

**Compliance Status
of
Environmental Clearance
of
West Bokaro Opencast Coal Mine
(EC No. J-110115/108/2206-IA.II(M), dated 17th May 2007)**



Parks & Garden

Tata Steel Ltd.
(October 2016 – March 2017)

A. Specific Conditions

- (i) *No mining operations shall be undertaken in the forestland until clearance has been obtained under the provisions of FC Act, 1980.*

Being complied with. However, different forest diversion proposals for mining are made and are in advanced stage of clearances.

- (ii) *The embankment along the River Bokaro shall be designed taking into account the highest flood level, based on past data, along the quarry area at the mine boundary along the River Bokaro so as to guard against mine inundation. The slope of the embankment shall at least 2:1 towards the ML and shall be stabilized by plantation. The height of the embankment shall be at least 5 m higher than the HFL.*

The height of the embankment along the Bokaro River is more than 5 m higher than the HFL. The HFL observed was 336 mts while the lower most level of quarry boundary is 346 mts. At the same time 30 mts solid surface has also been left from river to avoid any ingress of water in the mine pit. The slope of embankment is being maintained in the ratio of 2:1 along with plantation for stabilization.

- (iii) *Topsoil should be stacked properly with proper slope at earmarked site(s) and should not be kept active and shall be used for reclamation and development of green belt.*

Complied with, top soil is removed during excavation of coal, is being stacked separately in available mining area, which is being used for spreading on overburden dump surface for plantation and greenbelt development. Currently no top soil is being generated since mine is progressed in broken up area.

- (iv) *No new external OB dumps shall be created for storing OB. Monitoring and management of existing reclaimed dumpsites should continue until the vegetation becomes self sustaining. Compliance status should be submitted to the Ministry of Environment & Forests and its Regional office located at Bhubaneswar on and yearly basis.*

No further new external OB dumps will be created for storing of OB. Since the mined out area in the operating mines are available which is being used for in-pit dumping. The existing reclaimed dump site is being monitored & maintained to sustain vegetation. All the external OB dumps have stabilized over the years and more over, retaining wall has also been provided for further stability. Abandoned dump area has been identified and taken up for reclamation. As per modified mine plan, all existing dump are temporary and will be re-handled as mine advances.



Plantation in OB dump

- (v) *Catch drains and siltation ponds of appropriate size should be constructed to arrest silt and sediment flows from soil, OB and mineral dumps. The water so collected should be utilized for watering the mine area, roads, green belt development, etc. The drains should be regularly de silted and maintained properly.*

Garland drains (size, gradient and length) and sump capacity should be designed keeping 50% safety margin over and above the peak sudden rainfall and maximum discharge in the area adjoining the mine site. Sump capacity should also provided adequate retention period to allow proper settling of silt material.

To arrest the silt and sediment flow from soil, catch drains silt ponds were constructed in the dump area. The water collected in siltation pond is reused in gardening and dust suppression in mines area. Construction of garland drain is a regular practice to take care of run-off water in the mining operation. The details of garland drain are top width varies in between 6m to 10m & bottom width is kept at 3m. Depth varies from 2m to 7m. The sump capacity is in order of 48-120 million gallons considering maximum rainfall depending upon the catchment area. Accumulated mine pit water being used in industrial and domestic purpose after necessary treatment. One of the de coalled area of Query E site is being used as rain water, catchment water storage area.



Abandoned mine pit as RWH pond



Garland Drain

- (vi) *Dimension of the retaining wall at the toe of the dumps and OB benches within the mine to check run-off and siltation should be based on the rainfall data.*

Complied with. All the dumps are covered with toe wall and garland drains. All the drains are regularly being maintained for silt removal.



Toe wall & garland drain in the area

- (vii) *Crushers at the CHP should be operated with high efficiency bag filters, water sprinkling system should be provided to check fugitive emissions from crushing operations, conveyor system, haulage roads, transfer points, etc.*

Crusher houses and CHP areas are equipped with dry fog dust suppression system, fixed type dust suppression system are installed at all conveyor networks, haulage

roads, & various mineral transfer points. Conventional coal stock yards are replaced with concrete silos for dust controls. Mobile & fixed water sprinklers (pressurized water tankers) are used in mine haul roads.



Use of Fixed & mobile water sprinklers in area

(viii) *Drills should be wet operated.*

All the drills are wet operated and interlocked with drill operations.

(ix) *Controlled blasting should be practiced only during day time with use of delay detonators. The mitigative measures for control of ground vibrations and to arrest the fly rocks and boulders should be implemented.*

Blasting in mines area is regularly being practiced in day time only. Controlled blasting is practiced in the close proximity of structure, continuous monitoring along with data collection is being practiced. Delay detonators are used to minimize vibration, dust & formation of fly rocks. However, at regular intervals scientific study is also been conducted from reputed & recognized organizations.

(x) *Area brought under afforestation shall not be less than 1260 ha which includes reclaimed external OB dump (85 ha), backfilled area (974 ha), along ML boundary, along roads, green belt (201 ha), in undisturbed areas and in colony within the mine lease area by planting native species in consultation with the local DFO/ Agriculture Department. The density of the trees should be around 2500 plants per ha.*

Progressive afforestation is practiced as per plan in the area. Last year about 1 lakh saplings have been planted to cover an additional area of approximately 27 ha. This year a thrust has been given for green belt development along the safety zone in the area, local and native species was planted, including OB dumps, lease boundary, residential colonies, and coal dispatch area. Voluntary afforestation in & around villages is also being done with local communities.

TATA Steel is committed to conserve, enhance & restore the biodiversity in its areas of operations and made a biodiversity policy to achieve no net loss of biodiversity over a period of time. In this regard, International Union for Conservation of Nature (IUCN) agency was engaged for assessing the biodiversity in the area and developing an integrated biodiversity management plan for all its mining clusters. Various initiatives are taken to conserve and restore the bio-diversity in the area in consultation with IUCN & forest officials. This year a niche nesting project, an artificial nest of wooden boxes are being placed in & around areas for birds to enhance the population in the area is done along with water feeders.



Plantation activities



Biodiversity study & initiatives

- (xi) *A Progressive Closure Plan shall be implemented by reclamation of quarry area of 974 ha which shall be backfilled and afforested by planting native plant species in consultation with the local DFO/ Agriculture Department. The density of the trees should be around 2500 plants per ha. The balance 20 ha of de-coaled area being converted into a water reservoir shall gently slope along the upper benches and stabilized and reclaimed with plantation.*

The revised mine plan & mine closure plan had submitted to Ministry of Coal for approval, which includes all plantation details. Afforestation & reclamation of de-coaled area will be done by planting native species in consultation with DFO / Agriculture departments as per prevailing guidelines. As per revised mine plan, all dumps will be re-handled as the mine progress, however to stabilize the dumps, this year reclamation by lemon grass & mulberry plantation is done with additional area.

Lemon grass plantation in Overburden dump

One of the out pit dump area is taken up for lemon grass plantation for stabilization.



Lemon grass in the dump

Mulberry plantation in OB dump

In one of the OB dump area, mulberry plantation is done for development of greenery & stabilization of dumps.



Plantation of mulberry in dump for stabilization & reclamation

- (xii) *A Conservation Plan for endangered species found in and around the project area shall be formulated and for the medicinal plants (in-situ and ex-situ) shall be prepared and implemented in consultation with the State Forest and Wildlife Departments. Separate funds shall be earmarked for implementation of the various activities there under and the status thereof shall be regularly reported to this Ministry and the MoEF Regional Office, Bhubaneswar.*

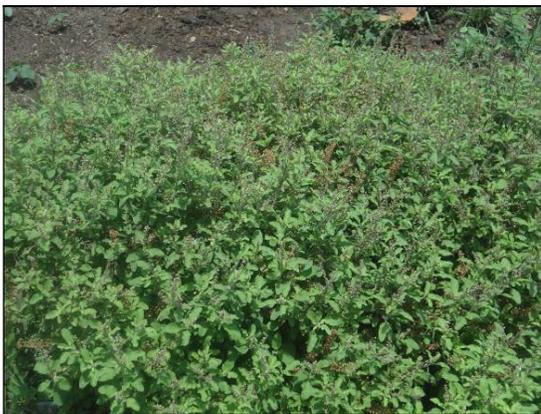
The project area doesn't have any endangered species found in and around area. However, some of the plants of having medicinal values are conserved by developing an area. Separate fund has been earmarked for implementation of conservation plan along with State Forest and Wildlife Department (if any). Some of the species of medicinal importance are as:



Datura (Datura stramonium)



Sarpagandha (Rauwolfia serpentine)



Tulsi (Ocimum sanctum)



Periwinkle (Catharanthus roseus)



Ghrith Kumari (*Aloe vera*)



Coleus aromaticus (*Plectranthus amboinicus*)



Ginger (*Zingiber officinalis*)



Adosa (*Adhatoda vasica*)



Lemongrass (*Cymbopogon citratus*)



Kadi patta (*Murraya koenigii*)

To conserve, restore and enhance the medicinal plants in the area, a separate medicinal garden also being prepared at one of the OB dump. Besides above several medicinal plants such as Bael (*Aegle marmelos*), Neem (*Azadirachta indica*), Avla (*Phyllanthus emblica*), Karanj (*Millettia pinnata*), Ber (*Ziziphus mauritiana*), Sarifa (*Annona squamosa*) were also planted in the area.

(xiii) No groundwater shall be used for the mining/project activities. Additional water required, if any, shall be met by recycling/reuse of the water from the existing activities and from rainwater harvesting measures.

It is being complied and regularly practiced; no ground water is used for mining & other project activities. All the plants are operated at Zero Liquid Discharge (ZLD) and entire processed water is recycled and reused. An abandoned mine pit is converted into rain water harvesting (RWH) pond. Check dams, rain water harvesting structures are also being constructed in surrounding villages. A separate RWH cum drinking water project is constructed in the area and about 7500 villagers were benefited through pipeline drinking water at doorstep in village.



RWH cum drinking water project at Duni village



Rainwater harvesting structures

(xiv) *Regular monitoring of groundwater level and quality should be carried out by establishing a network of existing wells and construction of new peizometers. The monitoring for quantity should be done four times a year in pre-monsoon (May), monsoon (August), post-monsoon (November) and winter (January) seasons and for quality in May. Data thus collected should be submitted to the Ministry of Environment & Forests and to the Central Pollution Control Board quarterly within one month of monitoring.*

Regular monitoring of ground water level of existing well is being carried out. The data collected for the month of November 2016 and January 2017 are as follows:

Sl. No.	LOCATION	MONTH	
		November 2016	January 2017
01.	RAJIV NAGAR	3'6"	3'8"
02.	JAIRAM HOTEL	5'5"	5'7"
03.	SHOPING COMPLEX	4'2"	5'3"
04.	JAGARNATH GOPE	7'9"	9'0"
05.	HOUSING	4'4"	5'0"
06.	MUKUND BERA	7'8"	11'10"
07.	DRIVER HUT	8'2"	7'8"
08.	2 NO WELL	5'6"	4'9"
09.	9 NO WELL	4'0"	4'8"
10.	PUNDI	12'2"	28'8"
11.	DUNI	6'10"	9'7"
12.	BANJI	12'2"	35'4"
13.	KEDLA ROAD	11'10"	14'0"

Sl. No.	LOCATION	MONTH	
		November 2016	January 2017
14.	JHARMA BASTI	4'8"	5'1"
15.	BIRHOR VILLAGE (New location)	9'8"	15'2"
16.	BELGADA VILLAGE (New location)	8'9"	2'7"

- (xv) *The Company shall put up artificial groundwater recharge measures for augmentation of groundwater resource. The project authorities should meet water requirement of nearby village(s) in case the village wells go dry due to dewatering of mine.*

The ground water recharge measures are continuously being taken up. In this year thrust has already been put up to streamline drinking water projects, which includes construction of ponds, bore well, check dams etc. in and around our leasehold areas. The projects also include construction of rain water harvesting structures, installation of water filtration plant, in surrounding villages.



Artificial ground water recharge pit (Bore well) in Birlor village



Drinking Water system at Atna village

- (xvi) *ETP should also be provided for workshop, coal washery and CHP. There shall be zero discharge of wastewater from CHP and the coal washeries. Effluents from the tailings pond shall be treated to conform to prescribed standards in case of discharge into any water course outside the lease.*

Zero liquid discharge (ZLD) is being maintained at Coal Washery, CHP, workshops & power plant; the effluent generated is completely recycled & reused. In addition to above, mechanical tailing dewatering system is installed for Washery & CHP area and Oil traps are installed for workshops. The water from tailing pond after proper de-

silting of tailings is recycled back to washeries to maintain zero discharge. Also the quality of water is being analyzed regularly (monthly). The tailing slurry is handled through high frequency screen and belt press to produce dry tailings and recover water for recycling. To address the undulated topography and to recover & recycle water a detailed study is under progress from external agency.



Mechanical tailings de-watering system



Coal transport by conveyor belt



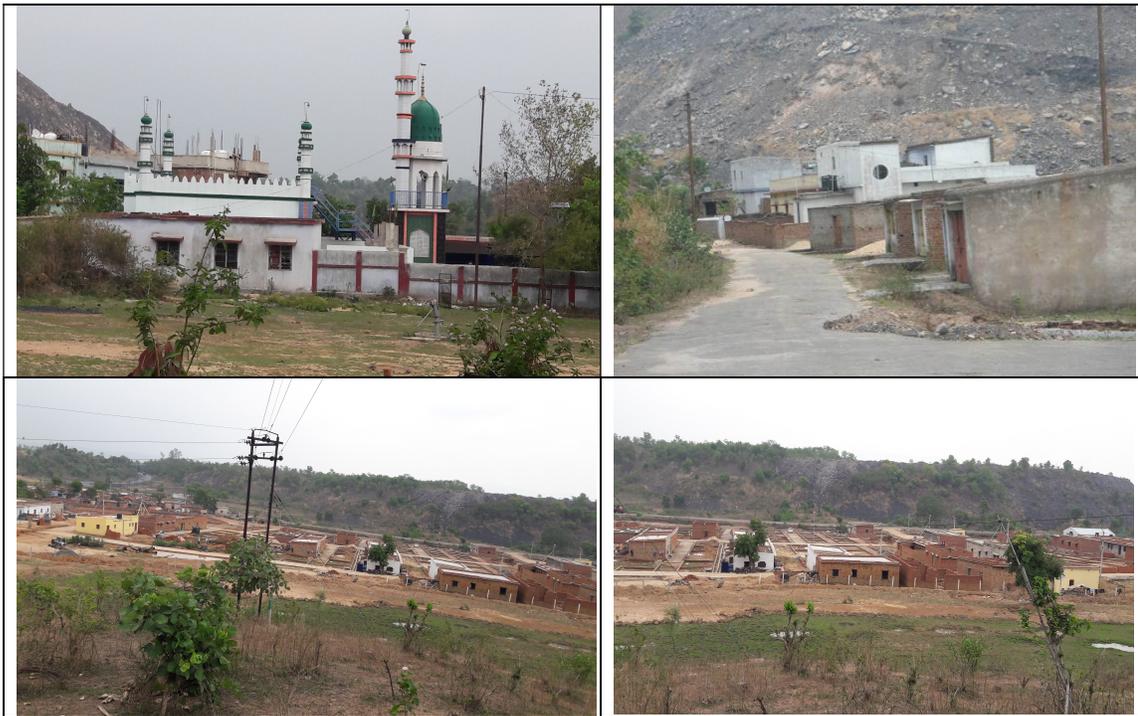
Effluent recycling in washery

- (xvii) *An STP shall be provided for the township/colony to treat the domestic effluents to prescribed standards and for their reuse in project activities.*

Sewage Treatment Plant (STP) of 0.24MLD is already installed in one of the residential block, treated water reused in dust suppression of road. For other areas a detailed feasibility study has been done by ISM Dhanbad. An STP of 300 KLD is being installed in colony area.

- (xviii) *R&R shall be based on norms laid down by the State Government and shall not be inferior than that in the National R&R Policy and shall be completed within a specified time - frame.*

The R&R policy designed for the project affected families is adequate & having additional benefits. As a part of R&R policy some of the measures taken are as follows:



R & R facility provided in the area

- (xix) *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: 5000) 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 maps are under preparation for core and buffer zone for this year after completion of study report will be submitted to ministry office. Work order for job done has already been done and will be completed at the earliest.

- (xx) *A Final Mine Closure Plan along with details of Corpus Fund should be submitted to the Ministry of Environment & Forests for approval 5 years in advance of final mine closure for approval.*

It will be complied five years in advance of final mine closure plan for approval. An adequate fund has been provided separately for final mine closure activity.

- (xxi) *Consent to operate shall be obtained before expanding mining operations.*

Consent to operate is being obtained regularly.

B. General Conditions

- (i) *No change in mining technology and scope of working should be made without prior approval of the Ministry of Environment and Forests.*

No change in mining technology is done. However, at few locations high wall mining technique will be practiced by considering geological conditions.

- (ii) *No change in the calendar plan including excavation, quantum of mineral coal and waste should be made.*

Complied with

- (iii) *Four ambient air quality monitoring stations should be established in the core zone as well as in the buffer zone for SPM, RPM, SO₂ and NO_x monitoring. Location of the stations should be decided based on the meteorological data, topographical features and environmentally and ecologically sensitive targets in consultation with the SPCB.*

Consulted with Regional Officer of Pollution Control Board, by considering the predominate wind direction, base line study and Air modeling one station in buffer zone, and 04 station in core zone has been suggested.

- (iv) *Fugitive dust emissions (SPM and RPM) from all the sources should be controlled regularly monitored and data recorded properly. Water spraying arrangement on haul roads, wagon loading, dump trucks (loading and unloading) points should be provided and properly maintained.*

All the strategic locations of operating plants where the possibilities of fugitive dust emissions, has been provided with adequate enclosures, side skirt, chute, seal plate, sealing of transfer points along with adequate dust suppression system. All the sites are monitored regularly (once in a month) and data is kept for record. The haul road, loading and unloading points are provided with pressurized water tanker for water spraying along with chemical dosing, wagon loading does not require any water spraying since the coal is in moist condition.



Fixed and mobile water suppression system

- (v) *Data on ambient air quality (SPM, RPM, SO₂ and NO_x) should be regularly submitted to the Ministry including its Regional Office at Bhubneshwar and to the State Pollution Control Board and to the Central Pollution Control Board once in six months.*

Being complied with, All monitoring details are attached as annexure-I.

Continuous online ambient air quality monitoring system (CAAQMS) is installed at division and being operational. All the parameters such as PM₁₀, PM_{2.5}, NO, NO₂, NO_x, CO, SO₂, Wind Speed (in m/s), and Wind Direction (in degree) are recorded on every 15 minutes interval, all parameters were measured by analyzers equipped in mobile van. A displayed unit is also, installed at main entrance of division. All the instruments including mobile van is supplied by CPCB authorized agency & approved from USEPA. The data connectivity with CPCB server & transmission facility is being installed.



Continuous Ambient Air Quality machine (CAAQMS) for data monitoring system

Environmental monitoring data is attached as an annexure-I & external monitoring report from NABL accredited laboratory is attached as annexure-II.

Online emission monitoring for FBC based 2x10MW captive power plant is installed at for PM, SO₂ & NO_x monitoring in stack and continuously being transmitted to JSPCB server. Electro Static Precipitator (ESP) is attached with the power plant and is regularly being maintained. The quality & quantity of emission is maintained well within limit as per standard. The approval for data connectivity permission to CPCB is recently granted to vendor. All the data of PM, SO_x & NO_x are working smoothly.



Continuous Emission Monitoring for Power House for PM, Sox & NO_x data

(vi) Adequate measures should be taken for control of noise levels below 85 db(A) in the work environment. Workers engaged in blasting and drilling operations, operation of HEMM, etc should be provided with ear plugs/ muffs.

Control measures are being taken up to keep noise level well within limit in working environment by providing adequate enclosure/ separation to the various high noise sources, proper maintenance, provision of control room, operator's a/c cabin etc. In addition all the persons are provided with PPEs such as ear plug/ muff during work. Warning signs in local language are also displayed at various areas in mines & plant. An adequate green belt is also maintained in the area.



Noise control measures in the area

(vii) Industrial wastewater (workshop and wastewater from the mine) should 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 should be installed before discharge of workshop effluents.

The Industrial wastewaters generated from various operations are handled through effluent management system provided in all operational dept. with the objective to treat the effluent and recycle the clear water. The HEMM maintenance shops have been provided with oil trap arrangement to recover the oil during washing of equipments. The recovered used oil during washing is sold to authorized recycler as per guideline and the effluent generated is checked for quality and recycled -reused in the system.



Oil trap in mines

Zero Effluent Discharge (ZLD) being maintained at all units including captive power plant (2x10MW FBC). A web camera (ip: 117.244.160.6) along with flow meter is installed at discharge end and all data being regularly submitted to state pollution control board.



Live web camera footage installed at discharge point



Online Effluent Monitoring System installed at site (Power Plant)

- (viii) *Vehicular emissions should be kept under control and regularly monitored. Vehicles used for transporting the mineral should be covered with tarpaulins and optimally loaded.*

Vehicular emission is kept under control by regularly monitoring & maintenance of vehicles. Overloading of vehicles is avoided during mineral transport. All the vehicles during transport of material covered with tarpaulin sheet. In future, the mineral transportation will be done by Pipe conveyor.



Transportation of mineral

- (ix) *Environmental laboratory should be established with adequate number and type of pollution monitoring and analysis equipment in consultation with the State Pollution Control Board.*

A full-fledged Environmental laboratory is functioning with adequate number of pollution monitoring and analysis instruments. Accreditation of laboratory from State Pollution Control Board & NABL is under process.

- (x) *Personnel working in dusty areas should wear protective respiratory devices and they should also be provided with adequate training and information on safety and health aspects. Occupational health surveillance programme of the workers should be undertaken periodically to observe any contractions due to exposure to dust and to take corrective measures, if needed.*

All dusty areas such as crushers etc are provided with dry fog system and fixed dust sprinklers so as to eliminate dust from source. All haul roads, are equipped with fixed and mobile dust sprinklers. All drill operations are wet only. The operators of various HEMM being operated inside the mines are provided with air-condition cabins. In addition dust mask has been provided to the personnel working in dusty area. The persons have been imparted necessary training on safe work practices and appraised the adverse consequences on health in case of any violation of the practices. Occupation health surveillance programme is being conducted on regular basis in our

Hospital for health check up as per the coal mines rule. The health awareness programme is also being conducted regularly in all the departments.

- (xi) *A separate environmental management cell with suitable qualified personnel should be set up under the control of a Senior Executive, who will report directly to the Head of the company.*

A separate Environment Management Cell is in place with qualified person reporting to Top management.

- (xii) *The funds earmarked for environmental protection measures should be kept in separate account and should not be diverted for other purpose. Year-wise expenditure should be reported to this Ministry and its Regional Office at Bhubaneswar.*

The Environmental Management Cell of West Bokaro division having separate fund for environmental protection measures / compliance to legal requirement. Besides above all other departments are having budgetary provision for environmental protection measures in their working area. The year wise expenditure on the above subject is reported to State pollution control Board. The expenditure occurred during the financial year 2016-2017 is more than Rs. 1500.00 Lakh.

- (xiii) *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.*

Being complied with.

- (xiv) *A copy of the clearance letter will be marked to concerned Panchayat/ local NGO, if any, from whom any suggestion/representation has been received while processing the proposal.*

Complied with.

- (xv) *State Pollution Control Board should display a copy of the clearance letter at the Regional Office, District Industry Centre and Collector's Office/ Tehsildar's Office for 30 days.*

Complied with.

- (xvi) *The Project authorities should 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 with.