CENTRAL COALFIELDS LIMITED
(A MINIRATNA CAT-I COMPANY)
(GOVT. OF INDIA UNDERTAKING)
OFFICE OF THE PROJECT OFFICER,
JARANGDIH COLLIERY, KATHARA AREA
PO:- JARANGDIH,BOKARO,JHARKHAND-829113

Ref:PO/JRD/EC Comp/2023/ 548 Date- 30/5/2023

To,

The Regional Officer,
Regional Office (ECZ)
Ministry of Environment, Forest and Climate Change
Bungalow No- A-2, Shyamali Colony, Doranda
Ranchi, Jharkhand 834002

Registered Post

Sub- Submission of Six monthly EC Compliance (OCT-2022 to MAR-2023) and monitoring reports of Jarangdih Opencast Mine of Kathara Area, CCL for coal production of 0.88 MTPA.

Reference:MoEF-EC letter no.- J11015/502/2008-IA.II(M) Dated 1ST March 2012

Respected Sir,

It is to inform that we are submitting Six monthly EC Compliance (Oct-2022 to Mar-2023) report for the conditions stipulated in the Environmental Clearance of Jarangdih Opencast Mine of Kathara Area, CCL for coal production of 0.88 MTPA with monitoring data report. The copy of the compliance report is also being sent in the soft format through E-Mail (ro.ranchi-mef@gov.in) for your kind perusal.

Thanking you

Yours faithfully

Project Officer
Jarangdih Colliery

Copy for Kind Information:-

1. The Member Secretary, JSPCB HEC colony, CTI Colony, Sector-3, Dhurwa, Ranchi-834004, ***Email- ranchijspcb@gmail.com***
2. The Regional Officer, JSPCB H.I.G.-1 Sardar Patel Nagar, Dhanbad-826001,***Email-dhanbadjspcb@gmail.com***
3. The HOD (Env. & Forest), CCL, HQ, Ranchi
4. The General Manager, Kathara Area
5. The S.O.(Env.), Kathara Area
6. The Office copy

SIX MONTHLY COMPLIANCE REPORT
(OCT-22 toMAR-23)

JARANGDIH OCP OF KATHARA AREA
CENTRAL COALFIELDS LIMITED
(A Miniratna Company)

Six Monthly Compliance Report of Environmental Clearance vide letter no J11015/502/2008-IA.II(M) Dated 1ST March 2012 issued BY MoEF& CC, Government of India as below:-

Specific Conditions

S.No	CONDITIONS.	COMPLIANCE STATUS
(i)	Peak production from Jarangdih OCP shall not exceed 0.88 MTPA without prior environmental clearance.	Followed. Production of 2022-23 is 0.872 MT.**(Attached as Annexure-1)**
(ii)	Mining shall be carried out as per statuette from River Konar, Streams/Nallah, flowing within the lease and maintaining a safe distance from River Konar and nalas flowing within the leasehold.	Quarry is at a distance of 400m (approx) from the HFL of river Konar. Embankment (35 mtr approx) has been created along the river.
(iii)	No Washery shall be established within the ML without prior environmental clearance from this Ministry.	No Washery has been established within the ML.
(iv)	Top soil, if any to be generated during the balance life of the Jarangdih OCP shall stacked proper slop at earmarked site(S) and shall not be kept Active and shall be used within a year of its generation for reclamation and development of greenbelt.	Top soil is being stored at an earmarked place and is spread greenery developed by throwing of seed balls.
(v)	Of the estimated total OB generation 5.14 MCum over the balance life of the mine is, which would be back filled during 2010-2014. An estimate 04 Mcum of OB to be generated during the next 03-04 year shall be re-handled into the de-coaled void, which would reduce the depth of the final void by 40 m. The ultimate slope of the dumps shall not exceed 28^0. Monitoring and Management of reclaimed dumps sites shall continue until the vegetation becomes self-sustaining. Compliance status shall be submitted to the Ministry of Environment & Forest and its Regional Office located at Bhubaneswar on yearly basis.	Production of mine will be enhanced from 0.88 MTPA to 1.5MTPA for which ToR is granted and Public Hearing has been done. Final reclamation/Mine Closure will be done as per New Project Report of 1.5 MTPA. **(Attached as Annexure-II)** Progressive plantation is being done over the vacant places. Scientific study on determination of ultimate dump slope and monitoring of slope stability has been done by the ISM, Dhanbad and maintained accordingly.

(vi)	Catch drains and siltation ponds of appropriate size shall be constructed to arrest silt and sediment flows from soil, OB and mineral dumps. The water so collected shall be utilized for watering the mine area, roads, green belt development, etc. The drains shall be regularly de-silted and maintain properly.	475m toe-wall along with catch drain and 2 nos of settling tank is present along OB Dump. 500m garland drain is present along quarry edge near Dhori Mata Church which is regulary cleaned.. Siltation pond is provided at discharge point of mine.
(vii)	Garland drains (size, gradient and length) and sump capacity shall be designed keeping 50% safety margin over and above the peak sudden rain fall and maximum discharge in the area adjoining the mine site. Sump capacity shall also provide adequate retention period to allow proper settling of silt material.	500m garland drain is present along quarry edge near Dhori Mata Church. Surface runoff is being collected in mining sump which is adequate. **Sump dimension/capacity-** Length- 150 m Breadth- 87 m Height- 12.33 m = 160906.50 cum (35.39 Million gallon)
(viii)	Dimension of the retaining wall at the toe of dumps and OB benches within the mine to check run-off and siltation shall be based on the rain fall data.	475m toe-wall along with catch drain and 2 nos of settling tank is present along OB Dump.
(ix)	Mineral transportation by road from the mine to Kathara Washery located at a distance of 4.5 KM from the mine and to Jarangdih Railway Siding within the leasehold shall use trucks of a minimum capacity of 20-T. All internal roads and approach roads, and roads for colony shall be black topped. A 3-Tier green belt shall be developed on both sides of these roads. Green belt shall be developed at Railway siding also.	Mineral transportation by road uses trucks of a minimum capacity of 20-T. Approach roads and roads of coloniesare black topped with revenue plantation. Plantation along the transportation road about 7.45 KM was planted in the year of 2011 to 2014. Green Barrier at railway siding along the platform is installed in about 250m in 2020 and 540m in 2021 and maintained properly. Plantation of 1500 Ashok tree has been done in the year 2022 along the Jarangdih Railway Siding and its nearby roads. Plantation along the dump slope and green belt on both sides along road near habitation has been done to protect againstdust from OB dump.

(x)	High efficiency water sprinkling system shall be provided to check fugitive emissions at the transfer points, haulage, toads, Jarangdih Railway Siding and CHP for crushing/ loading operations for dust control.	Regularly sprinkling is being done by using 2 Nos of 28 KL and 1 No of 12 KL & 2 No of 09 KL Mobile water sprinkler. **(Log book is attached as Annexure-III)** 24 Nos. of Fixed water sprinklers installed along the platform and additional 8 Nos. of fixed sprinklers are installed along the weighbridge. Overhead fixed sprinkles already installed at weighbridge. 30 Nos of Fixed water sprinklers installed along theJarangdih HMB road near Rly.siding. 32 Nos. of Fixed water sprinklers installed along the platform, weighbridge and overhead fixed sprinklers installed at weighbridge at Jarangdih railway siding. Water Jet spray system installed at coal crusher and fully closed with canopy to control fugitive emission. Crushers are equipped with nozzle dust sprayers for dust suppression. Permanent wind screen along the siding has been provided for arresting fugitive dust emissions.
(xi)	Drills shall be wet operated only.	All drills are wet operated.
(xii)	Controlled blasting shall be practiced with use of delay detonators. The mitigative measures for control of ground vibrations and to arrest the fly rocks and boulders shall be implemented.	Followed, Control blasting is done with the use of electronic detonators. Blasting parameters, pattern and vibration report of one week from 21.04.23 to 26.04.23 is attached as **attached as Annexure-IV**

(xiii)	The conceptual post mining land use for Jarangdih OCP involves a plan reclamation with plantation at end of mine life which includes backfilled area of 20.48 ha, an external OB dump of 18.21 ha and a plantation of roads (5 ha), coal stockyard (4ha) and in vacant area of 30 .30ha by planting native species from about the mix of consultation with the local DFO/Agriculture Department/suitable Institution. The density of trees shall be around 2500 plants per ha.	Production of mine will be enhanced from 0.88 MTPA to 1.5MTPA for which ToR is granted and Public Hearing has been done. Final reclamation/Mine Closure will be done as per New Project Report of 1.5 MTPAin consultation with the local DFO/Agricultural department. However progressive plantation by DFO Hazaribagh is being done over vacant places. Year wise plantation at Jarangdih Colliery is given below-

Sl	Year	No. of Plants	Plantation km/Area
1	1995-98		104.37 Ha
2	2004-05		21.36 Ha
3	2005-06		6.32 Ha
4	2013	840	2.1 km (0.336 Ha)
5	2014	2140	5.35km (0.856 Ha)
6	2020	Seed Ball	5.00 Ha
7	2020	600 plants distributed to employees	
8	2021	6250	2.50 Ha
9	2021	200 saplings distributed to employees.	
10	2022	1500	Along Rly. Siding
11	2023-24 (Proposed)	41925	16.77 Ha

Award letter of the proposed plantation for the year FY 2023-24 is attached as **Annexure-V**

<table>
<tr><td>(xiv)</td><td>A mine closer plan shall be implemented after completion of mining in about 5 years in Jarangdih OCP by reclamation of 20.48 hac.of the total quarry area shall be afforested by planting native plant species in consultation with the local DFO/agricultureDepartment/ Relevant Institution. The density of the trees shall be around 2500 plants per ha. The balance area of 13.38 ha being left as water body of max. depth of 40-45 would be reclaimed along the upper sides, which shall be gently sloped and stabilized with plantation from species found in the original ecosystem.</td><td>Production of mine will be enhanced from 0.88 MTPA to 1.5MTPA for which ToR is granted and Public Hearing has been done.
Final reclamation/Mine Closure will be done as per New Project Report of 1.5 MTPA in consultation with the local DFO/Agricultural department.
Plantation is done having the density of trees around 2500 plants per hectare.</td></tr>
<tr><td>(xv)</td><td>No ground water (bore well) shall be used for the Project. Rainwater harvesting structures including check dam for recharge of ground water shall be erected within and around the ML in case the water table shows a declining trend. Additional water if any required during mining operations shall be met from mine sump water or from rainwater.</td><td>No ground water (bore well) is used for mining operations.
Rain water harvesting, structures including check dams for recharge of ground water is done at PO office.
100 Nos. of Rain Water Harvestor is constructed at quarters to collect Rain water and recharge water table in Kathara Area.</td></tr>
<tr><td>(xvi)</td><td>Regular monitoring of ground water level and shall be carried out by establishing a network of existing wells and constructions of new piezometers. 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 in May; Data thus collected shall be submitted to the MoEF and to the Central Pollution Control Board Quarterly within one month of monitoring.</td><td>At present, regular monitoring of ground water level is carried out through wells in the area and piezometer is installed.
<table>
<tr><th>Month</th><th>Ground Water level from surface(Mtr)</th></tr>
<tr><td>Oct-22</td><td>2.2</td></tr>
<tr><td>Nov-22</td><td>2.0</td></tr>
<tr><td>Dec-22</td><td>2.7</td></tr>
<tr><td>Jan-23</td><td>3.1</td></tr>
<tr><td>Feb-23</td><td>3.6</td></tr>
<tr><td>Mar-23</td><td>3.8</td></tr>
</table></td></tr>
<tr><td>xvii</td><td>The Project authorities shall meet water requirement of nearby Village(s) in case the village wells go dray due to dewatering of mine.</td><td>Water is supplied to nearby villages through pipe lines and hired water tanker as per requirement.</td></tr>
</table>

xviii	Sewage treatment plant of adequate capacity shall be installed in the colony. ETP shall also be provided for workshop and CHP wasted water. Treated waste water meeting prescribed norms only shall be permitted to be discharged in to the natural water courses.	At colony sewages are treated by septic tank and soak-pits. Proposal for construction of STP is in approval stage. 100 KLD ETP is constructed at the Workshop of Jarangdih OCP. Treated waste water is being reused. Flowchart of ETP at Jarangdih OCP is hereby attached as **Annexure-VI**.
xix	Besides carrying out plant regular periodic health check up of their workers, 10% of the workers identified from workforce engaged in active mining operations shall be subjected to third party health check up for occupational diseases and heating impairment , if any, through an a medical institution/hospitals in the district/state..	Regular PME of 1/5th workers is done at designated hospitals every year as per provisions in mining statutes. PME record for the calendar year 2022 Target-210 Achievement- 212 IME record for the calendar year 2022 is 163.
xx	A provision of Rs.5/ tone of coal shall be earmarked for CSR for life of the Project. The details of expenditure and various activities which includes provision / augmenting facilities for water supply, education and health shall be form part of theAnnual Report of the company and also uploaded on the company website and updated at least once a year.	Followed. The Annual Report of the company is uploaded on the company website A list with details of expenditure on various activities done under CSR of JarangdihUnit is attached as **Annexure-VII**. A booklet on CSR at Kathara Area is attached in email.
xxi	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.	A time series of land use maps of Jarangdih OCP, based on satellite imagery prepared by CMPDILis enclosed herewith.(**Annexure-VIII**) Soft copy is sent to MOEF at mefcc[at]gov[dot]in on 5 May, 2023 and its Regional Office at Ranchi via e-mail on 25 Apr, 2023.

xxii	A detailed Final Mine closer plan along with details of corpus fund shall be implemented for JarangdihOCPafter completion of project in about 5 years and a plan for Final Mined Closure shall be prepared for JarangdihUGP and submitted to this ministry 5 years before its completion.	Mine closure plan of Jarangdih OCP will be followed. An ESCROW account for the purpose has been opened. Final Mine Closure for Jarangdih UGP has been submitted through E-mail on dtd 06.02.2023 to IRO, MOEF.

GENERAL CONDITIONS:-

(i)	No change in technology and scope of working shall be made without prior approval of the Ministry of Environment and Forests.	Followed
(ii)	No change in the calendar plan including quantum of mineral coal and waste being produced shall be made.	Followed
(iii)	Four ambient air quality monitoring stations shall be established in the core zone as well as in the buffer zone for monitoring PM-10, PM-2.5, SOx and NOx. Location of the stations shall be decided based on the meteorological 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 in particulates shall be carried out at least once in six months.	Followed.
(iv)	Data on ambient air quality (PM-10, PM-2.5, SO_2 and NO_x and heavy metals such as Hg, As, Ni. Cr, etc) 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 recognizes under the EP Rules, 1986 shall be furnished as part of the Compliance report.	Followed. Analysis report for the qtr ending Dec-2022 is attached as **Annexure-IX**. Hardcopy of the reports is sent to the State Pollution Control Board via post. Soft copy of report data is sent Ministry at mefcc[at]gov[dot]in including its Regional Office at Ranchi and to the State Pollution Control Board and the Central Pollution Control Board via e-mail on 5 may 2023.
(v)	Adequate measures shall be taken for control of noise levels below 85 dBA in the work environment. Workers engaged in blasting and drilling operations, of HEMM, etc. shall be provided with ear plugs/muffs.	Followed, Ear plugs/muffs are provided to workers engaged in blasting and drilling operations etc. as per requirement.

<table>
<tr><td>(vi)</td><td>Industrial waste water (workshop and wasted water from the mine) shall be properly collected and treated so as to conform to the standards including for heavy metals before discharge prescribed under CSR-122 (E) dated 19th May 1993 and 31st December 1993 or as amended from time to time. Oil and grease trap shall be installed before discharge of workshop effluents.</td><td>100 KLD Advance Treatment Plant/ ETP is constructed at the Workshop of Jarangdih OCP.</td></tr>
<tr><td>(vii)</td><td>Vehicular emissions shall be kept under control and regularly monitored. Vehicles used for transportation for the mineral shall be covered with tarpaulins and optimally loaded.</td><td>PUC certificates of all trasportation trucks are regulary checked at M-parivahan portal and only permitted in the mine after its clearance. PUC certificates is attached as Annexure-X.
All vehicles used for transportation for the mineral are covered with tarpaulins and optimally loaded.</td></tr>
<tr><td>(viii)</td><td>Monitoring of environmental quality parameter 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 trough a laboratory recognized under EP Rule, 1986.</td><td>Monitoring of Environmental quality parameters and its analysis is being done by CMPDI which is equipped NABL accredited laboratory.</td></tr>
<tr><td>(ix)</td><td>Personnel working in dusty areas shall wear protective reparatory devices and they shall also be provided with adequate training and information on safety and health aspects. Occupational health surveillance program of the workers shall be undertaken periodically to observe any contractions due to exposure to dust and to take corrective measures, if needed.</td><td>PPE are provided as per requirement.
Regular PME of 1/5th workers is done at designated hospitals every year as per provisions in mining statutes.
Regular training regarding information on safety and health aspects is being given to workers at Vocational Training Centre.
Daily safety talk is being given to workers.
Record for the calender year 2022.
<table>
<tr><td>Particulars</td><td>Achievement</td></tr>
<tr><td>PPE</td><td>Helmet- 56
Safety shoes- 210</td></tr>
<tr><td>PME</td><td>212</td></tr>
<tr><td>IME</td><td>163</td></tr>
</table></td></tr>
<tr><td>(x)</td><td>A separate environmental 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.</td><td>A separate Environmental cell headed by G.M has been established at company HQ, directly reporting to CMD, CCL.
Hierarchy of Environment cell
 
</td></tr>
</table>

(xi)	The funds earmarked for environmental protection measure shall be kept in separate purpose. Year-wise expenditure shall be reported to this Ministry and its Regional Office at Bhubaneswar.	Funds earmarked for environment are used for environmental protection measures only. **(Attached as Annexure -XI).** Soft copy of the same is sent to Ministry (MOEF) and Regional Office at Ranchi via e-mail 5 May 2023.
(xii)	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 7 (seven) days of the clearance letter information that the project has been accorded environmental clearance and a copy for 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://encfor.nic.in	The advertisement about the environment clearance had been published in Two local News Papers:-1. Prabhat Khabar and 2. Dainik Jagran in Hindi .
(xiii)	A copy of the environment clearance letter shall be marked to concerned Panchayats/ZilaPerishad, Municipal Corporation or Urban Local Body and local NGO, if any from whom any suggestion /representation has been received while proposal. A copy of the clearance letter shall also be displayed on the company's website.	A copy of the environment clearance letter has been sent to concerned panchayats for necessary action. Copy of EC has been hoisted on CCL website i.ewww.centralcoalfieds.in
(xiv)	Copy of the Environment Clearance letter shall be displayed on the website of the concerned JSPCB. The EC conditions shall also be displayed at the Regional Office, district Industry Centre and Collector's Office /Tehsildar's Office for 30 days.	Copy of environmental clearance has been submitted to JSPCB, Ranchi and its regional office at Dhanbad for display.

(xv)	The clearance letter shall be uploaded on the company's website. The compliance status of the stipulated EC conditions shall also be uploaded be the project authorities on their website and updated Monitoring of environmental quality parameter 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 trough a laboratory recognized under EP Rule , 1986.ateast one every six months so as to bring the same in the public domain. The monitoring data of environmental quality parameters (air, water, noise and soil) and critical pollutions such as PM-10, PM-2.5, SO_2 and NOX (ambient) and critical sectoral parameters shall also be displayed at the entrance of the project premises and mines office and in corporate office and one company's website.	Copy of EC has been hoisted on CCL website i.e www.centralcoalfieds.in and monitoring data are regularly uploaded. CAAQMS is installed at the entrance of GM Office, Kathara for displaying the monitoring data of environmental quality parameters.
(xvi)	The project proponent shall submit six monthly reports on the status of compliance of the stipulated environment clearance conditions (both in hard copy and in E-mail) to the respective Regional Office of MOEF, the respective Zonal offices of CPCB and the SPCB by furnishing the requisite date/information/reports.	Is being followed

xvii	The Regional Office of this Ministry located at Bhubaneswar shall monitor compliance of the stipulated conditions. The Project authorities extend full co-operation to the office(s) of the Regional Office by furnishing the requisite/information/monitoring reports.	Agreed
xviii	The environmental statement for each financial year ending 31st March Form-V is mandated to be submitted by the project proponent to 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 Office of the MOEF by E-mail.	Is being followed. The environmental statement for financial year 2021-22 is uploaded on the company's website. The environmental statement of the year 2021-22 in respect of the project is sent to the State Pollution Control Board vide PO/JRD/925 dated 29.07.2022. Soft copy is sent to the Regional Office of the MOEF via e-mail on dated Feb-3, 2023.

Project Officer
Jarangdih Colliery

Annexure I

COLLIERY :- JARANGDIH O/C MINE

MONTH :- March' 2023

FORM 4 (A)

(i) PRODUCTION DETAILS

MODE	SEAM	GRADE	This Month (Te.)		Prog. Yearly (Te.)	
			Target	Actual	Target	Actual
Coal OC (Dept.)	K.L.M. Bermo Seam	W - IV	11000	0	100000	151080
Coal OC (Hired)	Seam VII,VIIA & VI	W - IV	142000	201916.06	693000	720926.68
Coal OC (Total) :-	DO	DO	153000	201916.06	793000	872006.68

(ii) OB REMOVAL (a) SOLID (B) REHANDLING/DUMPED LOOSE OB

MODE	THIS MONTH (CUM)		Prog. Yearly (CUM.)		THIS MONTH (CUM)		Prog. Yearly (CUM.)		REMARKS
	Target	Actual	Target	Actual	Target	Actual	Target	Actual	
DEPARTMENTAL	41000	19773	392000	184715.50	0	0	0	0	
OUTSOURCING	175000	151034.49	875000	1099163.09	125000	129118.95	2726000	2634818.35	
TOTAL	216000	170807.49	1267000	1283878.59	125000	129118.95	2726000	2634818.35	

(iii) (a) DESPATCH / TRANSFER

MODE	This Month (Te.) ACTUAL							ACTUAL PROG. YEARLY (Te.)						
	Gr. W - III	Gr. W -IV	Gr. W -V	Gr. G - 9	Gr. G - 8	WCP	TOTAL	Gr. W - III	Gr. W -IV	Gr. W -V	Gr. G - 9	Gr. G - 8	WCP	TOTAL
RAIL	0	76537.97	62280.34	0	0	0.00	138818.31	0	788617.65	467498.21	0	0	0	1256115.86
ROAD SALE	0	8388.29	0	0	0	0	8388.29	0	41698.46	0	0	0	0	41698.46
CTPS	0	19917.07	0	0	0	0	19917.07	0	97220.14	0	0	0	0	97220.14
BTPS	0	256.13	0	0	0	0	256.13	0	25993.83	0	0	0	0	25993.83
TATA POWER	0	0.00	0	0	0	0	0	0	47972.39	0	0	0	0	47972.39
JHAJHAR POWER	0	0.00	0	0	0	0	0	0	7999.48	0	0	0	0	7999.48
BAJAJ ENERGY	0	0.00	0	0	0	0	0	0	15929.93	0	0	0	0	15929.93
MPL	0	24972.43	0	0	0	0	24972.43	0	45940.31	0	0	0	0	45940.31
LALITPUR	0	0.00	0	0	0	0	0	0	8846.70	0	0	0	0	8846.7
VSSPL	0	21228.81	0	0	0	0	21228.81	0	21228.81	0	0	0	0	21228.81
TOTAL	0	151300.7	62280.34	0	0	0	213581.04	0	1101447.70	467498.21	0	0	0	1568945.91
Transfer to KTW	0	33482.22	0	0	0	0	33482.22	0	169557.40	0	0	0	0	169557.40

iii (b) DETAILS ABOUT MOVEMENT OF COAL

	OPENING STOCK ON 1ST DAY OF THE MONTH (As		PRODUCTION THIS MONTH (Te.)	INTER COLLY. /AREA RECEIVED / TRANSFER			DESPATCH THIS MONTH ACTUAL (Te.)	COLLY. / DOMESTIC CONSUMPTION THIS MONTH (Te.)	CLOSING BOOK STOCK ON LAST DAY OF THE MONTH (TE.) (As on 31-03-2023)
	GRADE	QUANTITY (Te.)*		NAME OF COLLY. (COAL RECEIVED FROM)	RECEIVED THIS MONTH (Te.)	TRANSFER (Te.)			
BOOK STOCK	W - III	2.00	0	KATHARA WASHERY	0	0	0	0	2
BOOK STOCK	W - IV	348325.02	201916.06	GVP PH - II (OCP)	13192.16		151300.70	0	378973.15
				KTW	0	33482.22			
DUAL STOCK		106119.02		Bokaro Colly. (BKS)	0.00	KTW			136757.15
				Bokaro Colly. (RKT)	322.83				
				Bokaro Colly. (BDS)	0.00				
				KARO (OCP)	0				
				TOTAL :-	13514.99				
BOOK STOCK	W - V	1760.81	0	GVP PH - II (OCP)	61406.58	0	62280.34	0	887.05
				KARO (OCP)	0				
				Total :-	61406.58				
BOOK STOCK	G - 9	34.00	0	GVP PH - II (OCP)	0	0		0	34
BOOK STOCK	G - 8	11.00	0	AKK (OCP)	0	0	0	0	11
BOOK STOCK	WCP	266.00	0	KATHARA WASHERY	0	0	0.00	0	266.00

Note :- Opening Stock of 01.04.2022 is taken from A.C.M. H - Form 2021-2022

01/04/23
STATISTICAL CLERK, JRD (C)

5.4.23
SIDING INCHARGE (PF-II), JRD (C)

MANAGER (O/C)/JRD (C)

PROJECT OFFICER/JRD(C)

CHAPTER 8: PROGRESSIVE & FINAL MINE CLOSURE PLAN

Ministry of Coal has revised its guidelines vide letter no 34011/28/2019-CPAM dated 29th May 2020 related to preparation of Mining Plan & Mine Closure Plan for coal and lignite blocks. As per the guidelines, 2020 it is required that the mine closure activities are to be examined periodically in every five years' period and to be subjected to third party monitoring by agencies approved by the Central Government like CMPDIL, NEERI, IIT-ISM or any other institutes/organizations/agencies specified. Up to 50% of the total deposited amount including interest accrued in the ESCROW account may be released after every five years in line with the periodic examination of the Closure Plan. The amount released should be equal to expenditure incurred on the progressive mine closure in past five years or 50% whichever is less.

The salient points of this revised guidelines are:

- Progressive and Final Mine Closure Plan shall be integral part of Mining Plan.
- The closure cost was escalated to Rs 9 lakh per hectare in opencast and 1.5 lakh per hectare for underground mine.
- Reimbursement of upto 50% of total deposited amount in Escrow account will be released after every five years in line with the periodic examination.

8.1

Sl. No	Land use During Mining		Post Mining Land Use	
	Particulars	**Area(ha)**	**Particulars**	**Area(ha)**
1	Quarry including internal dump	86.35	Internal dump reclaimed with plantation	81.85
			Post Mining Water Body	4.50
2	Infrastructure including Work shop ,PO Office, etc. & Pipe Conveyor route	11.16	Infrastructure including Work shop ,PO Office,etc. & Pipe Conveyor route	11.16
3	External OB Dump	37.96	Vacant Land for CCL use	37.96
4	Existing OB Dump	16.36	Plantation over OB Dump, Embankment and degraded Land	28.22
5	Proposed Embankment	4.20		
6	Top Soil Storage Area	7.66		
7	Safety zone and Green belt	43.57	Plantation over Safety Zone & Greenbelt	43.57
	Total Project Area	**207.26**	**Total Project Area**	**207.26**

Source: Pan/Text supplied by the project

8.2	**Water Quality management:** Effluent water is regularly monitored. Siltation pond is provided at discharge point. Water quality monitoring will be carried out quarterly during the post closure stage, as per the CPCB Norms and will be compared with the IS 10500:2012 & 2015. The actual end use and treatment measures, if any required will be decided at the post closure stage depending upon the quality of water.
8.3	**Air Quality management:** Regularly sprinkling is being done by using 2 Nos of 28 KL and 2 No of 12 KL Mobile water sprinkler.24 Nos. of Fixed water sprinklers installed along the platform and additional 8 Nos. of fixed sprinklers are installed along the weighbridge. Overhead fixed sprinkles already installed at weighbridge. Water Jet spray system installed at crusher and fully closed to control fugitive emission. All roads in colony were black topped with revenue plantation. Plantation along the transportation road about 7.45 KM was planted in the year of 2011 to 2014. Green Barrier at railway siding along the platform is installed in about 250m in 2020 and 540m in 2021 and maintained properly. CAAQMS and PM10 analyzer are installed.
8.4	**Waste Management:** Colony sewages are treated by septic tank and soak-pits .ETP is constructed at the Workshop of the project. Solid wastes that will be generated in course of coal mining are overburden material consisting of fragments of sandstone/shale of assorted size. They have not been found to generate acid mine drainage or leach high quantity of heavy metals. About total 28.84 Mcum of OB will be removed. All the OB, from Western quarry is proposed to be dumped outside as external dump. From 6th year onwards eastern quarry will start after removal of all surface infrastructure. All OB, about 13.34 Mcum from eastern quarry is proposed to be dump in the void of western quarry up to the level of +240m. However, since it is still below the surface topography it is further proposed to fill it upto surface topography from western external dump
8.5	**Top Soil Management:** Out of 86.35 ha quarrable area, about 26 Ha area is unbroken land, wherein about 0.156 M. Cum of top soil will be generated. This top soil will be stored at an earmarked place (demarcated in the plan) and will be utilized for concurrent technical and biological reclamation of OB dumps.
8.6	**Management of Coal Rejects:** No washery proposed.
8.7	**Restoration of Land Used for Infrastructure:** Decision on Infrastructure to be kept for future Use or to be dismantled will be taken by CCL at a later stage.

8.8 **Disposal of Mining Machinery:** All the machineries which will have residual life will be shifted to the other collieries of the company i.e. CCL. The salvaging and shifting operation of mining machinery and other equipment will be done considering the ground realities during the period 1 (one) year advance of final mine closure. A list of surface assets (Plant & Machinery) will be prepared and made available to potential purchasers or transferred to other new/ working mines of the company. This will ensure that the assets perform during their economic life.

8.9 **Safety & Security:** 35 Mtr. Boundary is constructed near the entry of the pit. 225 m toe- wall is present along OB dump. 550 m garland drain is present along quarry edge near Dhori Mata Church. While carrying out all kinds of mining and allied activities in the project, the safety rules in force as per Rules and Regulations made under Mines Act-1952 and CMR 2017 will be observed and required safety measures will be taken and circulars issued time to time regarding safety to the personnel and equipment of the mine and to improve the working conditions of the mine will be complied. Refer chapter 4 for detailed safety management aspects.

8.10 **Abandonment Cost and Financial Assurance**

8.10.1 **Yardstick of Mine Closure Activities as per CMPDI Norms**

S. No.	Activity	Weighted % of Mine Closure Cost	
		Progressive	Final
A	**Dismantling of Structure**		
	Service building	**0**	**8.50**
	Residential Building		
	Industrial Structure		
B	**Safety & Security**		
	Random rubble mansory/concerete wall		
	Toe wall around dump/Gabbion wall	**6.50**	**3.20**
	Barbared wire fencing		
	Fencing/boundary wall, fencing around water body		
	Garland drains		
C	**OB Dump Reclamatiom**		
C A	**Technical Reclammation**		
	Re-handling of OB		
	Levelling by Dozer	**60.50**	**60.50**
	Grading		
	Levelling and grading of highwall slopes & OB Dump		

C B	**Biological Reclammation & Plantation**		
	Top soil Management	**15.00**	**11.70**
	Grassing of OB dump		
	Planatation around virgin Area, safety zone, green belt, over external Dump and internal reclaimed area		
	Plantation post care (including manpower)		
	Plantation over cleared area obtained after dismantling		
D	Land scaping of the open space in leasehold area for improving its esthetic. Drain, Pipe lines, Peripheral road,gates, Viewpoints,cemented steps on bank	**4.00**	**5.50**
	Development of Agriculture land		
E	**Environment mitigation & management**	**12.00**	**1.50**
	Air Quality (Water tanker, Sprinkler & other Control measures)		
	Water Quality (ETP & STP etc operating cost)		
	Manpower Cost and supervision		
F	**Post Closure Monitoring**	**0.00**	**3.20**
	Air Quality		
	Water Quality		
	Power Cost		
	Manpower Cost and supervision		
G	Entrepreneurship Development (Vocational/skill development training for sustainable income of affected people)	**1.00**	**0.50**
H	Miscellaneous & Other measures like Golden Handshake, one time financial grant, alternative jobs, other services etc.	**1.00**	**5.40**
	Total	**100.00**	**100.00**

Note: In mines of CCL, there are numbers of old mines operating or closed having high degree of complexities. The activities may vary from the above and can be dealt as case specific.

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

ESCROW ACCOUNT	
Project Name	Jarangdih Expansion OCP
Project Area (Ha)	207.26
Escrow Amount per Ha. For OC Project as on April, 2019 (lakhs/ Ha)	9.00
WPI as on April 2019	121.10
WPI as on August 2022	153.20
Escrow Amount per Ha. For OC Project as on August 2022 (lakhs/ Ha)	11.39
Current value of corpus as on August 2022 (lakhs)	2359.79
Amount deposited till 31.03.2022 (lakhs)	1560.01
Balance Corpus for which provision is to be made	799.78
Balance Life of mine (as on 01.04.2022)	11
Annual corpus (Balance corpus / Balance life in Rs. (Lakhs)	72.71
Year	Amount in Lakh (Rs.)
1	72.71
2	76.34
3	80.16
4	84.17
5	88.38
6	92.79
7	97.43
8	102.31
9	107.42
10	112.79
11	118.43
Total	1032.93
Total Mine closure cost (in Lakhs)	**2592.94**

Total Mine Closure Corpus to be deposited in Escrow A/c is estimated as **Rs. 2592.94 Lakhs**.

However, the additional amount beyond the escrow account, if any estimated later on, will be provided by the mine operator after estimating the final mine closure cost five years prior to mine closure (as per the mine closure guideline).

Annexure III

WATER-TANKER-28290-March-23 संचालन ...

DAILY RECORD OF OPERATION

दिनांक Date	शिफ्ट Shift	कार्य स्थल Place of work	कार्य के घंटे Hours Worked: एच.आर.के. मीटर रीडिंग सही Clock घं. शुरू Hrs. On	एच.आर.के. मीटर रीडिंग सही Clock घं. बंद Hrs. Off	कुल कार्य के घंटे Total hours worked	प्रगामी कुल घंटे Progressive total hours 596	डाउन टाइम Down Time: आराम Idle	ब्रेक डाउन Break down	शिफ्ट के दौरान ... और ब्रेक डाउन का ... Details of break down ... repairs done during ...
1	2	3	4	5	6	7	8	9	10
26/02	I				—	—	—	—	—
	II				—	—	—	—	—
	III				—		—	—	
27/02	I	2			2	598	6		
	II	1					8		
	III						8		
28/02	I	3			4	602	4		
	II	1					8		
	III						8		
01/03	I						8		
	II						8		
	III						8		
02/03	I	3			3	605	4		1
	II						8		
	III						8		
03/03	I	2			2	607	5		1
	II						8		
	III						8		
04/03	I	3			2	609	5		1
	II						8		
	III						8		
					13		128		03

गेज रीडिंग Gauge Reading: इंजन ऑयल दबाव Engine Oil Pressure	इंजन ऑयल तापमान Engine Oil Temp.	तापमान Temp.	हवा का दबाव Air Pressure	ऑपरेटर का नाम Operator's Name	संचालन शिफ्ट प्रभारी का हस्ताक्षर Signature of Operation Shift In-charge	निकाला गया पीओएल P.O.L. DRAWN: डीजल Diesel	इंजन ऑयल Engine Oil	एचवाईडी ऑयल Hyd. Oil	गियर ऑयल Gear Oil	ग्रीस Grease	विविध Misc.	रखरखाव प्रभारी के हस्ताक्षर Signature of Maintn. In-charge	टिप्पणी REMARKS
11	12	13	14	15	16	17	18	19	20	21	22	23	24
					26/02	✕							
					27/02	60							
					28/02	150							
					01/03	✕							
					02/03	50	5						
					03/03	100							
					04/03	50						[signature]	
						410							

WATER-TANKER-28290-March-23 संचालन का प्रति दिन का रिकॉर्ड

DAILY RECORD OF OPERATION

दिनांक Date	शिफ्ट Shift	कार्य स्थल Place of work	कार्य के घंटे Hours Worked: ए.म.आ.मे. मीटर घड़ी से घं. Hrs. Of	कार्य के घंटे Hours Worked: ए.म.आ.मे. मीटर घड़ी से घं. Hrs. Of	कुल कार्य के घंटे Total hours worked	प्रगामी कुल घंटे Progressive total hours 609	डाउन टाइम Down Time: आराम Idle	डाउन टाइम Down Time: ब्रेक डाउन Break down	शिफ्ट के दौरान मरम्मत और ब्रेक डाउन का विवरण Details of break down and repairs done during shift	गेज रीडिंग Gauge Reading: इंजन ऑयल दबाव Engine Oil Pressure	गेज रीडिंग Gauge Reading: इंजन ऑयल तापमान Engine Oil Temp.	गेज रीडिंग Gauge Reading: तापमान Temp.	गेज रीडिंग Gauge Reading: हवा का दबाव Air Pressure	ऑपरेटर का नाम Operator's Name	संचालन शिफ्ट प्रभारी का हस्ताक्षर Signature of Operation Shift In-charge	निकाला गया पी.ओ.एल. P.O.L. DRAWN: डीजल Diesel 410	इंजन ऑयल Engine Oil	हाइड्रोलिक ऑयल Hyd. Oil	गियर ऑयल Gear Oil	ग्रीस Grease	विविध Misc.	रखरखाव प्रभारी के हस्ताक्षर Signature of Maintn. In-charge	टिप्पणी REMARKS
1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24
05/03	I					—	—	—	—						05/03	<							
	II					—	—	—	—														
	III					—	—	—	—														
06/03	I	2			2	611	6								06/03	60							
	II						8																
	III						8																
07/03	I	2			2	613	6								07/03	90							
	II						8																
	III						8																
08/03	I				—	—		—	—						08/03	×							
	II				—	—	—	—	—														
	III				—		—	—	—														
09/03	I	2			2	615	5		1						09/03	50							
	II						8																
	III						8																
10/03	I	2			3	618	4		1						10/03	80							
	II						8																
	III						8																
11/03	I	3			2	620	5		1						11/03	50							[signature]
	II						8																
	III						8																
					11		106		03							740							

WATER-TANKER-28290-March-23

संचालन का प्रति दिन का रिकॉर्ड

DAILY RECORD OF OPERATION

दिनांक Date	शिफ्ट Shift	कार्य स्थान Place of work	कार्य के घंटे Hours Worked		कुल कार्य के घंटे Total hours worked	प्रगामी कुल घंटे Progressive total hours 620	डाउन टाइम Down Time: आराम Idle	डाउन टाइम Down Time: ब्रेक डाउन Break down	शिफ्ट के दौरान मरम्मत और ब्रेक डाउन का विवरण Details of break down and repairs done during shift	गेज रीडिंग Gauge Reading: Engine Oil Pressure	Engine Oil Temp	Temp	Air Pressure	ऑपरेटर का नाम Operator's Name	संचालन शिफ्ट प्रभारी का हस्ताक्षर Signature of Operation Shift In-charge	निकाला गया पीओएल P.O.L. DRAWN: [illegible] Guts 740	Engine Oil	Hyd. Oil	Gear Oil	Grease	Misc.	रखरखाव प्रभारी के हस्ताक्षर Signature of Maintn In-charge	टिप्पणी REMARKS
1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24
12/03	I			—	—	—	—		—						12/03	~							
	II			—	—			—															
	III			—	—	—	—	—															
13/03	I	2			3	623	5		1						13/03	70							
	II						8																
	III						8																
14/03	I	3			3	626	4		1						14/03	80							
	II						8																
	III						8																
15/03	I	3			2	628	6								15/03	50							
	II						8																
	III						8																
16/03	I	1			2	630	5		1						16/03	50							
	II						8																
	III						8																
17/03	I						8								17/03	~							
	II						8																
	III						8																
18/03	I	2			2	632	5		1						18/03	50							
	II						8									1040							
	III						8															[signature]	

WATER - TANKER - 28290 - March - 23 संचालन का प्रति दिन का रि

DAILY RECORD OF OPERATION

दिनांक Date	शिफ्ट Shift	कार्य स्थल Place of work	कार्य के घंटे Hours Worked: एच. आर. एम. मीटर घड़ी Meter Clock घं. शुरू Hrs. On	कार्य के घंटे Hours Worked: एच. आर. एम. मीटर घड़ी Meter Clock घं. बंद Hrs. Off	कुल कार्य के घंटे Total hours worked	प्रगामी कुल घंटे Progressive total hours 632	डाउन टाइम Down Time: आराम Idle	डाउन टाइम Down Time: ब्रेक डाउन Break down	M/c के दौरान ब्रेक डाउन का विवरण Details of break down repairs done during	गेज रीडिंग Gauge Reading: इंजन ऑयल दबाव Engine Oil Pressure	गेज रीडिंग Gauge Reading: इंजन ऑयल तापमान Engine Oil Temp.	गेज रीडिंग Gauge Reading: तापमान Temp.	गेज रीडिंग Gauge Reading: हवा का दबाव Air Pressure	ऑपरेटर का नाम Operator's Name	संचालन शिफ्ट प्रभारी का हस्ताक्षर Signature of Operation Shift In-charge	निकाला गया पी.ओ.एल. P.O.L. DRAWN: डीजल Diesel 1040	P.O.L. DRAWN: इंजन ऑयल Engine Oil	P.O.L. DRAWN: हाइड्रॉलिक ऑयल Hyd. Oil	P.O.L. DRAWN: गियर ऑयल Gear Oil	P.O.L. DRAWN: ग्रीस Grease	P.O.L. DRAWN: विवि. Misc.	रखरखाव प्रभारी के हस्ताक्षर Signature of Maintn. In-charge	टिप्पणी REMARKS
1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24
19/03	I	-	-	-	-	-	-	-	-						19/03	✗							
	II	-	-	-	-	-	-	-	-														
	III	-	-	-	-	-																	
20/03	I	2			2	634	6								20/03	50							
	II						8																
	III						8																
21/03	I	3			2	636	6								21/03	50							
	II						8																
	III						8																
22/03	I						8								22/03	∝							
	II						8																
	III						8																
23/03	I	2			4	640	4								23/03	100							
	II						8																
	III						8																
24/03	I	4			3	643	4		1						24/03	70							
24/03	II						8										?						
	III						8																
25/03	I	2			3	646	4		1						25/03	50							
	II						8									1360							
	II						8																
	III																						

March-23
W/Hr - 50
BD - 0
Idle - 479
Mai - 23
PJ - 646
Diesel - 1360
S/Hr - 552

Jokesh

14

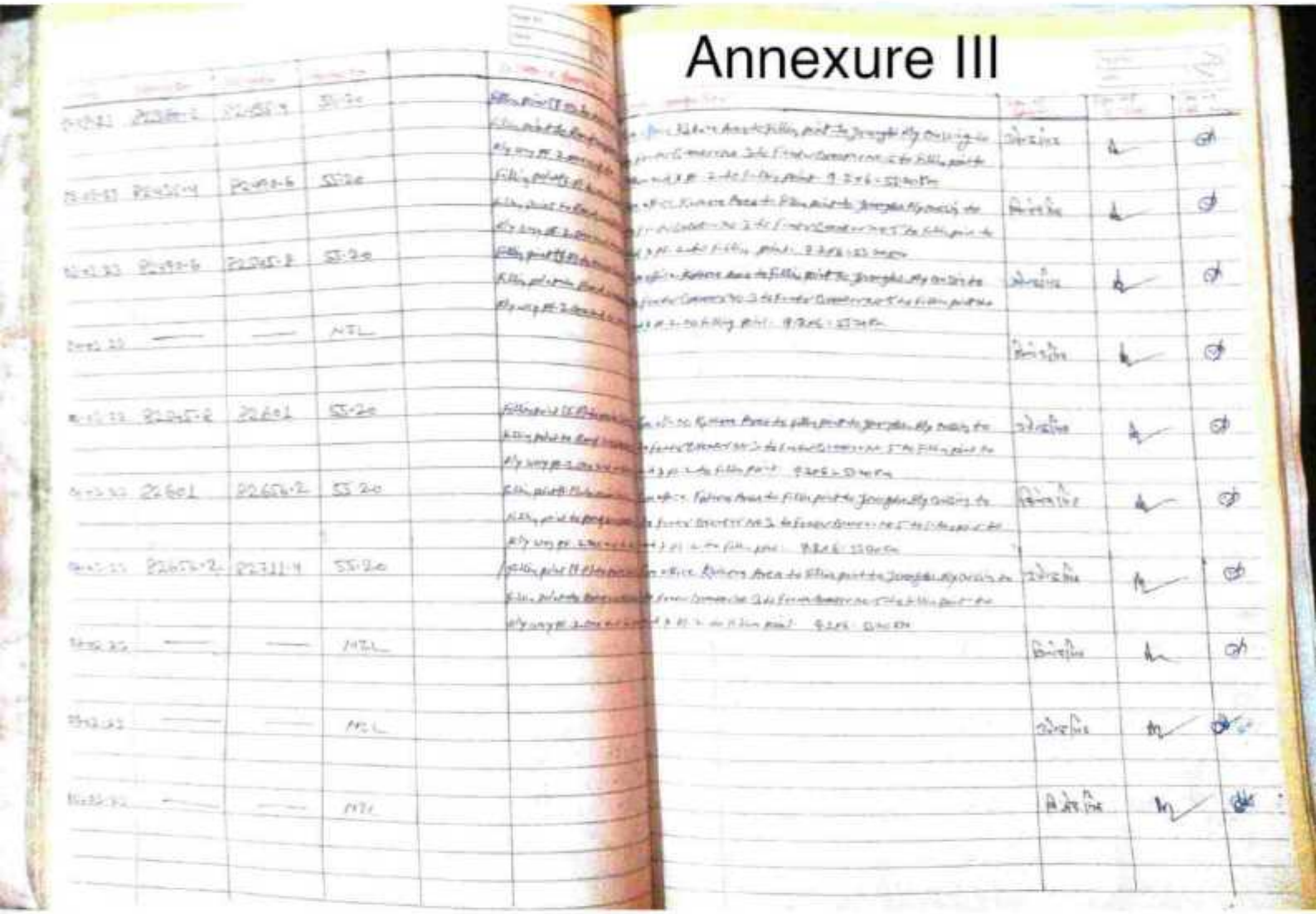
WATER · TANKER-28290-March 23

संचालन का प्रति दिन का

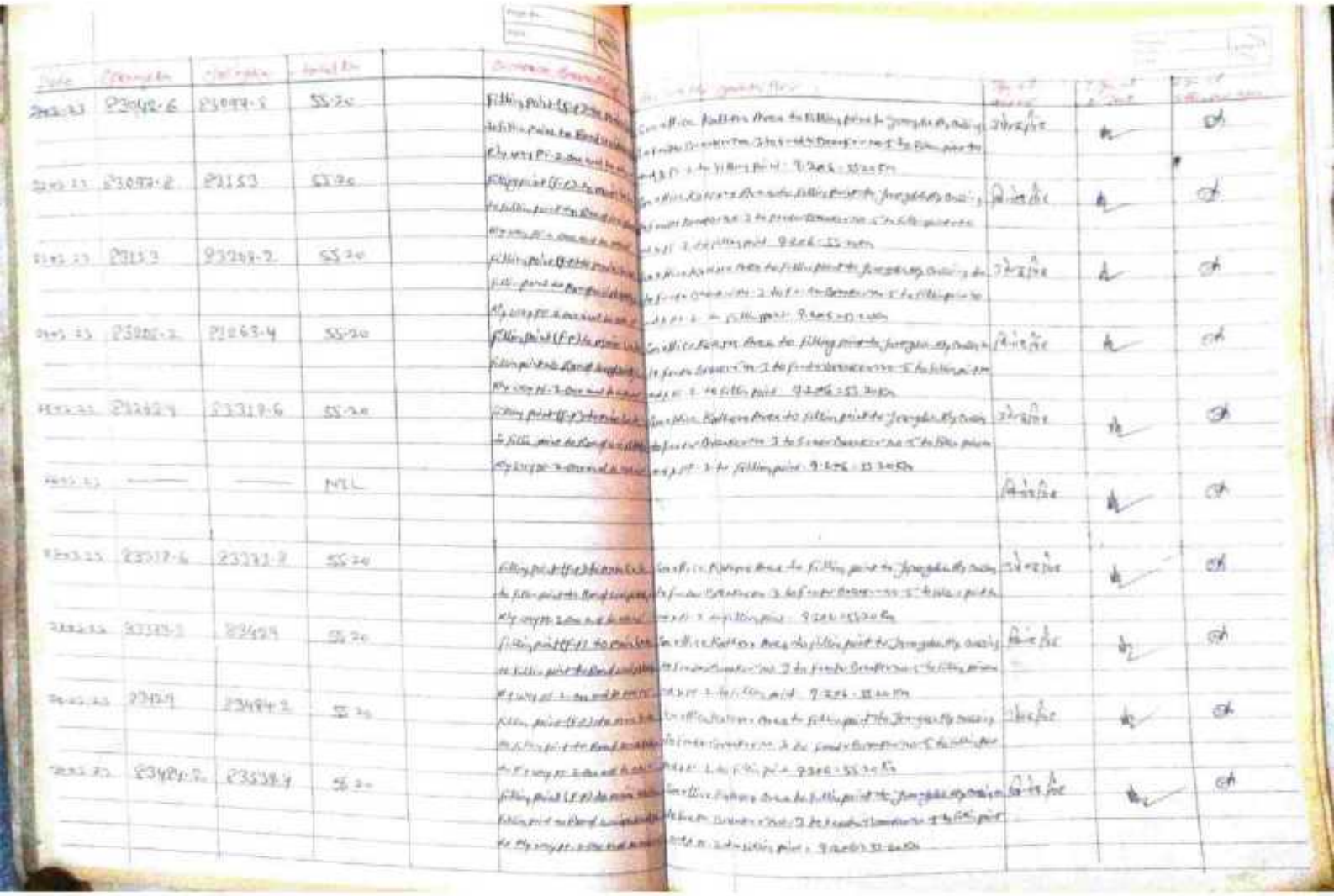
DAILY RECORD OF OPERATION

दिनांक Date	शिफ्ट Shift	कार्य स्थान Place of work	Hours Worked (from)	Hours Worked (to)	कुल कार्य के घंटे Total hours worked	प्रगामी कुल घंटे Progressive total hours 646	Down Time: Idle	Down Time: Break down	Details of break down / repairs done	Gauge Reading: Engine Oil Pressure	Engine Oil Temp.	Water Temp.	Air Pressure	ऑपरेटर का नाम Operator's Name	संचालन शिफ्ट प्रभारी का हस्ताक्षर Signature of Operation Shift in-charge	POL: Diesel	Engine Oil	Hydraulic Oil	Gear Oil	Grease	Misc.	Signature of Maint. in-charge	टिप्पणी REMARKS
1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24
26/03	I	—	—	—	—	—	—	—	—						26/03	^							
	II	—	—	—	—	—	—																
	III	—	—	—	—	—	—		/														
27/03	I	2			5	651	2								27/03	65							
	II						8																
	III						8																
28/03	I	3			3	654	5								28/03	70							
	II				2	656	6																
	III						8																
29/03	I	3			4	660	4								29/03	70							
	II				2	662	6																
	III						8																
30/03	I	2			3	665	5								30/03	70							
	II	1			4	669	4																
	III						8																
31/03	I				2	671	6								31/03	70							
	II				2	673	6																
	III						8																
01/04	I						8								01/04	~							
	II						8															jaiesh	
	III						8								345								
					27		116		01														

Annexure III



Date	O/Meter Km (?)	C/Meter Km (?)	Total Km (?)		[illegible]	Sign of driver (?)	Sign of officer (?)	Sign of [illegible]
11-03-23	—	—	NIL		—	[signature]	[signature]	[signature]
12-03-23	—	—	NIL		—	[signature]	[signature]	[signature]
13-03-23	82711.4	82766.6	55.20		Filling point [illegible] office [illegible] Area to Filling point to [illegible] Rly Siding to Filling point to [illegible] Feeder Breaker No. 3 to Feeder Breaker No. 5 to Filling point to Rly [illegible] PF-2 [illegible] to Filling point - [illegible] - 55.20 Km	[signature]	[signature]	[signature]
14-03-23	82766.6	82821.8	55.20		Filling point [illegible] office [illegible] Area to Filling point to [illegible] Rly Siding to Filling point to Road [illegible] Feeder Breaker No. 3 to Feeder Breaker No. 5 to Filling point to Rly [illegible] PF-2 [illegible] to Filling point - [illegible] 55.20 Km	[signature]	[signature]	[signature]
15-03-23	82821.8	82877	55.20		Filling point [illegible] office [illegible] Area to Filling point to [illegible] Rly Siding to Filling point to Road [illegible] Feeder Breaker No. 3 to Feeder Breaker No. 5 to Filling point to Rly [illegible] PF-2 [illegible] to Filling point - [illegible] - 55.20 Km	[signature]	[signature]	[signature]
16-03-23	82877	82932.2	55.20		Filling point [illegible] office [illegible] Area to Filling point to [illegible] Rly Siding to Filling point to Road [illegible] Feeder Breaker No. 3 to Feeder Breaker No. 5 to Filling point to Rly [illegible] PF-2 [illegible] to Filling point - [illegible] 55.20 Km	[signature]	[signature]	[signature]
17-03-23	82932.2	82987.4	55.20		Filling point [illegible] office [illegible] Area to Filling point to [illegible] Rly Siding to Filling point to Road [illegible] Feeder Breaker No. 3 to Feeder Breaker No. 5 to Filling point to Rly [illegible] PF-2 [illegible] to Filling point [illegible] 55.20 Km	[signature]	[signature]	[signature]
18-03-23	—	—	NIL		—	[signature]	[signature]	[signature]
19-03-23	—	—	NIL		—	[signature]	[signature]	[signature]
20-03-23	82987.4	83042.6	55.20		Filling point [illegible] office [illegible] Area to Filling point to [illegible] Rly Siding to Filling point to Road [illegible] Feeder Breaker No. 3 to Feeder Breaker No. 5 to Filling point to Rly [illegible] PF-2 to Filling point - 55.20 Km	[signature]	[signature]	[signature]



[illegible]	[illegible]	[illegible]	[illegible]		[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	83579.7	83574.6	55.20		[illegible]	[illegible]	[illegible]	[illegible]	[illegible]

[illegible] 82380.2

[illegible] 83574.6

[illegible] 1214.4

DEALING CLERK

[illegible]

SIDING MANAGER

[illegible]

Annexure IV

Name of colliery & Area - Jaragdih O/C, Kalltara Area
Date of Blast - 21/4/23
Material Blasted - O/S (OB)

Details of Blast parameter

No. of holes - 100
Average Burden - 2.5 m
Average Spacing - 2.5 m
Average Depth of holes - 4 m

Volume of Blast - $2.5m \times 2.5m \times 100 = 625\ m^2$

Blasted Material - $625\ m^2 \times 4m = 2500\ m^3$

Explosive consumed - $2000\ kg + 15\ kg = 2015\ kg$

P.F - $\frac{2500}{2015} = 1.24\ m^3/kg$

Details of explosives & accessories

SME - 2000 kg
Booster - 15 kg
E det - 100 nos.

Name of colliery & Area - Jarangdih OC, Kathara Pa
Date of Blast - 21/4/23
Material Blast - O/s (coal)

Details of Blast parameter -

No. of Holes - 15
Average Burden - 5 m
Average Spacing - 5 m
Average depth of Holes - 5m

Area of Blast - $5m \times 5m \times 15 = 375\ m^2$

Volume of Blast - $375\ m^2 \times 5m = 1875\ m^3$

Blasted Material - $1875\ m^3 \times 1.44\ te/m^3$
$= 2700\ te$

Exp. consumed - $= 500\ kg$

$$P.F = \frac{2700}{502.25}$$

$$= 5.37\ te/kg$$

Details of explosive & accessories -

SMF = 500 kg
Booster = 2.25 kg
E det = 15 Nos.

Jarangdih OC, Kathara Area

Date - 21/4/23

Material Blast - Dept. (OB)

Details of Blast parameter

No. of Holes - 09

Average Burden - 3.5 m

Average Spacing - 4 m

Average depth of Holes - 5 m

Area of Blast - $3.5m \times 4m \times 9 = 126\ m^2$

Volume of Blast - $126\ m^2 \times 5 = 630\ m^3$

Blasted Material - $630\ m^3$

Explosive consumed - 511.35 kg

$$P.F = \frac{630}{511.35} = 1.23\ m^3/kg$$

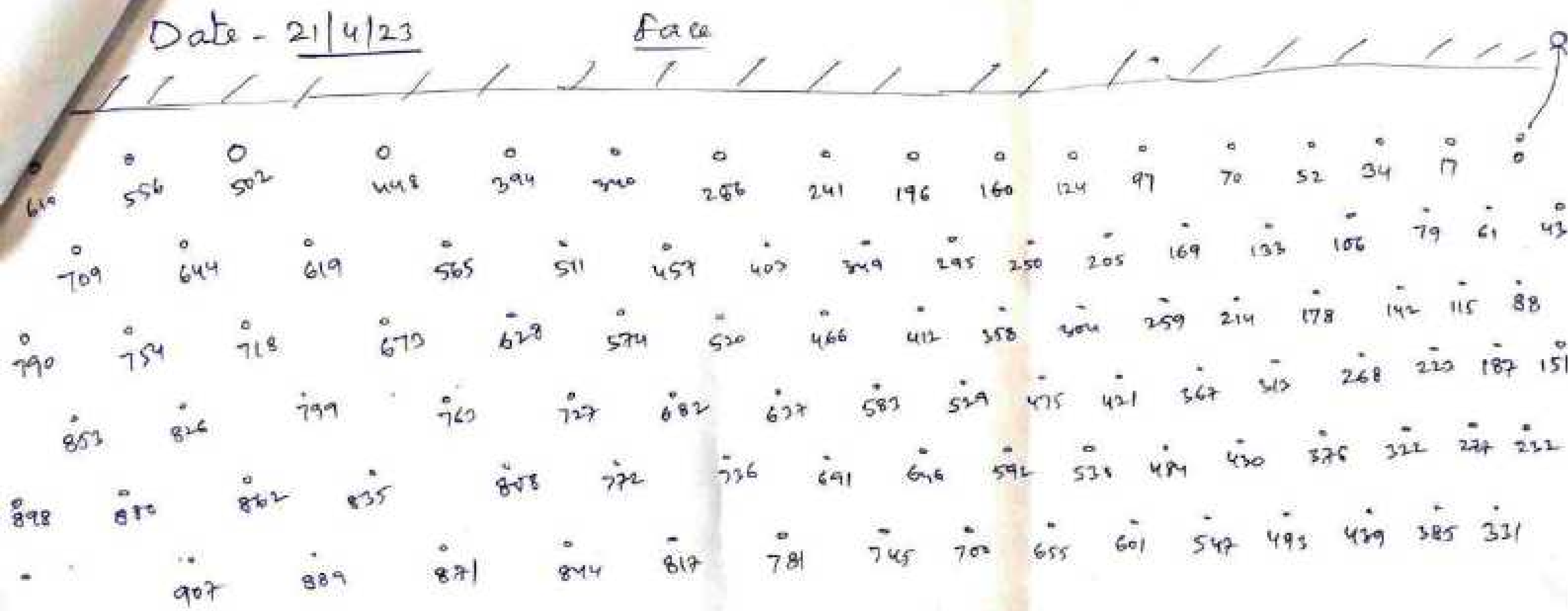
Details of explosives & Accessories

SmE = 510 kg

Booster = 1.35 kg

E det = 09 nos.

Date - 21/4/23



patch - 07s (O/B)

No. of holes - 100.
E det - 100 Nos.
(Time in MS)

Instantel

Indian Oil Corporation Limited

Date/Time	Vert at 14:39:51 April 21, 2023
Trigger Source	Geo: 0.200 mm/s, Mic: 100.00 dB(L)
Range	Geo: 254.0 mm/s
Record Time	3.0 sec at 4096 sps
Operator/Setup:	Operator/CCL ,MMB

Serial Number	UM16973 V 10-89 Micromate ISEE
Battery Level	3.7 Volts
Unit Calibration	January 18, 2023 by CIMFR Dhanabd
File Name	UM16973_20230421143951.IDFW

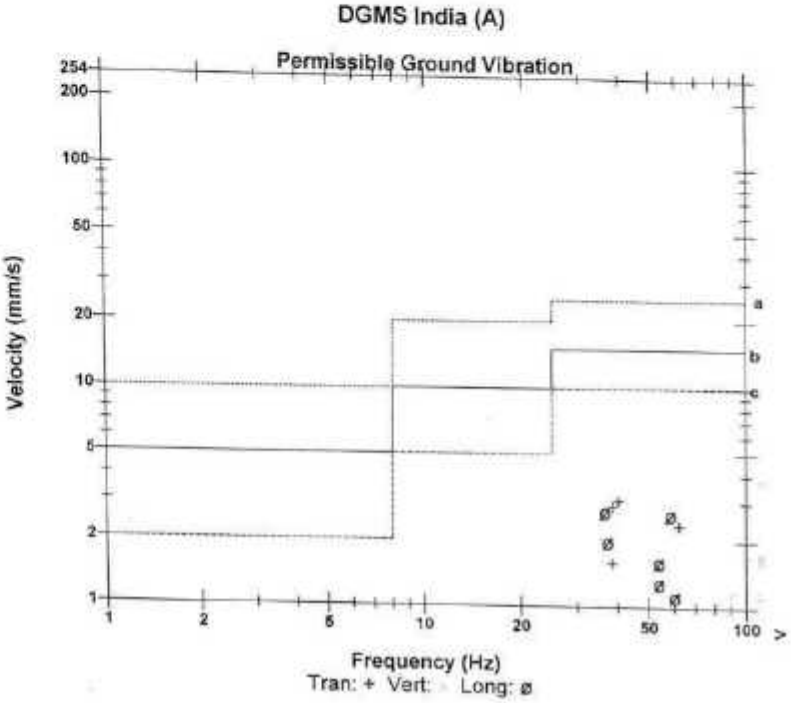
Notes
Location:
Client: Central Coalfields Limited (CCL)
User Name: IndianOil, Kathara
General: IOCL

Post Event Notes
Jarangdih Ocp
distance from blast 100 mtr

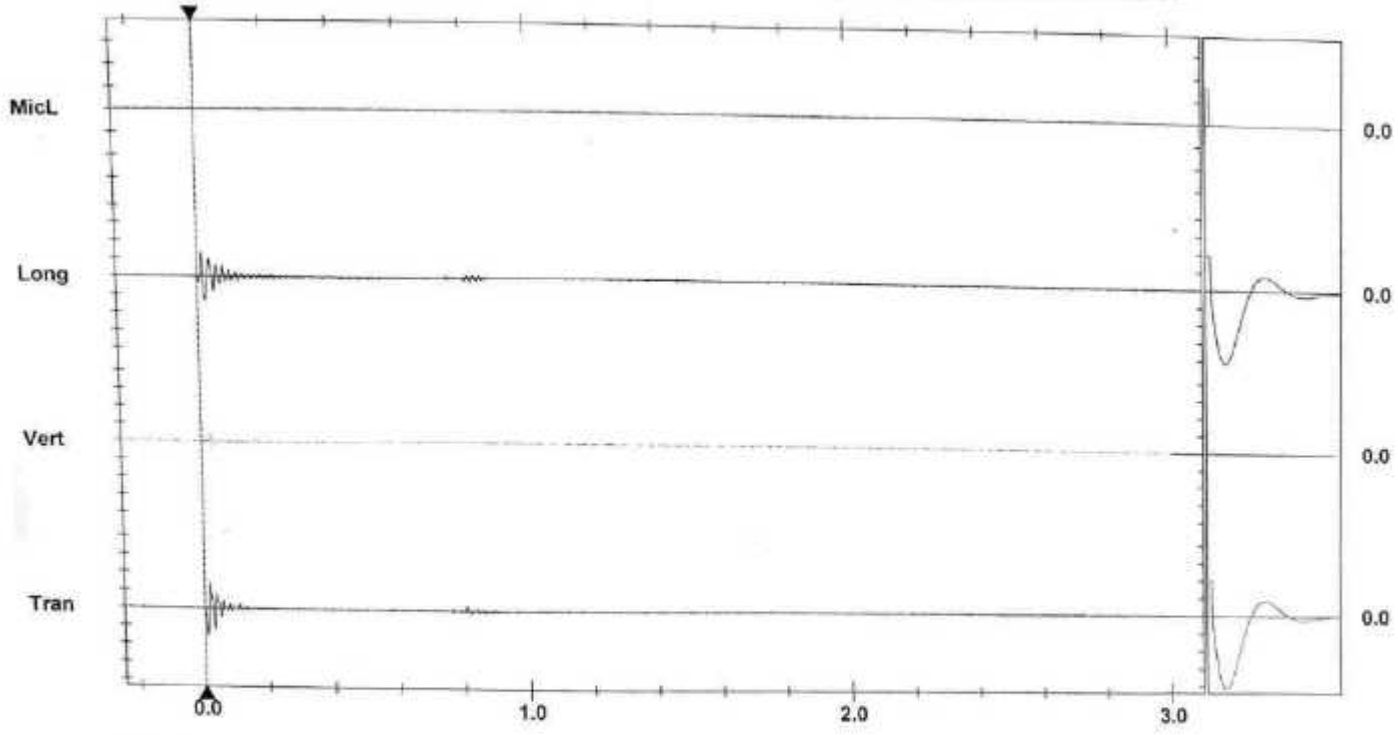
Microphone	Linear Weighting
PSPL	<86 dB(L)
ZC Freq	>400 Hz
Channel Test	Check (Freq = 0.0 Hz Amp = 0 mv)

	Tran	Vert	Long	
PPV	3.058	3.791	2.719	mm/s
ZC Freq	40	137	36.6	Hz
Time (Rel. to Trig)	0.009	0.027	0.023	sec
Peak Acceleration	0.125	0.329	0.099	g
Peak Displacement	0.011	0.004	0.012	mm
Sensor Check	Passed	Passed	Passed	
Frequency	7.1	7.3	6.9	Hz
Overswing Ratio	4.6	4.9	5.2	

Peak Vector Sum 4.509 mm/s at 0.027 sec
N/A: Not Applicable



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



Time Scale: 0.20 sec/div **Amplitude Scale:** Geo: 2.000 mm/s/div Mic: 1.000 pa.(L)/div
Trigger = ▶——◀

Sensor Check

Printed: May 6, 2023 (V 10.72 - 10.72)

Format © 1995-2014 Xmark Corporation

Name of Colliery & Area - Jarangdih OC, Kathara Area

Date of Blast - 22/04/23

Material Blast - OVS (OVB)

Details of Blast parameter-

No. of holes - 101

Average Burden - 3 m

Average Spacing - 3 m

Average depth of hole - 4.5 m

Area of Blast - $3m \times 3m \times 101 = 909\ m^2$

Volume of Blast - $909 \times 4.5 = 4090.5\ m^3$

Blast Material - $4090.5\ m^3$

Explosive consumed - $3210\ kg + 15.15$

$= 3225.15\ kg$

$$P.F = \frac{4090.5}{3225.15}$$

$= 1.27\ m^3/kg$

Details of explosives & accessories -

SME = 3210 kg

Booster = 15.15 kg

E det = 101 Nos.

Name of Colliery & Area - Jarangdih OC, Kathara Area
Date of Blast - 22/04/23
Material Blast - OVS (OVB)

Details of Blast parameter-

No. of holes - 101
Average Burden - 3 m
Average Spacing - 3 m
Average depth of hole - 4.5 m

Area of Blast - $3m \times 3m \times 101 = 909\ m^2$

Volume of Blast - $909 \times 4.5 = 4090.5\ m^3$

Blast Material - $4090.5\ m^3$

Explosive consumed - $3210\ kg + 15.15$
$= 3225.15\ kg$

$P.F = \frac{4090.5}{3225.15}$

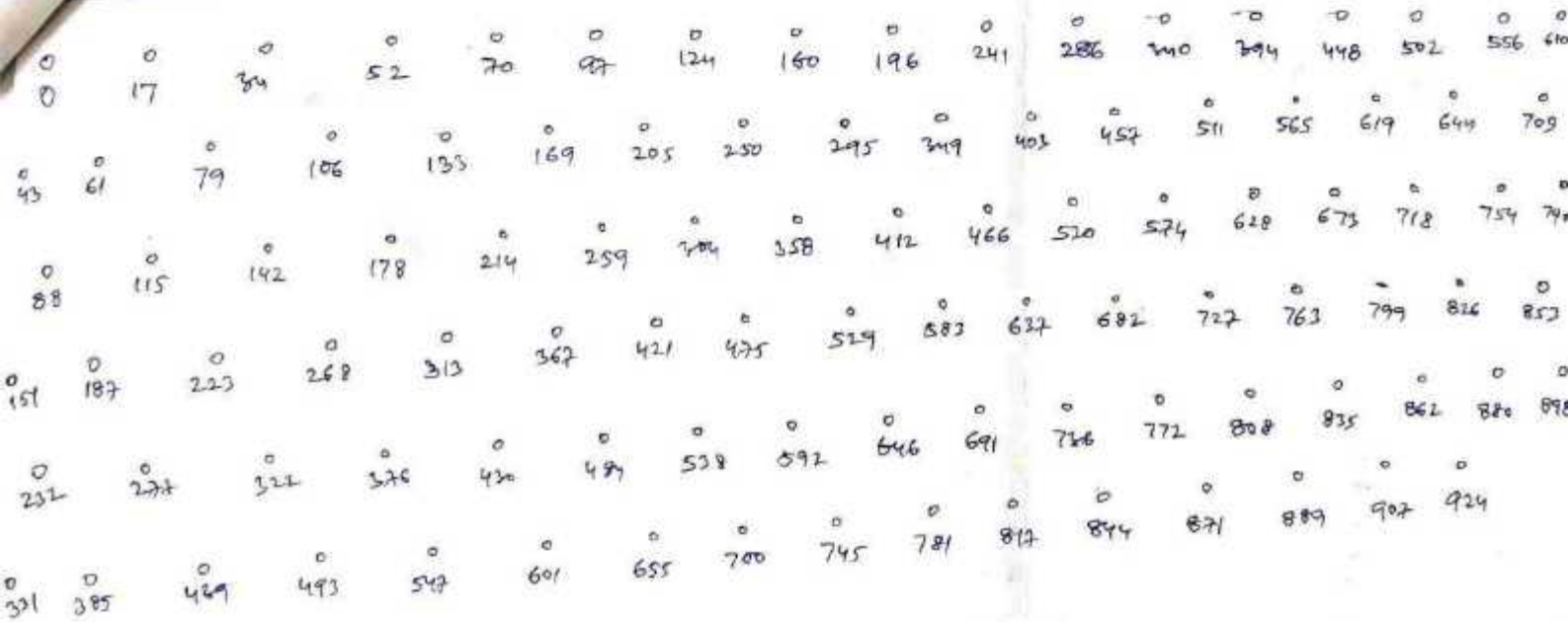
$= 1.27\ m^3/kg$

Details of explosive & accessories -

SME = 3210 kg
Booster = 15.15 kg
E det = 101 Nos.

Date - 22/04/23

Face



No. of holes - 101
E. def - 101 Nos.
(Time in MS)

Indian Oil Corporation Limited

...me	Vert at 14:26:47 April 22, 2023
...ger Source	Geo: 0.200 mm/s, Mic: 100.00 dB(L)
...ange	Geo: 254.0 mm/s
Record Time	3.0 sec at 4096 sps
Operator/Setup:	Operator/CCL .MMB

Notes
Location:
Client: Central Coalfields Limited (CCL)
User Name: IndianOil, Kathara
General: IOCL

Microphone	Linear Weighting
PSPL	<88 dB(L)
ZC Freq	>400 Hz
Channel Test	Check (Freq = 0.0 Hz Amp = 0 mv)

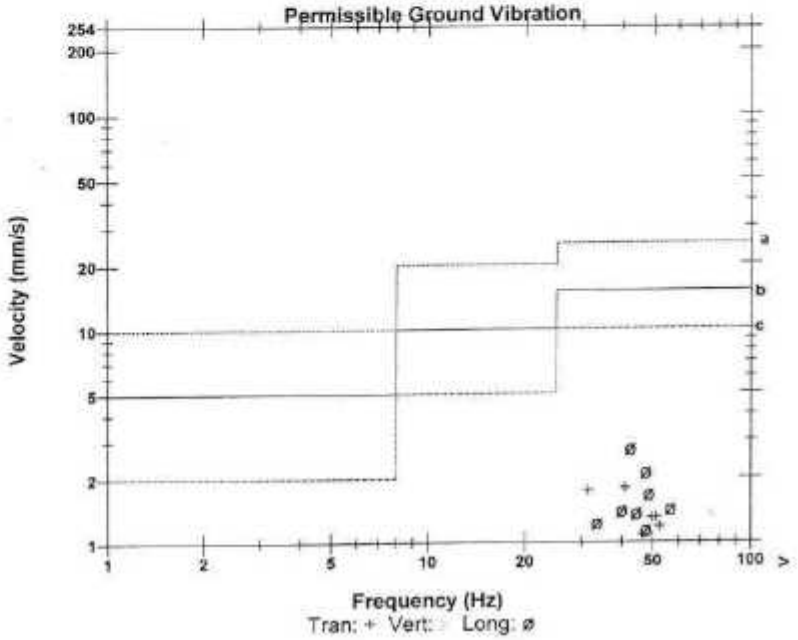
	Tran	Vert	Long	
PPV	1.789	1.356	2.727	mm/s
ZC Freq	41	76	43	Hz
Time (Rel. to Trig)	0.021	0.025	0.025	sec
Peak Acceleration	0.072	0.122	0.082	g
Peak Displacement	0.007	0.002	0.009	mm
Sensor Check	Passed	Passed	Passed	
Frequency	7.1	7.3	6.9	Hz
Overswing Ratio	4.6	4.9	5.2	

Peak Vector Sum 3.182 mm/s at 0.024 sec
N/A: Not Applicable

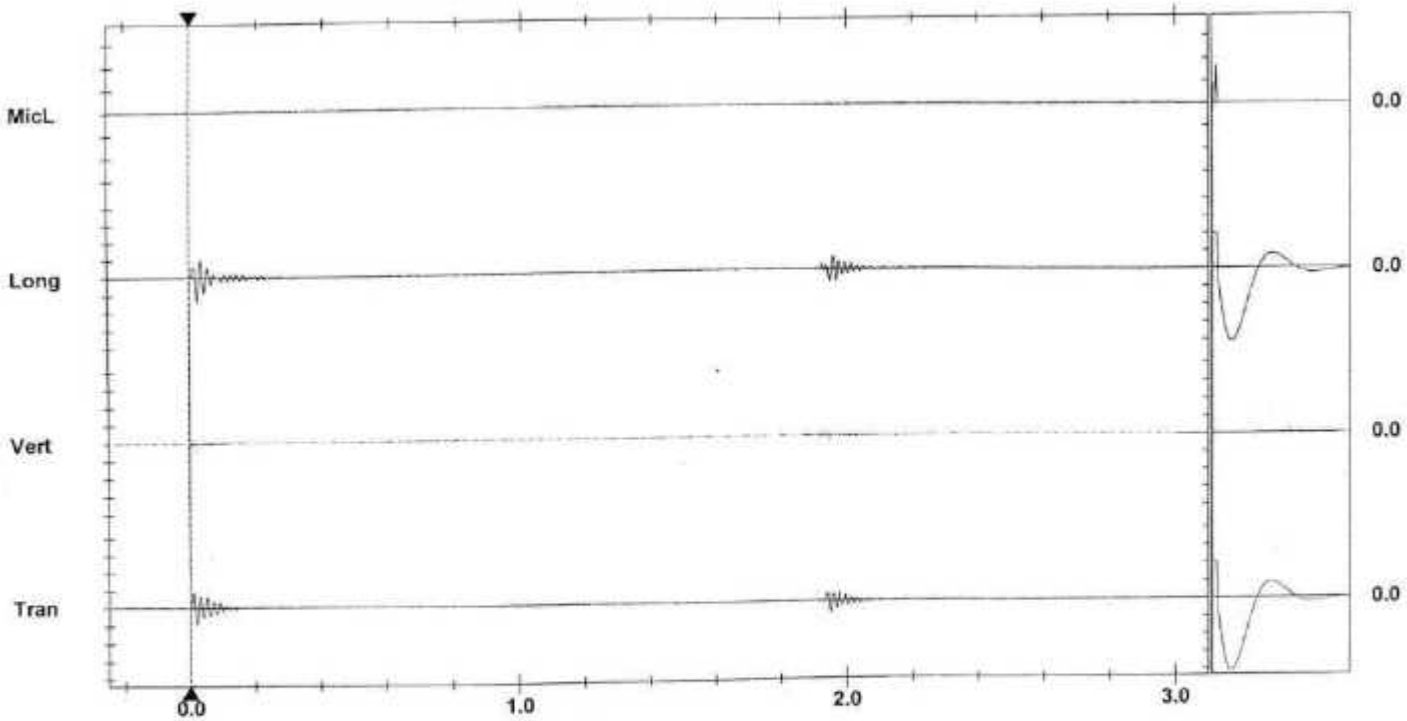
Serial Number	UM16973 V 10-89 Micromate ISEE
Battery Level	3.7 Volts
Unit Calibration	January 18, 2023 by CIMFR Dhanabd
File Name	UM16973_20230422142647.IDFW

Post Event Notes
Jarangdih Ocp
distance from blast 100 mtr

DGMS India (A)



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



Time Scale: 0.20 sec/div **Amplitude Scale:** Geo: 2.000 mm/s/div Mic: 1.000 pa.(L)/div
Trigger = ▶——◀

Sensor Check

Format © 1995-2014 Xmark Corporation

Name of colliery & Area - Jarangair O/C, Kathara Area

Date of Blast - 23/4/23

Material Blast - OVS (OB)

Details of Blast parameter -

No of holes - 144

Average Burden - 3 m

Average spacing - 3 m

Average depth of hole - 5 m

Area of Blast - $3m \times 3m \times 144 = 1296\ m^2$

Volume of Blast - $1296\ m^2 \times 5\ m^2 = 6480\ m^3$

Blast material - $6480\ m^3$

Explosive consumed - 5131.6 kg

$$P.F = \frac{6480}{5131.6} = 1.26\ m^3/kg$$

Details of explosives & accessories -

SMF - 5110 kg

Booster - 21.6 kg

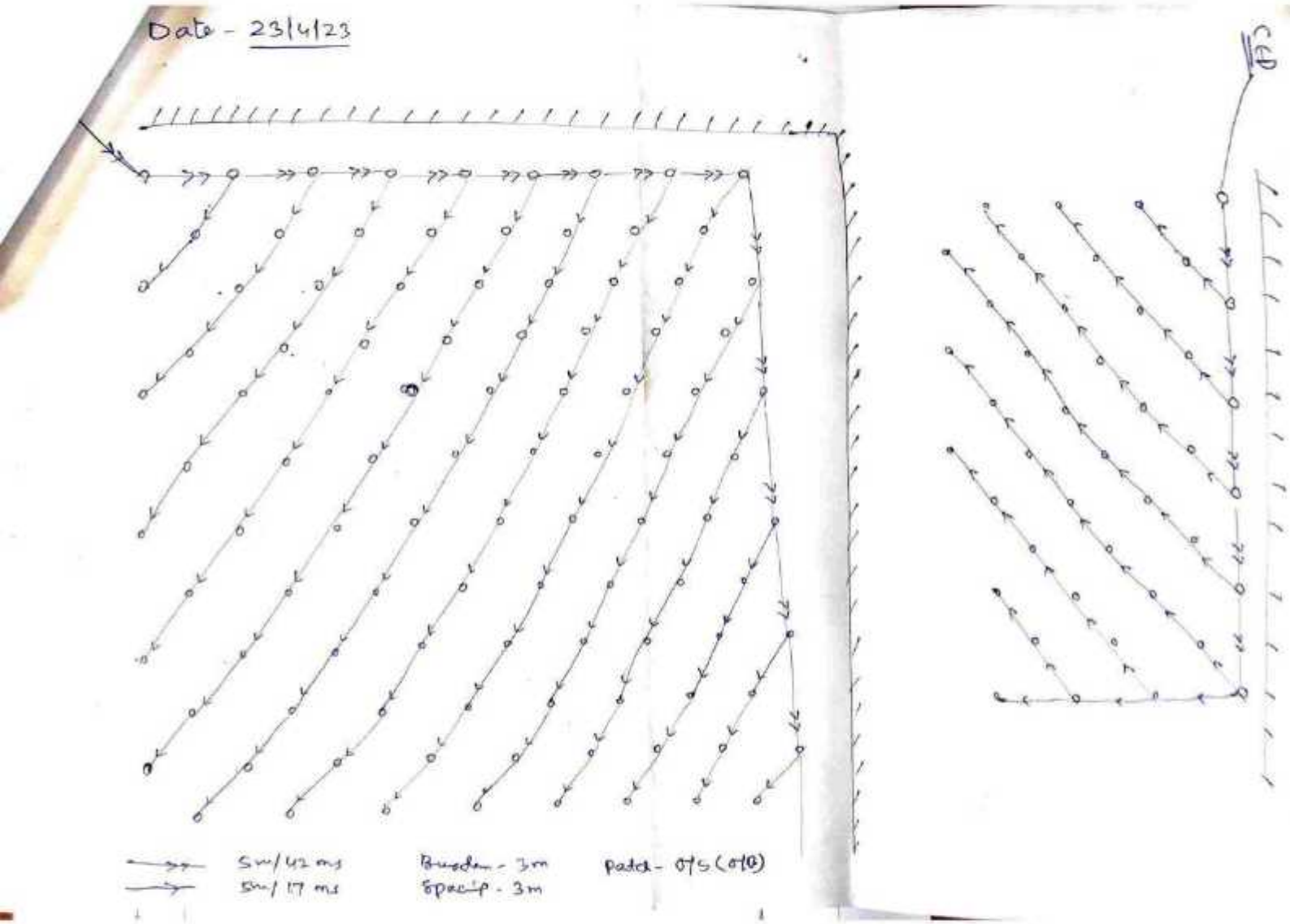
7m/250 - 144

5m/17ms - 160

5m/42ms - 20

CED - 08

Date - 23/4/23



Indian Oil Corporation Limited

Source	Vert at 14:57:18 April 23, 2023 Geo: 0.200 mm/s, Mic: 100.00 dB(L)
	Geo: 254.0 mm/s
Record Time	3.0 sec at 4096 sps
Operator/Setup:	Operator/CCL .MMB

Notes
Location:
Client: Central Coalfields Limited (CCL)
User Name: IndianOil, Kathara
General: IOCL

Serial Number	UM16973 V 10-89 Micromate ISEE
Battery Level	3.7 Volts
Unit Calibration	January 18, 2023 by CIMFR Dhanabd
File Name	UM16973_20230423145718.IDFW

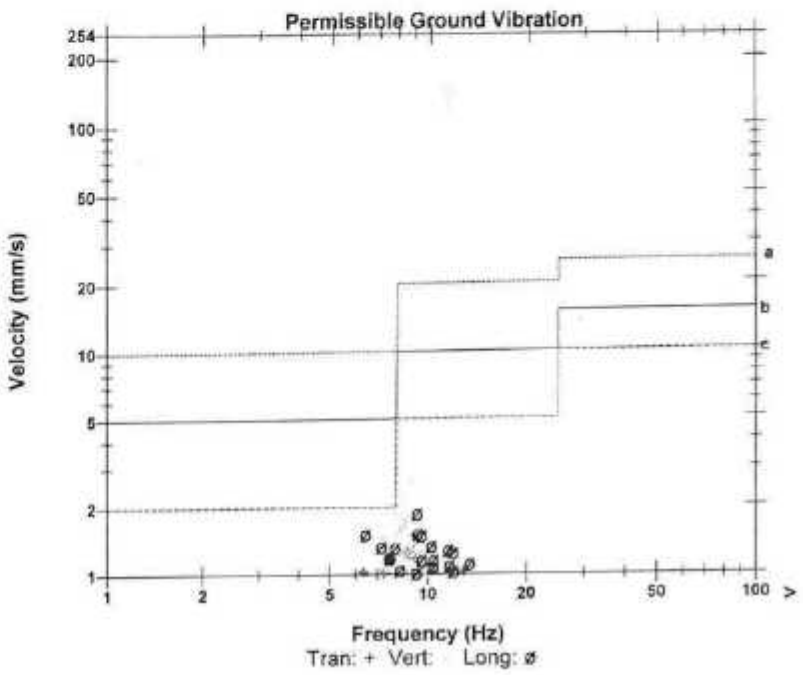
Post Event Notes
Jarangdih Ocp
distance from blast 100 mtr

Microphone	Linear Weighting
PSPL	<88 dB(L)
ZC Freq	>400 Hz
Channel Test	Check (Freq = 0.0 Hz Amp = 0 mv)

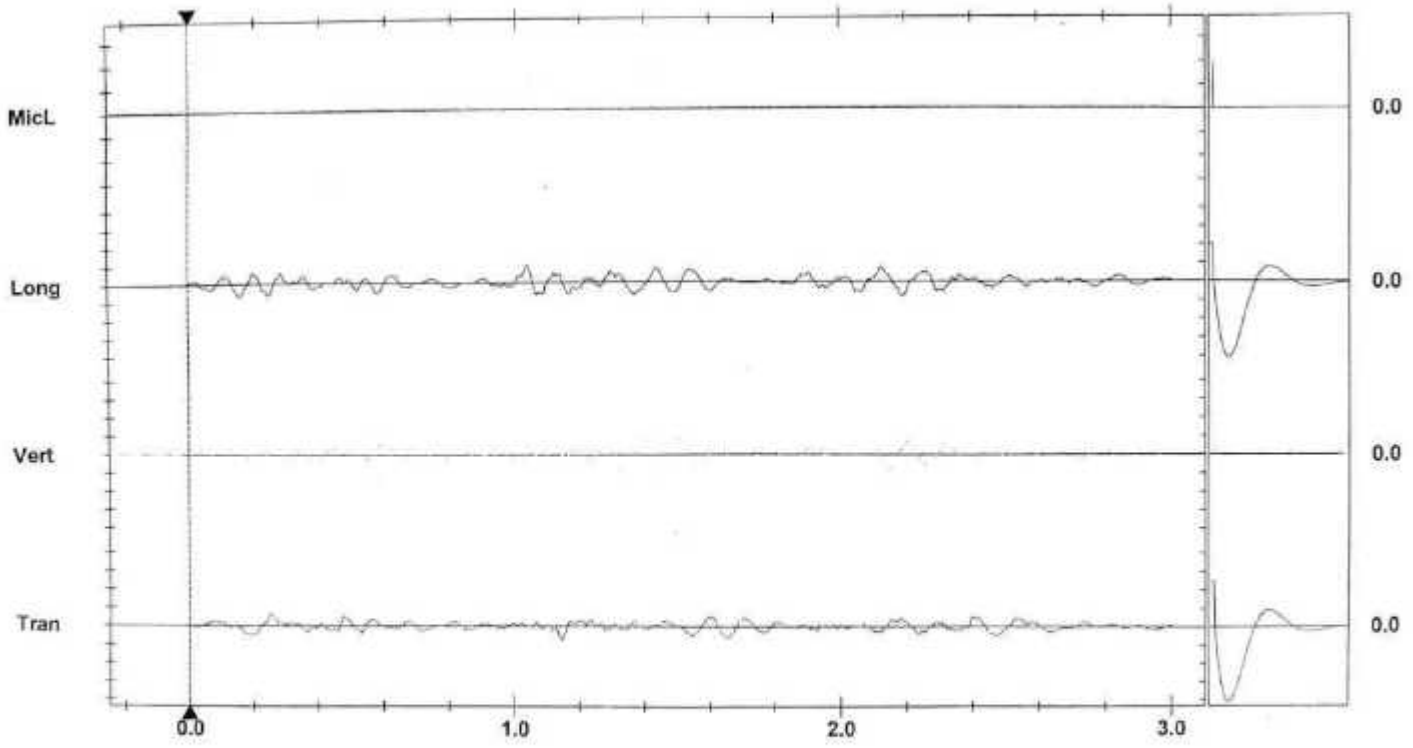
	Tran	Vert	Long	
PPV	1.490	2.719	1.860	mm/s
ZC Freq	9.1	8.9	9.3	Hz
Time (Rel. to Trig)	1.144	1.397	1.039	sec
Peak Acceleration	0.023	0.026	0.030	g
Peak Displacement	0.024	0.049	0.027	mm
Sensor Check	Passed	Passed	Passed	
Frequency	7.3	7.3	6.9	Hz
Overswing Ratio	4.5	4.9	5.2	

Peak Vector Sum 2.789 mm/s at 1.397 sec
N/A: Not Applicable

DGMS India (A)



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



Time Scale: 0.20 sec/div **Amplitude Scale:** Geo: 2.000 mm/s/div Mic: 1.000 pa.(L)/div
Trigger = ▶----------◀

Sensor Check

Format © 1995-2014 Xmark Corporation

Name of colliery & Area – Jarangdih OC, Kathara Area
Date of Blast – 24/04/23
Material Blasted – OS (OB)

Details of Blast parameter –

NO. of holes – 144
Average Burden – 3 m
Average spacing – 3.5 m
Average depth of hole – 5 M

Area of Blast – 3m × 3.5m × 144 = 1512 M^2

Volume of Blast – 1512 × 5 = 7560 m^3

Blasted material – 7560 m^3

Explosive consumed – 5921.6 kg

$$P.F = \frac{7560}{5921.6} = 1.28\ m^3/kg$$

Details of explosives & accessories –

SME – 5900 kg
Booster – 21.6 kg

7m/250ms – 144 NOS.
5m/17ms – 100 NOS.
5m/42ms – 35 NOS.
CED – 04

Name of colliery & Area - Jarangdih OC, Kathara Area
Date of Blast - 24/04/23
Material Blasted - Dept. (O/B)

Details of Blast parameter -

No. of hole - 09
Average Burden - 3.5 m
Average Spacing - 4 m
Average depth of hole - 5 m

Area of Blast - $3.5m \times 4m \times 09 = 126\ m^2$

Volume of Blast - $126\ m^3 \times 5m = 630\ m^3$

Blasted Material - $630\ m^3$

Explosive consumed - 521.35 kg

$$P.F = \frac{630}{521.35} = 1.21\ m^3/kg$$

Details of explosives & accessories -

SME - 520 kg
Booster - 1.35 kg

7 m/250ms - 09
5m/17ms - 10
5m/42ms - 05
CED - 01

Name of colliery & Area – Jarangdih OC, Kathara Area
Date of Blast - 24/4/23
Material Blast- OVS (Coal)

Details of Blast parameter -

No. of holes - 10
Average Burden - 5 m
Average Spacing - 5.5 m
Average depth of hole - 7 m

Area of Blast - $5m \times 5.5m \times 10 = 275 m^2$

volume of Blast - $275 m^2 \times 7m = 1925 m^3$

Blasted material - $1925 m^3 \times 1.44 t/m^3 = 2772 t$

Explosive Consumed - 521.5 kg

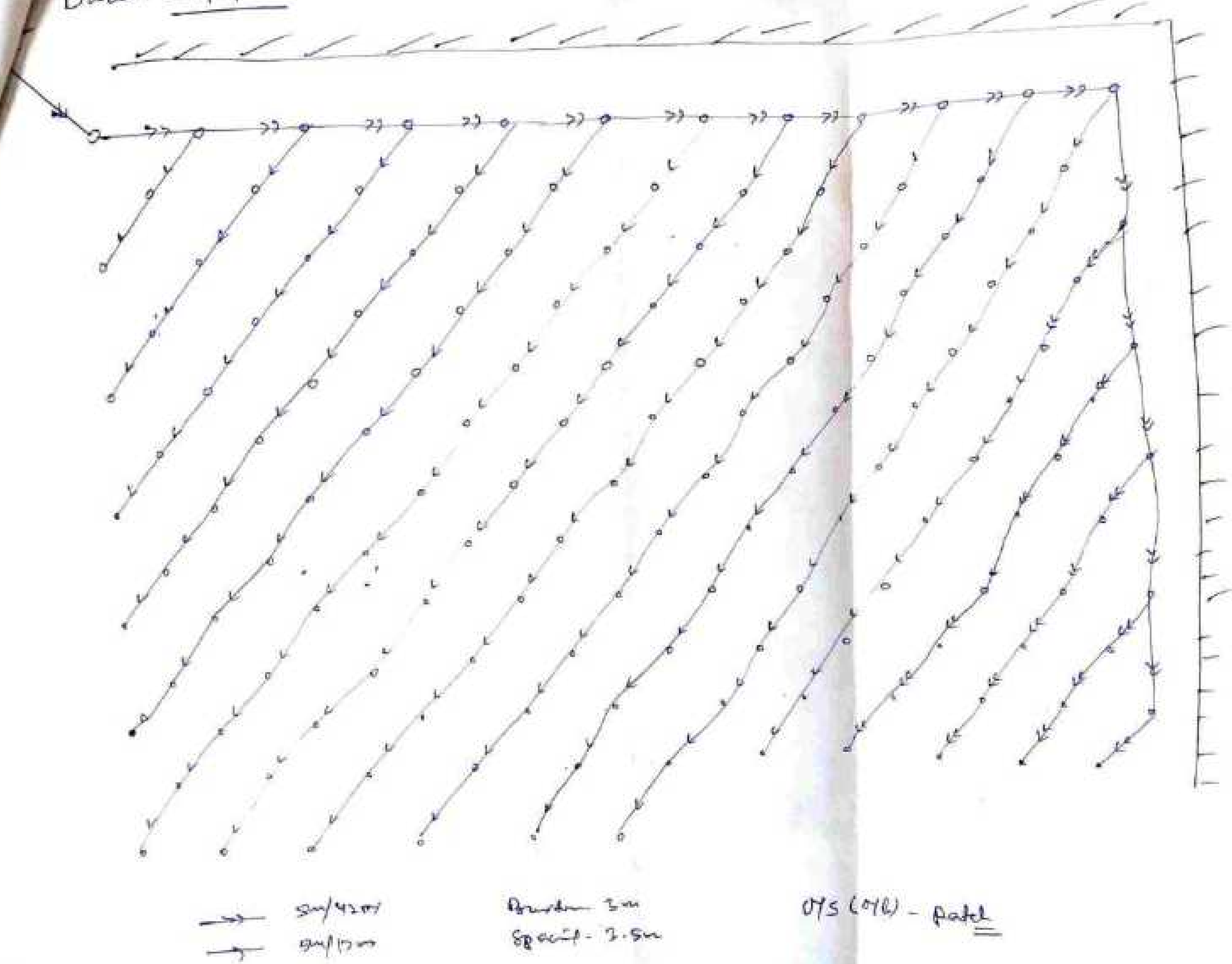
$$P.F = \frac{2772}{521.5} = 5.32 \text{ t/kg}$$

Details of explosives & accessories -

SME - 520 kg
Booster - 1.5 kg

7m/250ms - 10
5m/17ms - 10
5m/42ms - 10
CCD - 01

Date - 24/4/23



Indian Oil Corporation Limited

Vert at 15:00:47 April 24, 2023
Geo: 0.200 mm/s, Mic: 100.00 dB(L)
Geo: 254.0 mm/s
3.0 sec at 4096 sps
Operator/Setup: Operator/CCL .MMB

Notes
Location
Client: Central Coalfields Limited (CCL)
User Name: IndianOil, Kathara
General: IOCL

Serial Number UM16973 V 10-89 Micromate ISEE
Battery Level 3.7 Volts
Unit Calibration January 18, 2023 by CIMFR Dhanabd
File Name UM16973_20230424150047.IDFW

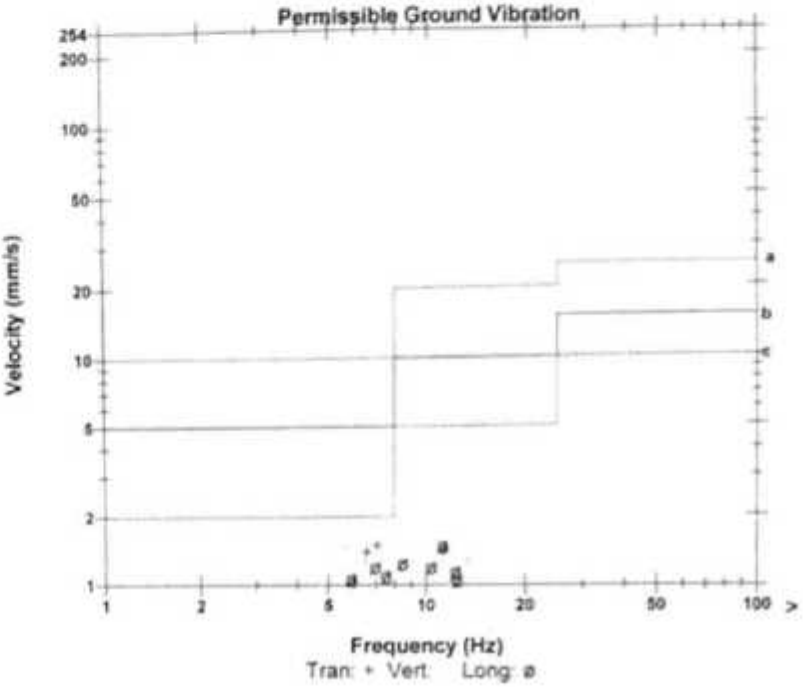
Post Event Notes
Jarangdih Ocp
distance from blast 100 mtr

Microphone: Linear Weighting
PSPL: <88 dB(L)
ZC Freq: >400 Hz
Channel Test: Check (Freq = 0.0 Hz Amp = 0 mv)

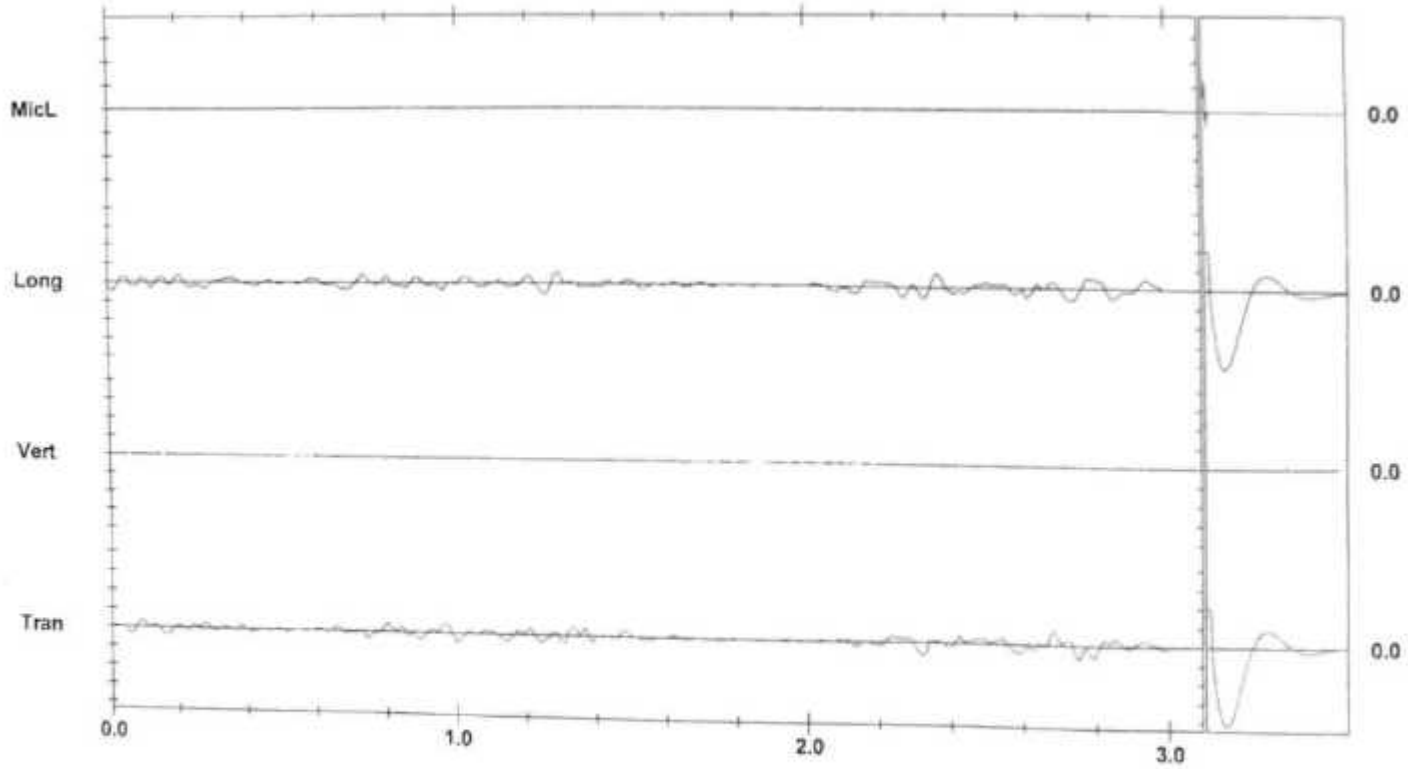
	Tran	Vert	Long	
PPV	1.490	2.215	1.482	mm/s
ZC Freq	7.1	6.4	11.3	Hz
Time (Rel. to Trig)	2.682	2.388	2.367	sec
Peak Acceleration	0.026	0.023	0.023	g
Peak Displacement	0.031	0.049	0.026	mm
Sensor Check	Passed	Passed	Passed	
Frequency	7.3	7.3	7.1	Hz
Overswing Ratio	4.6	4.9	5.2	

Peak Vector Sum 2.496 mm/s at 2.323 sec
N/A: Not Applicable

DGMS India (A)



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



Time Scale: 0.20 sec/div **Amplitude Scale:** Geo: 2.000 mm/s/div Mic: 1.000 pa.(L)/div

Sensor Check

Printed: May 6, 2023 (V 10.72 - 10.72)

Format © 1995-2014 Xmark Corporation

Name of colliery & Area - Jarangdih OC, Kalhara Area
Date of Blast - 25/4/23
Material Blast - OVS (OVB)

Details of Blast parameter -

No. of holes - 91
Average Burden - 3 m
Average spacing - 3 m
Average depth of hole - 4 m

Area of Blast - 3m x 3m x 91 = 819 m^2

Volume of Blast - 819 x 4m = 3276 m^3

Blasted Material - 3276 m^3

Explosive consumed - 2113.65 kg

$$P.F = \frac{3276}{2113.65} = 1.55 \ m^3/kg$$

Details of explosives & accessories -

SME - 2100 kg
Booster - 13.65 kg

7m/25ms - 91
5m/17ms - 65
5m/42ms - 924
CED - 02

Name of colliery & Area - Jarangdih OC, Kathara Area

Date of Blast - 25/4/23

Material Blast - OB (coal)

Details of Blast parameter -

No. of Holes - 20

Average Burden - 4m

Average Spacing - 4m

Average depth of hole - 6m

Area of Blast - 4m x 4m x 20 = 320 m^2

volume of Blast - 320 m^2 x 6m = 1920 m^3

Blast material - 1920 m^3 x 1.44 Te/m^3 = 2764.8 Te

Explosive carried - ~~320~~ ~~2764.8~~ / 523 kg.

P.F = $\frac{2764.8}{523}$ = 5.29 Te/kg

Details of explosive & accessories -

SME - 520 kg

Booster - 3 kg

Name of colliery & Area - Tasangdih OC, Kathara Area
Date of Blast - 25/4/23
Material Blast - Dept. (OB)

Details of Blast parameter -

No. of holes - 11
Average Burden - 3.5m
Average Spacing - 3.5m
Average depth of hole - 5m

Area of Blast - $3.5m \times 3.5m \times 11 = 134.75\ m^2$

Volume of Blast - $134.75\ m^2 \times 5m = 673.75\ m^3$

Blast Material - $673.75\ m^3$

Explosive consumed - 551.65 kg

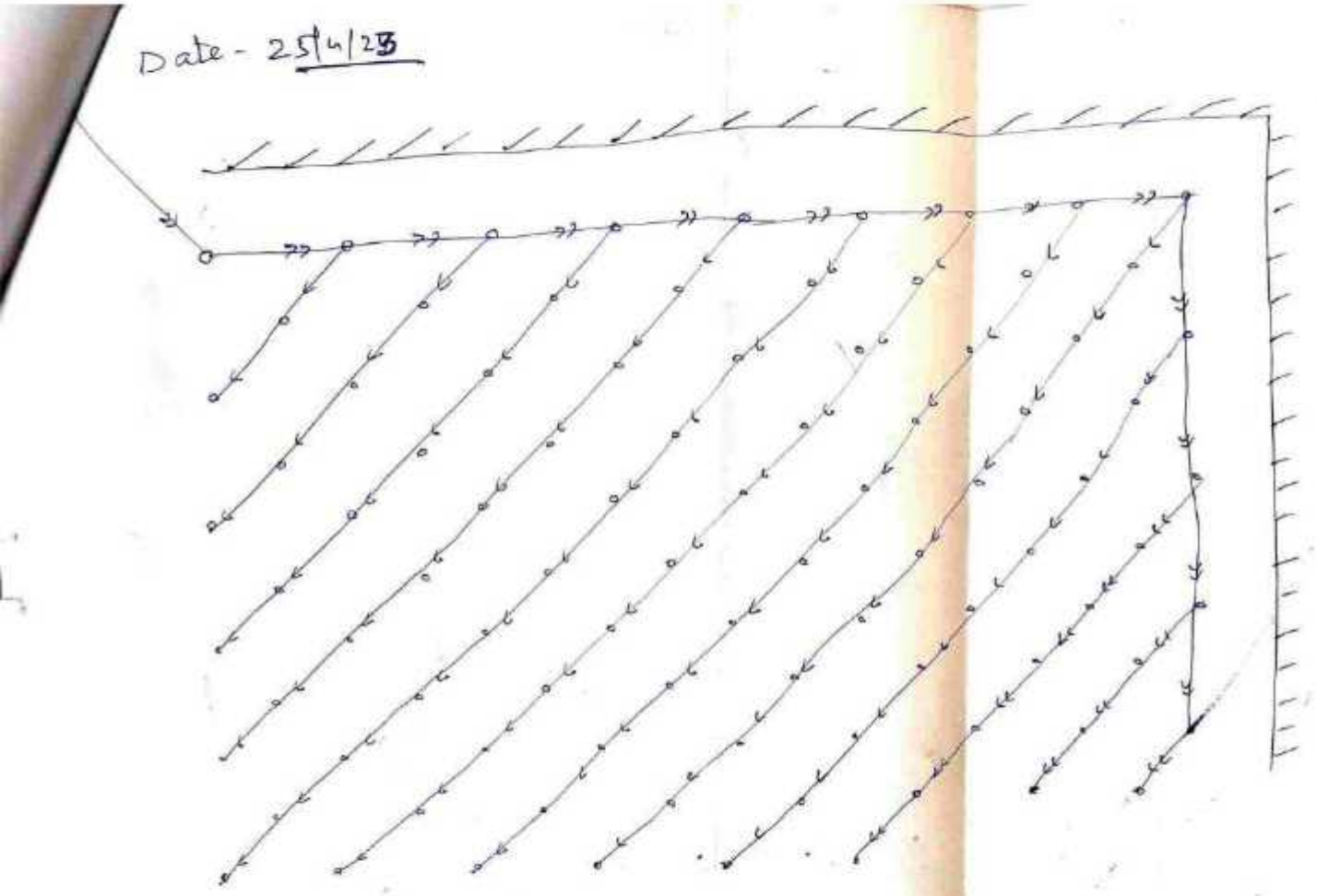
$$P.F = \frac{673.75}{551.65} = 1.22\ m^3/kg$$

Details of explosives & accessories -

SMF - 550 kg
Booster - 1.65 kg

7m/250ms - 11
5m/17ms - 05
5m/42ms - 06
C 60 - 01

Date - 25/4/25



5 m/42 m

5 m/17 m

Burden - 5 m

Spacing - 5.5 m

Patch - O/S (OPB)

Indian Oil Corporation Limited

Time	Vert at 14:04:44 April 25, 2023
Trigger Source	Geo: 0.200 mm/s, Mic: 100.00 dB(L)
Range	Geo: 254.0 mm/s
Record Time	3.0 sec at 4096 sps
Operator/Setup:	Operator/CCL .MMB

Notes
Location:
Client: Central Coalfields Limited (CCL)
User Name: IndianOil, Kathara
General: IOCL

Serial Number	UM16973 V 10-89 Micromate ISEE
Battery Level	3.5 Volts
Unit Calibration	January 18, 2023 by CIMFR Dhanabd
File Name	UM16973_20230425140444.IDFW

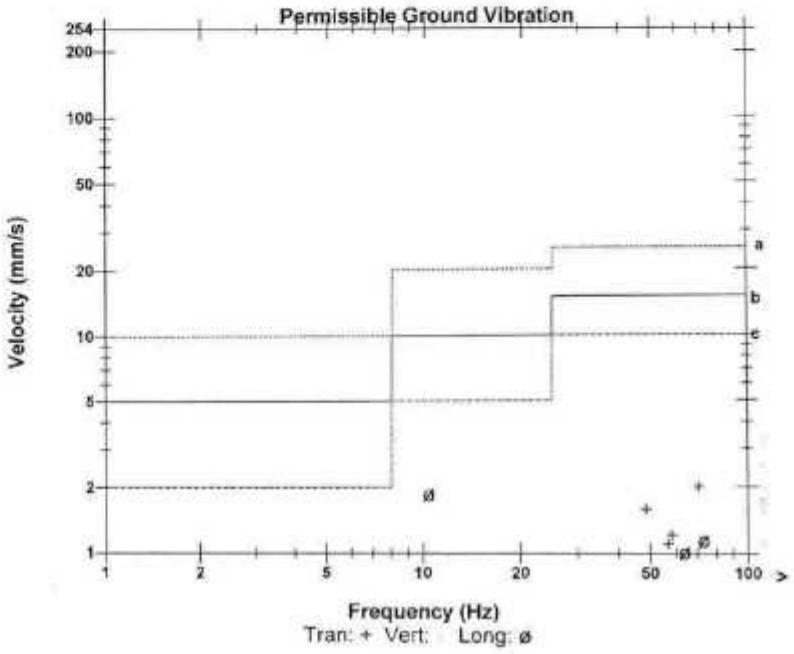
Post Event Notes
Jarangdih Ocp
distance from blast 100 mtr

Microphone	Linear Weighting
PSPL	<88 dB(L)
ZC Freq	>400 Hz
Channel Test	Check (Freq = 0.0 Hz Amp = 0 mv)

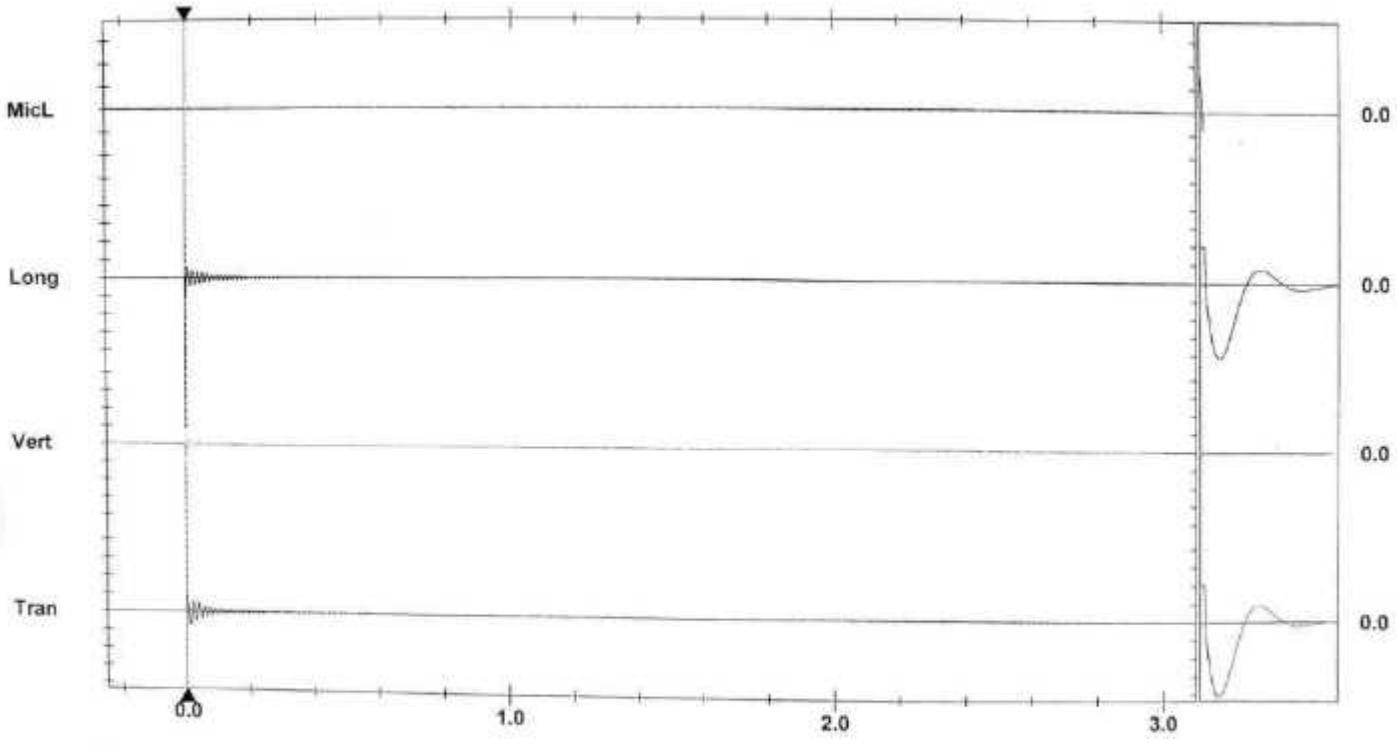
	Tran	Vert	Long	
PPV	2.002	3.279	1.860	mm/s
ZC Freq	71	341	10.4	Hz
Time (Rel. to Trig)	0.003	0.002	0.002	sec
Peak Acceleration	0.158	0.629	0.207	g
Peak Displacement	0.005	0.002	0.004	mm
Sensor Check	Passed	Passed	Passed	
Frequency	7.3	7.3	7.1	Hz
Overswing Ratio	4.6	4.9	5.2	

Peak Vector Sum 3.863 mm/s at 0.002 sec
N/A: Not Applicable

DGMS India (A)



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



Time Scale: 0.20 sec/div **Amplitude Scale:** Geo: 2.000 mm/s/div Mic: 1.000 pa.(L)/div
Trigger =

Sensor Check

Printed: May 6, 2023 (V 10.72 - 10.72)

Format © 1995-2014 Xmark Corporation

Name of colliery & Area - Jarangdih OC, Kathara Area
Date of Blast - 26/4/23
Material Blast - OVS (OB)

Details of Blast parameter:-

No. of Holes - 84
Average Burden - 2 m
Average Spacing - 2.5 m
Average depth of hole - 4 m

Area of Blast - $2m \times 2.5m \times 84 = 420\ m^2$

Volume of Blast - $420\ m^2 \times 4m = 1680\ m^3$

Blast Material - $1680\ m^3$

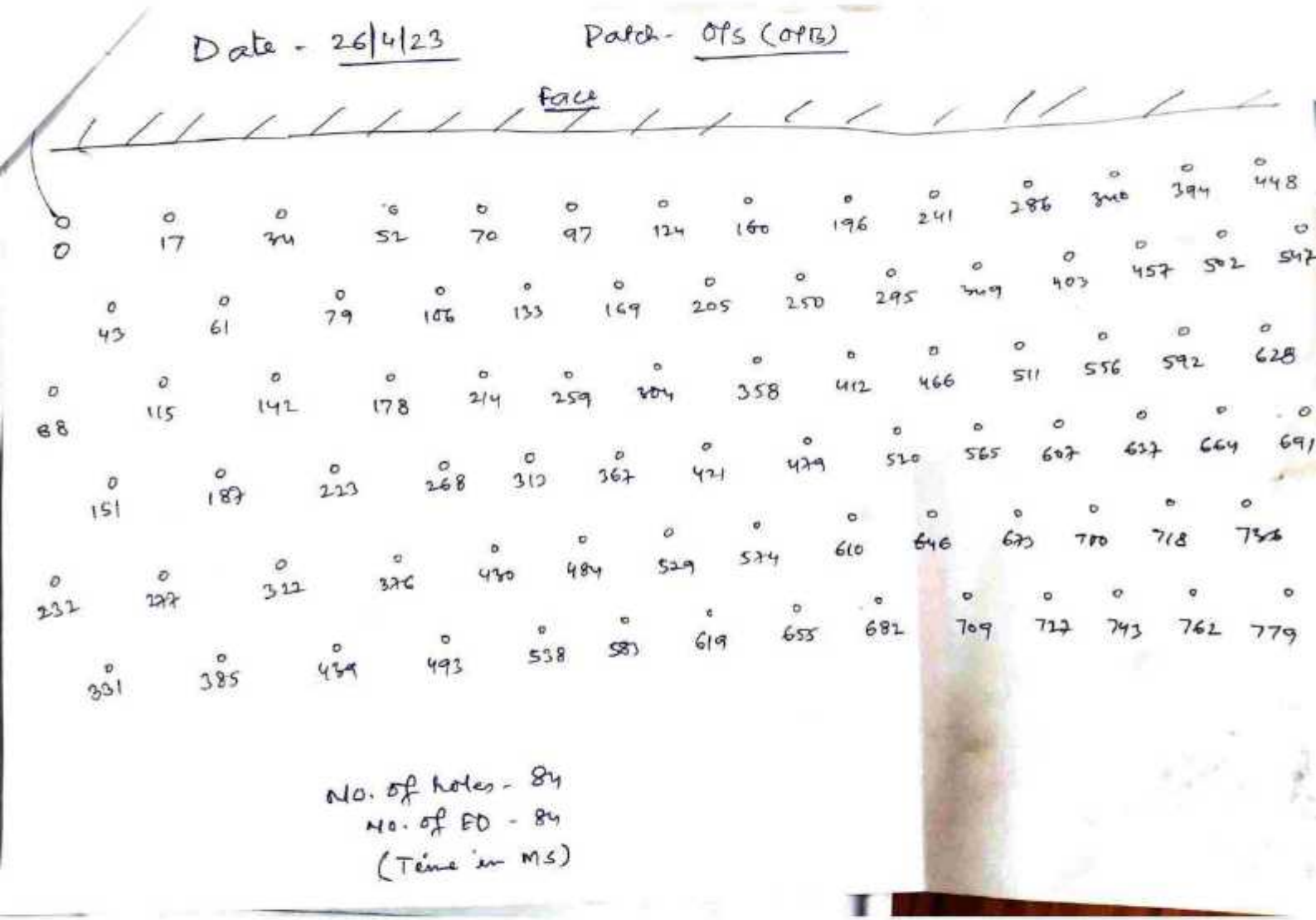
Explosive consumed = 1482.6 kg

$$P.F = \frac{1680}{1482.6} = 1.13\ m^3/kg$$

Details of explosives & accessories -

SMB - 1470 kg
Booster - 12.6 kg
E det - 84 Nos.

Date - 26/4/23 Patch - OPS (OPB)



No. of holes - 84
No. of ED - 84
(Time in MS)

Name of colliery & Area - Jarangdih OC, Kathara Area
Date of Blast - 26/4/23
Material Blast - O/S (Coal)

Details of Blast parameter -

No. of holes - 40
Average Burden - 4m
Average Spacing - 4m
Average depth of hole - 6m

Area of Blast - 4m × 4m × 40m = 640 m^3

volume of Blast - 640 m^3 × 6m = 3840 m^3

Blasted material - 3840 m^3 × 1.44 te/m^3 = 5529.6 te

Explosive consumed - 1046 kg

$$P.F = \frac{5529.6}{1046} = 5.29 \text{ te/kg}$$

Details of explosives & accessories -

SmE - 1040 kg
Booster - 6 kg
E det - 40 Nos.

Name of colliery & Area - Jarangdih OC, Kathara Area
Date of Blast - 26/4/23
Material Blast - Dept. (OB)

Details of Blast parameter -

No. of holes - 06
Average Burden - 3.5 m
Average Spacing - 3.5 m
Average depth of hole - 5 M

Area of Blast - $3.5m \times 3.5m \times 06 = 73.5\ m^2$

volume of Blast - $73.5\ m^2 \times 5 = 367.5\ m^3$

Blast material - $367.5\ m^3$

Explosive consumed - 310.9 kg

$$P.F = \frac{367.5}{310.9} = 1.18\ m^3/kg$$

Details of explosive & accessories -

SME - 310 kg
Booster - 0.9 kg
E det - 6 Nos.

Indian Oil Corporation Limited

Date/Time	Long at 14:43:59 April 26, 2023
Trigger Source	Geo: 0.200 mm/s, Mic: 100.00 dB(L)
Range	Geo: 254.0 mm/s
Record Time	3.0 sec at 4096 sps
Operator/Setup:	Operator/CCL, MMB

Serial Number	UM16973 V 10-89 Micromate ISEE
Battery Level	3.8 Volts
Unit Calibration	January 18, 2023 by CIMFR Dhanabd
File Name	UM16973_20230426144359.IDFW

Notes

Location	
Client	Central Coalfields Limited (CCL)
User Name	IndianOil, Katihara
General	IOCL

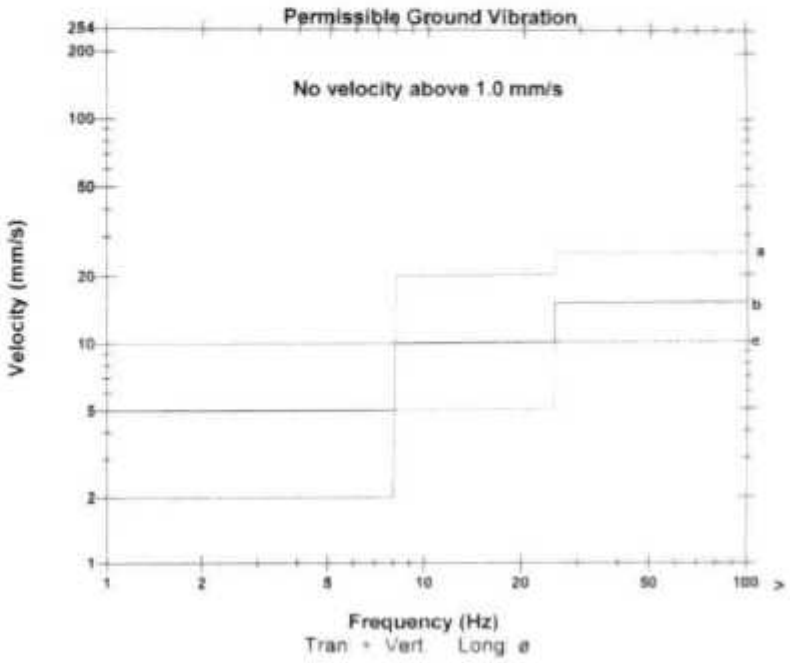
Post Event Notes
Jarangdih Ocp
distance from blast 120 mtr

Microphone	Linear Weighting
PSPL	<88 dB(L)
ZC Freq	>400 Hz
Channel Test	Check (Freq = 0.0 Hz, Amp = 0 mv)

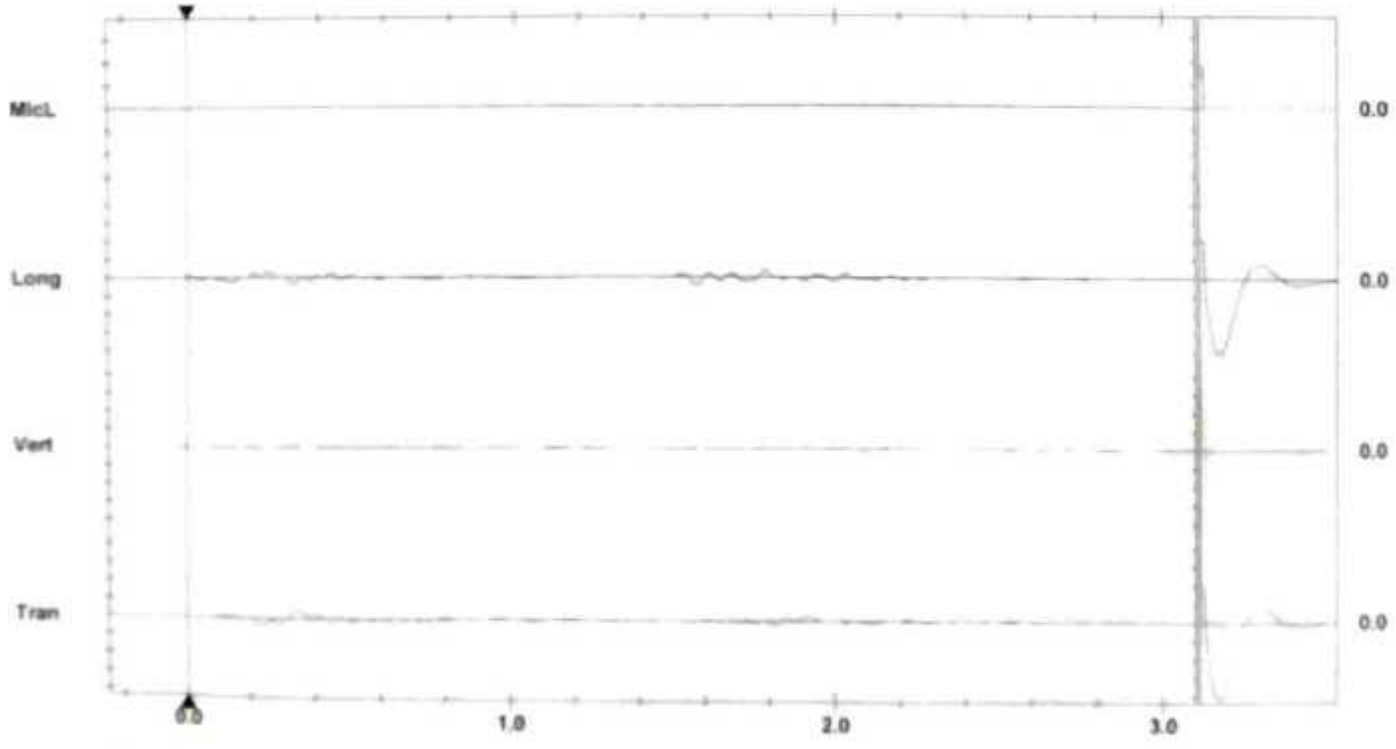
	Tran	Vert	Long	
PPV	0.914	0.725	0.899	mm/s
ZC Freq	4.5	8.9	10.1	Hz
Time (Rel. to Trig)	0.240	1.956	1.568	sec
Peak Acceleration	0.023	0.020	0.020	g
Peak Displacement	0.027	0.016	0.014	mm
Sensor Check	Passed	Passed	Passed	
Frequency	7.1	7.3	7.1	Hz
Overswing Ratio	4.6	4.8	5.1	

Peak Vector Sum 1.107 mm/s at 0.246 sec
N/A: Not Applicable

DGMS India (A)



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



Time Scale: 0.20 sec/div **Amplitude Scale**: Geo: 2.000 mm/s/div Mic: 1.000 pa (L)/div Sensor Check
Trigger = ▶ ◀

Printed: May 6, 2023 (V 10.72 - 10.73)
Format © 1998-2014 Instantel Corporation

CENTRAL COALFIELDS LIMITED

Annexure V

DARBHANGA HOUSE : RANCHI

Ref:CCL/HoD(Envt.)/GA/W.O./23-Plantation/Hzb.East/2023/ 926 **Dated:14.03.2023**

AWARD OF WORK

To,

The Divisional Forest Officer,

Hazaribagh East Forest Division, Hazaribagh.

Sub: Award of plantation work to DFO, Hazaribagh East Forest Division, Hazaribagh, Govt.of Jharkhand for plantation in Kathara, Jarangdih, SDOCM and Karo OCM of Kathara, Dhori and B&K area of CCL.

Ref: Our letter no. CCL/ HOD (Envt)/2023-Plantation/2023/ 851 dated: 31.01.2023 & CCL/HOD(Envt)/2023-Plantation/2023/ 866 dated: 15.02.2023 and your letter no.516 dated 21/28.02.2023.

Dear Sir,

This is to convey that competent authority has accepted the above mentioned estimate/scheme for a total value of Rs. 19484548.00 only (Rs. one crore ninety four lakh eighty four thousand five hundred forty-eight only) for carrying out plantation work over 29.649Ha &1.50 Km land comprising of 76122 nos. saplings of mixed native species in Kathara, Jarangdih, SDOCM and Karo OCM of Kathara, Dhori and B&K area of CCL, as per the estimate/scheme submitted to CCL based on office order no.38 dated 31.03.2002 of CCF (Development),office order no. संख्या- 01/ यो०ब०- 10/2014- 22 दिनांक 19.06.2018 of PCCF (Development) & office order no. संख्या- 01/ यो०ब०- 10 /14 II-04 dated 20.01.18 of additional principal chief conservator of forest(Development),Govt. of Jharkhand, minimum labour wages Rs.334.14 /Man days , Government of Jharkhand effective from 01.10.2022 & letter no.134 dated 05.02.2009 by DFO, Hazaribagh Afforestation Division. The detailed breakup of the works and cost thereof are as follows:

Amount in Rs.

Sl. No.	Name of Area	Area (ha.)	Adv. Work 2022-23	Comp. Work 2023-24	1st year maint. 2024-25	2nd year maint. 2025-26	Total
1	Kathara OCP	10.00	1933919.00	811974.00	388772.00	261356.00	3396021.00
2	Jarangdih OCP	5.75	995785.00	503119.00	277969.00	204705.00	1981578.00
3	Jarangdih OCP Patch-A	3.00	922251.00	303271.00	206273.00	168048.00	1599843.00
4	Jarangdih OCP Patch-B	2.75	845397.00	285103.00	199755.00	164716.00	1494971.00
5	Jarangdih OCP Patch-C	2.27	702398.00	250221.00	187241.00	158317.00	1298177.00
6	Jarangdih OCP Patch-D	3.00	948565.00	303271.00	206273.00	168048.00	1626157.00
7	Karo OCM Patch-I	1.175	464715.00	170645.00	158693.00	143721.00	937774.00
8	Karo OCM Patch-II	0.954	408213.00	154585.00	152931.00	140776.00	856505.00
9	Karo OCM Patch-III	0.75	362130.00	139760.00	147613.00	138056.00	787559.00
10	Dhori SDOCM Along Tisri Nallah from Karipani to Railway crossing &Near KPS weigh bridge	1.50km (2000 Plants)	2415146.00	1185021.00	952898.00	952898.00	5505963.00
	Total	29.649 ha &1.50Km	9998519.00	4106970.00	2878418.00	2500641.00	19484548.00

Continued overleaf

Scheme of plantation, spread over 4 years, will be as follows:

Details of Work	Value of works	Plantation Area (in Ha)/Length in Km	Nos. of Plants
Advance work 2022-23	9998519.00	29.649 Ha & 1.50Km	74122 + 2000
Completion Work 2023-24	4106970.00		
1st Year Maintenance Work 2024-25	2878418.00		
2nd Year Maintenance Work 2025-26	2500641.00		
Total	19484548.00	29.649 Ha & 1.50Km	74122+2000=76122

The MoU between Hazaribagh East Forest Division,Hazaribagh and CCL, effective from 23.11.2013 , shall be the guideline for implementation of the scheme. The amount as "Advance" to be released from time to time as per the stipulation of the MoU and shall be in accordance with the work order only and shall in no case exceed the amount as stipulated against each work component. Amount released shall be utilized for specific work head and not diverted to any other work component. Forest Department shall submit expenditure vouchers as stipulated in the MoU and the vouchers shall indicate the work component head against which vouchers are submitted.

Adjustment, if any, in the advance amount released during execution of work, the same shall be adjusted from subsequent release of fund. In case of revision in labour wages during the period of scheme a revised estimate shall be submitted to CCL for acceptance enclosing there with a copy of the State Government notification required as per MoU.

You are requested to take physical possession of the site for execution of the work from the concerned Project officer and start the work immediately with intimation to this office.

Yours faithfully,

14/03/23

HoD (Envt.)
CCL, Ranchi

Encl: (i).Copy of the MoU
(ii).Copy of the approved scheme/ estimate
(iii).Copy of the format for joint inspection

Copy forwarded for kind information:

CCL:

1. Director Tech(P&P),D(F),CCL.
2. CVO,CCL.
3. TS to CMD,CCL.
4. GM (Kathara,Dhori &B&Karea).-The expenditure occurred against this work will be charged against mine closure.
5. GM(Finance-I/C), CCL.
6. Chief Manager(F)/(P&P),CCL
7. Dy.GM Finance (XP/HQ),CCL
8. Area Finance Manager, (Kathara , Dhori & B&K area).
9. Project Officer Kathara,Jarangdih ,Karo,SDOCM OCP with a copy of MoU, Scheme/estimate &Joint Inspection format.
10. Area Env.officer Kathara , Dhori& B&K area: with a copy of MoU, Scheme/estimate & joint inspection format.
11. HoD (Envt.). CCL HQ Ranchi

Forest Department:
1. RCCF, Hazaribagh Region,Hzb
2. CF, Territorial Circle,Hazaribagh

Labour Department:
1. Asst.Labour.Commissioner,Hazaribagh

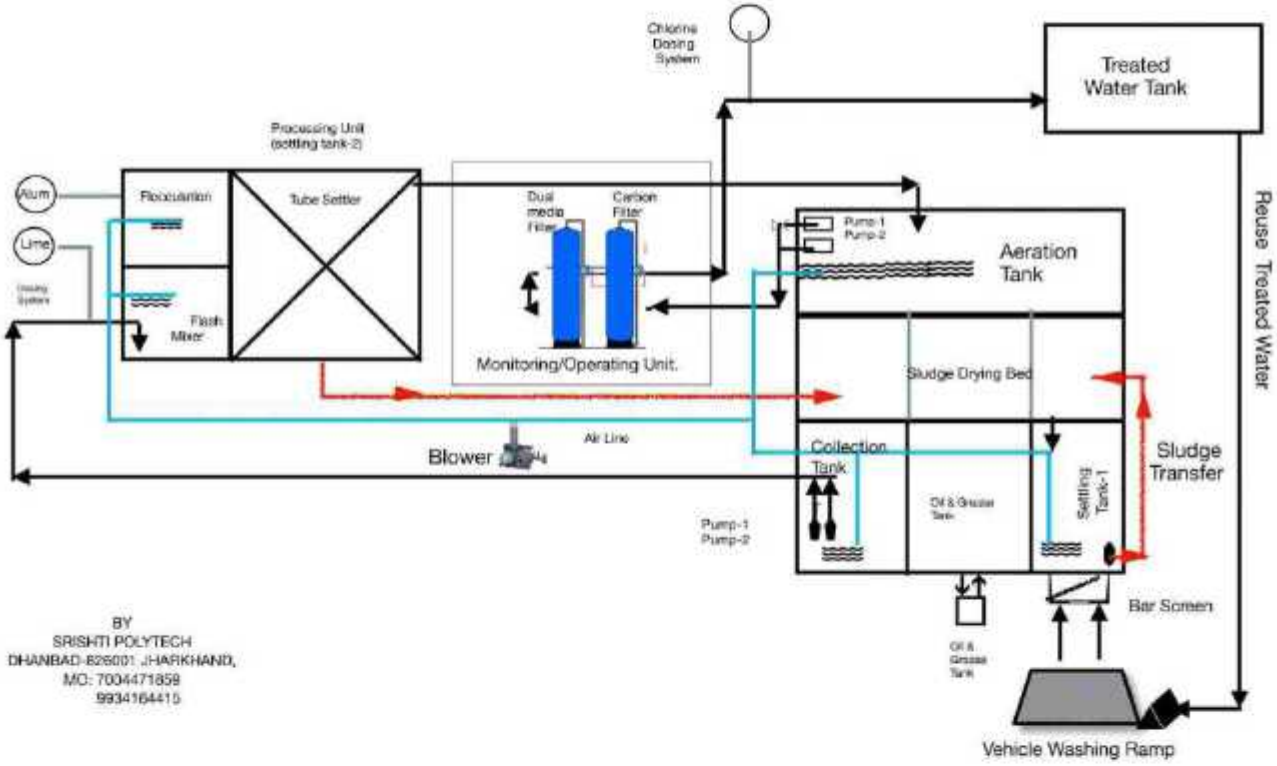
Annexure VI

CCL

JARANGDIH OCP

100 KLD EFFLUENT TREATMENT PLANT (ETP)

(An Initiative towards Advance Treatment and Zero Liquid Discharge)



BY
SRISHTI POLYTECH
DHANBAD-826001 JHARKHAND,
MO: 7004471859
9934164415

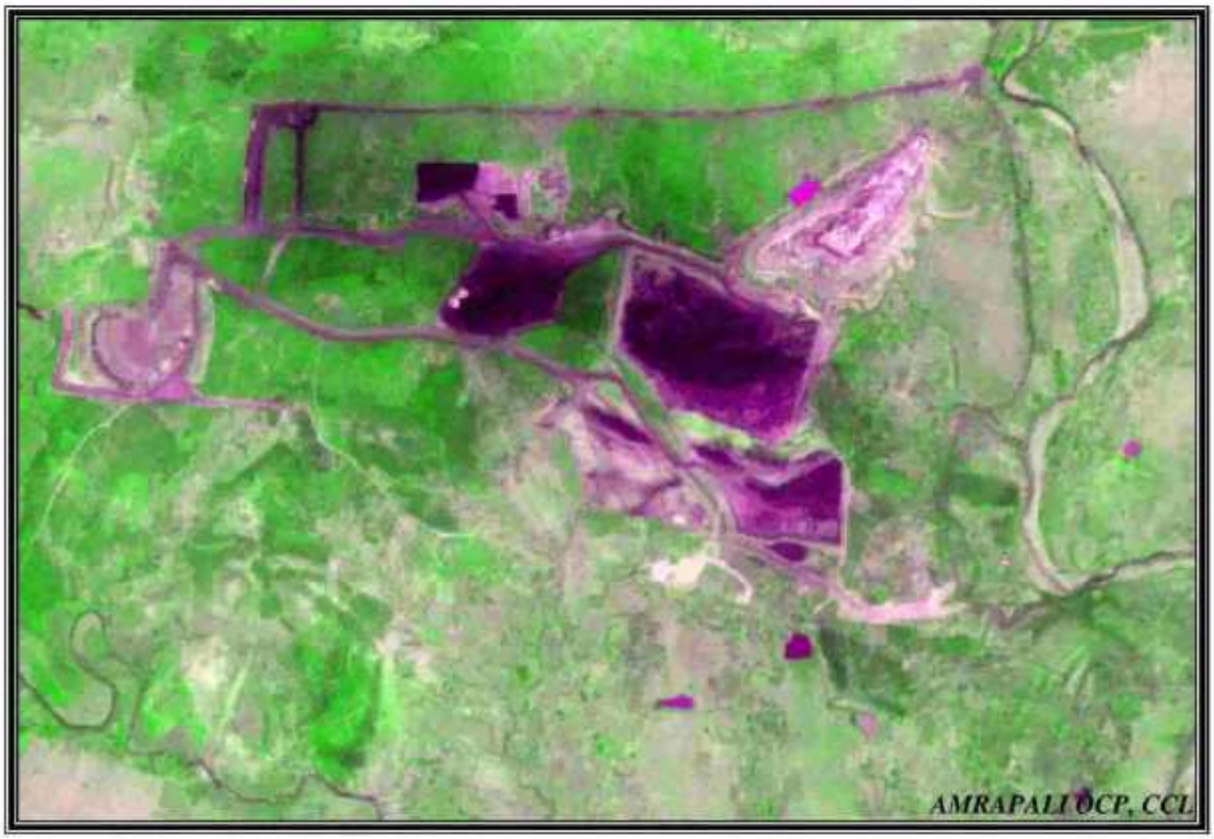
Annexure VII

Sl. No.	Name of Area	Sanction Year	Sector	Activity	Sanction Amount	Unit	Village	Block	District	Parliamentary Constituency	Award Value	Amount Paid
1	Kathara	2016-17	Drinking Water	Provision of Water Facility through pipeline from house of Shafiq to house of Naseem Ansari in	9.90	JRD	Jhirki	Gomia	Bokaro	Giridih	12.12	12.12
2	Kathara	2016-17	Drinking Water	Deep Boring in Khetko for drinking purpose	6.50	JRD	Khetko	Petarwar	Bokaro	Giridih	6.33	6.33
3	Kathara	2016-17	Infrastructure	Construction of Shed in front of Hari Mandir, Borbari Tola, Khetko	5.00	JRD	Khetko	Petarwar	Bokaro	Giridih	5.64	5.64
4	Kathara	2016-17	Infrastructure	PCC Road from Gram Panchayat Khetko through Partand to Thakur tola Shiv Mandir	5.00	jrd	Khetko	Petarwar	Bokaro	Giridih	4.75	4.75
5	Kathara	2016-17	Infrastructure	Construction of Community Shed in front of Jarangdih Project Office	6.50	jrd	Jarangdih	Bermo	Bokaro	Giridih	4.19	4.19
6	Kathara	2016-17	Water Management	Construction of Ghat in Bodia Talab	5.50	JRD	Bodia	Bermo	Bokaro	Giridih	3.46	3.46
7	Kathara	2016-17	Infrastructure	Construction of Floor of Idgah in Jhirki Panchayat	3.00	JRD	Jhirki	Gomia	Bokaro	Giridih	3.12	3.12
8	Kathara	2016-17	Drinking Water	Digging of Pond in Asnapani Village	3.00	JRD	Asnapani	Bermo	Bokaro	Giridih	2.11	2.11
9	Kathara	2016-17	Infrastructure	PCC Road from Anganbadi Kendra to Peepal Esthan in Bhaltongaria	1.50	JRD	Bhaltongaria	Gomia	Bokaro	Giridih	1.42	1.42
10	Kathara	2017-18	Drinking Water	Construction of Well in Khetko	3.50	JRD	Khetko	Petarwar	Bokaro	Giridih	3.23	3.23
11	Kathara	2017-18	Skill Development	Computer training programme for50PAPs/Unemployed youth of displaced	2.50	JRD	Jarangdih	Bermo	Bokaro	Giridih	1.63	1.63
12	Kathara	2017-18	Sanitation	Construction of Toilet in Bodia Utkramit Middle School	1.50	JRD	Bodia	Bermo	Bokaro	Giridih	1.47	1.47
13	Kathara	2017-18	Sanitation	Construction of toilet near Community Hall, Bandh Basti	1.50	JRD	Bandh Basti	Gomia	Bokaro	Giridih	1.45	1.45
[illegible]	[illegible]	2017-18	Drinking Water	Provision of Drinking Water in Up... Mohalla, Asnapani	1.50	JRD	Asnapani	Bermo	Bokaro	Giridih	[illegible]	1.33
15	Kathara	2018-19	Drinking Water	Deep boring in Middle School, Champi	4.00	JRD	Champi	Petarwar	Bokaro	Giridih	3.61	3.61
16	Kathara	2018-19	Drinking Water	Provision of water supply through pipeline from house of Nail Israil to House of Giyasuddin	3.00	JRD	Jhirki	Gomia	Bokaro	Giridih	3.21	3.21
17	Kathara	2018-19	Education	Construction of Boundary Wall in rajkiya Urdu Utkramit Middle School,Asnapani	2.50	JRD	Asnapani	Bermo	Bokaro	Giridih	2.27	2.27
18	Kathara	2019-20	Drinking Water	Const of deep borewell with Solar Power operated Submersible Pump at **Yadav Tola, Jhirkey**	9.13	JRD	Jhirkey	Gomia	Bokaro	Giridih	9.13	7.72
19	Kathara	2019-20	Skill Development	Establishment and operation of **Tailoring centre**(excluding cost of building).	10.00	JRD	Various	Bermo & Gomia	Bokaro	Giridih	5.53	5.53
20	Kathara	2019-20	Drinking Water	**Provision of water supply in Main Market,Jarangdih.**	2.00	JRD	Jarangdih.	Bermo	Bokaro	Giridih	1.82	1.82
21	Kathara	2019-20	Education	**Providing Equipments/Kits for Science laboratory.**	1.80	JRD	Various	Bermo & Gomia	Bokaro	Giridih	1.77	1.77
22	Kathara	2019-20	Education	Establishment of Community Library.	2.00	JRD	Jarangdih	Bermo	Bokaro	Giridih	0.96	0.96
23	Kathara	2019-20	Drinking Water	**Hand pump near Double Storey,Babu Quarter,Jarangdih.**	0.80	JRD	Jarangdih.	Bermo	Bokaro	Giridih	0.94	0.94

24	Kathara	2019-20	Drinking Water	**Handpump near Mansa Mandir,Jarangdih**	0.80	JRD	Jarangdih	Bermo	Bokaro	Giridih	0.94	0.94
25	Kathara	2019-20	Drinking Water	**Handpump near House of Tulsi Yadav Jhirkey.**	0.80	JRD	Jhirkey	Gomia	Bokaro	Giridih	0.93	0.93
26	Kathara	2019-20	Skill Development	Establishment and operation of **skill development** centre(excluding cost of building)	5.00	JRD	Jarangdih	Bermo	Bokaro	Giridih	0.78	0.78
27	Kathara	2020-21	**Education**	Construction of 2 Classrooms in Kathara High School, Kathara	15	JRD	Kathara	Gomia	Bokaro	Giridih	7.92	7.92
28	Kathara	2020-21	**Drinking Water**	Construction of Deep borewells with solar power operated submersible pumpset, pump house, recharge pit etc for drinking water at Asnapani	14	JRD	Asnapani	Bermo	Bokaro	Giridih	11.54	11.54
29	Kathara	2020-21	**Education**	Heightening of boundary wall, Barbed wire fencing and Construction of 2 toilets in Md head Assan High School, Jhirkey	10	JRD	Jhirki	Gomia	Bokaro	Giridih	Work Awarded	
30	Kathara	2020-21	**Infrastructure**	Community Toilet in Yadav Tola, Jhirkey	5	JRD	Jhirkey	Gomia	Bokaro	Giridih	3.49	3.49
31	Kathara	2021-22	**Sanitation**	Community Toilet near Jarangdih Market	11	JRD	JarangDih	Bermo	Bokaro	Giridih	Work Awarded	
32	Kathara	2021-22	**Drinking Water**	Power operated Submersible pump set, pump	12	JRD	Khetko	Petarwar	Bokaro	Giridih	Work Awarded	
33	Kathara	2021-22	**Self Employment**	Promotion of Self Employment through distribution of Bee Hives among nearby villagers	2	JRD	Champi	Petarwar	Bokaro	Giridih	1.94	1.94
34	Kathara	2021-22	**Water Management**	Renovation of Pond near Bodia Basti	6	JRD	Bodia Basti	Bermo	Bokaro	Giridih	Work Awarded	
35	Kathara	2021-22	**Drinking Water**	Provision of Water Supply through Pipeline in Bodia Basti	9.5	JRD	Bodia Basti	Bermo	Bokaro	Giridih	Work Awarded	
36	Kathara	2022-23	**Education**	Grant to CCL Aided Schools	17.76	JRD	Various	Bermo	Bokaro	Giridih	17.76	17.76
37	Kathara	2022-23	**Rural Development**	Construction of Chabutra with cover shed near Shiv Mandir, Khetko	6.00	JRD	Khetko	Petarwar	Bokaro	Giridih	Estimate under process	
38	Kathara	2022-23	**Rural Development**	Ghat besides Damodar River near Asnapani Niche Mohalla	8.00	JRD	Asnapani	Bermo	Bokaro	Giridih	Estimate under process	

Annexure VIII

Land Restoration / Reclamation Monitoring of less than 5 m cu. m. (Coal + OB) Capacity Open Cast Coal Mines of Central Coalfields Limited Based on Satellite Data for the Year 2015



Submitted to:

Central Coalfields Limited

cmpdi

A Mini Ratna Company

Land Restoration / Reclamation Monitoring of less than 5 m. cu. m (Coal + OB) capacity Open Cast Coal Mines of Central Coalfields Limited Based on Satellite Data for the Year 2015

March-2016

cmpdi
A Mini Ratna Company

Remote Sensing Cell
Geomatics Division
CMPDI, Ranchi

CONTENTS

List of Tables

List of Plates

List of Figures

List of Photographs

Executive Summary

1.0 Project

Land restoration / reclamation monitoring of 12 opencast coal mines of Central Coalfields Ltd. (CCL) producing less than 5 million cu. m. (Coal + OB) per year based on satellite data, on every three year basis.

2.0 Objective

Objective of the land restoration / reclamation monitoring is to assess the area of backfilled, plantation, social forestry, active mining area, water bodies, and distribution of wasteland, agricultural land and forest land in the leasehold area of the various projects. This will help in assessing the progressive status of mined out land reclamation and to take up remedial measures, if any, required for environmental protection.

3.0 Salient Findings

- Out of the total mine leasehold area of 9045.85 hectares of the 12 OC projects Viz. Tetriakhar, Dakra, Magadh, Amrapali, Giddi-A, Pundi, Kedla, Jarangdih, Kathara, Konar, Karo & Karma considered for monitoring during year 2015; total excavated area is only 2013.99 ha out of which 589.34 ha area (29.26%) has been planted, 827.05 ha area (41.07%) has been backfilled and 597.60 ha area (29.67%) is under active mining. It is evident from the analysis that 70.33% area of the OC projects have already been reclaimed and balance 29.67% area is under active mining. Project wise details are given in Table-1 & Fig -1.

- Of the total area reclaimed by CCL, 29.26% is under biological reclamation (plantation) and 41.07% is under technical reclamation. Out of 12 projects of CCL, Dakra OCP ranks on top for land reclamation (87.15%) followed by Kathara OCP (81.34%) and Kedla OCP (79.88%).

- Magadh, Amrapali and Konar are now operating projects, and the current status has been analyzed.

Table - 1
Projectwise Land Reclamation Status in Opencast Projects of CCL
based on Satellite Data of the year 2015

Area in Ha.
(% Calculated in terms of Total Excavated Area)

Sl. No.	Project			Biological Reclamation (Plantation/ Vegetation)		Technical Reclamation (Under Backfilling)		Under Active Mining		Total Excavated Area		Area under Reclamation	
	Name	Leasehold i		ii	ii	iii	iii	iv	iv	ii+iii+iv	ii+iii+iv	ii+iii	ii+iii
	Year	2012	2015	2012	2015	2012	2015	2012	2015	2012	2015	2012	2015
1	Teteriakhar	205	205.59	3.46	1.46	3.4	36.29	21.25	28.21	28.11	65.96	6.86	37.75
				12.31	*2.21*	*12.10*	*55.02*	*75.60*	*42.77*			*24.40*	*57.23*
2	Dakra	252.52	252.52	44.82	38.71	47.05	82.79	26.74	17.91	118.61	139.41	91.87	121.50
				37.79	*27.77*	*39.67*	*59.39*	*22.54*	*12.85*			*77.46*	*87.15*
3	Magadh *	1571	1704	0.00	0.00	0.00	20.35	0.00	16.97	0.00	37.32	0.00	20.35
				0.00	*0.00*	*0.00*	*54.53*	*0.00*	*45.47*			*0.00*	*54.53*
4	Amrapali *	1520	1300	0.00	0.00	0.00	59.30	0.00	119.86	0.00	179.16	0.00	59.30
				0.00	*0.00*	*0.00*	*33.10*	*0.00*	*66.90*			*0.00*	*33.10*
5	Giddi-A	494	494.2	103.04	122.43	106.40	106.51	83.22	82.83	292.66	311.77	209.44	228.94
				35.21	*39.27*	*36.36*	*34.16*	*28.44*	*26.57*			*71.56*	*73.43*
6	Pundi *	852	1357.2	35.24	38.24	53.28	57.55	43.54	40.94	132.06	136.73	88.52	95.79
				26.68	*27.97*	*40.35*	*42.09*	*32.97*	*29.94*			*67.03*	*70.06*
7	Kedla *	901	1157.43	11.37	28.51	127.75	145.30	73.51	43.77	212.63	217.58	139.12	173.81
				5.35	*13.10*	*60.08*	*66.78*	*34.57*	*20.12*			*65.43*	*79.88*
8	Jarangdih *	494.52	179.05	184.57	27.19	34.85	38.02	33.38	25.30	252.80	90.51	219.42	65.21
				73.01	*30.04*	*13.79*	*42.01*	*13.20*	*27.95*			*86.80*	*72.05*
9	Kathara	792.81	792.52	198.08	228.88	135.82	183.39	127.86	94.58	461.76	506.85	333.90	412.27
				42.90	*45.16*	*29.41*	*36.18*	*27.69*	*18.66*			*72.31*	*81.34*
10	Konar *	308.69	729.4	0.00	51.27	0.00	20.62	0.00	61.58	0.00	133.47	0.00	71.89
				0.00	*38.41*	*0.00*	*15.45*	*0.00*	*46.14*			*0.00*	*53.86*
11	Karo *	1204	575	64.40	42.08	30.77	56.38	38.00	42.10	133.17	140.56	95.17	98.46
				48.36	*29.94*	*23.11*	*40.11*	*28.53*	*29.95*			*71.47*	*70.05*
12	Karma	298.96	298.96	6.85	10.57	27.86	20.55	18.43	23.55	53.14	54.67	34.71	31.12
				12.89	*19.33*	*52.43*	*37.59*	*34.68*	*43.08*			*65.32*	*56.92*
TOTAL (CCL)		8894.50	9045.87	651.83	589.34	567.18	827.05	465.93	597.60	1684.94	2013.99	1219.01	1416.39
				38.69	*29.26*	*33.66*	*41.07*	*27.65*	*29.67*	*18.94*	*22.26*	*72.35*	*70.33*

** Leasehold is modified in 2015 w.r.t. 2012*

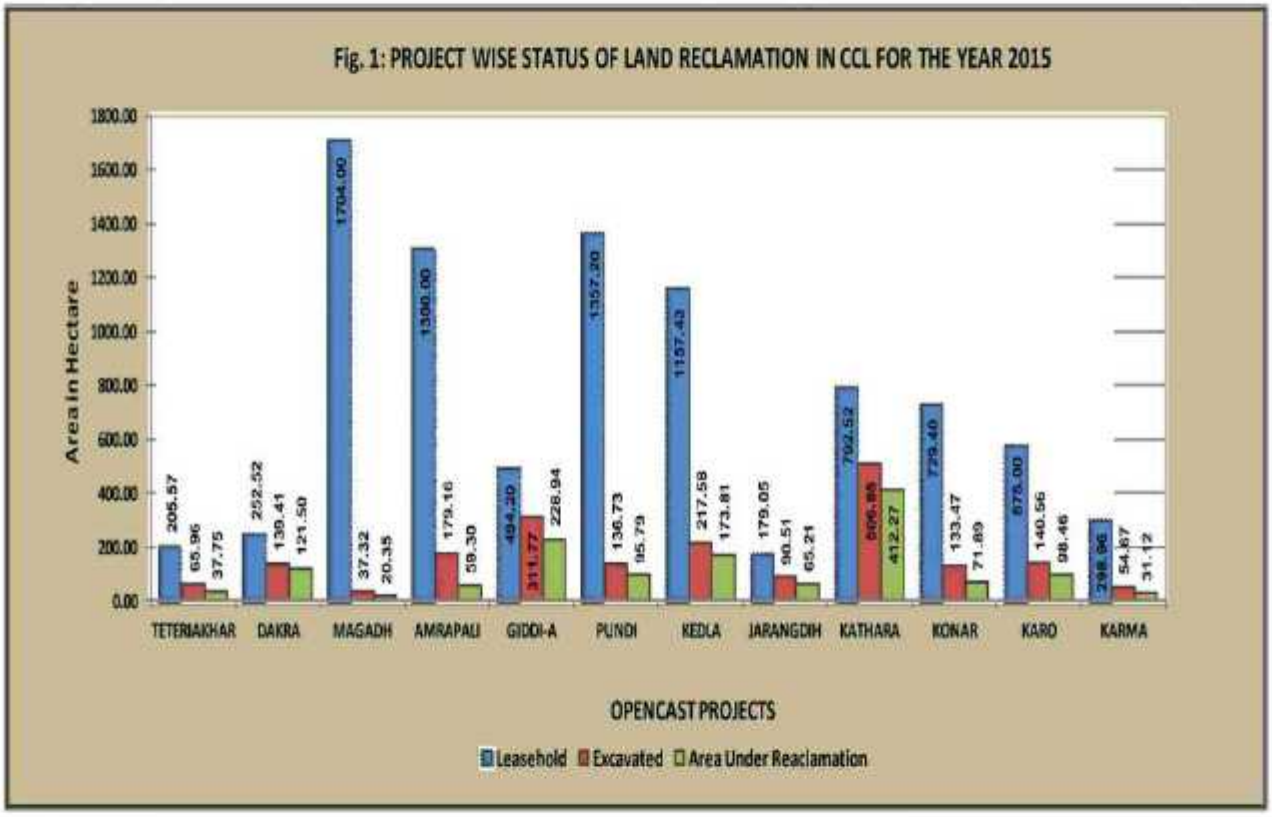


Fig. 1: PROJECT WISE STATUS OF LAND RECLAMATION IN CCL FOR THE YEAR 2015
Area In Hectare
1800.00
1600.00
1400.00
1200.00
1000.00
800.00
600.00
400.00
200.00
0.00
205.57
65.96
37.75
252.52
139.41
121.50
1704.00
37.32
20.35
1300.00
179.16
59.30
494.20
311.77
228.94
1357.20
136.73
95.79
1157.43
217.58
173.81
179.05
90.51
65.21
702.52
506.85
412.27
729.40
133.47
71.89
575.00
140.56
98.46
298.96
54.67
31.12
TETERIAKHAR
DAKRA
MAGADH
AMRAPALI
GIDDI-A
PUNDI
KEDLA
JARANGDIH
KATHARA
KONAR
KARO
KARMA
OPENCAST PROJECTS
Leasehold
Excavated
Area Under Reaclamation

1.0 Background

1.1 Land is the most important natural resource which embodies soil, water, flora, fauna and total ecosystem. All human activities are based on the land which is the most scarce natural resource in our country. Mining is a site specific industry and it could not be shifted anywhere else from the location where mineral occurs. It is a fact that surface mining activities do effect the land environment due to ground breaking. Therefore, there is an urgent need to reclaim and restore the mined out land for its productive use for sustainable development of mining. This will not only mitigate environmental degradation, but would also help in creating a more congenial environment for land acquisition by coal companies in future.

1.2 Keeping above in view, M/s. Coal India Ltd. (CIL) issued a work order vide letter no. CIL/WBP/Env/2011/4706 dated 12.10.2012 for monitoring of opencast mines of less than 5 million m^3 per annum capacity (Coal +OB) from the year 2012 at intervals of three years. The result of land reclamation status of all such mines is to be published on the website of CIL, CMPDI and the concerned coal companies in public domain. Detailed reports are to be submitted to Coal India and respective subsidiaries.

1.3 Land reclamation monitoring of all opencast coal mining projects would also comply the statutory requirements of Ministry of Environment & Forest (MoEF).Such monitoring would not only facilitate in taking timely mitigation measures against environmental degradation, but would also enable coal companies to utilize the reclaimed land for larger socio-economic benefits in a planned way.

1.4 Present report is embodying the finding of the study based on satellite data of the year 2015 carried out for 12 OC projects of Central Coalfields Ltd. producing less than 5 mcm (Coal+OB) per annum.

2.0 Objective

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

3.0 Methodology

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

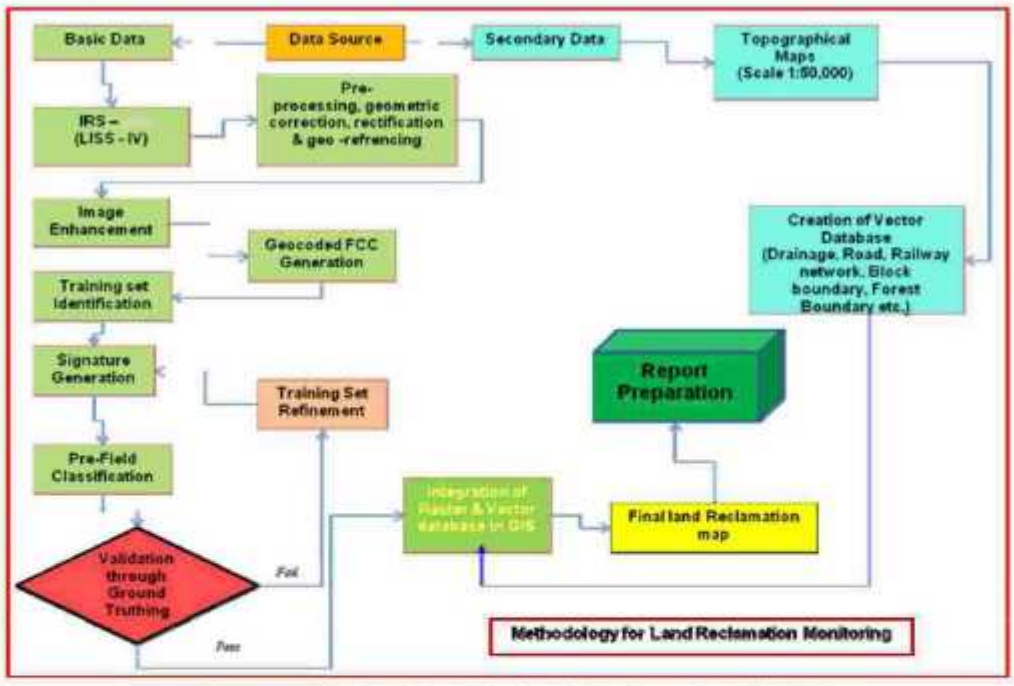


Figure: 2 Methodology for Land Reclamation Monitoring

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

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

- **Rectification & Georeferencing:** Inaccuracies in digital imagery may occur due to 'systematic errors' attributed to earth curvature and rotation as well as 'non-systematic errors' attributed to satellite receiving station itself. Raw digital images contain geometric distortions, which make them unusable as maps. Therefore, geo-referencing is required for correction of image data using ground control points (GCP) to make it compatible to SOI topo-sheet.

- **Image enhancement:** To improve the interpretability of the raw data, image enhancement is necessary. Local operations modify the value of each pixel based on brightness value of neighbouring pixels using ERDAS IMAGINE 14 s/w. and enhance the image quality for interpretation.

- **Training set selection**

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

- **Classification and Accuracy assessment**

  Image classification is carried out using the maximum likelihood algorithm. The classification proceeds through the following steps: (a) calculation of statistics [i.e.

signature generation] for the identified training areas, and (b) the decision boundary of maximum probability based on the mean vector, variance, covariance and correlation matrix of the pixels. After evaluating the statistical parameters of the training sets, reliability test of training sets is conducted by measuring the statistical separation between the classes that resulted from computing divergence matrix. The overall accuracy of the classification was finally assessed with reference to ground truth data.

- **Area calculation**

  The area of each land use class in the leasehold is determined using ERDAS IMAGINE v. 14 software and given in table 2.

- **Overlay of Vector data base**

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

- **Pre-field map preparation**

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

3.3 Ground Truthing:

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

3.4 Land reclamation database on GIS:

Land reclamation database is created on GIS platform to identify the temporal changes identified from satellite data of different cut-off dates.

4.0 Land Reclamation Status in Central Coalfields Ltd.

4.1 Following 12 OC projects producing less than 5 million m^3. (Coal + OB together) of Central Coalfields Ltd. have been taken up during the year 2015 for land reclamation monitoring:

- Teteriakhar
- Dakra
- Magadh
- Amrapali
- Giddi-A
- Pundi
- Kedla
- Jarangdih
- Kathara
- Konar
- Karo
- Karma

4.2 Area statistics of different land use classes present in OC projects in the year 2015 is given in Table 2. Land use maps derived from the satellite data is given in Plate no. 1 to 12. Land use statuses are shown in Fig. 3 – 14 and field photographs showing plantation and backfilled area in mining projects are shown in photos 1-5.

4.3 Leasehold of Konar OCP has increased from 308.69 ha to 729.4 ha due to mine expansion and amalgation with Khasmahal OCP. Also infrastructural development like washery and FBC plant are coming up in 2015-16. The modification of Karo leasehold is done as per approved project plan for 11/15 mty.

4.4 Study reveals that 70.33% of excavated area has already been reclaimed by CCL in the OC projects, out of which 29.26% area has been planted and 41.07% area are backfilled.

4.5 After analyzing the satellite data of year 2015, it is evident that plantation carried out on backfilled area, OB dumps as well as under social forestry in all the 12 mines of CCL taken up for study, has reached 29.26% till now. It can also be seen from the Table.1 that the total area of reclamation has reached 70.33% till the year 2015.

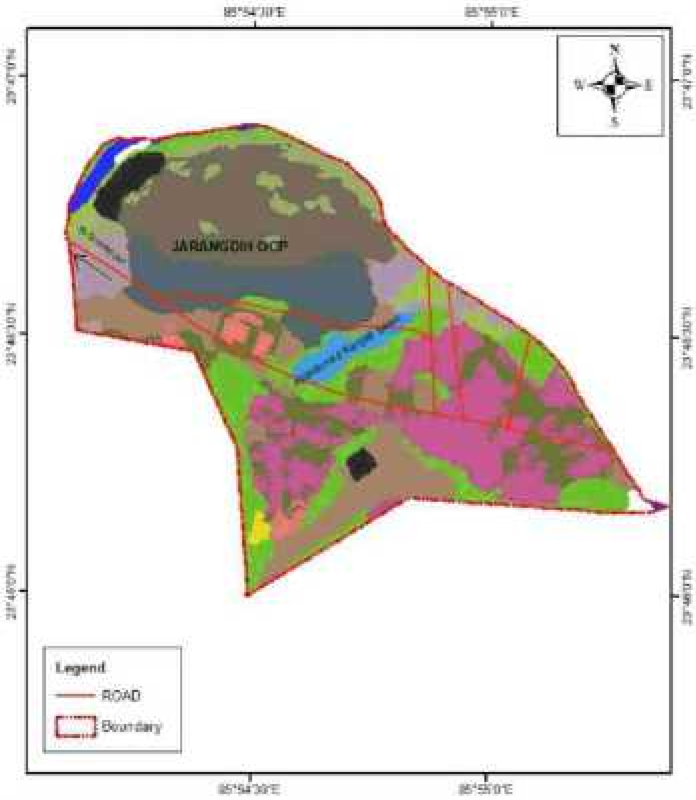
Table 5.1

Table 5.1 : STATUS OF LAND RECLAMATION IN CENTRAL COALFIELDS LIMITED BASED ON SATELLITE DATA OF THE YEAR 2015

(Area in Ha)

		TETERIAKHAR		DAKRA		MAGADH		AMRAPALI		GIDDI-A		PINDRA		KEDLA	
		Area	%	Area	%	Area	%	Area	%	Area	%	Area	%	Area	%
FORESTS	Dense Forest	0.02	0.01	0.00	0.00	53.17	3.12	41.73	3.21	0.00	0.00	181.38	13.38	0.04	0.00
	Open Forest	0.00	0.00	0.00	0.00	168.21	9.87	215.29	16.56	0.00	0.00	236.47	17.42	174.08	15.04
	Total Forest (A)	0.02	0.01	0.00	0.00	221.38	12.99	257.04	19.77	0.00	0.00	418.05	30.80	174.12	15.04
SCRUBS	Scrubs (B)	61.55	29.94	52.04	20.29	304.56	17.87	256.65	19.74	51.63	10.45	314.04	23.14	407.19	35.20
PLANTATION	Social Forestry	0.00	0.00	9.58	3.73	0.00	0.00	0.00	0.00	13.22	2.68	1.35	0.10	1.46	0.13
	Plantation on OB Dump	0.00	0.00	4.90	1.91	0.00	0.00	0.00	0.00	41.57	8.41	23.03	1.69	27.08	2.34
	Plantation on Backfill	0.00	0.00	24.23	9.45	0.00	0.00	0.00	0.00	67.64	13.68	13.86	1.02	0.00	0.00
	Total Plantation (*Biological Reclamation*) (C)	0.00	0.00	38.71	15.09	0.00	0.00	0.00	0.00	122.43	24.77	38.24	2.81	28.61	2.47
	Total Vegetation (A+B+C)	**61.57**	**29.95**	**90.75**	**35.38**	**525.92**	**30.86**	**513.69**	**39.51**	**174.06**	**35.22**	**770.33**	**56.76**	**609.82**	**52.69**
ACTIVE MINING	Coal Quarry	19.01	9.24	12.04	4.69	16.53	0.97	92.40	7.11	14.43	2.92	10.17	0.75	17.72	1.53
	Coal Dump	5.84	2.84	1.03	0.40	0.00	0.00	21.38	1.64	8.21	1.66	9.75	0.72	9.47	0.82
	Advance Quarry Site	0.00	0.00	0.00	0.00	0.09	0.01	6.09	0.47	1.00	0.20	2.48	0.18	0.34	0.03
	Quarry Filled with Water	3.37	1.64	3.94	1.54	0.00	0.00	0.00	0.00	59.19	11.97	18.57	1.37	16.24	1.40
	Total Area under *Active Mining*	28.21	13.72	17.91	6.68	16.97	1.00	119.86	9.22	82.83	16.75	40.94	3.02	43.77	3.78
RECLAMATION	Barren OB dump	36.29	17.65	37.94	14.79	20.35	1.19	59.30	4.56	0.79	0.16	26.49	1.95	95.83	8.28
	Area Under Backfilling	0.00	0.00	44.85	17.48	0.00	0.00	0.00	0.00	105.72	21.39	31.06	2.30	49.47	4.30
	Total Area under *Technical Reclamation*	36.29	17.65	82.79	32.27	20.35	1.19	59.30	4.56	106.51	21.55	57.55	4.25	145.30	12.56
	Total Area under Mine Operation	64.50	31.37	100.70	39.95	37.32	2.19	179.16	13.78	189.34	38.30	98.49	7.27	189.07	16.34
WASTELANDS	Waste Lands	29.72	14.46	16.71	6.90	165.94	9.72	241.75	18.6	21.47	4.37	129.31	9.53	73.77	6.37
	Fly Ash Pond/Sand Body	0.00	0.00	0.00	0.00	5.80	0.34	12.25	0.94	6.00	1.21	3.02	0.22	0.67	0.06
	Total Wastelands	29.72	14.46	16.71	6.90	171.74	10.07	254.00	19.54	27.47	5.58	132.33	9.75	74.44	6.43
WATER	Reservoir, nallah, ponds etc	6.30	3.07	4.12	1.60	17.43	1.02	21.63	1.66	18.21	3.68	8.92	0.66	16.53	1.43
	Total Waterbodies	6.30	3.07	4.12	1.60	17.43	1.02	21.63	1.66	18.21	3.68	8.92	0.66	16.53	1.43
AGRICULTURE	Crop Lands	0.01	0.00	0.00	0.00	291.08	17.10	97.32	7.49	0.00	0.00	127.27	9.38	1.45	0.13
	Fallow Lands	42.71	20.77	1.67	0.66	652.97	38.32	220.11	16.93	3.29	0.67	187.06	13.78	202.11	17.46
	Total Agriculture	42.72	20.77	1.67	0.66	944.05	55.42	317.43	24.42	3.29	0.67	314.33	23.16	203.56	17.59
SETTLEMENTS	Urban Settlement	0.01	0.00	12.87	5.41	0.00	0.00	0.00	0.00	61.15	12.37	6.90	0.51	26.72	2.31
	Rural Settlement	0.00	0.00	10.56	4.51	7.54	0.44	11.51	0.89	0.00	0.00	21.77	1.60	26.14	2.26
	Industrial Settlement	0.57	0.43	15.14	6.29	0.00	0.00	2.58	0.21	20.68	4.18	4.13	0.30	11.15	0.96
	Total Settlements	0.58	0.43	38.57	16.21	7.54	0.44	14.09	1.09	81.83	16.55	32.80	2.41	64.01	5.53
	GRAND TOTAL	205.39	100.00	252.52	100.00	1704.00	100.00	1300.00	100.00	494.20	100.00	1357.20	100.00	1157.43	100.00

		JARANGDIH		KATHARA		KONAR		KARO		KARMA		TOTAL	
		Area	%	Area	%	Area	%	Area	%			Area	%
FORESTS	Dense Forest	0.00	0.00	0.00	0.00	90.61	12.42	66.61	11.58	0.00	0.00	425.78	4.80
	Open Forest	0.00	0.00	0.02	0.00	249.43	34.20	102.90	17.90	23.28	7.79	1169.68	12.93
	Total Forest (A)	0.00	0.00	0.02	0.00	340.04	46.62	169.51	29.48	23.28	7.79	1602.48	17.73
SCRUBS	Scrubs (B)	28.08	15.68	66.31	8.37	132.41	18.41	125.65	21.85	89.86	30.05	1869.95	20.67
PLANTATION	Social Forestry	16.50	9.23	25.32	3.07	20.99	2.88	15.90	2.77	1.34	0.45	155.06	1.71
	Plantation on OB Dump	3.50	1.96	122.03	15.40	27.10	3.72	10.87	1.89	9.23	3.09	269.24	2.98
	Plantation on Backfill	7.19	4.02	31.93	4.12	3.48	0.48	11.84	2.07	0.00	0.00	160.11	1.77
	Total Plantation (*Biological Reclamation*) (C)	27.19	15.19	228.88	28.89	51.27	7.04	38.61	6.73	10.57	3.54	584.41	6.46
	Total Vegetation (A+B+C)	**55.27**	**30.87**	**295.21**	**37.26**	**503.72**	**69.07**	**333.77**	**58.06**	**123.71**	**41.38**	**4057.82**	**44.86**
ACTIVE MINING	Coal Quarry	17.88	9.99	37.46	4.73	49.54	6.79	38.20	6.64	11.59	3.88	337.39	3.73
	Coal Dump	3.73	2.08	15.91	2.01	9.80	1.12	7.91	1.38	2.83	0.95	96.56	1.07
	Advance Quarry Site	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	2.15	0.72	12.07	0.13
	Quarry Filled with Water	3.69	2.06	41.23	5.20	2.44	0.33	2.71	0.47	6.98	2.33	158.37	1.75
	Total Area under *Active Mining*	25.30	14.13	94.59	11.93	61.58	8.44	48.84	8.49	23.55	7.88	604.34	6.68
RECLAMATION	Barren OB dump	9.51	5.31	124.00	15.65	20.36	2.79	30.06	5.23	20.55	6.87	481.23	5.32
	Area Under Backfilling	28.51	15.93	59.39	7.49	0.26	0.04	14.13	2.45	0.00	0.00	333.63	3.69
	Total Area under *Technical Reclamation*	38.02	21.24	183.39	23.14	20.62	2.83	44.19	7.68	20.55	6.87	814.86	9.01
	Total Area under Mine Operation	63.32	35.37	277.97	35.07	82.20	11.27	93.03	16.17	44.10	14.75	1419.20	15.69
WASTELANDS	Waste Lands	21.51	12.01	42.96	5.42	22.07	3.03	59.89	10.41	39.73	13.29	864.83	9.60
	Fly Ash Pond/Sand Body	0.97	0.54	9.88	1.25	0.00	0.00	0.00	0.00	9.75	3.26	48.34	0.53
	Total Wastelands	22.48	12.55	52.84	6.67	22.07	3.03	59.89	10.41	49.48	16.55	913.17	10.15
WATER	Reservoir, nallah, ponds etc	2.28	1.28	5.43	0.68	0.44	0.06	1.21	0.21	11.94	4	114.36	1.26
	Total Waterbodies	2.28	1.28	5.43	0.68	0.44	0.06	1.21	0.21	11.94	4.00	114.36	1.26
AGRICULTURE	Crop Lands	0.62	0.34	20.21	2.54	6.96	0.95	0.09	0.02	0.00	0.00	545.01	6.02
	Fallow Lands	0.00	0.00	53.98	6.81	54.34	7.45	57.94	10.08	62.85	21.02	1539.03	17.01
	Total Agriculture	0.62	0.34	74.19	9.35	61.30	8.40	58.03	10.10	62.85	21.02	2084.04	23.03
SETTLEMENTS	Urban Settlement	31.96	17.85	40.83	5.15	51.21	7.02	19.93	3.46	0.00	0.00	251.58	2.78
	Rural Settlement	0.00	0.00	6.72	0.85	5.97	0.81	6.06	1.05	5.52	1.85	101.79	1.13
	Industrial Settlement	3.12	1.74	39.40	4.97	2.49	0.34	3.08	0.54	1.36	0.45	104.00	1.15
	Total Settlements	35.08	19.59	86.95	10.97	59.67	8.17	29.07	5.05	6.88	2.30	457.37	5.06
	GRAND TOTAL	179.05	100.00	792.52	100.00	729.40	100.00	575.00	100.00	298.96	100.00	9045.97	100.03



Area Statistics - JARANGDIH OCP 2015				
Classes		Colour	Area	
Level-I	Level-II		Area (Hec)	% of Total
Forest Land	Dense Forest		0.00	0.00
	Open Forest		0.00	0.00
	Total Forest Land		**0.00**	**0.00**
	Scrubs		**28.08**	**18.08**
Plantation Area	Social Forestry		16.50	9.21
	Plantation on OB		3.50	1.96
	Plantation on Backfill		7.26	4.02
	Total Plantation Area		**27.19**	**15.19**
	Total Vegetation		**55.27**	**30.87**
Agriculture Land	Crop land		0.62	0.34
	Fallow Land		0.00	0.00
	Total Agriculture Land		**0.62**	**0.34**
Waste Land	Waste Land		21.50	12.01
	Sand Body		0.97	0.54
	Ash Pond		0.01	0.00
	Total Waste Land		**22.48**	**12.55**
Mining Area	Coal Quarry		17.88	9.99
	Barren OB Dump		4.51	2.51
	Back Fill		28.51	15.93
	Coal Dump		3.78	2.08
	Advance Quarry Site		0.00	0.00
	Water Filled Qry		3.69	2.06
	Total Mining Area		**63.32**	**35.37**
Settlements	Urban Settlements		31.96	17.85
	Rural Settlements		0.00	0.00
	Industrial Settlements		3.12	1.74
	Total Settlement Area		**35.08**	**19.59**
Water Body	**River/ Ponds**		**2.28**	**1.28**
	Total Area		**179.05**	**100.00**

Customer	Central Coalfields Limited				
Title	Land Reclamation Monitoring of OC Project				
Subject	Activity	Name	Designation	Signature	Date
Land Reclamation status of JARANGDIH OCP based on the satellite data of the year 2015	Prepared	A.S. Azad	Asst.Mgr (RS&GIS)		
	Checked	R. Kumar	CM(Geomatics)		
cmpdi	Approved	N. P. Singh	GM(Geomatics)		

Plate-8

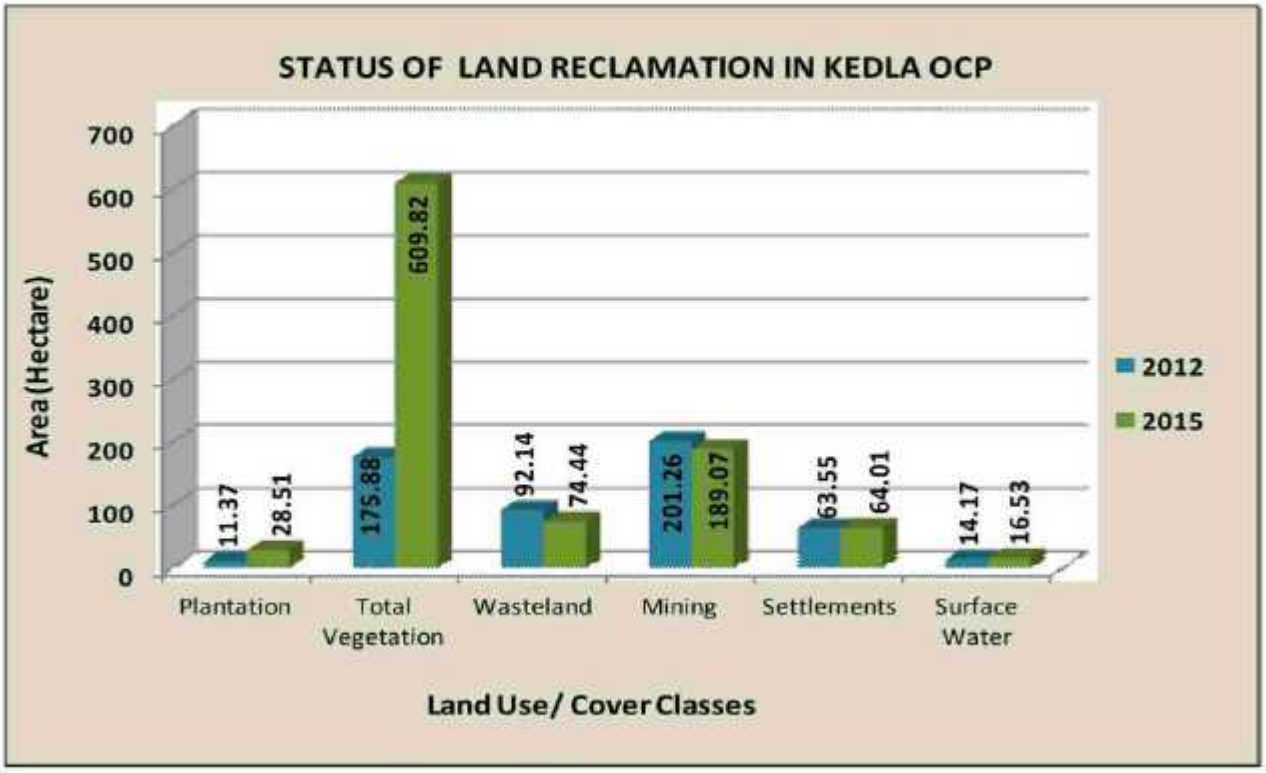


Figure - 9

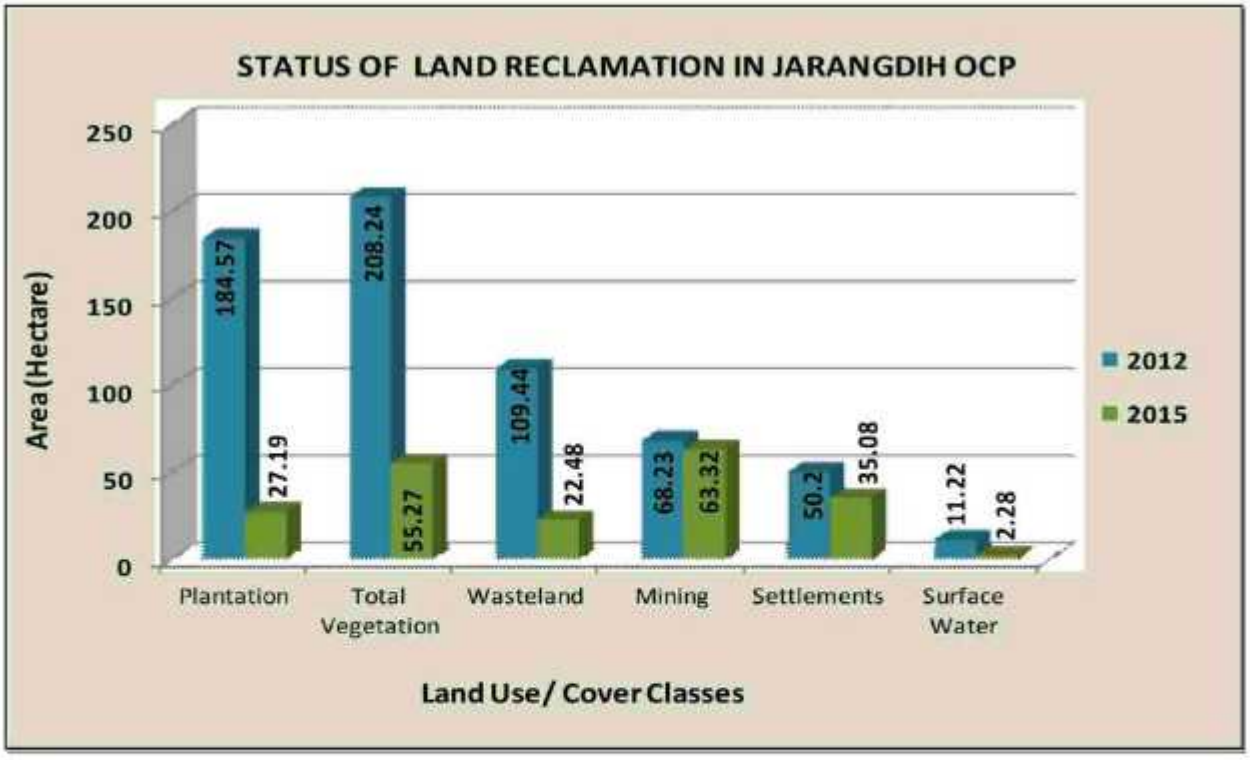


Figure - 10

Photo 7: Plantation on Backfill (Jarangdih OCP)

Photo 8: Plantation on OB Dump (Kathara OCP)

cmpdi
A Mini-Ratna Company

Central Mine Planning & Design Institute Ltd.
(A Subsidiary of Coal India Ltd.)
Gondwana Place, Kanke Road, Ranchi 834031, Jharkhand
Phone : (+91) 651 2230001, 2230002, 2230483, FAX (+91) 651 2231447, 2231851
Website : www.cmpdi.co.in, Email : cmpdihq@cmpdi.co.in

Annexure VIII

Land Restoration / Reclamation Monitoring of less than 5 m cu. m. (Coal + OB) Capacity Open Cast Coal Mines of Central Coalfields Limited Based on Satellite Data for the Year 2018

Submitted to:

Central Coalfields Limited

cmpdi

A Mini Ratna Company

Land Restoration / Reclamation Monitoring of less than 5 m. cu. m (Coal + OB) capacity Open Cast Coal Mines of Central Coalfields Limited Based on Satellite Data for the Year 2018

March-2019

cmpdi
A Mini Ratna Company
Remote Sensing Cell
Geomatics Division
CMPDI, Ranchi

CONTENTS

List of Tables

List of Plates

List of Figures

List of Photographs

Executive Summary

1.0 Project

Land restoration / reclamation monitoring of 12 opencast coal mines of Central Coalfields Ltd. (CCL) producing less than 5 million cu. m. (Coal + OB) per year based on satellite data, on every three year basis.

2.0 Objective

Objective of the land restoration / reclamation monitoring is to assess the area of backfilled, plantation, social forestry, active mining area, water bodies, and distribution of wasteland, agricultural land and forest land in the leasehold area of the various projects. This will help in assessing the progressive status of mined out land reclamation and to take up remedial measures, if any, required for environmental protection.

3.0 Salient Findings

- Out of the total mine leasehold area of 9126.74 hectares of the 12 OC projects Viz. Tetriakhar, Dakra, Magadh, Amrapali, Giddi-A, Pundi, Kedla, Jarangdih, Kathara, Konar, Karo & Karma considered for monitoring during year 2018; total excavated area is only 1108.03 ha out of which 196.55 ha area (17.74%) has been biologically reclaimed, 411.71 ha area (37.16%) has been backfilled and 499.77 ha area (45.10%) is under active mining. It is evident from the analysis that 54.90% area of the OC projects have already been reclaimed and balance 45.10% area is under active mining. Project wise details are given in Table-1 & Fig -1.

- Of the total area reclaimed by CCL, 17.74% is under biological reclamation (plantation on excavated/backfilled area) and 37.16% is under technical reclamation (area under backfilling). Out of 12 projects of CCL, Giddi-A OCP ranks on top for land reclamation (76.18%) followed by Dakra OCP (75.17%) and Jarangdih OCP (67.32%).

- It is important to note that a new table format has been designed by Coal India Ltd. with new parameters of biological and technical reclamation. For comparative purposes the basic dataset for the year 2015-16 has been fed into the new format so that it can be compared with the results of 2018-19.

Table-1

Status of Land Reclamation in Central Coalfields Limited based on Satellite Data for the Year 2018

(Projects producing less than 5 mcm of Coal/OB annually)

(Area in Hectare)

Sl. No.	Project	Total Leasehold Area		Technical Reclamation		Plantation						Area under Active Mining		Total Excavated Area		Total Area under Plantation (% Green Cover Generated in Leasehold)		Total Area under Reclamation	
				Area under Backfilling		Biological Reclamation		Other Plantations											
						Plantation on Excavated / Backfilled Area		Plantation on External Over Burden Dumps		Social Forestry, Avenue Plantation Etc.									
1	*2*	*3*		*4*		*5*		*6*		*7*		*8*		*9 (=4+5+8)*		*10 (=5+6+7)*		*11(=4+5)*	
		2015	*2018*	*2015*	*2018*	*2015*	*2018*	*2015*	*2018*	*2015*	*2018*	*2015*	*2018*	*2015*	*2018*	*2015*	*2018*	*2015*	*2018*
1	Tetariakhar	205.59	208.47	0.00	0.00	0.00	0.00	0.00	0.00	0.00	1.45	22.38	41.29	22.38	41.29	0.00	1.45	0.00	0.00
				0.00%	0.00%	0.00%	0.00%					100.00%	100.00%			0.00%	0.70%	0.00%	0.00%
2	Dakra	252.52	249.72	64.85	27.03	24.23	45.79	4.90	4.90	9.58	9.82	15.98	24.05	85.06	96.87	38.71	60.51	69.08	72.82
				53.73%	27.90%	38.46%	47.27%					18.79%	24.83%			15.33%	24.33%	81.21%	75.17%
3	Magadh	1769.00	1769.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	16.97	44.66	16.97	44.66	0.00	0.00	0.00	0.00
				0.00%	0.00%	0.00%	0.00%					100.00%	100.00%			0.00%	0.00%	0.00%	0.00%
4	Amrapali	1300.00	1300.00	0.00	72.84	0.00	0.00	0.00	1.36	0.00	0.00	98.48	53.90	98.48	126.74	0.00	1.36	0.00	72.84
				0.00%	57.47%	0.00%	0.00%					100.00%	42.53%			0.00%	0.10%	0.00%	57.47%
5	Giddi-A	494.20	510.00	105.72	109.10	67.64	80.14	41.57	43.90	13.22	14.00	74.61	59.16	247.97	248.40	122.43	138.04	173.36	189.24
				42.63%	43.92%	27.28%	32.26%					30.09%	23.82%			24.77%	27.07%	69.91%	76.18%
6	Pundi	1357.20	1357.20	31.06	35.87	13.88	13.88	23.03	22.36	1.35	1.35	31.19	30.75	76.11	80.50	38.24	37.59	44.92	49.75
				40.81%	44.56%	18.23%	17.24%					40.98%	38.20%			2.82%	2.77%	59.03%	61.80%
7	Kedla	1157.42	1157.42	49.73	49.76	0.00	0.00	27.05	26.75	1.46	1.46	34.30	45.92	84.03	95.68	28.51	28.21	49.73	49.76
				59.18%	52.01%	0.00%	0.00%					40.82%	47.99%			2.46%	2.44%	59.18%	52.01%
8	Jarangdih	179.05	179.05	28.51	29.53	7.19	7.20	3.50	3.50	16.50	18.83	21.57	17.83	57.27	54.56	27.19	29.63	35.70	36.73
				49.78%	54.12%	12.55%	13.20%					37.66%	32.68%			15.19%	16.55%	62.34%	67.32%
9	Kathara	792.52	792.52	59.39	61.04	31.53	31.53	122.03	103.67	75.02	89.17	78.67	76.58	169.89	169.85	228.68	224.67	91.22	92.87
				34.96%	35.94%	18.74%	18.74%					46.33%	45.32%			26.88%	26.35%	53.69%	54.68%
10	Konar	729.40	729.40	0.26	9.31	3.48	3.48	27.10	34.18	20.69	19.16	51.98	41.27	55.72	54.06	51.27	46.82	3.74	12.79
				0.47%	17.22%	6.25%	6.44%					93.29%	76.34%			7.03%	6.42%	6.71%	23.66%
11	Karo	575.00	575.00	14.11	17.23	11.88	14.23	10.83	12.07	15.90	15.78	40.93	34.19	66.92	66.66	38.61	42.08	25.99	31.46
				21.08%	26.25%	17.75%	21.68%					61.15%	52.08%			6.71%	7.32%	38.84%	47.92%
12	Karma	298.96	298.96	0.00	0.00	0.00	0.00	9.23	8.03	1.34	1.27	20.72	29.77	20.72	29.77	10.57	9.30	0.00	0.00
				0.00%	0.00%	0.00%	0.00%					100.00%	100.00%			3.54%	3.11%	0.00%	0.00%
	TOTAL	**9045.86**	**9126.74**	**333.63**	**411.71**	**160.11**	**196.55**	**269.24**	**258.72**	**155.06**	**172.39**	**507.78**	**499.77**	**1001.52**	**1108.03**	**584.41**	**619.66**	**493.74**	**608.26**
				33.31%	**37.16%**	**15.99%**	**17.74%**					**50.70%**	**45.10%**			**6.40%**	**6.79%**	**49.30%**	**54.9%**

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

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

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

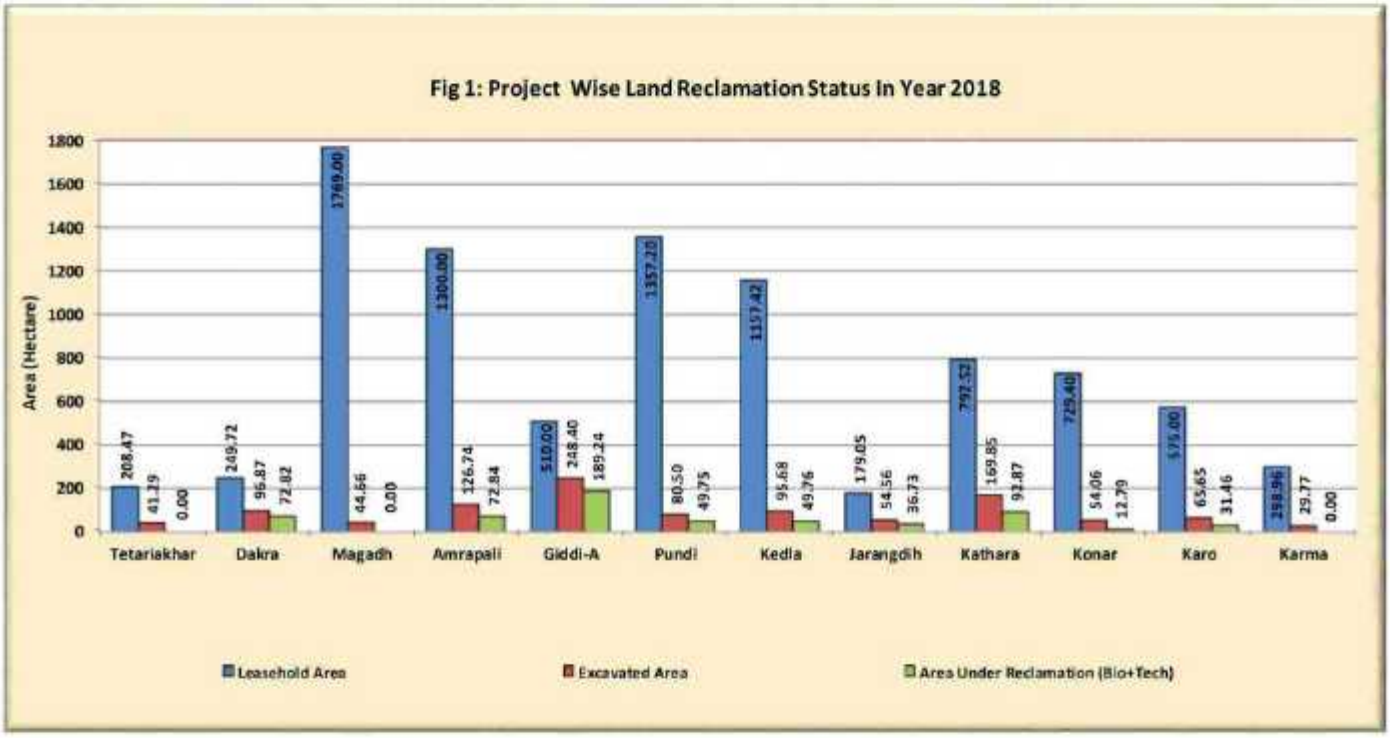


Fig 1: Project Wise Land Reclamation Status in Year 2018
Area (Hectare)
1800
1600
1400
1200
1000
800
600
400
200
0
208.47
41.19
0.00
249.72
95.87
72.82
1769.00
44.66
0.00
1300.00
126.74
72.84
510.00
248.40
189.24
1357.20
80.50
49.75
1157.42
95.68
49.76
179.05
54.56
36.73
797.52
169.85
93.87
725.40
54.06
12.79
575.00
65.65
31.46
298.96
29.77
0.00
Tetariakhar
Dakra
Magadh
Amrapali
Giddi-A
Pundi
Kedla
Jarangdih
Kathara
Konar
Karo
Karma
Leasehold Area
Excavated Area
Area Under Reclamation (Bio+Tech)

1.0 Background

1.1 Land is the most important natural resource which embodies soil, water, flora, fauna and total ecosystem. All human activities are based on the land which is the most scarce natural resource in our country. Mining is a site specific industry and it could not be shifted anywhere else from the location where mineral occurs. It is a fact that surface mining activities do effect the land environment due to ground breaking. Therefore, there is an urgent need to reclaim and restore the mined out land for its productive use for sustainable development of mining. This will not only mitigate environmental degradation, but would also help in creating a more congenial environment for land acquisition by coal companies in future.

1.2 Keeping above in view, M/s. Coal India Ltd. (CIL) issued a work order vide letter no. CIL/WBP/Env/2011/4706 dated 12.10.2012 for monitoring of opencast mines of less than 5 million m^3 per annum capacity (Coal +OB) from the year 2012 at intervals of three years. The result of land reclamation status of all such mines is to be published on the website of **CIL**, (www.coalindia.in), **CMPDI** (www.cmpdi.co.in) and the concerned coal companies in public domain. Detailed reports are to be submitted to Coal India and respective subsidiaries.

1.3 Land reclamation monitoring of all opencast coal mining projects would also comply the statutory requirements of Ministry of Environment & Forest (MoEF).Such monitoring would not only facilitate in taking timely mitigation measures against environmental degradation, but would also enable coal companies to utilize the reclaimed land for larger socio-economic benefits in a planned way.

1.4 Present report is embodying the finding of the study based on satellite data of the year 2018 carried out for 12 OC projects of Central Coalfields Ltd. producing less than 5 mcm (Coal+OB) per annum.

2.0 Objective

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

3.0 Methodology

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

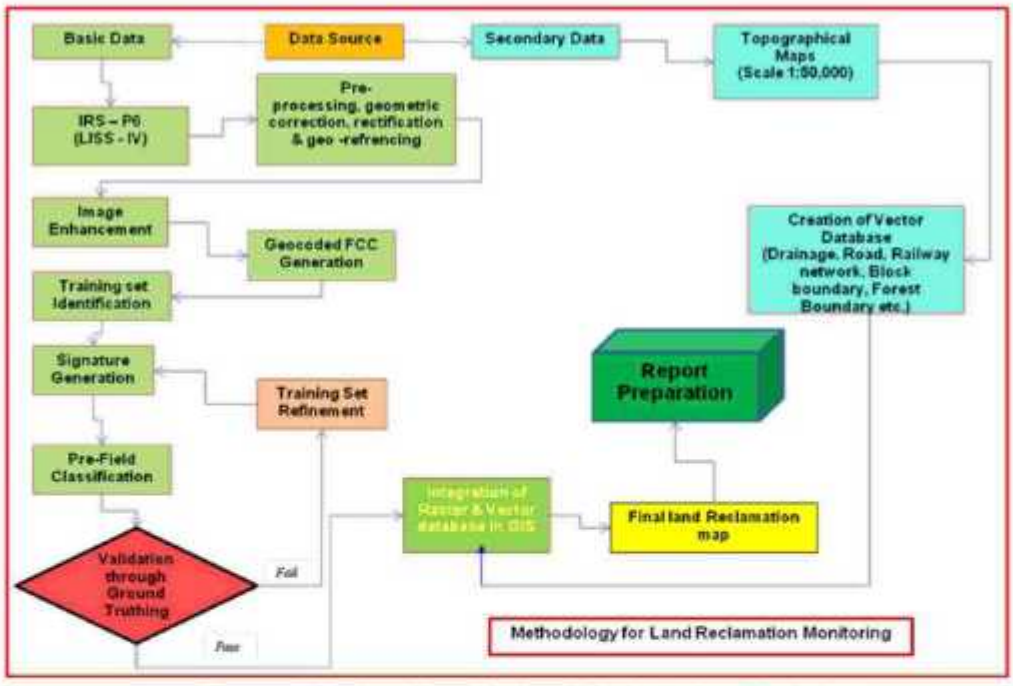


Figure: 2 Methodology for Land Reclamation Monitoring

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

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

- **Rectification & Georeferencing:** Inaccuracies in digital imagery may occur due to 'systematic errors' attributed to earth curvature and rotation as well as 'non-systematic errors' attributed to satellite receiving station itself. Raw digital images contain geometric distortions, which make them unusable as maps. Therefore, georeferencing is required for correction of image data using ground control points (GCP) to make it compatible to SOI toposheet.

- **Image enhancement:** To improve the interpretability of the raw data, image enhancement is necessary. Local operations modify the value of each pixel based on brightness value of neighbouring pixels using ERDAS IMAGINE 14 s/w. and enhance the image quality for interpretation.

- **Training set selection**

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

- **Classification and Accuracy assessment**

  Image classification is carried out using the maximum likelihood algorithm. The classification proceeds through the following steps: (a) calculation of statistics [i.e. signature generation] for the identified training areas, and (b) the decision boundary of maximum probability based on the mean vector, variance, covariance and correlation

matrix of the pixels. After evaluating the statistical parameters of the training sets, reliability test of training sets is conducted by measuring the statistical separation between the classes that resulted from computing divergence matrix. The overall accuracy of the classification was finally assessed with reference to ground truth data.

- **Area calculation**

  The area of each land use class in the leasehold is determined using ERDAS IMAGINE v. 14 software and given in table 2.

- **Overlay of Vector data base**

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

- **Pre-field map preparation**

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

3.3 Ground Truthing:

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

3.4 Land reclamation database on GIS:

Land reclamation database is created on GIS platform to identify the temporal changes identified from satellite data of different cut-off dates.

4.0 Land Reclamation Status in Central Coalfields Ltd.

4.1 Following 12 OC projects producing less than 5 million m^3. (Coal + OB together) of Central Coalfields Ltd. have been taken up during the year 2018 for land reclamation monitoring:

- Tetariakhar
- Dakra
- Magadh
- Amrapali
- Giddi-A
- Pundi
- Kedla
- Jarangdih
- Kathara
- Konar
- Karo
- Karma

4.2 Area statistics of different land use classes present in OC projects in the year 2018 is given in Table 2. Land use maps derived from the satellite data is given in Plate no. 1 to 12. Land use statuses are shown in Fig. 3 – 14 and field photographs showing plantation and backfilled area in mining projects are shown in photos 1-4.

4.3 Study reveals that 54.90% of excavated area has already been reclaimed by CCL in the OC projects, out of which 17.74% area has been planted and 37.16% area are under backfilling.

4.4 On comparing the status of land reclamation for the year 2018 with respect to the year 2015 in different projects, it is evident that the area of land reclamation has increased from 493.74 Ha.(Yr. 2015) to 608.26 Ha (Yr .2018)

4.5 Out of 12 projects of CCL, Giddi-A OCP ranks on top for land reclamation (76.18%) followed by Dakra OCP (75.17%) and Jarangdih OCP (67.32%).

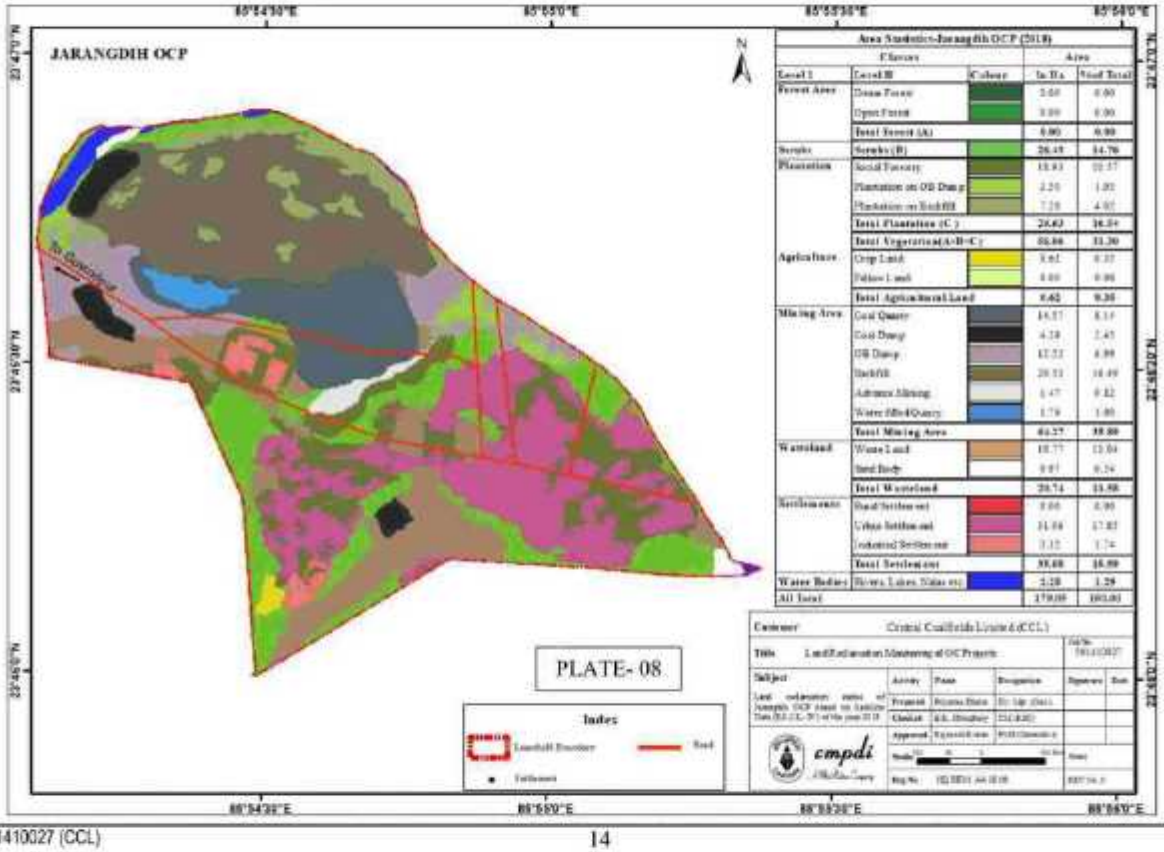
4.6 In Kathara OCP, plantation has decreased due to OB dumping over it.

Table 2 : STATUS OF LAND RECLAMATION IN CENTRAL COALFIELDS LIMITED BASED ON SATELLITE DATA OF THE YEAR 2018

(Area in Hectare)

		TETARIAKHAR		SARRA		MAGADH		AMRAPALI		GIDDI		PINDRA	
		Area	%	Area	%	Area	%	Area	%	Area	%	Area	%
FORESTS	Dense Forest	0.42	0.81	0.00	0.00	93.17	3.81	26.70	1.59	0.00	0.00	181.70	13.38
	Open Forest	5.09	2.44	0.00	0.00	105.75	5.71	159.72	14.56	0.00	0.00	225.65	17.36
	Total Forest (A)	5.51	2.45	0.00	0.00	221.38	12.52	186.02	16.15	0.00	0.00	417.33	30.74
SCRUBS	Scrubs (B)	47.31	22.61	46.23	18.53	276.39	15.60	277.0	16.27	52.55	10.18	304.17	22.71
PLANTATION	Social Forestry	1.45	0.70	8.42	3.51	0.00	0.00	0.00	0.00	14.00	2.75	1.35	0.10
	Plantation on External OB Dump	0.00	0.00	4.90	1.96	0.00	0.00	1.16	0.10	43.90	8.44	22.34	1.65
	Plantation on Backfill (Biological Reclamation)	0.00	0.00	45.79	18.34	0.00	0.00	0.00	0.00	80.74	15.77	13.88	1.02
	Total Plantation (Green Cover) (C)	1.45	0.70	60.51	24.23	0.00	0.00	1.16	0.10	138.84	27.07	37.58	2.77
	Total Vegetation (A+B+C)	53.87	25.86	106.04	42.78	488.34	28.18	460.86	34.53	191.57	37.57	702.95	58.22
	Coal Dump	20.09	9.65	1.00	0.40	9.00	0.51	19.50	1.40	5.55	1.08	4.87	0.36
ACTIVE MINING	Coal Quarry	26.71	12.85	13.33	5.42	35.31	2.01	44.23	3.45	9.89	1.98	15.95	1.17
	Advance Quarry Site	0.00	0.00	0.00	0.00	0.00	0.00	5.20	0.41	0.00	0.00	6.67	0.52
	Quarry Filled with Water	14.35	6.80	10.32	4.21	9.75	0.52	4.15	0.32	40.27	9.60	14.30	1.09
	Total Area under Active Mining	41.29	15.80	24.05	9.63	44.66	2.51	53.98	4.19	99.86	11.40	38.75	2.87
	Barren OB Dump	25.32	10.00	20.43	8.78	62.19	3.51	125.70	9.78	0.57	0.11	35.29	2.88
	Area Under Backfilling (Technical Reclamation)	0.00	0.00	27.53	10.82	0.00	0.00	72.56	5.61	109.18	21.19	15.97	2.66
	Total Area under Mine Operation	90.69	43.29	77.57	31.89	116.51	6.59	271.08	20.93	174.29	34.18	107.86	7.99
WASTELANDS	Waste Lands	18.63	8.96	22.23	8.9	255.58	14.81	208.07	16.00	71.68	7.00	128.16	9.41
	Fly Ash Pond/Sand Body	0.00	0.00	0.00	0.00	5.80	0.33	12.27	0.94	5.98	1.17	3.02	0.22
	Total Wastelands	18.63	8.96	22.23	8.96	261.38	14.75	220.34	16.94	41.83	8.35	131.18	9.66
WATER	Reservoir, nallah, ponds etc	6.34	3.05	2.85	1.16	17.44	0.98	20.81	1.61	17.89	1.52	8.60	0.64
	Total Waterbodies	6.34	3.05	2.85	1.16	17.44	0.98	20.81	1.61	17.89	1.52	8.60	0.64
AGRICULTURE	Crop Lands	0.00	0.00	0.00	0.00	289.00	16.30	97.22	7.40	0.00	0.00	127.37	9.38
	Fallow Lands	37.67	18.07	1.67	0.67	575.08	32.51	220.11	16.93	2.49	0.81	186.28	13.73
	Total Agriculture	37.67	18.07	1.67	0.67	864.17	48.85	317.42	24.42	2.49	0.49	312.65	23.11
SETTLEMENTS	Urban Settlement	0.00	0.00	12.87	5.15	0.00	0.00	0.00	0.00	61.38	11.99	6.95	0.51
	Rural Settlement	0.40	0.19	10.56	4.21	8.51	0.48	11.71	0.90	0.00	0.00	21.00	1.61
	Industrial Settlement	0.87	0.42	15.34	6.06	2.33	0.13	5.16	0.70	20.09	4.09	4.17	0.30
	Total Settlements	1.27	0.61	28.87	10.44	10.84	0.61	20.87	1.59	81.82	16.08	32.06	2.42
	GRAND TOTAL	208.47	100.00	249.73	100.00	1769.00	100.00	1300.01	100.00	510.00	100.00	1357.32	100.00

		SIRKA		JARANGDIH		KATHARA		KONAR		KARO		RAJRAPPA		TOTAL	
		Area	%	Area	%	Area	%	Area	%	Area	%	Area	%	Area	%
FORESTS	Dense Forest	9.04	0.80	0.00	0.00	0.00	0.00	78.78	20.13	80.43	13.98	0.00	0.00	396.99	4.37
	Open Forest	174.00	15.04	0.00	0.00	0.00	0.00	211.00	29.85	77.34	13.42	15.08	5.04	1078.45	11.79
	Total Forest (A)	174.22	15.04	0.00	0.00	0.00	0.00	289.58	29.58	163.75	25.80	15.08	5.04	1475.55	16.16
SCRUBS	Scrubs (B)	400.77	33.48	26.45	14.36	50.49	6.37	124.33	17.70	127.43	22.15	65.37	25.7	1779.09	19.49
PLANTATION	Social Forestry	1.46	0.13	18.85	10.57	89.17	11.25	18.16	2.65	15.78	2.74	1.23	0.43	175.39	1.88
	Plantation on External OB Dump	25.73	2.31	1.50	1.95	103.07	13.00	24.21	3.47	12.02	2.10	0.00	2.00	230.71	2.75
	Plantation on Backfill (Biological Reclamation)	0.00	0.00	7.20	4.02	35.83	4.52	1.40	0.40	14.22	2.47	0.00	0.00	190.53	2.23
	Total Plantation (Green Cover) (C)	28.21	2.44	29.65	16.54	224.67	28.25	46.83	6.43	42.08	7.31	9.18	3.11	619.66	6.79
	Total Vegetation (A+B+C)	660.68	52.58	56.05	31.36	275.16	34.72	405.01	63.77	313.26	54.47	85.53	33.28	3874.11	43.44
	Coal Dump	3.70	0.00	6.56	5.43	15.00	2.18	9.38	1.30	7.61	1.38	6.15	3.16	113.32	1.38
ACTIVE MINING	Coal Quarry	28.38	2.47	14.37	8.14	38.40	4.01	23.70	3.52	31.47	3.47	24.20	6.09	307.14	3.36
	Advance Quarry Site	9.54	0.83	1.47	0.82	0.00	0.00	17.99	1.58	0.00	0.00	1.42	0.47	22.87	0.25
	Quarry Filled with Water	17.08	1.47	1.76	1.00	40.40	5.11	2.30	0.35	2.72	0.47	4.15	1.39	170.60	1.87
	Total Area under Active Mining	45.92	3.97	17.83	9.96	76.99	9.71	41.27	5.65	34.19	5.94	29.77	9.95	495.77	5.47
	Barren OB Dump	88.70	7.86	12.32	0.59	144.47	18.23	44.65	6.86	20.15	4.81	45.36	18.23	675.67	7.41
	Area Under Backfilling (Technical Reclamation)	41.76	4.38	29.55	16.49	61.08	7.71	9.31	1.38	17.53	3.00	0.00	0.00	417.71	4.58
	Total Area under Mine Operation	198.14	16.83	64.77	35.99	298.19	37.64	124.56	17.87	98.28	17.13	84.97	28.28	1699.67	17.39
WASTELANDS	Waste Lands	70.61	6.19	19.71	10.98	43.85	5.54	25.09	3.96	72.81	12.62	31.70	10.70	979.68	10.70
	Fly Ash Pond/Sand Body	0.66	0.06	0.97	0.54	9.87	1.25	0.00	0.00	0.00	0.00	9.75	3.26	48.22	0.53
	Total Wastelands	71.67	6.25	20.74	11.58	53.75	6.79	28.09	3.96	72.85	12.66	41.75	13.96	987.98	10.83
WATER	Reservoir, nallah, ponds etc	15.53	1.35	2.28	1.28	5.45	0.69	8.48	0.86	3.81	0.70	11.94	4.00	111.84	1.23
	Total Waterbodies	15.53	1.35	2.28	1.28	5.45	0.69	8.48	0.86	3.81	0.70	11.94	4.00	111.84	1.23
AGRICULTURE	Crop Lands	1.40	0.12	0.62	0.35	20.12	2.58	6.50	0.98	0.09	0.02	0.00	0.00	542.97	5.95
	Fallow Lands	200.08	17.45	0.00	0.00	52.60	6.65	49.62	6.39	60.14	10.36	60.11	20.67	1445.85	15.84
	Total Agriculture	203.48	17.58	0.62	0.35	72.80	9.19	53.58	7.33	60.02	10.38	60.11	20.67	1988.32	21.79
SETTLEMENTS	Urban Settlement	25.75	2.21	31.96	17.83	46.02	5.35	39.00	6.06	20.07	3.46	0.00	0.00	231.19	2.50
	Rural Settlement	25.19	2.26	0.00	0.00	6.71	0.80	5.90	0.62	6.66	1.10	5.12	2.05	101.21	1.15
	Industrial Settlement	11.15	0.96	3.12	1.74	36.40	4.92	6.23	0.82	3.06	0.53	1.26	0.49	113.68	1.23
	Total Settlements	64.00	5.51	35.08	19.59	86.33	10.87	57.08	7.81	30.99	5.08	6.88	2.20	443.51	4.89
	GRAND TOTAL	1137.42	100.00	179.05	100.00	792.57	100.00	739.00	100.00	575.00	100.00	256.96	100.00	9126.79	100.00


JARANGDIH OCP
PLATE- 08
Index
Landfill Boundary
Road
Settlement
Area Statistics-Jarangdih OCP (2018)
Classes
Area
Level I
Level II
Colour
In Ha
Total
Forest Area
Scrubs
Plantation
Agriculture
Mining Area
Wasteland
Settlements
Water Bodies
All Total
Customer
Central Coalfields Limited (CCL)
Title
Land Reclamation Monitoring of OC Projects
Subject
Activity
Name
Designation
Signature
Date
Project
Checked
Approved
cmpdi

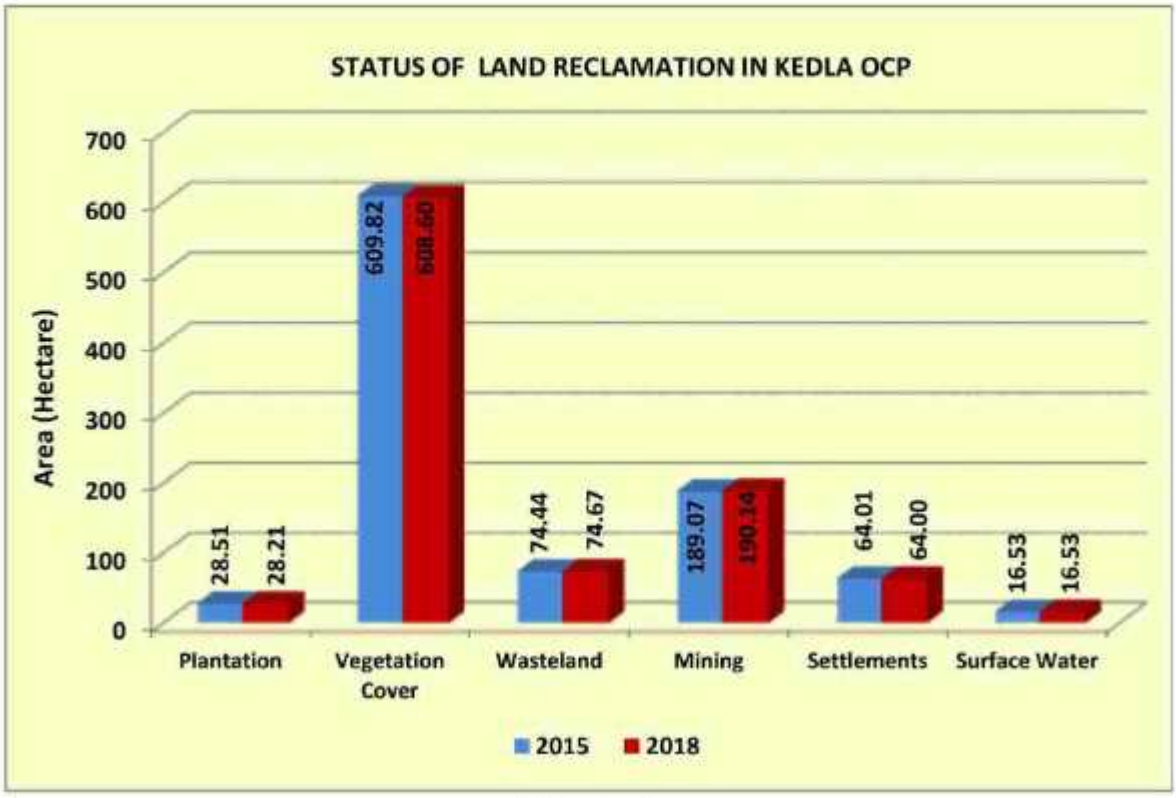


Figure – 9

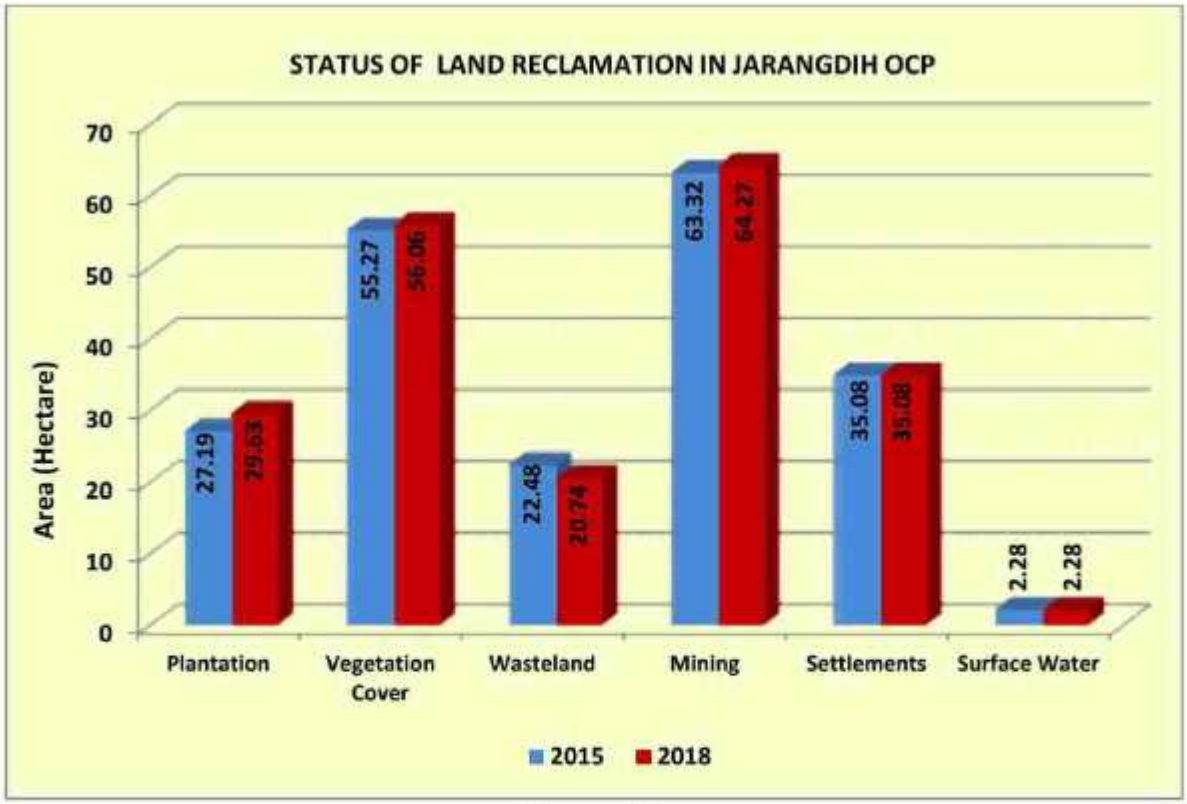
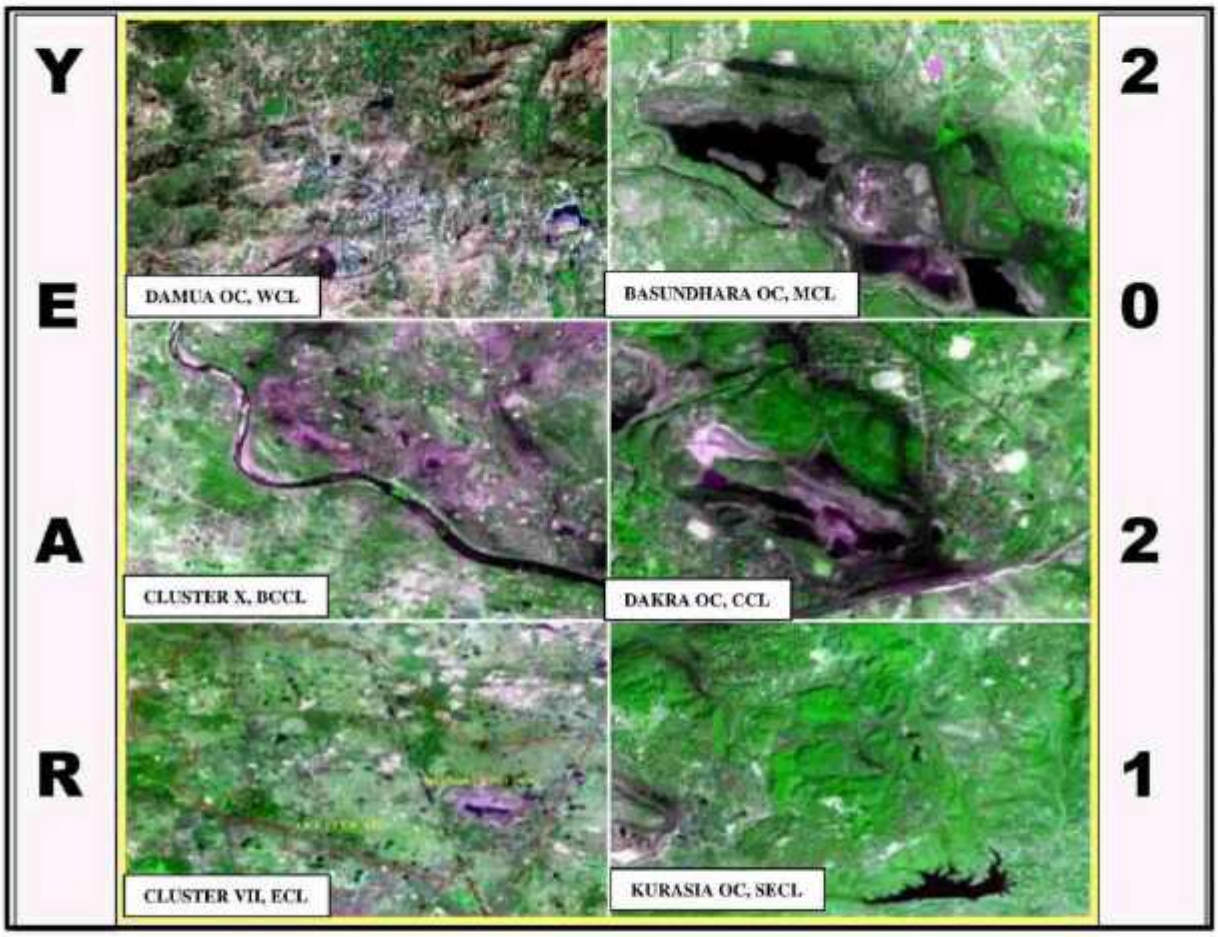


Figure - 10

Central Mine Planning & Design Institute Ltd.
(A Subsidiary of Coal India Ltd.)
Gondwana Place, Kanke Road, Ranchi 834031, Jharkhand
Phone : (+91) 651 2230001, 2230002, 2230483, FAX (+91) 651 2231447, 2231851
Wesite : www.cmpdi.co.in, Email : cmpdihq@cmpdi.co.in

Annexure VIII

Land Restoration / Reclamation Monitoring of 20 Opencast Coal Mines and 09 Clusters of coal mines of CIL producing less than 5 mcm (Coal+OB) annually based on Satellite Data for the Year 2021



Submitted to

Coal India Limited

cmpdi

A Mini Ratna Company

Land Restoration / Reclamation Monitoring of 20 Opencast Coal Mines and 09 Clusters of coal Mines of CIL producing less than 5 mcm (Coal+OB) annually based on Satellite Data for the Year 2021

MARCH - 2022

Remote Sensing Cell
Geomatics Division
CMPDI, Ranchi

CONTENTS

Executive Summary

1.0 Project

Land restoration / reclamation monitoring of 20 opencast coal mines and 09 clusters of coal mines of different subsidiaries of Coal India Ltd. (CIL) producing less than 5 million cu.m. (Coal+OB) per year based on satellite data regularly at an interval of three years.

2.0 Objective

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

3.0 Salient Findings

- Out of the total mine leasehold area of 38079.01 Hectares of the 20 opencast projects & 09 clusters together of different subsidiaries of CIL producing less than 5 mcm (Coal +OB) annually considered for monitoring during 2021-22; total excavated area is 3609.63 hectares, out of which 550.83 hectares (15.26%) is under plantation *(Biologically Reclaimed)*, 1792.63 hectares area (49.66%) is under backfilling *(Technical Reclamation)* and rest 1266.17 hectares (35.08%) area is under active mining. It is evident from the analysis that 2343.46 hectares (64.92%) area of the 20 OCPs & 09 clusters taken for monitoring for the year 2021-22 is under reclamation and balance 1266.17 hectares (35.08%) area is under active mining. Company wise details of land reclamation of the above OCPs & Clusters is given in Table-1 & Fig-1.

  The projects selected for land reclamation monitoring in the year 2021-22 are subdivided into two groups viz (A) 20 opencast projects belonging to WCL, SECL, MCL & CCL and (B) 09 clusters of mines of ECL and BCCL.

- For Group A, out of the total mine leasehold area of 10328.47 Hectares of the 20 OC projects of WCL, SECL, MCL and CCL producing less than 5 mcm (Coal+OB) annually considered for monitoring during 2021-22; total excavated area is 2339.45 hectares, out of which 488.91 hectares (20.90%) is under plantation *(Biologically Reclaimed)*, 1055.73 hectares (45.13%) area is under backfilling *(Technical Reclamation)* and 794.81 hectares (33.97%) area is under active mining. It is evident from the analysis that 1544.64 hectares (66.03%) area of the 20 OC

projects taken for monitoring for the year 2021-22 is under reclamation and balance 794.81 hectares (33.97%) area is under active mining. Company wise details of land reclamation of the above 20 projects is given in Table-1(A) & Fig-1.

- Out of 30 opencast projects of different subsidiaries of CIL producing less than 5 mcm (Coal+ OB) annually which were taken up for monitoring during the year 2018-19, total 10 opencast projects of different subsidiaries have now been diverted under category of those opencast mine which are producing more than 5 mcm (Coal+ OB) annually and balance 20 opencast projects producing less than 5 mcm (Coal+ OB) annually has been considered for land reclamation monitoring during year 2021-22. This has resulted in significant decrease in Technical reclamation (Area under backfilling) from 1329.06 Hectare area (43.56%) (Yr. 2018) to 1055.73 Hectare area (45.13%) (Yr. 2021) and total area under plantation (Green cover) has also decreased from 1864.05 Ha (9.22%) (Yr. 2018) to 1488.59 Ha (14.41%) (Yr. 2021) whereas total area under reclamation in 20 opencast projects of WCL, SECL, MCL and CCL has also decreased from 1766.51 Ha (57.90%) in the year 2018-19 to 1544.64 Ha (66.03%) in the year 2021-22.

- Study indicates that there is an increase in percentage of area under total plantation as such percentage of total plantation has been calculated with respect to total leasehold area. While percentage of technical reclamation and biological reclamation have been calculated with respect to total excavated area due to which there is in an increase in technical reclamation and biological reclamation from 47.17% (Yr. 2018) to 49.66% (Yr. 2021) and from 12.28% (Yr. 2018) to 15.26% (Yr. 2021) respectively.

- *For Opencast Projects under Group (A) in table-1:* On comparing the status of land reclamation for 20 nos. of opencast projects in WCL, SECL, MCL and CCL carried out in year 2021-22 with respect to previous cycle study done in the year 2018-19 in these opencast projects of CIL's subsidiary, it is evident from the analysis that area of plantation on backfill (Biological Reclamation) has increased from 437.45 Hectare (14.34%) area in the year 2018 to 488.91 Hectare (20.90%) in the year 2021.

- *For Clusters under Group (B) in table-1*: total 9 cluster of mines, 5 in BCCL and 4 in ECL have been considered for monitoring during year 2021-22 as compared to total 08 cluster monitored

during year 2018-19. One additional cluster of mines in BCCL is taken up for monitoring this year on request of BCCL.

- Out of the total mine leasehold of 27750.54 Hectare for total no. of 09 cluster of mines; 05 in BCCL and 04 in ECL producing less than 5 mcm (Coal+OB) annually considered for monitoring during the Year 2021-22: total excavated area is 1270.18 Hectare out of which 61.92 hectare (4.87%) has been planted on backfill (Biologically Reclaimed), 736.90 hectare (58.02%) area is under backfilling (*Technical Reclamation)* and 471.36 hectare (37.11%) area is under active mining. It is also evident from Table -1(B) that 798.82 hectare (62.89%) area is under reclamation.

- From table-1(B) it is evident from analysis that 09 cluster of mines taken for monitoring, Technical reclamation (Area under backfilling) has increased from 634.58 Ha (57.09%) in the year 2018 to 736.90 Ha (58.02%) in the year 2021-22.

- It has also been observed from table-1(B) that biological reclamation for 09 cluster of mines in BCCL and ECL has decreased from 73.92 Ha (6.65%) (Yr.2018) to 61.92 Ha (4.87%) (Yr.2021).

- From Table (B), it is evident that total area under reclamation in BCCL and ECL consisting of together 9 clusters, have increased from 708.50 hectare (63.74%) in the year 2018 to 798.82 Ha (62.89%) in the year 2021 and total area under plantation (Green Cover) in the leasehold boundary of all cluster has also increased from 1779.20 Ha (7.35%) to 1956.94 Ha (7.05%) in the year 2021.

- On comparing the results obtained from Digital Image Processing of satellite data of the year 2018 & 2021, it is evident from table 1(B) that there is static or decreasing trend in the biological reclamation and increasing trend in technical reclamation in all 9 cluster of mines of BCCL and ECL.

- From Table 1(A) and 1(B) combined, it can be seen that total area under reclamation in the 20 OC mines of WCL, CCL, MCL, SECL and 09 clusters of BCCL and ECL considered for monitoring this year is 2343.46 Hectares, out of which 550.83 hectares (15.26%) has been planted on backfill *(Biologically Reclaimed)*, 1792.63 Hectares area (49.66%) is under backfilling *(Technical Reclamation)* and balance 1266.17 hectares (35.08%) is under active mining.

Table-1

Company wise Land Reclamation Status in OC projects & Clusters of mines producing (Less than 5 million Cu.m. (Coal + OB))based on Satellite Data of year 2021

Sl. No.	Coal Company (No. of OC Projects , Cluster of mines)		Area in Hectare (% calculated in respect of total excavated area)																	
			Leasehold / All Right Boundary		Technical Reclamation		Plantation						Area under Active Mining		Total Excavated Area		Total Area under Plantation (% Green Cover generated in Leasehold)		Total Area under Reclamation	
					Area under Backfilling		Biological Reclamation		Other Plantation											
							Area under Plantation on backfill		Plantation on External OB Dumps		Social Forestry, Avenue Plantation etc.									
1	2		3		4		5		6		7		8		9 (=4+5+8)		10 (=5+6+7)		11 (=4+5)	
	2018	2021	2018	2021	2018	2021	2018	2021	2018	2021	2018	2021	2018	2021	2018	2021	2018	2021	2018	2021
(A)	PROJECTWISE(OC)																			
1	WCL(12)	WCL (11)	6035.43	5497.55	476.26 45.35%	522.15 47.97%	86.81 8.27%	114.54 10.52%	386.79	409.22	324.66	341.49	487.22 46.39%	451.58 41.51%	1050.29	1088.57	798.26 13.23%	865.22 16.00%	563.07 53.61%	636.69 58.49%
2	SECL(03)	SECL(01)	3020.60	523.00	277.03 52.14%	86.00 36.05%	152.96 28.79%	140.00 51.35%	7.99	0.00	241.89	80.00	101.32 19.07%	0.00 0.00%	531.31	226.00	402.84 13.34%	220.00 42.07%	429.99 80.93%	226.00 100.00%
4	MCL(03)	MCL (01)	2035.83	437.10	164.06 45.39%	143.13 71.13%	1.13 0.31%	0.00 0.00%	14.30	8.53	27.86	10.13	196.29 54.30%	58.10 28.87%	361.48	201.23	43.29 2.13%	18.66 4.27%	165.19 45.69%	143.13 71.13%
5	CCL(12)	CCL (07)	9126.74	3960.82	411.71 37.16%	304.45 36.96%	196.55 17.74%	234.37 28.46%	250.72	97.37	172.39	52.97	499.77 45.10%	284.53 34.58%	1108.03	823.65	619.66 6.79%	384.71 9.71%	608.26 54.90%	538.82 65.42%
TOTAL (A)(30)		TOTAL (A) (20)	20218.60	10328.47	1329.06 43.06%	1055.73 45.13%	437.45 14.34%	488.91 20.90%	659.80	515.12	766.80	484.56	1284.60 42.10%	794.81 33.97%	3051.11	2339.45	1864.03 9.22%	1488.59 14.41%	1766.51 57.90%	1544.64 66.03%
(B)	CLUSTERSWISE																			
1	BCCL(04)	BCCL(05)	5883.96	9411.54	625.15 58.11%	712.90 58.52%	73.92 6.87%	61.92 5.08%	156.71	149.84	570.04	757.18	376.70 35.02%	443.36 36.40%	1075.77	1218.18	800.67 13.61%	968.94 18.30%	699.07 64.98%	774.82 63.60%
2	ECL(04)	ECL (04)	18339.00	18339.00	9.43 26.37%	24.00 46.15%	0.00 0.00%	0.00 0.00%	0.00	0.00	978.53	988.00	26.33 73.63%	28.00 53.85%	35.76	52.00	978.53 5.34%	988.00 5.39%	9.43 26.37%	24.00 46.15%
TOTAL (B)(08)		TOTAL(B) (09)	24222.96	27750.54	634.58 57.09%	736.90 56.02%	73.92 6.65%	61.92 4.87%	156.71	149.84	1548.57	1745.18	403.03 36.26%	471.36 37.11%	1111.53	1270.18	1779.20 7.35%	1956.94 7.05%	708.50 63.74%	798.82 62.89%
TOTAL CIL (A+B) (38) Less than 5 MCM		TOTAL CIL (A+B) (29)	44441.56	38079.01	1963.64 47.17%	1792.63 49.66%	511.37 12.28%	550.83 15.26%	816.51	664.96	2315.37	2229.74	1687.63 40.54%	1266.17 35.08%	4162.64	3609.63	3643.25 8.20%	3445.53 9.05%	2475.01 59.46%	2343.46 64.92%

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

1. *Area under **Biological Reclamation** includes Areas under Plantation done on Backfilled Area Only.*
2. *Area under **Technical Reclamation** includes Area under Barren Backfilling only*
3. *Area under Active Mining includes Coal Quarry, Advance Quarry Site, Quarry filled with water etc., if any.*
4. *Social Forestry and Plantation on External OB Dumps are not included in Biological Reclamation and are put under separate categories as shown in the Table above.*

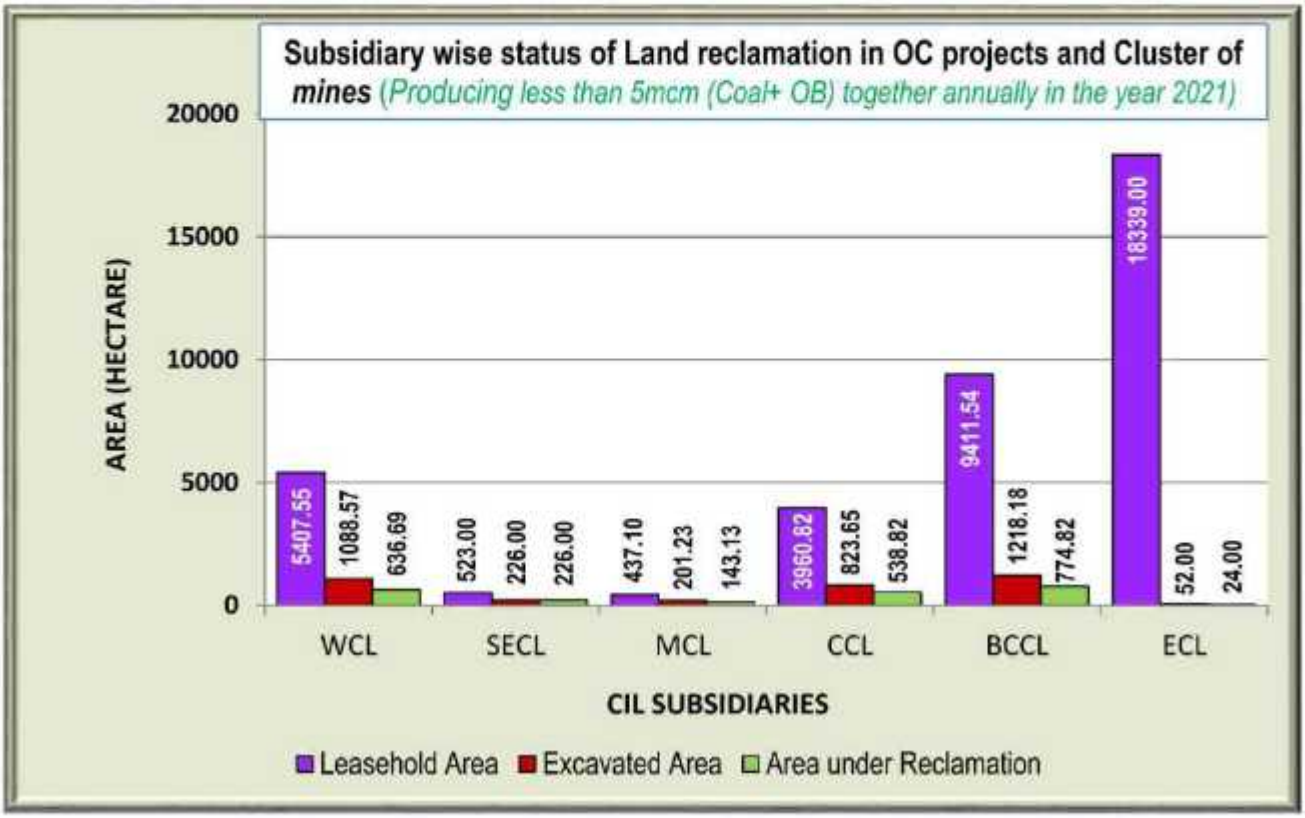


Fig. 1 : Company wise Land Reclamation Status in the Year 2021

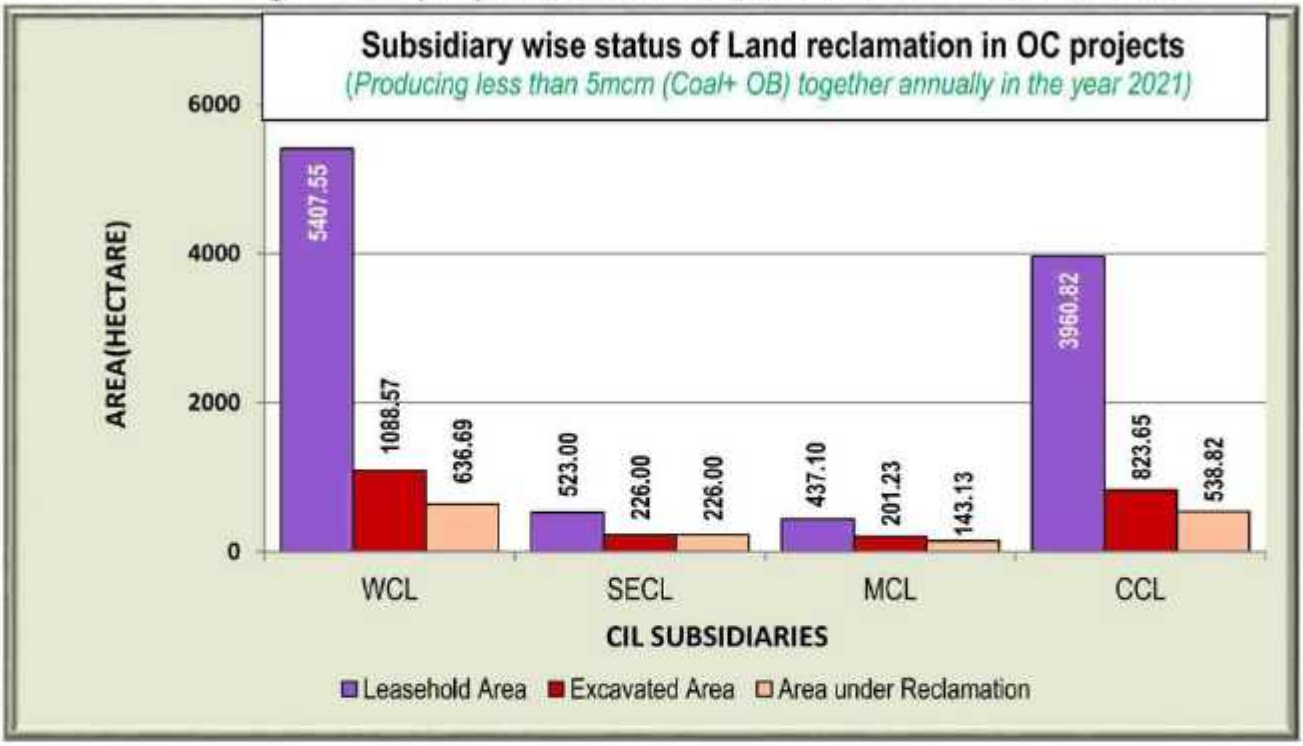


Fig. 2 : Company wise Land Reclamation Status in OC projects the Year 2021

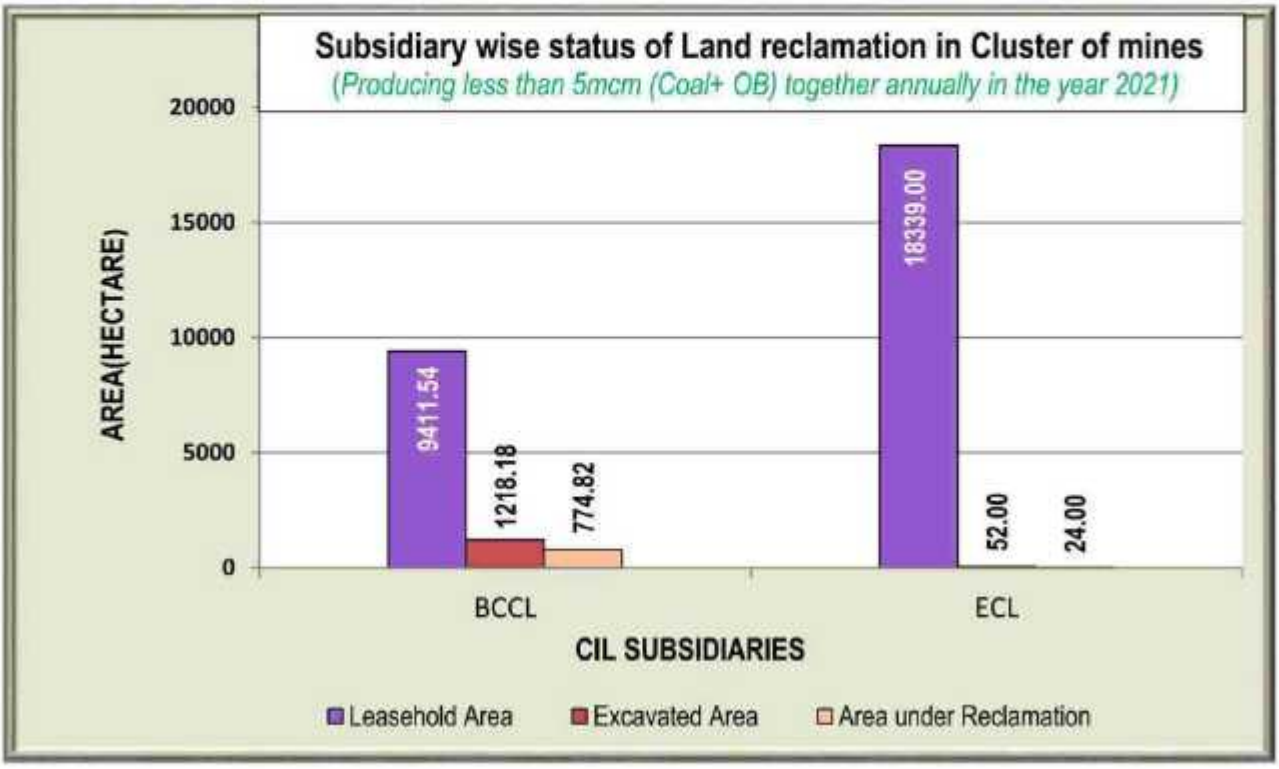


Fig.3 : Company wise Land Reclamation Status in OC projects the Year 2021

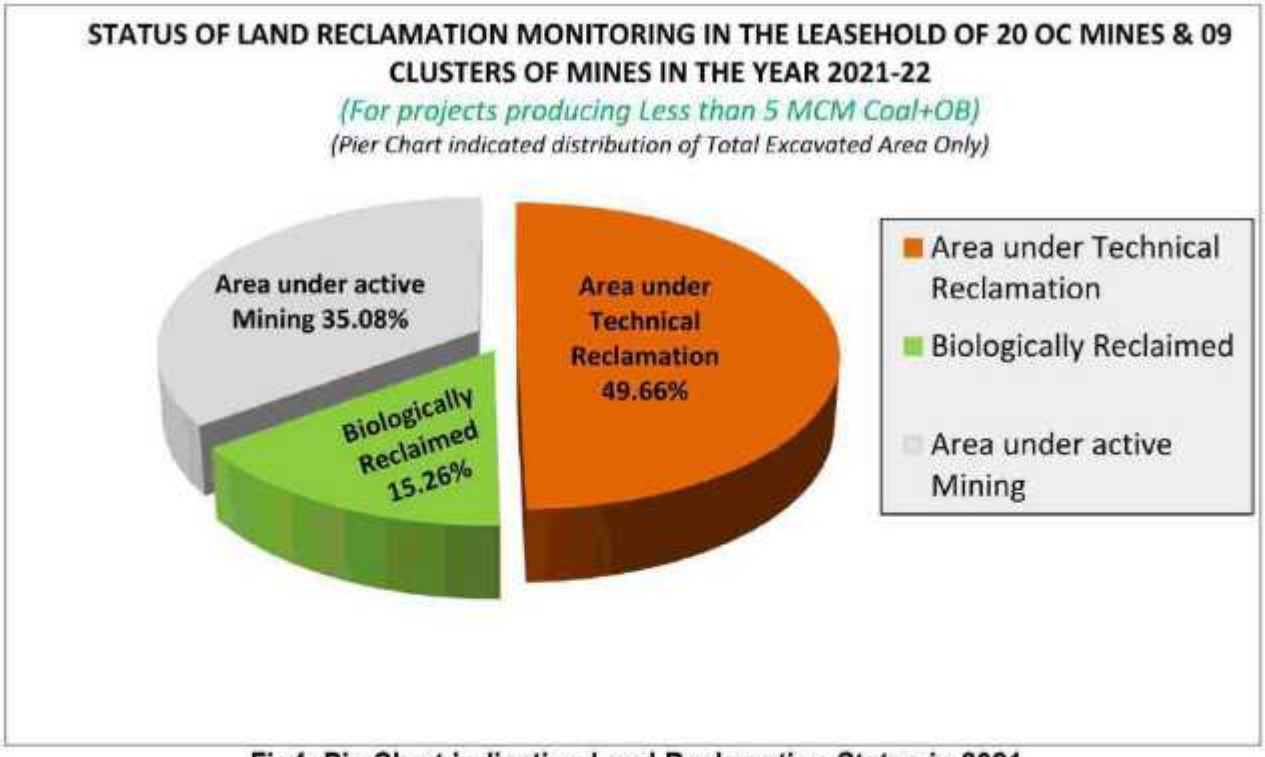


Fig4: Pie Chart indicating Land Reclamation Status in 2021

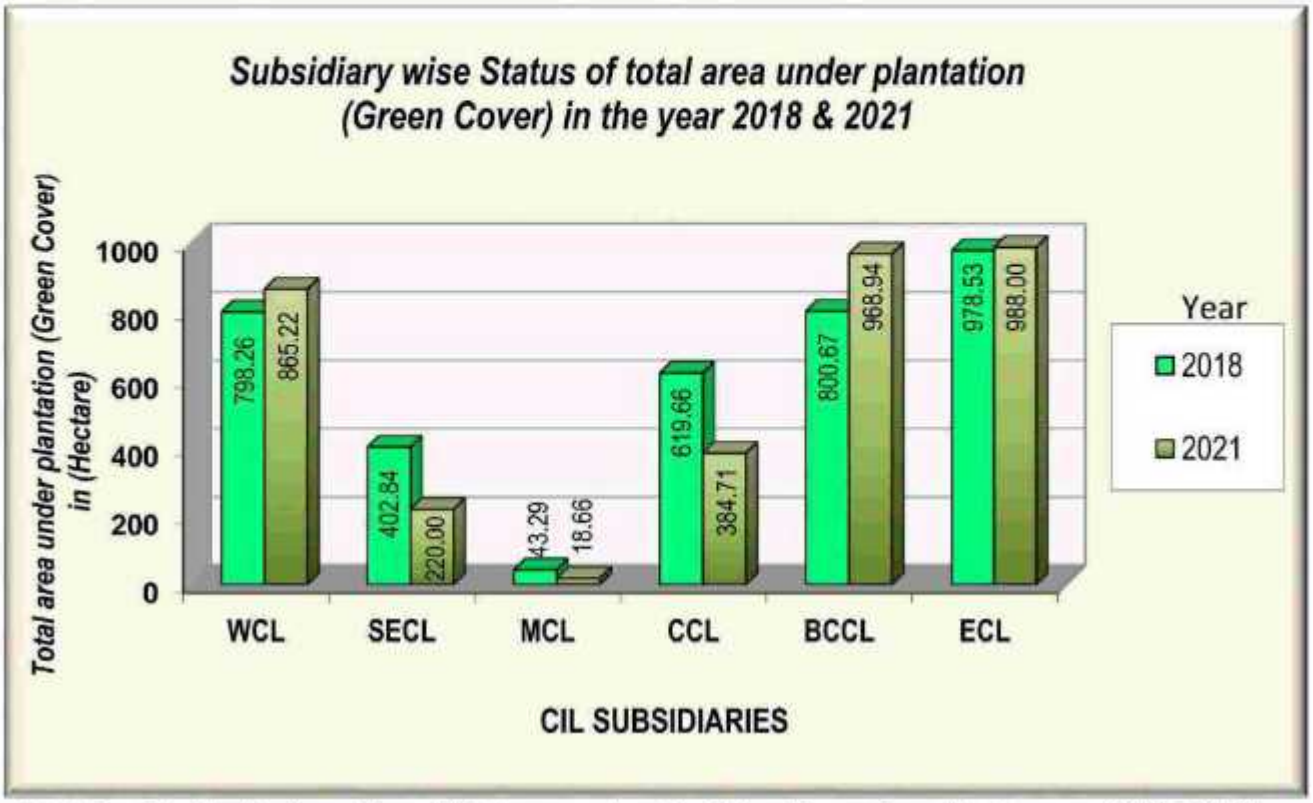


Fig 5: Bar Chart indicating status of total area under plantation (Green Cover) in the year 2018 & 2021

1.0 Background

1.1 Land is the most important natural resource which embodies soil, water, flora, fauna and total ecosystem. All human activities are based on the land which is the most scarce natural resource in our country. Mining is a site specific industry and it could not be shifted anywhere else from the location where mineral occurs. It is a fact that surface mining activities do effect the land environment due to ground breaking. Therefore, there is an urgent need to reclaim and restore the mined out land for its productive use for sustainable development of mining. This will not only mitigate environmental degradation, but would also help in creating a more congenial environment for land acquisition by coal companies in future.

1.2 Keeping above in view, a work order vide letter no. CIL/WBP/ENV./2011dated23/08/11 was issued by CIL for monitoring of less than 5 million m^3 per annum capacity (Coal +OB)

projects from the year 2011 at interval of three years. Further, a revised work order was issued vide letter no. CIL/WBP/Env/2011/4706 dated 12.10.2012 from Coal India Limited for the period 2012-13 to 2016-17 which was subsequently followed by another work order vide letter no. CIL/WBP/Env/2017/DP/8477 dated 21.09.2017 from Coal India Limited for the period 2017-18 to 2021-22 for land reclamation monitoring of opencast projects and vegetation cover monitoring of 19 major coalfields. According to this work order, all mines in CIL with output capacity of 5 million cu. m (coal +OB) shall be monitored every year and all mines below this capacity shall be monitored at an interval of 3 yrs. All coalfields in CIL shall also be monitored at an interval of 3 years as per a defined plan. The result of land reclamation status of all such mines to be put on the website of CIL, (www.coalindia.in), CMPDI (www.cmpdi.co.in) and the concerned coal companies in public domain. Detail report to be submitted to Coal India Limited and respective subsidiaries.

1.3 Land reclamation monitoring of all opencast coal mining projects would also comply the statutory requirements of Ministry of Environment & Forest (MoEF). Such monitoring would not only facilitate in taking timely mitigation measures against environmental degradation, but would also enable coal companies to utilize the reclaimed land for larger socio-economic benefits in a planned way.

1.4 CMPDI undertook the above study and the present report is embodying the findings in nutshell carrying out for the 20 opencast projects of different subsidiaries and 09 clusters of BCCL and ECL producing less than 5 million cubic m. Coal+OB annually in the year 2021-22 for baseline data generation and updation of database of these projects so that progressive changes in the status of land reclamation could be assessed in future.

2.0 Objective

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

3.0 Methodology

There are number of steps involved between raw satellite data procurement and preparation of final map. National Remote Sensing Centre (NRSC) Hyderabad, being the nodal agency for satellite data supply in India, provides only raw digital satellite data, which needs further digital image processing for extracting the information and map preparation before uploading the same in the website. Methodology for land reclamation monitoring is given in fig 4. Following steps are involved in land reclamation /restoration monitoring:

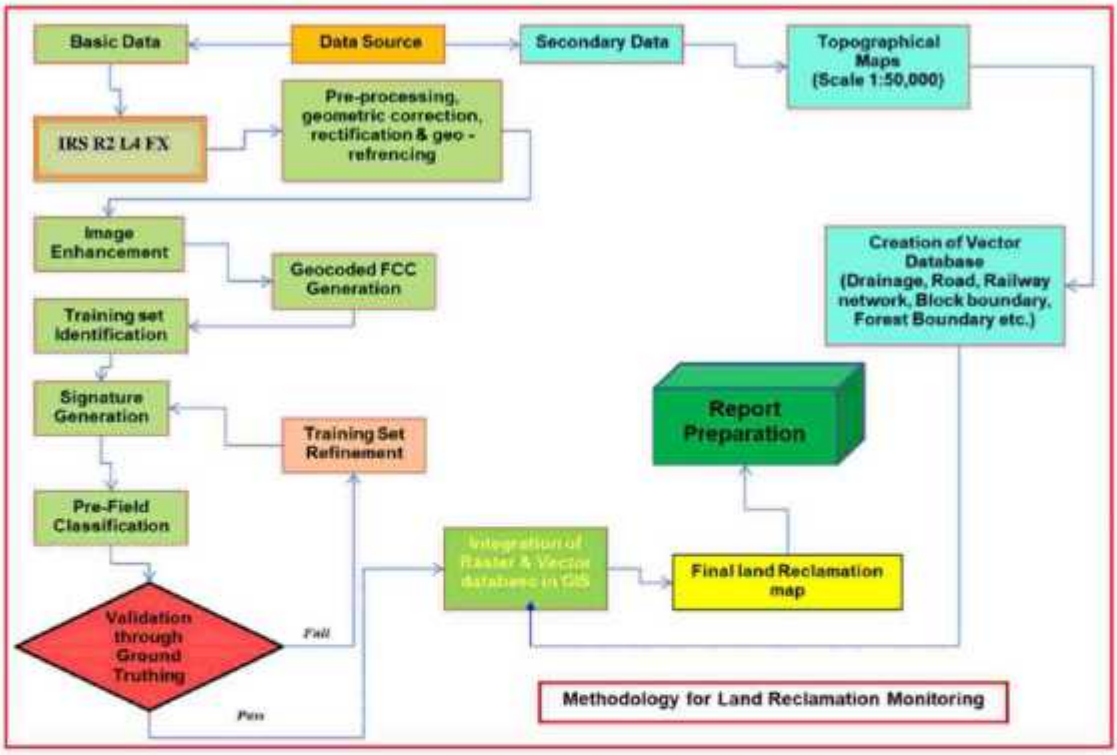


Fig : 6 Methodology for Land Reclamation Monitoring

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

3.2 Satellite Data Processing: Satellite data are processed using ERDAS IMAGINE v2014 s/w digital image processing s/w. Methodology involves the following major steps:

- **Rectification & Georeferencing:** Inaccuracies in digital imagery may occur due to 'systematic errors' attributed to earth curvature and rotation as well as 'non-systematic errors' attributed to satellite receiving station itself. Raw digital images contain geometric distortions, which make them unusable as maps. Therefore, geo-referencing is required for correction of image data using ground control points (GCP) to make it compatible to SoI toposheet.

- **Image enhancement:**

  To improve the interpretability of the raw data, image enhancement is necessary. Local operations modify the value of each pixel based on brightness value of neighbouring pixels using ERDAS IMAGINE v 2014 s/w and enhance the image quality for interpretation.

- **Training set selection**

  Training set requires to be selected, so that software can classify the image data accurately. The image data are analysed based on the interpretation keys. These keys are evolved from certain fundamental image-elements such as tone/colour, size, shape, texture, pattern, location, association and shadow. Based on the image-elements and other geo-technical elements like land form, drainage pattern

and physiography; training sets were selected/identified for each land use/cover class. Field survey was carried out by taking selective traverses in order to collect the ground information (or reference data) so that training sets are selected accurately in the image. This was intended to serve as an aid for classification.

- **Classification and Accuracy assessment**

  Image classification is carried out using the maximum likelihood algorithm. The classification proceeds through the following steps: (a) calculation of statistics [i.e. signature generation] for the identified training areas, and (b) the decision boundary of maximum probability based on the mean vector, variance, covariance and correlation matrix of the pixels. After evaluating the statistical parameters of the training sets, reliability test of training sets is conducted by measuring the statistical separation between the classes that resulted from computing divergence matrix. The overall accuracy of the classification was finally assessed with reference to ground truth data.

- **Area calculation**

  The area of each land use class in the leasehold is determined using ERDAS IMAGINE v2014 s/w.

- **Overlay of Vector data base**

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

- **Pre-field map preparation**

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

3.3 Ground Truthing:

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

3.4 Land reclamation database on GIS:

Land reclamation database is created on GIS platform to identify the temporal changes identified from satellite data of different cut-off dates.

4.0 Work Plan

4.1 Total 20 opencast projects of different CIL subsidiaries and 09 clusters of BCCL & ECL producing less than 5 million cubic m. (Coal + OB together) were taken up for the study during the year 2021-22. Based on the RESOURCESAT-2 satellite data, land reclamation /mine closure monitoring was carried out using ERDAS IMAGINE digital image processing s/w and Arc-Info GIS.

4.2 The list of the following 20 opencast projects of different CIL subsidiaries and 09 clusters of BCCL & ECL producing less than 5 mcm (Coal and OB) together annually taken up for land reclamation monitoring based on satellite data of year 2021 are given in table below:

Subsidiary *(No. of Projects)*	**Opencast Projects / Clusters** *(Less than 5 million Cu.m. Coal +OB per annum)*
WCL (11)	Inder UG to OC, Kamptee Deep OC, Navin Kunada, Shivpuri, Pauni Expn, HLOCM, Ghorawari, Dhorwasa, Damua, Barkuhi & Ambara.
SECL (01)	Kurasia.
MCL (01)	Basundhara.
CCL (07)	Tetariakhar, Dakra, Giddi – A, Pundi, Kedla, Jarangdih & Karma.
BCCL(05)	Cluster-I, Cluster-IV, Cluster-VII, Cluster-X & Cluster-XI.
ECL (04)	Cluster-V, Cluster-VI, Cluster-VII & Cluster-VIII.
TOTAL(29)	

4.3 Subsidiary wise land reclamation status of the above mentioned 20 opencast projects of different CIL subsidiaries and 09 clusters of BCCL & ECL derived from satellite data for the year 2021-22 are given in the following pages:

CENTRAL COALFIELDS LIMITED

8.0 Land Reclamation Status in Central Coalfields Limited

8.1 Following 07 opencast projects of CCL producing less than 5 million cubic m. (Coal+OB) together annually were taken up for land reclamation monitoring during the year 2021-22 :

- Tetariakhar
- Dakra
- Giddi-A
- Pundi
- Kedla
- Jarangdih
- Karma

8.2 Project wise Land Reclamation status in CCL is given in Table 8.1 and also shown graphically in Fig 8.1. Area statistics of different land use classes present in the mine leasehold of the above projects for the year 2021 are shown in the Table - 8.2. Land use maps derived from satellite data are shown in Plate 8.1 - 8.7. Different land use classes based on satellite data are depicted in Bar Charts in Fig.8.2 - 8.8 for the year 2018 and 2021.

8.3 Study reveals that out of total mine leasehold area of 3960.82 Ha of 7 OC projects in CCL Viz Teteriakhar ,Dakra ,Giddia-A ,Pundi ,Kedla ,Jarangdih and Karma OC considered for monitoring during year 2021-22 ; total excavated area is 823.65 Ha ,out of which 234.37 Ha (28.46%) area has been revegetated (Biologically reclaimed) and 304.45 Ha (36.96%) area is under backfilling (Technically reclaimed) and balance 284.83 Hectare (34.58%) area is under active mining. It is evident from analysis that 538.82 Hectare (65.42%) area of above OC projects is under total reclamation in CCL. Projectwise details area given in Table-8.1

8.4 On comparing the status of land reclamation for the year 2021 with respect to the year 2018 in different opencast mine of CCL taken for reclamation monitoring in the year 2021-22 ,it is evident from table-8.1 that area under total reclamation has increased from 398.30 Ha(61.55%) in the year 2018 to 538.82 Ha (65.42%) in the year 2021.

This increase of 140.52 Hectare area under total reclamation in CCL is due to increase of 87.36 Ha area under plantation on backfill (Biological reclamation) and 53.16 Ha area under backfilling (Technical reclamation) respectively.

8.5 There has been increase in area under technical reclamation in all projects of CCL in the year 2021, except in Giddi - A OCP where area under technical reclamation has decreased significantly as compared to the year 2018. Area under backfilling (Technical reclamation) in this OC mine has decreased from 109.10 Hectare(43.92%) (Yr..2018) to 90.81Hectare (37.30%) (Yr.2021).whereas plantation on backfill (Biological reclamation) has gone up from 80.14 Hectare (32.26%) in 2018 to 84.88 Hectare (34.87%) in the year 2022.

8.6 After analyzing the satellite data of year 2018 vs. 2021 it is evident that total area under plantation (Green Cover) carried out on backfilled area, OB dumps as well as under social forestry in all the mines of CCL has increased from 304.73 Hectare (7.69%) to 384.71 Hectare (9.71%) in the span of three years. This increase of 79.98 Hectare area of total plantation (Green Cover) in three year time is due to the sincere efforts made by CCL towards land reclamation of above mentioned OC mine and environment protection.

8.7 In Dakra OCP, area under plantation on OB has decreased from 4.90 Hectare (Yr. 2018) to 1.11 Hecatre (Yr. 2021) and plantation on backfill has also decreased from 45.79 Ha (Yr.2018) to 37.86 Ha (Yr. 2021). This decrease of 3.79 Hectare area in plantation on OB and 7.93 Hectare area in plantation on backfill (Biological reclamation) are mainly due to dumping of barren OB and barren backfill over planted area. However, overall increase in revegetated area (Biological reclamation) in the year 2021 is 87.36 Hectare with respect to the year 2018.

8.8 Out of 7 projects of CCL, Dakra OCP ranks on top for land reclamation (79.32%) followed by Kedla OCP (79.19%) and Giddi - A OCP (72.17%) respectively.

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

Table: 8.1

Project wise Land Reclamation Status in Opencast Project producing (<5 mcm (Coal+OB)) of Central Coalfields Ltd based on the Satellite data of the Year 2021

(Area in Hectare)

Sl.No.	Project	Total Leasehold Area		Technical Reclamation		Plantation						Area under Active Mining		Total Excavated Area		Total Area under Plantation (% Green Cover Generated in Leasehold)		Total Area under Reclamation	
						Biological Reclamation		Other Plantations											
				Area under Backfilling		Plantation on Excavated / Backfilled Area		Plantation on External Over Burden Dumps		Social Forestry, Avanue Plantation Etc.									
1	2	3		4		5		6		7		8		9 (=4+5+8)		10 (=5+6+7)		11(=4+5)	
		2018	2021	2018	2021	2018	2021	2018	2021	2018	2021	2018	2021	2018	2021	2018	2021	2018	2021
1	Tetariakhar	208.47	208.47	0.00	0.00	0.00	0.00	0.00	0.00	1.45	1.45	41.29	40.19	41.29	40.19	1.45	1.45	0.00	0.00
				0.00%	0.00%	0.00%	0.00%					100.00%	100.00%			0.70%	0.70%	0.00%	0.00%
2	Dakra	249.72	249.72	27.03	47.98	45.79	37.86	4.90	1.11	9.82	15.77	24.06	22.38	96.87	108.22	60.51	54.74	72.82	85.84
				27.90%	44.34%	47.27%	34.98%					24.83%	20.68%			24.23%	21.92%	75.17%	79.32%
3	Giddi-A	510.00	510.00	109.10	90.81	80.14	84.88	43.90	40.61	14.00	13.84	58.16	67.74	248.40	243.43	138.04	139.33	189.24	175.69
				43.92%	37.30%	32.26%	34.87%					23.42%	27.83%			27.07%	27.32%	76.18%	72.17%
4	Pundi	1357.20	1357.20	35.87	37.85	13.88	13.88	22.36	22.35	1.35	1.35	30.75	43.39	80.50	95.12	37.59	37.58	49.75	51.73
				44.56%	39.79%	17.24%	14.59%					38.20%	45.62%			2.77%	2.77%	61.80%	54.38%
5	Kedla	1157.42	1157.42	49.76	90.56	0.00	90.56	26.75	20.24	1.46	1.46	45.92	47.60	95.68	228.72	28.21	112.26	49.76	181.12
				52.01%	39.59%	0.00%	39.59%					47.99%	20.81%			2.44%	9.70%	52.01%	79.19%
6	Jarangdih	179.05	179.05	29.53	29.51	7.20	7.19	3.50	3.44	18.93	17.83	17.83	22.24	54.56	58.94	29.63	28.46	36.73	36.70
				54.12%	50.07%	13.20%	12.20%					32.68%	37.73%			16.56%	15.90%	67.32%	62.27%
7	Karma	298.90	298.90	0.00	7.74	0.00	0.00	8.03	9.02	1.27	1.27	29.77	41.29	29.77	49.03	9.30	10.89	0.00	7.74
				0.00%	15.79%	0.00%	0.00%					100.00%	84.21%			3.11%	3.64%	0.00%	15.79%
	TOTAL	3960.82	3960.82	251.29	304.45	147.01	234.37	109.44	97.37	48.28	52.97	248.77	284.83	647.07	823.65	304.73	384.71	398.30	538.82
				38.84%	36.96%	22.72%	28.46%					38.45%	34.58%			7.60%	9.71%	61.55%	65.42%

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

Note: In reference of the above Table-6.1, Different Parameter are classified as follows:

1. Area under Biological Reclamation includes area under plantation done on backfilled area only.
2. Area under Technical Reclamation includes area under barren backfill only.
3. Area under Active Mining includes Coal Quarry, Advance quarry site, Quarry filled with water etc.
4. Social Forestry and Plantation on External OB Dump area not included in Biological reclamation and are put under other plantation.
5. .% calculated in respect of total excavated area except for "Total area under plantation" where % has been calculated in terms of leasehold area.
6. **Total six opencast mine of CCL named as Rohini, Purnadih, Kathara, North Urimari, Karo, Konar Expn, Selected Dhori & Tapin North OC have been included under category of those oc mines which have capacity of producing more than 5 million cubic meter (Coal +OB) annually.**

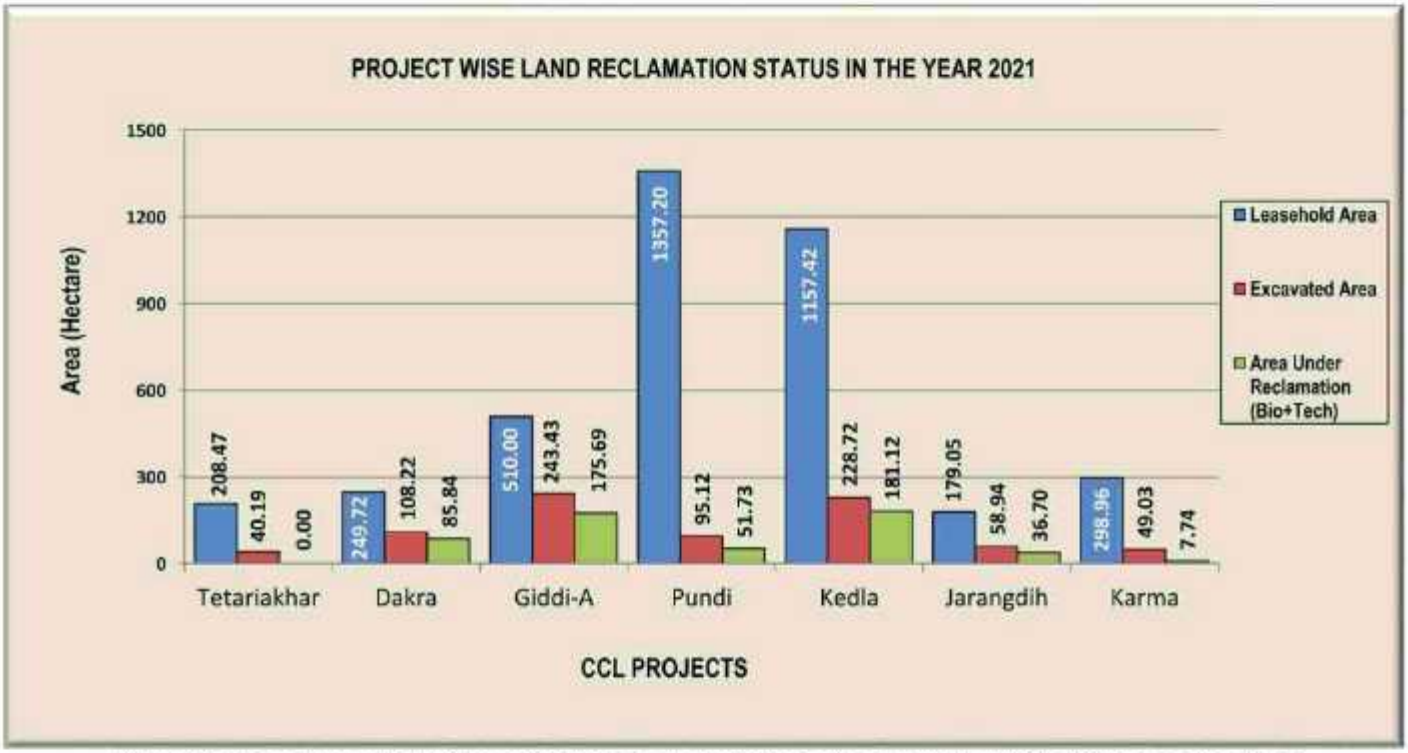
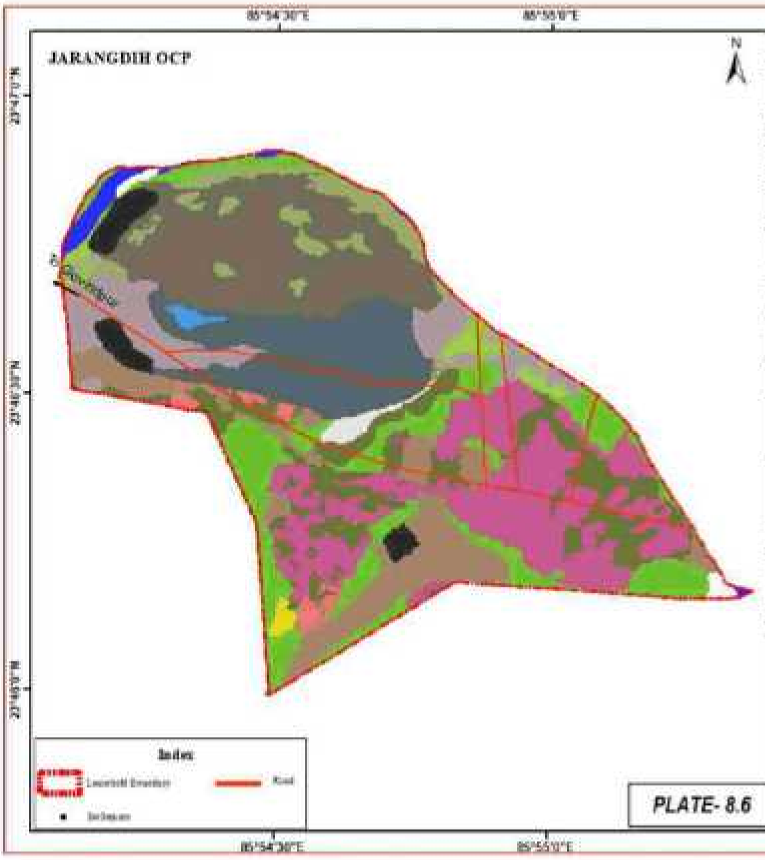


Figure. 8.1: Land Reclamation Status in OC Projects producing Less than 5mcm (Coal+OB) of CCL in the Year 2021

TABLE-8.2
AREA STATISTICS OF LAND USE/ COVER CLASSES IN OPENCAST PROJECTS PRODUCING (<5 MCM COAL+OB) OF CCL BASED ON SATELLITE DATA OF THE YEAR 2021

(Area in Hectare)

		TETARIAKHAR		DAKRA		GIDDI-A		PUNDI		KEDLA		JARANGDIH		KARMA		TOTAL	
		Area	%	Area	%	Area	%	Area	%	Area	%	Area	%	Area	%	Area	%
FORESTS	Dense Forest	0.02	0.01	0.00	0.00	0.00	0.00	182.67	13.46	0.00	0.00	0.00	0.00	0.00	0.00	182.69	4.61
	Open Forest	5.09	2.44	0.00	0.00	0.00	0.00	235.65	17.36	174.07	15.04	0.00	0.00	15.08	5.04	429.89	10.85
	Total Forest (A)	**5.11**	**2.45**	**0.00**	**0.00**	**0.00**	**0.00**	**418.32**	**30.82**	**174.07**	**15.04**	**0.00**	**0.00**	**15.08**	**5.04**	**612.58**	**15.47**
	Scrubs(B)	**40.64**	**19.49**	**54.68**	**21.90**	**52.13**	**10.22**	**301.95**	**22.25**	**397.87**	**34.38**	**26.02**	**14.53**	**60.60**	**20.27**	**933.89**	**23.58**
PLANTATION	Social Forestry	1.45	0.70	15.77	6.32	13.84	2.71	1.35	0.10	1.46	0.13	17.83	9.96	1.27	0.42	52.97	1.34
	Plantation on OB Dump	0.00	0.00	1.11	0.44	40.61	7.96	22.35	1.65	32.61	2.82	3.44	1.92	9.62	3.22	109.74	2.77
	Plantation on Backfill (Biological Reclamation)	0.00	0.00	37.86	15.16	84.88	16.64	13.86	1.02	20.24	1.75	7.19	4.02	0.00	0.00	164.05	4.14
	Total Plantation(C)	**1.45**	**0.70**	**54.74**	**21.92**	**139.33**	**27.32**	**37.58**	**2.77**	**54.31**	**4.69**	**28.46**	**15.90**	**10.89**	**3.64**	**326.76**	**8.25**
	Total Vegetation(A+B+C)	**47.20**	**22.64**	**109.42**	**43.82**	**191.46**	**37.54**	**757.85**	**55.84**	**626.25**	**54.11**	**54.48**	**30.43**	**86.57**	**28.96**	**1873.23**	**47.29**
ACTIVE MINING	Coal Quarry	27.70	13.29	12.11	4.85	18.02	3.53	21.52	1.59	28.36	2.45	20.22	11.29	37.25	12.46	165.20	4.17
	Advance Quarry Site	2.00	0.96	2.29	0.92	4.32	0.85	6.48	0.48	1.11	0.10	1.28	0.71	0.00	0.00	17.48	0.44
	Quarry Filled With Water	10.49	5.03	7.98	3.20	45.40	8.90	15.39	1.13	18.11	1.56	0.74	0.41	4.04	1.35	102.15	2.58
	Total Area under *Active Mining(D)*	**40.19**	**19.28**	**22.38**	**8.97**	**67.74**	**13.28**	**43.39**	**3.20**	**47.60**	**4.11**	**22.24**	**12.41**	**41.29**	**13.81**	**284.83**	**7.19**
MINING AREA	Coal Dump	20.08	9.63	2.94	1.18	5.52	1.08	4.18	0.31	5.49	0.47	4.39	2.45	6.51	2.18	49.11	1.24
	Barren OB Dump	46.71	22.41	9.19	3.68	13.15	2.58	30.45	2.24	29.23	2.53	12.52	6.99	46.82	15.66	188.07	4.75
	Area Under Backfilling (Technical Reclamation)	0.00	0.00	47.98	19.21	90.81	17.81	37.85	2.79	90.56	7.82	29.51	16.48	7.74	2.59	304.45	7.69
	Total Area under *Mine Operation(D+E)*	**106.98**	**51.32**	**82.49**	**33.04**	**177.22**	**34.75**	**115.87**	**8.54**	**172.88**	**14.93**	**68.66**	**38.33**	**102.36**	**34.24**	**826.46**	**20.87**
WASTELANDS	Waste Lands	14.46	6.94	10.99	4.40	33.27	6.52	125.57	9.25	74.01	6.39	18.01	10.06	21.21	7.09	297.52	7.51
	Fly Ash Pond / Sand Body	0.00	0.00	0.00	0.00	5.98	1.17	3.03	0.22	0.66	0.06	0.97	0.54	9.83	3.29	20.47	0.52
	Total Wasteland	**14.46**	**6.94**	**10.99**	**4.40**	**39.25**	**7.70**	**128.60**	**9.48**	**74.67**	**6.45**	**18.98**	**10.60**	**31.04**	**10.38**	**317.99**	**8.03**
WATERBODY	Reservoir, Nallah, Ponds	6.10	2.93	1.10	0.44	17.95	3.52	8.68	0.64	16.58	5.53	2.28	1.27	12.04	4.03	64.73	1.63
	Total Waterbodies	**6.10**	**2.93**	**1.10**	**0.44**	**17.95**	**3.52**	**8.68**	**0.64**	**16.58**	**5.53**	**2.28**	**1.27**	**12.04**	**4.03**	**64.73**	**1.63**
AGRICULTURE	Crop Lands	0.00	0.00	0.00	0.00	0.00	0.00	127.37	9.38	1.48	0.13	0.62	0.35	0.00	0.00	129.47	3.27
	Fallow Lands	32.46	15.57	1.61	0.64	2.49	0.49	186.01	13.71	201.56	17.41	0.00	0.00	60.01	20.07	484.14	12.22
	Total Agriculture	**32.46**	**15.57**	**1.61**	**0.64**	**2.49**	**0.49**	**313.38**	**23.09**	**203.04**	**17.54**	**0.62**	**0.35**	**60.01**	**20.07**	**613.61**	**15.49**
SETTLEMENTS	Urban Settlement	0.00	0.00	18.28	7.32	61.14	11.99	6.91	0.51	26.71	2.31	31.96	17.85	0.00	0.00	145.00	3.66
	Rural Settlement	0.40	0.19	17.18	6.88	0.00	0.00	21.80	1.61	26.14	2.26	0.00	0.00	5.57	1.86	71.09	1.79
	Industrial Settlement	0.87	0.42	8.65	3.46	20.49	4.02	4.11	0.30	11.15	0.96	2.07	1.16	1.37	0.46	48.71	1.23
	Total Settlements	**1.27**	**2.93**	**44.11**	**17.66**	**81.63**	**16.01**	**32.82**	**2.42**	**64.00**	**5.53**	**34.03**	**19.01**	**6.94**	**2.32**	**264.80**	**6.69**
	Grand Total	**208.47**	**100.00**	**249.72**	**100.00**	**510.00**	**100.00**	**1357.20**	**100.00**	**1157.42**	**100.00**	**179.05**	**100.00**	**298.96**	**100.00**	**3960.82**	**100.00**



Area Statistics - Jarangdih OCP (2021)				
Classes		Colour	Area	
Level-I	Level-II		Area (Ha)	% of Total
Forest Area	Dense Forest		0.00	0.00
	Open Forest		0.00	0.00
	Total Forest Area		**0.00**	**0.00**
Scrubs	**Scrubs**		**26.02**	**14.53**
Plantation	Social Forestry		17.85	9.96
	Plantation on Backfill		7.19	4.02
	Plantation on OB Dump		3.44	1.92
	Total Plantation		**28.46**	**15.90**
	Total Vegetation Area		**54.48**	**30.43**
Agriculture	Crop Land		0.62	0.35
	Fallow Land		0.00	0.00
	Total Agriculture Area		**0.62**	**0.35**
Waste Land	Waste Land		18.01	10.06
	Sand Body		0.97	0.54
	Total Waste Land		**18.98**	**10.60**
Mining Area	Coal Quarry		20.22	11.29
	Barren OB Dump		12.52	6.99
	Area Under Backfilling		29.51	16.48
	Water Filled Quarry		0.74	0.41
	Coal Dump		4.39	2.45
	Advance Quarry Site		1.28	0.71
	Total Mining Area		**68.66**	**38.35**
Settlements	Rural Settlement		0.00	0.00
	Urban Settlement		31.96	17.85
	Industrial Settlement		2.07	1.16
	Total Settlement Area		**34.03**	**19.01**
Water Body	**River, Ponds**		**2.28**	**1.27**
		Total	**170.05**	**100.00**

Customer: Central Coalfields Limited (CCL)

Title: Land Reclamation Monitoring of OC Projects

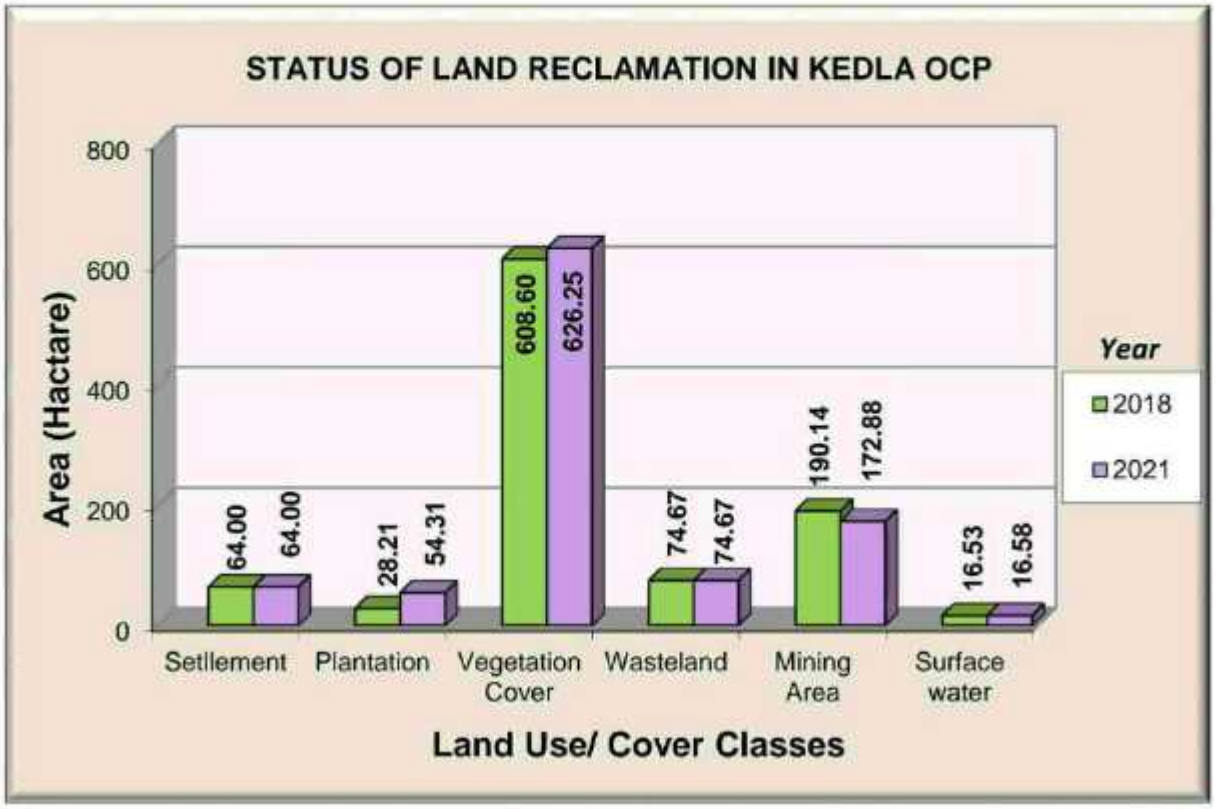


FIGURE – 8.6

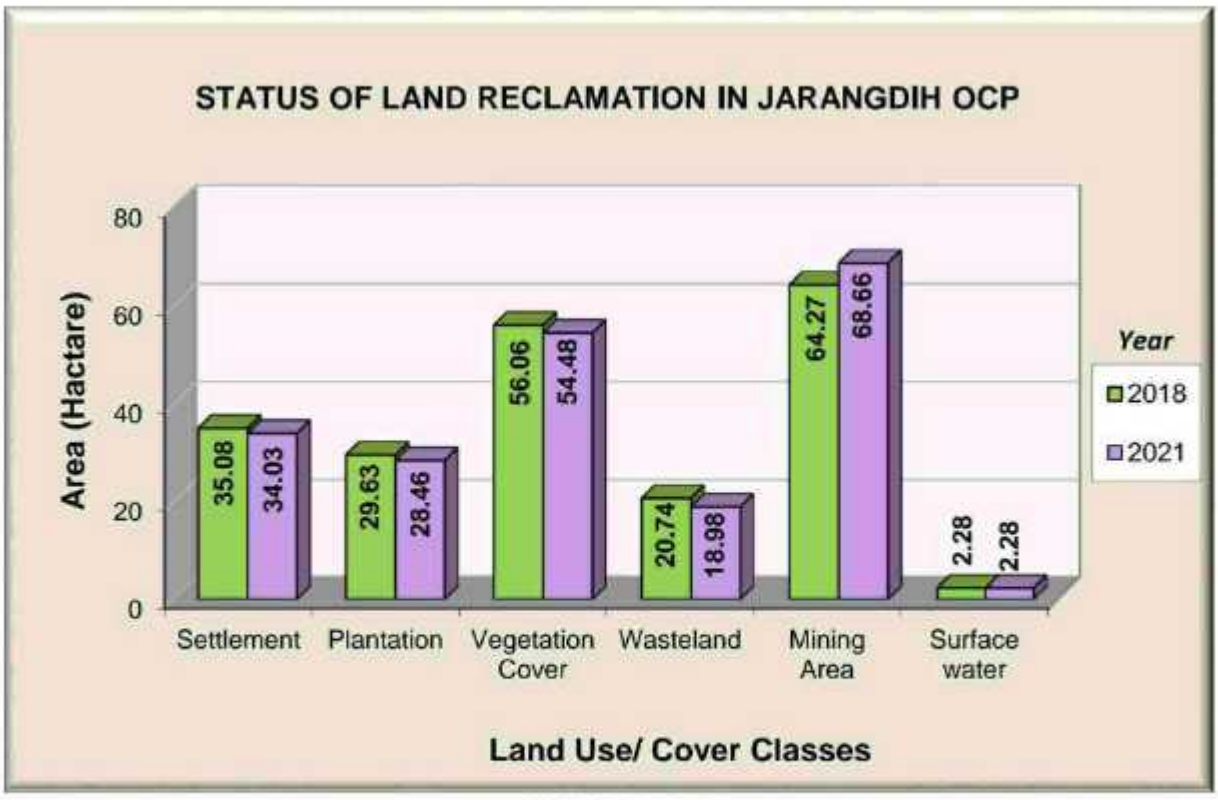


FIGURE – 8.7

Photo8.5: Plantation over Internal OB Dump in Pundi OCP

Photo 8.6: Plantation on Internal OB Dump in Jarangdih OCP

TEST REPORT

12/22 Test Report No. 1915	Job No. 094322160	Year	FY2022-23
Type of Sample	Ambient Air	Quarter Ending	Dec-22
Customer	CCL		
Mode of Receipt of Sample:	Joint sampling with customer		
Testing/ Sampling Protocol:	IS 5182 (part 14): 2000 ,R -2010, Methods for Measurement of Air Pollution, LQR 32		
Remarks & Observation:	All samplers placed 1.5 m above ground level		

TEST RESULT

The sample has been tested with the following results:-

Area : **Kathara** **Project:** **Jarangdih OC** **Stations:** Gayatri Colony

Month	Date of Sampling	Date of receipt of sample	Date of analysis	Parameters (in $\mu g/m^3$)					Wind Direction (from) & Weather
				Total Particulate Matter (PM_{10}+ >PM_{10})TPM	Particulate Matter (PM_{10})	Particulate Matter ($PM_{2.5}$)	Sulphur Dioxide (SO_2)	Nitrogen Oxides (as NO_x)	
Oct-22 1st FN	05/10/22-06/10/22	17-10-2022	17/10/22-27/10/22	137	69	34	< 25	< 6	East Sunny
Oct-22 2nd FN	19/10/22-20/10/22	01-11-2022	01/11/22-11/12/22	121	68	32	< 25	< 6	East Sunny
Nov-22 3rd FN	03/11/22-04/11/22	16-11-2022	16/11/22-21/11/22	143	77	42	< 25	< 6	East Sunny
Nov-22 4th FN	18/11/22-19/11/22	01-12-2022	01/12/22-13/12/22	124	79	50	< 25	< 6	East Sunny
Dec-22 5th FN	03/12/22-04/12/22	16-12-2022	16/12/22-26/12/22	135	74	38	< 25	< 6	North Sunny
Dec-22 6th FN	20/12/22-21/12/22	02-01-2023	02/01/23-13/01/23	226	98	56	< 25	< 6	East Sunny

Note:
1. Gazette Notification No. G.S.R 742(E) dt.25th Sept.'2000 is applicable in core zone.
2. Gazette Notification No. G.S.R 826 (E) dt.Nov.'2009 is applicable in buffer zone.

Analysed By

Authorized Signatory

Note: 1) This Report refers to the values obtained at the time of testing and results related to the items tested
2) This Report cannot be reproduced in part or full without written permission of the management.
3) This is computer generated report and requires no signature.

TEST REPORT

12/22 Test Report No. 1916	Job No. 094322160	Year	FY2022-23
Type of Sample	Ambient Air	Quarter Ending	Dec-22
Customer	CCL		
Mode of Receipt of Sample:	Joint sampling with customer		
Testing/ Sampling Protocol:	IS 5182 (part 14): 2000 ,R -2010, Methods for Measurement of Air Pollution, LQR 32		
Remarks & Observation:	All samplers placed 1.5 m above ground level		

TEST RESULT

The sample has been tested with the following results:-

Area : **Kathara** **Project:** **Jarangdih OC** **Stations:** **Jarangdih Colony**

Month	Date of Sampling	Date of receipt of sample	Date of analysis	Parameters (in µg/m³)					Wind Direction (from) & Weather
				Total Particulate Matter (PM_{10}+ >PM_{10})TPM	Particulate Matter (PM_{10})	Particulate Matter ($PM_{2.5}$)	Sulphur Dioxide (SO_2)	Nitrogen Oxides (as NO_x)	
Oct-22 1st FN	05/10/22-06/10/22	17-10-2022	17/10/22-27/10/22	169	81	40	< 25	< 6	East Sunny
Oct-22 2nd FN	19/10/22-20/10/22	01-11-2022	01/11/22-11/12/22	164	88	47	< 25	< 6	East Sunny
Nov-22 3rd FN	03/11/22-04/11/22	16-11-2022	16/11/22-21/11/22	228	98	59	< 25	< 6	East Sunny
Nov-22 4th FN	18/11/22-19/11/22	01-12-2022	01/12/22-13/12/22	128	57	36	< 25	< 6	East Sunny
Dec-22 5th FN	03/12/22-04/12/22	16-12-2022	16/12/22-26/12/22	146	64	26	< 25	< 6	North Sunny
Dec-22 6th FN	20/12/22-21/12/22	02-01-2023	02/01/23-13/01/23	140	74	41	< 25	< 6	East Sunny

Note:

1. Gazette Notification No. G.S.R 742(E) dt.25th Sept.'2000 is applicable in core zone.
2. Gazette Notification No. G.S.R 826 (E) dt.Nov.'2009 is applicable in buffer zone.

Analysed By

Authorized Signatory

Note: 1) This Report refers to the values obtained at the time of testing and results related to the items tested
2) This Report cannot be reproduced in part or full without written permission of the management.
3) This is computer generated report and requires no signature.

TEST REPORT

12/22 Test Report No. 1917	Job No. 094322160	Year	FY2022-23
Type of Sample	Ambient Air	Quarter Ending	Dec-22
Customer	CCL		
Mode of Receipt of Sample:	Joint sampling with customer		
Testing/ Sampling Protocol:	IS 5182 (part 14): 2000 ,R -2010, Methods for Measurement of Air Pollution, LQR 32		
Remarks & Observation:	All samplers placed 1.5 m above ground level		

TEST RESULT

The sample has been tested with the following results:-

Area : **Kathara** **Project:** **Jarangdih OC** **Stations:** **P.O.Office**

Month	Date of Sampling	Date of receipt of sample	Date of analysis	Parameters (in µg/m³)					Wind Direction (from) & Weather
				Total Particulate Matter (PM_{10}+ >PM_{10})TPM	Particulate Matter (PM_{10})	Particulate Matter ($PM_{2.5}$)	Sulphur Dioxide (SO_2)	Nitrogen Oxides (as NO_x)	
Oct-22 1st FN	05/10/22-06/10/22	17-10-2022	17/10/22-27/10/22	156	79	46	< 25	< 6	East Sunny
Oct-22 2nd FN	19/10/22-20/10/22	01-11-2022	01/11/22-11/12/22	230	114	66	< 25	< 6	East Sunny
Nov-22 3rd FN	03/11/22-04/11/22	16-11-2022	16/11/22-21/11/22	260	124	63	< 25	< 6	East Sunny
Nov-22 4th FN	18/11/22-19/11/22	01-12-2022	01/12/22-13/12/22	150	67	35	< 25	< 6	East Sunny
Dec-22 5th FN	03/12/22-04/12/22	16-12-2022	16/12/22-26/12/22	216	104	62	< 25	< 6	North Sunny
Dec-22 6th FN	20/12/22-21/12/22	02-01-2023	02/01/23-13/01/23	171	81	40	< 25	< 6	East Sunny

Note:
1. Gazette Notification No. G.S.R 742(E) dt.25th Sept.'2000 is applicable in core zone.
2. Gazette Notification No. G.S.R 826 (E) dt.Nov.'2009 is applicable in buffer zone.

Analysed By

Authorized Signatory

Note: 1) This Report refers to the values obtained at the time of testing and results related to the items tested
2) This Report cannot be reproduced in part or full without written permission of the management.
3) This is computer generated report and requires no signature.

TEST REPORT

12/22 Test Report No. 1918	Job No. 094322160	Year	FY2022-23
Type of Sample	Ambient Air	Quarter Ending	Dec-22
Customer	CCL		
Mode of Receipt of Sample:	Joint sampling with customer		
Testing/ Sampling Protocol:	IS 5182 (part 14): 2000 ,R -2010, Methods for Measurement of Air Pollution, LQR 32		
Remarks & Observation:	All samplers placed 1.5 m above ground level		

TEST RESULT

The sample has been tested with the following results:-

Area : **Kathara** **Project:** **Jarangdih OC** **Stations:** **Guest House**

Month	Date of Sampling	Date of receipt of sample	Date of analysis	Parameters (in µg/m³)					Wind Direction (from) & Weather
				Total Particulate Matter (PM_{10}+ >PM_{10})TPM	Particulate Matter (PM_{10})	Particulate Matter ($PM_{2.5}$)	Sulphur Dioxide (SO_2)	Nitrogen Oxides (as NO_x)	
Oct-22 1st FN	06/10/22-07/10/22	17-10-2022	17/10/22-27/10/22	113	56	24	< 25	< 6	East Sunny
Oct-22 2nd FN	20/10/22-21/10/22	01-11-2022	01/11/22-11/12/22	213	78	23	< 25	< 6	East Sunny
Nov-22 3rd FN	04/11/22-05/11/22	16-11-2022	16/11/22-21/11/22	210	84	40	< 25	< 6	East Sunny
Nov-22 4th FN	20/11/22-21/11/22	01-12-2022	01/12/22-13/12/22	230	97	53	< 25	< 6	East Sunny
Dec-22 5th FN	04/12/22-05/12/22	16-12-2022	16/12/22-26/12/22	108	53	24	< 25	< 6	North Sunny
Dec-22 6th FN	22/12/22-23/12/22	02-01-2023	02/01/23-13/01/23	204	95	46	< 25	< 6	East Sunny

Note:

1. Gazette Notification No. G.S.R 742(E) dt.25th Sept.'2000 is applicable in core zone.
2. Gazette Notification No. G.S.R 826 (E) dt.Nov.'2009 is applicable in buffer zone.

Analysed By

Authorized Signatory

Note: 1) This Report refers to the values obtained at the time of testing and results related to the items tested
2) This Report cannot be reproduced in part or full without written permission of the management.
3) This is computer generated report and requires no signature.

TEST REPORT

12/22 Test Report No. 1919	Job No. 094322160	Year	FY2022-23
Type of Sample:	Noise	Quarter Ending	Dec-22
Customer	CCL		
Testing/ Sampling Protocol:	*'The noise pollution (Regulation and Control), Rules,2000, LQR 34*		
Remarks:			

TEST RESULT

The sample has been tested with the following results:-

Area : **Kathara** **Project:** **Jarangdih OC**

Station Name	Noise Level dB(A) Leq					
	Oct-22 1st FN	Oct-22 2nd FN	Nov-22 3rd FN	Nov-22 4th FN	Dec-22 5th FN	Dec-22 6th FN
	Day/Night	Day/Night	Day/Night	Day/Night	Day/Night	Day/Night
Date of recording	05-10-2022	19-10-2022	03-11-2022	18-11-2022	03-12-2022	20-12-2022
1. Gyatri Colony	52.7/50.4	52.6/50.3	50.1/45.1	52.3/50.6	47.4/37.2	51.4/49.1
Date of recording	05-10-2022	19-10-2022	03-11-2022	18-11-2022	03-12-2022	20-12-2022
2. Jarangdih Colony	50.7/48.4	50.6/48.3	52.1/47.2	52.8/50.2	49.2/39.1	51.5/49.3
Date of recording	05-10-2022	19-10-2022	03-11-2022	18-11-2022	03-12-2022	20-12-2022
3. P.O.Office	50.9/48.2	50.8/48.3	50.1/46.0	51.6/49.4	52.8/42.4	50.4/48.5
Date of recording	06-10-2022	20-10-2022	04-11-2022	20-11-2022	04-12-2022	22-12-2022
4. Guest House	51.9/49.7	51.8/49.6	51.1/45.2	51.7/49.2	50.2/40.4	50.6/48.8

Ambient Air Quality Standards in respect of Noise as per 'The noise pollution (Regulation and Control), Rules,2000		
Time Frame	*Limits in dB(A) Leq*	
	Day Time 6.00 AM to 10.00 PM	*Night Time 10.00 PM to 6.00 AM*
Industrial Area	*75*	*70*
Commercial Area	*65*	*55*
Residential area	*55*	*45*
Silence Zone	*50*	*40*

Analysed By Authorized Signatory

Note: 1) This Report refers to the values obtained at the time of testing and results related to the items tested
2) This Report cannot be reproduced in part or full without written permission of the management.
3) This is computer generated report and requires no signature.

TEST REPORT

12/22 Test Report No. 1920	**Job No. 094322160**	**Year**	FY2022-23
Type of Sample:	**Effluent Water**	Quarter Ending	Dec-22
Customer	CCL		
Mode of Receipt of Sample:	Joint sampling with customer		
Testing/ Sampling Protocol:	**MOEF -SCH-VI STANDARDS, Class 'A', LQR 33**		
Remarks & Observation:	Samples received in 5 ltrs plastic Jerri cane, Colour as observed is transparent		

TEST RESULT

The sample has been tested with the following results:-

Area : **Kathara** **Project:** **Jarangdih OC** **Stations:** Mine Water

Analysis Results of FN Effluent Water							
Parameters →				**COD**	**O & G**	**pH value**	**TSS**
Detection Limit				**4**	**2**	**0.2**	**10**
MOEF -SCH-VI, STANDARDS, Class 'A'				**250**	**10**	**5.5 to 9.0**	**100**
Month	Date of Sampling	Date of Receipt of Sample	Date of Analysis	**Value in mg/l, except pH**			
Oct-22 1st FN	14/10/22	17/10/22	17/10/22-31/10/22	28	<2.00	7.85	59
Oct-22 2nd FN	31/10/22	01/11/22	01/11/22-15/11/22	16	<2.00	8.56	31
Nov-22 3rd FN	10/11/22	16/11/22	16/11/22-30/11/22	16	<2.00	8.1	27
Dec-22 5th FN	15/12/22	16/12/22	16/12/22-30/12/22	16	<2.00	8.3	37
Dec-22 6th FN	31/12/22	02/01/23	02/01/23-13/01/23	12	<2.00	8.7	28
BIS Standard & Method				APHA, 23rd Edition, Closed Reflux, Titrimetric Method, 2017	IS 3025/39:1991, R : 2003, Partition Gravimetric	IS-3025/11:1983, R-1996, Electrometric	IS 3025/17:1984, R :1996, Gravimetric Method

Analysed By

Authorized Signatory

Note: 1) This Report refers to the values obtained at the time of testing and results related to the items tested
2) This Report cannot be reproduced in part or full without written permission of the management.
3) This is computer generated report and requires no signature.

TEST REPORT

12/22 Test Report No. 1921	Job No. 094322160	Year	2022-23
Type of Sample:	**Effluent Water**	Quarter Ending	**Dec.'22**
Customer / W. O. no. & Date:	CCL	Date of Receipt of Sample:	01/12/22
Mode of Receipt of Sample:	Joint sampling with customer	Date of Analysis:	01/12/22-06/01/23
Testing /Sampling Protocol	**MOEF -SCH-VI STANDARDS, Class 'A',** LQR 33		
Remarks & Observation:	Samples received in 5 ltrs plastic Jerri cane, Colour as observed is transparent		

TEST RESULT

The sample has been tested with the following results: -

Area : **Kathara** **Project:** **Jarangdih OC**

Stations: **Date of Sampling:** 30/11/2022

1. Mine Water (Nov 2nd FN)
2.
3.

Sl.No.	Parameter	Sampling Stations			Detection Limit	MOEF -SCH-VI STANDARDS Class 'A'	BIS Standard & Method
		1	2	3			
1	Ammonical Nitrogen, mg/l, Max	0.82			0.02	50.0	IS 3025/34:1988, R : 2009, Nessler's Method
2	Arsenic (as As), mg/l, *Max*	<0.002			0.002	0.2	IS 3025/37:1988 R : 2003, AAS-VGA
3	B.O.D (3 days 27°C), mg/l, Max	<2.00			2.00	30.0	IS 3025 /44:1993, R:2003 3 day incubation at 27°C
4	Cadmium(as Cd), mg/l, Max	<0.0004			0.0004	2.0	APHA, 23rd Edition 3120 B ICP Method, 2017
5	COD, mg/l, Max	20			4.00	250.0	APHA, 23rd Edition, Closed Reflux, Titrimetric Method: 2017
6	Copper (as Cu), mg/l, *Max*	<0.02			0.02	3.0	IS 3025/42: 1992, R : 2009, AAS (Air-Ac-Flame)
7	Dissolved Phosphate, mg/l, Max	0.34			0.30	5.0	APHA, 23rd Edition Molybdovanadate Method, 2017
8	Fluoride (as F) mg/l, *Max*	1.26			0.02	2.0	APHA, 23rd Edition, SPADNS Method, 2017
9	Free Ammonia, mg/l, Max	<0.02			0.02	5.0	IS:3025/34:1988, Nesseler's
10	Hexavalent Chromium, mg/l, Max	<0.01			0.01	0.1	APHA, 23rd Edition, Diphenylcarbohydrazide
11	Iron (as Fe), mg/l, *Max*	<0.04			0.04	3.0	IS 3025 /53: 2003, R : 2009 , AAS-(Air-Ac-Flame)
12	Lead (as Pb), mg/l, *Max*	<0.001			0.001	0.1	APHA, 23rd Edition 3120 B ICP Method, 2017
13	Manganese(as Mn), mg/l, Max	<0.01			0.01	2.0	IS-3025/59:2006, AAS (Air-Ac-Flame)
14	Nickel (as Ni), mg/l, *Max*	<0.003			0.003	3.0	APHA, 23rd Edition 3120 B ICP Method, 2017
15	Nitrate Nitrogen, mg/l, *Max*	2.44			0.50	10.0	APHA, 23rd Edition, UV-Spectrphotometric Method, 2017
16	Oil & Grease, mg/l, Max	<2.00			2.00	10.0	IS 3025/39:1991, R : 2003, Partition Gravimetric Method
17	pH value	8.1			1.0	5.5 to 9.0	IS-3025/11:1983, R-1996, Electrometric Method
18	Phenolic compounds (as C_6H_5OH),mg/l, *Max*	<0.001			0.001	1.0	APHA, 23rd Edition, 4- Amino Antipyrine Method, 2017
19	Selenium (as Se), mg/l, *Max*	<0.0005			0.0005	0.05	APHA, 23rd Edition 3120 B ICP Method, 2017
20	Sulphide (as S^{-2}), mg/l, Max	<0.005			0.005	2.0	APHA, 23rd Edition Methylene Blue Method, 2017
21	Temperature (°C)	20.3			Shall not exceed 5° C above the receiving temp.		IS-3025/09:1984, R:2002, Thermometeric
22	Total Chromium (as Cr), mg/l, *Max*	<0.002			<0.002	2.0	APHA, 23rd Edition 3120 B ICP Method, 2017
23	Total Kjeldahl Nitrogen, mg/l, Max	2.8			1.00	100.0	APHA, 23rd Edition, Kjeldahl Method: 2017
24	Total Residual Chlorine, mg/l, Max	<0.02			0.02	1.0	APHA, 23rd Edition, DPD Method, 2017
25	Total Suspended Solids, mg/l, Max	64			10.00	100.0	IS 3025/17:1984, R :1996, Gravimetric Method
26	Zinc (as Zn), mg/l, *Max*	<0.005			0.005	5.0	IS 3025 /49: 1994, R: 2009, AAS (Air-Ac-Flame)

Analysed By

Authorized Signatory

Note: 1) This Report refers to the values obtained at the time of testing and results related to the items tested
2) This Report cannot be reproduced in part or full without written permission of the management.
3) This is computer generated report and requires no signature.

TEST REPORT

12/22 Test Report No. 1922	Job No. 094322160	Year	FY2022-23
Type of Sample:	Surface Water	Quarter Ending	Dec-22
Customer	CCL	Date of Receipt:	17-10-2022
Mode of Receipt of Sample:	Joint sampling with customer	Date of Analysis:	17.10.22-15.12.22
Testing/ Sampling Protocol:	LQR 33		
Remarks & Observation:	Samples received in 5 ltrs plastic Jerri cane, Colour as observed is transparent		

TEST RESULT

The sample has been tested with the following results:-

Area : Kathara **Project:** Jarangdih OC

Stations: Konar River Near Railway Bridge **Date of Sampling:** 14-10-2022

Sl.No	Parameter	Sampling Stations				Detection Limit	BIS Standard & Method
		1	2	3	4		
1	Arsenic (as As), mg/l, Max	<0.002				0.002	IS 3025/37:1988 R : 2003, AAS-VGA, Method
2	BOD (3 days 27°C), mg/l, Max	<2.0				2.00	IS 3025 /44: 1993, R: 2003 3 day incubation at 27°C
3	Cadmium(as Cd), mg/l, Max	<0.0004				0.0004	APHA, 23rd Edition AAS-GTA Method, 2017
4	Chlorides (as Cl), mg/l, Max	12				2.00	IS-3025/32:1988, R-2007, Argentometric Method
5	Copper (as Cu), mg/l, Max	<0.02				0.02	IS 3025/42: 1992, R : 2009, AAS (Air-Ac-Flame)
6	Dissolved Oxygen, min.	7.2				0.10	IS 3025/38: 1989, R:2003, Winkler Azide Method
7	Fluoride (as F) mg/l, Max	0.47				0.02	APHA, 23rd Edition, SPADNS Method, 2017
8	Hexavalent Chromium, mg/l, Max	<0.01				0.01	APHA, 23rd Edition, 2017 Diphenylcarbohydrazide,
9	Iron (as Fe), mg/l, Max	<0.04				0.04	IS 3025 /53: 2003, R : 2009, AAS (Air-Ac-Flame)
10	Lead (as Pb), mg/l, Max	<0.001				0.001	APHA, 23rd Edition AAS-GTA Method, 2017
11	Nitrate (as NO_3), mg/l, Max	4.18				0.50	APHA, 23rd Edition, UV - Spectrophotometric, 2017
12	pH value	8.17				1.0	IS-3025/11:1983, R-1996, Electrometric Method
13	Phenolic compounds (as C_6H_5OH), mg/l, Max	<0.001				0.001	APHA, 23rd Edition, 2017, 4-Amino Antipyrine Method,
14	Selenium (as Se), mg/l, Max	<0.0005				0.0005	IS 3025/56:2003 AAS-VGA Method
15	Sulphate (as SO_4) mg/l, Max	74				2.00	APHA, 23rd Edition Turbidity Method, 2017
16	Total Dissolved Solids, mg/l, Max	218				25.00	IS 3025 /16:1984 R : 2006, Gravimetric Method
17	Total Suspended Solids, mg/l, Max	27				10.00	IS 3025 /17:1984, R :1996, Gravimetric Method
18	Zinc (as Zn), mg/l, Max	<0.005				0.005	IS 3025 /49: 1994, R : 2009, AAS (Air-Ac-Flame)

Analysed By

Authorized Signatory

Note: 1) This Report refers to the values obtained at the time of testing and results related to the items tested
2) This Report cannot be reproduced in part or full without written permission of the management.
3) This is computer generated report and requires no signature.

TEST REPORT

12/22 Test Report No. 1952	Job No. 094322160	Year	FY2022-23
Type of Sample	Ambient Air	Quarter Ending	Dec-22
Customer	CCL		
Mode of Receipt of Sample:	Joint sampling with customer		
Testing/ Sampling Protocol:	IS 5182 (part 14): 2000 ,R -2010, Methods for Measurement of Air Pollution, LQR 32		
Remarks & Observation:	All samplers placed 1.5 m above ground level		

TEST RESULT

The sample has been tested with the following results:-

Area : **Kathara** **Project:** **Jarangdih UG** **Stations:** **Gr. VPC Jarangdih**

Month	Date of Sampling	Date of receipt of sample	Date of analysis	Parameters (in µg/m³)					Wind Direction (from) & Weather
				Total Particulate Matter (PM_{10}+ >PM_{10})TPM	Particulate Matter (PM_{10})	Particulate Matter ($PM_{2.5}$)	Sulphur Dioxide (SO_2)	Nitrogen Oxides (as NO_x)	
Oct-22 1st FN	12/10/22-13/10/22	17-10-2022	17/10/22-27/10/22	164	85	36	< 25	< 6	East Sunny
Oct-22 2nd FN	29/10/22-30/10/22	01-11-2022	01/11/22-11/12/22	237	116	54	< 25	< 6	East Sunny
Nov-22 3rd FN	08/11/22-09/11/22	16-11-2022	16/11/22-21/11/22	166	76	31	< 25	< 6	East Sunny
Nov-22 4th FN	25/11/22-26/11/22	01-12-2022	01/12/22-13/12/22	228	116	63	< 25	< 6	East Sunny
Dec-22 5th FN	12/12/22-13/12/22	16-12-2022	16/12/22-26/12/22	217	94	52	< 25	< 6	South Sunny
Dec-22 6th FN	29/12/22-30/12/22	02-01-2023	02/01/23-13/01/23	142	77	35	< 25	< 6	East Sunny

Note:
1. Gazette Notification No. G.S.R 742(E) dt.25th Sept.'2000 is applicable in core zone.
2. Gazette Notification No. G.S.R 826 (E) dt.Nov.'2009 is applicable in buffer zone.

Analysed By

Authorized Signatory

Note: 1) This Report refers to the values obtained at the time of testing and results related to the items tested
2) This Report cannot be reproduced in part or full without written permission of the management.
3) This is computer generated report and requires no signature.

TEST REPORT

12/22 Test Report No. 1953	Job No. 094322160	Year	FY2022-23
Type of Sample	Ambient Air	Quarter Ending	Dec-22
Customer	CCL		
Mode of Receipt of Sample:	Joint sampling with customer		
Testing/ Sampling Protocol:	IS 5182 (part 14): 2000 ,R -2010, Methods for Measurement of Air Pollution, LQR 32		
Remarks & Observation:	All samplers placed 1.5 m above ground level		

TEST RESULT

The sample has been tested with the following results:-

Area : **Kathara** **Project:** **Jarangdih UG** **Stations:** **5&6 Incline**

Month	Date of Sampling	Date of receipt of sample	Date of analysis	Parameters (in µg/m³)					Wind Direction (from) & Weather
				Total Particulate Matter (PM_{10}+ >PM_{10})TPM	Particulate Matter (PM_{10})	Particulate Matter ($PM_{2.5}$)	Sulphur Dioxide (SO_2)	Nitrogen Oxides (as NO_x)	
Oct-22 1st FN	12/10/22-13/10/22	17-10-2022	17/10/22-27/10/22	221	92	40	< 25	6	East Sunny
Oct-22 2nd FN	29/10/22-30/10/22	01-11-2022	01/11/22-11/12/22	210	135	72	< 25	< 6	East Sunny
Nov-22 3rd FN	08/11/22-09/11/22	16-11-2022	16/11/22-21/11/22	223	88	44	< 25	< 6	East Sunny
Nov-22 4th FN	25/11/22-26/11/22	01-12-2022	01/12/22-13/12/22	208	93	47	< 25	< 6	East Sunny
Dec-22 5th FN	12/12/22-13/12/22	16-12-2022	16/12/22-26/12/22	227	125	61	< 25	< 6	South Sunny
Dec-22 6th FN	29/12/22-30/12/22	02-01-2023	02/01/23-13/01/23	222	85	45	< 25	< 6	East Sunny

Note:
1. Gazette Notification No. G.S.R 742(E) dt.25th Sept.'2000 is applicable in core zone.
2. Gazette Notification No. G.S.R 826 (E) dt.Nov.'2009 is applicable in buffer zone.

Analysed By

Authorized Signatory

Note: 1) This Report refers to the values obtained at the time of testing and results related to the items tested
2) This Report cannot be reproduced in part or full without written permission of the management.
3) This is computer generated report and requires no signature.

TEST REPORT

12/22 Test Report No. 1954	Job No. 094322160	Year	FY2022-23
Type of Sample:	Noise	Quarter Ending	Dec-22
Customer	CCL		
Testing/ Sampling Protocol:	*'The noise pollution (Regulation and Control), Rules,2000, LQR 34*		
Remarks:			

TEST RESULT

The sample has been tested with the following results:-

Area : **Kathara** **Project:** **Jarandih UG**

Station Name	Noise Level dB(A) Leq					
	Oct-22 1st FN	Oct-22 2nd FN	Nov-22 3rd FN	Nov-22 4th FN	Dec-22 5th FN	Dec-22 6th FN
	Day/Night	Day/Night	Day/Night	Day/Night	Day/Night	Day/Night
Date of recording	12-10-2022	29-10-2022	08-11-2022	27-11-2022	12-12-2022	29-12-2022
1.Gr. VPC Jarangdih	51.3/49.4	51.2/49.3	50.1/45.0	51.7/49.3	49.2/39.1	50.3/48.5
Date of recording	12-10-2022	29-10-2022	08-11-2022	27-11-2022	12-12-2022	29-12-2022
2. 5&6 Incline	51.8/49.4	51.7/49.3	50.1/46.1	51.9/49.7	50.2/40.1	50.7/48.3

Ambient Air Quality Standards in respect of Noise as per 'The noise pollution (Regulation and Control), Rules,2000		
Time Frame	*Limits in dB(A) Leq*	
	Day Time 6.00 AM to 10.00 PM	*Night Time 10.00 PM to 6.00 AM*
Industrial Area	*75*	*70*
Commercial Area	*65*	*55*
Residential area	*55*	*45*
Silence Zone	*50*	*40*

Analysed By

Authorized Signatory

Note: 1) This Report refers to the values obtained at the time of testing and results related to the items tested
2) This Report cannot be reproduced in part or full without written permission of the management.
3) This is computer generated report and requires no signature.

TEST REPORT

TC - 7470	Lab No. T-2187		
	12/22 Test Report No. Metal/03	**Job No. 094322160**	2022-23

Type of Sample	Ambient Air	Quarter Ending	Dec'22
Customer	CCL	Date of Receipt of Sample:	17/10/2022
Mode of Receipt of Sample:	Joint sampling with customer	Date of Analysis:	05/11/22-23/12/22
Sampling Protocol:	USEPA IO-3.2: 1999, LQR 32		
Remarks & Observation:	All samples placed 1.5 m above ground level		

TEST RESULT

The sample has been tested with the following results:-

Area : **Kathara** **Project:** **Jarangdih OC**

Stations:

	Date of Sampling:
1. Gayatri Colony	05-06/10/2022
2. Jarangdih Colony	05-06/10/2022
3. P.O.Office	05-06/10/2022
4. Guest House	06-07/10/2022

S.No	Test Parameters	Units	Test Result				Method detection Limit	Limit (NAAQS-2011)	Test Method
	Stations:		1	2	3	4			
1	Conc. of As in Air	ng/m³	0.95	0.69	1.95	1.02	0.1	6.00	USEPA IO-3.2:1999
2	Conc. of Ni in Air	ng/m³	8.67	5.57	17.54	6.92	0.1	20.00	USEPA IO-3.2:1999
3	Conc. of Pb in Air	µg/m³	0.013	0.009	0.037	0.020	0.005	1.0	USEPA IO-3.2: 1999
4	Conc. of Cu in Air	ng/m³	<0.10	<0.10	0.13	0.11	0.1	-	USEPA IO-3.2: 1999
5	Conc. of Cd in Air	ng/m³	0.141	0.132	0.222	0.149	0.02	-	USEPA IO-3.2: 1999
6	Conc. of Cr in Air	ng/m³	1.73	4.49	1.62	1.65	0.1	-	USEPA IO-3.2: 1999

Note: 1) This Report refers to the values obtained at the time of testing and results related to the items tested
2) This Report cannot be reproduced in part or full without written permission of the management.
3) This is computer generated report and requires no signature.

TEST REPORT

TC - 7470	Lab No. T-2187		
	12/22 Test Report No. Metal/09	**Job No. 094322160**	2022-23

Type of Sample	Ambient Air	Quarter Ending	Dec'22
Customer	CCL	Date of Receipt of Sample:	17/10/2022
Mode of Receipt of Sample:	Joint sampling with customer	Date of Analysis:	05/11/22-23/12/22
Sampling Protocol:	USEPA IO-3.2: 1999, LQR 32		
Remarks & Observation:	All samples placed 1.5 m above ground level		

TEST RESULT

The sample has been tested with the following results:-

Area : **Kathara** **Project:** **Jarangdih UG**

Stations:

1. Gr. VPC Jarangdih
2. 5&6 Incline
3.
4.

Date of Sampling:
12-13/10/2022
12-13/10/2022

S.No	Test Parameters	Units	Test Result				Method detection Limit	Limit (NAAQS-2011)	Test Method
Stations:			1	2	3	4			
1	Conc. of As in Air	ng/m³	1.15	1.48			0.1	6.00	USEPA IO-3.2:1999
2	Conc. of Ni in Air	ng/m³	9.21	16.35			0.1	20.00	USEPA IO-3.2:1999
3	Conc. of Pb in Air	µg/m³	0.017	0.040			0.005	1.0	USEPA IO-3.2: 1999
4	Conc. of Cu in Air	ng/m³	<0.10	0.11			0.1	-	USEPA IO-3.2: 1999
5	Conc. of Cd in Air	ng/m³	0.154	0.229			0.02	-	USEPA IO-3.2: 1999
6	Conc. of Cr in Air	ng/m³	0.56	7.57			0.1	-	USEPA IO-3.2: 1999

Note: 1) This Report refers to the values obtained at the time of testing and results related to the items tested
2) This Report cannot be reproduced in part or full without written permission of the management.
3) This is computer generated report and requires no signature.

TEST REPORT

12/22 Test Report No. Metal/03		Job No. 094322160	2022-23
Type of Sample	Ambient Air	Quarter Ending	Dec.'22
Customer	CCL	Date of Receipt of Sample:	17/10/2022
Mode of Receipt of Sample:	Joint sampling with customer	Date of Analysis:	05/11/22-23/12/22
Sampling Protocol:	USEPA IO-3.2: 1999, LQR 32		
Remarks & Observation:	All samples placed 1.5 m above ground level		

TEST RESULT

The sample has been tested with the following results:-

Area : **Kathara** **Project:** **Jarangdih OC**

Stations:

	Date of Sampling:
1. Gayatri Colony	05-06/10/2022
2. Jarangdih Colony	05-06/10/2022
3. P.O.Office	05-06/10/2022
4. Guest House	06-07/10/2022

S.No	Test Parameters	Units	Test Result				Method detection Limit	Limit (NAAQS-2011)	Test Method
	Stations:		1	2	3	4			
1	Conc. of As in Air	ng/m³	0.95	0.69	1.95	1.02	0.1	6.00	USEPA IO-3.2:1999
2	Conc. of Ni in Air	ng/m³	8.67	5.57	17.54	6.92	0.1	20.00	USEPA IO-3.2:1999
3	Conc. of Pb in Air	µg/m³	0.013	0.009	0.037	0.020	0.005	1.0	USEPA IO-3.2: 1999
4	Conc. of Cu in Air	ng/m³	<0.10	<0.10	0.13	0.11	0.1	-	USEPA IO-3.2: 1999
5	Conc. of Cd in Air	ng/m³	0.141	0.132	0.222	0.149	0.02	-	USEPA IO-3.2: 1999
6	Conc. of Cr in Air	ng/m³	1.73	4.49	1.62	1.65	0.1	-	USEPA IO-3.2: 1999
7	Conc. of Hg in Air	ng/m³	<0.005	<0.005	<0.005	<0.005	0.005	-	USEPA IO-3.2: 1999

Note: 1) This Report refers to the values obtained at the time of testing and results related to the items tested
2) This Report cannot be reproduced in part or full without written permission of the management.
3) This is computer generated report and requires no signature.

TEST REPORT

12/22 Test Report No. Metal/09		Job No. 094322160	2022-23
Type of Sample	Ambient Air	Quarter Ending	Dec.'22
Customer	CCL	Date of Receipt of Sample:	17/10/2022
Mode of Receipt of Sample:	Joint sampling with customer	Date of Analysis:	05/11/22-23/12/22
Sampling Protocol:	USEPA IO-3.2: 1999, LQR 32		
Remarks & Observation:	All samples placed 1.5 m above ground level		

TEST RESULT

The sample has been tested with the following results:-

Area : **Kathara** **Project:** **Jarangdih UG**

Stations:

1. Gr. VPC Jarangdih
2. 5&6 Incline
3.
4.

Date of Sampling:
12-13/10/2022
12-13/10/2022

S.No	Test Parameters	Units	Test Result				Method detection Limit	Limit (NAAQS-2011)	Test Method
	Stations:		1	2	3	4			
1	Conc. of As in Air	ng/m³	1.15	1.48			0.1	6.00	USEPA IO-3.2:1999
2	Conc. of Ni in Air	ng/m³	9.21	16.35			0.1	20.00	USEPA IO-3.2:1999
3	Conc. of Pb in Air	µg/m³	0.017	0.040			0.005	1.0	USEPA IO-3.2: 1999
4	Conc. of Cu in Air	ng/m³	<0.10	0.11			0.1	-	USEPA IO-3.2: 1999
5	Conc. of Cd in Air	ng/m³	0.154	0.229			0.02	-	USEPA IO-3.2: 1999
6	Conc. of Cr in Air	ng/m³	0.56	7.57			0.1	-	USEPA IO-3.2: 1999
7	Conc. of Hg in Air	ng/m³	<0.005	<0.005			0.005	-	USEPA IO-3.2: 1999

Note: 1) This Report refers to the values obtained at the time of testing and results related to the items tested
2) This Report cannot be reproduced in part or full without written permission of the management.
3) This is computer generated report and requires no signature.

NextGen
mParivahan
One stop transport solution for citizen

Annexure X

Vehicle Search

Vehicle Number	JH01CU4655
Owner Name	*R*N* *U*A* *G*R*A*
Registering Authority	RANCHI, Jharkhand
Vehicle Class	Goods Carrier(HGV)
Fuel Type	DIESEL
Vehicle Age	5 Years & 2 months
Vehicle Status	ACTIVE

Tap to Check the Vehicle Impound & Seizure Document Status

Registration Date	30-Jan-2018
Fitness Valid UpTo	20-Jan-2024
Tax Valid UpTo	11-Oct-2023
Insurance Valid UpTo	29-Jun-2023
PUCC Valid UpTo	12-Apr-2024
Permit Valid UpTo	26-Jun-2027

Create Virtual RC

View Challan

NextGen
mParivahan
One stop transport solution for citizen

Vehicle Search

Vehicle Number	JH01CQ5483
Owner Name	*I*A*A* *U*P*R* *E*V*C*S* *V* *T*
Registering Authority	RANCHI, Jharkhand
Vehicle Class	Goods Carrier(HGV)
Fuel Type	DIESEL
Vehicle Age	5 Years & 5 months
Vehicle Status	ACTIVE

Tap to Check the Vehicle Impound & Seizure Document Status

Registration Date	17-Oct-2017
Fitness Valid UpTo	17-Nov-2023
Tax Valid UpTo	12-Jul-2023
Insurance Valid UpTo	27-Nov-2023
PUCC Valid UpTo	12-Apr-2024

Create Virtual RC

View Challan

NextGen
mParivahan
One stop transport solution for citizen

Vehicle Search

Vehicle Number	JH09AH5999
Owner Name	*I*O* *R* *G*A*A*
Registering Authority	BOKARO, Jharkhand
Vehicle Class	Goods Carrier(HGV)
Fuel Type	DIESEL
Vehicle Age	5 Years & 5 months
Vehicle Status	ACTIVE

Tap to Check the Vehicle Impound & Seizure Document Status

Registration Date	10-Nov-2017
Fitness Valid UpTo	08-Feb-2024
Tax Valid UpTo	17-Jul-2023
Insurance Valid UpTo	18-Oct-2023
PUCC Valid UpTo	12-Apr-2024

Create Virtual RC

View Challan

NextGen
mParivahan
One stop transport solution for citizen

Vehicle Search

Vehicle Number	JH09AH7952
Owner Name	*I*O* *U*A* *G*A*A*
Registering Authority	BOKARO, Jharkhand
Vehicle Class	Goods Carrier(HGV)
Fuel Type	DIESEL
Vehicle Age	5 Years & 5 months
Vehicle Status	ACTIVE

Tap to Check the Vehicle Impound & Seizure Document Status

Registration Date	10-Nov-2017
Fitness Valid UpTo	08-Feb-2024
Tax Valid UpTo	17-Jul-2023
Insurance Valid UpTo	18-Oct-2023
PUCC Valid UpTo	12-Apr-2024

Create Virtual RC

View Challan

NextGen
mParivahan
One stop transport solution for citizen

Vehicle Search

Vehicle Number	JH09AH0492
Owner Name	*I*O* *R* *G*A*A*
Registering Authority	BOKARO, Jharkhand
Vehicle Class	Goods Carrier(HGV)
Fuel Type	DIESEL
Vehicle Age	5 Years & 5 months
Vehicle Status	ACTIVE

Tap to Check the Vehicle Impound & Seizure Document Status

Registration Date	10-Nov-2017
Fitness Valid UpTo	08-Feb-2024
Tax Valid UpTo	17-Jul-2023
Insurance Valid UpTo	18-Oct-2023
PUCC Valid UpTo	12-Apr-2024

Create Virtual RC

View Challan

NextGen
mParivahan
One stop transport solution for citizen

Vehicle Search

Vehicle Number	JH09AH6233
Owner Name	*I*O* *R* *G*A*A*
Registering Authority	BOKARO, Jharkhand
Vehicle Class	Goods Carrier(HGV)
Fuel Type	DIESEL
Vehicle Age	5 Years & 5 months
Vehicle Status	ACTIVE

Tap to Check the Vehicle Impound & Seizure Document Status

Registration Date	10-Nov-2017
Fitness Valid UpTo	08-Feb-2024
Tax Valid UpTo	17-Jul-2023
Insurance Valid UpTo	18-Oct-2023
PUCC Valid UpTo	12-Apr-2024

Create Virtual RC

View Challan

NextGen
mParivahan
One stop transport solution for citizen

Vehicle Search

Vehicle Number	JH09AH3485
Owner Name	*R* *I*O* *R* *G*A*A*
Registering Authority	BOKARO, Jharkhand
Vehicle Class	Goods Carrier(HGV)
Fuel Type	DIESEL
Vehicle Age	5 Years & 5 months
Vehicle Status	ACTIVE

Tap to Check the Vehicle Impound & Seizure Document Status

Registration Date	16-Oct-2017
Fitness Valid UpTo	21-Jan-2024
Tax Valid UpTo	25-Sep-2023
Insurance Valid UpTo	01-Oct-2023
PUCC Valid UpTo	12-Apr-2024

Create Virtual RC

View Challan

Form 59

[See rules 115 (2)]

Annexure X

Pollution Under Control Certificate

Authorised By :
Government of Jharkhand

Date	:	**21/02/2023**
Time	:	**12:42:40 PM**
Validity upto	:	**20/08/2023**

Certificate SL. No.	:	JH00900550003200
Registration No.	:	JH10AX7038
Date of Registration	:	02/Feb/2016
Month & Year of Manufacturing	:	January-2016
Valid Mobile Number	:	******9360
Emission Norms	:	BHARAT STAGE III
Fuel	:	DIESEL
PUC Code	:	JH0090055
GSTIN	:	
Fees	:	Rs.300.00 (GST to be paid extra as applicable)
MIL observation	:	No

Vehicle Photo with Registration plate
60 mm x 30 mm

Sr. No.	Pollutant (as applicable)	Units (as applicable)	Emission limits	Measured Value (upto 2 decimal places)
1	2	3	4	5
Idling Emissions	Carbon Monoxide (CO)	percentage (%)		
	Hydrocarbon, (THC/HC)	ppm		
High idling emissions	CO	percentage (%)		
	RPM	RPM	2500 ± 200	
	Lambda	-	1 ± 0.03	
Smoke Density	Light absorption coefficient	1/metre	2.45	2.08

This PUC certificate is system generated through the national register of motor vehicles and does not require any signature.

Note : 1. Vehicle owners to link their mobile numbers to registered vehicle by logging to https://puc.parivahan.gov.in

Authorised Signature with stamp of PUC operator
60mm x 20 mm

Form 59

[See rules 115 (2)]

Pollution Under Control Certificate

Authorised By :
Government of Jharkhand

Date	:	**22/12/2022**
Time	:	**16:14:51 PM**
Validity upto	:	**21/12/2023**

Certificate SL. No.	:	JH00900550002965
Registration No.	:	JH10BS1724
Date of Registration	:	21/Feb/2019
Month & Year of Manufacturing	:	December-2018
Valid Mobile Number	:	******3681
Emission Norms	:	BHARAT STAGE IV
Fuel	:	DIESEL
PUC Code	:	JH0090055
GSTIN	:	
Fees	:	Rs.300.00 (GST to be paid extra as applicable)
MIL observation	:	No

Vehicle Photo with Registration plate
60 mm x 30 mm

Sr. No.	Pollutant (as applicable)	Units (as applicable)	Emission limits	Measured Value (upto 2 decimal places)
1	2	3	4	5
Idling Emissions	Carbon Monoxide (CO)	percentage (%)		
	Hydrocarbon, (THC/HC)	ppm		
High idling emissions	CO	percentage (%)		
	RPM	RPM	2500 ± 200	
	Lambda	-	1 ± 0.03	
Smoke Density	Light absorption coefficient	1/metre	1.62	1.22

This PUC certificate is system generated through the national register of motor vehicles and does not require any signature.

Note : 1. Vehicle owners to link their mobile numbers to registered vehicle by logging to https://vahan.parivahan.gov.in

Authorised Signature with stamp of PUC operator
60mm x 20 mm

Form 59

[See rules 115 (2)]

Pollution Under Control Certificate

Authorised By :
Government of Jharkhand

Date	:	**22/12/2022**
Time	:	**15:45:41 PM**
Validity upto	:	**21/06/2023**

Certificate SL. No.	:	JH00900550002964
Registration No.	:	JH09AA3753
Date of Registration	:	11/Sep/2015
Month & Year of Manufacturing	:	April-2015
Valid Mobile Number	:	******3681
Emission Norms	:	BHARAT STAGE III
Fuel	:	DIESEL
PUC Code	:	JH0090055
GSTIN	:	
Fees	:	Rs.300.00 (GST to be paid extra as applicable)
MIL observation	:	No

Vehicle Photo with Registration plate
60 mm x 30 mm

Sr. No.	Pollutant (as applicable)	Units (as applicable)	Emission limits	Measured Value (upto 2 decimal places)
1	2	3	4	5
Idling Emissions	Carbon Monoxide (CO)	percentage (%)		
	Hydrocarbon, (THC/HC)	ppm		
High idling emissions	CO	percentage (%)		
	RPM	RPM	2500 ± 200	
	Lambda	-	1 ± 0.03	
Smoke Density	Light absorption coefficient	1/metre	2.45	2.08

This PUC certificate is system generated through the national register of motor vehicles and does not require any signature.

Note : 1. Vehicle owners to link their mobile numbers to registered vehicle by logging to https://vahan.parivahan.gov.in

Authorised Signature with stamp of PUC operator
60mm x 20 mm

Annexure XI

Item wise expenditure on Environment protection measure for Jarangdih Project

Sl. No.	Item		2022-23	Expenditure (lakh) 2021-22	2020-21	2019-20	2018-19
1.	Seed Ball					2.065	
2.	Controlled Blasting	1. Wire Net			1.06	1.06	2.85
		2. Sake/Jute bag				0.61	2.43
3.	Water sprinkler on public road				2.67		13.86
4.	Fixed Sprinklers at Siding along the weighbridge				5		
5.	Tyre washing platform at Exit point of Mine				4.14		
6.	Wind Breaking Mesh along the railway siding			35	16.36		
7.	Distribution of Saplings to the Employees				0.90		
8.	Earth Cutting and dressing for covering of Fly Ash/coal dust				2.77		
9.	Peizometer			2.50			
10.	Siltation pond			2.96			
11.	Construction of 2 nos. silt settling tank with drain for drainage of Railway siding.			11.77			
12.	Installation of PM10 analyzer			9			
13.	Toe wall 225m at dump			7.30			
14.	Bamboo and other plantation			10			
15.	ETP at workshop		19				
16.	Fixed sprinklers along Jarangdih HMB Road near Siding		11.90				
17.	Plantation of Polyalthia longifolia (Ashok) along Railway Siding, Jarangdih OCP		11.37				
18.	Toe wall 250m at dump		15.59				
	Total		**57.86**	**78.53**	**32.90**	**3.735**	**19.14**

Proposed Capital budget of Jarangdih Project in 2023-24.

Sl. No.	Item	Expenditure(lakh)	Remarks
1.	Plantation	80	Award of work has been done
2.	STP at Colony	20	Approval phase
3.	Mist Fogger Machine to control dust	20	Tendering process
	Total	**120**	