out for CSR for its actual implementation."

The EMP (Environment Management Plan) contained the following:

S.N	***HEAD OF WORKS***	***CSR expenditure to be done per year in Rs. lakhs***				
		2011-12	***2012-13***	***2013-14***	***2014-15***	***2015-16***
1	*Education facilities including grant of schools, providing education kits, running of schools etc.*	*40.00*	*45.00*	*35.00*	*40.00*	*40.00*
2	*Water Supply and rain water harvesting works, wells, ponds, hand pumps and tube wells*	*30.00*	*35.00*	*45.00*	*30.00*	*30.00*
3	*Health Care and vaccination, awareness camp, mobile medical camp, Immunization, medicine etc.*	*20.00*	*20.00*	*10.00*	*20.00*	*20.00*
4	*Environment Protection i.e. plantation etc.*	*8.25*	*8.25*	*18.25*	*8.25*	*8.25*
5	*Social Empowerment Like Community centre, Literacy drive, shopping complex.*	*10.00*	*10.00*	*10.00*	*10.00*	*10.00*

6	*Infrastructure Development like road, bridge, repairing of school, drains, electric line etc.*	*20.00*	*10.00*	*10.00*	*20.00*	*20.00*
7	*Sports Culture like village stadium village stadium, grant to village sports body, organizing sports meet*	*3.00*	*3.00*	*3.00*	*3.00*	*3.00*
8	*Grant to NGO for community development*	*5.00*	*6.30*	*6.30*	*5.00*	*5.00*

STATUS

Healthcare: Annual CSR (Healthcare) Activities for the year 2018-19

BHARAT COKING COAL LIMITED

CSR CAMP AT REGIONAL HOSPITAL LOYABAD / DISPENSARIES OF SIJUA AREA

Year -2017 & up to till date 2018

SL no.	Date	Name of Camp	Benficiries
1	01.01.2017	Eye camp	101/40
2	24.01.2017	Ligation camp	18
3	20.02.2017	Lipid profile camp RHL	15
4	23.02.2017	Lipid profile camp RHL	28
5	20.03.2017	Lipid profile camp RHL	15
6	20.04.2017	Lipid profile camp RHL	23
7	20.05.2017	Blood sugar camp RHL	23
8	20.06.2017	Blood sugar camp RHL	3
9	03.07.2017	Diabetic camp RHL	6
10	11.07.2017	Lipid profile camp RHL	10
11	26.07.2017	Lipid profile camp RHL	7
12	17.9.2017	Health checkup at Nichitpur Town	208
13	16.10.2017	Lipid profile camp RHL	8
14	20.10.2017	Lipid profile camp RHL	3
15	03.11.2017	Diabetic camp RHL	6
16	24.11.2017	Thyoid camp RHL	8
17	12.12.2017	Sugar & Uric acid camp RHL	36
18	17.01.2018	Diabetic Camp	34
19	20.02.2018	Hyper tension & Dibetic camp	43
20	28.02.2018	Lipid profile camp	21
21	21.04.2018	Chield Health Check up camp	215
22	13.04.2018	Diabetic Camp	15
23	22.05.2018	Refraction i.e. Gen. Eye camp	65
		Total	810

2018

29/5/18

Dy. CMO/AMO
RHL, Sijua Area-V.

Dy. CMO/AMO
R. H. L.
Sijua Area

भारत कोकिंग कोल लिमिटेड
'एक मिनी रत्न कंपनी'
(कोल इंडिया लिमिटेड का एक अंग)
मुख्य चिकित्सा सेवाएं का कार्यालय
क्षेत्रीय चिकित्सालय लोयाबाद, सिजुआ क्षेत्र-V

Bharat Coking Coal Limited
'A Mini Ratna Company'
(A Subsidiary of Coal India Limited)
OFFICE OF CHIEF OF MEDICAL SERVICES
Regional Hospital Loyabad, Sijua Area-V

Ref. No.: RHL/SA/CMO/2019/ 285

Date: 22/5/19

To,

The Environment Department,
Sijua Area.

Sub: Report of CSR, and Health camp of Sijua Area.

Dear Sir,

We are sending herewith the report of CSR and Health camp of Sijau Area dispensaries and other place of under Sijua Area as desire by you.

This is for your kind information and necessary action.

Yours faithfully

22/5/19

Dy. CMO/AMO
RHL, Sijua Area.

Dy. CMO/AMO
R. H. L.
Sijua Area

BHARAT COKING COAL LIMITED

CSR CAMP AT REGIONAL HOSPITAL LOYABAD / DISPENSARIES OF SIJUA AREA
April-2018 to March-2019

1	21.04.2018	Free Chield Health Check up camp at Ambedkar School at Loyabad Bazar	215
2	13.04.2018	Diabetic Camp at RHL	15
3	22.05.2018	Refraction i.e. Gen. Eye camp, Tetulmari Dispensary	65
4	05.06.2018	Pulmonary Function Test at RHL	9
5	07.06.2018	Diabetic Camp at RHL	8
6	05.07.20118	Free Mega Camp for medical health checkup at Nitichit pur town ship dispensary	217
7	25.07.2018	Diabetic Camp at RHL	14
8	26.11.2018	Mega Health Camp at Harijan Basti Nichitpur	205
9	17.12.2018	Spiro-Metry Camp at RHL	5
		Total	705

22/5/19

Dy. CMO/AMO
RHL, Sijua Area.

Dy. CMO/AMO
R. H. L.
Sijua Area

BHARAT COKING COAL LIMITED
REGIONAL HOSPITAL LOYABAD
CSR Report of April-2018 to March-2019

Month	CSR Clinic (Benificiries)
April-2018	216
May-2018	247
June-2018	255
July-2018	332
August-2018	341
September-2018	310
October-2018	317
November-2018	256
December-2018	255
January-2018	323
February-2019	285
March-2019	231
Total	3368

9/5/19
Dy. CMO/AMO
RHL, Sijua Area.

Dy. CMO/AMO
R. H. L.
Sijua Area

Education: Annual CSR Activities for the year 2018-19

EDUCATION

School Grants (2018-19)

FINANCIAL ASSISTANCE TO PCM SHOOLS FOR THE PERIOD Apr 2018 TO Sep 2018 (FY 2018-19)

			Rate of financial asst. & No. of teachers				
Sl.No.	Name & Location of Private Committee Managed Schools	No.of eligible Teachers for getting fin.assistance	Under Graduate Rs.5000/- PM/PT	Graduate Rs.6500/- PM/PT	Graduate with BT Rs.6500/- PM/PT	Graduate with B.Ed Rs.7000/- PM/PT	Amt.of 1st & 2nd Qrt of FY 2018-19
1	2	3	4	5	6	7	8
	Sijua Area						
1	AdarshHarijanShishu Pathshala,Sendra-10	2	1	1	0	0	63000
2	S.S.S. Gyan Kunj, Loyabad.	6	4	2	0	0	186000
3	Saraswati Bal Vidya Mandir,Nichitpur.	2	2	0	0	0	60000
4	Pandey Madhya Vidyalaya, Kankanee	5	2	3	0	0	159000
5	Shishu Vidya Mandir,Tetulmari .	5	4	1	0	0	153000
6	Sarvodaya Shishu Mandir, Sendra Bansjora	4	4	0	0	0	120000
7	Saragwati Sewa Sadan Vidyalaya. Kankanee.	3	0	3	0	0	99000
8	Primary Janta School, Sendra No5	1	1	0	0	0	30000
9	Laxmi Devi Vidya Mandir,Loyabad	4	2	2	0	0	126000
10	Panda Kanali Madhya Vidyalaya,Loyabad Coke Plant	2	2	0	0	0	60000
11	Bangla Primary School, Loyabad	3	3	0	0	0	90000
12	Urdu Primary School,Kankanee	1	1	0	0	0	30000

	Contd. Page-2- Sijua						
13	Shishu Shiksha Niketan Loyabad,	3	3	0	0	0	90000
14	Gandhi Smarak Primary School	4	4	0	0	0	120000
15	Saraswati Vidya Mandir Tetulmari	3	3	0	0	0	90000
16	Janta Janardan Bal Vidya Mandir,Tetulmari	3	2	1	0	0	93000
17	Indira Gandhi Smarak Vidya Mandir,Tetulmari	3	3	0	0	0	90000
	Total	54	41	13	0	0	1659000

EBC SI No. BCCL/REV/2700/18-19/Educational Grant/2383 dated 30.10.2018 and
FC SL. No. BCCL/REV/HOD(PAY)I/C/E.F.C/18-19/2700/Educational Grant/3460 dated 11.03.2018

BD 951 12/3/19
APM Sec
cc. 13/3/19

School Grants (2017-18)

FINANCIAL ASSISTANCE TO PCM SHOOLS FOR THE PERIOD Oct 2017 TO March 2018
(FY 2017-18)

			Rate of financial asst. & No. of teachers					
Sl.No.	Name & Location of Private Committee Managed Schools	No.of eligible Teachers for getting fin.assistance	Under Graduate Rs.5000/- PM/PT	Graduate Rs.5500/- PM/PT	Graduate with BT Rs.6500/- PM/PT	Graduate with B.Ed Rs.7000/- PM/PT	Total Amount of Fin.assist. For 2017-18	Amt.of 3rd & 4th Qrt of FY 2017-18
1	2	3	4	5	6	7	8	9
	Sijua Area							
1	AdarshHarijanShishu Pathshala,Sendra-10	2	1	1	0	0	126000	63000
2	S.S.S. Gyan Kunj, Loyabad.	6	4	2	0	0	372000	186000
3	Saraswati Bal Vidya Mandir,Nichitpur.	2	2	0	0	0	120000	60000
4	Pandey Madhya Vidyalaya, Kankanee	5	2	3	0	0	318000	159000
5	Shishu Vidya Mandir,Tetulmari .	5	4	1	0	0	306000	153000
6	Sarvodaya Shishu Mandir, Sendra Bansjora	4	4	0	0	0	240000	120000
7	Saraswati Sewa Sadan Vidyalaya Kankanee.	3	0	3	0	0	198000	99000
8	Primary Janta School, Sendra No5	1	1	0	0	0	60000	30000
9	Laxmi Devi Vidya Mandir,Loyabad	4	2	2	0	0	252000	126000
10	Panda Kanali Madhya Vidyalaya,Loyabad Coke Plant	2	2	0	0	0	120000	60000
11	Bangla Primary School, Loyabad	3	3	0	0	0	180000	90000
12	Urdu Primary School,Kankanee	1	1	0	0	0	60000	30000

Contd. Page-2- Sijua

13	Shishu Shiksha Niketan Loyabad,	3	3	0	0	0	180000	90000
14	Gandhi Smarak Primary School	4	4	0	0	0	240000	120000
15	Saraswati Vidya Mandir, Tetulmari	3	3	0	0	0	180000	90000
16	Janta Janardan Bal Vidya Mandir,Tetulmari	3	2	1	0	0	186000	93000
17	Indira Gandhi Smarak Vidya Mandir,Tetulmari	3	3	0	0	0	180000	90000
	Total	54	41	13	0	0	3318000	1659000

School Grants (2016-17)

	FINANCIAL ASSISTANCE TO PCM SHOOLS FOR THE PERIOD April to September 2016 (FY 2016-17)							
1	SIJUA		Rate of financial asst.& No. of teachers					
Sl.No.	Name & Location of Private Committee Managed Schools	No.of eligible Teachers for getting fin.assista nce	Under Graduate Rs.5000/- PM/PT	Graduate Rs.5500/- PM/PT	Graduate with BT Rs.6500/- PM/PT	Graduate with B.Ed Rs.7000/- PM/PT	Total Amount of Fin.assist. For 2016-17	Amt.of 1st & 2nd Qr April-Sep 2016 of FY 2016-17
1	2	3	4	5	6	7	8	9
1	Adarsh Harijan Shishu Pathshala,Sendra-10	2	1	1	0	0	126000	63000
2	S.S.S. Gyan Kunj, Loyabad.	6	4	2	0	0	372000	186000
3	Saraswati Bal Vidya Mandir,Nichitpur.	2	2	0	0	0	120000	60000
4	Pandey Madhya Vidyalaya, Kankanee	5	2	3	0	0	318000	159000
5	Shishu Vidya Mandir,Tetulmari	5	4	1	0	0	306000	153000
6	Sarvodaya Shishu Mandir, Sendra Bansjora	4	4	0	0	0	240000	120000
7	Saraswati Sewa Sadan Vidyalaya. Kankanee,	3	0	3	0	0	198000	99000
8	Primary Janta School, Sendra No5	1	1	0	0	0	60000	30000
9	Laxmi Devi Vidya Mandir,Loyabad	4	2	2	0	0	252000	126000

	SIJUA Page -2-							
10	Panda Kanali Madhya Vidyalaya,Loyabad Coke Plant	2	2	0	0	0	120000	60000
11	Bangla Primary School, Loyabad	3	3	0	0	0	180000	90000
12	Urdu Primary School,Kankanee	1	1	0	0	0	60000	30000
13	Shishu Shiksha Niketan Loyabad,	3	3	0	0	0	180000	90000
14	Gandhi Smarak Primary School	4	4	0	0	0	240000	120000
15	Sarswati Vidya Mandir, Tetulmari	3	3	0	0	0	180000	90000
16	Janta janardan Bal Vidya Mandir,Tetulmari	3	2	1	0	0	186000	93000
17	Indira Gandhi Smarak Vidya Mandir,Tetulmari	3	3	0	0	0	180000	90000
TOTAL	17	54	41	13	0	0	3318000	1659000

Other CSR activities in Sijua Area (Cluster V) in previous Years:

2013-2014:

1. Revalidation: RE for construction of one library hall for Nehru Mahavidyalaya,Tetulmari
2. Construction of two classrooms for Nehru Balika Uchha Vidyalay, Tetulmari
3. Financial assistance for providing computer at Ambedkar School, Loyabad
4. Repair & Maintenance- Balika Uchaa Vidyalay Mudidih, Sijua Area

2014-2015:

1. One day Sustainable Development Awareness programme at Sijua area

2015-2016:

1. Construction of toilets in various schools in Paschimi Singhbhum including subsequent maintenance of 5 years under **Swachh Vidyalaya Abhiyan** by BCCL under CSR

2. Construction of two classrooms of Saraswathi Shishu Vidya Mandir, Tetulmari

Annexure 4- R&R Booklet

REHABILITATION & RESETTLEMENT BOOKLET

SIJUA AREA

CLUSTER V

2018-19

1. REHABILITATION AND RESETTLEMENT PLAN

The cluster of mines will be dovetailed with the approved Jharia A c t i o n Plan f o r dealing with fire, subsidence and rehabilitation of people. Master Plan for dealing with fire, subsidence and rehabilitation within the leasehold area of BCCL has already been approved by Government of Jharkhand & Government of India.

As per EC granted to Cluster V, R&R of 5835 nos. of PAFs are involved. They should be rehabilitated to safe areas at the cost of Rs 104024.9 Lakhs as per the approved Jharia Action Plan.

2. Requirement of land at Resettlement site:

A) For BCCL houses

The BCCL houses will be resettled in satellite townships with equivalent type of houses in triple storey building. The weighted average plinth area o f the houses proposed to be rehabilitated has been estimated at 48.09 sq m /house. Considering the amenities, infrastructure, internal roads etc. to be provided in the township, requirement of land for BCCL houses has been estimated at 34.30 Ha. (@ 160 m^2 /House)

B) For Non BCCL Houses

(i) Private (Authorized)

Head of every family will be provided a plot of land measuring 100 sq.m. Considering the amenities, infrastructure, internal roads etc to be provided in the township, requirement of land for private authorized houses has been estimated at 82.94 Ha. (@ 270 m^2/house)

(ii) Private Houses (Encroachers)

Encroachers will be provided with a house constructed on about 27 sq.m land in triple storied building in the resettlement site. However provision of 11 sq. m of land has been considered for construction of another room in future. Considering the amenities, infrastructure, internal roads etc to be provided in the township, requirement of land for encroachers has been estimated at 22.74 Ha. (@ 130 m^2/house).

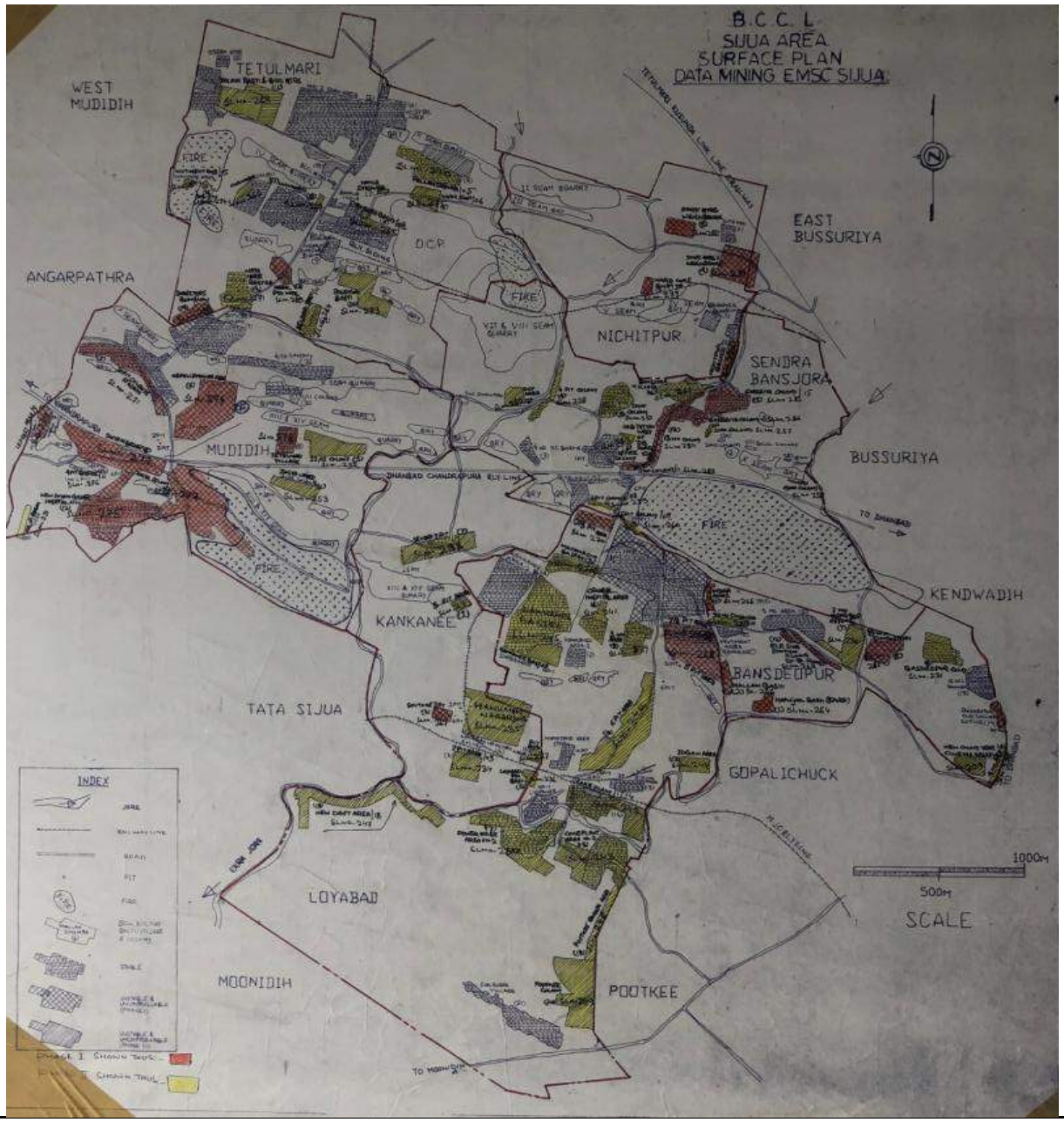
3. CURRENT STATUS:

- BCCL families from cluster V are being shifted to Karmik Nagar, Kusum Vihar and East Bassuriya colonies which have been provided with all the basic amenities. So far, approx. 85 families have been shifted to these quarters as of 31.03.2019.

Karmik Nagar Rehabilitation Township for BCCL families

- For, non-BCCL families, a fresh survey of houses situated in fire and subsidence affected areas is being carried out by Jharia Rehabilitation and Development Authority for allotment of houses for shifting. Total 78 such sites are located in Cluster V. All 78 sites have been surveyed as on 31.03.2019. All social/Community places (Schools/Colleges/Temples/Mosques/Community Hall etc.) will be surveyed soon by JRDA. No allotment of house for shifting has been done till date.

JRDA Site plan of Cluster V:



Annexure 5

Report of study on reduction in pollution load by reducing road transport for cluster V

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.

Study to Analyze the Extent of Reduction of Pollution Load Every Year by reducing Coal Transportation by Road

CLUSTER V GROUP OF MINES

(Tetulmari(UG&OC), Mudidih(UG&OC), Nichitpur OC, Sendra Bansjora(UG&OC) , Basdeopur(UG&OC) , Loyabad , Kankanee(UG&OC)

Normative Production : 4.854 MTPA
Peak Production : 6.311 MTPA
Lease Hold Area : 1957.08 Ha

Bharat Coking Coal Limited

(October, 2017)

Prepared by

Environment Division

Central Mine Planning & Design Institute Limited

CMPDI (HQ)

Gondwana Place

Kanke Road, Ranchi-834008

CONTENTS

Chapter – I

Introduction

1.1 Genesis:

MOEF provided Environmental Clearance to the various mines of the Cluster J-11015/01/2011-IA.II (M) dated 11 Feb 13

As per the Environmental Clearance Conditions given by the Ministry of Environment & Forest "A study should be initiated to analyse extent of reduction in pollution load every year by reducing road transport of coal". Therefore the present study has been carried out to quantify the pollution load due to coal transportation.

1.2 Methodology:

In order to find out the pollution load due to coal transportation a Questionnaire was developed by the Environment Division of CMPDI Headquarter and Regional Institute –II, Dhanbad. The Questionnaire was circulated to the various mines of BCCL for collection of the requisite inputs for this study. The quantification of pollution load for PM-10 has been carried out on the basis of the field visit, data provided by BCCL officials and interaction with them.

1.3 General Information about the Cluster:

1.3.1 Brief Description:

Cluster V (7 mines of 4.854 MTPA (Normative) and 6.311 MTPA (Peak) production of MTPA in a combined ML area of 1957.08 ha consists of Tetulmari(UG&OC), Mudidih(UG&OC), Nichitpur OC, Sendra Bansjora(UG&OC) , Basdeopur(UG&OC) , Loyabad , Kankanee(UG&OC) . These mines are taken over by BCCL from private mine owners after nationalization through Coal Mines Nationalization Act, 1972-73. BCCL is the proponent of the cluster and it is under the administrative control of Coal India Limited.

1.3.2 Nature and Size of the Cluster:

Cluster-V group of mines of BCCL is a group of seven mines consisting of one opencast mine, one underground mine with proposed OCP in the same leasehold, four mixed operating mines and one closed mine in the Jharia Coalfield of the Bharat Coking Coal Limited in the Dhanbad District of Jharkhand State.

The details of the mines showing normative/ peak productions, lease hold areas and life are given in Table no. 1.1.

Table 1.1: Details of the Mines of Cluster –V

Sl No	Name of Mine	Production Capacity (MTY)		Lease Hold Area (Ha)
		Normative	Peak	
	Tetulmari(UG&OC)	0.795	1.033	317.00
	Mudidih(UG&OC)	1.553	2.019	378.05
	Nichitpur OC	0.600	0.780	249.63
	Sendra Bansjora(UG&OC)	0.750	0.975	258.12
	Basdeopur(UG&OC)	0.678	0.879	104.72
	Loyabad	0.000	0.000	499.56
	Kankanee(UG&OC)	0.480	0.624	150.00
		4.854	6.311	1957.08

1.3.3 Impact of Fire Control on Ambient Air Quality:

Due to unscientific mining prior to nationalization there are unstable sites identified in the BCCL. Out of 595 unstable sites identified in the Master Plan, 77 sites with an area of 138.34 ha consisting of 5835 nos. of houses/families are affected. The affected families will be rehabilitated in adjacent non coal bearing area at a cost of Rs. 104024.9 lakhs.

1.3.4 Impact of Resettlement on Ambient Air Quality:

As per Jharia Action Plan (JAP) household will be shifted for implementation of master plan. The reduction in number of households within the leasehold area of Cluster will lead to reduction in generation of air pollutants due to reduction in movement of man & materials apart from decrease in consumption of coal as a

domestic fuel. As per Jharia Action Plan (JAP) household will be shifted as per for implementation.

1.4 Meteorological Data

A meteorological data generated during 1st January 16 to 31st March 2016 has been presented in this report .The micro meteorological set up was established at the roof of BCCL Dugda Guest house and parameters like temperature, relative humidity, wind speed and directions, cloud cover and rainfall were recorded. The data were collected on hourly basis during the entire study period.

Generally, moderate winds prevailed throughout the study period. The wind velocity ranged between ≤ 0.5 m/s to 13.2 m/s. The seasonal average wind speed was observed to be 0.69 m/s. Wind-roses were made by using latest WRPLOT View of Lakes Environmental Software.

The analysis of wind pattern during the season showed that the predominant wind directions were from North-West & West followed by North-East having frequencies 15.71%, 11.45% & 4.67% respectively.The receptors located in the Downwind directions i.e. SE and East from the dust generating sources are likely to be affected. The dispersion of air borne dust during calm period (45% of time) will be very poor and buildup of pollutant concentration during this period will occur.

The maximum temperature recorded was 39.3^{0}C and the minimum was 6.2^{0}C. The daily average relative humidity values were in the range of 32.2 to 65.0%. The sky was mostly clear during the study period. The average atmospheric pressure value has been found to be around 732.3 mm Hg. Total 94.5mm rainfall was recorded during the study period. The average rainfall during the season was found to be 1.04 mm.

Table 1.2: SEASONAL WIND DISTRIBUTION

Period: 01st JAN.'2016 – 31stMAR.'2016

Wind Direction	Wind Velocity (m/s) & Duration (%)				
	< 0.5	0.6 -1.5	1.6 -3.5	>3.5	Total
N		1.61	0.78	0.00	2.38
NNE		0.83	0.37	0.00	1.19
NE		3.17	1.47	0.05	4.67
ENE		0.41	0.14	0.00	0.55
E		1.10	0.69	0.00	1.79
ESE		0.50	0.37	0.00	0.87
SE		1.28	0.41	0.05	1.74
SSE		0.64	0.18	0.00	0.82
S		0.41	0.09	0.00	0.50
SSW		0.28	0.05	0.00	0.32
SW		2.29	0.60	0.00	2.88
WSW		1.06	0.41	0.00	1.47
W		8.99	2.48	0.00	11.45
WNW		1.24	1.01	0.00	2.24
NW		11.47	4.22	0.05	15.71
NNW		2.11	0.73	0.00	2.84
CALM	48.40	-	-	-	48.40
Total	48.40	37.32	13.97	0.15	100

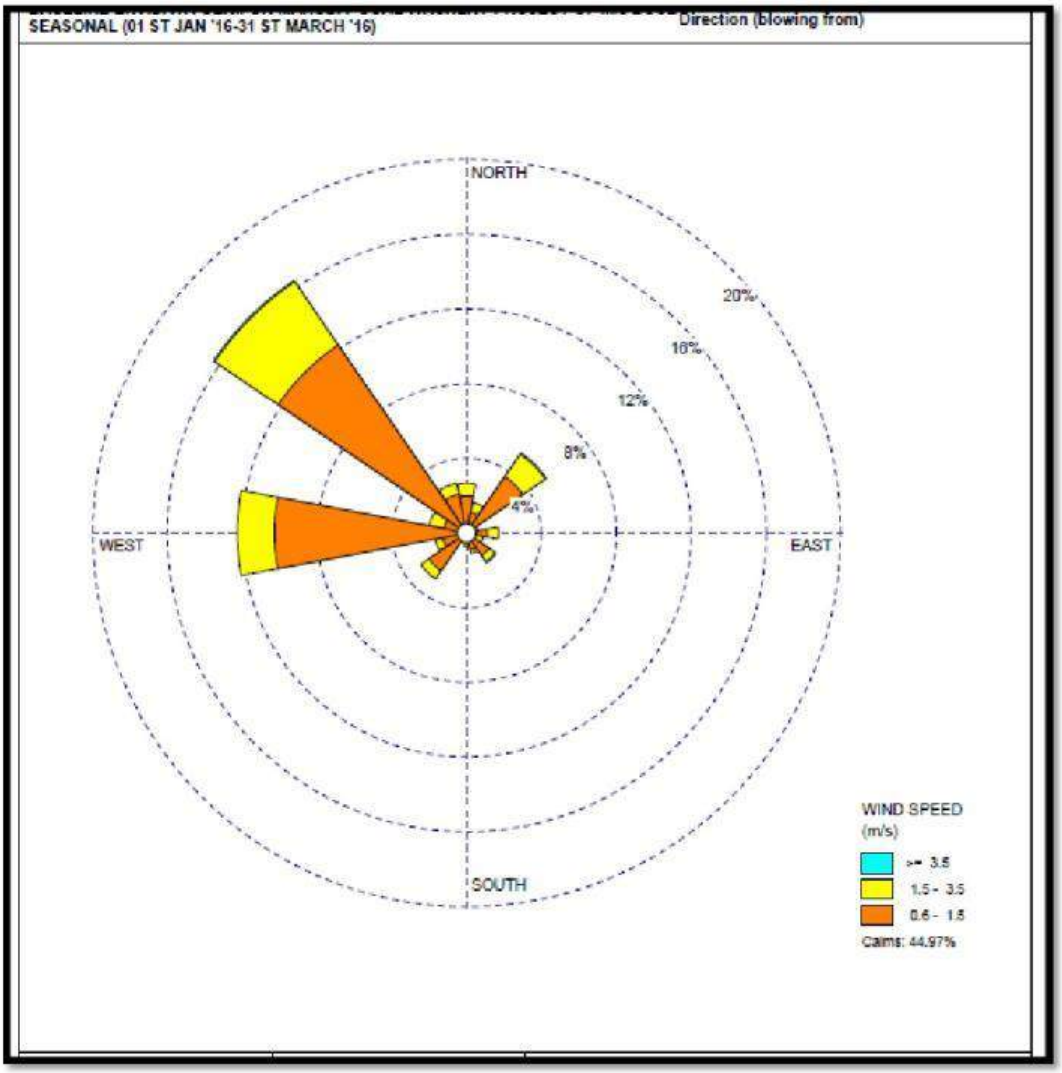


Figure No.-1.1 Wind Rose diagram for the period 1St Jan to 31St March 2016

Chapter – II

Fugitive Dust Generation Due To Movement of Coal

2.1 Introduction

The coal produced moves to the consumers via Road & Rail. Coal from the mine face is brought to the surface dumps and bulk of it goes to the nearby railway sidings for further movement to the consumer- end through rail. The journey from the mine face to the railway siding is covered by road. A portion of the coal produced by the mine directly goes to the consumers via road. Transportation of coal by rail is an environmentally better option than the road transportation. Road Transportation results in generation of fugitive dust from road surface apart from other pollutants released due to consumption of Diesel.

The fugitive dust generated due to coal transportation through road depend upon the following factors:

1. Speed and Weight of the moving vehicles.
2. Silt Content of the Road Dust (Particles less than 200 mesh size is considered as silt)
3. Silt loading of the road dust (Kg/m^2).
4. Moisture Content of the dust lying on the road surface.
5. Ambient Temperature, Humidity & wind velocity.

The dust generation will be lower if the quantity of dust (silt loading) lying on the road surface is minimum and the moisture content of the loose material lying on the road surface is high.

2.2 Movement of Coal

Distance travelled by coal and subsequent release of fugitive dust during its journey towards the consumer end has been described and dust load has been worked out for the year 2013-14, 2014-15 and 2015-16.

2.2.1 Dust generated per day (Kg/Day)

Table: 2.1 Dust Generation (Kg/day)

Name of the Mine	Year	Location	Distance from Face to Siding (Km)	Coal Transferred (Te)	Daily Coal Production (Te/Day)	Capacity of the Dumper	Vehicle Kilometer Travelled	Emission Rate for PM 10 (kg/VKT)	Pollution Load * Dust Generated Per Day (Kg/day)	Dust generated Kg/per tonne
Tetulmari(UG&OC)	13-14	Bansjora Railway Siding	1.80	1260031	3818.00	20.00	687.24	0.53	364.237	
		Total for 13-14			**3818.00**				**364.237**	0.10
	14-15	Bansjora Railway Siding	1.80	1218852	3693.00	20.00	664.74	0.53	352.312	
		Total for 14-15			**3693.00**				**352.312**	0.10
	15-16	Bansjora Railway Siding	1.80	731352	2216.00	20.00	398.88	0.53	211.406	
		Total for 15-16			**2216.00**				**211.406**	0.10
Mudidih Colliery	13-14	Bansjora Railway Siding	2.50	506882	1536.00	20.00	384.00	0.53	203.520	
		Total for 13-14			**1536.00**				**203.520**	0.13
	14-15	Bansjora Railway Siding	2.50	451164	1367.00	20.00	341.75	0.53	181.128	
		Total for 14-15			**1367.00**				**181.128**	0.13

Name of the Mine	Year	Location	Distance from Face to Siding (Km)	Coal Transferred (Te)	Daily Coal Production (Te/Day)	Capacity of the Dumper	Vehicle Kilometer Travelled	Emission Rate for PM 10 (kg/VKT)	Pollution Load * Dust Generated Per Day (Kg/day)	Dust generated Kg/per tonne
	15-16	Bansjora Railway Siding	2.50	48517	147.00	20.00	36.75	0.53	19.478	
		Total for 15-16			**147.00**				**19.478**	0.13
Nichitpur Colliery	13-14	Bansjora Railway Siding	2.80	363228	1101.00	20.00	308.28	0.53	163.388	
		Total for 13-14			**1101.00**				**163.388**	0.15
	14-15	Bansjora Railway Siding	2.80	286570	868.00	20.00	243.04	0.53	128.811	
		Total for 14-15			**868.00**				**128.811**	0.15
	15-16	Bansjora Railway Siding	2.80	618578	1874.00	20.00	524.72	0.53	278.102	
		Total for 15-16			**1874.00**				**278.102**	0.15
Sendra Bansjora(UG&OC)	13-14	Bansjora Railway Siding	0.20	557703	1690.00	20.00	33.80	0.53	17.914	
		Total for 13-14			**1690.00**				**17.914**	0.01
	14-15	Bansjora Railway Siding	0.20	638280	1934.00	20.00	38.68	0.53	20.500	
		Total for 14-15			**1934.00**				**20.500**	0.01
	15-16	Bansjora Railway Siding	0.20	831701	2520.00	20.00	50.40	0.53	26.712	
		Total for 15-16			**2520.00**				**26.712**	0.01
Ka nk	13-14	Jogta Railway Siding	0.20	0	0.00	20.00	0.00	0.53	0.000	

Name of the Mine	Year	Location	Distance from Face to Siding (Km)	Coal Transferred (Te)	Daily Coal Production (Te/Day)	Capacity of the Dumper	Vehicle Kilometer Travelled	Emission Rate for PM 10 (kg/VKT)	Pollution Load * Dust Generated Per Day (Kg/day)	Dust generated Kg/per tonne
		Total for 13-14			**0.00**				**0.000**	0.00
	14-15	Jogta Railway Siding	0.20	83425	253.00	20.00	5.06	0.53	2.682	
		Total for 14-15			**253.00**				**2.682**	0.01
	15-16	Jogta Railway Siding	0.20	561658	1702.00	20.00	34.04	0.53	18.041	
		Total for 15-16			**1702.00**				**18.041**	0.01

* In terms of PM 10 expressed as kg/day, ** Average distance has been considered, *** Capacities of Dumpers used in transportation of coal from face to siding taken as 30Te, to Washery 20Te, and Outside Transport 15 Te. ..## Emission rate for PM_{10} has been taken from the S&T work (funded by MoC) carried out by CMPDI during 2002-2007.

2.3 Optimum Coal Transportation scheme in the Present Scenario:

Phase – I (for 10 + 05 Years)

As suggested by the Environmental Appraisal Committee, it is proposed to continue the existing Road–Rail transport network system in view of the implementation of the Jharia Action Plan(JAP) for 10 years and another 05 years gestation period after the completion of the JAP for consolidation of the backfilled dug out fire areas and unstable areas is required. Thus the period of 15 years, make the Phase – I. All mitigation measures like covered trucks, green belting on either side of the road, enhanced water sprinkling, proper maintenance of roads, removal of spilled materials etc shall be adopted for 15 years with the existing road – rails transport system.

2.4 Conceptual Plan of Proposed Integrated Coal Transportation Network forthe Cluster:

Phase – II (after 15 Years):

As suggested by the EAC Members, BCCL shall implement conveyor –cum-rail transport to avoid movement of trucks within the cluster for coal transportation in Phase –II. Loading of coal by pay–loaders shall be discontinued.

During 2015-16, the combined daily coal production of the Cluster was 8459.00 tones resulting in 3362 kg of daily fugitive dust generation. The dust (PM-10) generation rate at present is 0.40 kg/te.

As a result of replacement of existing road transportation of coal by Conveyor to railway siding will result in reduction of fugitive dust generation to the extent of 760189 kg/day for daily coal production of 1912424 tonnes (6.311 MTY) during Phase –II.

Table 2.2: Proposed Infrastructure for Coal Transportation (phase – II)

Cluster	Mines in Operation in Phase - II	Production Capacity (MTY)	Proposed Transport Infrastructure in Phase – II
V	Cluster -V	6.311	**Coal transport by Conveyor to Railway Siding**
	Total	6.311= 1912424 tonnes /Day	

2.5 Conclusion:

On the basis of the study undertaken to assess the impact of coal transportation on pollution load, the followings may be concluded:

Phase – I :(2013-14 to 2028 -29):

1. During Phase – I, business as usual (BAU) scenario will prevail and the existing road cum rail transport network system will be used for coal dispatch to the consumers. During 2015-16, the combined daily coal production of the Cluster was 8459.00 tones resulting in 3362 kg of daily fugitive dust generation. The dust (PM-10) generation rate at present is 0.40 kg/te.
2. The generation of fugitive dust due to transportation of coal by road can be further reduced by enforcing covering of loaded trucks, periodical removal of loose materials lying on the road surface and black topping of coal transportation roads.
3. Avenue plantation, effective wetting of the road surface and proper maintenance of roads will further result in mitigation of the impact of road generated dust on ambient air quality.
4. Better road condition, by the use of Mechanical Sweeper or vacuum cleaner dust generation may be minimized.

Phase – II :(From 2029-30 Onwards):

1. As a result of replacement of existing road transportation of coal by Conveyor to railway siding will result in reduction of fugitive dust generation to the extent of 760189 kg/day for daily coal production of 1912424 tonnes (6.311 MTY) during Phase –II.
2. During Phase –II, dust load will further reduce due to quenching of mine fire and domestic coal consumption after resettlement of general population dwelling within the command area of cluster, as a result of implementation of Jharia Action Plan. It will result in significant improvement in ambient air quality.

3. **Coal Production Vs. Dust Generation due to Road Transportation is presented below:**

Table2.3: Coal Production Vs. Dust Generation due to Road Transportation

Year	Coal Production (Te/day)	Dust Generation(Kg/Day)
2015-16 (By Road transportation)	8459.00	3362
2029-30 (Considering peak production and all the coal transported through Road)	1912424	760189
2029-30(By Conveyor Transportation)	1912424	0

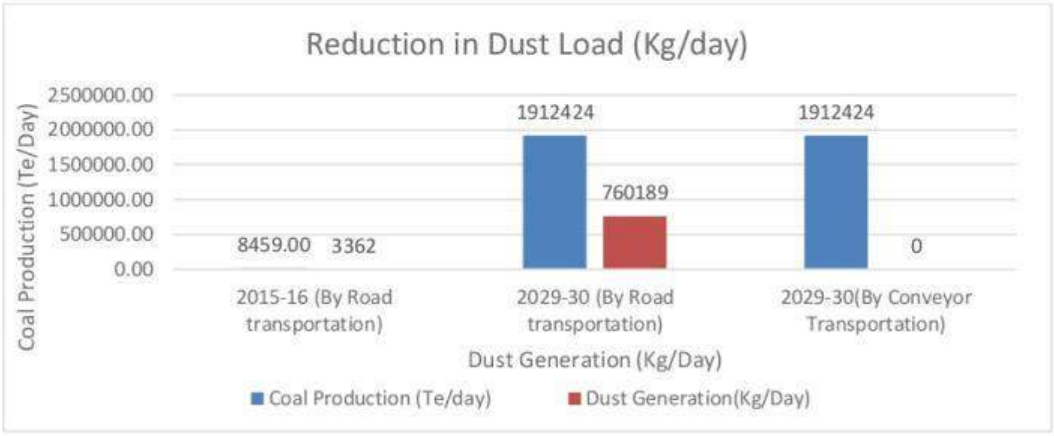


Figure 2.1: Presentation of reduction in dust generation due to replacement of Road transportation by Conveyor system.

Annexure 6- *Data regarding backfilling and reclamation for Cluster V*

DATA REGARDING MINE CLOSURE ACTIVITIES

1	Name of Mine	Nichitpur Colliery
2	Name of Company / Subsidary	BHARAT COKING COAL LIMITED
3	Type of Mine - OC	OC
4	Project Area as per MCP (Ha)	122.73 Hac.
5	Life of Mine	10 Yrs.
6	Balance life of Mine	06 Yrs.
7	Total Broken Area (Ha)	94.04 Hac.
8	Total Decoaled Area (Ha)	46.93 Hac.
9	Active Mining Area (Ha) (Sl.7-Sl.8)	47.11
10	Backfilled Area (out of decoaled area) (Ha)	28.00 Hac.
11	% Back filled (i.e.Sl. 10/ Sl.8)	59.43
12	Reclamation of backfilled area	2.80 Hac.
13	Reclamation of other area	NIL

Accompanied	Inspected by
Signature with Date :- Mahato 25/05/19	Signature with Date :- 25/5/19
Name :- Gopal Ch. Mahato	Name :- H. K. Sinha
Designation Sr. Surveyor	Designation Project officer

DATA REGARDING MINE CLOSURE ACTIVITIES

1	Name of Mine	MUDIDIH
2	Name of Company/Subsidiary	BHARAT COKING COAL LTD.
3	Type of Mine - OC	OCP
4	Project Area as per MCP (Ha)	164.90
5	Life of Mine	13 Yrs.
6	Balance life of Mine	NA (OCP not in operation at present)
7	Total Broken Area (Ha)	81.60 (approx)
8	Total Decoaled Area (Ha)	46.60
9	Active Mining Area (Ha) (Sl.7- Sl.8)	NA (OCP not in operation at present)
10	Backfilled Area (out of decoaled area) (Ha)	46.60
11	% Back filled (i.e. Sl. 10/ Sl. 8)	100%.
12	Reclamation of backfilled area	NIL
13	Reclamation of other areas	NIL

Accompanied by	Inspected by
Signature with Date:- 24/5/19	Signature with Date:- 24/5/19
Name:- SANJEEV KR. SINGH	Name:- JAYANT KR. JAISWAL
Designation:- SR. SURVEYOR	Designation:- PROJECT OFFICER

DATA REGARDING MINE CLOSURE ACTIVITIES

1	Name of Mine	KANKANEE COLLIERY
2	Name of Company/Subsidiary	BCCL
3	Type of Mine - OC	OCP
4	Project Area as per MCP (Ha)	201.08
5	Life of Mine	8428.
6	Balance life of Mine	8428
7	Total Broken Area (Ha)	82.66 Hect.
8	Total Decoaled Area (Ha)	NIL
9	Active Mining Area (Ha) (Sl.7- Sl.8)	82.66 Hect
10	Backfilled Area (out of decoaled area) (Ha)	NIL
11	% Back filled (i.e. Sl. 10/ Sl. 8)	0.0%
12	Reclamation of backfilled area	NIL
13	Reclamation of other areas	NIL

Accompanied by	Inspected by
Signature with Date:- 22/05/19	Signature with Date:- 22/5/19
Name:- M. Ahmed	Name:- J.K. Jaiswal
Designation:- Surveyor	Designation:- Agent

DATA REGARDING MINE CLOSURE ACTIVITIES

1	Name of Mine	**TETULMARI COLLIERY, SIJUA AREA**
2	Name of Company/Subsidiary	**B.C.C.L.,**
3	Type of Mine-OC	**OCP**
4	Project Area as per MCP (Ha)	175.80
5	Life of Mine	**10 YEARS**
6	Balance life of Mine	**06 YEARS**
7	Total Broken Area (Ha)	**62.62 Hect.**
8	Total Decoaled Area (Ha)	**39.97 Hect.**
9	Active Mining Area (Ha) (Sl7-Sl8)	**22.65 Hect.**
10	Backfilled Area (Out of Decoaled area) (Ha)	**28.78 Hect.**
11	% Back filled (i.e. Sl. 10/Sl.8)	**72.00%**
12	Reclamation of backfilled area	NIL
13	Reclamation of other area	NIL

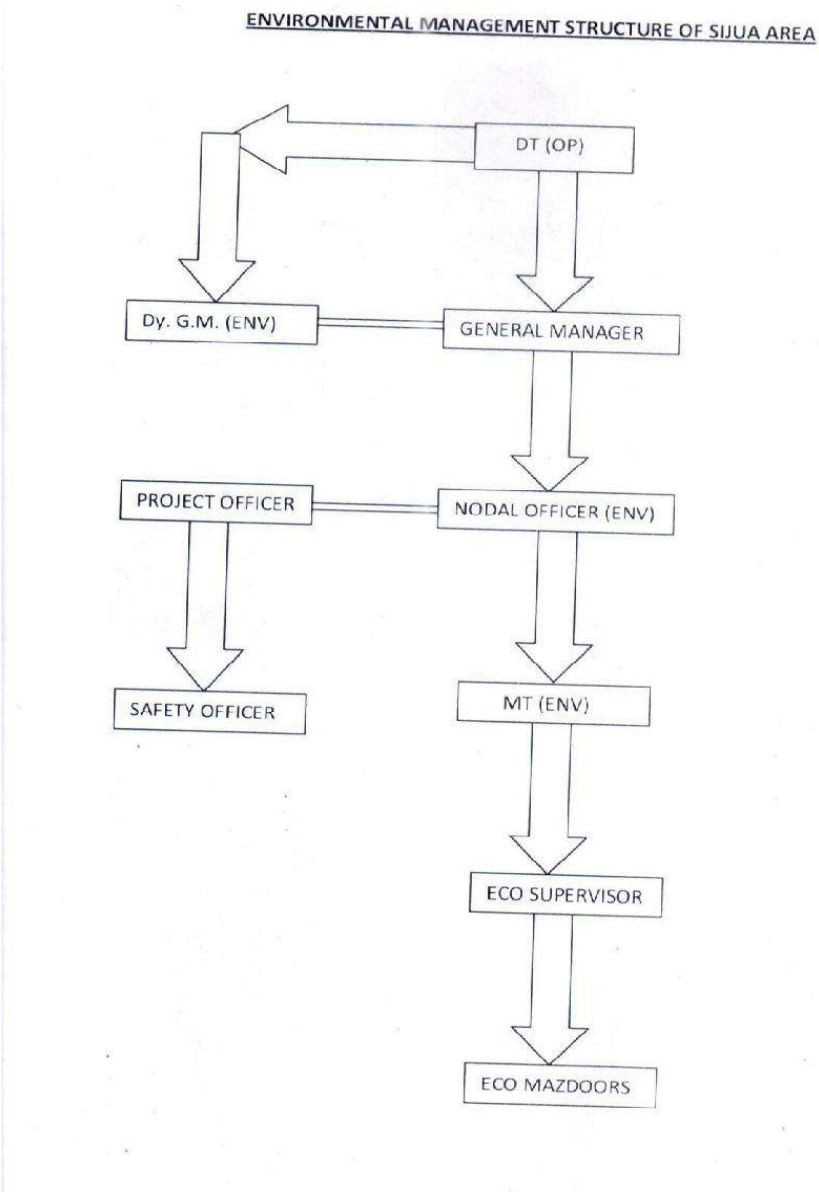
Accompanied By Signature with Date:- 23/5/19 Desgnation:- Dy. Manager (Survey) Tetulmari Colliery	Inspected by Signature with Date:- 23/5/19 Desgnation:- Project Officer Tetulmari Colliery

DATA REGARDING MINE CLOSER ACTIVITIES FOR THE YEAR 2018-19 , AS ON 31.03.2019		
1	Name of Mine	Sendra Bansjora Colliery
2	Name of Company / Subsidiary	Bharat Coking Coal Limited
3	Type of Mine - OC	Open Cast Mine
4	Project Area as per MCP(Ha)	150 Ha
5	Life of Mine	23 years
6	Blance life of Mine	16 years
7	Total Broken Area (Ha)	26.7
8	Total Decoaled Area (Ha)	7.06
9	Active Mining Area (Ha)(Sl.7-Sl.8)	19.64
10	Backfilled Area (out of decoaled area)(Ha)	NIL
11	% Back filled (i.e. Sl.10/Sl.8)	0
12	Reclamation of backfilled area	NIL
13	Reclamation of other areas	NIL

Accompanied by	Inspected by
Signature with date :- 21.05.19	Signature with date :- 21.05.19
Name :- S.K. Mitra	Name :- K. Sarkar
Designation Sr. Surveyor	Designation Sr. Mgr (Min)

Annexure 7

ENVIRONMENTAL MANAGEMENT STRUCTURE OF CLUSTER V (SIJUA AREA)



List of officers associated with the Environmental Management activities in Cluster V:

S. No.	Name	Designation	Educational Qualification
1	Rajesh Ranjan	Asst. Manager (Env.)	B.Tech (Environmental Engineering)
2	Anant Vijay Kumar	M.T. (Env.)	M.Tech (Environmental Engineering)
3	Paramjeet Ranjan	Asst. Manager (Community Development)	Masters(Rural Development)
4	B.N. Prasad	Sr. Manager (Mining)	Diploma (Mining)
5	S.K. Manna	Manager(Mining)	Diploma (Mining)
6	Ramu Prasad	Deputy Manager(Mining)	B.Tech (Mining)
7	Abhishek Kumar	Deputy Manager(Mining)	B.Tech (Mining)
8	U. Toppo	Asst. Manager(Mining)	Diploma (Mining)

Annexure-8: *Plan and Letter ratified by the Regional Officer, Jharkhand State Pollution Control Board*

(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.

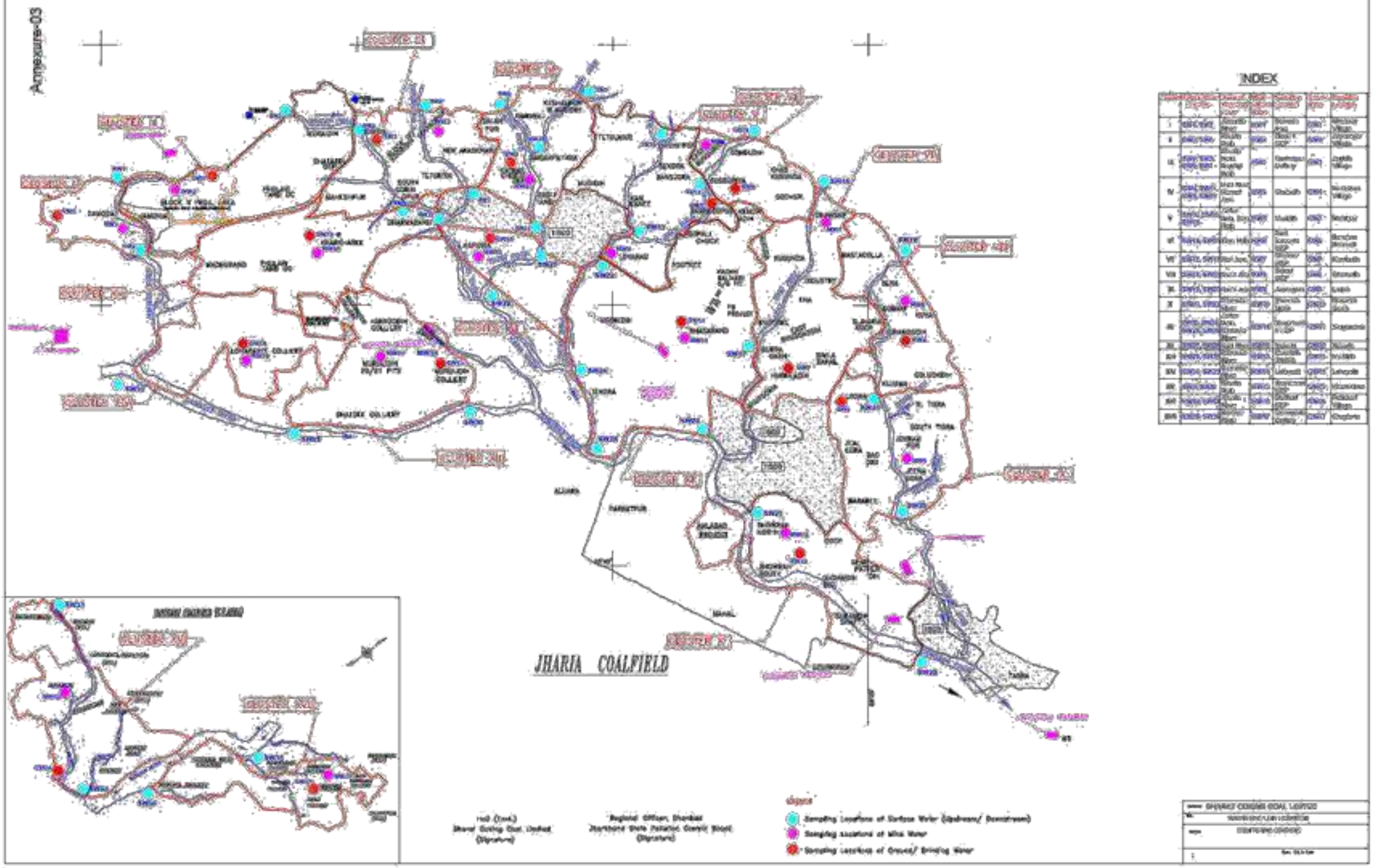
Encl-A/a.

(Dinesh Pd. Singh)
Regional Officer.

Printed by Sandip

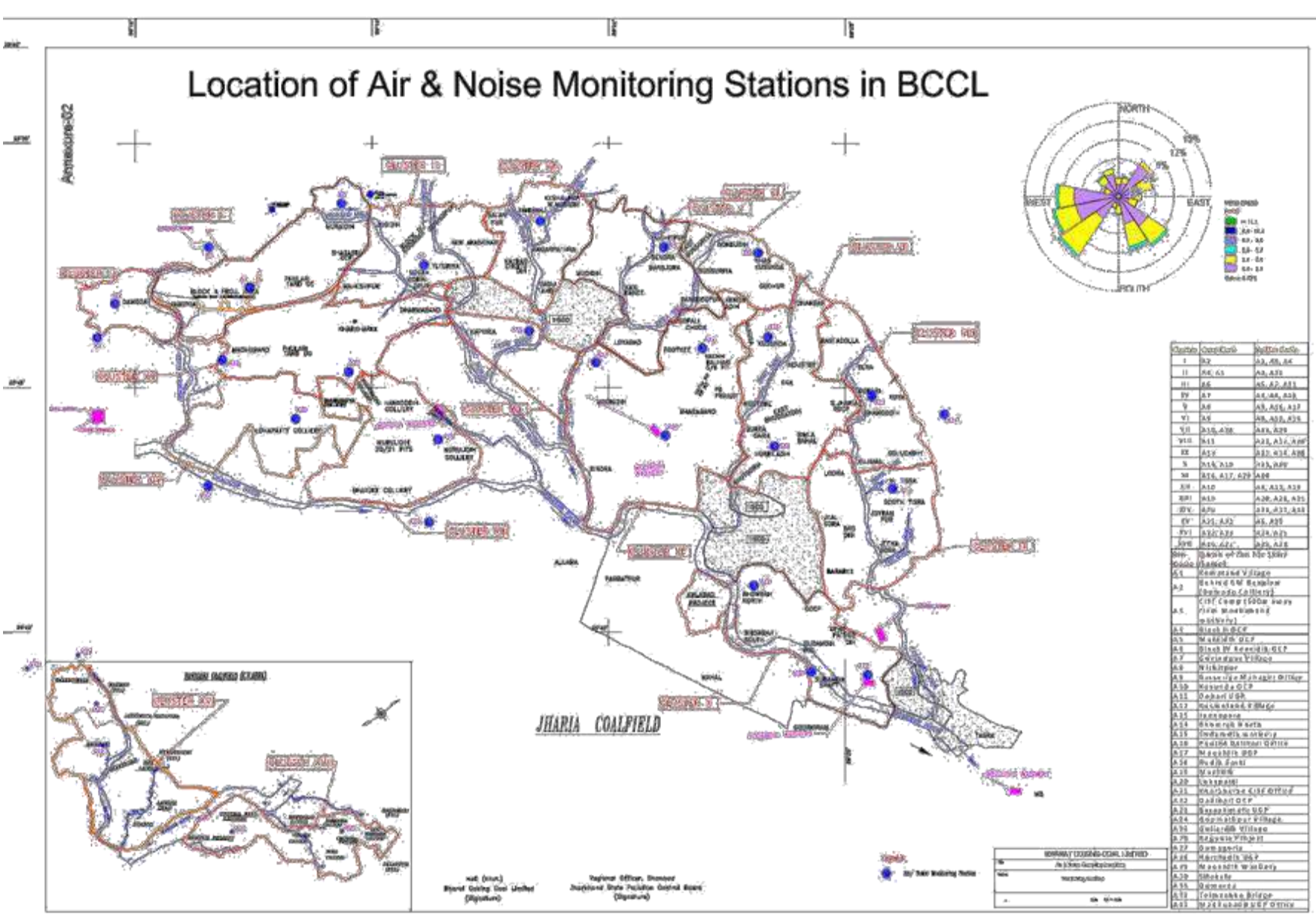
Annexure-03

Water Sampling Locations in BCCL



Location of Air & Noise Monitoring Stations in BCCL

Annexure-02



Annexure 9- Work Order awarded to NEERI, Nagpur for source apportionment Study

Annexure-15

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

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

CIN : U10101JH1972GOI000918

पत्र संख्या :भाकोकोलि/उपमहाप्रबंधक)पर्या/(SOURCE APPORTIONMENT (MoU) /NEERI /2018/854-86
दिनांक:12.05.2018

To,
The Director,
CSIR-NEERI,
Nehru Marg,
Nagpur– 440020
Maharashtra

Sub.: Work Order for the Project "Source Apportionment of ambient air particulate matter in Jharia coalfields region, Jharkhand".

Ref:
(i)Memorandum of Understanding between CIL & NEERI dated 03.12.2015
(ii)your proposal vide email dated 12.09.2016 and subsequent amendment including GST rates
(iii) "Terms of reference for the Project "Source Apportionment of ambient air particulate matter in Jharia coalfields region, Jharkhand" dated 09.03.2018.
(iv) NEERI's acceptance of "TOR" vide email dated 08.05.2018

Dear Sir,

This has reference to proposal "Source Apportionment of ambient air particulate matter in Jharia coalfields region, Jharkhand" vide email dated 12.09.2016. The Competent Authority has approved the award of work to NEERI namely "Source Apportionment of ambient air particulate matter in Jharia coalfields region, Jharkhand" for One Crore forty one Lakh and sixty thousand only inclusive of GST(Rs. 1,41,60,000/-) for a period of Twelve(12) months under the MOU dated 03.12.2015 between CIL & NEERI, extended to all subsidiaries of CIL & the terms of reference. The Project-in-charge will be HOD(Environment) or any of his authorized representative.

You are required to comply the scope, objective & terms and conditions in respect of above mentioned work as agreed in the "Terms of Reference" as given below.

1. Scope of the Work:

- To conduct Source Apportionment Study for varying sources of gasses/smoke/dust emission from source to source (fuel wood, coal, fly-ash, TPPs, coke plants, traffic, silica from natural dust etc., but not limited to this) for the entire Jharia Coalfields (within and up to 10 Km from the periphery / boundary of BCCL mines)

- Study of Mineralogical composition of the suspended particulate matter (PM10 and PM2.5) with their characterization and quantification.
- Ascertaining sources(fuel wood, coal, fly-ash, TPPs, coke plants, traffic, silica from natural dust etc., but not limited to this) and extent of the air pollution of Jharia coalfield with suggesting cluster-wise appropriate techno-economically viable, mitigation management plan including action plan for the control of pollution level.
- The Environment Clearance has been granted to mines of BCCL on Cluster Basis, the final report must be submitted to BCCL on Cluster Basis. JCF has been divided into Clusters. The study to include the entire Jharia Coalfield along with area up to 10 Km from the periphery / boundary of BCCL mines (Key Plan showing Clusters in Jharia Coalfield enclosed)
- Two Presentations to be made by NEERI- One to BCCL Management before submission of Final report & another to the various stake holders including regulatory agencies after submission of the report.
- The dispersion Model should be on GIS platform
- The Hotspots/bottleneck points to be identified where there is increased pollution on GIS platform.
- Skill transfer and capacity building training for BCCL personnel.
- Accomodation , travel , local transport, other incidental cost and anciallary expenditures to be borne by NEERI.

2. Objectives of the study:

The major objective of the study is to assess the current ambient air quality, sources of air pollution and propose the priorities for the actions for improvement of air quality. The study to include the entire Jharia Coalfield along with area up to 10 Km from the periphery / boundary of BCCL mines. The detailed objectives are as following;

A) Ambient Air Monitoring related

- Monitoring of ambient air quality at selected receptor locations for pollutants including PM10, PM 2.5(limited), SO2, NOx, PAHs to establish the current status of the air quality in Jharia Coalfields along with area up to 10 K.M from the periphery / boundary of BCCL mines. Also review of the available air quality monitoring data from Central Pollution Control Board(CPCB) /Jharkhand State Pollution Control Board(JSPCB) .
- To calibrate dispersion modelling predictions using measured air quality parameters
- To draw supportive data through specific site related monitoring regarding impact causing sources such as kerbside monitoring.
- To establish the impact of meteorological conditions on a few select indicator pollutants in different micro meteorological conditions of the Jharia Coalfileds.

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

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

- To establish possibilities of receptor level concentrations of air pollutants by matching dispersion modelling and air quality monitoring data.

C) Source apportionment related

- To identify and apportion the pollution load at receptor level to various sources in the Jharia Coalfields along with area up to 10 Km from the periphery / boundary of BCCL mines.
- To carry out the source apportionment using molecular markers for a limited number of samples through a time resolved sample collection at various period of the day and day-of-the-week.

D) Any other item in consensus between both BCCL/CIL & NEERI evolved during the study

3. TERMS & CONDITIONS:

- You would assist BCCL in clarifying/defending/justifying data of report submitted to regulatory authority or information under RTI, Act or reply of parliamentary Questions or any other litigations if required by Dy. GM (Env).
- CSIR-National Environmental Engineering Research Institute (NEERI) shall associate BCCL in projecting the reports/findings at various national & international forums, Conferences, Seminars, CSIR-National Environmental Engineering Research Institute (NEERI) newsletters & annual reports, meetings of regulatory authorities etc.
- All the materials required with regard to monitoring/analysis, videography, photography and presentation for the work shall be arranged by NEERI at its own cost and shall be of appropriate quality.
- The responsibility for the arrangement of the all equipment tools and plants etc. required for monitoring/analysis, videography, photography and presentation for the work lies on NEERI.
- GST and cess as applicable shall be paid as per rule. The Duration of the project is 12 Months.
- The progress report of the work should be submitted every 3 months. These reports shall be in the form of a booklet and soft copies along with videography and photography. Reports should be in line with the scope of work.
- BCCL shall not have any liability in case of any accident etc. towards CSIR-National Environmental Engineering Research Institute (NEERI)'s personnel/ staffs during filed visits
- Child labour is prohibited under Mines Act, therefore, NEERI Nagpur shall not deploy any child labour in the aforesaid work.
- Reports /findings shall be sole property of BCCL and hence the publishing of the reports /findings in any forum (i.e. hard copy / electronic or in any other form) shall be done only with prior permission of BCCL and shall acknowledge BCCL in all such activities.

- Matter relating to any dispute or difference arising out of this work order and subsequent contract awarded based on this work order shall be subject to the jurisdiction of Dhanbad court only

- All other terms and conditions of the MoU executed between CIL and CSIR-National Environmental Engineering Research Institute (NEERI) on 03.12.2015 and extended to its subsidiaries shall be applicable.

4. ARBITRATION:

Disputes between the parties arising from this agreement shall be settled amicably through negotiations in good faith. Failing the above, the dispute shall be referred to arbitration of three arbitrators one each to be appointed by each party and the two arbitrator shall appoint a third arbitrator in accordance with the provisions of Arbitration and Conciliation Act, 1996 or any subsequent amendment thereof. The decision of the three arbitrators shall be final and binding on the parties hereto. The place of arbitration shall be at Nagpur and shall be conducted in English language

5. FORCE MAJEURE :

Force majeure is herein defined as any cause which is beyond the reasonable control of BCCL or CSIR/NEERI as the case may be, which with a reasonable amount of diligence could not have been foreseen and which substantially affects the performance of the respective obligations of the parties, such as but not limited to :

- Act of God such as flood, drought cyclone, lighting, earthquake, etc.
- Rebellion, civil mutiny, commotion, riot, accident by fire, explosion, epidemic, or any other cause beyond the control of parties.
- Acts of any Government including but not limited to war, declared or undeclared priorities, quarantines.
- Any direction, order of any court or Authority adversely affecting the enforcement of this agreement in any manner.
- Strikes and Lockouts for a continuous period of 30 days

Provided that either party shall within 7 days from the occurrence or cessation of such a cause notify the other in writing of the same.

In the event Force Majeure event continue for more than 30 days, the parties shall mutually discuss and decide the future course of action. If not mutually agreed, the parties shall have the right to terminate this agreement.

BCCL or NEERI shall not be liable for non-performance of their respective obligations or delays in respect thereof as a result of force majeure as referred to and / or defined above

6. INDEMNITY

- BCCL shall indemnify and keep indemnified CSIR/NEERI from and against any and all loss damage or liability (whether criminal or civil) suffered and legal fees and costs incurred by CSIR/NEERI resulting from a breach of any of this agreement between BCCL and its licensors/consultants/contractors or any other third party.

- Notwithstanding anything in this agreement, in the event of any liability, claim or damage arising out of this agreement, the liability of CSIR/NEERI to BCCL shall under any circumstance exceed the amount received by CSIR-NEERI

7. CONFIDENTIALITY

The Parties, to the extent of their respective rights to do so, shall exchange such technical information and data as is reasonably required of each Party to perform its responsibilities under this agreement. Each Party agrees to keep in confidence and to use the same degree of care as it uses with respect to its own proprietary data to prevent the disclosure to third Parties of all technical information, data and confidential business information (hereinafter referred to as "Consolidated Data"). Exchange, use and maintenance of Confidential Data shall be mutually discussed and agreed to by the parties. The preceding provisions of confidentiality and restriction on use of Consolidated Data shall not apply to

- Information in the public domain or information, which subsequently enter into public domain without committing breach of this Article.
- Information in possession of the Party at the time of disclosure and was not acquired, directly or indirectly, from the other Party.
- Information, which a Party requires to disclose under law, rules or regulations or court orders.
- Information provided to Consultants / advisors, provided they, in turn, sign undertaking of confidentiality

8. OWNERSHIP OF INTLECTUAL PROPERTY -

- Any intellectual property rights obtained by the respective parties hereto pertaining to the PROJECT prior to signing of the agreement shall remain the property of the respective organizations. On mutual consent foreground IP shall be deployed for the project purpose.
- The intellectual property that is generated in the PROJECT shall be owned by BCCL.
- If an IP is generated the relevant IP clause shall be built in a project specific agreement mutually, as the, case arises.
- In the case of Intellectual Property developed independently by CSIR/NEERI in which BCCL has an interest, CSIR/NEERI shall grant to BCCL/CIL a non-exclusive license to manufacture and sell the product, and CSIR/NEERI reserves the right to grant similar license at its discretion to others.
- During the work as envisaged under this agreement in the event of CSIR/NEERI scientists exploring, inventing, or discovering results other than the specific objectives of the Project, CSIR/NEERI shall retain absolute rights on such results. CSIR/NEERI shall first offer such results to BCCL on negotiated terms by entering into a separate Agreement. In case BCCL does not accept the offer, CSIR/NEERI shall be free to negotiate the release of such results to other parties without any obligations to CIL.
- In case BCCL intends to renounce its interest in the Project, it shall give notice to NEERI of its intention upon receipt of which notice NEERI shall be free to work further on its own on such Projects and or enter into a licensing or joint development Agreement with any other interested third party.

9. Deliverables:

- Emission Inventory and Dispersion Modeling
- Source apportionment for identification of sources impact and prioritization of actions.
- Time-bound action plan guidelines for implementing measures for improving air quality
- 2 copies of Draft Report
- 15 copies of Final Report- Since the Environment Clearance has been granted to mines of BCCL on Cluster Basis, the final reports must be submitted to BCCL on Cluster Basis.

10. TERMS OF PAYMENT

Project Cost	Rs. 120 Lakhs (Rupees One Crore Twenty Lakhs Only)
GST @18%	Rs. 21.6 Lakhs (Rupees Twenty One Lakhs Sixty Thousand Only)
Total Cost (including GST)	Rs. 141.6 Lakhs (Rupees One Crore Forty One Lakhs Sixty Thousand Only)
Payment Terms	1st Installment: 50% + GST + All applicable Cess & surcharges – (After identification of stations in Jharia Coalfield and submission of its report) 2gd Installment: 30% + GST + All applicable Cess & surcharges – (After completion of field data collection) 3rd & Final Installment: 20% + GST + All applicable Cess & surcharges – (After submission of final report and its acceptance by BCCL.)
Project Duration	12 months

- All the payment will be made by ELECTRONIC MODE through bank. The CSIR-National Environmental Engineering Research Institute (NEERI) must furnish the details in the proforma as given in the Annexure-3.

11. PERFORMANCE SECURITY/SECURITY DEPOSIT

11.1 Security Deposit shall consist of two parts:

a) Performance Security to be submitted at award of work and
b) Retention Money to be recovered from running bills.

The security deposit shall bear no Interest.

You have to sign the Integrity Pact. This is as per the CVC guidelines. Name, address & contact No. of the Independent External Monitor(s) for this purpose is as given below:

1. Name: Prof (Dr.) L.C. Singhi, IAS (Retd.)
   Address: L-31, Third Floor, Kailash Colony, New Delhi-110048
2. Name: Shri Pramod Deepak Sudhakar, IAS (Retd.)
   Address: A-002, Stellar Park Apartments, C-58/24 Sector-62, Noida-201301

This terms of reference is given to you in duplicate. You are advised to submit your consent by returning second copy of the terms of referenceduly signed by you as a token of acceptance of the award within 7(seven) days from the date of receipt of this letter.

Failure to comply with the requirement as above shall constitute sufficient ground for cancellation of the award.

Enclosed:

1. Annexure-1 (Proforma of bank guarantee for performance security)
2. Annexure-2 FORMAT FOR CONTRACT AGREEMENT
3. Annexure -3 (Proforma for collecting payment through electronic mode including electronic fund transfer (ETF) & electronic clearing system (ECS))
4. Annexure -4 INTEGRITY PACT

Yours faithfully,

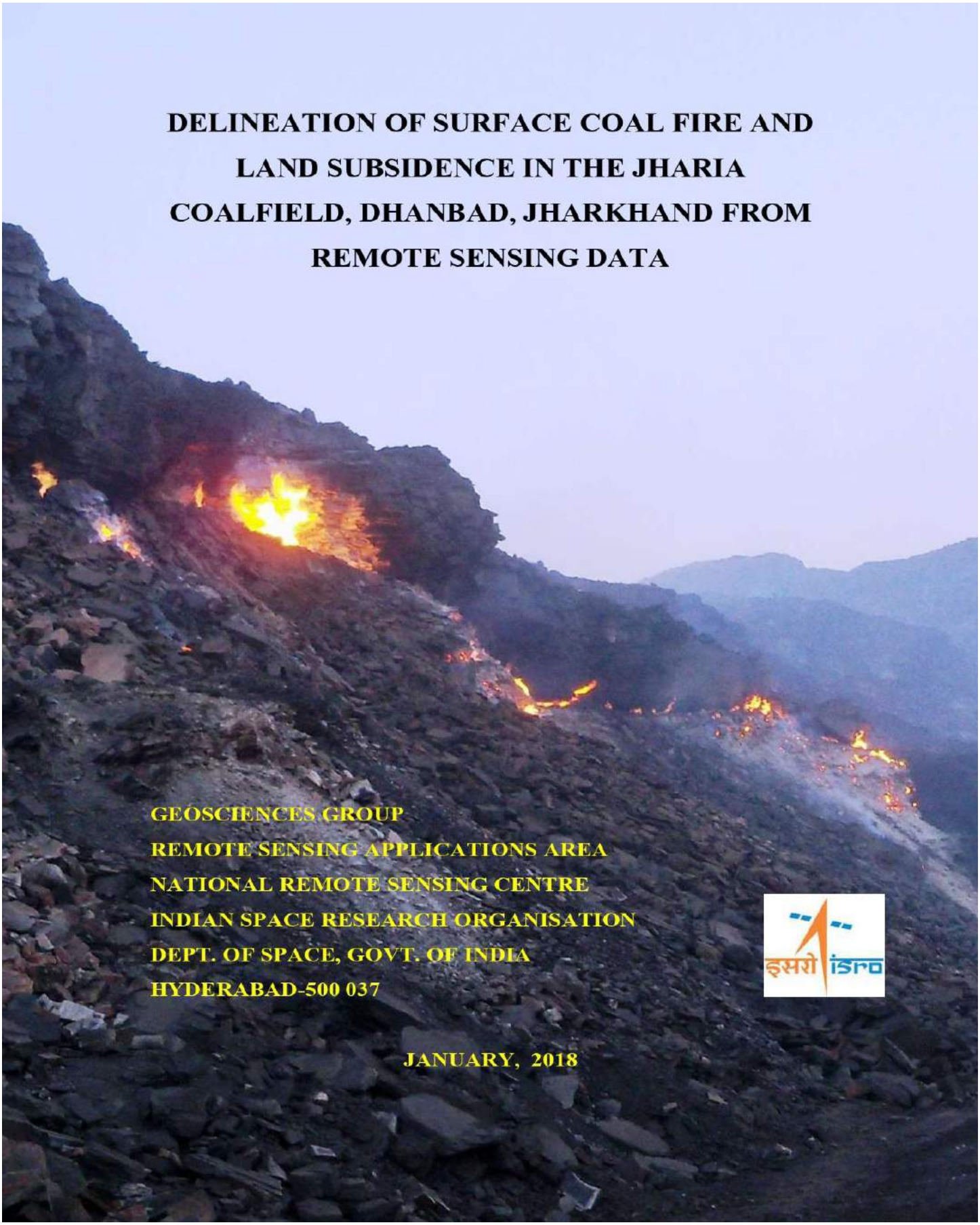
Dy. GM (Env.)

Copy to:

1) TS to D (T) OP/ D (F)/ D (T) P&P ..... for kind information
2) ES to CVO, BCCL ..... for kind information
3) TS to CMD, BCCL ..... for kind information
4) GM (Finance) I/C, BCCL, Koyla Bhawan
5) HOD(Fin)Pay.
6) GM(Env.), CIL ..... for kind information
7) Prof (Dr.) L.C Singhi, IAS (Retd.), L-31 Third Floor, Kailash Colony, New Delhi-1100481. Address: L-31, Third Floor, Kailash Colony, New Delhi-110048.
8) Concerned Fille.

Annexure-10

The map showing fire extent and the Results of fire extent



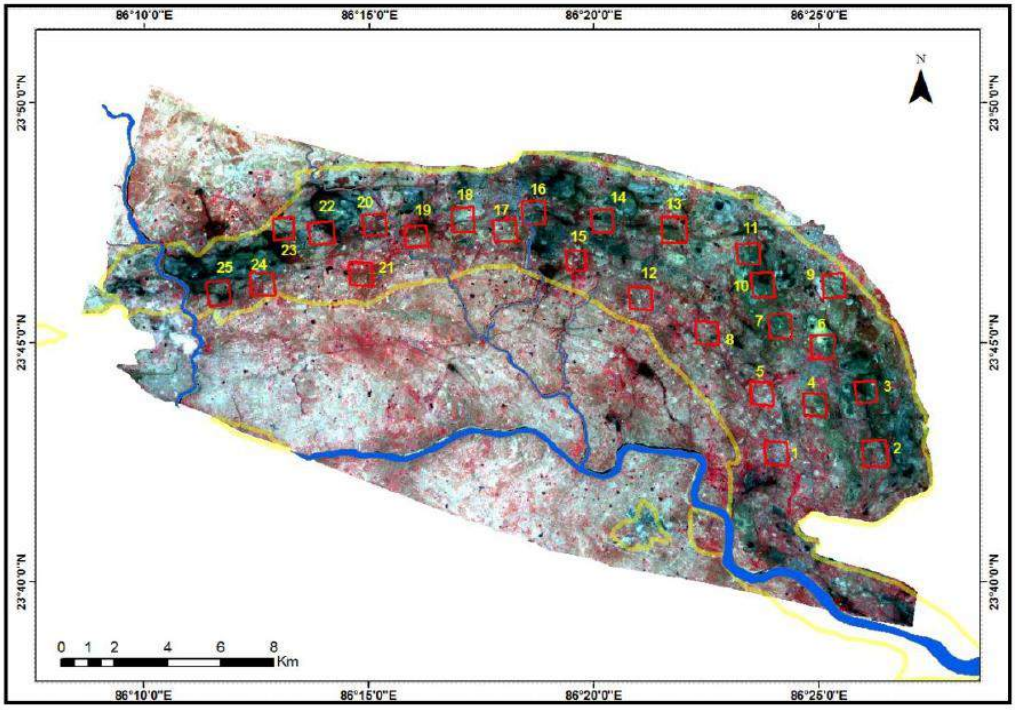


Figure 3. False colour composite image of Jharia Coalfield, with subset blocks (in red boxes) to obtain temperature values (from radiant temperature image) within the Barakar formation across the Jharia coalfield.

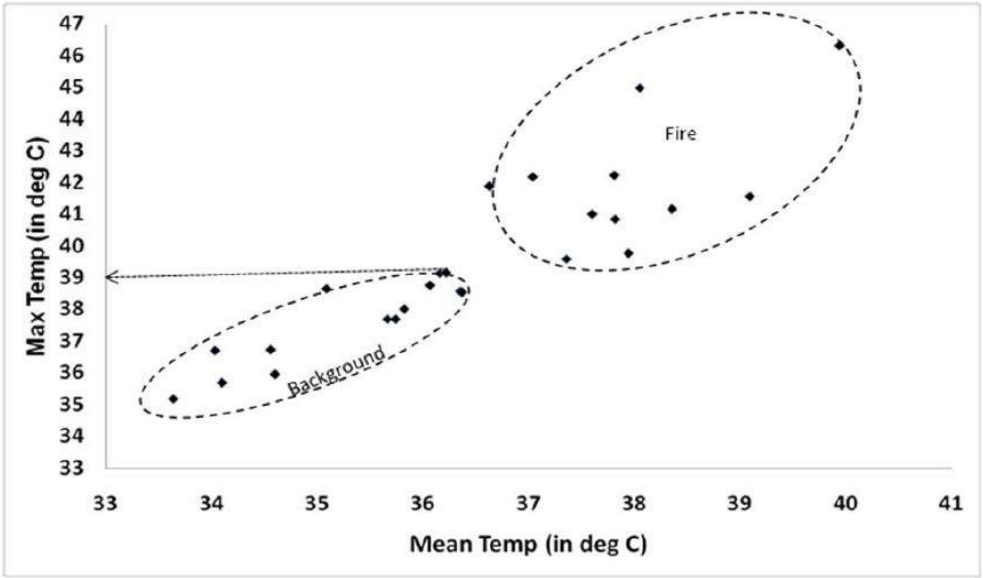


Figure 4. Maximum temperature plotted against mean temperature for various locations; cluster separation observed around 39 °C (marked with arrow)

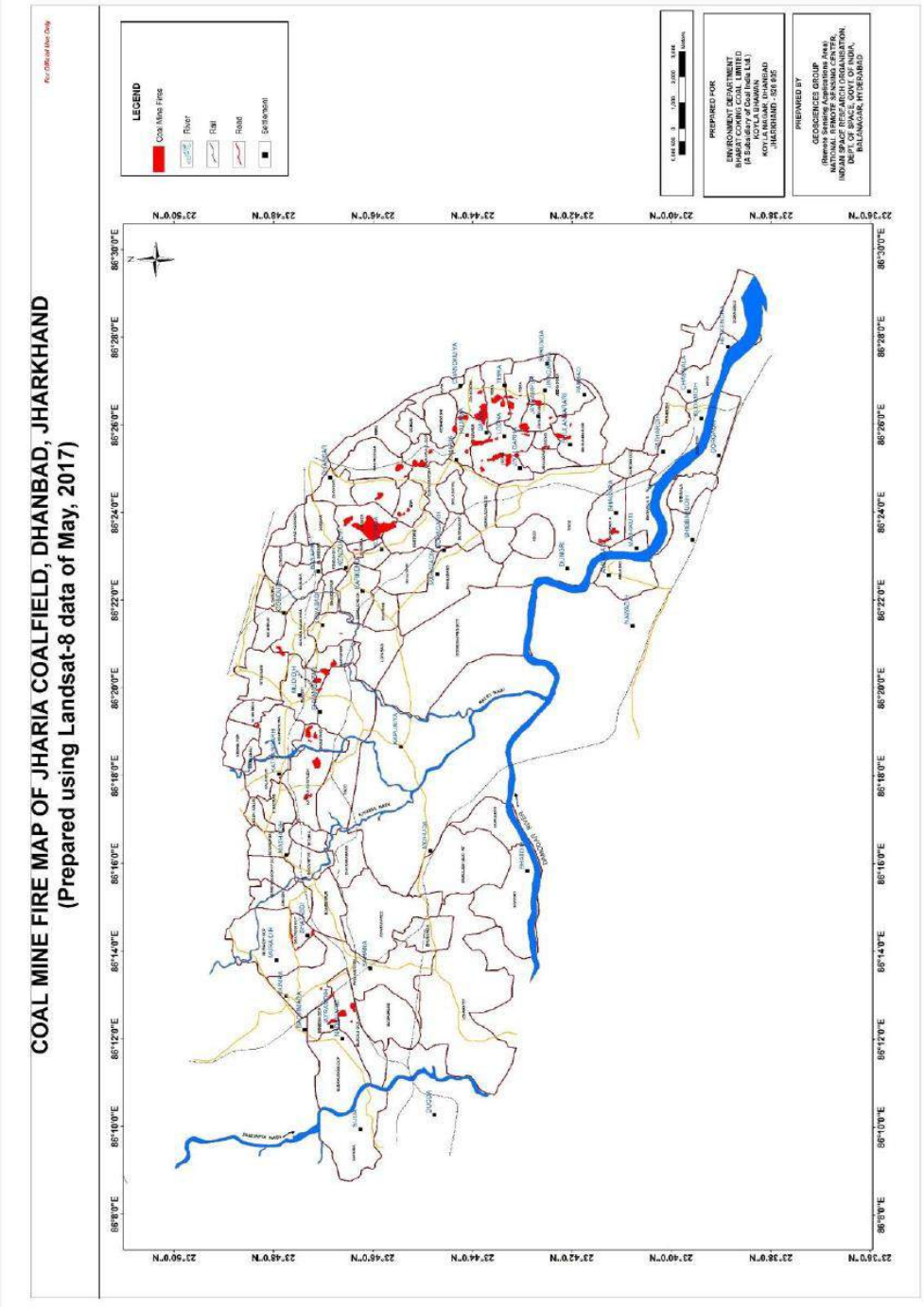


Figure 5: Coal mine fire map (May, 2017) of Jharia coal field, Dhanbad. The fire areas shown in this map have been verified in the field as per field points in figure 13.

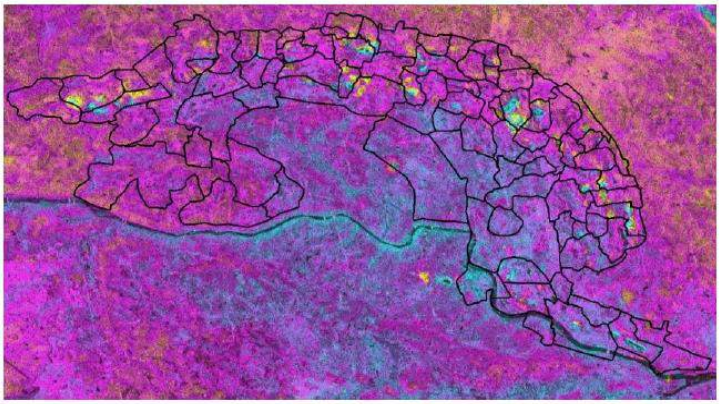


Figure 9. Fringe patterns generated from short baseline processing (e.g. Master: Oct, 16, Slave: Feb, 17).

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).

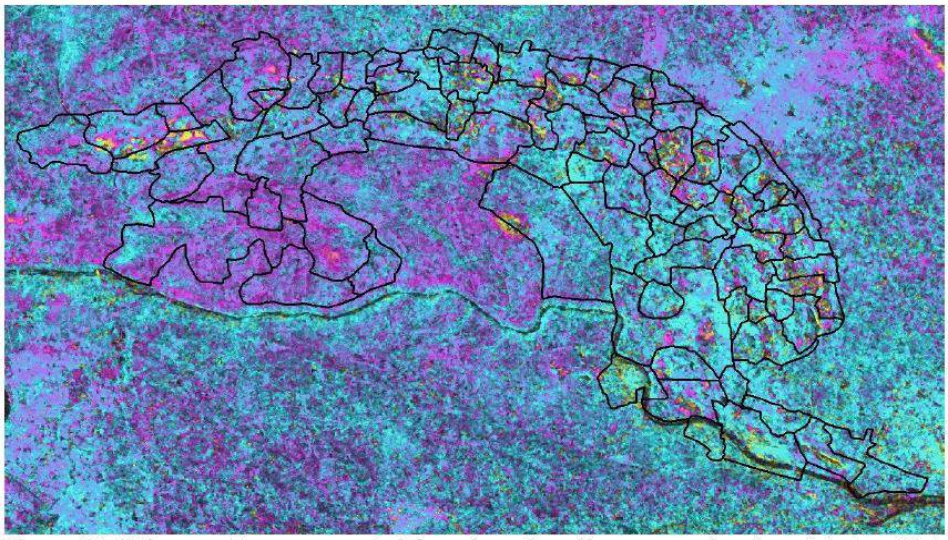


Figure 10. Fringe patterns generated from long baseline processing (e.g. Master: Oct, 15, Slave: Feb, 17).

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).

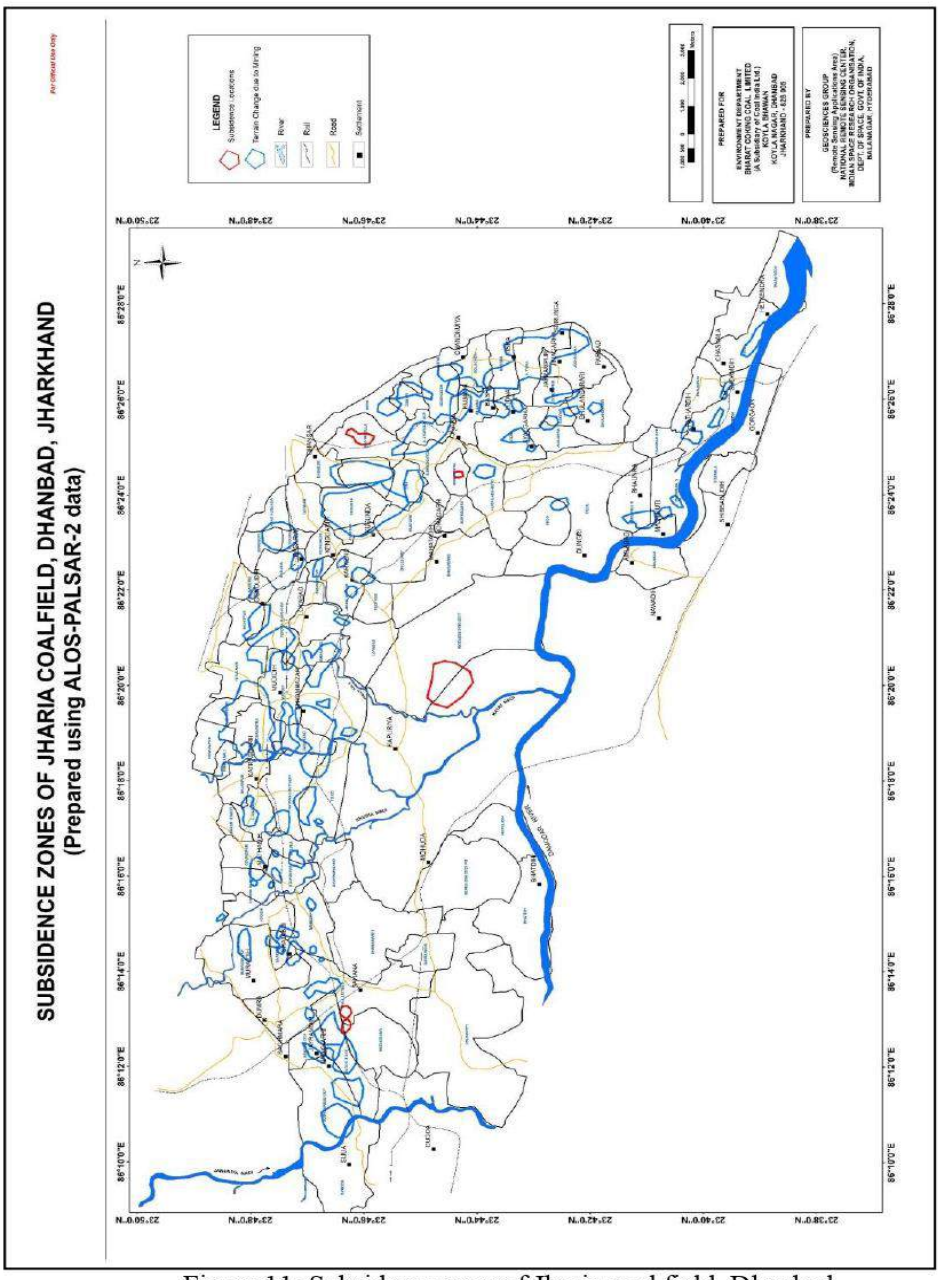


Figure 11: Subsidence map of Jharia coal field, Dhanbad.

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

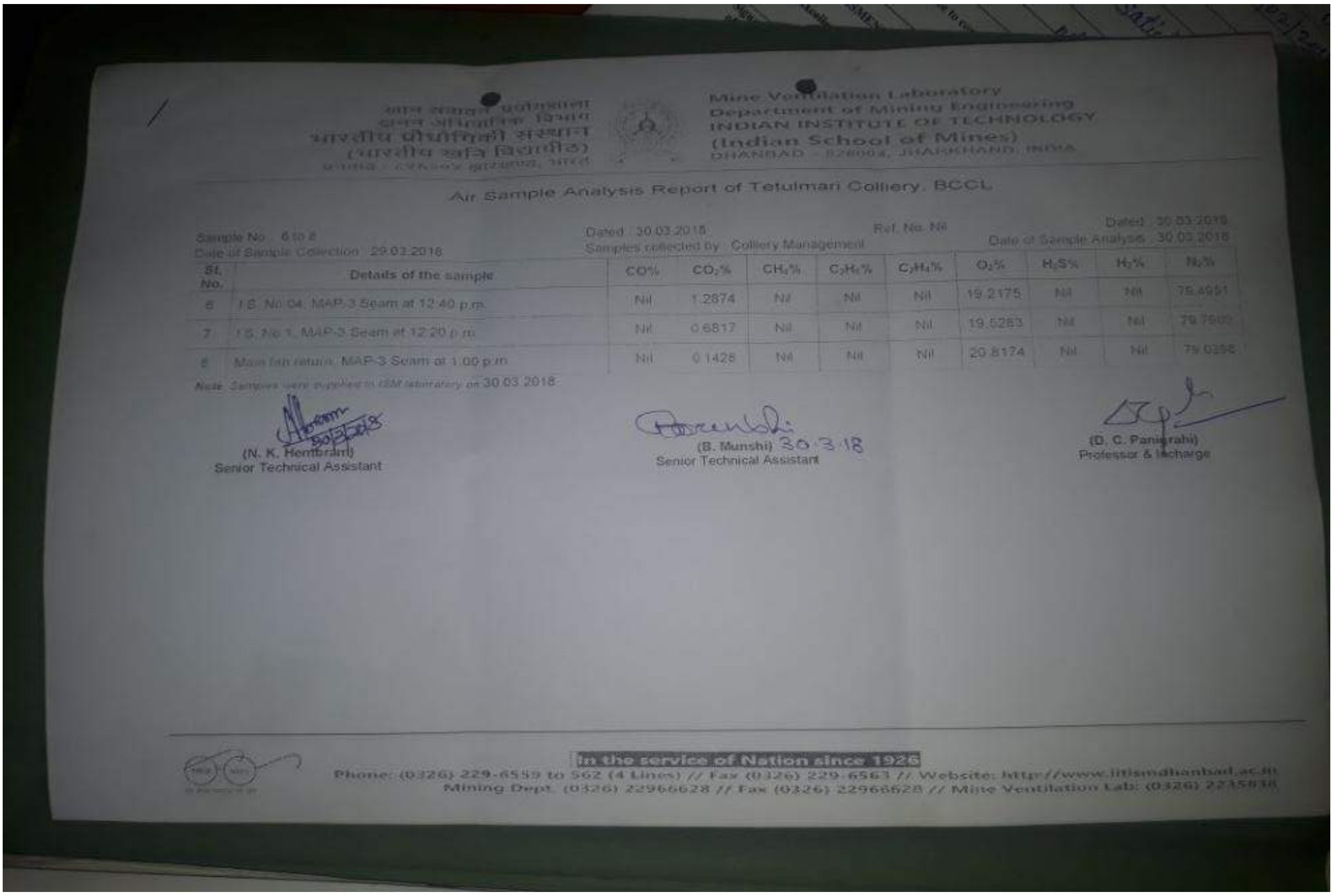
41	S. JHARIA-R. OCP	0.0244	0.1118	0.087	INCREASE
42	DOBARI	0.0000	0.0000	0.000	NO FIRE
43	GONHOODIH	0.0398	0.0322	-0.008	DECREASE
44	SIMLABAHAL	0.0000	0.0000	0.000	NO FIRE
45	HURRILADIH&STD	0.0000	0.0000	0.000	NO FIRE
46	ENA	0.0918	0.0432	-0.049	DECREASE
47	BURRAGARH	0.0000	0.0000	0.000	NO FIRE
48	N. 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 11- Report of the analysis done by IIT(ISM), Dhanbad



Mine Ventilation Laboratory
Department of Mining Engineering
INDIAN INSTITUTE OF TECHNOLOGY
(Indian School of Mines)
DHANBAD - 826004, JHARKHAND, INDIA

Air Sample Analysis Report of Tetulmari Colliery, BCCL

Sample No.: 6 to 8 | Dated: 30.03.2018 | Ref. No. Nil | Dated: 30.03.2018

Date of Sample Collection: 29.03.2018 | Samples collected by: Colliery Management | Date of Sample Analysis: 30.03.2018

Sl. No.	Details of the sample	CO%	CO_2%	CH_4%	C_2H_6%	C_2H_4%	O_2%	H_2S%	H_2%	N_2%
6	I.S. No 04, MAP-3 Seam at 12:40 p.m.	Nil	1.2874	Nil	Nil	Nil	19.2175	Nil	Nil	79.4951
7	I.S. No 1, MAP-3 Seam at 12:20 p.m.	Nil	0.6817	Nil	Nil	Nil	19.5283	Nil	Nil	79.7900
8	Main fan return, MAP-3 Seam at 1:00 p.m.	Nil	0.1428	Nil	Nil	Nil	20.8174	Nil	Nil	79.0398

Note: Samples were supplied in ISM laboratory on 30.03.2018

(N. K. Hembram) 30/3/2018
Senior Technical Assistant

(B. Munshi) 30.3.18
Senior Technical Assistant

(D. C. Panigrahi)
Professor & Incharge

In the service of Nation since 1926

Phone: (0326) 229-6559 to 562 (4 Lines) // Fax (0326) 229-6563 // Website: http://www.iitismdhanbad.ac.in
Mining Dept. (0326) 22966628 // Fax (0326) 22966628 // Mine Ventilation Lab: (0326) 2235838

खान संवातन प्रयोगशाला
खनन अभियांत्रिकी विभाग
भारतीय प्रौद्योगिकी संस्थान
(भारतीय खनि विद्यापीठ)
धनबाद - ८२६००४ झारखण्ड, भारत

Mine Ventilation Laboratory
Department of Mining Engineering
INDIAN INSTITUTE OF TECHNOLOGY
(Indian School of Mines)
DHANBAD – 826004, JHARKHAND, INDIA

Air Sample Analysis Report of Mudidih Colliery, Sijua Area, BCCL

Sample No.: 13 to 15 Dated: 17.05.2018 Ref. No. Nil Dated: 17.05.2018

Date of Sample Collection: 17.05.2018 Samples collected by: Colliery Management Date of Sample Analysis: 17.05.2018

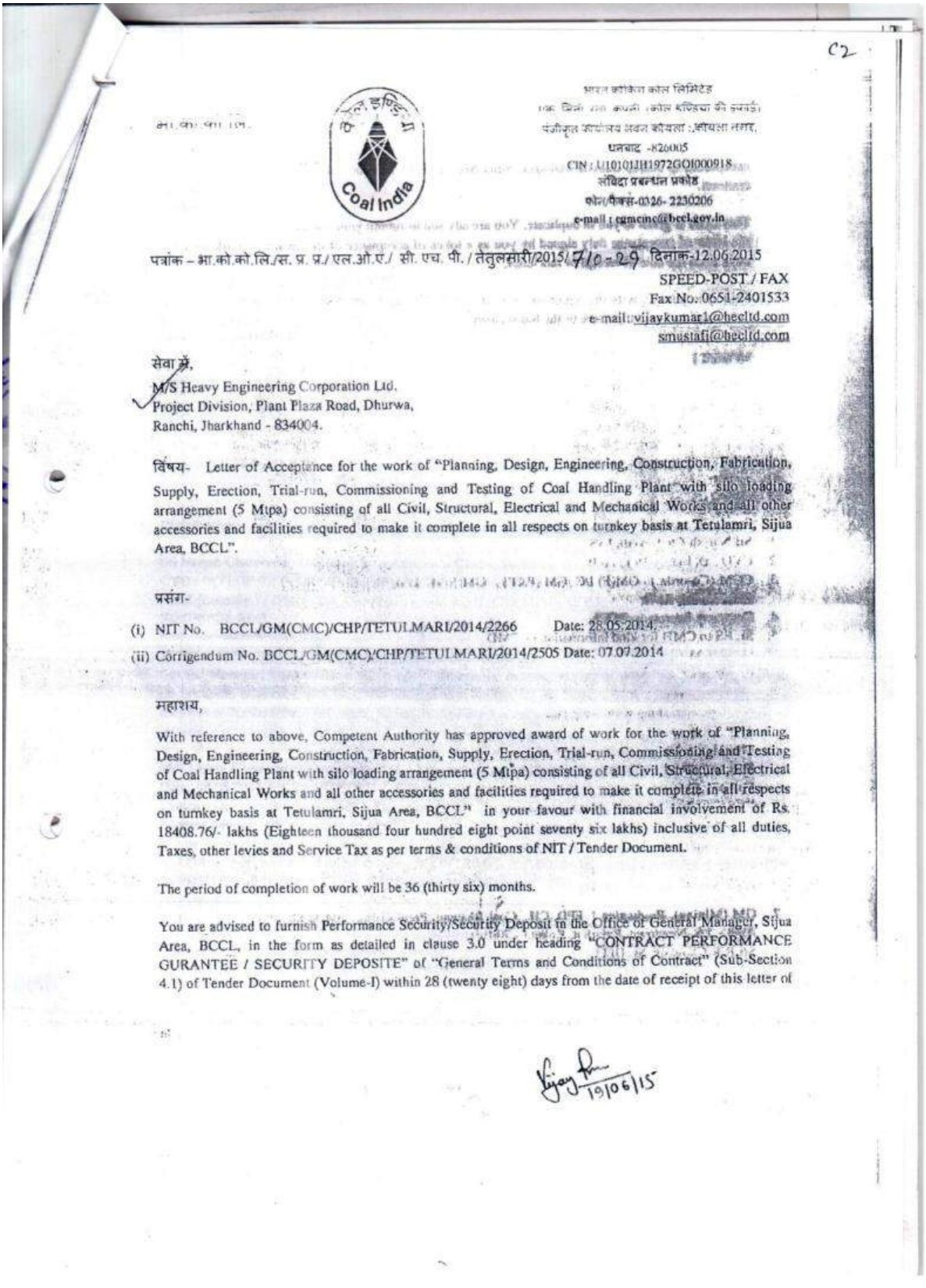
Sl. No.	Details of the sample	CO%	CO_2%	CH_4%	C_2H_6%	C_2H_2%	O_2%	H_2S%	H_2%	N_2%
13	EP stopping VIIIA seam at 11:50 a.m.	Nil	0.1876	Nil	Nil	Nil	20.4178	Nil	Nil	79.3946
14	EP stopping VIII seam at 11.05 a.m.	Nil	0.1389	Nil	Nil	Nil	20.8814	Nil	Nil	78.9797
15	Main return ½ Incline at 12:35 p.m.	Nil	0.1634	Nil	Nil	Nil	20.8603	Nil	Nil	78.9763

17/5/2018
(N. K. Hembram)
Senior Technical Assistant

17.5.18
(B. Munshi)
Senior Technical Assistant

(D. C. Panigrahi)
Professor & Incharge

Annexure 12- Copy of the work Order of Installation of Silo Loading



C2

भारत कोकिंग कोल लिमिटेड
एक मिनी रत्न कम्पनी (कोल इण्डिया की इकाई)
पंजीकृत कार्यालय भगत कोयला भवन, कोयला नगर,
धनबाद -826005
CIN : U10101JH1972GOI000918
संविदा प्रबन्धन प्रकोष्ठ
फोन/फैक्स-0326- 2230206
e-mail : cgmcinc@bccl.gov.in

पत्रांक – भा.को.को.लि./स. प्र. प्र./ एल.ओ.ए./ सी. एच. पी. / तेतुलमारी/2015/710 - 29 दिनांक-12.06.2015

SPEED-POST / FAX
Fax No: 0651-2401533
e-mail: vijaykumar1@heclid.com
smustafi@heclid.com

सेवा में,
M/S Heavy Engineering Corporation Ltd.
Project Division, Plant Plaza Road, Dhurwa,
Ranchi, Jharkhand - 834004.

विषय- Letter of Acceptance for the work of "Planning, Design, Engineering, Construction, Fabrication, Supply, Erection, Trial-run, Commissioning and Testing of Coal Handling Plant with silo loading arrangement (5 Mtpa) consisting of all Civil, Structural, Electrical and Mechanical Works and all other accessories and facilities required to make it complete in all respects on turnkey basis at Tetulamri, Sijua Area, BCCL".

प्रसंग-

(i) NIT No. BCCL/GM(CMC)/CHP/TETULMARI/2014/2266 Date: 28.05.2014.

(ii) Corrigendum No. BCCL/GM(CMC)/CHP/TETULMARI/2014/2505 Date: 07.07.2014

महाशय,

With reference to above, Competent Authority has approved award of work for the work of "Planning, Design, Engineering, Construction, Fabrication, Supply, Erection, Trial-run, Commissioning and Testing of Coal Handling Plant with silo loading arrangement (5 Mtpa) consisting of all Civil, Structural, Electrical and Mechanical Works and all other accessories and facilities required to make it complete in all respects on turnkey basis at Tetulamri, Sijua Area, BCCL" in your favour with financial involvement of Rs. 18408.76/- lakhs (Eighteen thousand four hundred eight point seventy six lakhs) inclusive of all duties, Taxes, other levies and Service Tax as per terms & conditions of NIT / Tender Document.

The period of completion of work will be 36 (thirty six) months.

You are advised to furnish Performance Security/Security Deposit in the Office of General Manager, Sijua Area, BCCL, in the form as detailed in clause 3.0 under heading "CONTRACT PERFORMANCE GURANTEE / SECURITY DEPOSITE" of "General Terms and Conditions of Contract" (Sub-Section 4.1) of Tender Document (Volume-I) within 28 (twenty eight) days from the date of receipt of this letter of

Vijay Kr 19/06/15

acceptance to enable General Manager, Sijua Area, BCCL, to issue formal work order to you and sign the contract.

This LOA is given to you in duplicate. You are advised to submit your consent by returning second copy of the letter of acceptance duly signed by you as a token of acceptance of the award of work within 7(seven) days from the date of receipt of this letter.

Failure to comply with the requirement as above shall constitute sufficient ground for cancellation of the award of work and forfeiture of the bid security.

धन्यवाद।

भवदीय

Sd/-

GM (CMC)
Bharat Coking Coal Limited

Distribution:

1. Sri Naresh Chaturvedi, IAS (Retd.), Address :- CL-14, Sector-II, Salt Lake, Kolkata- 700091.
2. CVO / D(T) OP /D(T) P&P /D(F) /D(P), BCCL.
3. CGM (Co-ordn.) / GM(F) I/C /GM (P&P) / GM(MM) /GM(E&M)I/C/ GM (Civil)/ GM (System), BCCL/ RD,CMPDI, RI-II.
4. Company Secretary, BCCL.
5. Sr. ES to CMD for kind information of CMD.
6. General Manager, Sijua Area, BCCL: Copy of Resolution item no. 3153 U of BCCL Board, all documents, i.e. complete original tender files, Bid documents submitted by the bidders, TCR , Approved estimate etc are to be collected from CMC deptt. for issuance of work order and execution of agreement after signing of Integrity Pact along with compliance of other formalities from your end.

   M/S Heavy Engineering Corporation Ltd. have submitted EMD in form of B.G No: 0962014BG0000157 Date: 08.08.2014 for Rs 50,00,000/- (Fifty lakhs) issued by State Bank of India, SME Branch, Mecon Campus, Doranda, Ranchi-834002. **Please note that the validity of the BG submitted by the Agency as Earnest Money will expire on 06.09.2015.** It is requested to kindly intimate the undersigned immediately in case Performance Security/Security Deposit is not submitted by the contractor within 28 days of receipt of LOA as per clause 3.0 under heading "CONTRACT PERFORMANCE GURANTEE/ SECURITY DEPOSITE" of "General Terms and Conditions of Contract" (Sub-section 4.1) of Tender Document (Volume-I).

7. GM (Mining), Production / FPD, CIL, Coal Bhawan, Premise No. – 04 MAR, Plot No. – AF-III, Action Area – 1A, Newtown, Rajarhat, Kolkata - 700156.
8. Sri R K Choubey, Sr. DEO, CMC Deptt. – For uploading this LOA in BCCL Website.

GM (CMC)
Bharat Coking Coal Limited

Vijay Rm
15/06/15

Annexure13- Data regarding backfilling and reclamation for Cluster V

YEARLY REPORT OF MINE CLOSURE ACTIVITIES

(As per clause 7 of annexure of the Guidelines for preparation of Mine Closure Plan, No.55011-01-2009-CPAM dated 07.01.2013 to be submitted before 1st July of every year)

Date:

To
The Coal Controller,
Office of the Coal Controller,
1, Council House Street,
Kolkata – 700 001.

Sir,
Please find herewith the yearly report of Mine Closure Activities for the year 2017 18 for .....**MUDIDIH**..... Mine of...**BHARAT COKING COAL LIMITED**..... company as given below:-

1	Name of the **coal**/lignite **mine**/block:	MUDIDIH Colliery
	a) Type: OPC/UG/Mixed	UG
	b) Total life of the mine:	17 Years as per Mine Closure Plan for UG
	c) Balance life of the mine:	12 Years as per Mine Closure Plan for UG
2	Name of the Owner:	Shri Deval Gangopadhyay, Director (T) P&P
3	Address of the Owner:	Koyla Bhawan , Koyla Nagar, Dhanbad-826005
4	i) Leasehold Area of the Mine:	378.05 Ha
	ii) Project Area of the Mine:	Ha
5	Mine Closure Plan approved By **BCCL Board**..... on (date):	September, 2013
6	Escrow Account number:	00150100008829
7	Name & address of Escrow Agent:	Bank of Baroda, Jharia Road, Dhanbad
8	Closure Cost deposited for the year 2017-18	Rs. 143.72 Lakhs
9	Cumulative Balance including interest in the account:	Rs. 754.64 Lakhs
10	Report being submitted for:	Progressive Mine Closure
11	Specific condition imposed. (if any, by Government agency):	NA
12	Reserves of Coal/Lignite(as per Mining Plan):	5.5 MT Mineable reserve as per Mine Closure Plan
	Coal/Lignite actually mined out during last year (2017-18):	0.0267 MT
13	Method of Mining:	UG
14	Area Mined out (Ha):	NIL Ha. in 2017-18
15	Area reclaimed	i) Physical: NIL in 2017-18 ii) Biological: NIL in 2017-18

16	Details of afforestation:	NIL in 2017-18
17	Water Quality Management	
	a) Water bodies available in leasehold area:	Sendra Jore,
	b) Measures taken for Protection: (Control of erosion, sedimentation, siltation, water treatment, diversion of water courses if any, measure for protection of contamination of ground water from leaching etc shall be described)	Drain Cleaning, Embankment and Strengthening
	c) Quantity of water pumped out from mine/Quarry	Monsoon-2000 GPM (As per Mine Closure Plan) Lean Period-1500 GPM (As per Mine Closure Plan)
	d) Quality of water (as per test result):	Mine water quality report for Cluster V attached
	e) Corrective measures taken confronting to the permissible limit:	Parameters of Mine water Within limit as above
	f) Is there any acid mine Drainage? If yes, the treatment method taken:	No
18	Air Quality Management	
	i) Existing air quality parameters:	Ambient air quality Monitoring Report Attached
	ii) Corrective measures taken for prevention of air pollution:	Regular water sprinkling on haul roads, approach roads and transportation roads Controlled Blasting
19	Waste Management	
	a) Quantity of overburden removal:	NA (In 2017-18)
	b) Quantity of Coal/Lignite reject generated:	NA
	c) Utilization of Waste Material done:	OB Dumping
	d) Protective Measures taken for prevention of siltation, erosion and dust generator for waste material:	Proper benching, Slope Maintenance
	e) Quantity of waste material rehandled/back-filled:	NIL IN 2017-18
	f) Height of dump and its stability measures taken:	Less than 60 M, Slope stability and benching
	g) After backfilling if left out area is filled with water or not (at the time of final closure)	Final Closure Stage yet to be reached

20	Top Soil Management	
	a) Top Soil available at site:	NA
	b) Utilization of the top soil during 2016-17:	

21	a) Coal Beneficiation facilities adopted:	CHP
	b) Maintenance of coal washeries being done:	No Coal Washery is present in MUDIDIH Colliery
	c) Dismantling of structure of washery (describe briefly if any):	NA

22. Subsidence management (for UG mine): UG mining is not being done in MUDIDH Colliery

23. Infrastructure:

Existing infrastructural facilities available	**Future Utilisation**	**Maintenance**
Roads	Will be handed over to state govt. if fit to use or will be dismantled	Being Maintained
Aerial Ropeways	NA	
Conveyor Belts	NA	
Railways	NA	
Bridge, Culverts	Will be handed over to state govt. if fit to use or will be dismantled	Being Maintained
Powerlines	Will be utilized for neighboring project if fit to use or will be dismantled	Being Maintained
Building & Structures	Will be handed over to state govt. if fit to use or will be dismantled	Being Maintained
Water Treatment Plant	NA	Being Maintained
Water Supply Sources	Will be handed over to state govt. if fit to use or will be dismantled	Being Maintained
Gas Pipeline	NA	
Sewer Line	Will be utilized for neighboring project if fit to use or will be dismantled	Being Maintained
Telephone Cables	Will be utilized for neighboring project if fit to use or will be dismantled	Being Maintained

Underground Tanks	Will be utilized for neighboring project if fit to use or will be dismantled	Being Maintained
Electric Cable	Will be utilized for neighboring project if fit to use or will be dismantled	Being Maintained
Transformers	Will be utilized for neighboring project if fit to use or will be dismantled	Being Maintained

Describe if decommissioning, dismantling or disposal is done of the above items during 2017-18(if any): NA

24. Disposal of Machinery:

Decommissioning of Mining Machinery and their possible post mining utilization:	Final Closure Stage yet to be reached

25 Safety and Security:

a	Safety measures implemented to prevent access to surface opening for Underground working (barbed wire fencing done):	Final Closure Stage yet to be reached
b	Safety measures implemented to prevent access to surface opening for excavation:	Final Closure Stage yet to be reached
c	Arrangement made up to the site being opened for general public:	Not open for general Public
D	Sealing of mine entries:	Being Done

26. Economic Repercussions of Closure of Mine

a	Number of local residents employed in the mine:	Final Closure Stage yet to be reached. Will be assessed at the time of final closure
b	Compensation given to the employees concerning their sustenance:	NA
c	Vocational / skill development training for sustainable income of affected people:	Being imparted

27. Any other closure activities as per approved Mine Closure Plan: NA

28. Post Environmental Monitoring for 3 years (to be given after closing of mine): Final Closure Stage is yet to be reached

The above information given is true to the best of my knowledge.

(Signature of Competent Authority)

Name:Shri J. K. Jaiswal
Designation:Project Officer
Date with seal:

YEARLY REPORT OF MINE CLOSURE ACTIVITIES

(As per clause 7 of annexure of the Guidelines for preparation of Mine Closure Plan, No.55011-01-2009-CPAM dated 07.01.2013 to be submitted before 1st July of every year).

To

Date:

The Coal Controller,
Office of the Coal Controller,
1, Council House Street,
Kolkata – 700 001.

Sir,

Please find herewith the yearly report of Mine Closure Activities for the year 2017-18 for .....NICHITPUR..... Mine of ..BHARAT COKING COAL LIMITED..... company as given below:

1	Name of the coal/lignite mine/block:	NICHITPUR Colliery
	a) Type: OCP/UG/Mixed	OCP
	b) Total life of the mine:	10 Years as per Mine Closure Plan for OCP
	c) Balance life of the mine:	05 Years as per Mine Closure Plan for OCP
2	Name of the Owner	Shri Deval Gangopadhyay, Director (T) P&P
3	Address of the Owner	Koyla Bhawan , Koyla Nagar, Dhanbad 826005
4	i) Leasehold Area of the Mine	150.00 Ha
✓	ii) Project Area of the Mine:	122.73 Ha
5	Mine Closure Plan approved By **BCCL Board**..... on (date):	September, 2013
6	Escrow Account number:	00150100008825
7	Name & address of Escrow Agent:	Bank of Baroda, Jharia Road, Dhanbad
8	Closure Cost deposited for the year 2017-18	Rs. 121.14 Lakhs
9	Cumulative Balance including interest in the account:	Rs. 636.24 Lakhs
10	Report being submitted for:	Progressive Mine Closure
11	Specific condition imposed, (if any, by Government agency).	NA
12	Reserves of Coal/Lignite(as per Mining Plan):	20.834 MT as per Mine Closure Plan
	Coal/Lignite actually mined out during last year (2017-18).	0.4607 MT
13	Method of Mining:	Open Cast
14	Area Mined out (Ha).	NIL Ha. in 2017-18
15	Area reclaimed	i) Physical: NIL in 2017-18
		ii) Biological: NIL in 2017-18

16	Details of afforestation:	500 in 2017-18
17	Water Quality Management	
	a) Water bodies available in leasehold area:	Nagri Jore, Ekra Jore
	b) Measures taken for Protection: (Control of erosion, sedimentation, siltation, water treatment, diversion of water courses if any, measure for protection of contamination of ground water from leaching etc shall be described)	Drain Cleaning, Embankment and Strengthening
	c) Quantity of water pumped out from mine/Quarry	Monsoon-1200 GPM (As per Mine Closure Plan) Lean Period-800 GPM (As per Mine Closure Plan)
	d) Quality of water (as per test result):	Mine water quality report for Cluster V attached
	e) Corrective measures taken confronting to the permissible limit:	Parameters of Mine water Within limit as above
	f) Is there any acid mine Drainage? If yes, the treatment method taken:	No
18	Air Quality Management	
	i) Existing air quality parameters:	Ambient air quality Monitoring Report Attached
	ii) Corrective measures taken for prevention of air pollution:	Regular water sprinkling on haul roads, approach roads and transportation roads Controlled Blasting
19	Waste Management	
	a) Quantity of overburden removal:	4152535 Cubic Metre (In 2017-18)
	b) Quantity of Coal/Lignite reject generated:	NA
	c) Utilization of Waste Material done:	OB Dumping
	d) Protective Measures taken for prevention of siltation, erosion and dust generator for waste material:	Proper benching, Slope Maintenance
	e) Quantity of waste material rehandled/back-filled.	NIL IN 2017 18
	f) Height of dump and its stability measures taken:	Less than 60 M, Slope stability and benching
	g) After backfilling if left out area is filled with water or not (at the time of final closure)	Final Closure Stage yet to be reached

20	Top Soil Management	
	a) Top Soil available at site:	NA
	b) Utilization of the top soil during 2016-17:	

21	a) Coal Beneficiation facilities adopted:	CHP
	b) Maintenance of coal washeries being done:	No Coal Washery is present in NICHITPUR Colliery
	c) Dismantling of structure of washery (describe briefly if any):	NA

22. Subsidence management (for UG mine). UG mining is not being done in NICHITPUR Colliery

23. Infrastructure:

Existing infrastructural facilities available	Future Utilisation	Maintenance
Roads	Will be handed over to state govt. if fit to use or will be dismantled	Being Maintained
Aerial Ropeways	NA	
Conveyor Belts	NA	
Railways	NA	
Bridge, Culverts	Will be handed over to state govt. if fit to use or will be dismantled	Being Maintained
Powerlines	Will be utilized for neighboring project if fit to use or will be dismantled	Being Maintained
Building & Structures	Will be handed over to state govt. if fit to use or will be dismantled	Being Maintained
Water Treatment Plant	NA	Being Maintained
Water Supply Sources	Will be handed over to state govt. if fit to use or will be dismantled	Being Maintained
Gas Pipeline	NA	
Sewer Line	Will be utilized for neighboring project if fit to use or will be dismantled	Being Maintained

Telephone Cables	Will be utilized for neighboring project if fit to use or will be dismantled	Being Maintained
Underground Tanks	Will be utilized for neighboring project if fit to use or will be dismantled	Being Maintained
Electric Cable	Will be utilized for neighboring project if fit to use or will be dismantled	Being Maintained
Transformers	Will be utilized for neighboring project if fit to use or will be dismantled	Being Maintained

Describe if decommissioning, dismantling or disposal is done of the above items during 2017-18(if any): NA

24. Disposal of Machinery:

Decommissioning of Mining Machinery and their possible post mining utilization:	Final Closure Stage yet to be reached

25 Safety and Security:

a	Safety measures implemented to prevent access to surface opening for Underground working (barbed wire fencing done):	Final Closure Stage yet to be reached
b	Safety measures implemented to prevent access to surface opening for excavation:	Final Closure Stage yet to be reached
c	Arrangement made up to the site being opened for general public:	Not open for general Public
D	Sealing of mine entries:	Being Done

26. Economic Repercussions of Closure of Mine

a	Number of local residents employed in the mine:	Final Closure Stage yet to be reached. Will be assessed at the time of final closure
b	Compensation given to the employees concerning their sustenance:	NA

c	Vocational / skill development training for sustainable income of affected people	Being imparted

27. Any other closure activities as per approved Mine Closure Plan: NA

28. Post Environmental Monitoring for 3 years (to be given after closing of mine): Final Closure Stage is yet to be reached

The above information given is true to the best of my knowledge.

26/07/18

(Signature of Competent Authority)

Name:Shri Kamlesh Kumar Sinha
Designation:Project Officer
Date with seal:

Project Officer
Nichitpur Colliery
Bharat Coking Coal Ltd.
Sijua Area, P.O.-Bansjora
Dist-Dhanbad-828101

YEARLY REPORT OF MINE CLOSURE ACTIVITIES

(As per clause 7 of annexure of the Guidelines for preparation of Mine Closure Plan, No.55011-01-2009-CPAM dated 07.01.2013 to be submitted before 1st July of every year).

Date:

To
The Coal Controller,
Office of the Coal Controller,
1, Council House Street,
Kolkata – 700 001.

Sir,
Please find herewith the yearly report of Mine Closure Activities for the year 2017-18 for .....**SENDRA BANSJORA**.....mine of...**BHARAT COKING COAL LIMITED**.....company as given below:-

1	Name of the coal/lignite mine/block:	Sendra Bansjora Colliery
	a) Type: OPC/UG/Mixed	OCP
	b) Total life of the mine:	23 Years as per Mine Closure Plan
	c) Balance life of the mine:	16 Years as per Mine Closure Plan
2	Name of the Owner:	Shri Deval Gangopadhyay, Director (T) P&P
3	Address of the Owner:	Koyla Bhawan , Koyla Nagar, Dhanbad-826005
4	i) Leasehold Area of the Mine:	249.63 Ha (As per Mine Closure Plan)
	ii) Project Area of the Mine:	150.00 Ha (As per Mine Closure Plan)
5	Mine Closure Plan approved By BCCL Board..... on (date):	September, 2013
6	Escrow Account number:	00150100008832
7	Name & address of Escrow Agent:	Bank of Baroda, Jharia Road, Dhanbad
8	Closure Cost deposited for the year 2017-18	Rs. 63.51 Lakhs
9	Cumulative Balance including interest in the account:	Rs. 337.25 Lakhs
10	Report being submitted for:	Progressive Mine Closure
11	Specific condition imposed. (if any, by Government agency):	NA
12	Reserves of Coal/Lignite(as per Mining Plan):	75.7495 MT
	Coal/Lignite actually mined out during last year (2017-18):	0.7515 MT
13	Method of Mining:	Open Cast
14	Area Mined out (Ha):	1.5 Ha. in 2017-18
15	Area reclaimed	i) Physical: NIL in 2017-18 ii) Biological: NIL in 2017-18

16	Details of afforestation:	NIL in 2017-18
17	Water Quality Management	
	a) Water bodies available in leasehold area:	Jores- Nagri Jore
	b) Measures taken for Protection: (Control of erosion, sedimentation, siltation, water treatment, diversion of water courses if any, measure for protection of contamination of ground water from leaching etc shall be described)	Drain Cleaning, Embankment and Strengthening
	c) Quantity of water pumped out from mine/Quarry	5800 GPM (As per Mine Closure Plan)
	d) Quality of water (as per test result):	Mine water quality report for Cluster V attached
	e) Corrective measures taken confronting to the permissible limit:	Parameters of Mine water Within limit as above
	f) Is there any acid mine Drainage? If yes, the treatment method taken:	No
18	Air Quality Management	
	i) Existing air quality parameters:	Ambient air quality Monitoring Report Attached
	ii) Corrective measures taken for prevention of air pollution:	Regular water sprinkling on haul roads, approach roads and transportation roads Controlled Blasting
19	Waste Management	
	a) Quantity of overburden removal:	3991940 Cubic Metre (In 2017-18)
	b) Quantity of Coal/Lignite reject generated:	NA
	c) Utilization of Waste Material done:	OB Dumping
	d) Protective Measures taken for prevention of siltation, erosion and dust generator for waste material:	Proper benching, Slope Maintenance
	e) Quantity of waste material rehandled/back-filled:	NIL IN 2017-18
	f) Height of dump and its stability measures taken:	60 M, Slope stability and benching
	g) After backfilling if left out area is filled with water or not (at the time of final closure)	Final Closure Stage yet to be reached

20	Top Soil Management	
	a) Top Soil available at site:	NA
	b) Utilization of the top soil during 2016-17:	

21	a) Coal Beneficiation facilities adopted:	CHP
	b) Maintenance of coal washeries being done:	No Coal Washery is present in Sendra Bansjora Colliery
	c) Dismantling of structure of washery (describe briefly if any):	NA

22. Subsidence management (for UG mine): UG mining is not being done in Sendra Bansjora Colliery

23. Infrastructure:

Existing infrastructural facilities available	Future Utilisation	Maintenance
Roads	Will be handed over to state govt. if fit to use or will be dismantled	Being Maintained
Aerial Ropeways	NA	
Conveyor Belts	NA	
Railways	Under Indian Railways	
Bridge, Culverts	Will be handed over to state govt. if fit to use or will be dismantled	Being Maintained
Powerlines	Will be utilized for neighbouing project if fit to use or will be dismantled	Being Maintained
Building & Structures	Will be handed over to state govt. if fit to use or will be dismantled	Being Maintained
Water Treatment Plant	Will be handed over to state govt. if fit to use or will be dismantled	Being Maintained
Water Supply Sources	Will be handed over to state govt. if fit to use or will be dismantled	Being Maintained
Gas Pipeline	NA	
Sewer Line	Will be utilized for neighbouring project if fit to use or will be dismantled	Being Maintained
Telephone Cables	Will be utilized for neighbouing project if fit to use or will be dismantled	Being Maintained

Underground Tanks	Will be utilized for neighbouing project if fit to use or will be dismantled	Being Maintained
Electric Cable	Will be utilized for neighbouing project if fit to use or will be dismantled	Being Maintained
Transformers	Will be utilized for neighbouing project if fit to use or will be dismantled	Being Maintained

Describe if decommissioning, dismantling or disposal is done of the above items during 2017-18(if any): NA

24. Disposal of Machinery:

Decommissioning of Mining Machinery and their possible post mining utilization:	Final Closure Stage yet to be reached

25 Safety and Security:

a	Safety measures implemented to prevent access to surface opening for Underground working (barbed wire fencing done):	Final Closure Stage yet to be reached
b	Safety measures implemented to prevent access to surface opening for excavation:	Final Closure Stage yet to be reached
c	Arrangement made up to the site being opened for general public:	Not open for general Public
D	Sealing of mine entries:	Being Done

26. Economic Repercussions of Closure of Mine

a	Number of local residents employed in the mine:	Final Closure Stage yet to be reached. Will be assessed at the time of final closure
b	Compensation given to the employees concerning their sustenance:	NA
c	Vocational / skill development training for sustainable income of affected people:	Being imparted

27. Any other closure activities as per approved Mine Closure Plan: NA

28. Post Environmental Monitoring for 3 years (to be given after closing of mine) Final Closure Stage is yet to be reached

The above information given is true to the best of my knowledge

(Signature of Competent Authority)

19/7/18

Name:Shri A.K.Singh
Designation:Project Officer
Date with seal:

YEARLY REPORT OF MINE CLOSURE ACTIVITIES

(As per clause 7 of annexure of the Guidelines for preparation of Mine Closure Plan, No.55011-01-2009-CPAM dated 07.01.2013 to be submitted before 1st July of every year).

To

Date: 18.07.18

The Coal Controller,
Office of the Coal Controller,
1, Council House Street,
Kolkata – 700 001.

Sir,

Please find herewith the yearly report of Mine Closure Activities for the year 2017-18 for .....**TETULMARI**..... Mine of...**BHARAT COKING COAL LIMITED**..... company as given below:-

1	Name of the **coal**/lignite **mine**/block:	TETULMARI Colliery
	a) Type: OPC/UG/Mixed	OCP (MIXED)
	b) Total life of the mine:	12 Years as per Mine Closure Plan for OCP 30 Years as per Mine Closure Plan for UG
	c) Balance life of the mine:	08 Years as per Mine Closure Plan for OCP 26 Years as per Mine Closure Plan for UG
2	Name of the Owner:	Shri Deval Gangopadhyay, Director (T) P&P
3	Address of the Owner:	Koyla Bhawan , Koyla Nagar, Dhanbad-826005
4	i) Leasehold Area of the Mine: ii) Project Area of the Mine:	177.50 Ha 134.00 Ha
5	Mine Closure Plan approved By **BCCL Board**..... on (date):	September, 2013
6	Escrow Account number:	00150100008833
7	Name & address of Escrow Agent:	Bank of Baroda, Jharia Road, Dhanbad
8	Closure Cost deposited for the year 2017-18	Rs. 156.99 Lakhs
9	Cumulative Balance including interest in the account:	Rs. 824.57 Lakhs
10	Report being submitted for:	Progressive Mine Closure
11	Specific condition imposed. (if any, by Government agency):	NA
12	Reserves of Coal/Lignite(as per Mining Plan): Coal/Lignite actually mined out during last year (2017-18):	(Mining Plan is under preparation) 0.6604 MT
13	Method of Mining:	Open Cast
14	Area Mined out (Ha):	6.0 Ha. in 2017-18
15	Area reclaimed	i) Physical: NIL in 2017-18 ii) Biological: NIL in 2017-18

16	Details of afforestation:	1500 in 2017-18
17	Water Quality Management	
	a) Water bodies available in leasehold area:	Jore, Pond
	b) Measures taken for Protection: (Control of erosion, sedimentation, siltation, water treatment, diversion of water courses if any, measure for protection of contamination of ground water from leaching etc shall be described)	Drain Cleaning, Embankment and Strengthening
	c) Quantity of water pumped out from mine/Quarry	Monsoon-29177 KLD (As per Mine Closure Plan) Lean Period-18816 KLD (As per Mine Closure Plan)
	d) Quality of water (as per test result):	Mine water quality report for Cluster V attached
	e) Corrective measures taken confronting to the permissible limit:	Parameters of Mine water Within limit as above
	f) Is there any acid mine Drainage? If yes, the treatment method taken:	No
18	Air Quality Management	
	i) Existing air quality parameters:	Ambient air quality Monitoring Report Attached
	ii) Corrective measures taken for prevention of air pollution:	Regular water sprinkling on haul roads, approach roads and transportation roads Controlled Blasting
19	Waste Management a) Quantity of overburden removal:	2493511 Cubic Metre (In 2017-18)
	b) Quantity of Coal/Lignite **reject** generated:	NA
	c) Utilization of Waste Material done:	OB Dumping
	d) Protective Measures taken for prevention of siltation, erosion and dust generator for waste material:	Proper benching, Slope Maintenance
	e) Quantity of waste material rehandled/back-filled:	NIL IN 2017-18
	f) Height of dump and its stability measures taken:	Less than 60 M, Slope stability and benching
	g) After backfilling if left out area is filled with water or not (at the time of final closure)	Final Closure Stage yet to be reached

20	Top Soil Management	
	a) Top Soil available at site:	NA
	b) Utilization of the top soil during 2016-17:	

21	a) Coal Beneficiation facilities adopted:	CHP
	b) Maintenance of coal washeries being done:	No Coal Washery is present in TETULMARI Colliery
	c) Dismantling of structure of washery (describe briefly if any):	NA

22. Subsidence management (for UG mine): UG mining is not being done in TETULMARI Colliery (No record of Subsidence)

23. Infrastructure:

Existing infrastructural facilities available	Future Utilisation	Maintenance
Roads	Will be handed over to state govt. if fit to use or will be dismantled	Being Maintained
Aerial Ropeways	NA	
Conveyor Belts	NA	
Railways	NA	
Bridge, Culverts	Will be handed over to state govt. if fit to use or will be dismantled	Being Maintained
Powerlines	Will be utilized for neighbouing project if fit to use or will be dismantled	Being Maintained
Building & Structures	Will be handed over to state govt. if fit to use or will be dismantled	Being Maintained
Water Treatment Plant	NA	Being Maintained
Water Supply Sources	Will be handed over to state govt. if fit to use or will be dismantled	Being Maintained
Gas Pipeline	NA	
Sewer Line	Will be utilized for neighbouring project if fit to use or will be dismantled	Being Maintained

Telephone Cables	Will be utilized for neighbouing project if fit to use or will be dismantled	Being Maintained
Underground Tanks	Will be utilized for neighbouing project if fit to use or will be dismantled	Being Maintained
Electric Cable	Will be utilized for neighbouing project if fit to use or will be dismantled	Being Maintained
Transformers	Will be utilized for neighbouing project if fit to use or will be dismantled	Being Maintained

Describe if decommissioning, dismantling or disposal is done of the above items during 2017-18(if any): NA

24. Disposal of Machinery:

Decommissioning of Mining Machinery and their possible post mining utilization:	Final Closure Stage yet to be reached

25 Safety and Security:

a	Safety measures implemented to prevent access to surface opening for Underground working (barbed wire fencing done):	Final Closure Stage yet to be reached
b	Safety measures implemented to prevent access to surface opening for excavation:	Final Closure Stage yet to be reached
c	Arrangement made up to the site being opened for general public:	Not open for general Public
D	Sealing of mine entries:	Being Done

26. Economic Repercussions of Closure of Mine

a	Number of local residents employed in the mine:	Final Closure Stage yet to be reached. Will be assessed at the time of final closure
b	Compensation given to the employees concerning their sustenance:	NA

c	Vocational / skill development training for sustainable income of affected people:	Being imparted

27. Any other closure activities as per approved Mine Closure Plan: NA

28. Post Environmental Monitoring for 3 years (to be given after closing of mine): Final Closure Stage is yet to be reached

The above information given is true to the best of my knowledge.

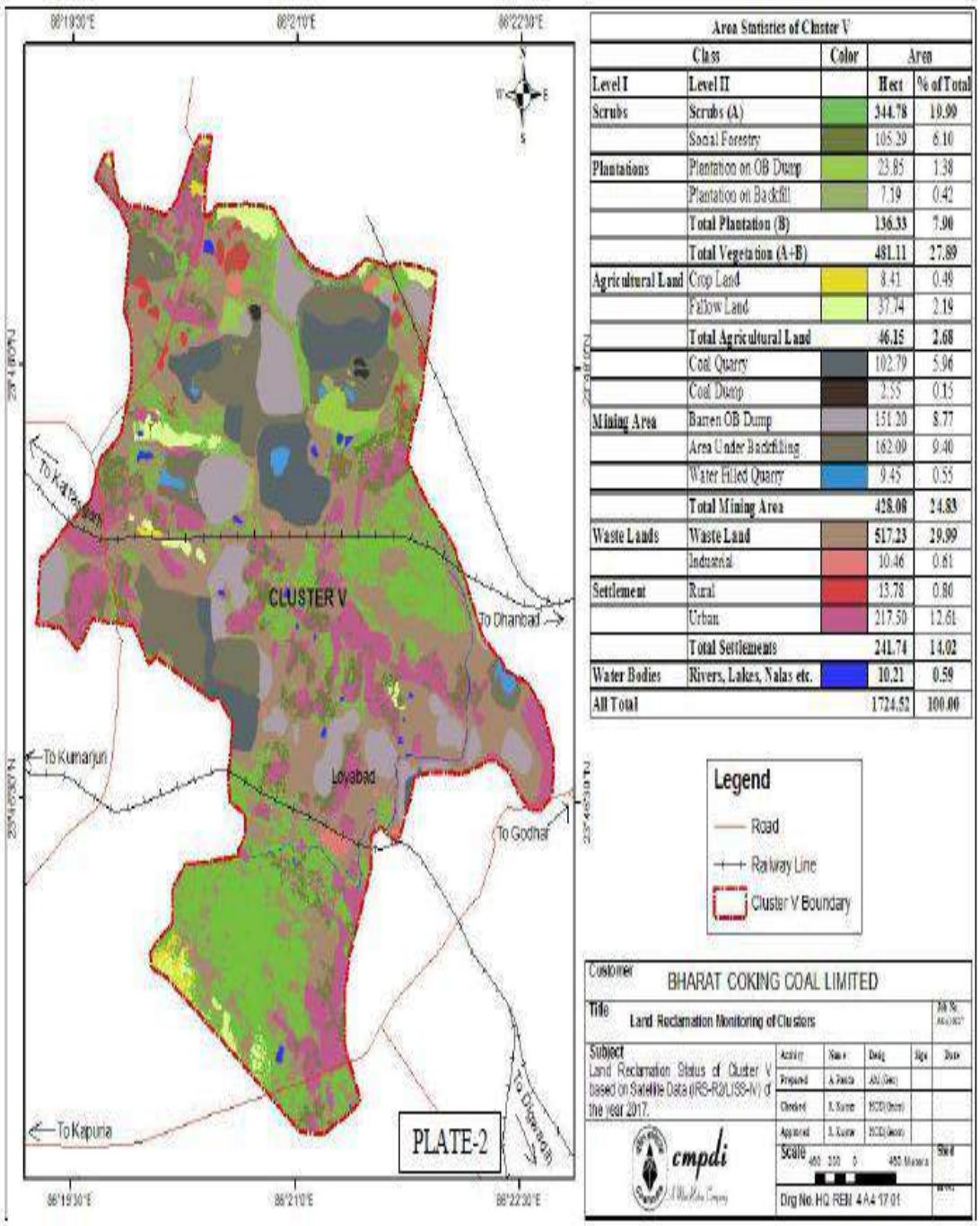
(Signature of Competent Authority)

18/7/18

PROJECT OFFICER
TETULMARI COLLIERY

Name:Shri Amit Sinha
Designation:Project Officer
Date with seal:

Annexure 14- Satellite based survey report of Land reclamation and restoration of the year 2017



Area Statistics of Cluster V				
Class		Color	Area	
Level I	Level II		Hect	% of Total
Scrubs	Scrubs (A)		344.78	19.99
	Social Forestry		105.29	6.10
Plantations	Plantation on OB Dump		23.85	1.38
	Plantation on Backfill		7.19	0.42
	Total Plantation (B)		**136.33**	**7.90**
	Total Vegetation (A+B)		**481.11**	**27.89**
Agricultural Land	Crop Land		8.41	0.49
	Fallow Land		37.74	2.19
	Total Agricultural Land		**46.15**	**2.68**
	Coal Quarry		102.79	5.96
	Coal Dump		2.55	0.15
Mining Area	Barren OB Dump		151.20	8.77
	Area Under Backfilling		162.09	9.40
	Water Filled Quarry		9.45	0.55
	Total Mining Area		**428.08**	**24.83**
Waste Lands	**Waste Land**		**517.23**	**29.99**
	Industrial		10.46	0.61
Settlement	Rural		13.78	0.80
	Urban		217.50	12.61
	Total Settlements		**241.74**	**14.02**
Water Bodies	Rivers, Lakes, Nalas etc.		10.21	0.59
All Total			1724.52	100.00

Legend
- Road
- Railway Line
- Cluster V Boundary

Customer: BHARAT COKING COAL LIMITED

Title: Land Reclamation Monitoring of Clusters

Subject: Land Reclamation Status of Cluster V based on Satellite Data (IRS-R2/LISS-IV) of the year 2017.

cmpdi

Scale: 450 225 0 450 Meters

Drg No. HQ REM 4A4 17 01

Annexure15- Inspection Report of Roadside Gabion Plantation from Shakti Chowk to Mohlidih

BHARAT COKING COAL LIMITED

Joint Inspection Report

Gabbion Plantation:- 2017 (2013-17)

Date:- 23.08.2017

1. Type of Gabbion:- Bamboo Gabion.
2. Total no. of Gabbion:- 1320
3. Species Planted in Gabbion:- ~~Kadam~~ Mango, Kathal, Mahogani, Semal, Neem, Bargad, Peepal, Kadam, Pelltoforum Goldmohar, etc.
4. Location:- Shakti Chowk to Mohlidih
5. Rate of survival:- 85-/.
6. Quality of the plant:- Very good.

BCCL Personnel's

(I) B. Modi, CM (M) - 23/8/17.

(II) R.N. Jha, (Dy M - Min) 23/8/17

(III) Adarsh Kumar (A.M. - Envt) - 23/8/17

(IV) Ashutosh Kumar (Area Surv. Off.) 23.8.17

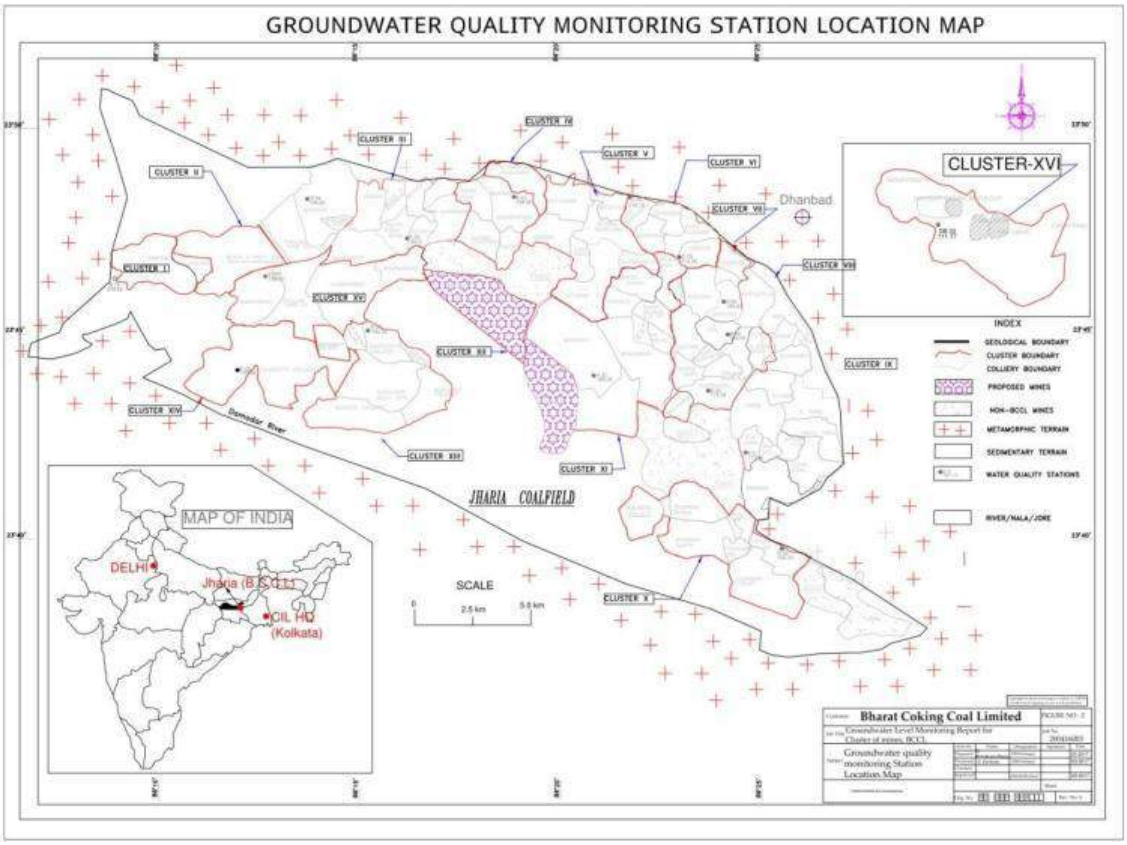
(V) Jameshwar Ram Dy Mgr (Survey) 23.8.17

Forest Personnel's

1) RANGE FOREST OFFICER TOPCHANCHI RANGE

2)

Annexure-16: Ground water Monitoring station map



Annexure-17

Groundwater Monitoring Report of Cluster V for 2018-19

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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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

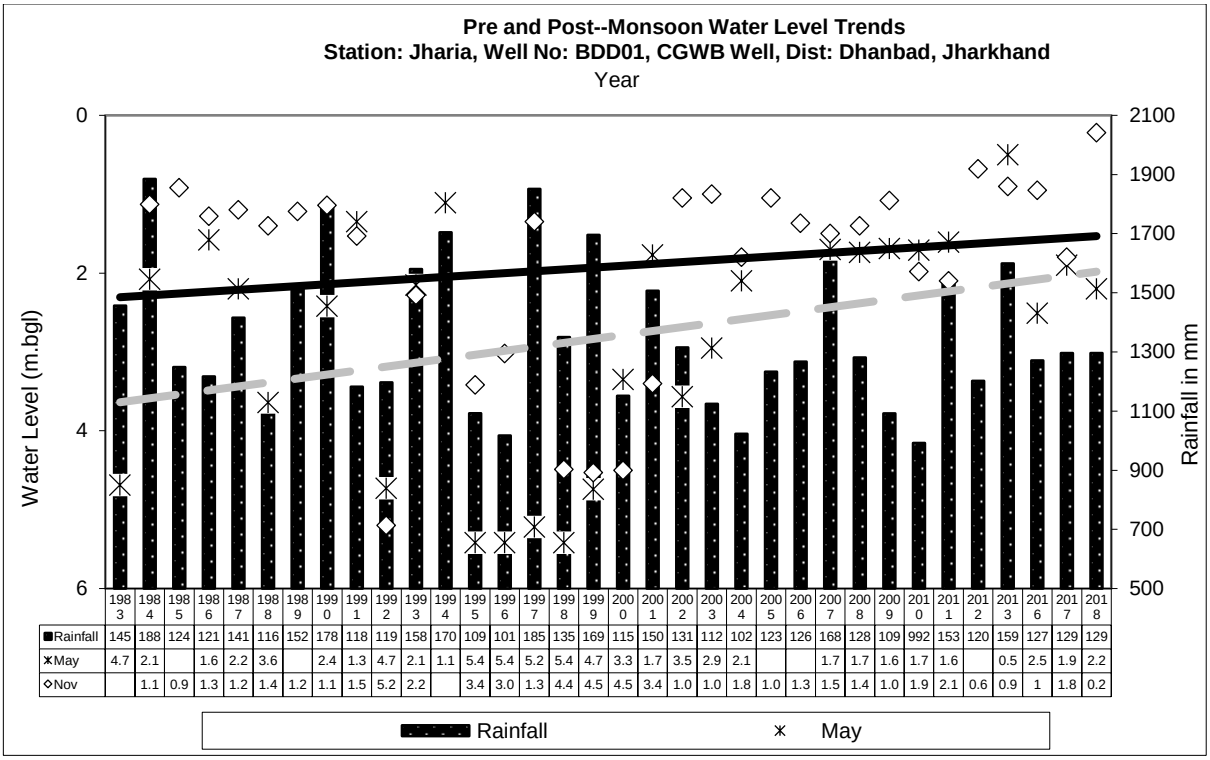
Historical Water Level data of Hydrograph Stations

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**

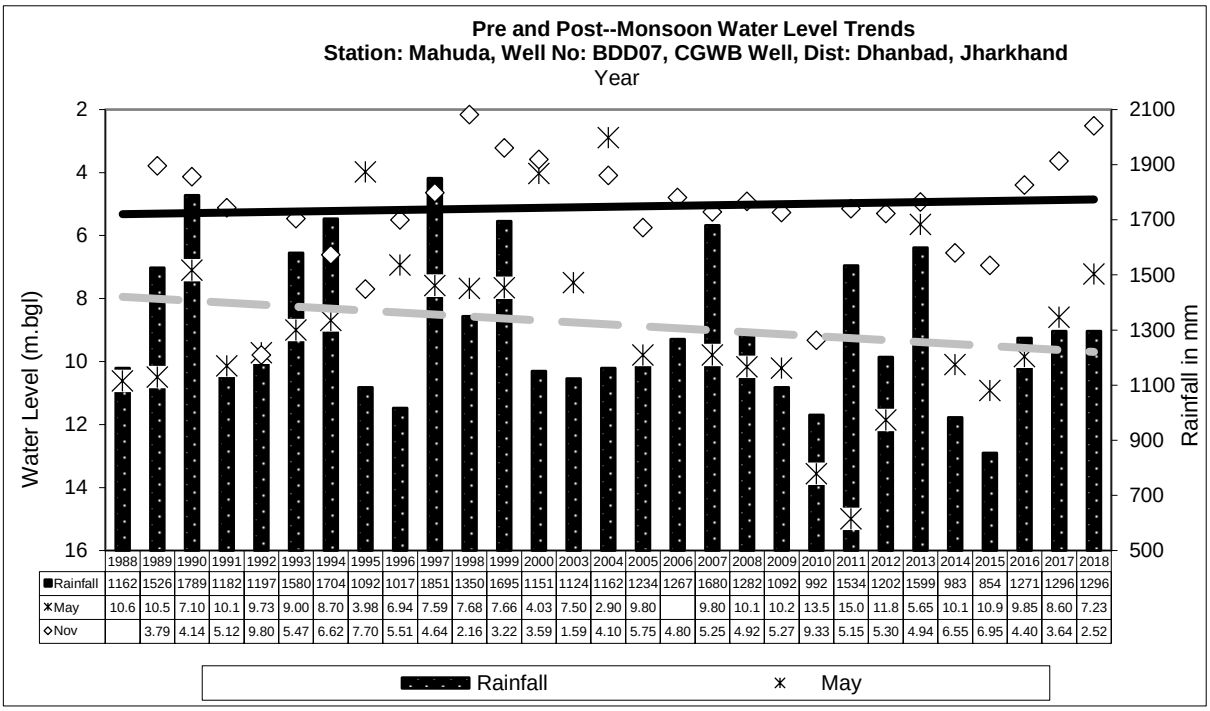
DB22		*2.43*	*2.38*	*8.18*	*2.64*	*6.48*	*3.03*	*4.59*	*3.53*	*5.38*	*3.33*	*1.93*	*1.63*	*2.34*	*1.93*
DB23		*2.90*	*2.33*	*5.05*	*3.10*	*3.95*	*2.13*	*3.38*	*6.04*	*5.30*	*0.90*	*2.05*	*1.90*	*2.85*	*1.75*
DB24		*-*	*-*	*-*	*8.25*	*-*	*8.45*	*9.52*	*8.20*	*10.65*	*6.50*	*5.80*	*3.78*	*8.25*	*5.70*
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



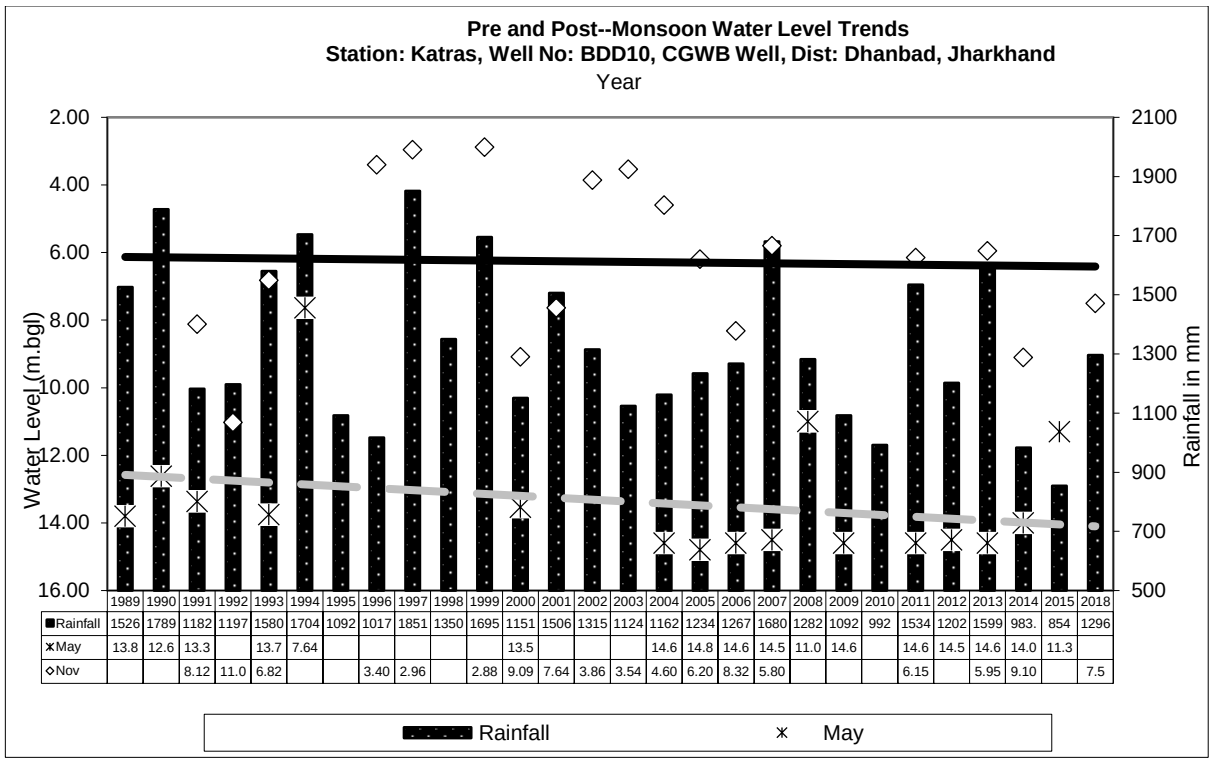
	1983	1984	1985	1986	1987	1988	1989	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018
Rainfall	145	188	124	121	141	116	152	178	118	119	158	170	109	101	185	135	169	115	150	131	112	102	123	126	168	128	109	992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



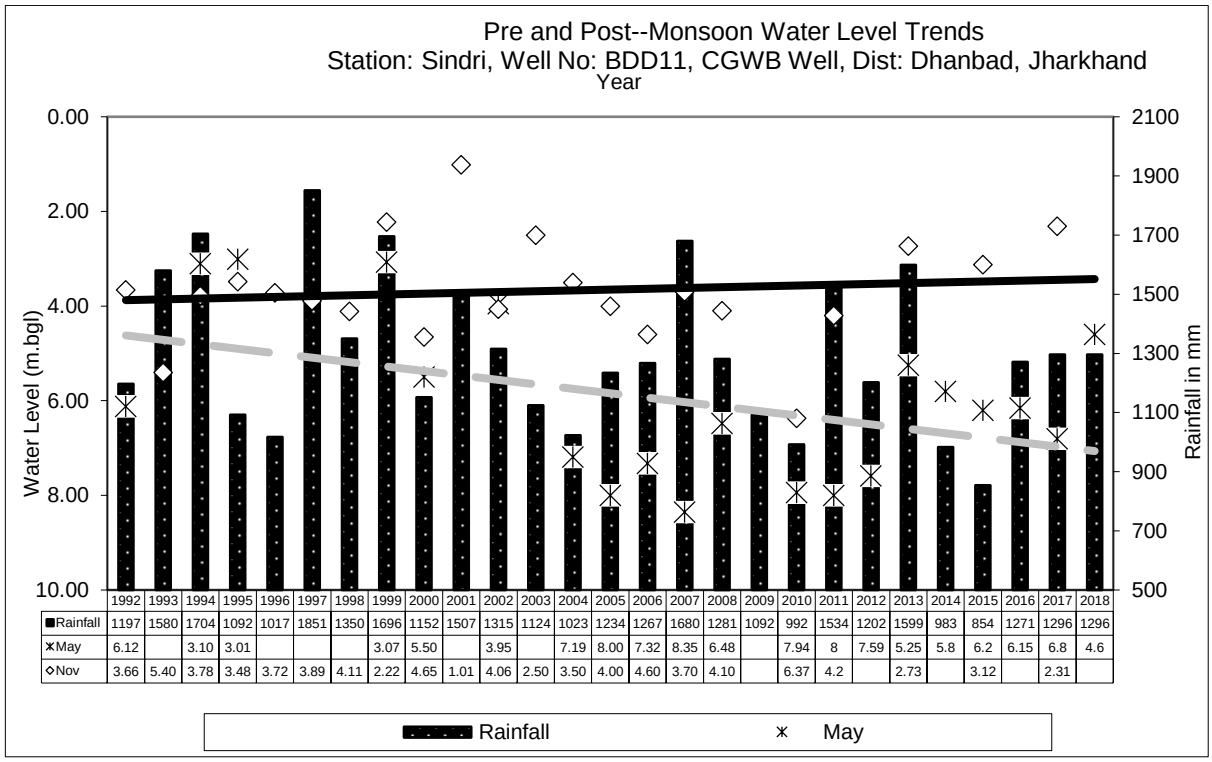
	1988	1989	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018
Rainfall	1162	1526	1789	1182	1197	1580	1704	1092	1017	1851	1350	1695	1151	1124	1162	1234	1267	1680	1282	1092	992	1534	1202	1599	983	854	1271	1296	1296
May	10.6	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_ac_{03}),, 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_aco_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_ac_{03}),, 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_{O3}),, 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

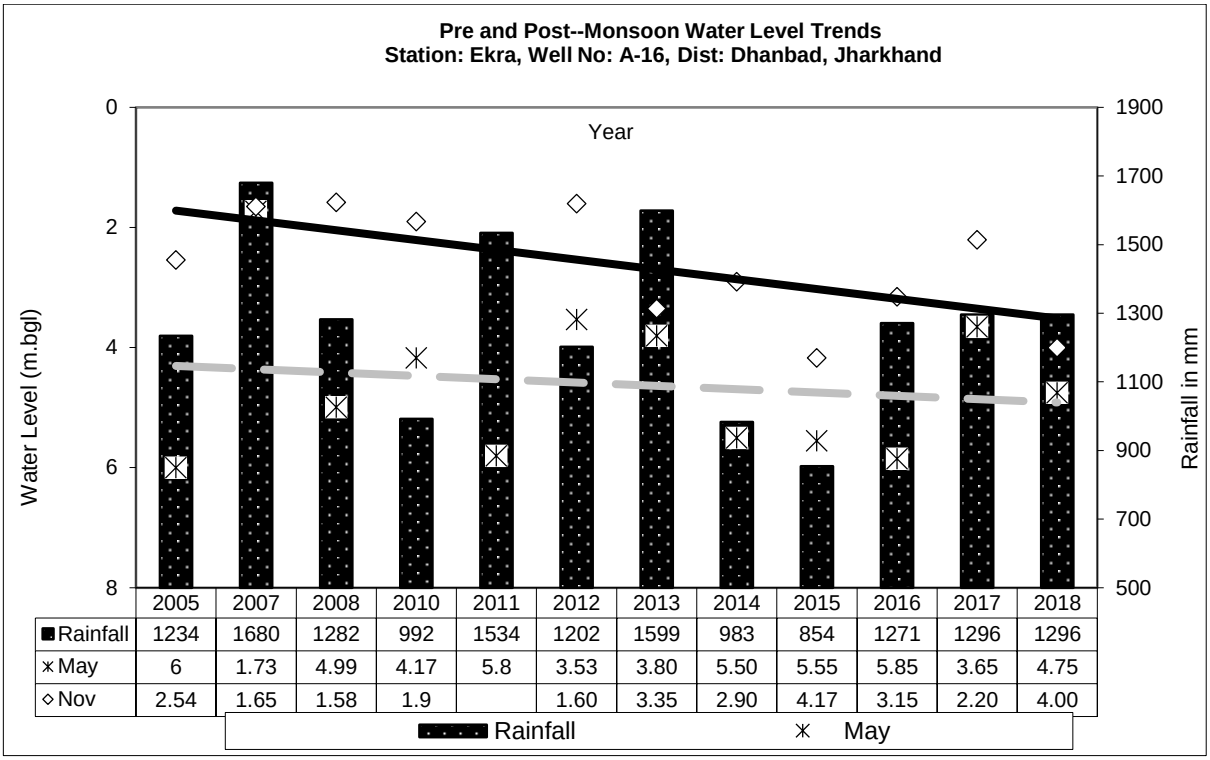
Sl. No	Parameter	*Sampling Stations*			Detection Limit	IS:10500 Drinking Water Standards	Standard / Test Method
		4	*5*	*6*			
1	Boron (as B), mg/l, Max	*<0.2*	*<0.2*	*<0.2*	0.20	*0.5*	APHA, 22nd Edition ,Carmine
2	Colour,in Hazen Units	*4*	*2*	*3*	1	*5*	APHA, 22nd Edition ,Pt.-Co. Method
3	Calcium (as 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_ac_{O3}),, 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*

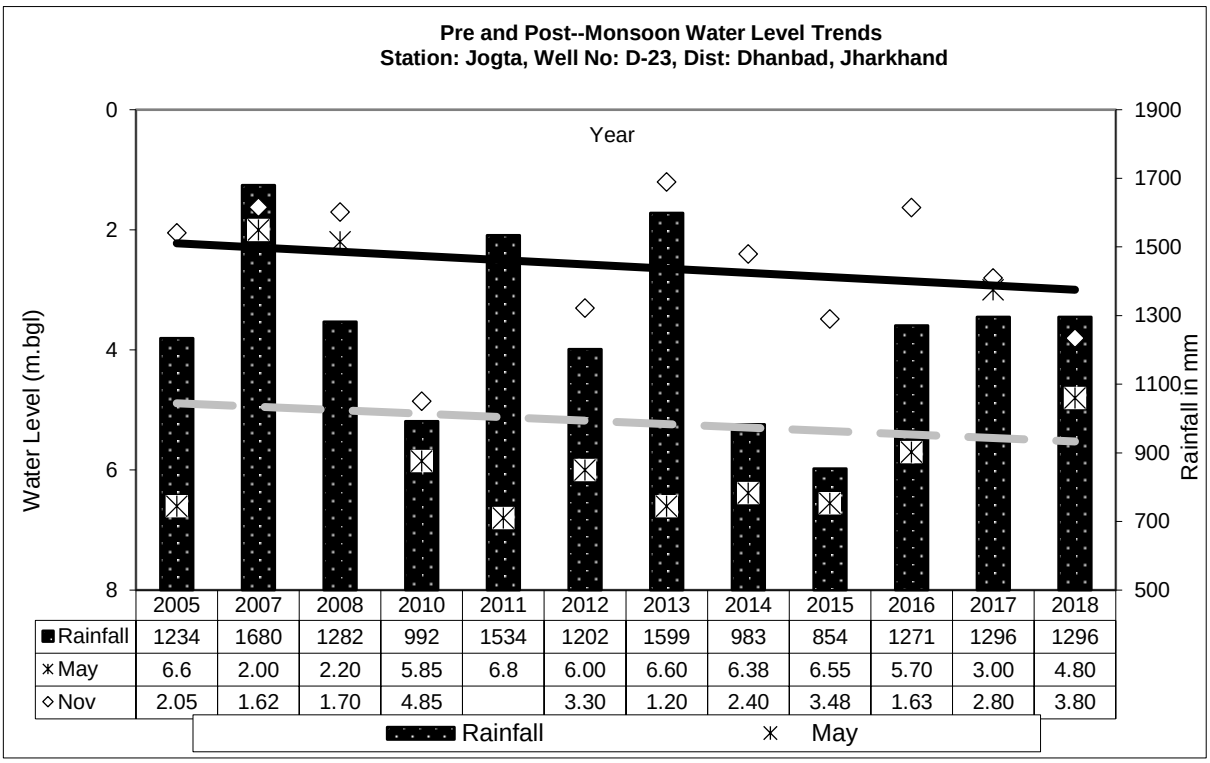
*****_Sampling location details and sampling date has been given in **Annexure-IV**._

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

Annexure 18- Analysis report of Mine **water discharge by CMPDIL at the monitoring point fixed in consultation with JSPCB**

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

(FOR THE Q.E. SEPTEMBER, 2018)

E. C. no. J-11015/01/2011-IA.II (M) dated 11.02.2013.

CMPDI
ISO 9001 Company
Regional Institute-II
Dhanbad, Jharkhand

CLUSTER - V

(FOR THE Q.E. SEPTEMBER, 2018)

CONTENTS

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WATER QUALITY REPORT
OF
BHARAT COKING COAL LIMITED
CLUSTER – V

(FOR THE Q.E. SEPTEMBER, 2018)

E. C. no. J-11015/01/2011-IA.II (M) dated 11.02.2013.

CMPDI

ISO 9001 Company
Regional Institute-II
Dhanbad, Jharkhand

EXECUTIVE SUMMARY

1.0 Introduction

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

Bharat Coking Coal Limited (BCCL), a Subsidiary company of Coal India Limited is operating Underground and Opencast Mines in Jharia Coalfield (JCF) is a part of Gondwana Coalfields located in Dhanbad district of Jharkhand, the JCF is bounded by $23^0$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 MoEFCC while granting environmental clearance of project, consent letter issued by the respective SPCB's, 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, wells/ 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 MoEFCC 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, Forest and Climate Change (MoEF&CC) ,Govt. of India.

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

Bharat Coking Coal has awarded Environmental Monitoring work of all Projects, Cluster wise, to Central Mine Planning & Design Institute Limited (CMPDIL). The environmental monitoring has been carried out as per conditions laid down by MoEF&CC while granting environmental clearance to different projects. CMPDIL 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-V is in the Northern part of the Jharia coalfield. It includes a group of 7 Mines (viz. Nichitpur, OCP, Mudidih colliery (Mixed), Tetulmari colliery (Mixed), Sendra Bansjora colliery (Mixed), Kankanee colliery (Mixed), Bansdeopur colliery (Mixed) and Loyabad colliery. The Cluster – V is situated about 25 - 30 kms from Dhanbad Railway Station. The mines of this Cluster – V are operating since pre-nationalization period (prior to 1972-73). It is connected by both Railway and Road. The drainage of the area is governed by Jarian Nala and Ekra Nala.

1.2 The Cluster-V is designed to produce 4.854 MTPA (normative) and 6.311 MTPA (peak) capacity of coal. The average grade of coal W – III & W- IV.

The Project has Environmental Clearance from Ministry of Environment, Forest and Climate Change (MoEF&CC) for a rated capacity 4.854 MTPA (normative) and 6.311 MTPA (peak) capacity of coal production vide letter no. J-11015/01/2010-IA.II (M) dated 11th 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 **Nichitpur Village (DW5)**

ii) Surface water quality at **U/S of Jarian Nala (SW12)**

iii) Surface water quality at **D/S of Jarian Nala (SW13)**

iv) Surface water quality at **U/S of Ekra Nala (SW15)**

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 and for 27 parameters on half yearly basis. The drinking and Surface water samples were collected and analyzed for 25 and 17 parameters respectively, on quarterly basis. Thereafter the samples were preserved and analyzed at the Environmental Laboratory at CMPDI (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

(SURFACE WATER- ALL PARAMETERS)

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

Name of the Cluster : **Cluster - V** Month: **Q. E.,SEPTEMBER, 2018**

Area : Sijua

Stations:

1. Upstream in Jarian Nala SW-12
2. Down stream in Jarian Nala SW-13
3. Upstream in Ekra Nala SW-15

Date of Sampling:

29/09/2018
29/09/2018
29/09/2018

Sl. No	Parameter	Sampling Stations				Detection Limit	IS:2296 – 1982 (Inland surface water) Class C	BIS Standard & Method
		SW-12	SW-13	Sw-15				
1	Arsenic (as As), mg/l, Max	<0.002	<0.002	<0.002		0.002	0.2	IS 3025/37:1988 R : 2003, AAS-VGA
2	BOD (3 days 27°C), mg/l, Max	2.4	2.6	2.2		2.00	300	IS 3025 /44: 1993, R : 2003 3 day incubation at 27°C
3	Colour	Colourless	colourless	Colourless		Qualitative	300	Physical/Qualitative
4	Chlorides (as Cl), mg/l, Max	44	30	48		2.00	600	IS-3025/32:1988, R-2007, Argentometric
5	Copper (as Cu), mg/l, Max	<0.001	<0.001	<0.001		0.03	1.5	IS 3025 /42 : 1992 R : 2009, AAS-Flame
6	Disolved Oxygen, min.	3.8	3.4	3.6		0.10	4	IS 3025/381989, R : 2003, Winkler Azide
7	Fluoride (as F) mg/l, Max	0.44	0.39	0.38		0.02	1.5	APHA, 22nd Edition SPADNS
8	Hexavalent Chromium, mg/l, Max	0.017	0.033	0.026		0.01	0.05	APHA, 22nd Edition, 1,5 - Diphenylcarbohydrazide
9	Iron (as Fe), mg/l, Max	0.24	<0.06	<0.06		0.06	50	IS 3025 /53 : 2003, R : 2009 , AAS-Flame
10	Lead (as Pb), mg/l, Max	<0.005	0.005	<0.005		0.005	0.1	APHA, 22nd Edition AAS-GTA
11	Nitrate (as NO_3), mg/l, Max	7.13	5.53	5.97		0.50	50	APHA, 22nd Edition, UV-Spectrphotometric
12	pH value	8.46	8.44	8.49		2.5	6.5-8.5	IS-3025/11:1983, R-1996, Electrometric
13	Phenolic compounds (as C_6H_5OH), mg/l, Max	<0.002	<0.002	<0.002		0.002	0.0005	APHA, 22nd Edition 4-Amino Antipyrine
14	Selenium (as Se), mg/l, Max	<0.002	<0.002	<0.002		0.002	0.05	APHA, 22nd Edition AAS-GTA
15	Sulphate (as SO_4) mg/l, Max	53	60	61		2.00	400	APHA, 22nd Edition Turbidity
16	Total Dissolved Solids, mg/l, Max	262	252	264		25.00	1500	IS 3025 /16:1984 R : 2006, Gravimetric
17	Zinc (as Zn), mg/l, Max	<0.01	<0.01	<0.01		0.01	5.0	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

(DRINKING WATER- ALL PARAMETERS)

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

Name of the Cluster : **Cluster - V** Month: **Q. E. SEPTEMBER, 2018**

Area : Sijua

Stations: Nichitpur Village DW-5 **Date of sampling: 31-08-2018**

Sl.No	Parameter	Result	Detection Limit	IS:10500 Drinking Water Standards	Standard / Test Method
1	Boron (as B), mg/l, Max	<0.2	0.20	0.5	APHA, 22nd Edition ,Carmine
2	Colour,in Hazen Units	6	1	5	APHA, 22nd Edition ,Pt.-Co. Method
3	Calcium (as Ca), mg/l, Max	64	1.60	75	IS-3025/40:1991, EDTA
4	Chloride (as Cl), mg/l, Max	36	2.00	250	IS-3025/32:1988, R-2007, Argentometric
5	Copper (as Cu), mg/l, Max	0.014	0.03	0.05	IS 3025/42 : 1992 R : 2009, AAS-Flame
6	Fluoride (as F) mg/l, Max	0.41	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	0.01	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	4.56	0.5	45	APHA, 22nd Edition, UV-Spectrphotometric
12	Odour	Agreeable	Qualitative	Agreeable	IS 3025 /05:1983, R-2012, Qualitative
13	pH value	8.18	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	0.004	0.002	0.01	APHA, 22nd Edition, AAS-GTA
16	Sulphate (as SO_4) mg/l, Max	75	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	140	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	338	25.00	500	IS 3025 /16:1984 R : 2006, Gravimetric
22	Total Hardness (c_aco_3), mg/l, Max	262	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

Annexure 19- High root density tree plantation certificate by FRI, Dehradun

Certificate of high root density plant for controlling subsidence

This is to certify that BCCL has been doing plantation/ecological restoration under the guidelines of Forest Research Institute. The various species selected for the restoration are having a tap root system with branches which serve the purpose. These species have high root density and are already being planted at all the ecorestoration/plantation sites of BCCL. The various species having tap root system are given below

S.No.	Species	Common name
1.	*Acacia nilotica*	Kikkar
2.	*Albezia odoratissima*	Kala siris
3.	*Bauhinia variegata*	Kachnar
4.	*Cassia fistula*	Amaltas
5.	*Ficus benghalensis*	Baniyan /bargad
6.	*Ficus racemosa*	Gular
7.	*Ficus religiosa*	Pipal
8.	*Gmelina arborea*	Ghamar
9.	*Lagerstroemea parviflora*	Jarul
10.	*Lannea coromandelica*	Zhingan
11.	*Madhuca latifolia*	Mahua
12.	*Mangifera indica*	Aam
13.	*Moris alba*	Shahtoot
14.	*Phyllanthus emblica*	Aonla
15.	*Pithecellobium dulce*	Jangal jalebi
16.	*Pongamia pinnata*	Karanj
17.	*Tamarindus indica*	Imli
18.	*Trema orientalis*	Tree
19.	*Terminalia arjuna*	Arjun
20.	*Terminalia bellerica*	Bahera
21.	*Dalbergia sissoo*	Shisham
22.	*Syzizium cumini*	Jamun
23.	*Azadirachta indica*	Neem
24.	*Holoptelea integrifolia*	Indian elm
25.	*Butea monosperma*	Palash /dhak

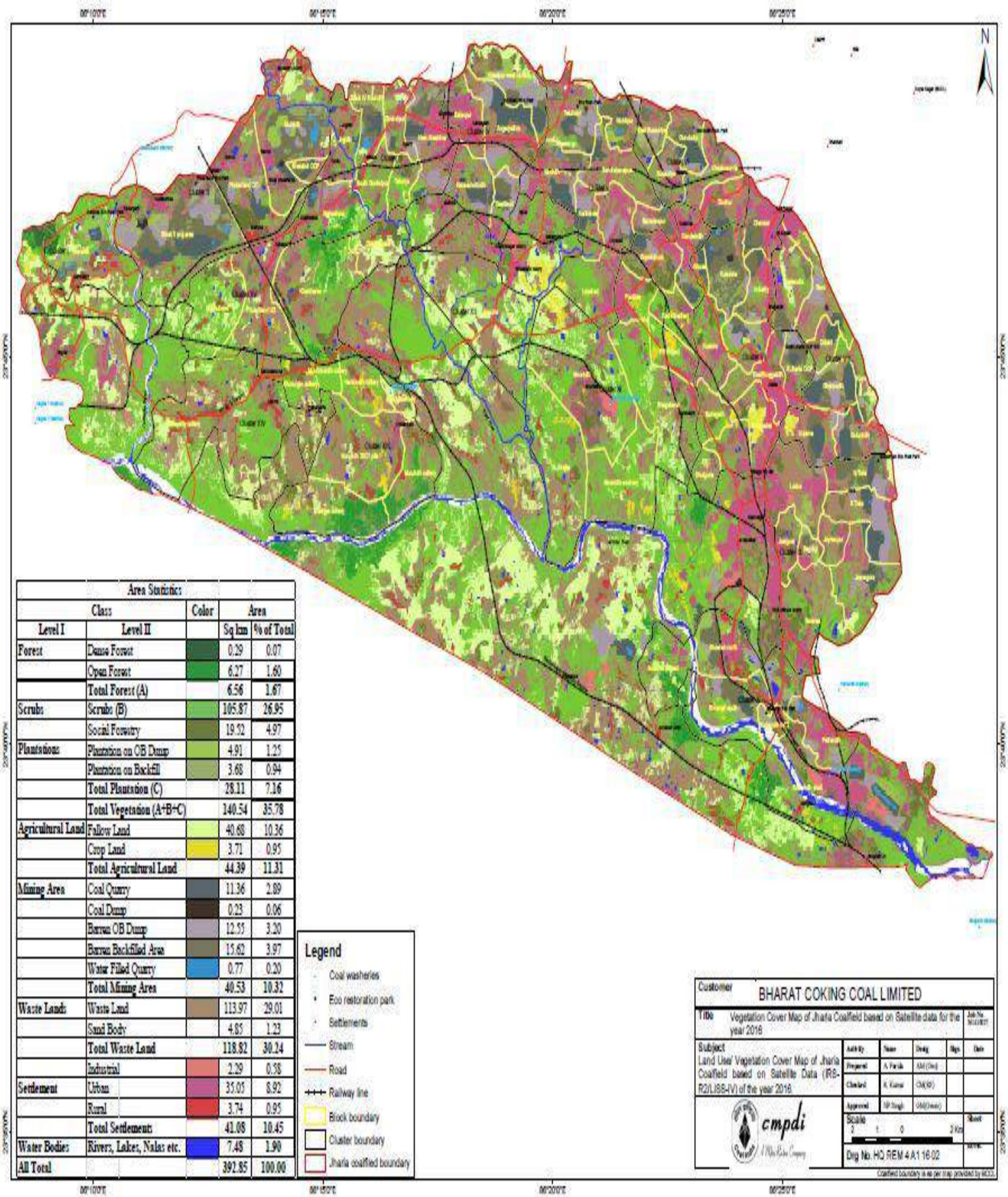
ANNEXURE-20

Status of issues raised in the public hearing of Cluster V:

S. No.	Issues Raised	Status
1	Trees are planted but not cared for and saved	Both the gabion plantation and block plantation done in Cluster V have been throughout cared after and has been well preserved as can be verified through the pictures and inspection report of gabion plantation by the forest Officials. The preservation and maintenance of all the plantation done is still continuing.
2	Public awareness should be generated to preserve the trees planted by BCCL.	Various initiatives have been taken such as awareness program mes in nearby schools on the occasions such as Environment Day & Swachhta Pakhwada to generate awareness. Moreover trees have also been planted by Cluster V in nearby schools, grounds and other areas.
3	Water Sprinkling frequency should be increased including in the night time.	The frequency of water sprinkling by mobile sprinklers has been increased for more effective dust suppression.
4	The no. of water tankers should be increased.	Sufficient no. of water tankers have been provided in Cluster V.
5	Arrangements should be made for Drinking water.	Cluster V supplies water for domestic usage in the nearby villages. A MoU has been signed between BCCL and Jharkhand Govt. for mine water utilization by converting Mine water to Drinking water.
6	BCCL spends too much money on CSR activities. There should be improvement in it.	CSR activities are carried out as per the CSR policy of BCCL.
7	Arrangements should be made for control of dust emissions during drilling operations.	Drill machines are fitted with wetting system and/or dust extractor system to control the emission of dust during the drilling operation.
8	No work has been done for environmental protection near Chandour Bastee in Tetulmari. The residents of Chandour Bastee should be rehabilitated as it is close to Tetulmari mine.	An area of 8 Ha has been ecologically restored near Chandour Bastee in Tetulmari Collliery. Water sprinkling is done on the roads and other dust prone areas to suppress dust. The rehabilitation work is under process as per Jharia Master Plan. Currently survey work of the affected families is being done by Jharia Rehabilitation and Development Authority.
9	Proper water spraying should be done in Nichitpur Township.	Regular water spraying is done in Nichitpur. The roads in Nichitpur

	Controlled blasting operation which is carried out in Nichitpur should be continued. The quarried out area should be backfilled with OB and trees planted thereon. Road lights, community centres, water arrangements, high schools roads(from Subhash Chowk to Azad chowk), ambulance should be provided in Nichitpur.	Township are also paved. Various provisions have been made in Nichitpur such as lighting, water supply and Handloom training centre. Road from Subhash Chowk to Azad chowk is bitumen topped and very well maintained. **(Plate)** An ambulance is available in Nichitpur Colliery.
10	Electricty, water and healthcare facilities should be provided.	Electricity, water and healthcare facilities are provided in Cluster V. Healthcare and wellness camps are also organized in nearby villages from time to time.
11	Sporting activities should be promoted.	Games and sports are duly funded and promoted in cluster V. There is a well maintained football stadium in Sijua in Cluster V.
12	Dust pollution from blasting activities should be controlled.	Controlled blasting and water spraying is done to control dust pollution.
13	Covered transportation should be done.	Tarpaulin covered transportation is being ensured to control dust pollution.
14	Closed UG mines should be reopened.	Operation of mines is guided by company policy, economic feasibility, safety and operational convenience,etc.
15	Water should be ensured in Chandour Pond.	Water is sufficiently available in Chandour pond. **(Annexure)**
16	Loyabad weighbridge should be shifted.	Loyabad weighbridge has been closed.
17	There should be no shortage of Doctors and paramedic staffs	Doctors, paramedic staffs and other healthcare personnels are deputed in Regional Hospital, Loyabad in cluster V.

Annexure 21- Land use pattern monitoring Report of JCF for the year 2016



Area Statistics				
Class		Color	Area	
Level I	Level II		Sq km	% of Total
Forest	Dense Forest		0.29	0.07
	Open Forest		6.27	1.60
	Total Forest (A)		6.56	1.67
Scrubs	Scrubs (B)		105.87	26.95
	Social Forestry		19.52	4.97
Plantations	Plantation on OB Dump		4.91	1.25
	Plantation on Backfill		3.68	0.94
	Total Plantation (C)		28.11	7.16
	Total Vegetation (A+B+C)		140.54	35.78
Agricultural Land	Fallow Land		40.68	10.36
	Crop Land		3.71	0.95
	Total Agricultural Land		44.39	11.31
Mining Area	Coal Quarry		11.36	2.89
	Coal Dump		0.23	0.06
	Barren OB Dump		12.55	3.20
	Barren Backfilled Area		15.62	3.97
	Water Filled Quarry		0.77	0.20
	Total Mining Area		40.53	10.32
Waste Lands	Waste Land		113.97	29.01
	Sand Body		4.85	1.23
	Total Waste Land		118.82	30.24
	Industrial		2.29	0.58
Settlement	Urban		35.05	8.92
	Rural		3.74	0.95
	Total Settlement:		41.08	10.45
Water Bodies	Rivers, Lakes, Nalas etc.		7.48	1.90
All Total			392.85	100.00

Annexure 22- Ecological Restoration Roadmap

Road Map for Ecorestoration of BCCL Mine Areas of Dhanbad, Jharkhand

Forest Ecology & Environment Division
Forest Research Institute
Indian Council of Forestry Research & Education
(Ministry of Environment & Forests, Govt. of India)
P.O. New Forest, Dehradun- 248006

Annexure 23- Corporate Environment Policy

BHARAT COKING COAL LIMITED
(A Subsidiary of Coal India Limited – A Maharatna Company)

CORPORATE ENVIRONMENTAL POLICY

Bharat Coking Coal Limited (BCCL), a subsidiary of Coal India Limited, is a Public Sector Undertaking engaged in mining of coal and allied activities. It is the only producer of Prime Coking Coal in India. BCCL was incorporated in 1972 to operate coking coal mines operating in the Jharia and Raniganj Coalfields. Currently, the Company operates 66 coal mines and 8 Coal Washeries.

Our mission is to produce the planned quantity of coal efficiently and economically with due regard to safety, conservation and quality. BCCL affirms its commitment for environment friendly mining with right mitigation of pollution, reclamation of the degraded land, preservation of biodiversity and proper disposal of waste following the best environmental practices including judicious use of the non-renewable energy on the path of continual improvement. Towards this commitment, BCCL shall endeavor to:

- Conduct mining and associated operations in an environmentally responsible manner to comply with applicable laws and other requirements related to environmental aspects.
- Design projects with due consideration of Sustainable Development by integrating sound environmental management practices in all our activities.
- Prevent pollution of surrounding habitation by continuous monitoring and adopting suitable measures for environment protection.
- Ensure compliance of all applicable Environmental and Forest Clearance conditions and other statutory conditions issued by regulatory agencies.
- Implement the Environmental Management Plans in all our mines effectively to mitigate pollutions on air, water and noise; proper disposal of wastes and reclamation and ecological restoration of degraded land; and by also dovetailing the Jharia action/ Master Plan for dealing with Fires, Subsidence and Rehabilitation of affected people with the Environmental Management Plans under the Cluster Concept.
- Strive to conserve Bio-Diversity through Ecological restoration methods.
- Conserve natural resources through recycling of wastes on the principle of Reduce, Recycle and Reuse. Put special thrusts on efficient energy utilization as a measure to reduce carbon foot-print.
- Strive for continual improvement in our environmental performances by setting targets, measuring progress and taking corrective action.
- Create environmental awareness among the employees and the local communities through pro-active communication and training and encourage our business associates to adopt similar approach for environmental protection.

Place: Dhanbad
Date: 25.5.12

Chairman-cum-Managing Director

Chairman-cum-Mg. Director
BHARAT COKING COAL LIMITED
Koyla Bhawan, Dhanbad-826 005

Annexure 24

Environmental Monitoring Report of Cluster V

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

(FOR THE MONTH MARCH, 2019)

E. C. no. J-11015/01/2010-IA.II (M) dated11.02.2013.

CMPDI
ISO 9001 Company
Regional Institute-II
Dhanbad, Jharkhand

CONTENTS

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

4.3 Noise Level

During the noise level survey it has been observed that the noise level in the sampling locations is within the permissible limits prescribed as per MoEF&CC Gazette Notification No. GSR 742(E) dt 25.09.2000 Standards for Coal Mines for Industrial Area and Noise pollution (Regulation and Control) Rules, 2000.

INTRODUCTION

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

The very purpose of environmental monitoring is to assess the quality of various attributes which affects the environment. As per quality of these attributes appropriate strategy is to be developed to control the pollution level within the permissible limits. The three major attributes are air, water and noise level.

Bharat Coking Coal has awarded Environmental Monitoring work of all Projects, Cluster wise, to Central Mine Planning & Design Institute Limited (CMPDIL). The environmental monitoring has been carried out as per conditions laid down by MoEF&CC while granting environmental clearance to different projects. CMPDI has trained manpower and well equipped laboratory to carry out monitoring, analysis and R&D work in the field of environment.

1.1 The Cluster-V is in the Northern part of the Jharia coalfield. It includes a group of 7 Mines (viz. Nichitpur, OCP, Mudidih colliery (Mixed), Tetulmari colliery (Mixed), SendraBansjora colliery (Mixed), Kankanee colliery (Mixed), Bansdeopur colliery (Mixed) and Loyabad colliery. The Cluster – V is situated about 25 - 30 kms from Dhanbad Railway Station. The mines of this Cluster – V are operating since pre nationalization period (prior to 1972-73). It is connected by both Railway and Road. The drainage of the area is governed by Jarian Nala and Ekra Nala.

1.2 The Cluster-V is designed to produce 4.854 MTPA (normative) and 6.311 MTPA (peak) capacity of coal. The average grade of coal W – III & W- IV.

The Project has Environmental Clearance from Ministry of Environment, Forest and Climate Change (MoEF&CC) for a rated capacity 4.854 MTPA (normative) and 6.311 MTPA (peak) capacity of coal production vide letter no. J-11015/01/2010-IA.II (M) dated 11th 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) Nichitpur (A8): Industrial Area

The location of the sampling station is 23^0 48'18.59" N $86^0$21'30.93" E.The samplers were placed at a height of approx. 1.5m above ground level at Nichitpur.

II.BUFFER ZONE Monitoring Location

i) Basseriya Managers Office (A9) : Industrial area

The location of the sampling station is 23^0 48'11.53" N & 86^0 22'17.50" E. The samplers were placed at a height of approx. 1.5m above ground level at Safety Office.

ii) Pootki Ballihari Office (A16) : Industrial area

The location of the sampling station is 23^o45.17.23' N 86^o21.46.27'E. The samplers were placed at a height of approx. 1.5m above ground level at Project Office.

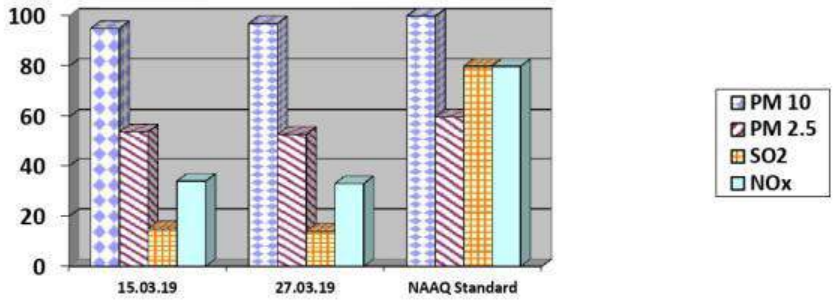
iii)Moonidih UGP(A17): Industrial Area

The location of the sampling station is 23^0 44'30.00" N & 86^0 20'56.00" E. The samplers were placed at a height of approx. 1.5m above ground level at project office.

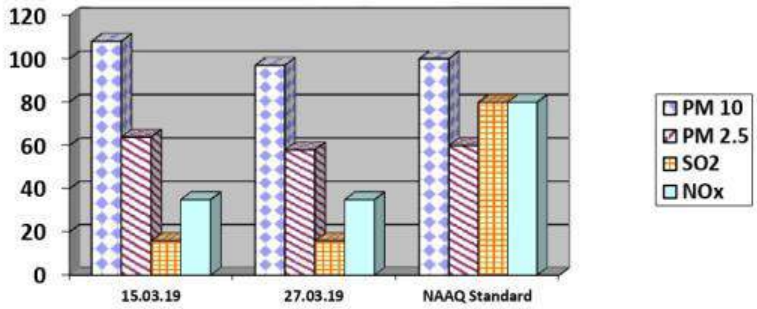
AMBIENT AIR QUALITY DATA

Cluster – V, Bharat Coking Coal limited Month: **MARCH , 2019** Year: **2018-19.**

Station Name: A8, Nichitpur		Zone: Core		Category: Industrial	
Sl. No.	Dates of sampling	PM 10	PM 2.5	SO_2	NO_x
1	15.03.19	95	54	15	34
2	27.03.19	97	53	14	33
	NAAQ Standard	100	60	80	80



Station Name: A9, Basseriya Managers office		Zone: Buffer		Category: Industrial	
Sl. No.	Dates of sampling	PM 10	PM 2.5	SO_2	NO_x
1	15.03.19	108	64	16	35
2	27.03.19	97	58	16	35
	NAAQ Standard	100	60	80	80

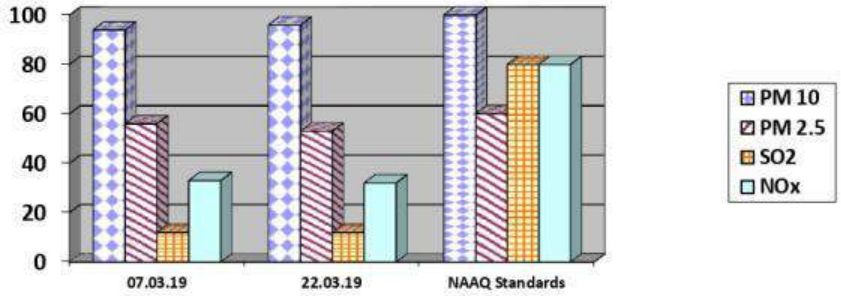


Analysed By
JSA/SA/SSA

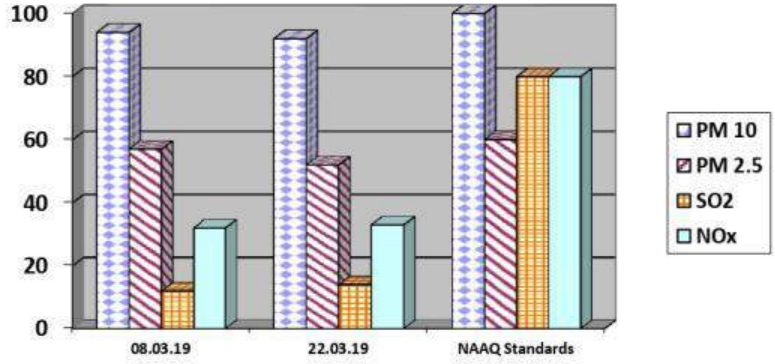
Checked By
Lab In Charge
RI-2, CMPDI, Dhanbad

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

Station Name: A16 Pootki Balihari office		Zone: Buffer		Category: Industrial	
Sl. No.	Dates of sampling	PM 10	PM 2.5	SO2	NOx
1	07.03.19	94	56	12	33
2	22.03.19	96	53	12	32
	NAAQ Standards	100	60	80	80



Station Name: A17 – Moonidih UGP		Zone: Buffer		Category: Industrial	
Sl. No.	Dates of sampling	PM 10	PM 2.5	SO2	NOx
1	08.03.19	94	57	12	32
2	22.03.19	92	52	14	33
	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 Mudidih (MW5)**

A sampling point is fixed to assess the effluent quality of Mine discharge. This location is selected to monitor effluent discharge in to Jarian Nala and Ekra Nala.

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 -V**		Month: **MARCH, 2019**	Name of the Station: **Mine Discharge of Mudidih**	
Sl. No.	**Parameters**	**MW5** First Fortnight **14.03.19**	**MW5** Second Fortnight **30.03.19**	**As per MOEF General Standards for schedule VI**
1	Total Suspended Solids	30	50	*100 (Max)*
2	pH	7.78	7.92	*5.5 - 9.0*
3	Oil & Grease	<2.0	<2.0	*10 (Max)*
4	COD	24	32	*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) **Nichitpur (N8)**
ii) **Basseriya Manager's office(N9)**
iii) **Pootki Balihari Office(N16)**
iv) **Moonidih UGP (N17)**

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 MoEFCC. 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 -V**			Month: **MARCH, 2019**		
Sl. No.	**Station Name/Code**	**Category of area**	**Date**	**Noise level dB(A)LEQ**	***Permissible Limit of Noise level in dB(A)***
1	Nichitpur (N8)	Industrial area	15.03.19	51.7	*75*
2	Nichitpur	Industrial area	27.03.19	58.8	*75*
3	Basseriya Managers Office(N9)	Industrial area	15.03.19	56.3	*75*
4	Basseriya Managers Office	Industrial area	27.03.19	63.3	*75*
5	Pootki Balihari Office(N16)	Industrial area	07.03.19	69.3	*75*
6	Pootki Balihari Office	Industrial area	22.03.19	73.5	*75*
7	Moonidih UGP(N17)	Industrial area	08.03.19	66.2	*75*
8	Moonidih UGP	Industrial area	22.03.19	65.3	*75*

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
	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

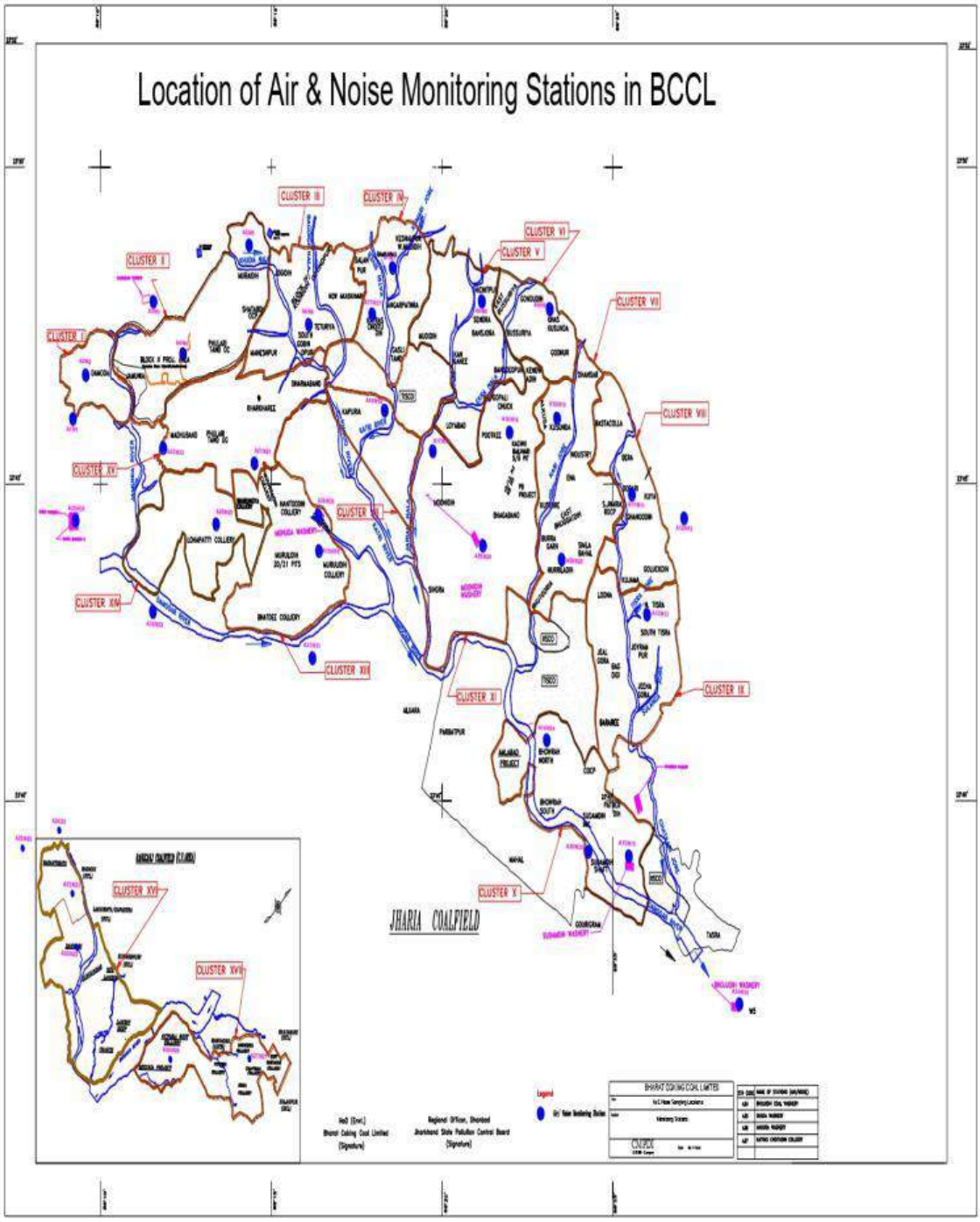
In exercise of the powers conferred by Sub-section (2) (h) of section 16 of the Air (Prevention and Control of Pollution) Act, 1981 (Act No. 14 of 1981), and in supersession of the notification No(s).S.O.384(E), dated 11th April 1994 and S.O.935(E), dated 14th October 1998, the Central Pollution Control 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

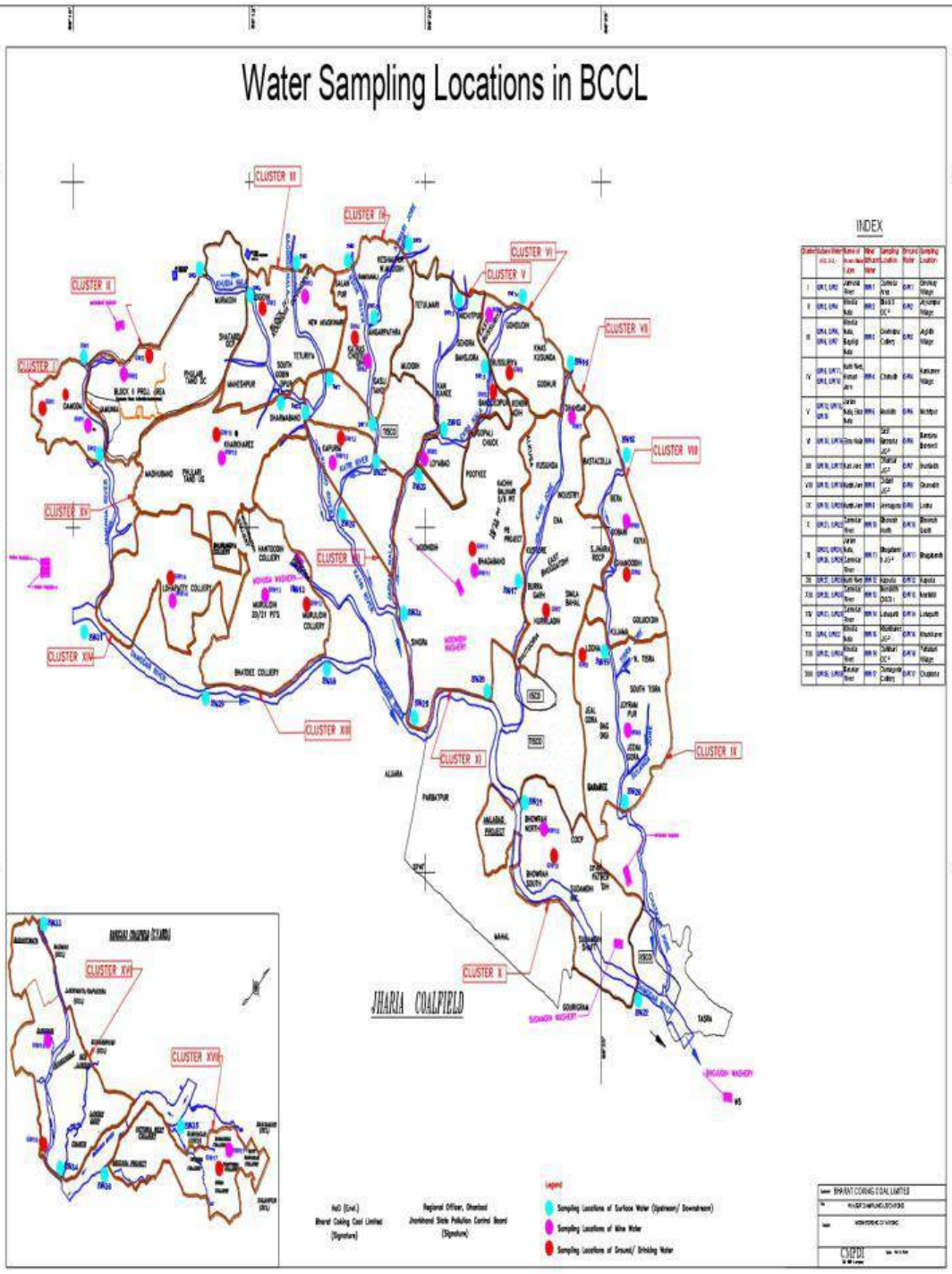
* Annual Arithmetic mean of minimum 104 measurements in a year at a particular site taken twice a week 24 hourly at uniform intervals.

** 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
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
BHARAT COKING COAL LIMITED

Water Sampling Locations in BCCL



Annexure 25

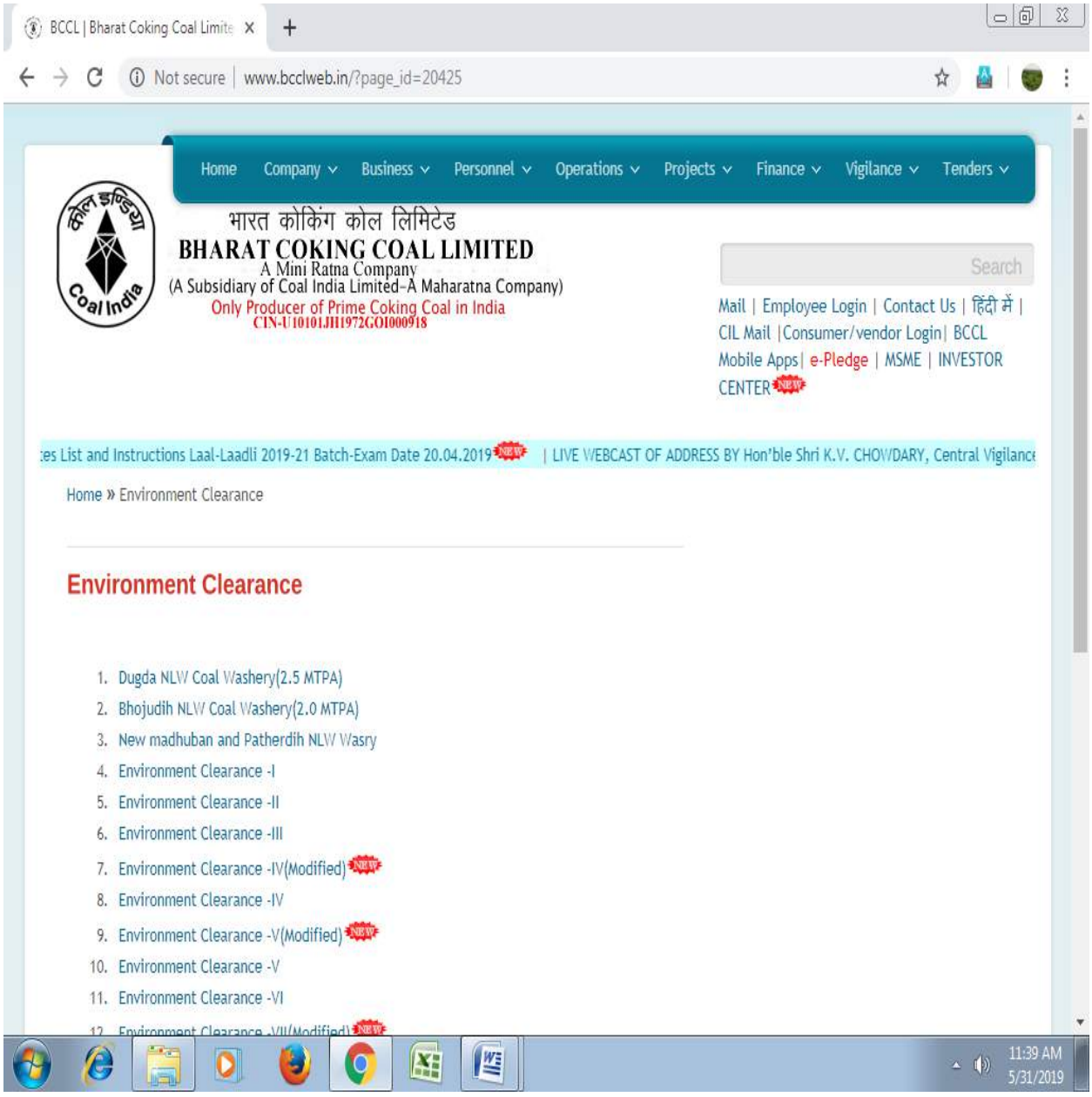
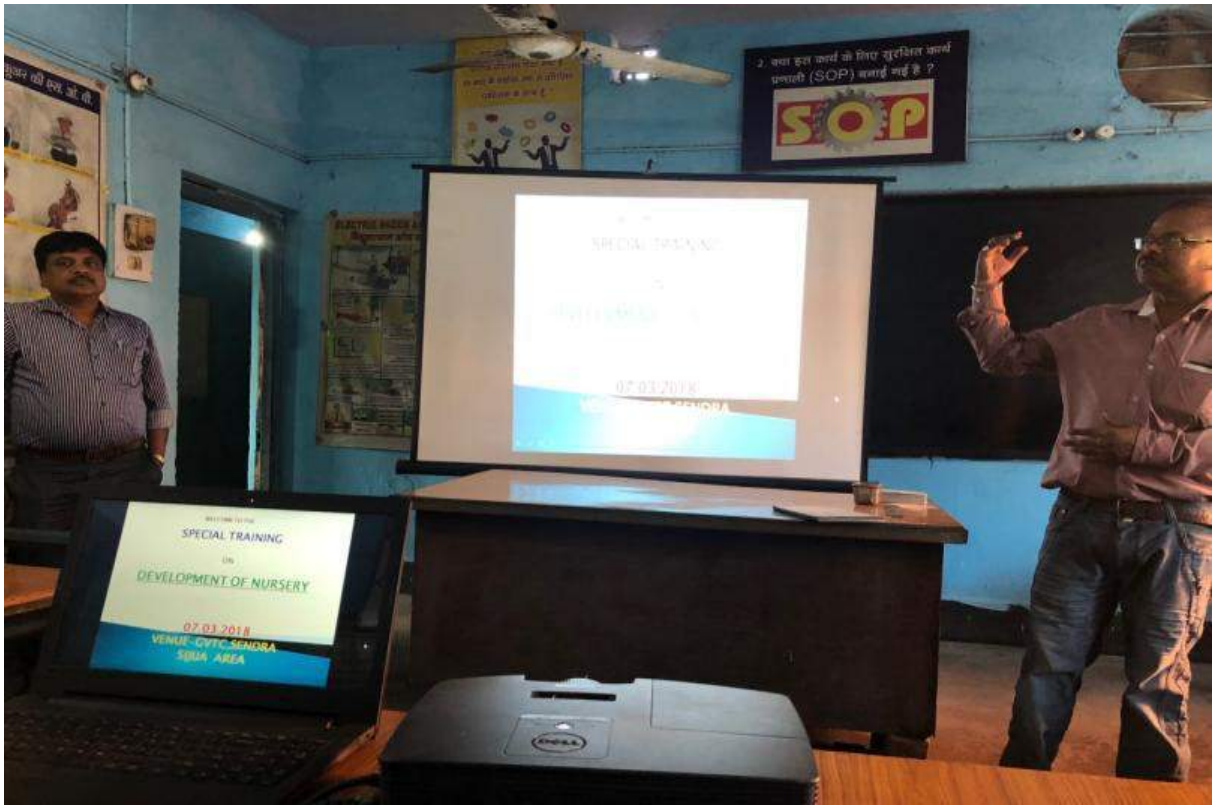

BCCL | Bharat Coking Coal Limite
Not secure | www.bcclweb.in/?page_id=20425
Home Company Business Personnel Operations Projects Finance Vigilance Tenders
भारत कोकिंग कोल लिमिटेड
BHARAT COKING COAL LIMITED
A Mini Ratna Company
(A Subsidiary of Coal India Limited-A Maharatna Company)
Only Producer of Prime Coking Coal in India
CIN-U10101JH1972GOI000918
Search
Mail | Employee Login | Contact Us | हिंदी में |
CIL Mail |Consumer/vendor Login| BCCL
Mobile Apps| e-Pledge | MSME | INVESTOR
CENTER
es List and Instructions Laal-Laadli 2019-21 Batch-Exam Date 20.04.2019
| LIVE WEBCAST OF ADDRESS BY Hon'ble Shri K.V. CHOWDARY, Central Vigilanc
Home » Environment Clearance
Environment Clearance
1. Dugda NLW Coal Washery(2.5 MTPA)
2. Bhojudih NLW Coal Washery(2.0 MTPA)
3. New madhuban and Patherdih NLW Wasry
4. Environment Clearance -I
5. Environment Clearance -II
6. Environment Clearance -III
7. Environment Clearance -IV(Modified)
8. Environment Clearance -IV
9. Environment Clearance -V(Modified)
10. Environment Clearance -V
11. Environment Clearance -VI
11:39 AM
5/31/2019

PLATE -1

Avenue Plantation in Cluster V

PLATE -2


भा. को. को. लि. नारी शक्ति समिति, सी. एस. आर.
(CSR) और सेवा अमृत ट्रस्ट के सहयोग से सिलाई
सेन्टर, नि:शुल्क शिक्षा एवं कम्प्युटर प्रशिक्षण
केन्द्र का उद्घाटन
भा. को. को. लि. नारी शक्ति समिति की अध्यक्षा एवं
प्रथम महिला परम आदरणीया
श्रीमति सुमना लाहिड़ी
के कर कमलों द्वारा
दिनांक 10-1-2015 को किया गया।


SOP
SPECIAL TRAINING
ON
DEVELOPMENT OF NURSERY
07.03.2018
VENUE- GVTC SENDRA
SDJA AREA


NIKE

पर्यावरण संरक्षण कार्यशाला शुरू

सिजुआ. सिजुआ गेस्ट हाउस में बुधवार से पर्यावरण संरक्षण तथा संपोषण पर दो दिवसीय कार्यशाला शुरू हुई. आयोजन सिजुआ क्षेत्र ने किया है. कार्यशाला में एएफआरआइ देहरादून के आधा दर्जन वैज्ञानिक शामिल हो रहे हैं. उद्घाटन निदेशक कार्मिक आरएस महापात्रा ने किया. कहा कि धरती का संतुलन बनाये रखने के लिए हमें पर्यावरण का ख्याल रखना होगा. देहरादून के वैज्ञानिकों ने कहा कि धरती का संतुलन लगातार बदतर होता जा रहा है. प्रशिक्षण प्राप्त करने आये सिजुआ एरिया के अलावा कुसुंडा एरिया, पुटकी बलिहारी तथा डब्ल्यूजे एरिया के लगभग 105 प्रशिक्षु कर्मियों को पर्यावरण से संबंधित कई जानकारी दी. इससे पूर्व कर्मियों व प्रशिक्षुओं को स्वास्थ्य तथा सुरक्षा की शपथ श्री महापात्रा ने दिलायी. मौके पर पर्यावरण मुख्यालय के एजीएम इवीआर राजू, जीएम पी चंद्रा, एजीएम चंदन भट्टाचार्य, सुनील कुमार, जेके जैसवाल, धर्मवीर आलोक, राजेश रंजन कुमार, आनंद विजय, मीणा कुमारी, आरबी दोर्जी, एनके सरकार, देहरादून एएफआरआइ के प्रमुख एन बाला, डॉ एचबी वशिष्ठ, डॉ ताराचंद, एसके शर्मा, शैलेश पांडेय, एसके कंबोज, सचिन कुमार आदि मौजूद थे.

[Capacity Building Activities in cluster V]

Plate 3

Aquaculture in abandoned pit Water Bodies in Cluster V

Plate 4

Garland Drain in Cluster V

Plate 5

Stone pitching of Jores in Cluster V

Plate 6

OB dump being biologically stabilized

Plate 7

Plantation at Undisturbed area at Loyabad

Plate 8

Plantation at external dump at Tetulmari colliery (Cluster V)

Plate 9

Plantation near mine working boundary at Sendra Bansjora

Plate 10

Gabion Plantation at cluster V

Plate 11

Water sprinkling on mines roads

Water sprinkling on mines roads

Plate 12

Oil & Grease trap at Nichitpur Workshop in Sijua Area.

Plate 13

Dedicated Mobile Vehicle to spread awareness in fire and subsidence affected areas of Cluster-V

Plate 14

Nichitpur Colliery Ecological Park

Plate 15

Slope Stabilization with tier-wise plantation in Nichitpur Colliery

Plate 16

Establishment of flora & fauna diversity in eco-restoration sites

Plate 17

Water Bodies (Chandor Pond) in Cluster V

Plate 18

Bitumen-topped Pucca road from Subhash chowk to Mohlidih as demanded In public hearing of cluster V

Plate 19

Backfilling and Physical reclamation of mined out areas in Cluster V

Plate 20

Printed Medium and Social sites like Twitter/Facebook pages etc. being used to spread environmental awareness in Cluster V

Plate 21

Top soil Storage yard in Cluster V

Plate 22

Plantation drive with School students in Cluster V