WESTERN COALFIELDS LIMITED
OFFICE OF THE SUB AREA MANAGER
SASTI SUB AREA, BALLARPUR AREA

Ref No. WCL/BA/AGM/ENV/708 Date 27/11/2025

To
Addl. Principal Chief Conservator of Forests,
Ministry of Environment, Forest & Climate Change
Integrated Regional Office, Ground Floor,
East Wing, "New Secretariat Building", Civil Lines,
Nagpur, Maharashtra- 440001

Sub: - Submission of Six-monthly EC Compliance Report in respect of **DHOPTALA OC MINE**, Ballarpur Area, WCL for the period from 1st April 2025 to 30th September 2025.

Respected Sir,

Please find enclosed herewith the Six-Monthly EC Compliance Report in respect of Dhoptala Opencast Project, Ballarpur Area for the period from 1st April 2025 to 30th September 2025.
EC NO: J-11015/538/2008-IA.II(M) Dated:- 10.01.2013

Thanking you.

Encl. Environment Compliance Report

Yours Faithfully,

Sub Area Manager
Sasti Sub Area

Copy To,
1. **Regional Officer, MPCB Chandrapur.**
2. **AGM, Ballarpur Area , WCL**
3. **The General Manager (Env) WCL, Nagpur**
4. **GM (Environment), CMPDIL RI – IV, Nagpur**
5. **Area Nodal Officer (Env), Wani Area.**
6. **Office Copy**

BY SPEED POST

No. J-11015/538/2008-IA.II (M)
Government of India
Ministry of Environment & Forests

Paryavaran Bhawan,
CGO Complex,Lodi Road
New Delhi-110510.
Dated: 10th January, 2013

To
The General Manager (Environment),
M/s Western Coalfields Ltd.,
Coal Estate, Civil Lines,
NAGPUR – 440001.

Sub: **Dhuptala Opencast Mining Project (1.70 MTPA production capacity in an area of 1300.91 ha) of M/s Western Coalfields Ltd located near village Dhuptala, Tehsil Rajura, District Chandrapur, Maharashtra-Environmental Clearance-regarding**

Sir,

This has reference to letter No. 43011/121/2008-CPAM dated 19.12.2008 of Ministry of Coal forwarding your application for Terms of Reference (TOR) and this Ministry's letter dated 9th February 2009 granting TOR to the above mentioned Project and subsequent letter from M/s WCL bearing no. WCL/ENV/HQ/1-C/309 dated 21.07.2012 submitting therewith the final EIA/EMP for Environmental Clearance for the above mentioned subject.

2. The Ministry of Environment & Forests has considered the application. It is noted that the application is for environmental clearance for new **Opencast Project named Dhuptala Opencast in terms of 1.70 MTPA production capacity in an area of 1300.91 ha.**The proposal is for conversion of Sasti underground mine to opencast mine (OCP) and to amalgamate it with the existing Dhuptala OCP. It has been noted, as has been presented by the proponent, that:

(i) The proposal is for conversion of Sasti underground mine to opencast mine (OCP) and to amalgamate it with the existing Dhuptala OCP. The main consumer of coal is MAHAGENCO. Of the total lease area of 1300.91 ha, 1264.31 ha consist of agricultural land (land to be acquired – 879.14 ha and 385.17 ha is under possession) and 36.60 ha Govt. land (to be acquired) and 5 ha outside ML area for colony.

(ii) The land use pattern of the of the open cast area (total 1300.91 ha) would be 385.68ha forexcavation area, 396ha for external OB dump, 30 ha for infrastructure / approach road, 3 ha for colony,15 ha for nala diversion, 381.23 ha for rationalization of mine boundary, 90 ha is for embankment.

(iii) The mineable reserve is 54.60.The depth of initial mining is 25 m and final depth would be150m. The gradient of seam is 1 in 10 to 1 in 18. The average thickness of seam is 15.68m and the grade of coal is F. The stripping ratio is 5.12 m3/t. Life of mine is 37 years.

(iv) The coal transportation would be carried out by tarpaulin covered trucks.

(v) The open cast mining would be by Shovel & Dumper combination. Continuous miner would be introduced in future.

(vi) The total OB (including access trench) would be 279.50 Mm^3. Of the total excavated area, 200 ha excavated area would be backfilled. The backfilling will be started from 10th year of the opening of the project. The total O.B. would be 289.16 Mm^3. OB in external O.B. dump would be 203.46Mm^3(including 6.0mm^3OB in embankment, 34.30Mm^3 OB in external dump (unconsolidated) and 163.16Mm^3(hard OB) in external dump. OB in internal dumping would be 85.70mm^3.

(vii) In the post-mining stage, the land use pattern would be that the area under plantation would be 756 ha, public use will be 38 ha, undisturbed/area will be 321.23 ha, water body in 185.68 ha area with 150m depth . At the end of mining total 756 ha area would be under plantation with 1890000 no of plants.

(viii) River Wardha flows adjacent to the ML boundary. Dhuptala nala and a local drain are flowing through the proposed quarriable area and drain into Rajur nala and further into Wardha River. Water level in core area is 6.75 to 7.40 m.bgl (Pre-Monsoon) & 1.1m bgl & 1.50m- bgl (Post Monsoon). The total requirement of water is 460 m^3/day, the industrial requirement is 260m^3/day and domestic requirement is 200 m^3/day and mine water discharge is 13000m^3/day.

(ix) The R&R of Sasti village involves PAFs 75 Nos. which is located in quarriable area and is proposed to be shifted to a new site. The R&R cost would be Rs 10.82 crores. The Environmental Management & Protection Cost would be Rs 30 Lakh and recurring cost Rs 51.00 Lakh/annum. The CSR cost would be Rs.6.00 lakhs / year. The capital investment for the mining would be Rs.194.1064 crores.

(x) There is no forest land involved in the project. There is no National Parks, Wildlife Sanctuaries, Biosphere Reserves is reported to be found in the 10 km buffer zone.

(xi) The Public Hearing was held on 07.12.2011. The proponent had assured to take necessary action on the issues raised during public hearing.

2. The Ministry of Environment & Forests hereby accords environmental clearance for the above-mentioned **Dhuptala Opencast Coal Mine Project of M/s Western Coalfield for (1.70 MTPA production capacity in an area of 1300.91 ha)** under the provisions of the Environmental Impact Assessment Notification, 2006 and subsequent amendments thereto subject to the compliance of the terms and conditions mentioned below:

A. Specific Conditions

(i) The embankment constructed along the river boundary shall be of suitable dimensions and critical patches shall be strengthened by stone pitching on the river front side and stabilised with plantation so as to withstand the peak water flow and prevent mine inundation.

(ii) There shall be no overflow of OB into the river and into the agricultural fields and massive plantation of native species shall be taken up in the area between the river and the project.

(iii) OB shall be stacked at two earmarked external OB dumpsite(s) only. The ultimate slope of the dump shall not exceed 28°. Monitoring and management of existing reclaimed dumpsites shall continue until the vegetation becomes self-sustaining. Compliance status shall be submitted to the Ministry of Environment & Forests and its Regional office located at Bhopal on yearly basis.

(iv) 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 utilised for watering the mine area, roads, green belt development, etc. The drains shall be regularly desilted and maintained properly. Garland drains (size, gradient and length) and sump capacity shall be designed keeping 50% safety margin over and above the peak sudden rainfall and maximum discharge in the area adjoining the mine site. Sump capacity shall also provide adequate retention period to allow proper settling of silt material.

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

(vi) Crushers at the CHP of adequate capacity for the expansion project shall be operated with high efficiency bag filters, water sprinkling system shall be provided to check fugitive emissions from crushing operations, conveyor system, haulage roads, transfer points, etc.

(vii) Drills shall be wet operated.

(viii) The project authorities shall undertake regular repairing and tarring of roads used for mineral transportation. A 3-tier green belt comprising of a mix of native species shall be developed all along the major approach roads,

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

(x) A Progressive afforestation plan shall be implemented covering an area of 630 ha at the end of mining, which includes reclaimed external OB dump (350 ha), Excavation area (150 ha), along ML boundary, along roads and infrastructure (10 ha), embankment area (50 ha) and Green belt (70 ha) and in township located outside the lease by planting native species in consultation with the local DFO/Agriculture Department. The density of the trees shall be around 2500 plants per ha. Massive plantation shall be carried out in open spaces in and around the mine and a 3-tier avenue plantation along the main approach roads to the mine.

(xi) An estimated 289.16 Mm3 of OB will be generated during the entire life of the mine. Out of which 197.46 Mm3 of OB will be dumped in two external OB Dump in an earmarked area covering 396.00 ha of land. 6.00 Mm3 of OB will be dumped in embankment covering an area of 50.00 ha. The maximum height of external OB dump for hard OB will not exceed 90 m and that for soft OB shall not exceed 60 m. The maximum slope of the dump shall not exceed 28 degrees. Monitoring and management of reclaimed dump sites shall continue till the vegetation becomes self- sustaining and compliance status shall be submitted to MOEF and its Regional Office on yearly basis.

(xii) Of the total quarry area of 385.68 ha, the backfilled quarry area of 150 ha shall be reclaimed with plantation and a void of 185.68 ha at a depth of 150 m which is proposed to be converted into a water body shall be gently sloped and the upper benches shall be terraced and stabilised with plantation/afforestation by planting native plant species in consultation with the local DFO/Agriculture Department. The density of the trees shall be around 2500 plants per ha.

(xiii) No groundwater shall be used for mining operations.

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

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

(xvi) Sewage treatment plant shall be installed in the existing colony. ETP shall also be provided for workshop and CHP wastewater.

(xvii) Besides carrying out regular periodic health check up of their workers, 10% of the workers identified from workforce engaged in active mining operations shall be subjected to health check up for occupational diseases and hearing impairment, if any, through an specialised agency /institution within the District/State and the results reported to this Ministry and to DGMS.

EC Dhuptala

(xviii) Land oustees shall be compensated as per the norms laid out R&R Policy of CIL or the National R&R Policy or R&R Policy of the State Government whichever is higher.

(xix) For monitoring land use pattern and for post mining land use, a time series of landuse 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 Bhopal.

(xx) A detailed Final Mine Closure Plan along with details of Corpus Fund shall be submitted to the Ministry of Environment & Forests within 6 months of grant of Environmental Clearance.

(xxi) The project authorities shall in consultation with the Panchayats of the local villages and administration identify socio-economic and welfare measures under CSR to be carried out over the balance life of the mine.

(xxii) Corporate Environment Responsibility:

a) The Company shall have a well laid down Environment Policy approved by the Board of Directors.

b) The Environment Policy shall prescribe for standard operating process/procedures to bring into focus any infringements/deviation/violation of the environmental or forest norms/conditions.

c) The hierarchical system or Administrative Order of the company to deal with environmental issues and for ensuring compliance with the environmental clearance conditions shall be furnished.

d) To have proper checks and balances, the company shall have a well laid down system of reporting of non-compliances/violations of environmental norms to the Board of Directors of the company and/or shareholders or stakeholders at large.

(xxiii) Additional Conditions:-

i. A Social Audit should be carried out annually for CSR activities. CSR activities should be carried out @ Rs 5/MT of production apart from Rs 80 Lakhs one time Capital expenditure.

ii. The proponent should prepare restoration and reclamation plan for the degraded area. The land be used in a productive and sustainable manner.

iii. Compensatory Ecological &Restoration of waste land, other degraded land and OB dumps in lieu of breaking open the land be carried out.

iv. The mining should be phased out in sustainable manner. No extra over burden dumps are permitted.

v. 100% backfilling should be carried out.

vi. The transportation of coal should be by a combination of road and rail. The road transportation of coal from the mine to railway siding will be by road and thereafter by rail to MAHAGENCO.

vii. Mechanically covered trucks should be introduced for coal transportation.

viii. Wagon loading at railway siding to be by mechanized hopper/silo loading.

ix. The proponent should implement the assurances given during the Public Hearing.

B. General Conditions

i. No change in mining technology and scope of working shall be made without prior approval of the Ministry of Environment and Forests.

ii. No change in the calendar plan of production for quantum of mineral coal shall be made.

iii. Four ambient air quality monitoring stations shall be established in the core zone as well as in the buffer zone for PM_{10}, $PM_{2.5}$, SO_2 and NOx monitoring. Location of the stations shall be decided based on the meteorological data, topographical features and environmentally and ecologically sensitive targets in consultation with the State Pollution Control Board. In addition, CO and CH4 shall also be monitored within the underground coal mine and records thereof maintained and uploaded on the company website and also submitted to MOEF, RO, Bhopal.

iv. Fugitive dust emissions (PM_{10} and $PM_{2.5}$) from all the sources shall be controlled regularly monitored and data recorded properly. Water spraying arrangement on haul roads, wagon loading, dump trucks (loading and unloading) points shall be provided and properly maintained.

v. Data on ambient air quality (PM_{10}, $PM_{2.5}$, SO2 and NOx) shall be regularly submitted to the Ministry including its Regional Office at Bhopal and to the State Pollution Control Board and the Central Pollution Control Board once in six months.

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

vii. Industrial wastewater (workshop and wastewater from the mine) shall be properly collected, treated so as to conform to the standards prescribed under GSR 422 (E) dated 19th May 1993 and 31st December 1993 or as amended from time to time before discharge. Oil and grease trap shall be installed before discharge of workshop effluents.

viii. Vehicular emissions shall be kept under control and regularly monitored. Vehicles used for transporting the mineral shall be covered with tarpaulins and optimally loaded.

ix. Monitoring of environmental quality parameters shall be carried out through establishment of adequate number and type of pollution monitoring and analysis equipment in consultation with the State Pollution Control Board and data got analysed through a laboratory recognised under EP Rules, 1986.

x. Personnel working in dusty areas shall wear protective respiratory devices and they shall also be provided with adequate training and information on safety and health aspects.

Occupational health surveillance programme of the workers shall be undertaken periodically to observe any contractions due to exposure to dust and to take corrective measures, if needed and records maintained thereof.

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

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

ix. The proponent should implement the assurances given during the Public Hearing.

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xiii. The Regional Office of this Ministry located at Bhopal shall monitor compliance of the stipulated conditions. The Project authorities shall extend full cooperation to the office(s) of the Regional Office by furnishing the requisite data/ information/monitoring reports.

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

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

xvi. The Project authorities shall advertise at least in two local newspapers widely circulated around the project, one of which shall be in the vernacular language of the locality concerned within seven days of the clearance letter informing that the project has been accorded environmental clearance and a copy of the clearance letter is available with the State Pollution control Board and may also be seen at the website of the ministry of Environment & Forests at http://envfor.nic.in.

3. The Ministry or any other competent authority may stipulate any further condition for environmental protection.

4. Failure to comply with any of the conditions mentioned above may result in withdrawal of this clearance and attract the provisions of the Environment (Protection) Act, 1986.

5. The above conditions will be enforced *inter-alia*, under the provisions of the Water (Prevention & Control of Pollution) Act, 1974, the Air (Prevention & Control of Pollution) Act, 1981, the Environment (Protection) Act, 1986 and the Public Liability Insurance Act, 1991 along with their amendments and Rules. The proponent shall ensure to undertake and provide for the costs incurred for taking up remedial measures in case of soil contamination, contamination of groundwater and surface water, and occupational and other diseases due to the mining operations.

10 Jan 2013
(Dr. Manoranjan Hota)
Director

Copy to:

1. Secretary, Ministry of Coal, New Delhi.
2. Secretary, Department of Environment, Government of Maharashtra, 15th Floor, New Admn. Bldg., Madam Cama Road, MUMBAI – 400032..
3. Chief Conservator of Forests, Regional office (EZ), Ministry of Environment & Forests, E-2/240 Arera Colony, Bhopal – 462016.
4. Member Secretary, Maharsashtra State Pollution Control Board, Kalapataru Point, 3rd& 4th Floors, Sion, Matunga Scheme Road No. 8, Opp. Cine Planet Cinema, Near Sion Circle, Sion (E), Mumbai – 400002.
5. Chairman, Central Pollution Control Board, CBD-cum-Office Complex, East Arjun Nagar, New Delhi -110032.
6. Member-Secretary, Central Ground Water Authority, Ministry of Water Resources, Curzon Road Barracks, A-2, W-3 Kasturba Gandhi Marg, New Delhi.
7. Dr. R.K. Garg, Advisor, Coal India Limited, SCOPE Minar, Core-I, 4t Floor, VikasMarg, Laxminagar, New Delhi.
8. District Collector, Chandrpaur, Government of Maharashtra.
9. Monitoring File 10. Guard File 11. Record File.

10 Jan 2013
(Dr. Manoranjan Hota)
Director

Environmental Clearance No.J - 11015/538/2008 - IA.II (M) Date: 10.01.2013

Compliance of Conditions

DHOPTALA OCM(Project)

A) Specific Conditions

Sr.N	Conditions	Compliance
i)	The embankment constructed along the river boundary shall be of suitable dimensions and critical patches shall be strenthened by stone pitching on the river front side and stablised. With plantation so as to withstand the peak water flow and prevent mine inundation	Embankment of length 2km has been constructed has already been stabilized with plantation of 46.60 Ha. Biodiversity study has been conducted by CMPDIL, Ranchi in August 2023 which helps to understand understanding the ecological impact of mining activities and the effectiveness of reclamation efforts. A biodiversity study of the reclaimed OB dump sites of Dhuptala OC Mines would provide valuable information on the success of reclamation efforts in restoring ecological diversity and sustainability to areas that have been affected by mining activities. It has been concluded in the study that there are 29 different varieties of 116 tree species found in the study area representing 12 families. The embankment has been completely stabilized. Report enclosed as **Annexure I.**
ii)	There shall be no overflow of OB in to the river and in to agricultural fields and massive plantation of native species shall be taken up in the area between the river and the project	There is no overflow of OB into the river. Embankment of length 2km has been constructed has already been stabilized with plantation of 46.60 Ha. Biodiversity study has been conducted by CMPDIL, Ranchi in August 2023 which helps to understand understanding the ecological impact of mining activities and the effectiveness of reclamation efforts. A biodiversity study of the reclaimed OB dump sites of Dhuptala OC Mines would provide valuable information on the success of reclamation efforts in restoring ecological diversity and sustainability to areas that have been affected by mining activities. It has been concluded in the study that there are 29 different varieties of 116 tree species found in the study area representing 12 families. The embankment has been completely stabilized. Report enclosed as **Annexure I.**
iii)	OB shall be stacked at two earmarked external OB dump site (S) only. The ultimate slope of the dump shall not exceed 28 degree.monitoring and management of existing reclaimed dumpsites shall continue until the vegetation becomes self-substaining. Compliance status shall be submitted to the ministry of environment and forest and its regional office located at bhopal on yearly basis.	OB will be stacked at two earmarked OB dump sites during life of mine. . In addition once the dumps get inactive, biological reclamation shall also be carried. Compliance status will be submitted along with six monthly compliance reports. The “Stability Analysis of Pit & Overburden Dump Slopes at Dhoptala Opencast Mine ”, has been conducted by IIEST, Shibpur and documented in the Scientific study report of October 2022. Copy Enclosed as **Annexure- II.**

Iv)	Catch drain and siltation pond of appropriate size shall be constructed to arrest silt and sediment flows from soil, OB and mineral dumps. The water so collected should be utilized for watering the mine area, roads, green belt development etc. The drains should be regularly desisted and maintained properly. Garland drains (size gradient and length) and sump capacity should be designed keeping 50 % safety margin over and above the peak sudden rainfall and maximum discharge in the area adjoining the mine site. Sump capacity should be also provided adequate retention periods to allow proper settling of site materials.	Noted and will be complied. 5.11 km of catch drains of 3.5 m x 1.5 m size have been provided all along periphery of existing OB dump to arrest silt and sediment flow from the respective dump sites. Cleaning of drains every year before the onset of monsson.
V	Dimension of the retaining wall at the toe of the dumps and OB benches within the mine to check run-off and siltation should be based on rainfall data.	Measures have been taken at the toe of the dump for checking run-off and siltation through construction of garland drains around the periphery of dumps. 5.11 km of catch drains of 3.5 m x 1.5 m size have been provided. These drains are cleaned and de-silted before onset of every monsoon. In addition once the dumps get inactive, biological reclamation shall also be carried which will further arrest flow of silt and sedimentation from OB dumps.
Vi	Crushers of the CHP of adequate capacity for the expansion project shall be operated with high efficiency bag filters, water sprinkling system shall be provided to check fugitive emission from crushing operations , conveyor system, haulage roads,transferpoints,etc.	Appropriate dust control measures have been installed at Crusher to check fugitive emission. 1. PP procured 3 no. of trolley mounted mist fogger machine to control fugitive dust emission. 2. Truck mounted sweeping machine have been deployed to curtail dust emission. 3. 16 nos. rain-guns have been installed around coal stock yard for dust suppression. 4. Automatic Tire Wash System has been commissioned 5. Dust Barrier of length 350 m has been provided along Coal stock yard to arrest dust. 6. 4 nos. Mobile water tankers have been deployed of 1 no. 20 Kl and 3 nos. 15 KL.
Vii	Drills shall be wet operated.	3 nos. Of Drills have been deployed and are wet operated.

<table>
<tr><td>viii</td><td>The project authorities' shall undertake regular repairing and tarring of roads used for mineral transportation .A 3-tier green belt comprising of a mix of native species shall be developed all along the major approach road</td><td>Total Coal transportation road from Coal stock yard to Railway siding of length 4.8 km have been converted to Tar road.
Regular maintenance is done as per requirement.
Further, Avenue plantation have been proposed to be done along Coal transportation road in FY 25-26</td></tr>
<tr><td>Ix</td><td>Controlled blasting shall be practiced with the use of delay detonators and only during daytime .the meditative measures for control of ground vibrations and to arrest the fly rocks and boulders shall be implemented</td><td>Controlled blasting is done based on Scientific study conducted. (Enclosed as Annexure-III)

Deep hole blasting is being done using NONEL down the hole initiation system. Connectors are used to provide hole to hole delay in blasting sequence, that reduce overall vibration due to Blasting. Vibrators are being used to measure ground vibrations.</td></tr>
<tr><td>x</td><td>A progressive afforestation plan shall be implemented covering an area of 630 ha at the end of mining ,which includes reclaimed external OB dumb (350 ha),excavation area (150 ha),along ML boundary ,along roads and infrastructure (10 ha) ,embankment area (150ha) and green belt(70 ha) and in township located outside the lease by planting native species in consultation with the local DFO OR Agriculture department .the density of the tress shall be around 2500 plants per ha. Massive plantation shall be carried out in open spaces in and around the mine and a 3-tier avenue plantation along main approach roads to the mine</td><td>In Dhoptala Mine upto 31.03.2025, plantation has been carried out in 98.35 Ha of land (387125 nos.) with maintenance of four years. The species of plants planted are namely; Shishu, Imli, Jambhul, Awala, Neem, Karanj, Bamboo, Raintree, Arjun, Amalthas, etc. From the above, it may be seen that, 171500 Nos. (57.6 Ha) saplings have been planted on External OB Dump and over Embankment.

Future progressive plantation to be carried out in Next 5 years is as follows:
<table>
<tr><th>Sr no.</th><th>Year</th><th>Area (Ha)</th></tr>
<tr><td>1</td><td>2025-26</td><td>8</td></tr>
<tr><td>2</td><td>2026-27</td><td>13</td></tr>
<tr><td>3</td><td>2027-28</td><td>25</td></tr>
<tr><td>4</td><td>2028-29</td><td>10</td></tr>
<tr><td>5</td><td>2029-30</td><td>5</td></tr>
</table>
Further plantation shall be carried out as mine progresses, to meet the plantation cover as per EC i.e. 630 Ha at the end of mine life.</td></tr>
</table>

<table>
<tr>
<td>xi</td>
<td>An estimated 289.16 Mm3 of OB will be generated during the entire life of the mine. Out of which 197.46 Mm3 of OB will be dumped in two external OB dump in an earmarked area covering 396.00 ha of land 6.00 Mm^3 of OB will be dumped in embankment covering
an area of 50.00ha. the maximum height of external OB dump for hard OB will not exceed 90m and that for soft Ob shall not exceed 28 degrees. Monitoring and management of reclaimed dump sites shall continue till the vegetation becomes self – sustaining and compliance status shall be submitted to MOEF and its Regional Office on yearly basis</td>
<td>Noted and will be complied.
Dhuptala OC mine is basically a conversion of existing Sasti UG mine. However, the EC has been obtained in 2013, Mine came into operation in FY 22-23.

Present average height of OB Dump is 60 m and overall slope is less than 28 degrees.

The quantity of OB dump generated from begining of the mine is given below
<table>
<tr><th>Sr. No.</th><th>Year</th><th>Hard Dump (Mm3)</th></tr>
<tr><td>1.</td><td>2022-23</td><td>7.407</td></tr>
<tr><td>2.</td><td>2023-24</td><td>11.306</td></tr>
<tr><td>3.</td><td>2024-25</td><td>9.42</td></tr>
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<tr>
<td>xii</td>
<td>Of the total quarry area of 385.68 ha ,the backfilled quarry area of 150 ha shall be reclaimed with plantation and avoid of 185.68 ha at adepth of 150 m which is proposed to be converted into water body shall be gently sloped and the upper benches shall be terraced and stabilised with plantation or afforestation by planting native plant species in consultation with local DFO or agricultural department .the density of the trees shall be around 2500 plants per ha</td>
<td>All OB presently has been accommodated into external OB dump, further as internal backfilling starts in future plantation shall be taken up in backfilled quarry area. Also,
a void of 185.68 ha at a depth of 150 m shall be left at the end of mine life.

In Dhoptala Mine upto 31.03.2025, plantation has been carried out in 98.35 Ha of land (387125 nos.) with maintenance of four years. The species of plants planted are namely; Shishu, Imli, Jambhul, Awala, Neem, Karanj, Bamboo, Raintree, Arjun, Amalthas, etc. From the above, it may be seen that, 171500 Nos. (57.6 Ha) saplings have been planted on External OB Dump and over Embankment.</td>
</tr>
<tr>
<td>xiii</td>
<td>No ground water shall be used for mining operations.</td>
<td>For day to day mining operations, mine water is used for dust suppression, and firefighting. The entire demand is met from the mine pumped out water of quantity 2137 m3/day.
No groundwater is being extracted for any mining activities. Copy of CGWA NOC attached as Annexure IV.</td>
</tr>
</table>

<table>
<tr><td>xiv</td><td>Regular monitoring of ground water level and quality should be carried out by establishing a network of existing wells and constructing new piezometers during the mining operation .the monitoring should be carried out four times in a year – pre-monsoon (April-may) monsoon (August) post monsoon (November) and winter (January) seasons and for quality in may. Data thus Collected Shall be Submitted to the Ministry of Environment & Forest and tot eh central pollution control Board Quarterly within one month of monitoring</td><td>The groundwater level monitoring is being carried 4 times a year in pre-monsoon (May), Monsoon (August), Post-monsoon (November) and Winter (January) seasons and for quality once in a year. The monitoring report is regularly sent to Regional Officer, CGWB Nagpur with a copy to MoEF&CC & CPCB.
Monitoring report of ground water level and quality enclosed as Annexure- V.</td></tr>
<tr><td>xv</td><td>The company shall put up artificial groundwater recharge measures for augmentation of groundwater resource in case monitoring indicates a decline in water table. The project authorities shall meet water requirement of nearby villages in case the village wells go dry due to dewatering of mine</td><td>Ground water level analysis is being done by CMPDIL on regular basis. There is no decline in water table as per Ground water monitoring reports. However, water is being supplied to nearby villages during summer season through tankers as per requirements given by gram panchayat.
Further, Rain water harvesting structures have been constructed at various location in Ballarpur Area for ground water augmentation.

Details of rainwater harvesting in Ballarpur Area enclosed as (Annexure-VI).

Details of Area and Location of rain water Harvesting system is as follows:
<table>
<tr><th>Sr.No.</th><th>Location</th><th>Area (m2)</th></tr>
<tr><td>1</td><td>AGM office, Ballarpur Area</td><td>900</td></tr>
<tr><td>2</td><td>Sub Area Manager Office, Gouri Sub Area</td><td>262.5</td></tr>
<tr><td>3</td><td>Workshop Gourideep</td><td>288</td></tr>
<tr><td>4</td><td>Manager Office, Gourideep</td><td>99.7</td></tr>
<tr><td>5</td><td>Officer Guesthouse, Ballarpur Area</td><td>300</td></tr>
<tr><td>6</td><td>Sub Area Manager Office, Sasti OC</td><td>323</td></tr>
</table></td></tr>
<tr><td>xvi</td><td>Sewage treatment Plant should be installed for the colony. ETP should also be Provided for workshop and CHP wastewater.</td><td>The manpower of this project are accomodated in existing Sasti township having a fullfledged STP of 1 MLD.
ETP of 150 KLD is under construction and will be Commissioned by 30.04.2024.
ETP is having oil Skimmer, Sedimentation tank , rapid mixer, Clarifloculator.
ETP sludge is sent to CHWTSDF at Butibori.</td></tr>
</table>

<table>
<tr><td>xvii</td><td>Besides carrying out regular periodic health check up of their workers ,10% of the workers identified from workforce engaged in active mining operations shall be subjected to health check up for occupational diseases and hearing impairment ,if any, through an specialised agency or institution within the district or state and the result reported to this ministry and to DGMS</td><td>Personal working in dusty areas are provided with dust masks. As per DGMS guildlines point no. 4.6 given in 10th conference on safety in mines held on 27.11.2007 in Delhi.

Personal working in dusty areas are provided with dust masks. Periodical health check-up of mine workers are carried out once in 5 years with the purpose of detecting occupational diseases & hearing impairment. Every worker in the mine is examined in 5 years- up to the age of 45; the workers who are above 45 years are subjected to periodic medical examination at three years interval. Area Hospital in WCL Ballarpur Area is a 25 bedded hospital.

At present, since opening no such occupational diseases and or hearing impairment has been recorded.
Details of Medical examination are as below:

PME record of Last two year
<table>
<tr><th>Year</th><th>Target</th><th>Departmental PME</th><th>Contractual IME</th></tr>
<tr><td>2022</td><td>-----</td><td>120</td><td>167</td></tr>
<tr><td>2023</td><td>225 (REVISED 140)</td><td>148</td><td>515</td></tr>
<tr><td>2024</td><td></td><td>266</td><td>695</td></tr>
</table>
</td></tr>
<tr><td>xviii</td><td>Land oustees shall be compensated as per the norms laid out R &R policy of CIL or the national R & R policy of the state government whichever is higher</td><td>Land ousted are compensated as per provisions of Maharashtra GR 2012. R&R benefits are provided as per provisions of CIL R&R policy. No R&R involved in Dhuptala OC mine.</td></tr>
<tr><td>xix</td><td>For monitoring land use pattern and for post mining land use, a time series of landuse 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 tn the time series),and the report submitted to MOEF and its regional office at Bhopal</td><td>Digital survey of entire lease hold area/core zone using satellite remote sensing survey will be carried out once in three years.
(Coal+OB) capacity is being done by Satellite and the data is available in the website of WCL, www. westerncoal.in.
The satellite data for Dhuptala OC mine shall be done in FY 24-25 report yet to be received.</td></tr>
</table>

<table>
<tr><td>xx</td><td>A detailed final mine closure plan along with details of corpus fund shall be submitted to the ministry of environment & forest within 6 months of grant of environmental clearance</td><td>Progressive Mine closure plan has been approved for the project by WCL Board on 09.03.2022.

Details of Amount Deposited is al follows:<table><tr><th>Sr no</th><th>Year</th><th>Amount Depos in Rs. Lakhs</th></tr><tr><td>1</td><td>2022-23</td><td>909.5</td></tr><tr><td>2</td><td>2023-24</td><td>22.74</td></tr><tr><td>3</td><td>2024-25</td><td>501.36</td></tr></table>Dhuptala OC mine is basically a conversion of existing Sasti UG mine. However, the EC has been obtained in 2013, Mine came into operation in FY 22-23.
Mine closure plan has been approved for the project by WCL Board on 09.03.2022. Attached as Annexure VII.</td></tr>
<tr><td>xxi</td><td>The project authorities shall inconsultation with the panchayats of the local villages and administration identify socio-economic and welfare measures under CSR to be carried out over the balance life of the mine.</td><td>It is being done in all other operating mines of WCL Ballarpur area. The same will be carried out in this project too.
CSR Expenditure for last five years is as below:<table><tr><th>Sr no.</th><th>Year</th><th>Expenditure (lakhs)</th></tr><tr><td>1</td><td>2019-20</td><td>237.35</td></tr><tr><td>2</td><td>2020-21</td><td>47.05</td></tr><tr><td>3</td><td>2021-22</td><td>2.17</td></tr><tr><td>4</td><td>2022-23</td><td>25.52</td></tr><tr><td>5</td><td>2023-24</td><td>60.3</td></tr><tr><td>6</td><td>2024-25</td><td>379.35</td></tr></table></td></tr>
<tr><td>xxii</td><td>Corporate environment responsibility:
a)The company shall have a well laid down environment policy approved by the board of directors
b)The environmental policy shall prescribe for standard operating/procedures to bring focus any infringements/deviation / violation of the environmental or forest norms/conditions.
c)the hierarchical system or administrative order of the company to deal with environmental issues and for ensuring compliance with the environmental clearance conditions shall be furnished
d) To have proper checks and balances ,the company shall have a well laid down system of reporting of non-compliances /violations of environmental norms to the board of directors of the company and/or shareholders at large.</td><td>The Coal India Limited Corporate Environment Policy 2019 is duly followed by WCL. As per OM F no. 22-65 2017 IA.III dated 30/09/2020 “The Expert Appraisal Committee or State Level Expert Appraisal Committee shall deliberate on the commitments made by the project proponent to address the concerns raised during the public consultation and prescribe specific condition(s) in physical terms while recommending the proposal, for grant of prior environment clearance instead of allocation of funds under Corporate Environment Responsibility”. Detailed compliance of assurances made in previous Public Hearing enclosed as (Annexure-VIII).

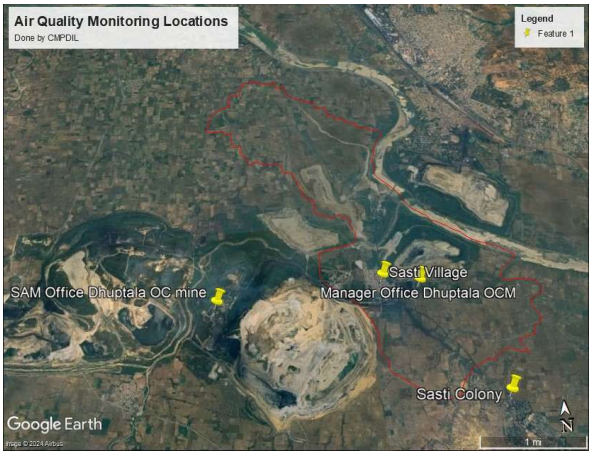
The Coal India Limited Corporate Environment Policy 2023 is duly followed by WCL. Attached as Annexure IX.
In view of the present fast changing social, economic and environmental scenario, this policy shall be reviewed every 5 years to incorporate the changes in the legal, technical, environmental, economic and social inputs prevailing at that time. Whenever, there is change in National Environmental Policy or other</td></tr>
</table>

<table>
<tr><td></td><td></td><td>National / State relevant policies, Acts etc, this Corporate Environmental Policy would be reviewed and suitably revised.</td></tr>
<tr><td>xxiii</td><td>Additional condition :
i)A social audit should be carried out annually for CSR activities should be carried out @Rs 5/MT of production apart from Rs 80 lakhs one time capital expenditure.</td><td>It is being done in all other operating mines of WCL Ballarpur area. The same will be carried out in this project too.
CSR Expenditure for last five years is as below:
<table>
<tr><td>Sr no.</td><td>Year</td><td>Expenditure (lakhs)</td></tr>
<tr><td>1</td><td>2020-21</td><td>47.05</td></tr>
<tr><td>2</td><td>2021-22</td><td>2.17</td></tr>
<tr><td>3</td><td>2022-23</td><td>25.52</td></tr>
<tr><td>4</td><td>2023-24</td><td>60.3</td></tr>
<tr><td>5</td><td>2024-25</td><td>379.35</td></tr>
</table></td></tr>
<tr><td></td><td>ii)The proponent should prepare restoration and reclamation plan for the degraded area. The land be used in a productive and sustainable manner.
iii) compensatory ecological & restoration of waste land,other degraded land and OB dumps in lieu of breaking open the land be carried out</td><td>Restoration and Reclamation shall be done based on EIA/EMP report. In Dhoptala Mine upto 31.03.2024, plantation has been carried out in 90.35 Ha of land (367125 nos.) with maintenance of four years. The species of plants planted are namely; Shishu, Imli, Jambhul, Awala, Neem, Karanj, Bamboo, Raintree, Arjun, Amalthas, etc.
From the above, it may be seen that, 171500 Nos. (57.6 Ha) saplings have been planted on External OB Dump and over Embankment.</td></tr>
<tr><td></td><td>iv)The mining should be phased out in sustainable manner. No extra over burden dumps are permitted.</td><td>Mining is being carried out as per mining plan.</td></tr>
<tr><td></td><td>v)100% backfilling should be carried out</td><td>Backfilling shall be carried out as per mining plan.</td></tr>
<tr><td></td><td>vi) the transportation of coal should be by a combination of road and rail. The road transportation of coal from the mine to railway siding will be by road and there after by rail to MAHAGENCO.</td><td>100% transportation is being done by Rail mode through siding.</td></tr>
<tr><td></td><td>Vii)mechanically covered trucks should be introduced for coal transportation .</td><td>Trucks are covered with Tarpaulin sheet to ensure no spillage occurs.</td></tr>
<tr><td></td><td>viii) wagon loading at railway siding to be by mechanized hopper/silo loading.</td><td></td></tr>
</table>

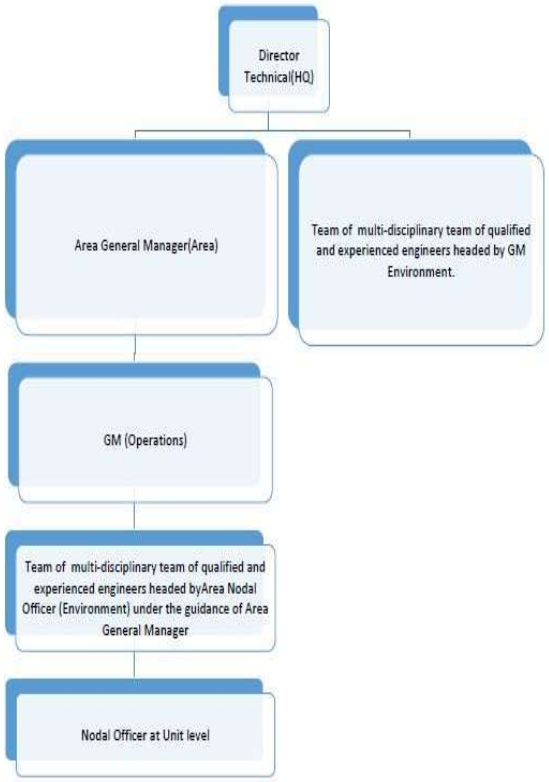
	ix) The proponent should implement the assurances given during the public hearing.	Wagon loading is done by tippers at Railway siding Detailed status of implementation of assurances made in previous Public hearing **attached as Annexure X.**
B	**General Condition.**	
i	No change in mining technology and scope of working should bemade without prior approval of the Ministry of Environment and Forests.	No change in mining technology and scope of working has been made.
ii	No change in the calendar plan including excavation quantum of mineral coal, and waste should be made.	No change in the calendar plan including excavation quantum of mineral coal, and waste has been done.
iii	Four ambient air quality monitoring stations shall be established in the core zone as well as in the buffer zone for $PM_{10,}$ $PM_{2.5,}$ $SO_{2,}$and NOX monitoring location of the stations should be decided based on the metrological date, topographical features and environmentally and ecologically sensitive targets in consultation with the state Pollution Control Board. In addition, CO and CH4 Shall also monitored within the underground coal mine and records there of maintained and uploaded on the company website and also submitted to MOEF, RO, Bhopal	Monitoring of Ambient Air quality is being done by CMPDIL, Nagpur every fortnight. AAQ monitoring stations have already been established. The stations being 1. SAM office DSA -- BSUA-1 2.Sasti Colony --- BSUA-2 3. Sasti Village ---- BSUA-3 4. Manager office DOC – BSUA-4. Latest Monitoring report attached as **Annexure XI** Monitoring reports are being uploaded on company website on regular basis. Link is as below:\ http://www.westerncoal.in/index1.php/StaticPage/153**.**
iv	Fugitive dust emissions($PM_{10,and}$ $PM_{2.5,}$)from all the sources shall be controlled regularly monitored and data recorded properly.water spraying arrangement on haul roads, wagon loading ,dump truck (loading and un loading)point shall be provided and properly maintained.	It is being monitored by CMPDIL regularly. **Copy Enclosed as Annexure XI.**
v	Data on ambient air quality ($PM_{10,}$ $PM_{2.5,}$ $SO_{2,}$and NOX) shall be regularly submitted to the ministry including its Regional office at Bhopal and to the state pollution control Board and the Central pollution control Board once in six months.	Data is submitted along with the Six monthly compliance reports. Covering letter for Six monthly compliance report submitted for September 2024 attached as **Annexure-XII.** It is also being uploaded on company website.

<table>
<tr><td>vi</td><td>Adequate measures shall be taken for control of noise levels below 85 dBA in the work environment. Workers engaged in blasting and drilling operations, operation of HEMM etc. shall be provided with ear plugs/ muffs.</td><td>Adequate measures are taken for control of Noise pollution. Workers engaged in blasting and drilling operations, operation of HEMM, etc are provided with ear plugs/muffs.

Details of Noise levels observed in month of February 2025 is as below:
<table>
<tr><th>Sr no.</th><th>Date of monitoring</th><th>Time</th><th>Level dB</th><th>Location</th><th>Limit</th></tr>
<tr><td>1</td><td>10/02/25</td><td>DAY</td><td>67.6</td><td>CHP</td><td>75</td></tr>
<tr><td>2</td><td></td><td>NIGHT</td><td>65.2</td><td></td><td>70</td></tr>
<tr><td>3</td><td>10/02/25</td><td>DAY</td><td>44.9</td><td>Sasti Colony</td><td>55</td></tr>
<tr><td>4</td><td></td><td>NIGHT</td><td>42.3</td><td></td><td>45</td></tr>
</table></td></tr>
<tr><td>vii</td><td>Industrial waste water (workshop and waste water from the mine) shall be properly collected treated so as to conform to the standards prescribed under GSR 422 (E) dated 19 the May 1993 and 31 St December 1993 or as emended from time to time before discharge. Oil and grease trap should be installed before discharge of workshop effluent.</td><td>There will be no vehicle washing in the premises of the mine. Presently ETP of 150 KLD having oil Skimmer, Sedimentation tank, rapid mixer, Clarifloculator has been provided.</td></tr>
<tr><td>viii</td><td>Vehicular emissions shall be kept under control and regularly monitored. Vehicles used for transporting the mineral shall be covered with tarpaulins and optimally loaded</td><td>Only vehicles with valid PUC are being allowed</td></tr>
<tr><td>ix</td><td>Monitoring of environmental quality parameters shall be carried out through establishment of adequate number and type of pollution monitoring and analysis equipment in consultation with the state pollution control Board and data got analysed through a laboratory recognised under EP Rules, 1986</td><td>Monitoring of Ambient Air quality is being done by CMPDIL, Nagpur every fortnight.
AAQ monitoring stations have already been established in consultation MPCB. The stations being
1. SAM office DSA -- BSUA-1
2.Sasti Colony -- BSUA-2
3. Sasti Village -- BSUA-3
4. Manager office DOC – BSUA-4.
Location of Air Quality Monitoring locations in Google Map:</td></tr>
</table>

<table>
<tr>
<td></td>
<td></td>
<td> 
</td>
</tr>
<tr>
<td>x</td>
<td>Personal working industry are as shall be wear protective respiratory devices and they shall be also be provided with adequate training and information on safety and health aspects. Occupational health surveillance programme of the workers shall be undertaken periodically to observe any contraction due to exposure to dust and to take corrective measure if needed. And records maintained thereof.</td>
<td>Personal working in dusty areas are provided with dust masks. As per DGMS guildlines point no. 4.6 given in 10th conference on safety in mines held on 27.11.2007 in Delhi.

Personal working in dusty areas are provided with dust masks. Periodical health check-up of mine workers are carried out once in 5 years with the purpose of detecting occupational diseases & hearing impairment. Every worker in the mine is examined in 5 years- up to the age of 45; the workers who are above 45 years are subjected to periodic medical examination at three years interval.
Area Hospital in WCL Ballarpur Area is a 25 bedded hospital.
Details of Medical examination are as below:
PME record of Last three year:
<table>
<tr><td>Year</td><td>Target</td><td>Departmental PME</td><td>Contractual IME</td></tr>
<tr><td>Year</td><td>Target</td><td>Departmental PME</td><td>Contractual IME</td></tr>
<tr><td>2022</td><td>-----</td><td>120</td><td>167</td></tr>
<tr><td>2023</td><td>225 (REVISED 140)</td><td>148</td><td>515</td></tr>
<tr><td>2024</td><td></td><td>266</td><td>695</td></tr>
</table>
PPE Kit distribution details is as below for FY 2024-25:
<table>
<tr><th>Sr no.</th><th>Item</th><th>Quantity</th></tr>
<tr><td>1</td><td>Helmet</td><td>120</td></tr>
<tr><td>2</td><td>Canvas Shoes</td><td>460</td></tr>
</table></td>
</tr>
</table>

<table>
<tr><td></td><td></td><td><table>
<tr><td>3</td><td>Gum Boot</td><td>40</td></tr>
<tr><td>4</td><td>Reflecting jackets</td><td>200</td></tr>
</table></td></tr>
<tr><td>xi</td><td>A Separate environmental management cell with suitable qualified personnel shall be set up under the control of a senior executive who will report directly to the head of the company.</td><td>Oraganogram for environment managament cell is as below:
 
</td></tr>
<tr><td>xii.</td><td>The funds earmarked for environmental protection measure shall be kept in separate account and shall not be diverted for other purpose. Year wise expenditure shall be reported to this Ministry and its Regional Office at Bhopal.</td><td>The funds earmarked for environment protection measures are kept in separate account and it is not used for any other purpose. Expenditure statement is shown in every six monthly compliance report sent to MoEF&CC.

Capital Expenditure details for the mine is as follows:
<table>
<tr><td>Sr no.</td><td>Work details</td><td>Cost (Rs. Lakhs)</td></tr>
<tr><td>1</td><td>Provision of ETP</td><td>45</td></tr>
<tr><td>2</td><td>Provision of Sedimentation tank</td><td>25</td></tr>
<tr><td>3</td><td>Rain guns provided at Coal stock yard</td><td>16</td></tr>
<tr><td>4</td><td>Trolley mounted Fog cannon</td><td>17</td></tr>
</table></td></tr>
</table>

		5	Tyre wash system	33	
		6	Wind Barrier	24	
			TOTAL	160	
		Rs. 250 Lakhs (Revenue Expenditure) has also been made which includes work like Plantation in mine lease area, regular maintenance of Pollution control measures, etc.			
xiii	The Regional office of this Ministry located at Bhopal shall monitor compliance of the stipulated condition. The project authorities shall extend full cooperation to the Officer(s) of the Regional Office by furnishing the requisite data /information / monitoring reports.	**PP noted this condition.**			
xv	State pollution control board should display a copy of the clearance letter at the Regional office, District industry centre and Collectors office / Tahsildar office for 30 days	**PP noted this condition.**			
xvi	The project authorities shall advertise at least in two local newspapers widely circulated around the project one of which shall be in the vernacular language of the locality concerned within seven days of the clearance letter informing that the project has been accorded environmental clearance and a copy of the clearance letter is available with the state pollution control board and may also be seen website of the ministry of Environment & Forest at http: // envfor. nic.in	The advertisement has been done in following newspapers. 1.Mahavidarbh, Chandrapur on 20.01.2013 2.Chandrapur Samachar on 20.01.2013 Attached as **Annexure XIII**			

Sub Area Manager,

Sasti Sub Area.

MAHARASHTRA POLLUTION CONTROL BOARD

Tel: 24010706/24010437
Fax: 24023516
Website: http://mpcb.gov.in
Email: cac-cell@mpcb.gov.in

Kalpataru Point, 2nd and 4th floor, Opp. Cine Planet Cinema, Near Sion Circle, Sion (E), Mumbai-400022

RED/L.S.I (R35)
No:- Format1.0/CAC/UAN No.MPCB-CONSENT-0000166169/CR/2307001630

Date: 26/07/2023

To,
M/s Western Coalfields Limited,
Dhoptala Opencast Mine,
Near Sasti village,
Tal-Rajura, Dist-Chandrapur.

Your Service is Our Duty

Sub: Renewal of consent with decreased in CI under RED category.

Ref:
1. Consent to establish granted by Board vide No. Format1.0/CAC/UAN-91611/ CO/2211000720 dated 10.11.2022 valid up to 31.03.2023.
2. Minutes of Consent Appraisal Committee (CAC) Meeting held on 03.07.2023

Your application No.MPCB-CONSENT-0000166169 Dated 24.03.2023

For: grant of Consent to Operate under Section 26 of the Water (Prevention & Control of Pollution) Act, 1974 & under Section 21 of the Air (Prevention & Control of Pollution) Act, 1981 and Authorization under Rule 6 and Rule 18(7) of the Hazardous & Other Wastes (Management & Transboundary Movement) Rules 2016 is considered and the consent is hereby granted subject to the following terms and conditions and as detailed in the schedule I, II, III & IV annexed to this order:

1. **The consent to renewal is granted for a period up to 31/03/2024**
2. **The capital investment of the project is Rs.170.4283 Crs. (As per Balance Sheet submitted by industry Existing CI is-Rs. 194.1 Cr - decrease in C.I. – Rs. 23.6757 Cr=Total CI-Rs.170.4283 CR)**
3. **Consent is valid for the manufacture of:**

Sr No	Product	Maximum Quantity	UOM
Products			
1	Coal	1.7	MTPA

4. **Conditions under Water (P&CP), 1974 Act for discharge of effluent:**

Sr No	Description	Permitted (in CMD)	Standards to	Disposal Path
1.	Trade effluent	7485	As per Schedule-I	Recycle to the maximum extent for Dust Suppression & Fire Fighting and remaining on land for plantation/Irrigation/Gardening.

Sr No	Description	Permitted	Standards to	Disposal
2.	Domestic effluent	15	As per Schedule-I	On land for gardening

5. **Conditions under Air (P& CP) Act, 1981 for air emissions:**

Sr No.	Stack No.	Description of stack / source	Number of Stack	Standards to be achieved
1	0	-	0	As per Schedule -II

6. **Non-Hazardous Wastes:**

Sr No	Type of Waste	Quantity	UoM	Treatment	Disposal
1	-	0	--NA--	-	-

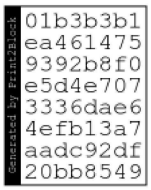
7. **Conditions under Hazardous & Other Wastes (M & T M) Rules 2016 for Collection, Segregation, Storage, Transportation, Treatment and Disposal of hazardous waste:**

Sr No	Category No./ Type	Quantity	UoM	Treatment	Disposal
1	5.1 Used or spent oil	4	Ton/Y	Recycle	Sale to authorised party
2	5.2 Wastes or residues containing oil	2	Ton/Y	Incineration	CHWTSDF
3	35.3 Chemical sludge from waste water treatment	18	Ton/Y	Landfill	CHWTSDF

8. The Board reserves the right to review, amend, suspend, revoke etc. this consent and the same shall be binding on the industry.
9. This consent should not be construed as exemption from obtaining necessary NOC/permission from any other Government authorities
10. The applicant shall comply with the conditions of the Environmental Clearance granted by MoEFCC GoI vide letter No.J-11015/538/2008-IA.II(M) dated 10.01.2013.
11. PP shall install CAAQMS within 3 months & submit the BG of Rs.5.0 Lakh towards compliance of same.
12. PP shall provide Tyre Wash system at entry and exit of mine within 3 months period & submit the BG of Rs.5.0 Lakh towards compliance of same.
13. PP shall provide STP for treatment of domestic effluent in the mine area & submit the BG of Rs.5.0 Lakh towards compliance of same.
14. PP shall provide Trolley/Truck mounted mist fog cannons & submit the BG of Rs.5.0 Lakh towards compliance of same.
15. Industry shall provide dust suppression system at coal crusher; CHP area and belt conveyors transfer points within 3 months.
16. PP shall submit the undertaking on stamp paper regarding the compliances of above points within a month.
17. PP shall submit the BG as per BG regime of mines.
18. PP shall carry out over burden dump management as per CPCB guidelines.
19. PP shall carry out plantation as per EC condition before ensuing monsoon.

20. The applicant shall make an application for renewal of consent 60 days prior to date of expiry of the consent.

. This consent is issued as per communication letter dated 03/11/2022 which is approved by competent authority of the board.



Signed by: Dr J. B. Sangewar
Joint Director(WPC) & InCharge Of CAC-Cell
For and on behalf of,
Maharashtra Pollution Control Board
cac-cell@mpcb.gov.in
2023-07-26 11:44:51 IST

Received Consent fee of -

Sr.No	Amount(Rs.)	Transaction/DR.No.	Date	Transaction Type
1	2041713.00	MPCB-DR-18310	11/04/2023	NEFT

Consent renewal fees for the period up to 31.03.2024 is Rs.10,20,857/-. Penal Fees for 10 days delay in application for renewal is Rs.1,39,843/-. Consent fees balanced with the Board is Rs.8,81,013/- which will be considered during next renewal of consent.

Copy to:

1. Regional Officer, MPCB, Chandrapur and Sub-Regional Officer, MPCB, Chandrapur
- They are directed to ensure the compliance of the consent conditions.
2. Chief Accounts Officer, MPCB,Sion, Mumbai
3. CAC desk -For record and website updation purposes

SCHEDULE-I

Terms & conditions for compliance of Water Pollution Control:

1. A] As per your application, you have provided the ETP of capacity 150 CMD for treatment of workshop effluent. Sedimentation tank of capacity-1794 KLD provided for treatment Mine Water discharge.

   B] The Applicant shall operate the effluent treatment plant (ETP) to treat the trade effluent so as to achieve the following standards prescribed by the Board or under EP Act, 1986 and Rules made there under from time to time, whichever is stringent:

Sr.No	Parameters	Limiting concentration not to exceed in mg/l, except for pH
(1)	pH	5.5 to 9.0
(2)	Oil & Grease	10
(3)	BOD (3 days 27°C)	30
(4)	COD	250
(5)	Total Suspended solids	100
(6)	Total Dissolved solids	2100

   C] The Industry shall ensure connectivity online monitoring system to the MPCB server including separate energy meter for pollution control system.

   D] The treated effluent shall be recycled for secondary purposes to the maximum extent and remaining shall be discharged on land for gardening within premise after confirming above standards. In no case, effluent shall find its way to outside factory premises.

2. A] As per your application, you have provided Septic Tank followed by Soak pit for the treatment of 15 CMD of sewage.

   B] The Applicant shall operate the sewage treatment system to treat the sewage so as to achieve the following standards.

Sr.No	Parameters	Standards (mg/l)	
1	BOD (3 days 27°C)	Not to exceed	30
2	COD	Not to exceed	100
3	SS	Not to exceed	50

   C] The treated sewage shall be recycled for secondary purposes to the maximum extent and remaining shall be discharged on land for gardening within premise after confirming above standards. In no case, sewage shall find its way for gardening / outside factory premises.

3. The Board reserves its rights to review plans, specifications or other data relating to plant setup for the treatment of waterworks for the purification there of & the system for the disposal of sewage or trade effluent or in connection with the grant of any consent conditions. The Applicant shall obtain prior consent of the Board to take steps to establish the unit or establish any treatment and disposal system or an extension or addition thereto.

4. The industry shall ensure replacement of pollution control system or its parts after expiry of its expected life as defined by manufacturer so as to ensure the compliance of standards and safety of the operation thereof.
5. The Applicant shall comply with the provisions of the Water (Prevention & Control of Pollution) Act, 1974 and as amended, by installing water meters and other provisions as contained in the said act:

Sr. No.	Purpose for water consumed	Water consumption quantity (CMD)
1.	Industrial Cooling, spraying in mine pits or boiler feed	600.00
2.	Domestic purpose	15.00
3.	Processing whereby water gets polluted & pollutants are easily biodegradable	0.00
4.	Processing whereby water gets polluted & pollutants are not easily biodegradable and are toxic	0.00
5.	Gardening	0

6. The Applicant shall provide Specific Water Pollution control system as per the conditions of EP Act, 1986 and rule made there under from time to time/ Environmental Clearance/ CREP guidelines.

SCHEDULE-II

Terms & conditions for compliance of Air Pollution Control:

1. As per your application, you have provided the Air pollution control (APC) system and erected following stack (s) to observe the following fuel pattern:

Stack No.	Source	APC System provided/proposed	Stack Height(in mtr)	Type of Fuel	Sulphur Content(in %)	Pollutant	Standard
0	-		0.00	- 0 -- NA--	-	-	-

2. The Applicant shall provide Specific Air Pollution control equipments as per the conditions of EP Act, 1986 and rule made there under from time to time/ Environmental Clearance / CREP guidelines.
3. The Applicant shall obtain necessary prior permission for providing additional control equipment with necessary specifications and operation thereof or alteration or replacement/alteration well before its life come to an end or erection of new pollution control equipment.
4. The Board reserves its rights to vary all or any of the condition in the consent, if due to any technological improvement or otherwise such variation (including the change of any control equipment, other in whole or in part is necessary).
5. Control Equipments
    a. Coal handling plant provided with dust collector & automatic water sprinkler shall be operated
    b. Scientific spraying of water on all working area, dump area, stock piles with the help of appropriate dust suppression system.
    c. Minerals shall be properly covered during transportation. Overloading of dumpers shall be avoided to prevent spillages.

d. The applicant shall carry out tree plantation along road side, around dumps or compulsory afforestation as per proposal approved by Forest Department. The tree plantation programme shall be taken up well in advance of the actual mining activity, so that green belt of sufficient width & height is developed between mining area/road and surrounding environment.

e. Black topped metal roads provided shall be well maintained to prevent dust formation.

f. Minerals transportation shall be done by installing conveyors wherever possible & mechanically covered closed trucks shall be used for transportation.

g. Correct type & quantity of explosive shall be used to avoid excess dust formation & vibration in the surrounding area.

h. The slope of the over burden shall have slope not more than 28^{o} to the horizontal. The overburden shall be properly covered by vegetation for stabilization.

6. Standards for Ambient Air Pollutants:

The Suspended Particulate Matter (SPM), Respirable Particulate Matter (RPM), Sulphur dioxide (SO_2) and Oxides of Nitrogen (NO_x) concentration in downwind direction considering predominant wind direction, at a distance of 500 metres from the following dust generating sources shall not exceed the standards specified in the table given below:

Dust Generating Sources:

Loading or unloading, Haul Road, coal transportation road, Coal handling plant (CHP), Railway Sliding, Blasting, Drilling, Overburden dumps, or any other dust generating external sources like coke ovens (hard as well as soft), briquette industry, nearby road etc.

Pollutant	***Time weighted average***	***Concentration in Ambient Air***
Suspended Particulates Matter (SPM)	Annual Average	360 µg/m^3
	24 hours	500 µg/m^3
Respirable Particulate Matter (size less than 10 µm) (RPM)	Annual Average	180 µg/m^3
	24 hours	250 µg/m^3
Sulphur Dioxide (SO_2)	Annual Average	80 µg/m^3
	24 hours	120 µg/m^3
Oxides of Nitrogen as NO_x	Annual Average	80 µg/m^3
	24 hours	120 µg/m^3

i. In case of any residential or commercial or industrial place falls within 500 metres of any dust generating sources, the National Ambient Air Quality Standards notified vide MOEFCC GOI notification dtd 16.11.2009 as ammended shall be made applicable.

ii. The applicant shall provide minimum three ambient air quality monitoring stations within mining area which should be monitored for SPM, RSPM, SO_2, NOx, HC, CO etc. The Annual Arithmetic Mean of minimum 104 measurements in a year taken twice a week 24 hourly at uniform interval shall conform to the National Ambient Air Quality Standards prescribed under Air (Prevention and Control of Pollution) Act, 1981 and Environment (Protection) Act, 1986. The records of results of monitoring done shall be made available for inspection to the officers of the Board.

7. The applicant shall take adequate measures for control of noise levels from its own sources as follows:

Sr. No	Location	Permissible Norms [in dB (A)]	Desired minimum thickness of green belt (m)
1.	Along Road side	65 (Commercial Area)	20
2.	In colonies	55 (Residential Area)	20
3.	Near Opencast Mines	75 (Industrial Area)	10
4.	Near CHPs	75	30
5.	Near Shaft	75	20
6.	Near Mine exhaust fan	75	> 50

8. Other conditions:

i Whenever due to any accident or other unforeseen act or even, such emissions occur or is apprehended to occur in excess standards laid down, such information shall be forthwith reported to Board, concerned Police station, office of Directorate of Health services, Dept. of explosives, Inspectorate of Factories & Local Body. In case of failure of pollution control equipments, the production process connected to it shall be stopped.

SCHEDULE-III

Details of Bank Guarantees:

Sr. No.	Consent (C2E/ C2O /C2R)	Amt of BG Imposed	Submission Period	Purpose of BG	Compliance Period	Validity Date
1	C2R	Rs. 2.0 Lakh	15 days	Regular monitoring of ground water level and quality should be carried out by establishing the network of existing wells and constructing new piezometers during mining operations	6 Monthly	31.03.2025
2	C2R	Rs.5.0 Lakh	15 days	Catch drain and siltation ponds of appropriate size should be constructed to arrest silt and sediment flow from soil, OB and mineral dumps. Water so collected should be utilized for watering of the mining area, roads green belt developers etc.	Regular Activity	31.03.2025
3	C2R	Rs.5.0 Lakh	15 days	PP shall install STP for treatment of domestic effluent-15 CMD at mine area within 6 months	6 Months	31.03.2025

Sr. No.	Consent (C2E/ C2O /C2R)	Amt of BG Imposed	Submission Period	Purpose of BG	Compliance Period	Validity Date
4	C2R	Rs.25.0 Lakh	15 days	Coal transportation shall be done by covered trucks. Overloading of truck shall be avoided to prevent spillages.	6 Months	31.03.2025
5	C2R	Rs.5.0 Lakh	15 days	PP shall provide Truck mounted Fog cannon system within 3 months	3 Months	31.03.2025
6	C2R	Rs.5.0 Lakh	15 days	PP shall provide dust suppression system at Coal crusher, CHP, and belt conveyors within 3 months	3 Months	31.03.2025
7	C2R	Rs.5.0 Lakh	15 days	PP shall provide the Fixed Mist type water sprinkling system at haul roads and coal transportation roads within 3 months period	3 Months	31.03.2025
8	C2R	Rs.5.0 Lakh	15 days	Deploying mechanized sweepers which are automated suction sweeper for cleaning the coal dust from road.	3 Months	31.03.2025
9	C2R	Rs.5.0 Lakh	15 days	Adoption of Boswell / Bios wale technology on the road sides. Boswell is a land scape element of construction design, primarily a run off converyance system by the sides of road, to remove dust and emissions	3 Months	31.03.2025
10	C2R	Rs.5.0 Lakh	15 days	PP shall provide Tyre Wash system at entry and exit of mine within 3 months period	3 Months	31.03.2025
11	C2R	Rs.5.0 Lakh	15 days	PP shall provide the CAAQMS within 6 months	6 Months	31.03.2025

Sr. No.	Consent (C2E/ C2O /C2R)	Amt of BG Imposed	Submission Period	Purpose of BG	Compliance Period	Validity Date
12	C2R	Rs.5.0 Lakh	15 days	Over burden (OB) should be stacked at earmarked dumpsites only and should not be kept active for long period. Proper terracing of OB should be carried out so that the overall slope will come down to 28°. Over Burden shall be disposed by way of backfilling.	Regular Activity	31.03.2025
13	C2R	Rs.25.0 Lakh	15 days	Operation and Maintenance of pollution control system & compliance of consent and EC conditions	Regular Activity	31.03.2025

The above Bank Guarantee(s) shall be submitted by the applicant in favour of Regional Officer at the respective Regional Office within 15 days from the date of issue of Consent.

BG Forfeiture History

Srno.	Consent (C2E/C2O/C2R)	Amount of BG imposed	Submission Period	Purpose of BG	Amount of BG Forfeiture	Reason of BG Forfeiture
NA						

BG Return details

Srno.	Consent (C2E/C2O/C2R)	BG imposed	Purpose of BG	Amount of BG Returned
NA				

SCHEDULE-IV

General Conditions:

1. The applicant shall provide facility for collection of environmental samples and samples of trade and sewage effluents, air emissions and hazardous waste to the Board staff at the terminal or designated points and shall pay to the Board for the services rendered in this behalf.
2. If the MIDC pipeline is broken/ overflowing chamber, in such cases industry shall not discharge their treated effluent into MIDC drain, it shall be sent to CETP by tanker.
3. Industry should monitor effluent quality, stack emissions and ambient air quality monthly/quarterly.
4. The applicant shall provide ports in the chimney/(s) and facilities such as ladder, platform etc. for monitoring the air emissions and the same shall be open for inspection to/and for use of the Board's Staff. The chimney(s) vents attached to various sources of emission shall be designated by numbers such as S-1, S-2, etc. and these shall be painted/ displayed to facilitate identification.

5. Whenever due to any accident or other unforeseen act or even, such emissions occur or is apprehended to occur in excess of standards laid down, such information shall be forthwith Reported to Board, concerned Police Station, office of Directorate of Health Services, Department of Explosives, Inspectorate of Factories and Local Body. In case of failure of pollution control equipment, the production process connected to it shall be stopped.
6. The applicant shall provide an alternate electric power source sufficient to operate all pollution control facilities installed to maintain compliance with the terms and conditions of the consent. In the absence, the applicant shall stop, reduce or otherwise, control production to abide by terms and conditions of this consent.
7. The firm shall submit to this office, the 30th day of September every year, the Environmental Statement Report for the financial year ending 31st March in the prescribed Form-V as per the provisions of rule 14 of the Environment (Protection) (Second Amendment) Rules, 1992.
8. The industry shall recycle/reprocess/reuse/recover Hazardous Waste as per the provision contain in the H&OW(M&TM) Rules 2016, which can be recycled/processed/ reused/ recovered and only waste which has to be incinerated shall go to incineration and waste which can be used for land filling and cannot be recycled/ reprocessed etc. should go for that purpose, in order to reduce load on incineration and landfill site/environment.
9. The industry should comply with the Hazardous & Other Wastes (M & TM) Rules, 2016 and submit the Annual Returns as per Rule 6(5) & 20(2) of Hazardous & Other Wastes (M & TM) Rules, 2016 for the preceding year April to March in Form-IV by 30th June of every year.
10. An inspection book shall be opened and made available to the Board's officers during their visit to the applicant.
11. The applicant shall make an application for renewal of the consent at least 60 days before the date of the expiry of the consent.
12. Industry shall strictly comply with the Water (P&CP) Act, 1974, Air (P&CP) Act,1981 and Environmental Protection Act,1986 and industry specific standard under EP Rules 1986 which are available on MPCB website(www.mpcb.gov.in).
13. The industry shall constitute an Environmental cell with qualified staff/personnel/agency to see the day to day compliance of consent condition towards Environment Protection.
14. Separate drainage system shall be provided for collection of trade and sewage effluents. Terminal manholes shall be provided at the end of the collection system with arrangement for measuring the flow. No effluent shall be admitted in the pipes/sewers downstream of the terminal manholes. No effluent shall find its way other than in designed and provided collection system.
15. Neither storm water nor discharge from other premises shall be allowed to mix with the effluents from the factory.
16. The applicant shall install a separate meter showing the consumption of energy for operation of domestic and industrial effluent treatment plants and air pollution control system. A register showing consumption of chemicals used for treatment shall be maintained.
17. Conditions for D.G. Set
    a) Noise from the D.G. Set should be controlled by providing an acoustic enclosure or by treating the room acoustically.
    b) Industry should provide acoustic enclosure for control of noise. The acoustic enclosure/ acoustic treatment of the room should be designed for minimum 25 dB (A) insertion loss or for meeting the ambient noise standards, whichever is on higher side. A suitable exhaust muffler with insertion loss of 25 dB (A) shall also be provided. The measurement of insertion loss will be done at different points at 0.5 meters from acoustic enclosure/room and then average.

c) Industry should make efforts to bring down noise level due to DG set, outside industrial premises, within ambient noise requirements by proper sitting and control measures.

d) Installation of DG Set must be strictly in compliance with recommendations of DG Set manufacturer.

e) A proper routine and preventive maintenance procedure for DG set should be set and followed in consultation with the DG manufacturer which would help to prevent noise levels of DG set from deteriorating with use.

f) D.G. Set shall be operated only in case of power failure.

g) The applicant should not cause any nuisance in the surrounding area due to operation of D.G. Set.

h) The applicant shall comply with the notification of MoEFCC, India on Environment (Protection) second Amendment Rules vide GSR 371(E) dated 17.05.2002 and its amendments regarding noise limit for generator sets run with diesel.

18. The industry should not cause any nuisance in surrounding area.
19. The industry shall take adequate measures for control of noise levels from its own sources within the premises so as to maintain ambient air quality standard in respect of noise to less than 75 dB (A) during day time and 70 dB (A) during night time. Day time is reckoned in between 6 a.m. and 10 p.m. and night time is reckoned between 10 p.m. and 6 a.m.
20. The applicant shall maintain good housekeeping.
21. The applicant shall bring minimum 33% of the available open land under green coverage/ plantation. The applicant shall submit a yearly statement by 30th September every year on available open plot area, number of trees surviving as on 31st March of the year and number of trees planted by September end
22. The non-hazardous solid waste arising in the factory premises, sweepings, etc. be disposed of scientifically so as not to cause any nuisance / pollution. The applicant shall take necessary permissions from civic authorities for disposal of solid waste.
23. The applicant shall not change or alter the quantity, quality, the rate of discharge, temperature or the mode of the effluent/emissions or hazardous wastes or control equipment provided for without previous written permission of the Board. The industry will not carry out any activity, for which this consent has not been granted/without prior consent of the Board.
24. The industry shall ensure that fugitive emissions from the activity are controlled so as to maintain clean and safe environment in and around the factory premises
25. The industry shall submit official e-mail address and any change will be duly informed to the MPCB.
26. The industry shall achieve the National Ambient Air Quality standards prescribed vide Government of India, Notification dtd. 18.11.2009 as amended.

This certificate is digitally & electronically signed.

Maharashtra Pollution Control Board

महाराष्ट्र प्रदूषण नियंत्रण मंडळ

Application for Consent/ Authorisation

Sir,
I/We hereby apply for*

1. Consent to Establish/Operate/Renewal of consent under section 25 and 26 of the Water (Prevention & Control of Pollution) Act, 1974 as amended.

2. Consent to Establish/Operate/Renewal of consent under Section 21 of the Air (Prevention and Control of Pollution) Act, 1981, as amended.

3. Authorization/renewal of authorization under Hazardous and Other Wastes (Management and Transboundary Movement) Rules, 2016 in connection with my/our/existing/proposed/altered/ additional manufacturing/processing activity from the premises as per the details given below.

Consent Information

UAN No:
MPCB-CONSENT-0000200063

Application submitted on:
22-02-2024

Industry Information

Consent To:
Renewal (Normal)

IIN No.:

Submit to:
SRO - Chandrapur

Type of institution:
Industry

Industry Type:
R35 Mining and ore beneficiation

Category:
Red

Scale:
L.S.I

Location of industry/activity/etc:
Local Body

Name of Local Body:
Sasti village

EC Reqd.
Yes

EC Obtained
EC Obtained

EC Ref. No.
J-11015/538/2008-IA.II(M)

Date of issue of EC
Jan 10, 2013

Parivesh Proposal Number
J-11015/538/2008-IA.II(M)

MoEFCC/SEIAA File Number
J-11015/538/2008-IA.II(M)

Whether construction-buildup area is more than 20,000 sq.mtr.(Existing Expansion Unit)
Yes

General Information

1. Name, designation, office address with Telephone/Fax numbers, e-mail of the Applicant Occupier/Industry/Institution / Local Body.

Name
Ravi Mohan Krishna

Address
Dhoptala Opencast mine, WCL Ballarpur area, near Sasti village, Rajura-Ballarpur road,Sasti (CT),Chandrapur

Designation
Sub Area Manager

Taluka
Rajura

Area
1300.91 Ha

District
Chandrapur

Telephone
8175968410

Fax
07173230076

Email
envdhoptala@gmail.com

Pan Number
AAACW1578L

---

2. (a) Name and location of the industrial unit/premises for which the application is made (Give revenue Survey Number/Plot number name of Taluka and District, also telephone and fax number)

Industry name
Dhoptala Opencast Mine

Location of Unit
Near Sasti Village

Survey number/Plot Number
-

Taluka
Rajura

District
Chandrapur

(b) Details of the planning permission obtained from the local body/Town and Country Planning authority/Metropolitan Development authority/ designated Authority.

Planning permission
THIS IS CENTRAL PSU UNDER COAL MINISTRY,UNDER WHICH MINE IS PLANNED AND APPROVED FROM COMPANY BOARD

Planning Authority
Approval from Company Board

Name of the local body under whose jurisdiction the unit is located and Name of the licence issuing authority

Name of Local Body
Sasti Grampanchayat

Name of the licence issuing authority
MoEF&CC

Sanction plan/ Approved layout Plan/Commencement Certificate

---

3. Names,addresses with Telephone and Fax Number of Managing Director / Managing Partner and officer responsible for matters connected with pollution control and/or Hazardous waste disposal.

Name of Managing Director
J. P. Dwivedi

Telephone number
8275968410

Fax number
07173230076

Officer responsible for day to day business
Ravi Mohan Krishna

4. (a.) Are you registered Industrial unit ?

Yes

Registration number
U10100MH1975GOI018626

Date of registration
Oct 29, 1975

---

5. Gross capital investment of the unit without depreciation till the date of application (Cost of building, land, plant and machinery). (To be supported by an affidavit/undertaking on Rs.20/- stamp paper, annual report or certificate from a Chartered Accountant for proposed unit(s), give estimated figure)

Gross capital (in Lakh)	**** Verified***	**** Terms***	**** Consent Fee***
21845.28	Undertaking	2	2233811.00

---

6. If the site is located near sea-shore/river bank/other water bodies/Highway, Indicate the crow fly distance and the name of the water body, if any.

Distance From	***Distance(Km)***	**** Name***
SH/NH	0.00	--NA--
River	0.50	Wardha River
Human Habitation	0.00	--NA--
Religious Place	0.00	--NA--
Historical Place	0.00	--NA--

Creek/Sea	0.00	--NA--

6b. Enter Latitude and Longitude details of site

Latitude	***Longitude***
19.82	79.338

7. Does the location satisfy the Requirements Under relevant Central/State Govt. Notification such as Coastal Regulation Zone. Notification on Ecologically Fragile Area, Industrial Location policy, etc. If so, give details.

Location	***Approved Industry Area***	***Sensitive Area***	***If Yes, Name Of Area***	***Industry Location with Reference to CRZ***
Near Sasti Village	No	No	-	

8. If the site is situated in notified industrial estate,

		Details
(a) Whether effluent collection, treatment and disposal system has been provided by the authority.	No	-
(b) Will the applicant utilize the system, if provided.	No	-
(c) If not provided, details of proposed arrangement.	-	

9.

(a) Total plot area (in squear meter)	***(b) Built up area and (in squear meter)***	***(c) Area available for the use of treated sewage/ trade effluent for gardening/irrigation. (in squear meter)***
13009100	-	-

10. Month and year of commissioning of the Unit.

2020-11-01

11. Number of workers and office staff

Workers	***staff***	***Hrs. of shift***	***Weekly off***
275	21	8	Wednesday

12.

(a) Do you have a residential colony Within the premises in respect of Which the present application is Made ?	No	-

(b) If yes, please state population staying

Number of person staying	***Water consumption***	***Sewage generation***	***Whether is STP provided?***
0	0	0	No

(c) Indicate its location and distance with reference to plant site.

Number of person staying	***Water consumption***
-	0

13. List of products and by-products Manufactured in tonnes/month, Kl/month or numbers/month with their types i.e.Dyes, drugs etc. (Give figures corresponding to maximum installed production capacity

Products Name and Quantity

Product Name	UOM	Product Name	Existing	Consented	Proposed Revision	Total	Remarks
Mining	MT/A	Coal	1.70	1.70	0	1.7	-

Products Name and Quantity

Product Name	UOM	Quantity	Remarks
-	--NA--	0	-

14. List of raw materials and process chemicals with annual consumption corresponding to above stated production figures, in tonnes/month or kl/month or numbers/month.

Name of Raw Material	UOM	Quantity	Hazardous Waste	Hazardous Chemicals	Remarks
Diesel	Lit/Day	215	No	No	-
Explosives	Kg/Day	8775	No	No	-

15. Description of process of manufacture for each of the products showing input, output, quality and quantity of solid, liquid and gaseous wastes, if any from each unit process.

Document Attached

Part B : Waste Water aspects

16. Water consumption for different uses (m3/day)

Purpose	Consumption	Effluent Generation	Treatment	Remarks	Disposal	Remarks
Domestic Pourpose	52	40	Septic Tank & Soak Pit	-	--NA--	-
Water gets Polluted & Pollutants are Biodegradable	0	0	--NA--	-	--NA--	-
Water gets Polluted,Pollutants are not Biodegradable & Toxic	0	0	--NA--	-	--NA--	-
Industrial Cooling,spraying in mine pits or boiler feed	400	0	--NA--	-	--NA--	-
Others	0					

17. Source of water supply, Name of authority granting permission if applicable and quantity permitted.

Source of water supply	Specify Other	Name of authority granting permission	Qauntity permitted
Other	Mine Discharge	CGWB	2137

18. Quantity of waste water (effluent) generated (m3/day)

Domastic	Boiler Blowdown	Industrial	Cooling water blowdown
40	00	1686	0
Process	**DM Plants/Softening**	**Washing**	**Tail race discharge from**
0	0	0	0

19. Water budget calculations accounting for difference between water consumption and effluent generated.

Document Attached

---

20. Present treatment of sewage/canteen effluent (Give sizes/capacities of treatment units).

Capacity of STP (m3/day)

0

Treatment unit	***Size (mxm)***	***Retention time (hr)***
-	0	0

---

21. Present treatment of trade effluent (Give sizes/capacities of treatment units) (A schematic diagram of the treatment scheme with inlet/outlet characteristics of each unit operation/process is to be provided. Include details of residue Management system (ETP sludges)

Capacity of ETP (m3/day)

150

Treatment unit	***Size (mxm)***	***Retention time (hr)***
oil skimmer, settling tank, clarifloculator	0	0

22.

(i) Are sewage and trade effluents mixed together?	No
If yes, state at which stage-Whether before, intermittently or after treatment.	-

---

23. Capacity of treated effluent sump, Guard Pond if any.

Capacity of treated effluent sump (m3)	50 m3	
Effluent sump/Guard pond details	Yes	50 m3
If yes, state at which stage-Whether before, intermittently or after treatment.	No	-

---

24. Mode of disposal of treated effluent With respective quantity, m3/day

(i) into stream/river (name of river)	1686 m3/day into local nallah	***(ii) into creek/estuary (name of Creek/estuary)***	0
(iii) into sea	0	***(iv) into drain/sewer (owner of sewer)***	0
(v) On land for irrigation on owned land/ase land. Specify cropped area.	0	***(vi) Connected to CETP***	0
(vii) Quantity of treated effluent reused/ recycled, m3/day Provide a location map of disposal arrangement indicating the outler(s) for sampling. Treated effluent reused / recycled (m3/day)	0	***Mode of disposal types***	Recycle
Mode of disposal types other (if any)			

---

25. (a) Quality of untreated/treated effluents (Specify pH and concentration of SS, BOD,COD and specific pollutants relevant to the industry. TDS to be reported for disposal on land or into stream/river.

Untreated Effluent

pH	-
SS (mg/l)	-

BOD (mg/l)	-
COD (mg/l)	-
TDS (mg/l)	-

Specific pollutant if any	***Name***	***Value***
1	-	-

Treated Effluent

pH	7.5
SS (mg/l)	18
BOD (mg/l)	0
COD (mg/l)	20
TDS (mg/l)	0

Specific pollutant if any	***Name***	***Value***
1	-	-

(b) Enclose a copy of the latest report of analysis from the laboratory approved by State Board/ Committee/Central Board/Central Government in the Ministry of Environment expected characteristics of the untreated/treated effluent

CMPDIL monitoring report attached

---

26. Fuel consumption

Fuel Type	***UOM***	***Fuel Consumption TPD/LKD***	***Calorific value***
--NA--	--NA--	0	0
Ash content	***Sulphur content***	***Quantity***	***Other (specify)***
0	0	1	-

---

27. (a) Details of stack (process & fuel stacks: D. G.)

(a) Stack number(s)	***(b) Stack attached to***	***(c) Capacity***	***(d) Fuel Type***
0	-	0	-
(e) Fuel quantiy (Kg/hr.)	***(f) Material of construction***	***(g) Shape (round/rectangular)***	***(h) Height, m (above ground level)***
0	-	-	0
(i) Diameter/Size, in meters	***(j) Gas quantity, Nm3/hr.***	***(k) Gas temperature °C***	***(l) Exit gas velocity, m/sec.***
0	0	0	0
(m) Control equipment preceding the stack	***(n) Nature of pollutants likely to present in stack gases such as CI2, Nox, Sox TPM etc.***	***(o) Emissions control system provided***	***(p) In case of D.G. Set power generation capacity in KVA***
-	-	-	-

---

27. (B) Whether any release of odoriferous compounds such as Mercaptans, Phorate etc. Are coming out from any storages or process house.

-

---

28. Do you have adequate facility for collection of samples of emissions in the form of port holes, platform, ladder\etc. As per Central Board Publication “Emission regulations Part-III” (December, 1985)

Poart hole	No	***Details***	-
Platform	No	***Details***	-
Ladder	No	***Details***	-

29. Quality of treated flue gas emissions and process emissions. Quantity of treated flue gas emissions and process emissions.

Sr. No.	Stack attached to	Parameter	Concentration mg/Nm3	flow (Nm3/hr)
1	-	-	0	0

(Specify concentration of criteria pollutants and industry/process-specific pollutants stack-wise. Enclose a copy of the latest report of analysis from the laboratory approved by State Board/Central Board/ Central Government in the Ministry of Environment & Forests. For proposed unit furnish expected characteristics of the emissions..

-

Part - D: Hazardous Waste aspect

30 Information about Hazardous Waste Management as defined in Hazardous Waste (Management & Handling) Rules, 1989 as amended in Jan.,2000. Type/Category of Waste as per

Waste (Annually) Schedule I

Cat No	Type	Qty	UOM
5.2	5.2 Wastes or residues containing oil	4	Ton/Y
Max	**Method of collection**	**Method of reception**	**Method of storage**
	Manual	Manual	Near ETP
Method of transport	**Method of treatment**	**Method of disposal**	
Trucks	CHWTSDF, Butibori	CHWTSDF, Butibori	

Cat No	Type	Qty	UOM
35.3	35.3 Chemical sludge from waste water treatment	9	Ton/Y
Max	**Method of collection**	**Method of reception**	**Method of storage**
	Manual	Manual	Near ETP
Method of transport	**Method of treatment**	**Method of disposal**	
Trucks	CHWTSDF, Butibori	CHWTSDF, Butibori	

Waste (Annually) Schedule II

31. Details about use of hazardous waste

Name of hazardous waste/Spent chemical	Quantity used/month	Party from whom purchased	Party to whom sold
-	0	-	-

32.

a. Details about technical capability and equipments available with the applicant to handle the Hazardous Waste

-

b. Characteristics of hazardous waste(s) Specify concentration of relevant pollutants. Enclose a copy of the latest report of analysis from the laboratory approved by State Board/Central Board/Central Govt. in the ministry of Environment & Forests. For proposed units furnish expected characteristics

-

33.

Copy of format of manifest/record Keeping practiced by the applicant.

-

34.

Details of self-monitoring (source and environment system)

-

35.

Are you using any imported hazardous waste. If yes, give details.

-

36.

Copy of actual user Registration/certificate obtained from State Pollution Control Board/Ministry of Environment & Forests, Government of India, for use of hazardous waste.

-

37.

Present treatment of hazardous waste, if any (give type and capacity of treatment units)

-

38. Quantity of hazardous waste disposal

(i) Within factory

0

(ii) Outside the factory (specify location and enclose copies of agreement.)

0

(iii) Through sale (enclosed documentary proof and copies of agreement.)

0

(iv) Outside state/Union Territory, if yes particulars of (1 & 3) above.

0

(v) Other (Specify)

0

Part - E: Additional information

39.

a. Do you have any proposals to upgrade the present system for treatment and disposal of effluent/emissions and/or hazardous waste.

-

b. If yes, give the details with time- schedule for the implementation and approximate expenditure to be incurred on it.

-

40.

Capital and recurring (O & M) expenditure on various aspect of environment protection such as effluent, emission, hazardous waste, solid waste, tree- plantation, monitoring, data acquisition etc. (give figures separately for items implemented/to be implemented).

-

41.

To which of the pollution control equipment, separate meters for recording consumption of electric energy are installed ?

-

42.

Which of the pollution control items are connected to D.G. Set (captive power source) to ensure their running in the event of normal power failure

-

43. Nature, quantity and method of disposal of non- hazardous solid waste generated separately from the process of manufacture and waste treatment. (Give details of area/capacity available in applicant's land)

Type	*Quantity*	*UOM*	*Treatment*	*Disposal*	*Other Details*
-	0	--NA--	-	-	-

44. Hazardous Chemicals – Give details of Chemicals and quantities handled and Stored.

(i) Is the unit a Majot Accident Hazard unit as per Mfg.Storage Import Hazardous Chemicals Rules ?

-

(ii) Is the unit an isolated storage as defined under the MSIHC Rules ?

-

(iii) Indicate status of compliance of Rules 5,7,10,11,12,13 and 18 of the MSIHC Rules.

-

(iv) Has approval of site been obtained from the concerned authority?

-

(v) Has the unit prepared an off-site Emergency Plan? Is it updated ?

-

(vi) Has information on imports of Chemicals been provided to the concerned authority?

-

(vii) Does the unit possess a policy under the PLI Act?

-

45. Brief details of tree plantation/green belt development within applicant's premises (in hectors)

Open Space Availability	*Plantation Done On*	*Number of Trees Planted*
7650000 Square meter	0 Square meter(0.0 %)	0

46.

Information of schemes for waste Minimization, resource recovery and recycling - implemented and to be implemented, separately.

-

47.

(a) The applicant shall indicate whether Industry comes under Public Hearing, if so, the relevant documents such as EIA, EMP, Risk Analysis etc. shall be submitted, if so, the relevant documents enclosed shall be indicated accordingly.

-

(b) Any other additional information that the applicants desires to give

-

(c) Whether Environmental Statement submitted ? If submitted, give date of submission.

Submitted

48.

I/We further declare that the information furnished above is correct to the best of my/our knowledge.

49.

I/We hereby submit that in case of any change from what is stated in this application in respect of raw materials, products, process of manufacture and treatment and/or disposal of effluent, emission, hazardous wastes etc. In quality and quantity; a fresh application for Consent/Authorization shall be made and until the grant of fresh Consent/Authorization no change shall be made.

50.

I/We undertake to furnish any other information within one month of its being called by the Board

Yours faithfully

Signature : Sub Area Manager
Name : Ravi Mohan Krishna
Designation : Sub ARea Manager

Additional Information

Air Pollution

Sr No.	*Air Pollution Source*	*Pollutants*	*APCS Provided*	*Remark*
1	Coal Stock Yard, Coal transportation road, Crusher	SPM, PM10, PM2.5	Rain guns are provided and water spraying is done on roads by mobile water tanker	-

Separate EM Provided	No	***Other Emission Sources***	-
Measures Proposed	-	***Foul Smell Coming Out***	No
Air Sampling Facility Details	Every fortnight monitoring by CMPDIL RI-IV Nagpur		

D.G. Set Details

Description	*Capacity(KVA)*	*Remarks*
-	0	-

Hazardous Waste Generation

Hazardous Waste	*Quantity*	*UOM*	*Treatment*	*Disposal*	*Other Details*
5.2 Wastes or residues containing oil	0	Ton/Y	CHWTSDF Butibori	CHWTSDF Butibori	-
35.3 Chemical sludge from waste water treatment	0	Ton/Y	CHWTSDF BUTIBORI	CHWSTDF BUTIBORI	-

CHWTSDF Details

Member of CHWTSDF	*CHWTSDF Name*	*Remarks*

Cess Details

Cess Applicable	*Cess Paid*	*If Yes, UpTo*
No	No	Aug 31 2015 12:00:00:000AM

Legal Actions

Legal Action Taken	Legal Record Of Company	Legal Action Details	Remarks
No			

Bank Guarantee Applicable:

No

Annexure

Environment Clearance

Date	Project Details	Capital Investment(Crs.)	Total Plot area(sq. mtrs.)	Total Built up area(sq. mtrs.)	Amendment/Extension
Jan 1, 1970		0	0	0	

DATA SHEET

<table>
<tr><th>S. No.</th><th>Particulars</th><th>Details</th></tr>
<tr><td>1</td><td>Project type</td><td>Opencast Coal Mining Project</td></tr>
<tr><td>2</td><td>Name of the Project</td><td>DHOPTALA OPEN CAST MINING PROJECT</td></tr>
<tr><td></td><td>Clearance letter</td><td>J-11015/538/2008-IA.II(M) Dated 10.01.2013</td></tr>
<tr><td>4</td><td>Location</td><td></td></tr>
<tr><td></td><td>a) District</td><td>Chandrapur</td></tr>
<tr><td></td><td>b) State</td><td>Maharashtra</td></tr>
<tr><td></td><td>c) Latitude/Longitude</td><td>N 19^{O}47’5” to N 19^{o}49’52”
E 79^{O}19’28” to E 79^{o}24’11”</td></tr>
<tr><td>5</td><td>Address for Correspondence</td><td></td></tr>
<tr><td></td><td>a) Address of concerned project chief Engineer with pin code & Telephone</td><td>Dhoptala Open Cast Mining Project, WCL, Ballarpur Area near Sasti village on Rajura – Ballarpur road, Tq:-Rajura, Dist: Chandrapur, Maharashtra.</td></tr>
<tr><td></td><td>b) Address of concerned project Engineer with pin code & Telephone</td><td>Dhoptala Open Cast Mining Project, WCL, Ballarpur Area near Sasti village on Rajura – Ballarpur road, Tq:-Rajura, Dist: Chandrapur, Maharashtra.</td></tr>
<tr><td>6</td><td>a) Salient Features of the project</td><td>The subject mine is an opencast mine in ML area of 1300.91 Ha. There is no Forest land involved. There is no National Park, Wildlife Sanctuary or Biosphere reserves found in 10 km buffer zone.
Land use pattern:
<table>
<tr><th>Sr no</th><th>Details</th><th>Area (Ha)</th></tr>
<tr><td>1</td><td>Excavated Area</td><td>385.68</td></tr>
<tr><td>2</td><td>External Dump</td><td>396</td></tr>
<tr><td>3</td><td>Infrastructure</td><td>30</td></tr>
</table>
</td></tr>
</table>

<table>
<tr><td></td><td></td><td><table>
<tr><td>4</td><td>Colony</td><td>3</td></tr>
<tr><td>5</td><td>Nallah Diversion</td><td>15</td></tr>
<tr><td>6</td><td>Rationalization</td><td>381.23</td></tr>
<tr><td>7</td><td>Embankment</td><td>90</td></tr>
</table></td></tr>
<tr><td></td><td>b) Environment Management Plan</td><td>As per EIA-EMP</td></tr>
<tr><td>7</td><td>Break – Up of the project area</td><td>Total Area – 1300.91 Ha
Agricultural land – 1264.31 Ha
Govt Land – 36.60 Ha</td></tr>
<tr><td>8</td><td>Break – up of the project affected Population enumeration of those losing houses/dwelling unit only and agricultural land less laborers/artisans.
a) SC, ST /Adivasis
b) Others</td><td>No R&R involved</td></tr>
<tr><td>9</td><td>Financial Details
a) Project</td><td>Sale Price – Rs. 2789.87/- per Tonne
Cost of Production – 1338.12 per Tonne</td></tr>
<tr><td></td><td>b) Environmental Management Cost</td><td>In built in Project cost</td></tr>
<tr><td></td><td>c) Actual Expenditure incurred in project</td><td>Detailed as below:<table>
<tr><td>Sr no.</td><td>Work details</td><td>Cost (Rs. Lakhs)</td></tr>
<tr><td>1</td><td>Provision of ETP</td><td>45</td></tr>
<tr><td>2</td><td>Provision of Sedimentation tank</td><td>25</td></tr>
<tr><td>3</td><td>Rain guns provided at Coal stock yard</td><td>16</td></tr>
<tr><td>4</td><td>Trolley mounted Fog cannon</td><td>17</td></tr>
<tr><td>5</td><td>Tyre wash system</td><td>33</td></tr>
<tr><td>6</td><td>Wind Barrier</td><td>24</td></tr>
<tr><td></td><td>TOTAL</td><td>160</td></tr>
</table></td></tr>
</table>

	d) **Actual Expenditure incurred in Environmental Management plan**	Rs. 250 Lakhs (Revenue Expenditure)
10	**Forest land requirement**	
	a) **The status of approval for diversion of forest land for non-forestry use**	NA
	b) **The status of clearing /felling**	30.4 Ha land cleared of Plantation for mine working
	c) **Comments on viability and sustainability of compensatory afforestation in the light of actual field experience so far**	NA
11	**Status of construction (Actual/ planned) Date of completion (Actual/ planed)**	**-**
12	**Reason for delay**	**-**
13	**Date of site visit** **a) The date on which the project was monitored by the regional officer, MoEF, Regional Office.**	**04.06.2024**

Sub Area Manager
Sasti Sub Area

"Under jurisdiction of Nagpur Court only"

वेस्टर्नकोलफिल्ड्सलिमिटेड़
(मिनी रत्न कम्पनी)
कार्यालय : उपक्षेत्रीय प्रबंधक, सास्ती उपक्षेत्र
बल्लारपुर क्षेत्र
पोस्ट : सास्ती, तहसीलः राजुरा, जिला :चंद्रपुर(म.रा)
पिनकोडः 442706, फोन : 07173 – 254022

Western Coalfields Limited
(A Mini Ratna Company)
Office : Sub Area Manager, Sasti Sub Area,
Ballarpur Area
Po:Sasti,Tah:Rajura,Dist:Chandrapur(MS)
Pin Code: 442706, Phone No :07173 - 254022

पंजी. कार्या. : कोलईस्टेट, सिविललाईन्स, नागपुर–440 001
Regd. Office : Coal Estate, Civil Lines, Nagpur-400 001
CIN : U10100MH1975GO1018626
Website : www.westerncoal.nic.in

संदर्भ कं. वेकोलि / बक्षे / उप्र / साउक्षे / 2025.26 / 898 दिनांकः 03-05-2025

CERTIFICATE

This is to certify that there are no pending court cases against Dhuptala OC Mine in any court of law. The total manpower employed at Dhuptala OC are 755 nos.

Sub Area Manager
Sasti Sub Area

"Under jurisdiction of Nagpur Court only"

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(मिनी रत्न कम्पनी)
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CIN : U10100MH1975GO1018626
Website : www.westerncoal.nic.in

संदर्भ कं. वेकोलि/बक्षे/उप्र/साउक्षे/2025.26/898 दिनांकः 03.05.2025

CERTIFICATE

There are no Show Cause Notice issued by CPCB, MPCB, MoEF&CC pending with Dhuptala OC of WCL, Ballarpur Area.

Sub Area Manager
Sasti Sub Area

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संदर्भ कं. वेकोलि / बक्षे / उप्र / साउक्षे / 2025.26 / 898

दिनांकः 03.05.2025

COAL AND OB PRODUCTION DETAILS OF DHUPTALA OC

Sr no	Year	Coal (MTPA)	OB (Mm^3)
1	22-23	0.7	7.407
2	23-24	1.68	11.306
3	24-25	1.7	9.42
TOTAL		4.08	28.133

Sub Area Manager.
Sasti Sub Area.

Maharashtra Pollution Control Board

महाराष्ट्र प्रदूषण नियंत्रण मंडळ

FORM V

(See Rule 14)

Environmental Audit Report for the financial Year ending the 31st March 2024

Unique Application Number	Submitted Date
MPCB-ENVIRONMENT_STATEMENT-0000073189	28-09-2024

PART A

Company Information

Company Name	Application UAN number	
M/s WCL Dhuptala OCM	MPCB-CONSENT-0000166169	
Address		
Dhuptala OCM, Rajura.		
Plot no	**Taluka**	**Village**
-	Rajura	Dhuptala
Capital Investment (In lakhs)	**Scale**	**City**
17042.83	L.S.I	Chandrapur
Pincode	**Person Name**	**Designation**
442905	Shri Manish Podey	Sub ARea Manager
Telephone Number	**Fax Number**	**Email**
9422135447	07173230076	envdhoptala@gmail.com
Region	**Industry Category**	**Industry Type**
SRO-Chandrapur	Red	R35 Mining and ore beneficiation
Last Environmental statement submitted online	**Consent Number**	**Consent Issue Date**
yes	Format1.0/CAC/UAN No.MPCBCONSENT-0000166169/CR/2307001630	2023-07-26
Consent Valid Upto	**Establishment Year**	**Date of last environment statement submitted**
2024-03-31	2021	Sep 28 2023 12:00:00:000AM
Industry Category Primary (STC Code) & Secondary (STC Code)		

Product Information

Product Name	Consent Quantity	Actual Quantity	UOM
Coal	1.70	1.681	MT/A

By-product Information

By Product Name	Consent Quantity	Actual Quantity	UOM
-	0	0	MT/A

Part-B (Water & Raw Material Consumption)

1) Water Consumption in m3/day

Water Consumption for	Consent Quantity in m3/day	Actual Quantity in m3/day
Process	600.00	700.00
Cooling	0.00	0.00
Domestic	15.00	605.00
All others	0.00	0.00
Total	615.00	1305.00

2) Effluent Generation in CMD / MLD

Particulars	Consent Quantity	Actual Quantity	UOM
Trade effluent (CGWA NOC)	2137	832	CMD

2) Product Wise Process Water Consumption (cubic meter of process water per unit of product)

Name of Products (Production)	During the Previous financial Year	During the current Financial year	UOM
Coal (Cubic Meter/ Tonne)	0.364	0.152	CMD

3) Raw Material Consumption (Consumption of raw material per unit of product)

Name of Raw Materials	During the Previous financial Year	During the current Financial year	UOM
Explosives (Kg /Tonne)	1.704	2.156	

4) Fuel Consumption

Fuel Name	Consent quantity	Actual Quantity	UOM
Deisel	0	79	KL/A

Part-C

Pollution discharged to environment/unit of output (Parameter as specified in the consent issued)

[A] Water

Pollutants Detail	Quantity of Pollutants discharged (kL/day)	Concentration of Pollutants discharged(Mg/Lit) Except PH,Temp,Colour	Percentage of variation from prescribed standards with reasons		
	Quantity	Concentration	%variation	Standard	Reason
WATER REPORT ATTACHED IN PART I	0	0	0	0	NA

[B] Air (Stack)

Pollutants Detail	Quantity of Pollutants discharged (kL/day)	Concentration of Pollutants discharged(Mg/NM3)	Percentage of variation from prescribed standards with reasons		
	Quantity	Concentration	%variation	Standard	Reason
NA	0	0	0	0	NO STACK EMMISSION

Part-D

HAZARDOUS WASTES

1) From Process

Hazardous Waste Type	Total During Previous Financial year	Total During Current Financial year	UOM

5.1 Used or spent oil	0	0	KL/A
5.2 Wastes or residues containing oil	0	0	Ton/Y

2) From Pollution Control Facilities

Hazardous Waste Type	Total During Previous Financial year	Total During Current Financial year	UOM
35.3 Chemical sludge from waste water treatment	0	0	Ton/Y

Part-E

SOLID WASTES

1) From Process

Non Hazardous Waste Type	Total During Previous Financial year	Total During Current Financial year	UOM
Over Burden	4367000	11306000	M3/Anum

2) From Pollution Control Facilities

Non Hazardous Waste Type	Total During Previous Financial year	Total During Current Financial year	UOM
NA	0	0	Ton/Y

3) Quantity Recycled or Re-utilized within the unit

Waste Type	Total During Previous Financial year	Total During Current Financial year	UOM
0	0	0	Ton/Y

Part-F

Please specify the characteristics(in terms of concentration and quantum) of hazardous as well as solid wastes and indicate disposal practice adopted for both these categories of wastes.

1) Hazardous Waste

Type of Hazardous Waste Generated	Qty of Hazardous Waste	UOM	Concentration of Hazardous Waste
0	0	Ton/Y	0

2) Solid Waste

Type of Solid Waste Generated	Qty of Solid Waste	UOM	Concentration of Solid Waste
OVERBURDEN	11306000	M3/Anum	0

Part-G

Impact of the pollution Control measures taken on conservation of natural resources and consequently on the cost of production.

Description	Reduction in Water Consumption (M3/day)	Reduction in Fuel & Solvent Consumption (KL/day)	Reduction in Raw Material (Kg)	Reduction in Power Consumption (KWH)	Capital Investment(in Lacs)	Reduction in Maintenance(in Lacs)
IN COMPARISION TO PREVIOUS FINANCIAL YEAR	0	-0.107	-242900	-7924000	0	0

Part-H

Additional measures/investment proposal for environmental protection abatement of pollution, prevention of pollution.

[A] Investment made during the period of Environmental Statement

Detail of measures for Environmental Protection	*Environmental Protection Measures*	*Capital Investment (Lacks)*
ETP	-	25
sedimentation Tank	-	15

[B] Investment Proposed for next Year

Detail of measures for Environmental Protection	*Environmental Protection Measures*	*Capital Investment (Lacks)*
Trolley mounted fogging machine	-	15

Part-I

Any other particulars for improving the quality of the environment.

Particulars

-

Name & Designation

Shri Manish Podey, Sub Area Manager

UAN No:

MPCB-ENVIRONMENT_STATEMENT-0000073189

Submitted On:

28-09-2024

वेस्टर्न कोलफील्ड्स लिमिटेड
Western Coalfields Limited
कंपनी सचिव का कार्यालय
Office of the Company Secretary
पंजी.का.: कोयला विहार, सिविल लाइन्स, नागपुर (महाराष्ट्र)-440001 email - companysecretary.wcl@coalindia.in
Regd. Off.: Coal Estate, Civil Lines, Nagpur (MS) - 440001 ☎/FAX: 0712 - 2511216
CIN - U10100MH1975GOI018626 www.westerncoal.in

657
23/03/2022

BOARD MATTER
CONFIDENTIAL

REF: WCL/Office of CS/BM-341/2021-22/974 DATE: 22.03.2022.

Reproduced below is the relevant excerpt from the minutes of 341st meeting of the Board of Directors of WCL held on 09th March, 2022:

"ITEM NO.341/ C-4
SUB Approval of Mining Plan including Mine Closure Plan for Dhuptala OC (Sasti UG to OC) Phase I, II & III, Ballarpur Area.

i) While deliberating on the proposal brought out in the agenda note, Shri Jai Prakash Dwivedi, Director (Technical) apprised the salient features of Mining Plan of Dhuptala OC (Sasti UG to OC) Phase I, II & III, Ballarpur Area to the Board.

ii) The Board, after deliberation, accorded approval to the Mining Plan including Mine Closure Plan of Dhuptala OC (Sasti UG to OC) Mine Phase I, II & III, Ballarpur Area for 2.50 MTY Capacity within 1070.49 Ha land without any additional capital and land of approved project report as brought out in the agenda note.

iii) General Manager (P&P) to take necessary action in the matter."

22/3/2022
COMPANY SECRETARY

GENERAL MANAGER (P&P)

CC: DIRECTOR (PERSONNEL)
DIRECTOR (TECHNICAL) OP
DIRECTOR (FINANCE)
DIRECTOR (TECHNICAL) P&P

RD / CMOP&I RI-IV

657
23/03/2022

25/03/2022

1) HOD(OC)
2) HOD (Env.)

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MINING PLAN

FOR

DHUPTALA OC MINE (2.50 Mty)
(PHASE- I, II & III)

(BALLARPUR AREA)

WESTERN COALFIELDS LIMITED

FEBRUARY- 2022

CMPDI

REGIONAL INSTITUTE-IV, KASTURBA NAGAR,
JARIPATKA, NAGPUR, PIN – 440 014

AN ISO 9001 : 2015 COMPANY

MINING PLAN FOR DHUPTALA OC (SASTI UG TO OC) MINE (PHASE-I, II & III)

1.0 BACKGROUND

The proposed Dhuptala OC (Sasti UG to OC) mine is basically a conversion of existing Sasti RO (UG) mine into opencast mine in Sectors D, E, F, G & H of Dhuptala Geological Block. Dhuptala Geological Block of Wardha Valley Coalfield is located in southern bank of Wardha River near Ballarpur in Chandrapur District of Maharashtra State. In this geological block, Sector 'E' is totally depillared in all the three sections of the Composite Seam, Sector 'F' is depillared in major portion and Sector 'D', 'H' & 'G' have been developed in major portion by underground method of working.

The Project Report of Dhuptala OC (Sasti UG to OC) mine was prepared in January 2008 for a capacity of 1.70 Mty. The report was presented and discussed in WCL Board meeting held on 17/18.06.2008 at WCL (HQ), Nagpur. After detailed deliberation, WCL Board approved the Project Report of Dhuptala OC (Sasti UG to OC) Mine for a capacity of 1.70 Mty. with an additional capital investment of Rs. 194.1064 crores excluding WDV of Rs. 21.2001 crores on Partial Hiring Option (Coal Extraction by Departmental Equipment and Top OB removal by Hiring of equipment) on Cost-plus basis.

The cost plus customer could not be identified for Dhuptala OC (Sasti UG to OC) mine and to continue the existing Sasti RO UG, it was essential to work the part of reserves of Dhuptala OC (Sasti UG to OC) by existing underground mine. Accordingly, the status of various cost plus projects of WCL was presented in the 237th meeting of the Board of Directors of WCL held on 31st March, 2012. The Board directed that production and dispatch from these underground mines should continue with the existing system till the time these mines are converted into OC mines and take off on cost plus basis. An updated Project Report is to be placed before the Board for approval.

Accordingly, the PR of Dhuptala OC (Sasti UG to OC) mine was updated in Partial Hiring Option with revised land price and other indices for September, 2012. As per the updated PR, the gap between desired selling price to yield

12% IRR at 85% capacity and the average notified selling price of coal was increased to Rs. 1282.01/t. Due to such high cost, it was difficult to identify cost plus customer for the proposed Dhuptala OC (Sasti UG to OC) mine.

New guidelines for preparation of Project Report were made as per the decision of 317th CIL Board meeting held on 13/07/2015. The notified price of coal was further revised with effect from 30.05.2016.

Accordingly, it was decided by WCL to update the PR of Dhuptala OC (Sasti UG to OC) mine with updated norms/indices. Hence, the Project Report of Dhupata OC (Sasti UG to OC) mine was updated in June, 2017 for the approved Partial Hiring option for 1.70 Mty capacity. However, to explore the possibility of economical viability in Notified price, one more option was worked out for 2.50 Mty capacity in Total Hiring option in June, 2017.

WCL requested CMPDI, RI-IV to tentatively update the Project Report of Dhuptala OC (Sasti UG to OC) for 2.50 Mty capacity in Total Hiring option after loading the surplus manpower generated due to land acquisition. Accordingly, a tentative updation of the PR of Dhuptala OC (Sasti UG to OC) mine was done by CMPDI, RI-IV in September, 2018 after loading about 1000 surplus manpower (approx.) generated due to land acquision.

The above updated PR of Dhuptala OC (Sasti UG to OC) was discussed in the Technical Sub-Committee of WCL board for Projects held on 16.11.2018 at WCL (HQ), Nagpur. After detailed deliberation, Technical Sub-Committee of WCL Board directed to update the Project Report with following recommendations before submitting the PR before WCL Board:

1. Manpower generated due to land acquisition to be adjusted with financial provision.
2. Phasing of Sasti village rehabilitation after eight years.

Based on the above directives of Technical Sub-Committee of WCL Board for Projects, the Project Report of Dhuptala OC (Sasti UG to OC) was updated in November, 2018 for 2.50 Mty capacity in Total Hiring option after absorbing the cost of surplus manpower generated due to land acquisition.

1.1 Salient Features of PR of Dhuptala OC (Sasti UG TO OC) Mine

The PR of proposed Dhuptala OC (Sasti UG to OC) mine was updated in November, 2018 for a target capacity of 2.50 Mty in Total Hiring option. The salient features of the PR are summarized below:

Salient Features of PR of Dhuptala OC (Sasti UG to OC), Nov., 2018

Sl. No.	Particulars	Total Hiring Option	
		26 Yrs. Life	20 Yrs. Prod. Life
A	**General Parameters**		
1	Mineable Reserves (Mt)	53.11	42.70
2	GCV(kCal/kg) (G11)	4210	4210
3	Volume of Overburden (Mm^3) (Excluding Trench Cutting and Rehandling)	279.50	228.00
4	Average S/R (m^3/t)	5.26	5.34
5	Mine Capacity (Mty)	2.50	2.50
6	Manpower Requirement (Nos.) Addl. Manpower due to land acquisition Total Manpower	174 844 1018	174 844 1018
7	Overall OMS (t) (Based on 174 dept. manpower)	54.424	54.424
8	EMS (in Rs.)	3356.08	3356.08
B	**Financial Parameters**		
1	Additional Capital Required (Rs.in Crs.)	711.0093	710.1377
1.1	WDV (Rs.in Crs.)	9.8570	9.8570
1.2	Total Capital (Rs.in Crs.)	720.8663	719.9947
2	Cost of Production (Rs./t)		
2.1	@ 100% of target capacity (Rs./t)	1585.66	1636.69
2.2	@ 85% of target capacity (Rs./t)	1726.61	1783.54
3	Av. Notified Selling Price (Rs./t) for G-11 grade (GCV- 4210 kCal/kg) for **Power Sector**	1224.75	1224.75
4	Profit/Loss (Rs./t) for Power Sector		
4.1	@ 100% of target capacity (Rs./t)	(-) 360.91	(-) 411.94
4.2	@ 85% of target capacity (Rs./t)	(-) 501.86	(-) 558.79
5	Financial IRR at 85% of capacity for Power Sector	Negative	Negative
6	Price to yield 12 % IRR @ 85% capacity (Rs./t)	1962.00	**2005.36**
7	*Difference between price to yield 12 % IRR @ 85% capacity & Notified Selling Price (Rs./t)*	737.25	780.61

1.2 JUSTIFICATION OF MINING PLAN PREPARATION

The last Environment Clearance for Dhuptala OC (Sasti UG to OC) was obtained for a capacity of 1.70 MTPA with total mining lease area of 1300.91 Ha based on approved PR of Dhuptal OC (January-2008) .

As mentioned in Section 1.0, the PR was updated and finally submitted in November - 2018 with a target capacity of 2.50 Mty and approved in 379th CIL Board meeting held on 12th February 2019. Although the mine area of this PR is within the leasehold area of approved EC, fresh Environmental Clearance will have to be obtained due to increase in target capacity from 1.70 Mty to 2.50 Mty. Also in the approved EC, for calculation of mine closure cost, an amount @ Rs. 6.00 lakhs per Ha of the project area was considered, however, as per Circular No. 34011/28/2019-CPAM, GOI, Ministry of Coal, dated 29th May 2020, for opencast mine, an amount @ Rs 9.00 lakhs per Ha of the project area is required to be deposited in this account for final mine closure

The PR of Sasti Expansion OC neighbouring mine of Dhuptala OC was updated and submitted in June-2020 with a target capacity of 2.50 Mty and approved in 324th WCL Board meeting held on 17th August 2020. In approved PR of Sasti Expansion OC, it was envisaged to transfer 11.70 Ha land from Dhuptala OC to Sasti Expansion OC. The PR of Ballarpur NW OC neighbouring mine of Dhuptala OC was updated and submitted in November - 2021 with a target capacity of 1.50 Mty and approved in 339th WCL Board meeting held on 4th January 2022. In approved PR of Ballarpur NW OC mine, 213.93 ha land earlier proposed for external dump of Dhuptala OC was proposed to be transferred from Dhuptala OC to Ballarpur NW OC mine. After the exhaustion of Ballarpur NW OC mine (after 17 years of mine life), the void of Ballarpur NW OC mine is proposed to be utilized for OB dumping of Dhuptala OC mine and thus there will be saving of land by such optimization of OB dumping . Considering transfer of land between these three mines, The total land used pattern and total land requirement for Dhuptala OC is summarized in below table :-

Sl. No.	Particulars	Area (ha) as per Approved EC, 2013	Area (ha) as per present Mining Plan
	Within Mine Leasehold Boundary		
1	Excavation area	385.68	385.68
2	External OB Dump (including top soil dump)	396	255.3
3	Infrastructure/Roads	30	50

Sl. No.	Particulars	Area (ha) as per Approved EC, 2013	Area (ha) as per present Mining Plan
4	Embankment	90	60
5	For nala diversion	15	15
6	Rationisation Boundary /Blasting Zone / Land for Future Coal Extraction and OB Dumping	327.57	117.85
7	Green Belt		130
		1244.25	**1013.83**
	Outside Mine Leasehold Boundary		
8	Colony	3	3
9	For Village Rehabilitation	15	15
10	Existing Combined Township	38.66	38.66
	TOTAL	**1300.91**	**1070.49**

The break up of land for proposed Dhuptala OC is as follows :

Sl. No.	**Particulars**	**Land to be (ha)**
1	Land Already acquired by WCL under Dhuptala OC, Sasti UG and Sasti OC mines	368.59
2	Tenancy land (including 3 Ha land for colony outside mine leasehold)	824.62
3	Land to be transferred to Ballarpur NW OC (as per approved PR of Ballarpur NW OC (November, 2021)	(-) 213.93
4	Land to be transferred to Sasti Expansion OC (as per approved PR of Sasti Expansion OC (June, 2020)	(-) 11.70
5	Forest Land	NIL
6	Govt. land	49.25
7	Land Outside ML area for Village Rehabilitation	15
8	Existing Sasti Township (Outside leasehold Boundary)	38.66
	Total (A+B)	**1070.49**

Due to changes in land used pattern the proposed Mining Plan for Dhuptala OC (Sasti UG to OC) mine is being prepared in three phases as given below:

Phase-I : In this phase, working will be done as per existing EC for a capacity of 1.70 MTPA for a area of 1070.49 Ha (1013.83Ha within mine leasehold boundary and 56.66 Ha land outside mine leasehold boundary) for initial four years.

Phase-II : In this phase, Dhuptala OC mine is reaching its target capacity of 2.50 Mty . In Phase-II, EC capacity of 2.50 Mty will be required for 1070.49 Ha land. Phase –II is proposed from 5th year to 18th year of mine life considering the working will be done in this phase till exhaustion of reserves of Ballarpur NW OC mine having 17 years mine life.

Phase-III: In this phase, after exhaustion of Ballarpur NW OC mine, the void of Ballarpur NW OC mine is proposed to be utilized for OB dumping of Dhuptala OC mine and thus there will be saving of land by optimization of OB dumping. The target capacity of Dhuptala OC i.e. 2.50 Mty is proposed to be maintained till balance life of Dhuptala OC mine. With a total requirement of land area about 1660.02 ha {1070.49 ha (1013.83 Ha within mine leasehold boundary and 56.66 Ha land outside mine leasehold boundary) for Dhuptala OC + 589.53 ha land area for Ballarpur NW OC}. However, for calculation of closure cost, only 1013.83 ha land within project leasehold boundary will be considered. For the land area of 589.53 Ha of Ballarpur NW OC mine, a separate escrow account will be maintained.

Hence, the proposed Mining Plan for Dhuptala OC (Sasti UG to OC) mine is being prepared for grant of EC for 2.50 Mty capacity, optimization of land required for OB dumping and revision of rate per Ha for calculation of mine closure cost.

1.2 EXPLORATION STATUS AND RECENT STUDIES

CMPDI, RI-IV took up the job of studying the feasibility of working a major part of Sasti Colliery by opencast mining. The plans showing surface contours, extent of workings of different sections, spot levels of working sections, faults encountered and boreholes drilled by colliery authorities were supplied to CMPDI by Sasti Colliery authorities. In addition to this, 10 nos. of boreholes were drilled by CMPDI during the period from January to May 1981. Based on these data, CMPDI prepared a Geological Report namely “Geological Appraisal of Dhuptala Opencast (Major) Area, covering Sasti Colliery workings, Wardha Valley Coalfield, District Chandrapur, Maharashtra” in March, 1982.

In the above mentioned Geological Report, the entire Dhuptala Block has been divided into eight Sectors namely Sector A, B, C, D, E, F, G & H on the basis of disposition of faults. Out of these eight sectors, six Sectors (i.e. A to F) were identified for Opencast and Sector G & H for underground mining.

Sector-A, B and C of Dhuptala Block have already been extracted by opencast mining. In 2007 it was decided to prepare a detailed PR of Dhuptala block by Opencast mining in Sector D, E, F, G & H involving the rehabilitation of Sasti Village. It was proposed to convert the underground workings of existing Sasti UG (RO) mine into an opencast project. Accordingly, a Project Report for Dhuptala OC (Sasti UG to OC) mine was prepared in January 2008 for a target capacity of 1.70 Mty which was approved by WCL Board on 17/18.6.2008 in Partial Hiring Option subject to cost plus agreement. It has been proposed in this report that the underground mining in Sasti UG (RO) mine will be stopped before starting the Access trench in Sector E. The proposed quarry in Dhuptala OC (Sasti UG to OC) is limited to 120m depth in Sector G and 150 m depth in Sector H due to presence of Dhuptala village, Dhuptala nala and local nala in the dip side.

1.3 PRESENT STATUS OF MINE/PROJECT

The proposed Dhuptala OC (Sasti UG to OC) is basically a conversion of existing Sasti RO (UG) mine in Sectors D, E, F, G & H of Dhuptala Geological Block. In this geological block, Sector 'E' is totally depillared in all the three sections of Composite Seam, Sector 'F' is depillared in major portion and Sector 'D', 'H' & 'G' have been developed in major portion by underground method of working. The underground workings of Sasti UG (RO) mine have reached upto about 150 m depth.

1.4 DIFFICULTIES AND CONSTRAINTS IN MINING WITH ASSOCIATED RISK

Various surface constraints / risks involved in the proposed Dhuptala OC (Sasti UG to OC) Project are as detailed below :

1. Acquisition of Land and dismantling of Hutments etc.

Proposed Dhuptala OC (Sasti UG to OC) mine involves acquisition of 870.87 ha of additional land within the mine leasehold boundary and 18.00 Ha

(3.00 Ha for Colony and 15.00 Ha land for Village rehabilitation) additional land outside the mine leasehold boundary . In addition to this, about 368.59 ha of acquired land of existing Sasti RO UG mine, Sasti OC mine and Dhuptala OC mine will also be used in the proposed project and 38.66 Ha existing land of Sasti township of Ballarpur Area is considered in this project

Sasti village is located in Quarriable area and it is proposed to be shifted. Adequate capital provision has been made in this PR for shifting and rehablitation of Sasti village. About 75 nos. of hutments/quarters belonging to private occupants are existing in the land already acquired by WCL near the site proposed for external OB dumping for the proposed Dhuptala OC (Sasti UG to OC) mine. These hutments are required to be dismantled and adequate provision has been made in this report.

2. Diversion of Electric lines

Four nos. of 11 kV electric lines of MSEB and WCL and one no of 66 kV electric lines are passing over the proposed quarry area which need to be diverted. Adequate provisions have been made in the PR for this purpose.

3. Diversion of Nalla

Dhuptala nala and a local drain are flowing through the proposed quarriable area and drain into Rajur nala which ultimately join to Wardha river. These nallas are required to be partly diverted.

4. Diversion of PWD Road

A P.W.D. road from Ballarpur to Rajura is passing through the proposed quarriable area which needs to be diverted. The part diversion of about 5.25 km is proposed from the northern side along the Wardha river over flood protection embankment. In addition about 3.75km diversion of village road is also proposed in the approved PR.

5. Diversion of Water Pipeline

A water pipeline is also passing through the proposed quarriable and dump area which needs to be diverted. The part diversion of about 8.00 km is proposed from the northern side along the flood protection embankment.

6. Shifting of Petrol Pump & Intake Well

A Petrol Pump is located in the dip side of the quarriable area which needs to be shifted. An intake well located in the dip side of quarriable area which caters the water demand for Sasti town ship, is also required to be shifted.

2.0 MARKETABILITY

The mines of WCL are under constant pressure to meet the increasing demand of non-coking coal for power houses and other bulk consumers from Western as well as Southern part of country. The justification of this mine has been studied in the light of estimated demand for non-coking coal from power and other sectors and production forecast from existing, completed, ongoing and future projects of WCL.

To reduce the gap between demand and supply of coal, it is very essential to either open new mines or increase the production from existing mines of WCL. Thus, Mining Plan of Dhuptala OC (Sasti UG to OC) mine having target capacity of 2.50 Mty will help to reduce the gap between demand and supply of coal from WCL mines.

3.0 PROJECT SITE INFORMATION

3.1 LOCATION

The proposed Dhuptala OC (Sasti UG to OC) mine is basically a conversion of existing Sasti RO (UG) mine into opencast mine in Sectors D, E, F, G & H of Dhuptala Geological Block. Dhuptala Geological Block of Wardha Valley Coalfield is located in southern bank of Wardha River near Ballarpur in Chandrapur District of Maharashtra State. The proposed Dhuptala OC (Sasti UG to OC) mine is located about 7 km from Rajura township and 8 km from Ballarpur township. The mine falls in the Survey of India toposheet No. 56 M/5 (RF 1:50,0000). The area is bounded by latitudes N 19°47' and N19°49'.

3.2 ACCESSIBILITY AND COMMUNICATION

The block is well connected by road. The proposed Dhuptala OC (Sasti UG to OC) mine is located about 7 km from Rajura township and 8 km from Ballarpur township via new bridge on Wardha River near Ballarpur OC mine.

Rajura is connected to Ballarpur (12 km) and Ballarpur is connected to Nagpur (165 km) by all weather metalled road as well as by rail link.

3.3 TOPOGRAPHY AND DRAINAGE

The area has a slightly undulating topography with gentle slope towards Wardha River in the North. The surface reduced level values vary between 260.54 m to 273.85 m. **The H.F.L. of Wardha River as recorded by Sasti Colliery in 1959 is 271.88 m.** However, it may be mentioned that topographical features are with reference to arbitrary benchmark. In terms of Mean Sea Level, the corrected reduced level would be lesser by 93.50 m as established by Ballarpur Area Survey officials by connecting assumed reduced level to reduced level as mentioned on the railway bridge on Wardha River near Ballarpur. However, in the present assessment and in all the plans, only the assumed reduced level values have been utilized. Whenever a correct reduced level value is required, the value of 93.50 m has to be deducted from the RL values as mentioned in the assessment and plans.

The Wardha river controls the main drainage of the area. The Dhuptala nala and a local nala are flowing over the quarry area in the dip side and merge with Rajur Nala which ultimately discharges into Wardha river.

3.4 CLIMATE AND RAINFALL

The average rainfall is 1100 mm. The maximum precipitation is during June to September. The area experience tropical climate. The summer season is from April to June with the maximum temperature reaching through 48^{o}C during May. Winters are moderate with the minimum temperature dropping upto 8^{o}C.

3.5 PRESENT LAND USE PATTERN

The major part of the block is agricultural land. The proposed land required for the project comprises of surrounding villages namely Kolgaon, Manoli, Sasti, Dhuptala, Bhadangpur. Land of these villages is mostly used for cultivation purpose. Cash crops like cotton, chillies etc are also grown apart from standard agricultural product like rice, wheat & jawar.

4.0 GEOLOGY AND DEPOSIT APPRAISAL

4.1 Introduction

The proposed Dhuptala block has been extensively worked by Sasti UG mine through Bord and Pillar method of mining. To study the feasibility of working major part of Sasti Colliery by opencast mine, the plans showing surface contours, extent of workings of different sections, spot levels of working sections, faults encountered and boreholes drilled by colliery authorities were supplied to CMPDI by Sasti Colliery authorities. In addition to this, 10 nos. of boreholes were drilled by CMPDI during the period from January to May 1981. Based on these data, CMPDI prepared a Geological Report namely "Geological Appraisal of Dhuptala Opencast (Major) Area, covering Sasti Colliery workings, Wardha Valley Coalfield, District Chandrapur, Maharashtra" in March, 1982.

In the above mentioned Geological Report, the entire Dhuptala Block has been divided into eight Sectors namely Sector A, B, C, D, E, F, G & H on the basis of disposition of faults. Out of these eight sectors, six Sectors (i.e. A to F) were identified for Opencast and Sector G & H for underground mining.

Sector-A, B and C of Dhuptala Block have already been extracted by opencast mining upto the limit of surface constraint like close proximity to Wardha river/ diverted Sasti nala etc. Hence the Dhuptala Geological block in this report is limited to Sectors D, E, F, G and H only.

4.1.1 Geological Reports

The Project Report is based on following geological documents:

1. Geological Appraisal of Dhuptala Opencast (Major) Area, covering Sasti Colliery Workings, Wardha Valley Coalfield, District Chandrapur (MS), CMPDIL, March, 1982.
2. Geological Report on Exploration for Coal 'Dhuptala Dip Side Block', Wardha Valley Coalfield, Ballarpur Area, District Chandrapur (MS), MECL, April, 1991.
3. Geological Report on Exploration for Coal in Sasti O/C, Wardha Valley CF, District Chandrapur (MS), MECL, March, 1992.

4. Geological Report on Exploration on Coal in Mathra Block, Wardha Valley CF, District Chandrapur (MS),MECL, Sept.1992

5. Geological Note on Production Support Drilling 'Dhuptala Opencast Area (Sector-C), Wardha Valley CF, District Chandrapur (MS), MECL, June 1994.

6. Geological Note on Production Support Drilling 'Sasti Underground Mine Area' Wardha Valley CF, District Chandrapur (MS), MECL, December, 1994.

7. Basic drilling data of borehole name CMWD-11, 12, 13.

4.1.2 Geological Block Boundary

The geological area of Sectors D, E, F, G & H of Dhuptala Block extends over an area of about 3.20 sq. km and is limited by the following boundaries.

North : Fault F_8 - F_8, F_6 - F_6, F_2 - F_2.

East : Fault F_1 - F_1

South : Fault F_{13} - F_{13}, Dhuptala nala, Fault F_{11} - F_{11} and F_{12} - F_{12}

West : Subcrop of composite seam.

4.2 EXPLORATION STATUS

The details of boreholes drilled in the proposed quarry and Mining area are tabulated below:

Exploration Details in Dhuptala OC (Sasti UG to OC) Mine

Sl. No.	Borehole No.	Agency	Period	Meterage
1	CMWD – 1, 3, 7	C.M.P.D.I.	31.1.81 – 30.5.81	311.90
2	CMWD – 11, 12, 13	C.M.P.D.I.	7.11.01 – 3.12.01	259.40
3	MWS – 15, 19, 22, 26, 48, 113	MECL	7.8.87 –22.2.90	900.50
4	MWSU - 1	MECL	20.9.94 – 10.10.94	104.00
Total	**13**			**1575.80**

Note : PBH, BH and SBH series boreholes were drilling by colliery authorities. These are non-coring boreholes drilled upto the roof of seam as and when require. These boreholes were not taken into account while computing borehole density.

4.2.1 Borehole Density

Total 13 boreholes were drilled in and around mining block having an area of 3.20 sq.km. The borehole density is 4/sq.km.

4.3 GEOLOGY AND STRUCTURE OF BLOCK AREA

4.3.1 Geological Succession

The geology of the block has been established mainly from the sub-surface borehole data as the entire area is covered under a blanket of soil. The geological formations encountered in boreholes beyond to Lower Gondwanas. No igneous intrusion has been intersected in the boreholes.

The Geological succession of the block is given below :

GEOLOGICAL SEQUENCE OF MINING BLOCK

Formation	Lithology	Thickness Range (m)	
		Minimum	Maximum
Soil	Black cotton soil, sandy soil Depth of weathering is 22 m	3.00 (MWS-19)	11.00 (MWSU-1)
-----U N C O N F O R M I T Y------			
Kamthis	Red,brown,yellow coloured fine to coarse grained sandstone, variegated clays	9.00 (MWS-48)	26.65 (CMWD-13)
-----U N C O N F O R M I T Y------			
Barakars	Grey to white, fine to medium grained sandstone, intercalation of shale and sandstone, shale, carb shale, coal etc.	44.28 (CMWD-12)	174.25 (MWS-48)
Talchirs	Greenish sandstone and greenish shale	Not encountered.	

4.3.2 Strike & Dip

The strike and dip of the coal seam in the proposed mining block is based on the sub-surface data. Floor contour of the composite seam has been drawn at 10 m interval from which it would be seen that the amount of dip and strike direction is quite variable. The strike of the seam is NE-SW to N-S and gradient is 1 in 10 to 1 in 18 due east.

4.3.3 Faults

The interpretation of faults is based on the sub-surface data i.e truncation of seam and difference in floor reduced level of coal seam on either side of the fault. Details of the fault are tabulated below :

DESCRIPTION OF FAULTS

Sl. No.	Fault Name	Trend	Direction and Amount of throw (m)	Evidences
1.	F1-F1	NW-SE	SW, 75-170 m	1. Encountered in the underground mine workings of Sasti UG. 2. In CMWS-10 and MWS-170, seam is faulted 3. Difference in FRL values in either side of the fault
2.	F2-F2	ENE-WSW	SSE, 25 m	1. Encountered in the underground mine workings of Sasti UG. 2. Difference in FRL values in either side of the fault.
3.	F4-F4	NE – SW	SE, 5-25m	1. Encountered in the underground mine workings of Sasti UG. 2. Difference in FRL values in either side of the fault.
4.	F5-F5	NE – SW	NW, 14-55m	1. Encountered in the underground mine workings of Sasti UG. 2. Difference in FRL values in either side of the fault.
5	F6-F6	WNW-ESE	SSW, 30m	1. Encountered in the underground mine workings of Sasti UG. 2. Difference in FRL values in either side of the fault.
6.	F7-F7	NW – SE	NE, 6-12 m	1. Encountered in the underground mine workings of Sasti UG.
7.	F8-F8	WNW-ESE	SSW, 20 m	1. Difference in FRL values in either side of the fault.

Sl. No.	Fault Name	Trend	Direction and Amount of throw (m)	Evidences
8.	F9-F9	NE-SW	NW, 10-15m	1. Difference in FRL values in either side of the fault.
9.	F10-F10	NW – SE	NE. 25-35m	1. Encountered in the underground mine workings of Sasti UG. 2. Difference in FRL values in either side of the fault.
10.	F11-F11	E – W	S, 5-17m	1. Encountered in the underground mine workings of Sasti UG. 2. Difference in FRL values in either side of the fault.
11.	F12-F12	NE – SW	SE, 10m	1. Difference in FRL values in either side of the fault.

Note: In addition, many minor faults having a throw less than 5 m have been encountered in the Sasti UG Mine.

4.3.4 Sectors

The entire Dhuptala Block has been divided into eight Sectors namely Sector A, B, C, D, E, F, G & H on the basis of disposition of faults. Out of these eight sectors, three sectors namely Sector - A, B & C have already been extracted through opencast mining upto the limit of surface constraint like close proximity to Wardha river/ diverted Sasti nala etc. Hence the Dhuptala Geological block in this report is limited to Sectors D, E, F, G and H only. The sector boundaries are described below :-

Limit of the Sectors

Sectors	Bounded by
A	Subcrop of Composite Seam in west, Fault F3-F3 in south, Wardha river in north and Fault F4-F4 in east.
B	Subcrop of Composite Seam in west, Fault F2-F2 in south, Fault F3-F3 in north and Fault F4-F4 in east.
C	Fault F4-F4 in west, Fault F6-F6 in south, Wardha river in north and Fault F8-F8 &Fault F14-F14 in east.

Sectors	Bounded by
D	Fault F4-F4 in west, Fault F7-F7 in south , Fault F6-F6 in north and Fault F5-F5 in east.
E	Subcrop of Composite Seam in west, Boundary Fault F1-F1 in south, Faults F2-F2 in north and Fault F4-F4 in east.
F	Fault F4-F4 in west, Boundary Fault F1-F1 in south, Fault F7-F7 in north and Fault F5-F5 in east.
G	Fault F5-F5 in west, Boundary Fault F1-F1 in south, Fault F10-F10 in north and Fault F11-F11 &Fault F12-F12 in east.
H	Fault F9-F9 in west, Fault F10-F10 in south , Fault F8-F8 & F13-F13 in north and Dhuptala nala in east.

4.4 DESCRIPTION OF COAL SEAMS

A thick composite seam occurs in middle Barakar formation in proposed Dhuptala Block. This composite seam is split into two coaly sections namely Top Split and Bottom Split separated by a parting of shale, carbacenous shale and intercalation of shale and sandstone. The thickness range of partings is 2.37 m to 3.35 m and the average parting is 2.86 m. Hence for opencast purposes, the seam Top Split + Parting + Bottom Split has been named as composite seam and quality has been re-estimated accordingly. The thickness of composite seam ranges from 12.77 m (CMWD-41) to 17.18 m (MWS-16). Since few exploratory boreholes are available in the mining block, an average thickness of 15.68 m has been taken as the thickness of Top and Bottom split including the parting in between the two.

The Top Split of composite seam is relatively more banded than the Bottom Split. However, disposition of these bands are highly irregular. The seam quality has been estimated by including all in seam dirt bands irrespective of thickness and nature.

4.5 QUALITY OF COAL SEAM

In view of the variation in the quality of composite seam in different boreholes falling in the mining block, the weighted average data has been estimated.

Quality Parameters (Top Split + Parting + Bottom Split)

Sl. No.	Quality of Coal	UHV (k. Cal/kg)	GCV (k.Cal/kg) (Calculated)	Grade
1	Undiluted	3320	4375	G-10
2	0.05m Dilution at each contact point without blanketing	3170	4270	G-11
3	0.05m Dilution at each contact point with blanketing	3080	4210	G-11

In this Mining Plan, the GCV of **4210 kCal/kg** has been considered with 0.05m dilution of coal at each contact point and also the impact of OB blanketing to deal the spontaneous heating while extracting coal of already developed / depillared pillars of underground workings. The corresponding band of GCV works out to **G-11.**

4.6 NET GEOLOGICAL RESERVES

In the area under report, only one workable coal seam viz. Composite Seam, having average thickness of 15.68 m has been established. A total of 69.63 Mt of coal has been estimated in block. The sector-wise net insitu proved geological reserves in million tonnes in the proposed block are given below:

Net In-situ Proved Geological Reserves (Mt)

Sector	Reserves (Mt)
D	5.70
E	15.25
F	14.59
G	13.52
H	20.57
Total	**69.63**

5.0 MINE BOUNDARIES, RESERVES & MINE LIFE

5.1 INTRODUCTION

The proposed Dhuptala OC (Sasti UG to OC) mine is basically a conversion of existing Sasti RO (UG) mine into opencast mine in Sectors D, E, F, G & H of Dhuptala Geological Block.

5.2 MINE BOUNDARY DELINEATION

5.2.1 Selection of Seam

There is one prominent composite coal seam present in the block having two coaly sections separated by parting consisting of shale, carb shale and intercalation parting of 2.37 m to 3.35 m. This parting between sections is difficult to separate during opencast mining, hence taken as one Composite Seam. The thickness of composite seam ranges from 12.77 m (CMWD-41) to 17.18 m (MWS-16). In the proposed area, the Composite Seam has already been worked by underground method of mining. Two sections namely, Top and Middle have been worked by underground mining.

5.2.2 Selection of Sectors

The entire Dhuptala Block has been divided into eight Sectors namely Sector A, B, C, D, E, F, G & H on the basis of disposition of faults. Out of these eight sectors, three sectors namely Sector - A, B & C have already been extracted through opencast mining upto the limit of surface constraint like close proximity to Wardha river/ diverted Sasti nala etc. Hence the Dhuptala Geological block in this report is limited to Sectors D, E, F, G and H only. The proposed Dhuptala OC (Sasti UG to OC) mine has been planned in Sector, D, E, F, G and H sectors of Dhuptala Geological block. The mine has been proposed for a maximum depth of 150m in Sector - H leaving 175m safe distance from Dhuptala Nala.

5.2.3 Quarry Boundary

The mine boundaries of proposed Dhuptala OC (Sasti UG to OC) mine are as follows :

West (Rise side)	:	Half Incrop of composite seam
East (Dip side)	:	150 m depth (120m FRL) in Sector H and 175 m safe distance from Dhuptala nala.
North	:	175 m safe distance from Wardha River & merging with Quarry floor of existing Dhuptala OC - Sector C.
South	:	Keeping 60 m distance from surface of Sasti Expansion OC.

5.2.4 Vertical Mine Boundary

The floor of Composite seam forms the vertical mine boundary of proposed Dhuptala OC (Sasti UG to OC) mine.

5.3 MINEABLE RESERVES

5.3.1 Geological Reserves

Total geological reserves assessed in Dhuptala Geological block in Sector- D, E, F, G & H is 69.63 Mt.

5.3.2 Mineable Reserves

The summary of Mineable reserves are detailed below :

Sl. No.	Particulars	Reserves (Mt)
1.	Net Geological Reserves in Dhuptala Block (Sector – D, E, F, G & H)	69.63
2.	Reserves already extracted from existing Sasti UG (RO) mine and likely to be extracted upto 31.03.2022	8.73
3	Reserves left out in Dip side (beyond 175 m depth/ Fault F3-F3) as well as in rise, dip and east side batters and keeping Quarry Surface at 170m safe distance from Wardha river in North and Eastern sides.	4.99
4	Balance Geological reserves considered for Mining in proposed Dhuptala OC (Sasti UG to OC) (5 = 1 – 2 – 3 – 4)	55.91
5	Mining Losses @ 5%	2.80
7	Net Mineable Reserves (7 = 5 – 6) as on 01.04.2022	**53.11**

5.4 TARGET CAPACITY AND MINE LIFE

5.4.1 Target Capacity

The proposed Report for Dhuptala OC (Sasti UG to OC) Mine has been prepared for a targeted capacity of **2.50 Mt/annum** for Total Hiring Option.

The parameters of opencast mine field and technical conditions of its development make this target feasible with normal indices namely length, width & depth of the excavated block, number of coal seams, seam gradient, method of mining, location of equipment, deployment, etc. Moreover, with proposed target of 2.50 Mty, the rate of deepening works out to about 12-15 m per year, which is close to prevailing rate of deepening in mines of WCL.

5.4.2 Mine Life

The proposed rated output of mine is 2.50 Mty in Total hiring option. Considering 53.11 Mt mineable reserves, the total life of mine works out to 25 years (Phase-I: 4 years, Phase-II:14 years. Phase-III : 7 years).

The break-up of mine life is as follows :

Year	Break-up of Mine Life	Years
1	Pre-construction period	0
2	Construction/Production build-up year	5
3	Target production year	19
4	Tapering production year	1
TOTAL		**25**

6.0 METHOD OF MINING

The proposed Dhuptala OC (Sasti UG to OC) mine is conversion of existing Sasti RO (UG) mine into opencast mine in Sectors D, E, F, G & H of Dhuptala Geological Block. Considering the proposed extraction of already developed/depillared pillars in proposed Dhuptala OC mine, Shovel Dumper System of mining has been proposed.

6.1 MINE PARAMETERS

The broad mine parameters of the proposed Dhuptala OC (Sasti UG to OC) mine are as follows:-

MINE PARAMETERS

Sl. No.	PARTICULARS	TOTAL
1	Area of the Quarry	
(a)	On floor (ha)	291.45

Sl. No.	PARTICULARS	TOTAL
(b)	On surface (ha)	385.68
2	Average Strike length (m)	
(a)	At surface	1700
(b)	At floor	1400
3	Average width (m)	
(a)	At surface	1700
(b)	At floor	1500
4	Depth (m)	
(a)	Initial	25
(b)	Final	150
5	Gradient of seam	1 in 10 to 1 in 18
6	Average thickness of Composite seam (m)	15.68
7	Grade/GCV (k.Cal./kg.)	G11/4210
8	Mineable reserves (Mt) (Phase-I, II & III)	53.11
9	Total OB (Mm^3) (Excluding Trench Cutting & Rehandling of OB)	279.50
10	Average SR (m^3/t)	5.26
11	Rehandling of OB (Mm^3)	9.66*
12	Volume of Trench Cutting (Mm^3)	2.70

*Re-handling of OB includes existing OB Dump / Embankment of Dhuptala OC (Sector C) dumped in the proposed quarriable area.

6.2 CHOICE OF TECHNOLOGY

This Mining Plan has envisaged conversion of Sasti (RO) UG mine into an opencast mine. Since vast area of the proposed mine is already developed on Board & Pillar method of mining, only Shovel-Dumper system of opencast mine has been found suitable for proposed Dhuptala OC mine. Shovel Dumper System is very flexible and convenient method of opencast mining and can deal with varying geo-mining conditions. It also offers flexibility for easy transition to any other technology or equipment configuration. The technology is well adopted in several opencast mines of WCL and skilled manpower is available for this method of mining.

The average gradient of coal seams in Dhuptala (Sasti UG to OC) mine is mild (1 in 10 to 1 in 18) which is suitable for deployment of shovel and dumpers.

Deployment of Dragline is ruled out due to geologically disturbed area having numerous faults. Surface Miner deployment is also not feasible as most of the area is already developed/depillared by underground mining. Shovel-Dumper Technology is most flexible system and moreover, well adopted in coal mines of WCL.

With Shovel -Dumper system, two stripping methods are possible:

1. Inclined Slicing method
2. Horizontal Slicing method

In mild gradient of seams, positioning of HEMM is not difficult in inclined slicing method where benches in coal are made parallel to the seam. In horizontal slicing method, coal and OB are to be excavated in same bench and there is chance of mixing of parting OB with coal, thus, deterioration of the coal quality. In proposed Dhuptala (Sasti UG to OC) mine, the average gradient is mild (1 in 10 to 1 in 18), hence horizontal Slicing method has been ruled out and the Shovel -Dumper system of mining with inclined Slicing is recommended for the proposed mine.

6.3 EQUIPMENT SELECTION

In the proposed Mining Plan, entire coal extraction and OB removal will be carried out by hiring / out-sourcing of HEMM. Moreover, rehandling of Top Soil Dump will also be done by hiring of HEMM. Few common departmental HEMM have been provided in Total Out-sourcing option as tabulated below :

Sl. No.	HEMM	Nos.
A	**For Common**	
1.	8-12 t Mobile crane	1
2.	Fire Fighting Truck	1
3.	2.8 m^3 Diesel hyd. Backhoe	1

6.4 MINING SYSTEM & SYSTEM PARAMETERS

6.4.1 Width and Height of working and non-working benches

For overburden, keeping the bench height of 10 m, the width of working and non-working benches are kept as 30 m and 20 m respectively for planning purpose. However, in hiring option, the actual bench width and height would depend upon the size of equipment deployed by the hiring / outsourcing agency.

6.4.2 Slope of Benches & Quarry

i) During Mining Operation

The slope of individual benches depends on the type of strata. In this report, the slope of individual bench is proposed as 45^{o} in soil, alluvium and clay whereas, it is 70^{o} in hard strata. The overall slope of the quarry in dip side during mining operation varies from 18^{o} to 22^{o} from horizontal plane depending on the nature of strata in the entire depth of quarry.

ii) At the End of Quarry

The slope of individual benches in the batter at the end of quarry remains same as that during mining operation i.e. 45^{o} in soil, alluvium and clay and 70^{o} in hard strata. Overall angle of batter considered at the end of quarry is about 37^{o} for the dip side batter and rise side batter. However, it is proposed to do scientific study for slope stability in quarry benches and OB dumps by any Scientific Agency.

7.0 MINING & DUMPING STRATEGY

The proposed Mining Plan of Dhuptala OC (Sasti UG to OC) mine has beed prepared for a target capacity of 2.50 Mty and peak OB removal of 17.00 Mm^3 per annum in Total Hiring Option. The total mineable reserves estimated in the PR is 53.11 Mt and the mine life is 25 years. Sasti village is located in the rise side of quarry and its shifting and rehabilitation has been proposed in the approved PR. However, considering the shifting of village as time consuming activity, initially, quarry is proposed to be worked leaving safe distance from

Sasti village. The OB excavated from the quarry will be accommodated in External OB dump on non coal bearing area in rise side of Dhuptala block and later on from 8th year onwards internal backfilling will also start in the void of Dhuptala OC Sector-C, from 12th year onwards internal backfilling will start in the void of proposed quarry and from 19th year onwards internal backfilling will start in the void of Ballarpur NW OC quarry.

7.1 MINING STRATEGY

Sasti village is located in the rise side of the proposed quarry which is proposed to be rehabilitated. However, the rehabilitation may take time and therefore, initially the quarry surface boundary is proposed at a safe distance of 300 m from the village. After rehabilitation of village, the rise side quarry will be extended towards village.

Access trench would be driven at a gradient of 1 in 16 to touch the floor of the composite seam at full thickness of composite seam. The major portion of the access trench is over the full thickness of composite seam in Sector E, because of the limitation of keeping quarry surface boundary at a distance of 300m from Sasti village (Sasti village is proposed to be rehabilitated and shifted in 6th to 7th year of quarry operation). Due to this limitation, it is proposed to touch the full thickness of composite seam at 45m initial depth, though composite seam at full thickness is available at 25 m. About 0.11 Mt of coal will be extracted in the access trench drivage.

Initially it is proposed to touch composite seam (at full thickness) and making box-cut in Sector E and then deepen the mine along the dip direction by opening total strike length of the mine. First of all Sector-E will be worked leaving 300m distance from Sasti village. This will be followed by working in Sector-F, G, balance part of Sector-E (after rehabilitation of Sasti village), Sector-D and finally in Sector-H upto 150 m depth.

In this project it has been proposed to achieve the target production of 2.50 Mty in the 6th year. The coal production and overburden removal programme has been proposed on the basis of stripping ratio in box cut and cuts made at different horizons and overburden in Access trench. Upto Box

Cut (including Access Trench) only 0.59 Mt coal reserves at stripping ratio of 12.49 m^3/t are available and therefore initial target built up is slow.

Access trench would be driven at a gradient of 1 in 16 to touch the floor of the seam II (Bottom). The slope of the access trench batter upto unconsolidated strata / weathered zone depth is proposed to be kept 1 in 2 for slope stability point of view and after weathered zone about 45° slope is assumed till the floor of the bottom seam is touched. The width of access trench is proposed as 30 m, depth of access trench works out to 45 m and volume of access trench has been estimated as 1.37 Mm^3. Provisions have been made for study of slope stability design. The alignment of access trench is shown in Quarry & Surface layout plan of Dhuptala OC (Sasti UG to OC) mine and is directed towards the proposed coal handling plant. The position and alignment of access trench is tentative and is subject to minor changes to suit the local condition.

7.1.1 Volume Regime

In Dhuptala OC (Sasti UG to OC) mine, the quarry has been sub-divided into eleven cuts for assessment of coal, OB and Stripping Ratio for preparation of liquidation plan. The description of these Cuts are as follows:

Sl. No.	Cut	Sector	Description
1	Access Trench	E	From Surface to touch coal seam at 226 FRL (45m depth)
2	Box Cut	E	From Access Trench to 210m FRL
3	Cut - 1	E	From 210m FRL to Fault F_4 – F_4
4	Cut - 2	F	From fault F_4 – F_4 to 180m FRL
5	Cut - 3	F	From 180m FRL to Fault F_5 – F_5
6	Cut – 4	G	From fault F_5 – F_5 to dip side limit i.e., 150m FRL
7	Cut - 5	E	Upto 220m FRL
8	Cut - 6	E	From 220m FRL to Fault F_4 – F_4
9	Cut - 7	D/E	From Fault F_4 – F_4 to Fault F_5 – F_5
10	Cut - 8	H	From Fault F_5 – F_5 to 150m FRL
11	Balance Cut		Upto dip side in Sector H upto 150m depth

Cut-wise Coal, OB & Stripping ratio

The cut-wise coal, OB and stripping ratio in the proposed Dhuptala OC (Sasti UG to OC) mine is given in following table:

CUT-WISE COAL, OB AND STRIPPING RATIO					
Sl. No.	Cut	Sector	Mineable Coal (Mt) (Composite Section)	OB (Mm^3)	SR (m^3/t)
1	Access Trench	E	0.11	1.37	12.45
2	Box Cut	E	0.48	6.0	12.50
3	Cut 1	E	1.33	6.30	4.74
4	Cut 2	F	2.83	26.72	9.44
5	Cut 3	F	6.55	48.32	7.38
6	Cut 4	G	9.50	26.04	2.74
7	Cut 5	E	2.76	7.72	2.80
8	Cut 6	E	5.85	25.47	4.35
9	Cut 7	D/E	9.44	61.34	6.50
10	Cut 8	H	9.30	43.50	4.60
11	Balance Cut	H	4.96	26.72	5.39
	TOTAL		**53.11**	**279.50**	**5.26**

In addition to above, 2.70 Mm^3 Black Cotton Soil is proposed to be excavated from trench cutting along the periphery of External OB Dump Site for stability of OB Dump. Thus Total OB including B.C. Soil from Trench Cutting will be **282.20 Mm^3** (279.50 Mm3 from Quarry Area + 2.70 Mm^3 from Trench cutting at Dump site)

Re-handling of OB

About 9.66 Mm^3 OB of existing Dhuptala OC Sector-C, dumped in Sector-D, E & H of proposed quarry area is proposed to be rehandled.This existing OB dump of Dhuptala OC Sector-C will be rehandled on external OB dump at a later stage (from 12th Year onwards)

7.1.2 Sequence of Mining

To maximize the internal dumping, it is proposed to work the opencast mine along the floor of bottom most composite seam. Therefore, an Access Trench has been proposed over the full thickness of composite seam in Sector E, because of the limitation of keeping quarry surface boundary at a distance of 300m from Sasti village (Sasti village is proposed to be rehabilitated and

shifted in 6th to 7th year of quarry operation). Initially it is proposed to touch composite seam (at full thickness) and making box-cut in Sector E and then deepen the mine along the dip direction by opening total strike length of the mine. First of all Sector-E will be worked leaving 300m distance from Sasti village. This will be followed by working in Sector-F, G, balance part of Sector-E (after rehabilitation of Sasti village), Sector-D and finally in Sector-H upto 150 m depth.

7.2 DUMPING STRATEGY

The total insitu OB proposed to be excavated from the quarry is 279.50 Mm^3. Out of 279.50 Mm^3 of total OB in the proposed quarry about 34.30 Mm^3 OB is black cotton soil and rest 245.20 Mm^3 is hard strata OB. In addition to this 9.66 Mm^3 OB of existing Dhuptala OC Sector-C, dumped in Sector-D, E & H of proposed quarry area will have to be rehandled. It is also proposed to excavate a trench of 120 m width along the periphery of proposed external OB dump to provide stability to 90 m high hard OB dump. For this purpose, 2.70 Mm^3 of BC Soil will be excavated and dumped over the proposed BC Soil dump . Thus, total OB, including trench cutting and rehandling is 291.86 Mm^3 (279.50 Mm^3 + 2.70 Mm^3 + 9.66 Mm^3).

To provide stability of dumps and prevent slope failures, it is proposed to have separate dumps for black cotton soil and hard OB. The height of hard OB dump and BC soil dump have been proposed as 90 m and 60 m from ground level respectively.

As the whole mine area falls below HFL, an embankment with 30 m width at top has been proposed along the periphery of mine. About 6.0 Mm^3 of hard OB will be utilized in construction of flood protection Embankment. About 153.89 Mm^3 of OB (including rehandling of 9.66 Mm^3 OB of existing Dump of Dhuptala OC Sector-C) is proposed in external dump and about 137.97 Mm^3 OB is proposed for internal dumping.

The different OB dumps proposed in Dhuptala OC (Sasti UG to OC) along with their dump capacity are tabulated below :

DUMP CAPACITY

Overburden	Quantity (Mm^3)	Embank-ment (Mm^3)	External OB Dump (Mm^3)	External BC Soil Dump (Mm^3)	Internal Dumping in void of Dhuptala Sector-C (Mm^3)	Internal Dumping in void of quarry (Mm^3)	Internal Dumping in void of Ballarpur NW quarry (Mm^3)
Top OB excluding BC Soil	245.20	6.00	106.03	-	11.70	70.20	51.27
B.C. Soil (Mm3)	34.30	-	4.31	25.19	-	4.80	-
Sub-Total	**279.50**	**6.00**	**110.34**	**25.19**	**11.70**	**75.00**	**51.27**
BC soil from Trench Cutting along the periphery of proposed External OB Dump Site	2.70	-	-	2.70	-	-	-
Rehandling of Existing OB of Dhuptala Sector C	9.66	-	9.66	-	-	-	-
Total OB (Mm3)	**291.86**	**6.00**	**120.00**	**27.89**	**11.70**	**75.00**	**51.27**

- **Year of Starting of Internal Dumping**

The internal dumping would be started in 8th year of quarry operation.

7.5 SEQUENCE OF DUMPING OPERATIONS AND PHASE-WISE DETAILS

The Phase-wise details of Quarry and Dumping operations have been worked out for the following three phases:

Phase-I - At the end of Cut-I of Quarry and just start of Cut II (During 4th year of mine life).

Phase-II - At the near to end of Cut-VII of Quarry (During 18th year of mine life).

Phase-III - At the end of Balance Cut of Quarry (During 25th year of mine life).

The Phasewise wise extraction of coal, removal of OB, area of excavation, sequence of dumping operations and quantity of OB dumped in external and internal dumps are tabulated below. The Phase-wise quarry and surface layout plan are given in plans of this report.

Sl. No.	Phase-wise Plan	Quantity
A)	**Stage Plan at the End of 4th year (Phase-I)**	
1.	Coal mined (Mt)	3.20
2.	OB excavated (Mm^3)	34.70
3.	Stripping ratio (m^3/t) (incl. Rehan. & Trench)	10.84
4.	Excavated quarry area (Ha)	100.00
5.	Internal dump (Mm^3)	0.00
	Void of Dhuptala Sector-C	0.00
	Void of Dhuptala proposed quarry	0.00
6.	External dump (Mm^3)	34.70
	Rise side of Dhuptala block	22.82
	Embankment	6.00
	BC Soil Dump	5.88
B)	**Stage Plan at the End of 18th year (Phase-II)**	
1.	Coal mined (Mt)	37.70
2.	OB excavated (Mm^3)	215.36
3.	Stripping ratio (m^3/t) (incl. Rehan. & Trench)	5.71
4.	Excavated quarry area (Ha)	342.28
5.	Internal dump (Mm^3)	66.70
	Void of Dhuptala Sector-C	11.70
	Void of Dhuptala proposed quarry	55.00
6.	External dump (Mm^3)	148.66
	Rise side of Dhuptala block	120.00
	Embankment	6.00
	BC Soil Dump	22.66
C)	**Stage Plan at the End of 25th year (End of Mine Life) (Phase-III)**	
1.	Coal mined (Mt)	53.11
2.	OB Excavated (Mm^3)	291.86
3.	Stripping ratio (m^3/t) (incl. Rehan. & Trench)	5.50
4.	Excavated quarry area (Ha)	385.68

Sl. No.	**Phase-wise Plan**	Quantity
5.	Internal dump (Mm^3)	137.97
	Void of Dhuptala Sector-C	11.70
	Void of Dhuptala proposed quarry	75.00
	Void of Ballarpur NW OC quarry	51.27
6.	External dump (Mm^3)	153.89
	Rise side of Dhuptala block	120.00
	Embankment	6.00
	BC Soil Dump	27.89

8.0 MINING SCHEDULE AND EQUIPMENT REQUIREMENT

Working Regime

Mining Plan for proposed Dhuptala OC (Sasti UG to OC) Project envisages following working regime :

Number of Days of Working in a Year

330 days of working has been envisaged in a year based on 7 days schedule of mine working.

Number of Shifts

As per the prevalent practice in WCL/MCL, there will be three working shifts in a day in proposed Dhuptala OC (Sasti UG to OC) Project.

Number of Hours in Every Shifts

It has been envisaged in the PR that every shift will be of eight hours duration.

Excavation Category Assumed

The excavation category of OB material has been assumed as 50% Category III + 50% Category IV, whereas for Coal it is assumed as Category III.

Insitu Volume Weight t/m^3

The insitu volume weight of OB material has been taken as 2.1 t/m^3 whereas for coal it is considered as 1.68 t/m^3.

8.1 ANNUAL PRODUCTIVITY OF HEMM

The Project Report of proposed Dhuptala OC (Sasti UG to OC) mine has been prepared in Total Out-Sourcing option and the entire HEMM required for extraction of coal as well as removal of OB will be deployed by out-sourcing agency. Hence, the productivity of HEMM will depend on the size and type of HEMM deployed by out-sourcing agency.

8.1.1 Annual Average Lead

The coal extraction and OB removal will be carried out by out-sourcing agency. Based on the quarry profile, dump location & distance between different cuts of quarry & dumps, the haul distances for coal and OB will vary year to year. The year-wise coal extraction and OB removal along with annual weighted average lead for Coal and OB are tabulated below :

Annual Average Lead for Coal and Top OB

CUT-WISE COAL, OB AND LEAD FOR DHUPTALA (SASTI UG TO OC) MINE					
S. No.	Cuts	FOR OB		FOR COAL	
		OB (Mm^3)	Lead (km)	Coal (Mt)	Lead (km)
1	Access Trench	1.37	1.75	0.11	1.00
2	Box Cut	6.0	1.75	0.48	1.50
3	Cut 1	6.30	3.00	1.33	1.75
4	Cut 2	26.72	4.50	2.83	2.25
5	Cut 3	48.32	3.50	6.55	2.75
6	Cut 4	26.04	4.50	9.50	3.00
7	Cut 5	7.72	3.50	2.76	3.50
8	Cut 6	25.47	4.25	5.85	4.00
9	Cut 7	61.34	6.25	9.44	4.00
10	Cut 8	43.50	5.75	9.30	4.25
11	Balance Cut	26.72	2.00	4.96	4.25
	TOTAL	**279.50**		**53.11**	

8.2 CALENDER PROGRAMME OF EXCAVATION

In Total Hiring option (2.50 Mty target capacity), entire coal as well as OB will be excavated by hiring/out-sourcing of equipment. About 279.50 Mm^3 of OB is proposed to be removed by hiring/out sourcing agency throughout the mine

life. In addition to this, rehandling of OB as well as trench cutting along the periphery of External Dump site will also be carried out through hiring agency.

It is envisaged in the Mining Plan that production will start from Quarry from 1st year (2022-23) and target will be achieved in the 6th year. The Calendar programme of excavation showing year-wise and cut-wise coal extraction and OB removal (Natural and programmed) is tabulated below.

CALENDAR PROGRAMME OF EXCAVATION

Year	CUT	Coal (Mt)		Natural O.B (Mm3)				Programmed O.B (Mm3)			
		Yearly	Cut Wise Cum. Coal	Top Soil	Top OB Excl. Top Soil	Total OB	Cut Wise Cum. OB	Top Soil	Top OB Excl. Top Soil	Total OB	Cut Wise Cum. OB
	Phase-I										
1	Access Trench	0.11	0.11	0.17	1.2	1.37	1.37	0.17	1.2	1.37	1.37
	Box Cut	0.09	0.09	0.20	0.93	1.13	1.13	0.2	1.43	1.63	1.63
	Sub-Total	**0.20**		**0.37**	**2.13**	**2.50**		0.37	**2.63**	**3.00**	
2	Box-Cut	0.39	0.48	0.54	4.34	4.88	6.00	0.54	3.83	4.37	6.00
	Cut-1	0.11	0.11	0.20	0.32	0.52	0.52	0.2	1.43	1.63	1.63
	Sub-Total	**0.50**		**0.74**	**4.66**	**5.40**		0.74	**5.26**	**6.00**	
3	Cut-1	1.00	1.11	0.57	4.17	4.74	5.26	0.57	4.10	4.67	6.30
	Cut-2	0.00	0.00	0.00	0.00	0.00	0.00	0	2.33	2.33	2.33
	Sub-Total	**1.00**		**0.57**	**4.17**	**4.74**		0.57	**6.43**	**7.00**	
4	Cut-1	0.22	1.33	0.00	1.04	1.04	6.30	0	0.00	0.00	6.30
	Cut-2	1.28	1.28	1.50	10.59	12.09	12.09	1.5	14.50	16.00	18.33
	Sub-Total	**1.50**		**1.50**	**11.63**	**13.13**		1.5	**14.50**	**16.00**	
	Phase-II										
5	Cut-2	1.55	2.83	1.78	12.85	14.63	26.72	1.78	6.61	8.39	26.72
	Cut-3	0.45	0.45	0.50	2.82	3.32	3.32	0.5	7.11	7.61	7.61
	Sub-Total	**2.00**		**2.28**	**15.67**	**17.95**		2.28	**13.72**	**16.00**	
6	Cut-3	2.50	2.95	2.50	15.94	18.44	21.76	2.5	13.50	16.00	23.61
7	Cut-3	2.50	5.45	2.50	15.94	18.44	40.21	2.5	14.50	17.00	40.61
8	Cut-3	1.10	6.55	0.43	7.68	8.11	48.32	0.43	7.28	7.71	48.32
	Cut-4	1.40	1.40	0.50	3.34	3.84	3.84	0.5	3.79	4.29	4.29
	Sub-Total	**2.50**	**12.70**	**0.93**	**11.02**	**11.95**		0.93	**11.07**	**12.00**	
9	Cut-4	2.50	3.90	1.00	5.85	6.85	10.69	1.00	9.00	10.00	14.29
10	Cut-4	2.50	6.40	1.00	5.85	6.85	17.54	1.00	7.00	8.00	22.29

Year	CUT	Coal (Mt)		Natural O.B (Mm3)				Programmed O.B (Mm3)			
		Yearly	Cut Wise Cum. Coal	Top Soil	Top OB Excl. Top Soil	Total OB	Cut Wise Cum. OB	Top Soil	Top OB Excl. Top Soil	Total OB	Cut Wise Cum. OB
11	Cut-4	2.50	8.90	0.70	6.15	6.85	24.40	0.70	3.05	3.75	26.04
	Cut-5	0.00	0.00	0.00	0.00	0.00	0.00	0.80	3.45	4.25	4.25
	Sub-Total	**2.50**	**20.20**	**0.70**	**6.15**	**6.85**		1.50	**6.50**	**8.00**	
12	Cut-4	0.60	9.50	0.00	1.64	1.64	26.04	0.00	0.00	0.00	26.04
	Cut-5	1.90	1.90	0.80	4.51	5.31	5.31	0.15	3.32	3.47	7.72
	Cut-6	0.00	0.00	0.00	0.00	0.00	0.00	0.00	4.53	4.53	4.53
	Sub-Total	**2.50**	**22.70**	**0.80**	**6.16**	**6.96**		0.15	**7.85**	**8.00**	
13	Cut-5	0.86	2.76	0.15	2.26	2.41	7.72	0.00	0.00	0.00	7.72
	Cut-6	1.64	1.64	0.85	6.29	7.14	7.14	0.85	**7.15**	8.00	12.53
	Sub-Total	**2.50**	**25.20**	**1.00**	**8.55**	**9.55**		0.85	**7.15**	**8.00**	
14	Cut-6	2.50	4.14	1.50	9.38	10.88	18.02	1.5	8.50	10.00	22.53
15	Cut-6	1.71	5.85	0.78	6.67	7.45	25.47	0.78	2.16	2.94	25.47
	Cut-7	0.79	0.79	0.10	5.03	5.13	5.13	0.10	9.96	10.06	10.06
	Sub-Total	**2.50**	**30.20**	**0.88**	**11.70**	**12.58**		0.88	**12.12**	**13.00**	
16	Cut-7	2.50	3.29	2.00	14.24	16.24	21.38	2.00	13.00	15.00	25.06
17	Cut-7	2.50	5.79	2.00	14.24	16.24	37.62	2.00	13.00	15.00	40.06
18	Cut-7	2.50	8.29	2.00	14.24	16.24	53.87	2.00	13.00	15.00	55.06
	Phase-III										
19	Cut-7	1.15	9.44	1.43	6.04	7.47	61.34	1.43	4.85	6.28	61.34
	Cut-8	1.35	1.35	0.37	5.94	6.31	6.31	0.37	6.35	6.72	6.72
	Sub-Total	**2.50**	**40.20**	**1.80**	**11.99**	**13.79**		1.8	**11.20**	**13.00**	
20	Cut-8	2.50	3.85	1.50	10.19	11.69	18.01	1.5	10.50	12.00	18.72
21	Cut-8	2.50	6.35	1.50	10.19	11.69	29.70	1.50	10.50	12.00	30.72
22	Cut-8	2.50	8.85	1.50	10.19	11.69	41.40	1.50	10.50	12.00	42.72
23	Cut-8	0.45	9.30	0.47	1.63	2.10	43.50	0.47	0.31	0.78	43.50
	Bal. Cut	2.05	2.05	1.00	9.78	10.78	10.78	1.00	10.22	11.22	11.22
	Sub-Total	**2.50**	**50.20**	**1.47**	**11.42**	**12.89**		1.47	**10.53**	**12.00**	
24	Bal. Cut	2.50	4.55	1.80	11.35	13.15	23.93	1.80	11.20	13.00	24.22
25	Bal. Cut	0.41	4.96	0.46	2.33	2.79	26.72	0.46	2.04	2.50	26.72
TOTAL		**53.11**		**34.30**	**245.20**	**279.50**		**34.30**	**245.20**	**279.50**	

8.2.1 Trench Cutting and Rehandling of OB

In addition to the above 279.50 Mm3 OB from quarry, it is proposed to excavate 2.70 Mm^3 Black Cotton Soil from trench cutting along the periphery of the External OB Dump site in 2nd year through hiring agency. Similarly 9.66 Mm^3 OB of existing Dump of Dhuptala Sector-C over the surface of proposed

quarry will be rehandled through hiring agency. The year-wise OB quantity in Trench Cutting and rehandling are tabulated below :

Total Hiring Option		
Year	Trench Cutting (Mm^3)	Rehandling of OB (Mm^3)
2	0.70	
3	2.00	
12		3.00
13		3.00
14		3.66
	2.70	**9.66**

8.3 DUMPING SCHEDULE

The total insitu OB proposed to be excavated from the quarry is 279.50 Mm^3. Out of 279.50 Mm^3 of total OB in the proposed quarry, about 34.30 Mm^3 OB is black cotton soil and rest 245.20 Mm^3 is hard strata OB. In addition to this 9.66 Mm^3 OB of existing Dhuptala OC Sector-C, dumped in Sector-D, E & H of proposed quarry area will have to be rehandled.

It is also proposed to excavate a trench of 120 m width along the periphery of proposed external OB dump to provide stability to 90 m high hard OB dump. For this purpose, 2.70 Mm^3 of BC Soil will be excavated and dumped over the proposed BC Soil Dump area. Thus, total OB, including trench cutting and rehandling of OB workls out to 291.86 Mm^3 (279.50 Mm^3 + 2.70 Mm^3 + 9.66 Mm^3).

As the whole mine area falls below HFL, an embankment with 30 m width at top has been proposed along the periphery of mine. About 6.0 Mm^3 of hard OB will be utilized in construction of flood protection Embankment. About 120.00 Mm^3 of OB (including 9.66 Mm^3 of rehandled OB of existing Dump of Dhuptala OC Sector-C) is proposed in external hard OB dump. A separate dump for black cotton soil will accommodate about 27.89 Mm^3. About 86.70 Mm^3 OB is proposed for dumping in the void of Dhuptala OC Sector-C (11.70 Mm^3) and internal void of proposed quarry (75.00 Mm^3). Rest 51.27 Mm^3 (291.86 Mm^3– 6.00 Mm^3 – 120.00 Mm^3 – 27.89 Mm^3 – 86.70 Mm^3) will be dumped in the void of the Ballarpur NW OC mine after the Ballarpur NW OC reserves proposed in the PR of Ballarpur NW OC exhausted.

The year-wise dumping schedule is tabulated below :

Dumping Schedule

Year	Source of OB	Volume of OB (Mm^3)	External Dump			Internal Dump		
			Embankment (Mm^3)	Top Soil Dump (Mm^3)	External Hard OB dump (Mm3)	Decoaled Void in Dhuptala OC Sector-C	Internal Void of Dhuptala Quarry (Mm^3)	Internal Void of Ballarpur NW Quarry (Mm^3)
	Phase-I							
1	Quarry	3.00	2.63	0.37				
2	Trench Cutting	0.70		0.70				
	Quarry	6.00	3.37	0.74	1.89			
	Sub-Total	6.70	3.37	1.44	1.89			
3	Trench Cutting	2.00		2.00				
	Quarry	7.00		0.57	6.43			
	Sub-Total	9.00		2.57	6.43			
4	Quarry	16.00		1.50	14.50			
PHASE-I TOTAL		**34.70**	**6.00**	**5.88**	**22.82**			
	Phase-II							
5	Quarry	16.00		2.28	13.72			
6	Quarry	16.00		2.50	13.50			
7	Quarry	17.00		2.50	14.50			
8	Quarry	12.00		0.93	8.07	3.00		
9	Quarry	10.00		1.00	3.00	6.00		
10	Quarry	8.00		1.00	4.30	2.70		
11	Quarry	8.00		1.50	6.50			
12	Quarry	8.00		0.15	5.85		2.00	
	Rehandling	3.00			3.00			
	Sub-Total	11.00		0.15	8.85		2.00	
13	Quarry	8.00		0.85	5.15		2.00	
	Rehandling	3.00			3.00			
	Sub-Total	11.00		0.85	8.15		2.00	
14	Quarry	10.00		1.50	6.50		2.00	
	Rehandling	3.66			3.66			
	Sub-Total	13.66		1.50	10.16		2.00	
15	Quarry	13.00		0.88	2.12		10.00	
16	Quarry	15.00		1.69	0.31		13.00	
17	Quarry	15.00			2.00		13.00	
18	Quarry	15.00			2.00		13.00	
PHASE-II TOTAL		**215.36**	**6.00**	**22.66**	**120.00**	**11.70**	**55.00**	

Year	Source of OB	Volume of OB (Mm^3)	External Dump			Internal Dump		
			Embankment (Mm^3)	Top Soil Dump (Mm^3)	External Hard OB dump (Mm3)	Decoaled Void in Dhuptala OC Sector-C	Internal Void of Dhuptala Quarry (Mm^3)	Internal Void of Ballarpur NW Quarry (Mm^3)
	Phase-III							
19	Quarry	13.00					9.40	3.60
20	Quarry	12.00					9.10	2.90
21	Quarry	12.00					1.50	10.50
22	Quarry	12.00		1.5				10.50
23	Quarry	12.00		1.47				10.53
24	Quarry	13.00		1.80				11.20
25	Quarry	2.50		0.46				2.04
Total		**291.86**	**6.00**	**27.89**	**120.00**	**11.70**	**75.00**	51.27

8.4 EQUIPMENT SCHEDULE

In this Mining Plan, entire coal extraction and OB removal will be carried out by hiring / out-sourcing of HEMM. Moreover, trench cutting along the periphery of External Dump site and rehandling of Top Soil Dump will also be done by hiring of HEMM. The requirement of major equipment is tabulated below :

HEMM Requirement

Sl. No.	HEMM	Nos.
A)	**For Common**	
1.	8-12 t Mobile Crane	1
2.	Fire fighting Truck	1
3.	2.8 m^3 Diesel Hyd. Backhoe	1

8.5 DRILLING & BLASTING

The degree of fragmentation in opencast mine has to be optimised so that total cost of drilling, blasting, excavating, transport and crushing as a total system is minimised. Sasti village is located in the rise side of the proposed

quarry and it is proposed to shift and rehabilitate this village to work the proposed quarry of Dhuptala OC (Sasti UG to OC) mine. This shifting may take considerable time and therefore it is proposed to initially start the quarry leaving a safe distance of about 300m from the proposed quarry edge. Once the village is rehabilitated, quarry will be extended in rise side. One more village namely Dhuptala village is located in the dip side. Therefore, Controlled blasting method has to be adopted in proximity of these villages.

In order to keep the ground vibrations within the permissible limit as per DGMS Circular No. 7 of 1997, to avoid flying of rock fragments and also to achieve satisfactory blasting results, optimized drilling / blasting parameters depending upon rock formation using combination of relays / delays will have to be evolved. It is further recommended that at the time of actual execution, proper study for controlled blasting and ground vibration is to be done with the help of scientific body in order to evolve site specific charge distance relationship.

It is proposed that Site Mixed explosive should be used to save charging time and avoid creating extra Magazine capacity. The existing magazine of New Dhuptala OCM (Sector-C) would cater for this project also. Powder factor of 2.20 m^3/kg & 5.39 t/kg for OB and coal has been considered in this report based on the existing data in adjacent Sasti OCM. However at the time of operation of mine, drilling parameters have to be optimized on the basis of actual field trial depending upon joint pattern, bedding plane and local geology of the blast site and accordingly powder factor for OB & coal may be deviated after final trial of blasting. It is also proposed in this report to undertake scientific study to assess the powder factor for OB & coal.

9.0 COAL QUALITY

A thick composite seam occurs in middle Barakar formation in proposed Dhuptala Block. This composite seam is split into two coaly sections namely Top Split and Bottom Split separated by a parting of shale, carbacenous shale and intercalation of shale and sandstone. The thickness range of partings is 2.37m to 3.35m and the average parting is 2.86 m. Hence for opencast

purposes, the Top Split + Parting + Bottom Split has been named as composite seam and quality has been re-estimated accordingly. The thickness of composite seam ranges from 12.77 m (CMWD-41) to 17.18 m (MWS-16). Since few exploratory boreholes are available in the mining block, an average thickness of 15.68 m has been taken as the thickness of Top and Bottom split including the parting in between the two.

The Top Split of composite seam is relatively more banded than the Bottom Split. However, disposition of these bands are highly irregular. The seam quality has been estimated by including all in seam dirt bands irrespective of thickness and nature.

9.1 PROJECTED COAL QUALITY

9.1.1 Weighted Average Overall Coal Quality

In view of the variation in the quality of composite seam in different boreholes falling in the mining block, the weighted average data has been estimated.

In this Mining Plan, the GCV of **4210 kCal/kg** has been considered with 0.05m dilution of coal at each contact point and also the impact of OB blanketing to deal the spontaneous heating while extracting coal of already developed / depillared pillars of underground workings. The corresponding band of GCV works out to **G-11.**

Quality Parameters (Top Split + Parting + Bottom Split)

Sl. No.	Quality of Coal	UHV (k. Cal/kg)	GCV (k.Cal/kg) (Calculated)	Grade
1	Undiluted	3320	4375	G-10
2	0.05m Dilution at each contact point without blanketing	3170	4270	G-11
3	0.05m Dilution at each contact point with blanketing	3080	4210	G-11

10.0 PUMPING & DRAINAGE

In absence of sufficient hydro-geological data and actual make of water of the mine, ground seepage is assumed 15% of maximum rainfall water accumulated in a day. Pumping provision made in this report is sufficient to sustain the production for target plus five years.

10.1 CALCULATION OF PUMPING CAPACITY

The Pumping capacity required at the time of five years after reaching the target has been calculated as under:-

PUMPING CALCULATION:

Sl. No.	PARTICULARS	Calculated Data
1	Max. Exposed Area (m^2)	1,870,000
2	Surface Area of Mine considered for excavation (m^2)	1,870,000
3	Area beyond excavation (5% of item No.2) (m^2)	93,500
4	Backfilled Area (m^2) above GL	NIL
5	Run-off co-efficient for:-	
	(a) Open excavation	0.7
	(b) Beyond excavation	0.1
	(c) Infiltration Co-efficient for Backfilled area	0.2
6	Probable Max. rainfall in a day (mm)	195
7	Water collected into the quarry by direct rainfall (m^3)	257078
8	Required pumping capacity to handle the whole rain water in 100 hrs (lps)	715
9	Required pumping capacity to handle the seepage water in 18 hrs. (lps)	108
10	Total pumping capacity required to handle the whole water of the mine. (lps)	823
11	Depth of Mine (m), target plus five years	120

Pumping system has been designed for the volume of water accumulated in the mine at the target plus five-year production considering maximum rainfall in a day as 195 mm.

Peak pumping requirement worked out as 295640 m^3. Above volume of water will be dewatered in 5 days at the rate of 20 hrs pumping per day. Pumping required per day thus worked out as 59,128 m^3. Installed pumping capacity per day is 900 LPS (295640 m^3/day) for 20 hours of working in a day.

10.2 SELECTION OF PUMPS AND DELIVERY RANGES

Pumping capacity of 900 lps is proposed to evacuate the whole rain water in 100 hrs. For this purpose, following pumps have been provided :

(i) Six pumps of 180 lps x 150m head have been proposed. Out of Six pumps, one pump is standby.

(ii) Three pumps of 80 lps x 80 m head have been proposed for initial and auxiliary pumping.

(iii) One existing diesel pumps of 80 lps x 60m head has been used.

(iv) Three face pumps of 11 lps x 30 m head have been envisaged in this report and one is standby.

(v) Two delivery ranges of 406.4mm dia. have been proposed for four main pumps of 180lps x 150m head and maximum one pump will be connected in each delivery.

(vi) One delivery ranges of 324 mm dia. have been proposed for one main pump of 180lps x 150m head and maximum one pump will be connected in each delivery.

(vii) Three existing delivery ranges of 250/200 mm dia has been used for auxiliary pumping for pumps of 80 lps X 80m head and maximum one pump will be connected in each delivery.

(viii) 80 mm dia. G.I. pipe will be used for face pumps.

(ix) No piping provisions have been made for standby pumps.

The pumping arrangements have been designed to cater the needs of 5 years after targeted production i.e. 12th years of quarry operation. Fresh assessment

for pumping capacity should be made before replacement of the proposed pumps.

11.0 COAL HANDLING & DESPATCH ARRANGEMENT

A coal handling plant is proposed on hiring to handle entire production from mine. The CHP will have facilities like crushing, storage, truck loading facility and weighment. Mode of despatch of coal from CHP to customer will be by road.

Crushed coal from CHP will be evacuated by road / Railway sidings (Sasti Railway siding/ Ballarpur Railway siding) to cost plus customer.

12.0 WORKSHOP

All HEMM deployed in this mine will be hired and their maintenance will be contractor's responsibilities. Hence, there is no provision of any unit excavation workshop in the report. E & M workshop facilities have been provided to carry out the maintenance and repair of pumps, electrical, LMVs etc. of the mine. This E & M workshop will be supported by Regional/Central workshop for major repairs and parts manufacture, because it is essentially a pithead maintenance workshop.

Maintenance and repairs of pumps, electrical, LMVs, manufacture of spares to a limited extent, transformer oil filtration, scheduling for repair needs at Regional/Central workshop etc. have been provided in the scope of activities of the workshop. Facilities provided in this workshop are machine shop, mechanical repair shop, electrical repair shop, welding and structural section, etc. Necessary provision for plant and machinery, tools, testing equipment etc. has been provided in respective shops for efficient repair and maintenance of the mine equipments.

13.0 POWER SUPPLY

13.1 Source of Power

The proposed Dhuptala OC Mine (Sasti UG to OC Mine) will receive power at 11 kV by drawing 4 km long overhead line from 66 kV / 11 kV Sasti substation of WCL. For erecting 11 kV double feeder overhead line, provision has been

made in Appendix A.8.1. Provisions for new overhead lines have been made to ensure reliability and better voltage regulation considering higher capacity of pumps.

Presently, the 2 x 10/12.50 MVA, 66kV/11kV Sasti central substation of WCL has a contract demand of 9000 kVA. It is feeding power to different mines and colonies of Ballarpur area. As per the discussion with mines officials, some of the mines are going to be closed or completing its life in coming 1-2 years. Hence the power requirement of the proposed Dhuptala OC Mine could be meet by the Sasti 66kV/11kV substation. If required, the contract demand of the Sasti 66kV/11kV substation could be increased accordingly as per power requirement.

For power cost calculation, loads of 29 no's of new quarters as well as existing quarters is considered. As per the norms, load in operation will be 211 kW. Accordingly the projected maximum power demand due to these quarters will be approximately 156 kVA. The existing power supply arrangement will continue to feed power to these quarters. Provision for electrification of these quarters has also been made in appendix A.3.2.

The estimated maximum demand of mine loads of Dhuptala OC Mine (as detailed in power demand table) works out to 2011 kVA.

- **CONNECTED LOAD, MAXIMUM DEMAND**

The details of connected load and Maximum Demand of the proposed Dhuptala OC mine and its colony are as given below :-

Sl. No.	Item Head	
1.	CONNECTED LOAD	
	a) Only Mine	3919 kW
	b) Only Colony	211 kW
	c) Total	4130 kW
2.	LOAD IN OPERATION	
	a) Only mine	3508 kW
	b) Only township	211 kW
	c) Total	3719 kW
3.	PROJECTED MAXIMUM DEMAND	
	a) Only mine	2011 kVA
	b) Only township	156 kVA
	c) Total	2166 kVA

14.0 CIVIL CONSTRUCTION WORK

14.1 Life of the project & specifications

The estimated life of proposed Dhuptala OC (Sasti UG to OC) Project is about 25 years. Considering the future expansion of mine and availability of coal reserves, as such all civil works have been envisaged on permanent specifications.

14.2 SERVICE BUILDINGS

Keeping in view the needs and requirements of this mine, provision for service buildings such as, Project office, E & M Workshop, Unit Stores, Sub-stations, Magazine and other service buildings have been provided which can be futher utilized during deepening of Dhuptala OC in future. These buildings are proposed near the access trench where the old infrastructure of Sasti exist which can be dismantled as per the MCP of Sasti UG .

14.3 RESIDENTIAL BUILDING

14.3.1 Manpower & No. of Quarters

The total manpower proposed in this PR is 174. Considering the necessity of the project 119 Nos. typed quarters have been envisaged which satisfies 68.39% of the required manpower of Dhuptala OC Mine (Sasti UG to OC). These 119 quarters include 36 Miner's quarters, 49 'B' type quarters, 20 'C' type quarters and 14 hostel type accommodation.

As per the data given by Mine/Area, 298 Nos. "Miners quarters", 95 Nos. 'B' type, 5 Nos. 'C' type, and 1 No 'D' type of Dhuptala OC housing complex has been considered as existing quarters in the head of Dhuptala OC Mine (Sasti UG to OC). Hence provision for only 29 required quarters (15 Nos. 'C' typed quarters and 14 Nos. hostel typed) has been made in this Mining Plan.

14.4 WATER SUPPLY ARRANGEMENT

14.4.1 Water Demand

Separate water supply arrangements have been envisaged both for colony and project site.

14.4.1.1 Colony Water Demand

The water demand for 29 quarters is 24 kl and the details are as follows:

Sl. No.	Particulars	Unit	
(i)	Manpower	Nos	174
(ii)	Total No. of houses required	Nos	399
(iii)	No of qtrs to be provided	Nos	29
	Population		
1	Residential Population @ 5 person per house	Nos	145
2	Non Residential workers	Nos	0
A	**Water Demand for Colony**	-	
(i)	Water requirement for residential population @ 135 litre per capita per day	lpd	19575
(ii)	Water requirement for Welfare/ community buildings to be located in the colony @ 10 % of item (A) (I) above	lpd	1957.5
(iii)	Process and other losses @ 10% of (A) (I) & (ii)		2153.25
	Total of (A)	lpd	23685.75
	Say	lpd	24000
		Kl	**24**
	Hourly reqirment for 16 hrs pumping	lph	1480.35
		lpm	24.67
		lps	0.41
	Say	**lps**	**1**

14.4.1.2 Industrial Water Demand

Water demand for project site includes water to be supplied for dust suppression, firefighting, water sprinkling on roads, etc. The total water requirement for project site has been worked out to 484 Kl and same has been considered in out-sourcing option to meet the water requirement of out-sourcing agency also.

(B)	**Industrial Water Demand for Project including Potable Water demand for Persons working in the Project**	**Unit**	Total Hiring Option
	For Opencast Projects	-	
	Capacity:	2.50	Mty
	No. of Dumpers =	47	
	No. of Dozers =	5	
a)	Water requirement for total manpower of Project @ 45 litre/capita/day	lpd	7830
b)	Water requirement for washing of dumpers @ 1800 litre/ dumper/day	lpd	93600
c)	Water requirement for dust suppression in CHP & other industrial premises @22500 litre/ day/million tonne of coal production per year	lpd	56250
d)	Water requirement for fire fighting @45000 litre/ day/million tonne of coal production per year	lpd	112500
e)	Water requirement for road watering @ 67500 litre/ day/million tonne of coal production per year	lpd	168750
f)	Water requirement of Service Buildings @ 10% of item (a) of above	lpd	783
g)	Allowance for loss & wastage @ 10% (a) to(f)	lpd	43971.30
	Total Water Demand	lpd	483684.30
	Say	lpd	484000
		Kl	**484**
	Hourly requirement for 16 hrs pumping	lph	30230.26
		lpm	503.83
		lps	8
	Say	**lps**	**8**

14.5 SEWAGE DISPOSAL ARRANGEMENT

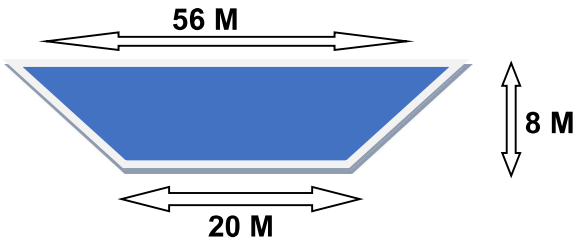
To avoid any discharge of effluent into natural watercourses, sewage disposal arrangement has been envisaged.

14.6 NALLAH DIVERSION

As per the proposed mine plan, one nallah needs to be diverted. Due to

unavailability of data, cross section details of the nallah are assumed as shown in the figure below. Diversion length is taken as 2.4 km as per proposed mine plan and cost is provided only for earthwork excavation.

It is however suggested that actual diversion of nallah should be done after carrying out detailed survey & investigations, catchment area, adequate side slopes may be lined or unlined, accordingly bed slope, and detailed engineering.



14.7 PIPELINE DIVERSION

As per the proposed mine plan, one pipeline of 400 mm diameter needs to be diverted. Diversion length is taken as 8.0 km as per proposed mine plan. It is however suggested that actual diversion route should be done after carrying out detailed survey & investigations.

14.8 CONSTRUCTION OF BRIDGE

As per the proposed mine plan, one bridge of 50m is proposed over the Sakhra Nallah. It is however suggested that actual construction of bridge should be done after carrying out detailed design & investigations.

15.0 SAFETY & CONSERVATION

The project report has been drawn in conformity with the prevailing statutory provisions as per Mines Act 1952 and CMR 2017 applicable for safety in Opencast Mines. However, all statutory rules, regulations, applicable laws etc. and statutory requirement related to Govt. licenses, workers compensation, Insurance, etc. including minimum wage act/CIL High Power Committee wages for workers employed by the agency outsourcing HEMM shall have to be adhered to. All the regulations & schedules of coal mines Regulations 2017 relating to opencast mining have to be adhered to and implemented in order to maintain day to day safety precautions as per statute.

15.1 INUNDATION

Dhuptala nalla & one small local nala are passing over the proposed project area. Provision has been made for the diversion of these nallas beyond quarry area and ultimately discharging into Wardha river. The H.F.L. of Wardha river as recorded by Sasti Colliery in 1959 is 271.88 m with reference to local bench mark. In terms of Mean Sea Level, the corrected reduced level would be lesser by 93.50m as established by Ballarpur Area Survey officials.

Proposed quarry area is mostly below HFL of Wardha river, hence an embankment of 30m width and 6m above HFL has been proposed for the safety of the mine. The alignment of the proposed embankment is shown in Quarry & Surface Layout Plan. It is also suggested to determine withdrawal level/Danger mark, so that as water level crosses the limit, workings shall be stopped.

The rain water falling within the project area would be diverted from the quarry area by providing garland drains and shall be collected towards low lying area.

15.2 DUST SUPPRESSION

For suppression of dust, water sprinkler has been provided in the PR. Suppression of mine dust may be done by using package bond & dust bond, for methodology of application relevant DGMS Circular may be referred.

15.3 GENERAL LIGHTING

The standards of lighting to be provided in opencast coal mines during working at different places or areas where natural light is not sufficient has been specified in CMR, 2017. They have to be strictly adhered to for efficient and safe working.

Illumination of quarry general area/dump area will be by 300 W, LED lamps fitted in flood light luminaries. A cluster of six lamps mounted on 15 m high lighting towers will be provided. Sufficient nos. of such towers has been provided. The illumination of haul road is permanent in nature and will be illuminated by 250 W LED lamps fitted in street light fittings. These fittings will

be mounted on 12.0 m high poles installed along the length of haul road either on one side or on two sides depending on the width of haul road. The

production faces will be illuminated by 300 W LED lamps fitted in symmetrical flood light fittings and mounted on 5.5 m high towers (self supporting) or may be mounted on HEMM itself.

Sufficient no's of mobile lighting tower is also provided for illumination of general quarry area and production faces. These mobile lighting tower will be movable type and can be shifted as per requirement.

15.4 FIRE AND SPONTANEOUS HEATING

Following safety precautions should be followed to avoid fire and spontaneous heating in the mine :

i) Wild or herbaceous plants shall be removed from the mine.

ii) No person shall deposit heated material or ashes on any opencast working. Also no person shall light a fire or permit a fire to be lighted in any OC working except by the permission in writing of the Manager and only for a special purpose specified therein.

iii) No coal shall be left exposed in coal benches more than its incubation period to avoid fire due to spontaneous heating.

iv) Proper type of the extinguisher should be kept in each HEMM ready for use in case of emergency.

v) In coal stock, coal shall be dispatched on the basis of first in first out.

The project report proposes extraction of standing pillars of Sasti UG (RO) mine by opencast method. There may be spontaneous heating of coal in underground galleries near the quarry coal face due to leakage of air and fire may break-out as soon as these galleries are exposed. It is proposed to lay water pipeline along the strike length on the dip side of quarry so that flexible hoses can be taken out from 'T' points of the pipeline for immediate quenching of the fire in coal galleries / pillars. Also Fire Fighting Truck has been provided in this report to fight fire locally. In addition to this, a fire retardant Bitumen based sealant which is in the approved list of DGMS can

be used in the coal benches to minimize leakage of air and thereby reduce incidence of occurrences of fire due to spontaneous heating.

Use of OB as blanketing material will also be tried whenever possible to fight fire. Necessary precautions must be taken while re-handling the hot OB which was used for blanketing. The cost of OB blanketing (maximum 4 lakh cum per annum) has been considered in this report in hiring cost in Appendix – C. While extracting pillars by opencast method, precautions against coal dust explosion as specified in DGMS Circular No.-4 of 1983 should be adhered to.

15.5 SLOPE STABILITY

It is suggested that following actions may be taken to deal with slope stability problem.

i) Vulnerable area may be identified and marked on quarry plan.

ii) Observation of actual alignment of fault, its throw, joints, etc. may be recorded during the process of exploitation.

iii) Water drainage system may be properly implemented to prevent accumulation of water in cracks. Also dumps shall be levelled to prevent accumulation of water over it. Proper drainage in dumps shall be also provided to prevent erosion of toe of dump.

iv) Regular monitoring of tension cracks, horizontal and vertical movement of strata in critical area may be done.

v) Rise side slope to be reinforced if required because it has to stand throughout quarry life. No dumps/surface structures to be located within 15m of quarry edge as it will act as surcharge there by destabilizing the slope.

vi) No undercutting of slopes to be done.

vii) Proper hydro-geological studies should be done and if water table is at level of slope it should be brought down by using submersible pumps to prevent hydrostatic pressure.

viii) Proper selection of site for dumping to be done. Before dumping, place of dumping should be made free from loose material. Dumping shall not

be done at an angle more than angle of repose of material being dumped.

ix) After completion of dumping operations, dumps should be stabilized by growing vegetation.

x) Every person deployed by leaser of HEMM must be trained & briefed about aspects related to slope stability.

15.6 BLASTING

i) At the time of operation of mine, drilling parameters have to be optimized on the basis of actual field trial depending upon joint pattern, bedding plane, type of rock and local geology of the blast site.

ii) Suitable precautions would be taken as per statute before and after blasting operations. While working near infrastructure, buildings etc., controlled blasting technique has to be practiced to minimize fly-off rocks and ground vibrations and to keep them within safe limits. Provision for conducting such scientific studies has been made in this report.

15.7 HAUL ROAD MAINTENANCE

Adequate care must be taken for proper construction and maintenance of haul road as per the existing guidelines. The gradient of haul road should not be steeper than 1 in 16.

15.8 SCIENTIFIC STUDIES

Following areas have been identified in the proposed Dhuptala OC (Sasti UG to OC) mine for detailed scientific studies:

a) Slope Stability

It is proposed to carry out scientific study on slope stability of external and internal OB dumps as well as for final slope of quarry batter. Based on the findings of scientific research the proposed slope of dumps and batter in the report may change.

b) Drilling & Blasting

For optimum fragmentation of rock and coal to minimize the overall cost of excavation, it is proposed in this report to engage some scientific body to carry out research for optimum drilling and blasting. Accordingly, the powder factor suggested after this study will be followed in the proposed mine.

c) Hydrogeology

Proper provision has been made in this report for scientific study to assess the hydrogeological parameters of the proposed area.

In addition to this, various other parameters like, soil testing, etc. need scientific study. A capital provision of Rs. 0.80 crore has been made in this report for the above scientific studies.

16.0 ENVIRONMENT MANAGEMENT

16.1 INTRODUCTION

Dhuptala OC (Sasti UG to OC) mine has been planned in Dhuptala Geological block located in southern bank of Wardha River near Ballarpur in Chandrapur district of Maharashtra State.

Environmental clearance for Dhuptala OC (Sasti UG to OC) mine was obtained for a capacity of 1.70 MTPA with total mining lease area of 1300.91 ha vide MoEF&CC letter No. J-11015/538/2008-IA.II (M) dated 10th January, 2013.

The project report of Dhuptala UG to OC was updated in 2018 for production capacity of 2.50 MTPA. The PR was approved by CIL Board vide its letter Ref No CIL: XI (D):04112:2019:22712 dated 5th March, 2019.

In the north of the project, a coal mine Ballarpur NW OCP with production capacity of 1.50 MTPA has been planned to extract the available coal reserves. The Project Report of Ballarpur OCP (Nov, 2021) was approved by WCL board vide its letter no WCL/Office of CS/BM-339/2021-22/766 dated 04.01.2022. In this PR, it was proposed to transfer 213.93 ha of land from Dhuptala OC to Ballarpur NW OC for overburden dumping. This was necessary to reduce the additional land requirement for external overburden dumping.

The 51.27 Mm^3 of overburden which was earlier proposed to be dump externally, is proposed to be dumped within the void of Ballarpur NW OC. This will save more than 140 ha of agriculture land from degradation.

To incorporate the changes proposed in the approved PR of Ballarpur NW OC, this mining plan is being prepared. The land area of Dhuptala OC will reduced to 1070.49 ha.

In the approved PR of Sasti Expansion OC, June, 2020, it was proposed to transfer 11.70 ha of land from Dhuptala OC to Sasti Expansion OC for maintaining the quarry geometry. The land details are provided below:

S. No.	Particular	Land (ha)
1	ML Area as per EC dated	1300.91
2	Land to be transferred to Ballarpur NW OC (as per approved PR of Ballarpur NW OC, October, 2021)	(-) 213.93
3	Land to be transferred to Sasti Expansion OC (as per approved PR of Sasti Expansion OC, June, 2020)	(-) 11.70
4	Area reduced by rationalization	(-) 4.79
Total Project Area (as per this Mining Plan)		**1070.49**

The environment clearance will be required to be obtained for production capacity of 2.50 MTPA within ML area of 1070.49 ha.

In the subsequent paragraphs attempt has been made to assess the likely environmental impacts due to mining activities in proposed Dhuptala OC (Sasti UG to OC) mine.

16.2 EXISTING ENVIRONMENTAL QUALITY

The baseline data on environment for Dhuptala UG to OC was collected in pre-monsoon season, 2020. The summarized details of baseline data is provided below.

16.2.1 AMBIENT AIR QUALITY IN PROJECT AREA

The baseline ambient air quality was collected for 8 locations within core and buffer zone of the project from April, 2020 to June, 2020.

Sl. No.	Location Name/ Location Code	Description
1.	Manager Office Ballarpur UG	Industrial area
2.	Sam Office –Dhuptala Sub Area	Industrial area
3.	Sasti Village	Residential Area
4.	Mathara Village	Residential Area
5.	Colony Dhoptala	Residential Area
6.	Antargaon Village	Residential Area
7.	Goyegaon Village	Residential Area
8.	Gouri Colny /Filter Plant	Residential Area

The summary of baseline ambient air quality status generated from April, 2020 to June, 2020 with 24 samples.

Location	Particular	SPM	PM_{10}	$PM_{2.5}$	NO_X	SO_2
		Parameters (In µg/m3)				
MANAGER OFFICE BALLARPUR UG	Minimum	83	43	10	6	BDL
	Maximum	219	118	51	28	16
	Average	137	71	35	16	12
	98th percentile	215	114	50	27	14
SAM OFFICE –DHOPTALA SUB AREA	Minimum	102	53	27	10	BDL
	Maximum	208	142	48	28	18
	Average	156	84	36	17	13
	98th percentile	207	139	47	27	17
SASTI VILLAGE	Minimum	74	42	29	11	BDL
	Maximum	184	88	43	27	16
	Average	125.71	66.79	35.67	16.88	11.69
	98th percentile	176.64	87.08	43	25.16	15.52
MATHARA VILLAGE	Minimum	98	51	32	13	BDL
	Maximum	145	84	42	27	15
	Average	122.08	62.71	36.13	18.75	12.62
	98th percentile	141.78	78.94	42	27	14.76

Location	Particular	SPM	PM10	PM2.5	NOX	SO2
		Parameters (In µg/m3)				
COLONY DHOPTALA	Minimum	84	44	20	13	BDL
	Maximum	174	86	49	26	16
	Average	123.67	59.42	31.46	17.96	13.07
	98th percentile	169.4	82.78	44.4	25.08	16
ANTARGAON VILLAGE	Minimum	78	46	18	10	BDL
	Maximum	167	88	53	27	18
	Average	127.92	65.63	30.29	17.29	13
	98th percentile	167	86.16	47.02	27	17.6
GOYEGAON VILLAGE	Minimum	60	29	21	10	BDL
	Maximum	168	80	42	27	14
	Average	122	59	30	16	11.6
	98th percentile	167	79	41	25.6	13.6
GOURI COLONY FILTER PLANT	Minimum	85	39	20	11	BDL
	Maximum	186	86	42	26	18
	Average	137.65	63.48	32.57	16.61	12.8
	98th percentile	178	84	41	25	17.6

Observation

All values are found to be well within the standards for coal mines stipulated by Ministry of Environment and Forests & Climate Change (MOEF & CC).

16.2.2 WATER QUALITY

The water quality characterization has been conducted by collecting water samples from drinking water, surface water and mine water discharge for the proposed project during pre-monsoon season i.e. Apr'20 to June'20.
Details of sampling location are given below:

Sampling Locations for Industrial Effluent

To assess the quality of effluent water discharge, water samples were collected from the following locations:

Sl. No.	Name of Sampling Locations	Frequency	Location Code
1.	Mine Water Discharge, Dhuptala OC mine	Once in a season	BBDOWMD 01
2.	ETP discharge, Dhuptala OC	Once in a season	BBDOWETP

Sampling Locations for Surface Water

To assess the quality of surface water, water samples were collected from the following locations:

Sl. No	Name of Sampling Locations	Frequency	Location Code
01.	Upstream of Wardha River w.r.t. Dhuptala OC	Once in a season	BBDOWSW 02
02.	Downstream of Wardha River w.r.t. Dhuptala OC	Once in a season	BBDOWSW 01

Drinking Water/ Ground water Sampling Locations

To assess the quality of drinking water around the project area, the water samples were collected from the following locations around the project area:

Sl. No.	Name of Sampling Locations	Frequency	Location Code
1.	Mathara village	Once in a season	BBDOWD02
2.	Goyegaon Village	Once in a season	BBDOWD01

The mine discharge water quality is provided below. The water quality for rest of the sample is provided within the baseline report. The details report will be provide within the EIA-EMP report.

Name of Monitoring Station: DHUPTALA MINE

Sample Description: Mine Water Discharge .

Date of Monitoring: 14.06.2020

Sl. No	Parameters	Test Method	Detection Limit	Standard for discharge Part A, Schedule VI	Analysis Result
1	pH Value	IS-3025/11:1983 Electrometric	0.2	5.5 to 9.0	7.39
2	Temperature (^{0}C)	IS 3025 (Part 9) : 1984, Thermometric	4°	Te < Ts + 5^{O}C	27
3	Colour (Hz)	APHA, 23rd Edition Platinum Cobalt	1	*	2
4	Odour	IS 3025 /05:1983, Physical, Qualitative	--	Unobjectionable	Unobjectionable
5	TSS –mg/l	IS-3025/17:1984 Gravimetric	10	100	46
6	Oil & Grease –mg/l	IS-3025/39:1991 Partition Gravimetric	2	10	BDL
7	C.O.D. – mg/l	APHA, 23rd Edition Closed Reflux	4	250	40
8	B.O.D. (3 days at 27^{0}C)-mg/l	IS 3025 (Part 44) : 1993	2	30	8
9	Residual Chlorine -mg/l	APHA, 23rd Edition DPD	0.02	1	0.03
10	Ammonical Nitrogen-mg/l	IS 3025 (Part 34) : 1988	0.02	50	0.52
11	Total Kjeldahl Nitrogen-mg/l	APHA, 23rd Edition Kjeldahl	1	100	18.6
12	Dissolved Phosphate –mg/l	APHA, 23rd Edition Molybdovanadate	0.3	5	0.65
13	Arsenic -mg/l	APHA, 23rd Edition AAS-VGA	0.005	0.2	BDL
14	Lead -mg/l	APHA, 23rd Edition AAS-GTA	0.007	0.1	BDL
15	Hexavalent Chromium -mg/l	APHA, 23rd Edition 1,5-	0.01	0.1	0.046
16	Total Chromium -mg/l	IS 3025 (Part 52) : 2003 AAS-Flame	0.06	2	BDL
17	Copper -mg/l	IS-3025/42:1992 AAS-Flame	0.03	3	BDL
18	Zinc -mg/l	IS-3025/49:1994 AAS-Flame	0.01	5	0.011
19	Selenium –mg/l	APHA, 23rd Edition AAS-VGA	0.005	0.05	BDL
20	Nickel -mg/l	IS 3025 (Part 54) : 2003, AAS-Flame	0.1	3	BDL
21	Cadmium - mg/l	APHA, 23rd Edition AAS-GTA	0.005	2	BDL
22	Fluoride - mg/l	APHA, 23rd Edition SPADNS	0.02	2	0.86
23	Sulphide – mg/l	APHA, 23rd Edition Methylene blue	0.1	2	BDL
24	Iron -mg/l	IS-3025/53:2003 AAS-Flame	0.06	3	BDL
25	Manganese - mg/l	IS-3025/59:2006 AAS-Flame	0.02	2	BDL
26	Nitrate Nitrogen - mg/l	APHA, 23rd Edition UV-Spectrophotometric	0.5	10	3.2

16.2.3 NOISE LEVEL QUALITY

The baseline noise level was monitored at 8 locations from April, 2020 to June, 2020. The locations details are provided below:

Location Code	Location Name	Description
BBDON01	SAM OFFICE –DHOPTALA SUB AREA	Ambient Noise monitoring location
BBDON02	ANTARGAON VILLAGE	Ambient Noise monitoring location
BBDON03	SASTI VILLAGE	Ambient Noise monitoring location
BBDON04	MANGER OFFICE BALLARPUR UG	Ambient Noise monitoring location
BBDON05	GOYEGAON VILLAGE	Ambient Noise monitoring location
BBDON06	COLONY DHOPTALA	Ambient Noise monitoring location
BBDON07	MATHARA VILLAGE	Ambient Noise monitoring location
BBDON08	GOURI COLNY /FILTER PLANT	Ambient Noise monitoring location

All the Noise Level Data are within the Standard as per Env. (Protection) Amendment rule 2000.

16.2.4 FLORA AND FAUNA

The baseline data for flora and fauna has been conducted in March, 2021 within the core and buffer zone of the project. As reported in the baseline, Tadoba Andhari Tiger reserve is at a distance of 17.7 Km in North East of the lease area. A tiger corridor passes at a distance of approximately 15 Km from the study area in the North East.

Following are Schedule I/ Endangered Species in the study area

Name			WPA, 1972 Status	IUCN Status
Scientific	English	Common / Hindi		
Mammal				
Cuon alpinus	Wild dog	jungli kutta	II	EN
Melursus ursinus	Sloth bear	Bhalu	I	VU
Panthera Pardus	Leopard	Tendua	I	VU
Panthera tigris	Tiger	Wagh	I	EN
Bird				
Pavo cristatus	Indian peafowl	Morr	I	LC

During survey, the locals reported that peacock is spotted often and mammals are sighted sometimes in the study area. A wildlife conservation

plan including the other nearby coal mines of WCL will be prepared at submitted along with EIA-EMP report.

16.2.5 LAND RESOURCE

The break-up of the type of land required for Dhuptala OC (Sasti UG to OC) Project is as follows :

Sl. No.	Particulars	Land (ha)
1	Land Already acquired by WCL under Dhuptala OC, Sasti UG and Sasti OC mines	368.59
2	Tenancy land (including 3 Ha land for colony outside mine leasehold)	824.62
3	Land to be transferred to Ballarpur NW OC (as per approved PR of Ballarpur NW OC, Nov, 2021)	(-) 213.93
4	Land to be transferred to Sasti Expansion OC (as per approved PR of Sasti Expansion OC, June, 2020)	(-) 11.70
5	Forest Land	NIL
6	Govt. land	49.25
7	Land Outside ML area for Village Rehabilitation	15
8	Existing Sasti Township (Outside leasehold Boundary)	38.66
	Total (A+B)	**1070.49**

16.3 ENVIRONMENTAL IMPACT

16.3.1 AIR QUALITY IMPACT

Due to coal transportation, wind erosion of OB dumps and coal handling, dust is likely to be generated. Concentration of NO_X is likely to increase due to the increased vehicular movement.

16.3.2 WATER QUALITY IMPACT

Analysis of water pumped out from existing nearby mines around the proposed project shows that the mine water meets the acceptable limits, so quality of water pumped out from the proposed project will be less, likely to have any significant pollution load. Wardha River passes along the eastern boundary of the project. Regular monitoring of mine discharge water along with surface water of Wardha River will be done periodically.

16.3.3 GROUND WATER IMPACT

Due to proposed project, it is anticipated that the effect on ground water regime will be pronounced upto around 500 m from mine edge and effect will be pronounced in the down-dip side and milder in the up-dip side. But this effect will be temporary in nature and once the project is over, after 2 – 3 rains, the regime will regain its almost original status.

16.3.4 NOISE IMPACT

Existing noise level at the mine site is likely to increase due to the increased number of vehicular movement and deployment of additional HEMM.

16.3.5 FLORA AND FAUNA

The wildlife conservation plan will be prepared for schedule-I species.

16.3.6 SOCIO-ECONOMIC STATUS

Impacts on Socio-Economic status would be most likely observed as there will be change in standard of living of the project affected people. Shift in means of livelihood is also expected to occur as impact of the proposed project.

16.3.7 LAND USE

Break up of proposed land use during mining for Dhuptala OC (Sasti UG to OC) Project in three phases is as given below :

Land use pattern

Sl. No.	Particular	Area (ha) as per Approved EC, 2013	Area (ha) as per present Mining Plan
	Within Mine Leasehold Boundary		
1	Excavation area	385.68	385.68
2	External OB Dump (including top soil dump)	396	255.3
3	Infrastructure/Roads	30	50
4	Embankment	90	60

Sl. No.	Particular	Area (ha) as per Approved EC, 2013	Area (ha) as per present Mining Plan
5	For nala diversion	15	15
6	Rationisation Boundary /Blasting Zone / Land for Future Coal Extraction and OB Dumping	327.57	117.85
7	Green Belt		130
	Outside Mine Leasehold Boundary	**1244.25**	1013.83
8	Colony	3	3
9	For Village Rehabilitation	15	15
10	Existing SastiTownship	38.66	38.66
	TOTAL	**1300.91**	**1070.49**

Post mining land use details are provided below:

S.N.	Land use during mining	Land use (ha)				
		Plantation	**Water Body**	**Public use**	**Undisturbed**	**Total**
1	External OB Dump	175	-	-	23.3	198.3
2	Top soil dump	45	-	-	12	57
3	Excavation	88	297.68	-	-	385.68
4	Roads	0.5	-	4.5	-	5
5	Area around	10	-	35	-	45

	buildings and infrastructure					
6	Green Belt	130	-	-	-	130
7	Undisturbed Area	15	-	-	102.85	117.85
8	Nala diversion	0	15	0	-	15
9	Flood protection embankment	2	-	58	-	60
10	Colony+Village Rehablitation + Existing Township	5	-	51.66	-	56.66
		470.5	312.68	149.16	138.15	1070.49

16.4 ENVIRONMENT MANAGEMENT

16.4.1 AIR QUALITY MANAGEMENT

Ambient Air quality of the existing Sasti UG Mine is being regularly monitored as per Environmental Protection Amendment Rules 2000, and the same would be continued for the proposed Dhuptala OC (Sasti UG to OC) project after getting statutory clearances for convertion of UG to OC mine. Also Baseline Data for Dhuptala OC (Sasti UG to OC) Project will be generated.

Air Pollution will be controlled by black topping of roads, water spraying on roads, biological reclamation of OB dumps, green belt around CHP, OB dump and along coal transportation roads on both sides etc.

16.4.2 WATER QUALITY MANAGEMENT

The control measures like provision of settling tank for mine water discharge, Effluent Treatment Plant, etc. will be constructed. The regular Water Quality Monitoring as per Environment Protection Amendment Rules, 2000 will be undertaken, for the proposed project after getting statutory clearances.

Mine pumped out water, after sedimentation, will be utilized within mine premises and balance will be used for supplementing any shortage of water in the nearby villages. Effluent from workshop will be treated in ETP & thereafter recycled. Similarly, water from CHP, after sedimentation, will also be recycled.

16.4.3 NOISE MANAGEMENT

The control measures will be undertaken as is being done in the nearby existing projects of WCL. The worker exposed to high noise level will be provided with earplugs & ear muffs. Proper enclosure and regular maintenance of equipment will be done. Plantation along road and around industrial & service building will be done to reduce the noise level.

The regular Ambient Noise Quality monitoring as per Environment Protection Amendment Rules, 2000 will be undertaken after getting statutory clearances.

16.4.4 FLORA AND FAUNA MANAGEMENT

Adequate plantation has been proposed with native species to maintain the diversity and also to attract the fauna.

16.4.5 SOCIO-ECONOMIC STATUS

Sasti Village located within the core zone is required to be proposed to rehabilitated. The compensation will be paid as per R&R policy of Coal India Limited. The direct and indirect employment opportunities will improve in and nearby project area along with development of the basic amenities like roads, hospitals and schools with updated facilities.

16.4.6 LAND RESOURCE MANAGEMENT

The following table depicts stage wise land resource management strategy which is laid out to properly utilize land during mining and after mining scenario.

Sl. No.	Land use category	Present Year	4th Year	5th Year	10th Year	15th Year	18th Year	20th Year	25th Year End of Mine	Post mining (After 3 years)
1	Backfilled Area	0	0	0	0	0	0	30	88	88
	(Reclaimed with plantation)	0	0	0					30	88

2	Excavated Area (Not reclaimed)/ void	30	100	115	187.68	271	342.28	355.68	297.68	297.68
3	Ext. OB dump	0	106	120	198.3	198.3	198.3	198.3	198.3	198.3
	(Reclaimed with plantation)	0	0	0	0	50	100	125	150	175
4	Top SoilDump	0	57	57	57	57	57	57	57	57
	(Reclaimed with plantation)	0	0	0	0	0	20	25	40	45
5	*Undisturbed area	1033.49	595.83	546.83	370.85	272.53	191.25	137.85	127.85	117.85
	(under plantation)		2	2	5	10	12	15	15	15
6	Green Belt	0	30	50	75	90	100	110	120	130

Sl. No.	Land use category	Present Year	4th Year	5th Year	10th Year	15th Year	18th Year	20th Year	25th Year End of Mine	Post mining (After 3 years)
7	Roads	2	5	5	5	5	5	5	5	5
	(brought under plantation)	0	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5
8	Nala diversion and Flood protection embankment	0	75	75	75	75	75	75	75	75
	(under plantation)	0	2	2	2	2	2	2	2	2
9	Area around buildings and infrastructure	5	45	45	45	45	45	45	45	45
	(under plantation)	0	5	5	7.5	10	10	10	10	10
10	Colony+Village Rehablitation + Existing Township	0	56.66	56.66	56.66	56.66	56.66	56.66	56.66	56.66
	(under plantation)		5	5	5	5	5	5	5	5
	Total	**1070.49**	**1070.49**	**1070.49**	**1070.49**	**1070.49**	**1070.49**	**1070.49**	**1070.49**	**1070.49**
	Total Plantation	**0**	**44.5**	**64.5**	**95**	**167.5**	**249.5**	**292.5**	**372.5**	**470.5**

Note: The area which is shown as undisturbed area is already having tree plantation.

2500 plants/ha are proposed as plantation density.

Plantation would be carried out during mining and post mining. Plantation schedule is given below:-

(Plantation in '000s)

Year	Backfilled Area		External OB Dump+ Top Soil Dump		Others (undisturbed area/etc.)		Total	
	Area (ha)	No. of trees	Area (ha)	No. of trees	Area (ha)	No. of trees	Area (ha)	No. of trees
1st year	0	0	0	0	0	0	0	0
4th year	0	0	0	0	40	100000	40	100000
5th year	0	0	0	0	60	150000	60	150000
10th year	0	0	0	0	90.5	226250	90.5	226250
15th year	0	0	50	125000	113	282500	163	407500

Year	Backfilled Area		External OB Dump+ Top Soil Dump		Others (undisturbed area/etc.)		Total	
	Area (ha)	No. of trees	Area (ha)	No. of trees	Area (ha)	No. of trees	Area (ha)	No. of trees
18th year	0	0	120	300000	125	312500	245	612500
20th year	30	75000	150	375000	138	345000	318	795000
25th year	88	220000	190	475000	148	370000	426	1065000
Post mining (After 3 years)	88	220000	220	550000	158	395000	466	1165000

16.5 ENVIRONMENT MANAGEMENT SYSTEM

To have a close watch on the environmental condition and implementation of the various measures suggested, a multi- disciplinary approach is essential. At present WCL headquarter acts as apex body which supervises the activities relating to environment at project level through the General Manager. General Manager of the area coordinates the activities of various disciplines in the area to render all necessary assistance at the implementing level i.e. the project Area Nodal Officer (Environment) monitors all aspects of environment on behalf of the General Manager. He also takes suitable steps for generation of environment data along with its analysis and interpretations.

As far as plantation is concerned suitable backup staff is provided in the area for undertaking the plantation jobs including rising of a nursery.

Sub-Area Manager is responsible for mechanical reclamation of the area. He is also responsible for biological reclamation with the assistance of GM's office. Toe wall (if required) around the periphery of external dumps shall be made to prevent the flow of OB material into nearby water bodies, public road or land not belonging to the project. Garland drain around the toe of the dump will be made to carry the silt.

17.0 LAND REQUIREMENT

The total requirement of land for Dhuptala OC (Sasti UG to OC) Project would be 1070.49 ha. Proposed Dhuptala OC (Sasti UG to OC) mine involves acquisition of 870.87 ha of additional land within the mine leasehold boundary and 18.00 Ha (3.00 Ha for Colony and 15.00 Ha land for Village rehabilitation) additional land outside the mine leasehold boundary . In addition to this, about 368.59 ha of acquired land of existing Sasti RO UG mine, Sasti OC mine and Dhuptala OC mine will also be used in the proposed project and 38.66 Ha existing land of Sasti township of Ballarpur Area is considered in this project .The proposed land required for the project belong to surrounding villages namely Kolgaon, Manoli, Sasti, Dhuptala, Bhadangpur. Land of these villages is mostly used for cultivation purpose. Cash crops like cotton, chillies etc are also grown apart from standard agricultural product like rice, wheat & jawar.

17.1 LAND REQUIREMENT

The break-up of the type of land required for Dhuptala OC (Sasti UG to OC) Project is as follows :

Sl. No.	Particulars	Land (ha)
`1	Land Already acquired by WCL under Dhuptala OC, Sasti UG and Sasti OC mines	368.59
2	Tenancy land (including 3 Ha land for colony outside mine leasehold)	824.62
3	Land to be transferred to Ballarpur NW OC (as per approved PR of Ballarpur NW OC, November, 2021)	(-) 213.93

4	Land to be transferred to Sasti Expansion OC (as per approved PR of Sasti Expansion OC, June, 2020)	(-) 11.70
5	Forest Land	NIL
6	Govt. land	49.25
7	Land Outside ML area for Village Rehabilitation	15
8	Existing Sasti Township (Outside leasehold Boundary)	38.66
	Total (A+B)	**1070.49**

Due to changes in land used pattern the proposed Mining Plan for Dhuptala OC (Sasti UG to OC) mine is being prepared in three phases as given below:

Phase-I : In this phase, Working will be done as per existing EC for a capacity of 1.70 MTPA for a area of 1070.49 Ha (1013.83 within mine leasehold boundary and 56.66 Ha land outside mine leasehold boundary) for initial four years.

Phase-II : In this phase, Dhuptala OC mine is reaching its target capacity of 2.50 Mty . In Phase-II, EC capacity of 2.50 Mty will be required for 1070.49 Ha land (1013.83 within mine leasehold boundary and 56.66 Ha land outside mine leasehold boundary). Phase –II is proposed from 5th Year to 18th Year of mine life considering the working will be done in this phase till exhaustion of reserves of Ballarpur NW OC mine having 17 years mine life.

Phase-III: In this phase, after exhaustion of Ballarpur NW OC mine the void of Ballarpur NW OC mine is proposed to be utilized for OB dumping of Dhuptala OC mine and thus there will be saving of land by optimization of OB dumping. The target capacity of Dhuptala OC i.e. 2.50 Mty is proposed to be maintained till balance life of Dhuptala OC mine. With a total requirement of land area will be 1660.02 ha {1070.49 ha (1013.83 within mine leasehold boundary and 56.66 Ha land outside mine leasehold boundary) land area for Dhuptala OC +589.53 ha land area for Ballarpur NW OC}. However, for calculation of closure cost, only 1013.83 ha land will be considered. For the land area of 589.53 Ha of Ballarpur NW OC mine separate escrow account will be maintained.

Hence, the proposed Mining Plan for Dhuptala OC (Sasti UG to OC) mine is being prepared for grant of EC for 2.50 Mty capacity, optimization of land required for OB dumping and revision of rate per Ha for calculation of mine closure cost.

17.3 LAND USE OF THE PROJECT

Break up of proposed land use during mining for Dhuptala OC (Sasti UG to OC) Project is given below :

Sl. No.	Particulars	Area (ha) as per present Mining Plan
	Within Mine Leasehold Boundary	
1	Excavation area	385.68
2	External OB Dump (including top soil dump)	255.3
3	Infrastructure/Roads	50
4	Embankment	60
5	For nala diversion	15
6	Rationisation Boundary /Blasting Zone / Land for Future Coal Extraction and OB Dumping	117.85
7	Green Belt	130
	Sub Total	**1013.83**
	Outside Mine Leasehold Boundary	
8	Colony	3
9	For Village Rehabilitation	15
10	Existing Combined Township	38.66
	TOTAL	**1070.49**

18.0 MINE CLOSURE PLANNING

Mine closure planning has to be done at the starting point of the mining operations and needs periodic review and revision during its life cycle to cope with the market due to geo-technical constraints, safety and economic risks, social & environmental challenges.

18.1 MINE CLOSURE COST

Mine closure planning has to be carried out at the starting of the mine and needs periodic reviewing and revision during its life cycle to cope with the geo-technical constraints, safety and economic risks, social & environmental challenges. For the Mine Closure activities, a corpus fund is created by opening an escrow account with the coal controller organization in nationalized bank. For opencast mine, an amount @ Rs 9.00 lakhs per Ha of the project area and for underground mine, an amount @ Rs 1.50 lakhs per Ha of the project area is required to be deposited in this account for final mine closure. The above rate has been adopted as per Circular No. 34011/28/2019-CPAM, GOI, Ministry of Coal, dated 29th May 2020.

The proposed PR of Dhuptala OC (Sasti UG to OC) mine has envisaged the conversion of Sasti UG mine into an opencast mine. The zero date for the proposed Mining Plan has been considered as 01.04.2022 and it is envisaged that Mining Plan approval and different notifications for acquisition of tenancy land will be completed prior to zero date.

Closure corpus for proposed opencast mine will be deposited from 2022-23 onwards for 25 years life (4 years for Phase-I and 21 years for Phase-II & III).

The total land in proposed Dhuptala OC (Sasti UG to OC) mine is estimated as 1013.83 ha respectively and closure cost for the mine has been estimated for this land, which is detailed below. For the purpose of closure cost 1013.83 ha land has been considered, as for the entire land of Ballarpur NW OC, separate escrow account will be opened.

Closure Cost Calculation

Sl. No.	Details	
1	WPI for All Commodities for Apr 2019 (New series)	121.10
2	WPI for All Commodities for Nov, 2021 (New series)	143.70
3	Ratio of WPI =(2) / (1)	1.1866226
4	Total land area requirement for the project (ha) =	1013.83

5	Mine closure cost @ Rs 9 lacs/ha (Rs in Lakhs) =	9124.47
6	Mine closure cost after indexing from Apr'19 to Nov'21 (Rs. In Lakhs) = (5) x (3) =	10827.30
7	Mine closure cost escalated @ 5% per year for 2022-23 (Rs in Lakhs)	11368.67
8	Life of Dhuptala OC (Sasti UG to OC) mine in years starting from 1st year (2022-23)	25
9	Annual Contribution to Escrow fund as on 2022-23 (Rs in Lakhs) = (9) / (10)	454.75

The annual Mine Closure Cost with 5% escalation in subsequent years is tabulated below:

Annual Mine Closure Cost

Year		Annual Production (Mty)	Corpus Fund (Rs. in Lakhs)	Mine Closure Cost (Rs /t)
1	2022-23	0.20	454.75	227.38
2	2023-24	0.50	477.49	95.50

Year		Annual Production (Mty)	Corpus Fund (Rs. in Lakhs)	Mine Closure Cost (Rs /t)
3	2024-25	1.00	501.36	50.14
4	2025-26	1.50	526.43	35.10
Total (Phase-I)		**3.20**	**1960.03**	
5	2026-27	2.00	552.75	27.64
6	2027-28	2.50	580.39	23.22
7	2028-29	2.50	609.41	24.38
8	2029-30	2.50	639.88	25.60
9	2030-31	2.50	671.87	26.87
10	2031-32	2.50	705.47	28.22
11	2032-33	2.50	740.74	29.63
12	2033-34	2.50	777.78	31.11
13	2034-35	2.50	816.67	32.67
14	2035-36	2.50	857.50	34.30
15	2036-37	2.50	900.37	36.01
16	2037-38	2.50	945.39	37.82
17	2038-39	2.50	992.66	39.71
18	2039-40	2.50	1042.30	41.69
Total (Phase-II)		**37.70**	**12793.20**	
19	2040-41	2.50	1094.41	43.78
20	2041-42	2.50	1149.13	45.97

21	2042-43	2.50	1206.59	48.26
22	2043-44	2.50	1266.92	50.68
23	2044-45	2.50	1330.26	53.21
24	2045-46	2.50	1396.78	55.87
25	2046-47	0.41	1466.61	357.71
Total (Phase-III) (1st to 25th Year)		**53.11**	**21703.90**	

18.2 BREAK-UP OF CLOSURE FUND FOR VARIOUS CLOSURE ACTIVITIES

The corpus amount deposited in the Escrow A/c will be utilized for various mine closure activities and the break-up of closure fund for various activities is tabulated below :

Activity wise Break-up of Closure Fund

Total Corpus Fund = Rs. 1960.03 Lakhs (upto Phase-I) + Rs. 19743.87 Lakhs (Phase-II & III) = Rs 21703.90 Lakhs

Sl. No.	Activity	Weighted % of Mine Closure Cost			Mine Closure Amount (Rs. in Lakhs)
		Progre-ssive	Final	Aver-age	
A	**Dismantling of structure**	0.00	8.50	4.25	922.42
	Service Building				
	Residential Building				
	Industrial Structure				
B	**Safety & Security**	6.50	3.20	4.85	1052.64
	Random rubble mansory / concrete wall				
	Toe wall around dump/Gabbion wall				
	Barbed wire fencing				
	Fencing/Boundary wall, fencing around water body				
	Garland Drains				
C	**OB Dumping Reclamation**				
C. 1	**Technical Reclamation**	60.5	60.50	60.50	13130.86
	Re-handling of OB				
	Levelling by Dozer				
	Grading				
	Levelling and Grading of highwall slopes and OB Dump				
C. 2	**Biological Reclamation & Plantation**	15.0	11.70	13.35	2897.47
	Top Soil Management				
	Grassing of OB Dump				

	Plantation around virgin area, safety zone, green belt over external dump and internal reclamation area				
	Plantation post care (incl. manpower)				
	Plantation over cleared area obtained after dismantling				
D	Landscaping of the open space in leasehold area for improving its esthetic. Drain, pipe lines, peripheral road, gates, View points, cemented steps on bank	4.00	5.50	4.75	1030.94
	Development of Agriculture Land				
E	**Environment Mitigation ans Manpower**				
	Air Quality (Water tanker, Sprinkler & Other control measures.)	12.0	1.50	6.75	1465.01
	Water Quality (ETP & STP etc operating cost)				
	Manpower cost and Supervision				
F	**Post Closure Monitoring**				
	Air Quality				
	Water Quality	0.00	3.20	1.60	347.62
	Power Cost				
	Manpower cost and supervision				

Sl. No.	Activity	Weighted % of Mine Closure Cost			Mine Closure Amount (Rs. in Lakhs)
		Progre-ssive	Final	Aver-age	
G	Enterpreneurship Development (Vocational/Skill development training for sustainable income of affected people)	1.00	0.50	0.75	162.78
H	Miscellaneous & Other measures like Golden Handshake, one time financial grant, alternative jobs, other services etc.	1.00	5.40	3.20	694.16
	TOTAL	**100**	**100**	**100**	**21703.90**

1. Mining is to be carried out in a phased manner initiating afforestation / reclamation work in the mined out area.

2. Upto 80% of the total deposited amount including interest accrued in the ECSROW account may be released after every 5 years. The amount released should be equal to expenditure incurred on Progressive Mine closure in past 5 years or 80% whichever is less.

3. The above cost/expenditure will be met from the corpus fund deposited in the escrow account by the mine operator. However, the additional amount

beyond the escrow account will be provided by the mine operator after estimating the final mine closure cost (as per the mine closure guideline).

4. The amount indicated separately under each head in the above table is indicative only and based on actual expenditure the amount may change.

19.0 MANPOWER

The manpower requirement for proposed Dhuptala OC (Sasti UG to OC) mine has been calculated on the basis of 3 shift operation for 330 days in a year. The manpower requirement for this project has been detailed in Appendix-B and B.1 of the project report. The manpower to be deployed in the proposed project for Out-sourcing option is 174.

The manpower requirement of this project has been summarised as follows:

Manpower Requirement (Out-sourcing Option)

Sl. No.	Particulars	Strength (Nos.)
1.	Executives	19
2.	Non-executives:	
i)	Monthly rated staff	84
ii)	Daily rated staff	71
3.	**Total**	**174**

In addition to above, 25 Nos. of manpower for security have been provided on hiring in basis.

The total manpower requirement in proposed PR of Dhuptala OC (Sasti UG to OC) mine works out to 174 in Total Hiring option.

About 824.62 ha tenancy land is proposed to be acquired in Dhuptala (Sasti UG to OC) mine. As per the directive of Technical Sub-Committee of WCL Board for projects held on 16.11.2018 at WCL (HQ), Nagpur, the manpower generated due to land acquisition is to be adjusted with financial provision in this PR. It is envisaged that 1018 manpower will be generated @ 1 job per 2 acre of land to acquire 824.62 ha tenancy land. The requirement of manpower in Total Hiring option works out to 174 and therefore financial provision for

844 surplus manpower generated due to land acquisition has been made in the approved PR along with 174 manpower required for the proposed mine under Salary and Wages Expenditure head in Unit Cost of production .

20.0 CONCLUSION

PR for Dhuptala OC (Sasti UG to OC) mine (November, 2018) was planned for a target capacity of 2.50 Mty. This PR was approved in 379th CIL Board meeting held on 12th February 2019. Environmental clearance for Dhuptala OC (Sasti UG to OC) mine was obtained for a capacity of 1.70 MTPA with total mining lease area of 1300.91 ha vide MoEF&CC letter No. J-11015/538/2008-IA.II (M) dated 10th January, 2013 based on approved PR of Dhuptala OC (January, 2008). Although the mine area of approved PR of Dhuptala OC (November, 2018) is within the leasehold area of approved EC, fresh Environmental Clearance will have to be obtained due to increase in target capacity from 1.70 Mty to 2.50 Mty. Also in the approved EC, for calculation of mine closure cost, an amount @ Rs. 6.00 lakhs per Ha of the project area was considered, however, as per Circular No. 34011/28/2019-CPAM, GOI, Ministry of Coal, dated 29th May 2020, for opencast mine, an amount @ Rs 9.00 lakhs per Ha of the project area is required to be deposited in this account for final mine closure.

In the approved PR of Ballarpur NW OC, it was proposed to transfer 213.93 ha of land from Dhuptala OC to Ballarpur NW OC for overburden dumping. 51.27 Mm^3 of overburden of Dhuptala OC which was earlier proposed to be dumped externally, is proposed to be dumped in the void of Ballarpur NW OC after exhaustion of its reserves. In the approved PR of Sasti Expansion OC (June, 2020), it was proposed to transfer 11.70 ha land from Dhuptala OC to Sasti Expansion OC for maintaining the quarry geometry. To incorporate the changes proposed in the approved PR of Ballarpur NW OC and changes in the land requirement in Dhuptala OC, this mining plan is being prepared. The land area of Dhuptala OC will reduced to 1070.49 ha. The environment clearance will be required to be obtained for production capacity of 2.50 MTPA with area of 1070.49 ha.

The proposed Mining Plan for Dhuptala OC (Sasti UG to OC) mine is being prepared in three phases as given below:

Phase-I : In this phase, working will be done as per existing EC for a capacity of 1.70 MTPA for a area of 1070.49 Ha (1013.83 Ha within mine leasehold boundary and 56.66 Ha land outside mine leasehold boundary) for initial four years.

Phase-II: In this phase, Dhuptala OC mine is reaching its target capacity of 2.50 Mty . In Phase-II, EC capacity of 2.50 Mty will be required for 1070.49 Ha land. Phase –II is proposed from 5th year to 18th year of mine life considering the working will be done in this phase till exhaustion of reserves of Ballarpur NW OC mine having 17 years mine life.

Phase-III: In this phase, after exhaustion of Ballarpur NW OC mine, the void of Ballarpur NW OC mine is proposed to be utilized for OB dumping of Dhuptala OC mine and thus there will be saving of land by optimization of OB dumping. The target capacity of Dhuptala OC i.e. 2.50 Mty is proposed to be maintained till balance life of Dhuptala OC mine. With a total requirement of land area 1660.02 ha {1070.49 ha (1013.83 Ha within mine leasehold boundary and 56.66 Ha land outside mine leasehold boundary) for Dhuptala OC +589.53 ha land area for Ballarpur NW OC}. However, for calculation of closure cost, only 1013.83 ha land within mine leasehold boundary of Dhuptala OC will be considered. For the land area of 589.53 Ha of Ballarpur NW OC mine, a separate escrow account will be maintained.

Hence, the proposed Mining Plan for Dhuptala OC (Sasti UG to OC) mine is being prepared for grant of EC for 2.50 Mty capacity in 1070.49 ha land, optimization of land required for OB dumping and revision of rate per Ha for calculation of mine closure cost.

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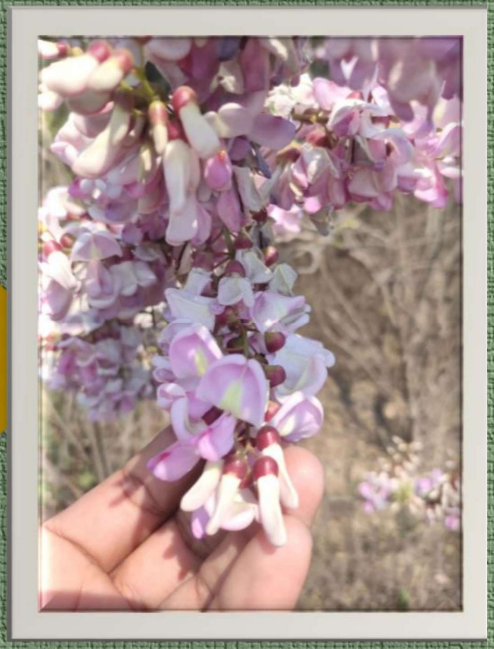
BIODIVERSITY STUDY OF RECLAIMED MINING AREA OF DHUPTALA OCP, BALLARPUR AREA, WCL

ANNEXURE I



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Chapter-1 Introduction

1.1 An Introduction to coal mining in the study Area:

Coal mining in Maharashtra, India is mainly concentrated in the Vidarbha region of the state. The major coalfields in the region include Wardha Valley, Chandrapur, and Kamptee coalfields. These coalfields are located in the eastern part of Maharashtra and have played a significant role in the development of the state's economy.

The Wardha Valley coalfield is the largest in the region and is located in the Chandrapur district. It covers an area of approximately 1000 square kilometers and has reserves of high-quality coal that are suitable for power generation. The Chandrapur Super Thermal Power Station, one of the largest thermal power plants in India, is located in this region and is powered by coal from the Wardha Valley coalfield.The Kamptee coalfield is located in the Nagpur district of Maharashtra and covers an area of approximately 180 square kilometers. The coal from this region is of lower quality and is primarily used for industrial purposes.

Overall, coal mining in Maharashtra has been an important contributor to the state's economy, providing employment opportunities and supporting the development of the power and industrial sectors. However, the environmental impact of coal mining, such as air and water pollution, and land degradation, has been a concern in the region, and efforts are being made to mitigate these impacts through sustainable mining practices and environmental regulations.

1.2 Environmental Legislations of Coal Mining Operations

In India, coal mining operations are subject to various environmental regulations that are designed to protect the environment and minimize the impact of mining activities. Some of the key environmental regulations that apply to coal mining operations in India include:

1. Environmental Impact Assessment (EIA), 2006: The EIA process is a mandatory requirement for obtaining environmental clearance for mining projects in India. The EIA process involves assessing the potential environmental impacts of the mining project and developing a plan for mitigating these impacts.
2. Forest Conservation Act (FCA), 980: The FCA regulates the diversion of forest land for non-forest purposes, including mining. Under the FCA, mining projects must obtain permission from the Ministry of Environment and Forests (MoEF) to divert forest land.

3. Water (Prevention and Control of Pollution) Act, 1974: This act regulates the discharge of pollutants into water bodies, including those resulting from coal mining activities. Mining projects must obtain consent to operate under this act, and must comply with the specified water quality standards.

4. Air (Prevention and Control of Pollution) Act, 1981: This act regulates the release of air pollutants from industrial activities, including coal mining. Mining projects must obtain consent to operate under this act, and must comply with the specified air quality standards.

Mine Closure Plan, 2022: The Ministry of Coal has issued guidelines for the preparation of mine closure plans, which are required to be submitted by mining companies. These plans must include measures for restoring the land, water bodies, and vegetation, and for mitigating any adverse impacts on the environment and local communities. In addition to these regulations, coal mining operations in India may also be subject to other environmental laws and regulations at the state and local levels. The government of India also periodically updates its policies and regulations related to coal mining to improve environmental protection and ensure sustainable development.

1.3 General Impact of Coal Mining:

Open-cast coal mining can have significant environmental impacts, including:

1. Land degradation: Open-cast mining activities can lead to the removal of vegetation and topsoil, which can result in land degradation and loss of habitat for plant and animal species.

2. Water pollution: The mining process can release pollutants such as heavy metals, sediment, and acids into nearby water bodies, leading to water pollution and ecosystem degradation.

3. Air pollution: Mining activities can release dust and other pollutants into the air, which can cause respiratory problems and other health issues for nearby communities. The release of greenhouse gases during mining and transportation of coal can also contribute to climate change.

4. Noise pollution: Mining activities can generate significant noise pollution, which can be disruptive to nearby communities and wildlife.

5. Social impacts: The displacement of communities and loss of livelihoods can result from mining activities. It can also lead to conflicts with indigenous people over land and resources.

6. Wildlife impacts: The removal of vegetation and habitat can negatively impact wildlife populations, while fragmentation of habitat can lead to isolation of populations and reduced genetic diversity.

To mitigate these impacts, mining companies are required to follow environmental regulations and implement best practices for mining and reclamation. Reclamation efforts can include the restoration of vegetation, soil stabilization, and restoration of water bodies, among other measures. Additionally, mine operators may implement measures to reduce noise and dust emissions, as well as minimize water and energy consumption. Continuous monitoring of environmental impacts and taking corrective actions are also essential for minimizing the impact of mining activities on the environment.

1.4 Reclamation of OB dumps:

OB (overburden) dump sites are areas where soil and rock that were removed during mining operations are piled up. Reclaiming OB dump sites is an important aspect of responsible mining practices, as it can help to restore the land to its natural state and mitigate the environmental impacts of mining. Here are some steps that are typically involved in the reclamation of OB dump sites:

1. Assess the site: Conduct an initial assessment of the site to determine the extent of environmental damage and identify the potential risks and opportunities for reclamation.

2. Develop a reclamation plan: Develop a detailed plan for reclaiming the site, including the objectives, the methods to be used, and the expected outcomes. The plan should take into account factors such as the local climate, vegetation, and soil conditions.

3. Technical reclamation: Technical reclamation involves the physical restoration of the land, such as grading the surface, re-grading the slopes, and constructing water control structures. It also includes the removal of hazardous materials, such as acid mine drainage (AMD) and mine fires.

4. Biological reclamation: Biological reclamation involves the reestablishment of vegetation on the reclaimed land. This helps to stabilize the soil, prevent erosion, and improve water quality. It also helps to create a habitat for wildlife.

5. Monitor and maintain the site: Monitor the site regularly to assess the success of the reclamation efforts, and make adjustments as necessary. This may involve additional planting, soil amendments, or erosion control measures. Maintenance activities may include mowing, weeding, and watering, as well as monitoring for any signs of erosion or other issues.

Reclamation of OB dump sites can be a challenging and complex process, but it is an important step in the responsible management of mining operations. By restoring the land to a healthy, productive state, mining companies can help to mitigate the environmental impacts of their operations and create a legacy of sustainable land use for future generations.

1.5 About the Dhuptala Open Cast Project:

Dhuptala OC (Sasti UG to OC) mine has been planned in Dhuptala Geological block located in southern bank of Wardha River near Ballarpur in Chandrapur district of Maharashtra State. Environmental clearance for Dhuptala OC (Sasti UG to OC) mine was obtained for a capacity of 1.70 MTPA with total mining lease area of 1300.91 ha vide MoEF&CC letter No. J-11015/538/2008-IA.II (M) dated 10th January, 2013.

The proposed Dhuptala OC (Sasti UG to OC) mine is basically a conversion of existing Sasti RO (UG) mine into opencast mine in Sectors D, E, F, G & H of Dhuptala Geological Block. Dhuptala Geological Block of Wardha Valley Coalfield. The proposed Dhuptala OC (Sasti UG to OC) mine is located about 7 km from Rajura township and 8 km from Ballarpur township. The mine falls in the Survey of India toposheet No. 56 M/5 (RF 1:50,0000). The area is bounded by latitudes N 19^{o}47’ and N19^{o}49’.

In recent years, WCL has implemented measures to improve the safety and efficiency of mining operations at Dhuptala OC Coal Mine. This includes the use of advanced mining equipment and technology to increase productivity and reduce costs. Additionally, the company has undertaken initiatives to promote sustainable mining practices and reduce the environmental impact of its operations.

1.6 Biodiversity Study of reclaimed OB dump sites of Dhuptala OC mines:

A biodiversity study of the reclaimed overburden (OB) dump sites of Dhuptala Open Cast (OC) Coal Mines of WCL would be an important step towards understanding the ecological impact of mining activities and the effectiveness of reclamation efforts. A biodiversity study of the reclaimed OB dump sites of Dhuptala OC Mines would provide valuable information on the success of reclamation efforts in restoring ecological diversity and sustainability to areas that have been affected by mining activities. This information can be used to guide future mining and reclamation practices, and to inform policies and regulations aimed at promoting sustainable mining practices and protecting biodiversity.

This biodiversity study involved the following steps:

1. Site selection: Selecting representative sites for the study that have undergone different stages of reclamation and have varying ecological conditions.
2. Habitat assessment: Conducting an assessment of the different habitats present at the selected sites, including soil and vegetation types, and noting any specific features such as wetlands or water bodies.
3. Biodiversity assessment: Conducting a survey of the flora and fauna present at the sites, including plants, insects, birds, and other animals. This may involve using a variety of sampling methods such as quadrate methods, transect surveys, pitfall traps, and visual surveys.
4. Carbon Estimation: The Carbon sequestration services by plantation is being estimated through quadrate survey, soil organic carbon and extrapolation.
5. Data analysis: Analysing the collected data to determine the diversity, abundance, and distribution of different species at the sites. This involve statistical analysis of the data to identify patterns or trends.
6. Interpretation and reporting: Interpreting the results of the analysis to draw conclusions about the ecological impact of mining activities and the effectiveness of reclamation efforts. A report summarizing the findings of the study, including recommendations for further research or management actions.

Chapter-2 Project Details

2.1 About Dhuptala OC Mines:

Dhuptala Open Cast (OC) Coal Mine is located in Ballarpur, Chandrapur district of Maharashtra, India. It comes under Ballarpur Area of Western Coalfields Limited. The proposed Dhuptala OC (Sasti UG to OC) mine is basically a conversion of existing Sasti RO (UG) mine into opencast mine in Sectors D, E, F, G & H of Dhuptala Geological Block. Dhuptala Geological Block of Wardha Valley Coalfield. The proposed Dhuptala OC (Sasti UG to OC) mine is located about 7 km from Rajura township and 8 km from Ballarpur township.

The PR of proposed Dhuptala OC (Sasti UG to OC) mine was updated in November, 2018 for a target capacity of 2.50 Mty in total hiring option.

2.2 Topography and Drainage

The area has a slightly undulating topography with gentle slope towards Wardha River in the North. The surface reduced level values vary between 260.54 m to 273.85 m. The H.F.L. of Wardha River as recorded by Sasti Colliery in 1959 is 271.88 m. However, it may be mentioned that topographical features are with reference to arbitrary benchmark. In terms of Mean Sea Level, the corrected reduced level would be lesser by 93.50 m as established by Ballarpur Area Survey officials by connecting assumed reduced level to reduced level as mentioned on the railway bridge on Wardha River near Ballarpur. However, in the present assessment and in all the plans, only the assumed reduced level values have been utilized. Whenever a correct reduced level value is required, the value of 93.50 m has to be deducted from the RL values as mentioned in the assessment and plans.

The Wardha river controls the main drainage of the area. The Dhuptala nala and a local nala are flowing over the quarry area in the dip side and merge with Rajur Nala which ultimately discharges into Wardha river.

2.3 Climate and Rainfall

The average rainfall is 1100 mm. The maximum precipitation is during June to September. The area experience tropical climate. The summer season is from April to June with the

maximum temperature reaching through 48ºC during May. Winters are moderate with the minimum temperature dropping upto 8ºC.

2.4 Present Land Use Pattern

The major part of the block is agricultural land. The proposed land required for the project comprises of surrounding villages namely Kolgaon, Manoli, Sasti, Dhuptala, Bhadangpur. Land of these villages is mostly used for cultivation purpose. Cash crops like cotton, chillies etc. are also grown apart from standard agricultural product like rice, wheat & jawar.

2.5 Geology

The geology of the block has been established mainly from the sub-surface borehole data as the entire area is covered under a blanket of soil. The geological formations encountered in boreholes beyond to Lower Gondwanas. No igneous intrusion has been intersected in the boreholes. A total of 69.63 Mt of coal has been estimated in block. The Geological succession of the block is given below:

GEOLOGICAL SEQUENCE OF MINING BLOCK

Formation	Lithology	Thickness Range (m)	
		Minimum	Maximum
Soil	Black cotton soil, sandy soil Depth of weathering is 22 m	3.00 (MWS-19)	11.00 (MWSU-1)
-----U N C O N F O R M I T Y------			
Kamthis	Red,brown,yellow coloured fine to coarse grained sandstone, variegated clays	9.00 (MWS-48)	26.65 (CMWD-13)
	-----U N C O N F O R M I T Y------		
Barakars	Grey to white, fine to medium grained sandstone, intercalation of shale and sandstone, shale, carb shale, coal etc.	44.28 (CMWD-12)	174.25 (MWS-48)
Talchirs	Greenish sandstone and greenish shale	Not encountered.	

There are following existing opencast coal mines which are adjoin to Dhuptala mine and also comes under the Ballarpur Area of WCL.

1. Ballarpur OCP

2. Sasti OCP

3. Pauni OCP

4. Gauri Deep OCP

The location plan of all the neighbouring projects is provided in Figure 2.1 below and detailed map of the Dhuptala mines is provided in Figure 2.2 below.

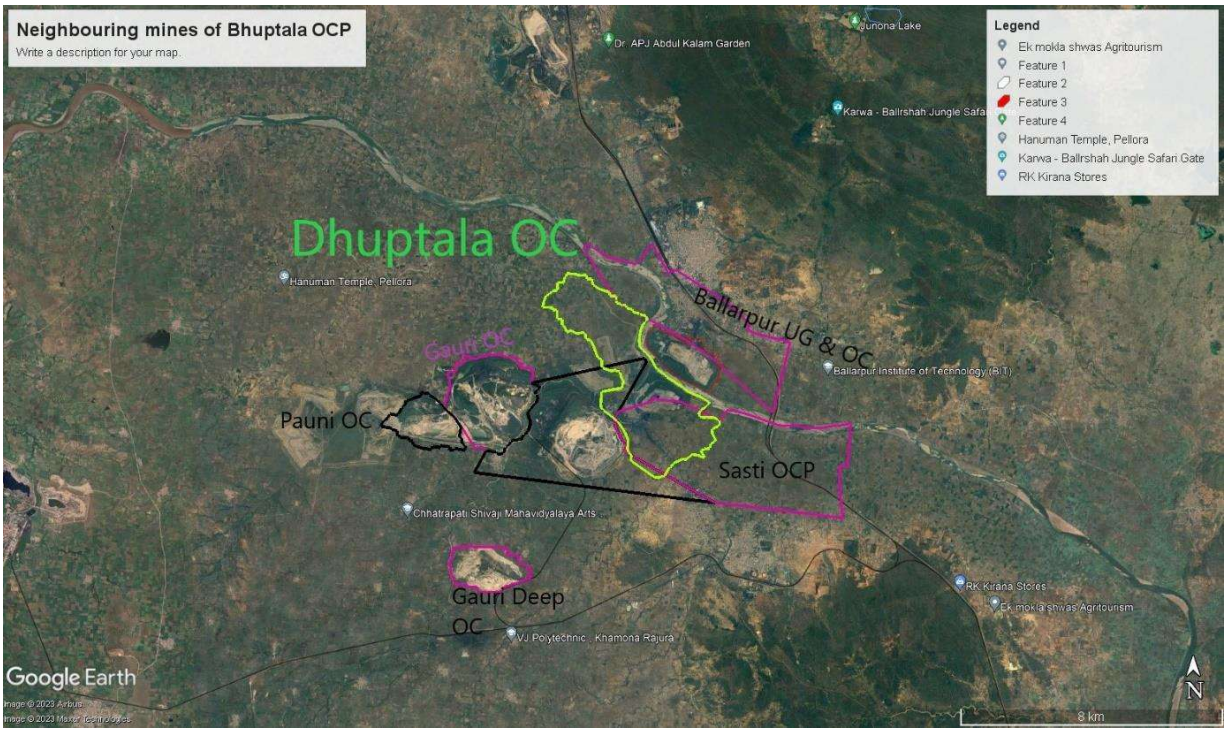


Fig 2.1: Neighbouring coal mines near to Dhuptala OCP Project, WCL

Fig 2.2: Map Showing Dhuptala OCP, WCL

2.6 Land use of the project area

There is no forest land involved in the project. A total of 1070.49 ha of land is required for project. The break-up of the type of land required for Dhuptala OC Project is as follows:

Table 2.1: Land Use Details of Mines

Sl. No.	Particulars	Land (ha)
1	Land Already acquired by WCL under Dhuptala OC, Sasti UG and Sasti OC mines	368.59
2	Tenancy land (including 3 Ha land for colony outside mine leasehold)	824.62
3	Land to be transferred to Ballarpur NW OC (as per approved PR of Ballarpur NW OC, Nov, 2021)	(-) 213.93
4	Land to be transferred to Sasti Expansion OC (as per approved PR of Sasti Expansion OC, June, 2020)	(-) 11.70
5	Forest Land	NIL
6	Govt. land	49.25
7	Land Outside ML area for Village Rehabilitation	15
8	Existing Sasti Township (Outside leasehold Boundary)	38.66
	Total (A+B)	**1070.49**

2.7 Stage-wise Land use and Reclamation Area (ha)

The stage wise reclamation details are provided in Table 2.2 below. The following table depicts stage wise land resource management strategy which is laid out to properly utilize land during mining and after mining scenario.

Table 2.2: Land Use Details of Mines

Sl. No.	Land use category	Present Year	4th Year	5th	10th	15th	18th	20th	25th End of Mine	Post (After 3 years)
1	Backfilled Area	0	0	0	0	0	0	30	88	88
	(Reclaimed with plantation)	0	0	0					30	88
2	Excavated Area (Not reclaimed)/ void	30	100	115	187.68	271	342.28	355.68	297.68	297.68
3	Ext. OB dump	0	106	120	198.3	198.3	198.3	198.3	198.3	198.3
	(Reclaimed with plantation)	0	0	0	0	50	100	125	150	175

4	Top SoilDump	0	57	57	57	57	57	57	57	57
	(Reclaimed with plantation)	0	0	0	0	0	20	25	40	45
5	*Undisturbed area	1033.4	595.8	546.8	370.8	272.5	191.2	137.8	127.8	117.8
	(under plantation)		2	2	5	10	12	15	15	15
6	Green Belt	0	30	50	75	90	100	110	120	130
7	Roads	2	5	5	5	5	5	5	5	5
	(brought under plantation)	0	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5
8	Nala diversion and Flood protection embankment	0	75	75	75	75	75	75	75	75
	(under plantation)	0	2	2	2	2	2	2	2	2
9	Area around buildings and infrastructure	5	45	45	45	45	45	45	45	45
	(under plantation)	0	5	5	7.5	10	10	10	10	10
10	Colony+Village Rehablitation + Existing Township	0	56.6	56.6	56.6	56.6	56.6	56.6	56.6	56.6
	(under plantation)		5	5	5	5	5	5	5	5
	Total	**1070.4**	**1070.4**	**1070.4**	**1070.4**	**1070.4**	**1070.4**	**1070.4**	**1070.4**	**1070.4**
	Total Plantation	**0**	**44.5**	**64.5**	**95**	**167.5**	**249.5**	**292.5**	**372.5**	**470.5**

2.8 Stage-wise cumulative plantation:

A stage wise cumulative plantations details is provided in **Table 2.3.** Plantation would be carried out during mining and post mining. A total of 88 ha of area with backfilled will be planted with approximately 2, 20,000 tree species, 220 ha of OB dump land would be planted with approximately 5,50,000 tree species and other areas (undisturbed) of 158 ha would be planted with approximately 3,95,000 tree species. Thus, over-all 466 ha of land will be planted with approximately 11, 65,000 tree species in 25 years' time.

Table 2.3: Plantation details in Mines

Year	Backfilled		External OB Dump+ Top Soil Dump		Others (undisturbed area/etc.)		Total	
	Area							
	Area (ha)	No. of trees	Area (ha)	No. of trees	Area (ha)	No. of trees	Area (ha)	No. of trees
1st year	0	0	0	0	0	0	0	0
4th year	0	0	0	0	40	100000	40	100000
5th year	0	0	0	0	60	150000	60	150000
10th year	0	0	0	0	90.5	226250	90.5	226250
15th year	0	0	50	125000	113	282500	163	407500
18th year	0	0	120	300000	125	312500	245	612500
20th year	30	75000	150	375000	138	345000	318	795000
25th year	88	220000	190	475000	148	370000	426	1065000
Post mining (After 3 years)	88	220000	220	550000	158	395000	466	1165000

A total of 426 ha has been reclaimed through plantation on external dumps, backfilled area and other avenue plantation. Post mining, the plantation area has increased to 466 ha with total number of plants being planted as 1165000 till date in the project area.

Chapter 3: Methodology

3.1 Introduction to Methodology of biodiversity assessment:

Biodiversity assessment included both secondary and primary surveys. Secondary survey includes desktop investigations through published literature, forest working plan documents and research articles and primary survey includes field surveys through quadrate method. The qualified ecologists conducted the field flora survey between February-March 2023.

The vegetation and flora survey was conducted using a combination of quadrats (10 m x 10 m) at each Material Investigation Area to delineate vegetation structure, and ensured that all vegetation types at each of the Study Areas were surveyed. Additionally, areas that were likely to support unusual flora, such as creek lines and breakaways were surveyed thoroughly. The study included recording of flora species and mapping of vegetation types, vegetation condition and weed status. GPS photography was used to assist in the delineation of vegetation types present in the Project Area and the vegetation was rated according to the vegetation condition scale.

A full list of flora species was generated for each of the Material Investigation Areas. The presence of Declared Rare or Priority Flora was assessed, with suitable habitat searched during the survey to determine the presence of threatened flora. The flora survey included an inventory of dominant exotic plants including noxious plants and environmental weed species.

3.2 Sampling Technique

A simple stratified random sampling technique should be adopted for carrying out ecological sampling in the core and buffer zone of the project sites. Sample plots of uniform size 10 X 10 m were laid to enumerate and measure trees and shrub species. Sub plots of 1X1 m were laid diagonally opposite to the main plots to enumerate shrub and grass species. A minimum of total number 20 sample plots (including core and buffer zone) of 10 X 10 m size were laid to assess the vegetation of area. In each sample plots, height and girth of the tree species to be measured. A conservative approach to be followed to consider pre-project trees, wherein all the vegetation type having girth more than 10 cm were considered as trees, while vegetation less than or equal to 10 cm girth were considered as a shrub. All the tree species data i.e. scientific name, girth class, height and presence of any rare and endangered species were

collected from the three strata in a standard format. The herbs, shrubs and grass species were also gathered from the sample plots.

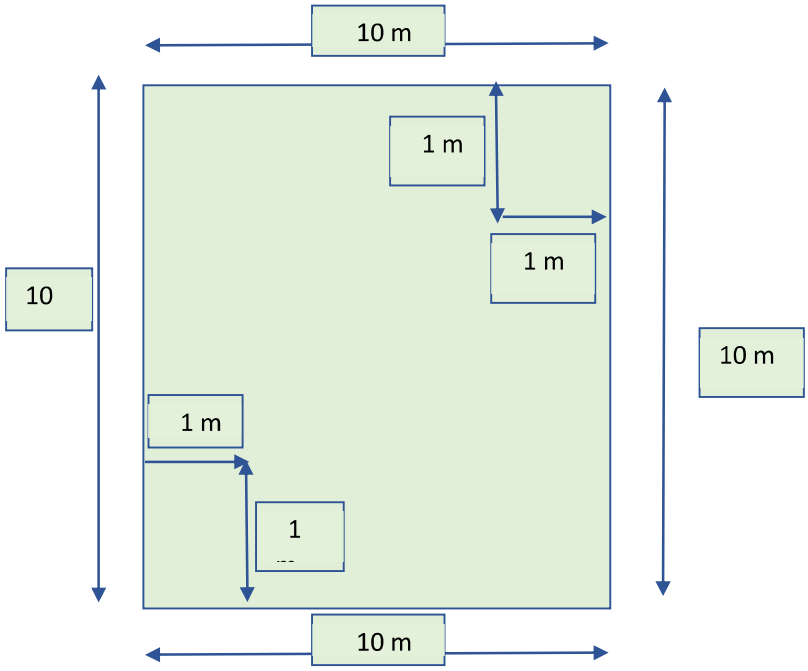


Figure 3.1: Design of a sample plot and Sub-plots for ecological data collection.

3.3 Biodiversity Indices

Biodiversity is a contraction of 'biological diversity' and is used to describe the variety of life. It refers to the number and variety of organisms within a particular area and has three components: **species diversity**; **ecosystem (or habitat) diversity**; and **genetic diversity**. Biodiversity is often used as a measure of the health of biological systems.

3.3.1 Species diversity

Species diversity relates to the number of the different species and the number of individuals of each species within any one community. A number of objective measures have been created in order to measure species diversity.

3.3.2 Species richness

Species richness is the number of different species present in an area. The more species present in a sample the 'richer' the area.

Figure 3.2: The plantation sites in coalfield field and the CMPDIL expert team.

3.3.3 Calculation of Biodiversity Index

Species richness as a measure on its own takes no account of the number of individuals of each species present. It gives equal weight to those species with very few individuals and those with many individuals. A community dominated by one or two species is considered to be less diverse than one in which several different species have a similar abundance.

Biodiversity index (**D**) is a measure of diversity, which takes into account both species richness, and an evenness of abundance among the species present. In essence it measures the probability that two individuals randomly selected from an area will belong to the same species. The formula for calculating D is presented as:

$$D = \frac{\sum n_i(n_i - 1)}{N(N-1)}$$

where n_i = the total number of organisms of each individual species

N = the total number of organisms of all species

The value of **D** ranges from 0 to 1. With this index, 0 represents infinite diversity and, 1, no diversity. That is, the bigger the value the lower the diversity.

To calculate index for a particular area, the area must be sampled. The number of individuals of each species must be noted. For example, the diversity of the ground flora in woodland might be determined by sampling with random quadrats. The number of plant species in each quadrat, as well as the number of individuals of each species should be noted. There is no necessity to be able to identify all the species provided that they can be distinguished from each other. Further, percentage cover can be used to determine plant abundance but there must be consistency, either all by 'number of individuals' or all by 'percentage cover'.

Low species diversity suggests:

- Relatively few successful species in the habitat
- The environment is quite stressful with relatively few ecological niches and only a few organisms are really well adapted to that environment
- Food webs which are relatively simple
- Change in the environment would probably have quite serious effects.

High species diversity suggests:

- A greater number of successful species and a more stable ecosystem
- More ecological niches are available and the environment is less likely to be hostile
- Complex food webs
- Environmental change is less likely to be damaging to the ecosystem as a whole

Species biodiversity may be used to indicate the 'biological health' of a particular habitat. However, care should be used in interpreting biodiversity measures. Some habitats are stressful and so few organisms are adapted for life there, but, those that do, may well be unique or, indeed, rare. Such habitats are important even if there is little biodiversity. Alternatively, an increase in the biodiversity of an area may mean that corrective measures have been effective.

3.3.4 Aquatic Diversity

Methodology for Planktons study: One litre water sample is collected from each of the water bodies of the study area using 50 - micron phytoplankton net. Collected samples are labelled and preserved by adding sufficient formaldehyde solution to maintain 4% formaldehyde. The samples were brought to the laboratory. Water samples taken in a concave glass plate, a drop of Lugol's Iodine solution is added to the sample and observed under compound microscope at different magnifications. Different categories of algae (*Chorophyceae, Bacillariophyceae, Cyanophyceae, Euglenophyceae*), Zooplanktons *(Protozoa, Rotifera, Cladocera, Copepoda, Ostrocada* etc.) are searched under microscope. Clear images of the planktons were saved using the camera attached with the microscope. The organisms are identified using the regional research publications and by experts. Images are cropped, size reduced, tabulated and labelled and the data is analysed.

3.4 Faunal and Avifaunal Assessment:

The faunal and avifaunal assessments are most commonly done through field surveys to collect data on faunal and avifaunal populations. This method involves walking transects and observing animals in their natural habitat, as well as identifying species through visual and auditory cues. Transect walks can be conducted using various sampling methods such as line transects, point transects, or quadrats. For, the present study line transect method has been used to assess faunal and avifaunal study of study area.

3.5 Methodology of Biomass and Carbon Estimation:

A random sampling method was adopted for carrying out ecological sampling in the core, buffer and forest area surrounding the project sites. Sample plot of size 10 X 10 m were laid to account for trees and shrub species in the plantation/forest areas of the study area. In each sample plot, height and girth of the trees were measured through Ravi multimeter and measuring tape respectively. A conservative approach was followed to consider pre-project trees, wherein all the vegetation type having girth more than 10 cm were considered as trees, while vegetation less than or equal to 10 cm girth were considered as a shrub.

Estimation of carbon stock in the trees is estimated using a stepwise procedure as per the standard methodology. The first step is selection of Biomass Expansion Factor (BEF) technique out of the three prescribed techniques i.e. (Biomass Expansion Factor Technique, Allometric Equation Technique and Baseline Default Technique) to estimate the biomass from tree species. In this, the volume of each tree species has been calculated using the local volume equations and then converts into the dry above ground biomass by using the wood density and biomass expansion factor for each tree species. Further, applying the root shoot ratio of each tree species, below ground biomass was calculated. Thus, biomass of each tree species within each sample plot is estimated using the following equation:

$$B_{TREE,j,p,I,t} = V_{TREE,j,p,I,t} \times D_j \times BEF_{2,j} \times (1 + R_j)$$

Where:

$B_{TREE,j,p,I,t}$	:	Biomass of trees of species *j* in sample plot p of stratum *i* at a point of time in year *t*; *t* dry matter (d.m.)
$V_{TREE,j,p,I,t}$	:	Stem volume of trees of species *j* in sample plot p of stratum i at a point of time in year *t*, estimated by using the tree dimension(s) as entry data into a volume table or volume equation; m^3
D_j	:	Density (Overbark) of tree species *j*; t d.m. m^{-3}
$BEF_{2,j}$	:	Biomass expansion factor for conversion of stem biomass to above-ground tree biomass, for tree species *j*; dimensionless
R_j	:	Root-shoot ratio for tree species *j*; dimensionless

Following steps are sequentially followed to get the estimated value of biomass of tree species in baseline scenario.

Step 1: The tree species biomass in sample plot *p* of stratum *i* is estimated as:

$$B_{TREE,p,i,t} = \sum jB_{TREE,j,p,i,t}$$

Step 2: Then, tree biomass per hectare in plot *p* in stratum *i* is estimated using the formulae:

$$b_{TREE,p,i,t} = B_{TREE,p,i,t} / A_{p,i}$$

Step 3: Mean tree biomass per hectare in stratum *i* is estimated as follows:

$$b_{TREE,i,t} = \sum pb_{TREE,p,i,t} / n_i$$

Step 4: Mean tree biomass per hectare within the project boundary is estimated as follows:

$$b_{TREE,t} = \sum iW_i \times b_{TREE,i,t}$$

Step 5: Total tree biomass within the project boundary at a given point of time in year t is estimated as follows:

$$B_{TREE,t} = A \times b_{TREE,t}$$

Step 6: Carbon stock in tree biomass within the project boundary at a given point of time in year *t* is estimated as follows:

$$C_{TREE,t} = 44/12 \times B_{TREE,t} \times CF_{TREE}$$

3.6: Estimation of Soil Organic Carbon:

The estimation of soil organic carbon can be done using several methods. Here are some commonly used methodologies:

Walk-over survey method: In this method, the soil organic carbon content is estimated by observing the colour, texture, and other physical characteristics of the soil. This method is often used for rapid soil surveys.

Laboratory analysis method: This method involves the extraction of soil samples from the field and analyzing them in a laboratory. The samples are dried, ground, and then analyzed for organic carbon content using various techniques such as dry combustion, wet oxidation, or loss on ignition.

Soil carbon modelling method: This method involves the use of mathematical models to estimate soil organic carbon content. These models are developed based on various factors such as soil type, vegetation cover, land use history, climate, and management practices.

Remote sensing method: This method involves the use of remote sensing techniques to estimate soil organic carbon content. This can be done by analyzing the reflectance spectra of the soil using satellite imagery or other remote sensing tools.

The Laboratory analysis method is used in the present study. The laboratory analysis also gives the result of other soil quality parameters of the reclaimed OB dump sites. The following Soil parameters were studied through the laboratory equipment's.

S.no	Name of Soil Parameters	Use of Instrument
1	Sodium & Potassium	AAS & Balance
2	Soil Texture	Hydrometer
3	pH	pH Meter
4	Cation Exchange	Mufel Furnance
5	Phosphate	Spectro Photo Meter
6	Conductivity	Magnetic Stirrer & Mechanical Shacker Conductivity Meter
9	Soil Organic Carbon	Through Standard laboratory Procedure

Chapter-4 Data Collection and its analysis

The biodiversity of reclaimed OB dumps and mine site area is assessed through vegetation survey, soil sample collection, and water sample collection, faunal & avifaunal assessment. The details of data collected through quadrate survey, vegetation survey, and other assessment techniques is presented in this chapter.

4.1 Details of Quadrate Survey at Plantation Sites:

There are total of 20 number of random quadrate laid over the study area. The tree GBH (Girth at Breast Height) and approximate height is measured for each tree species (more than 10 cm girth) fall inside the random quadrate and their height is approximately measured. The shrubs, herbs, grasses and climber species are noted in each quadrate. The quadrate wise data collected from plantation sites is presented below:

There are total of 116 number of tree species found in the quadrate survey representing 29 different types of tree species and 12 families. The most dominant tree species in the study area are *Prosopis juliflora and Leucaena leucocephala* and co-dominated by *Pongomia pinnata*, *Albizia lebbeck, Dalbergia sissoo and Senna siamea*. The girth class analysis graph shown in Figure 4.1 below suggests that most of the plantation sites are dominated by girth class of 10-20 cm followed by 20-40 cm and the minimum distribution of greater than 60 cm girth class.

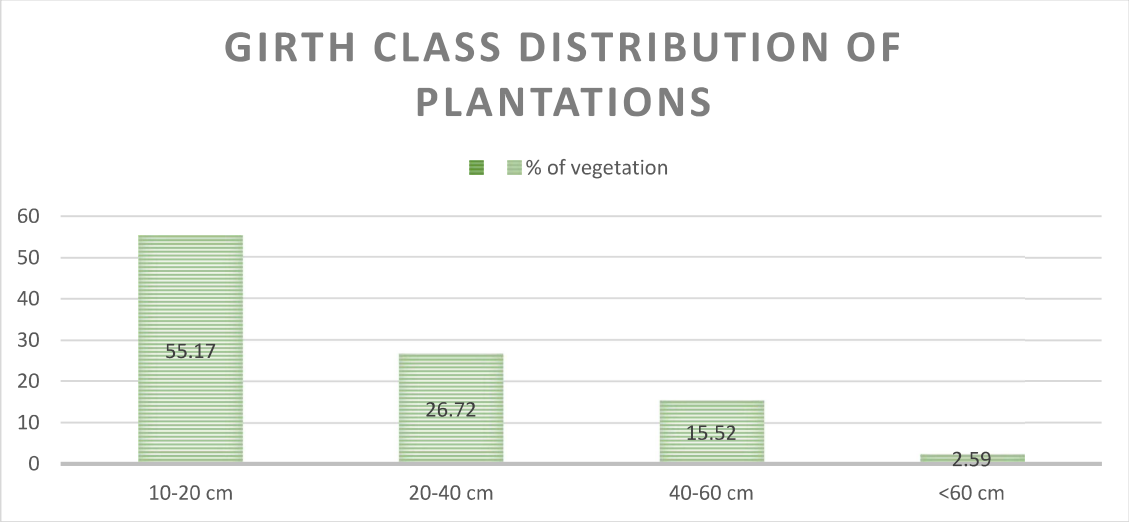
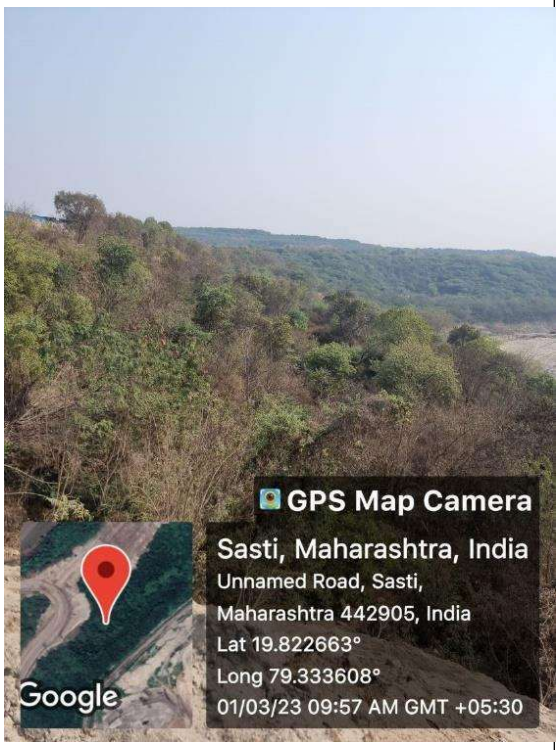


Figure 4.1 Girth Class Distribution of Plantations in the Quadrate Survey

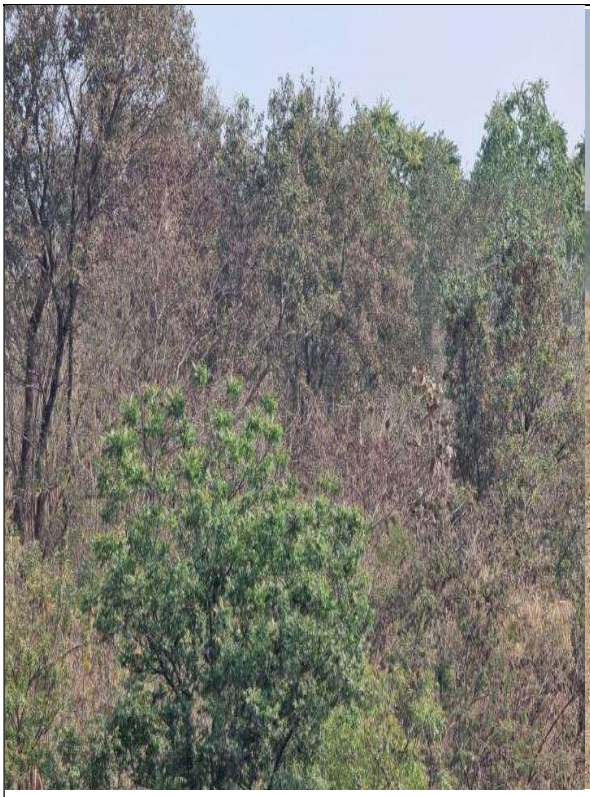
4.1.1: Location, species composition and photographs of each quadrate surveyed

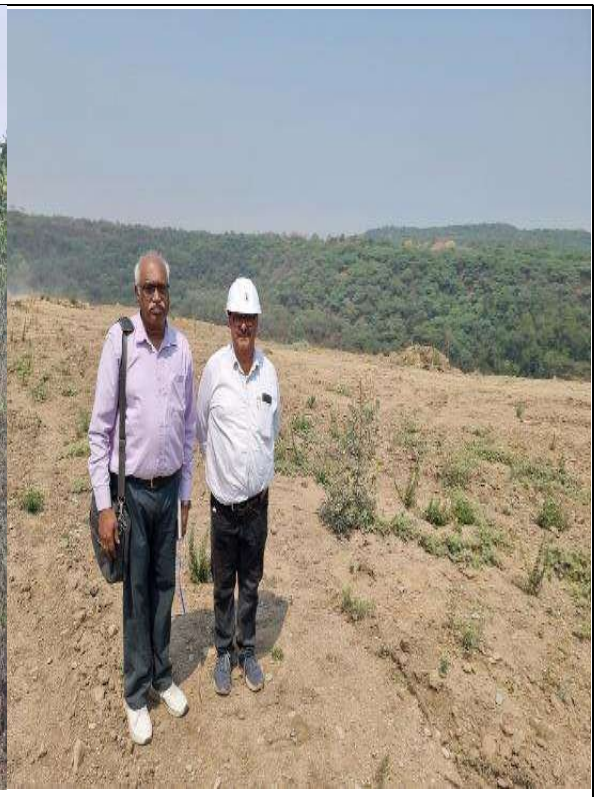
Quadrate 1



Quadrate 1, 19.822663,79.333608			**Reconnaisance from mine view point by Team**		
S. N	**Species**	**Scientific name**	**Number**	**GBH (in cm)**	**Height (m)**
1	Subabul	*Leucaena leucocephala*	8	10-40	8 - 9
2	Sirish	*Albizia lebbeck*	1	100	13
3	Neem	*Azadirachta indica*	1	100	12
4	Maharuk	*Ailanthus excelsa*	1	95	10
5	Chikondi	*Senna siamea*	3	60	7
6	Jungle Khekar	*Prosopis juliflora*	6	20	7
	Shrub				
1	Aak	*Calotropis gigantea*	2		
2	Kambojini	*Phyllanthus reticulatus*	2		
	Grass				
1	Eng Bara grass	*Pennisetum pedicellatum*	3		

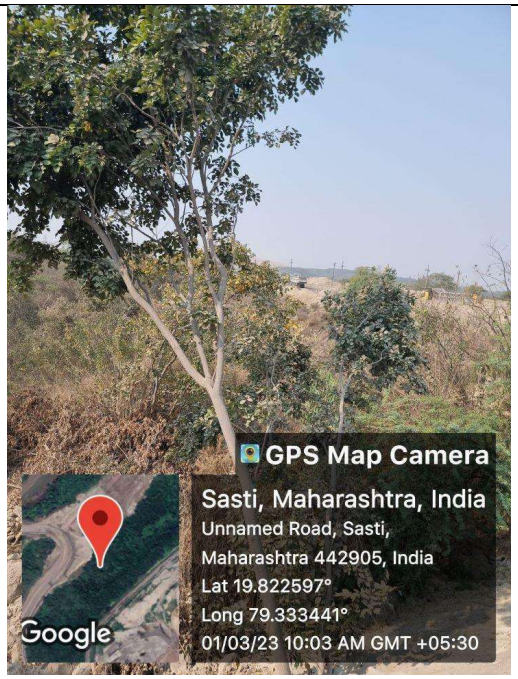
Quadrate 2





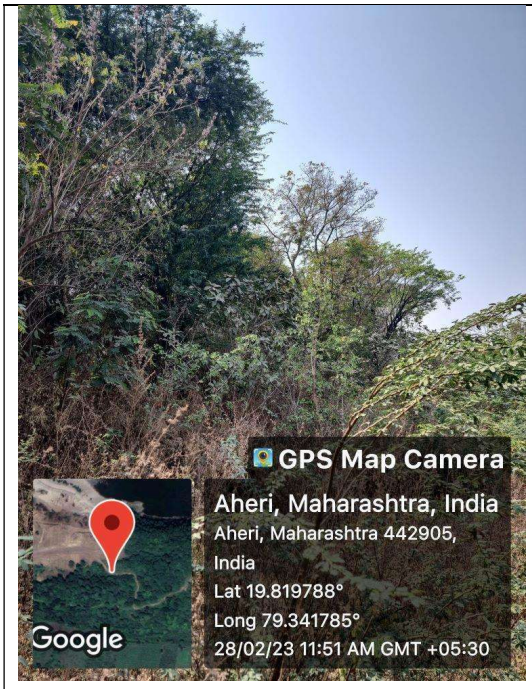
Quadrate 2 - 19°49'27.92"N 79°20'8.18"E			Field Survey Team		
S.N	**Species**	**Scientific name**	**Number**	**GBH (in cm)**	**Height (m)**
1	Jamun	*Syzygium cumini*	3	40- 90	10- 11
2	Sagwan	*Tectona grandis*	1	100	13
3	Neem	*Azadirachta indica*	4	50-80	11-12
4	Maharuk	*Ailanthus excelsa*	1	60	9
	Shrub				
1	Acacia	*Acacia holocerecea*	2		2
2	Wild sage	*Lantana camera*	2		1

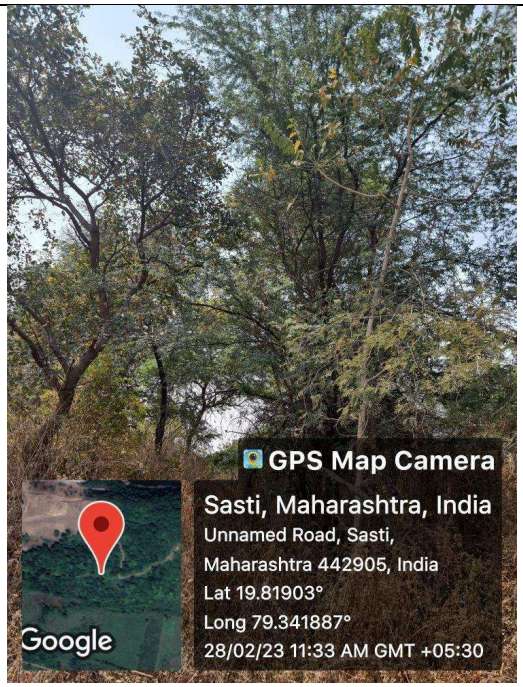
Quadrate 3 and Quadrate 4



Quadrate 3 19.822663 º N, 79.333608ºE			**Quadrate 4, 19.822543 º N,79.333407 ºE**		
S. N	**Species**	**Scientific name**	**Number**	**GBH (in cm)**	**Height (m)**
1	Karnj	*Pongamia pinnata*	3	40- 60	6- 10
2	Gliricidia	*Gliricidia sepium*	3	20-30	6
3	Jungle Khekar	*Prosopis juliflora*	3	20-30	4
4	Devils fig	*Ficus hispida*	1	30	6
	Quadrat 4, 19.822543 º N,79.333407 ºE				
1	Khair	*Acacia catechu*	1	40	10
2	Jungle Khekar	*Prosopis juliflora*	8	20	5
3	Maharuk	*Ailanthus excelsa*	1	10	2
	Climber				
	Ipomoea	*Ipomoea staphylina*	1		11
1	Khair	*Acacia catechu*	1	40	10
2	Jungle Khekar	*Prosopis juliflora*	8	20	5

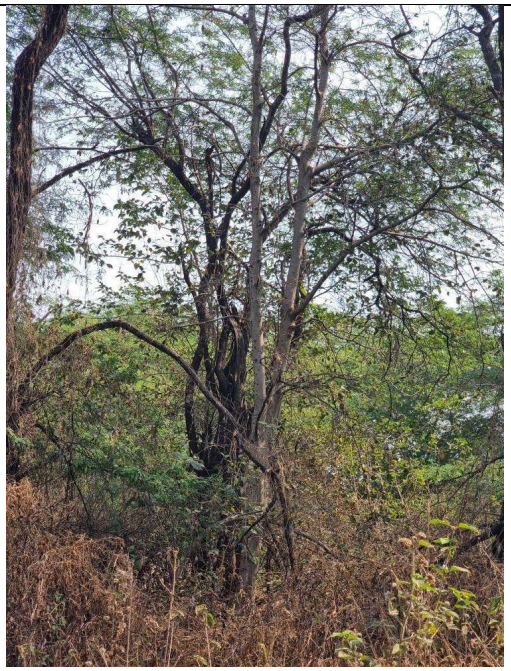
Quadrate 5 and Quadrate 6

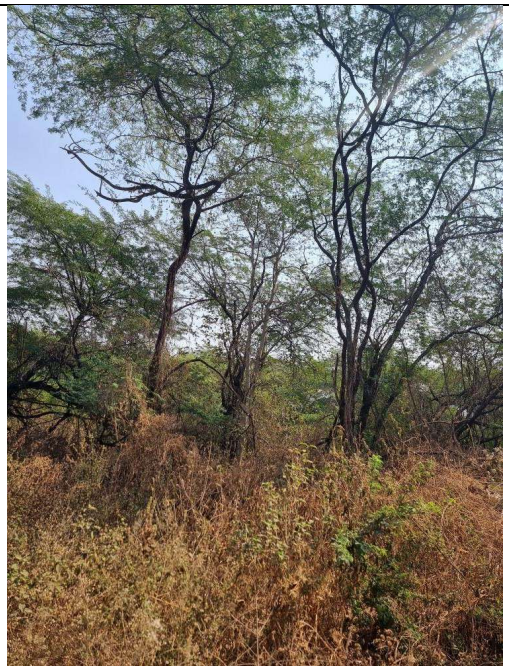




Quadrate 5 19. 819788 º N, 79. 341785 ºE			**Quadrate 6, 19.81903 º N,79.341877 ºE**		
S. N	**Species**	**Scientific name**	**Number**	**GBH (in cm)**	**Height (m)**
1	Gliricidia	*Gliricidia sepium*	1	50	10
2	Jungle Khekar	*Prosopis juliflora*	3	10- 30	3-5
3	Imli	*Tamarindus indica*	1	120	12
4	Jungli jilebe	*Pithecellobium dulce*	1	50	11
5	Devil fig	*Ficus hispida*	1	20	3
	Herbs				
	Hyptis	*Hyptis suaveolens*	5		
	Quadrat 6, 19.81903 º N,79.341877 ºE				
1	*Sesham*	*Dalbergia sissoo*	1	80	11
2	Jungle Khekar	*Prosopis juliflora*	3	30-55	5-9
3	Siamese cassia	*Senna siamea*	1	40	10
	Climber/shrub				
	Wild sage	*Lantana camera*	1		5

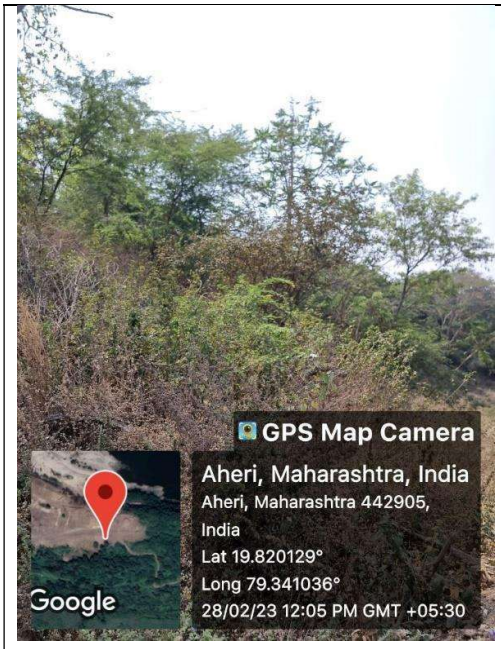
Quadrate 7 and Quadrate 8

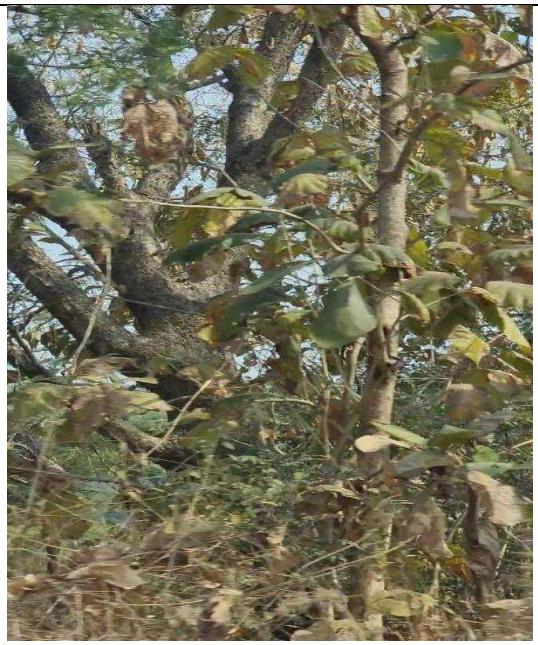




Quadrate 7, 19°49'10.14"N, 79°20'39.63"E			**Quadrate 8, 19°49'29.11"N, 79°20'31.24"E**		
S. N	Species	Scientific name	Number	GBH (in cm)	Height (m)
1	Indian elm	*Holoptelea integrifolia*	1	40	11
2	Jungle Khekar	*Prosopis juliflora*	5	20- 50	8-11
	Shrub				
1	Wild sage	*Lantana camera*	3		
2	Binding vine	*Coculus hirshutus*	2		
	Herb				
1	*Waltheria*	*Waltheria indica*	3		
2	Pignut	*Mesosphaerum suaveolens*	5		
	Quadrat 8, 19.81903 º N,79.341877 ºE				
1	Jungle Khekar	*Prosopis juliflora*	12	10- 50	3- 9
	Herb				
1	Pignut	*Mesosphaerum suaveolens*	5		
2	Chirchita	*Achyranthus aspera*	2		
3	Kakajunga	*Peristrophe bicayculata*	3		
4	Chindrella weed	Synedrella nodiflora	3		
	Grasses				
1	Soft bristle grass	Setaria pumila	5		

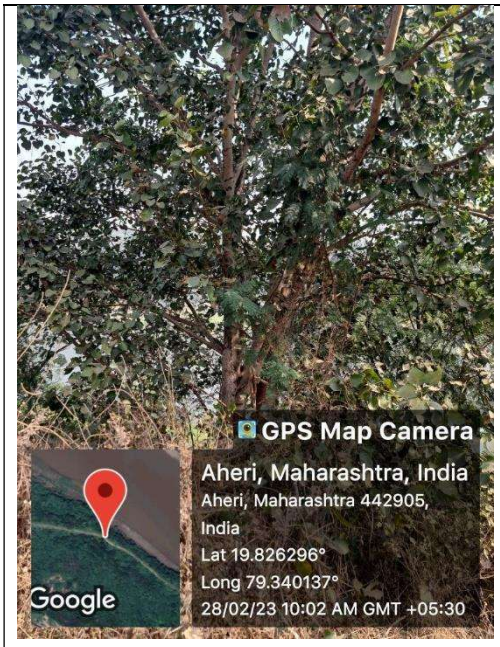
Quadrate 9 and Quadrate 10

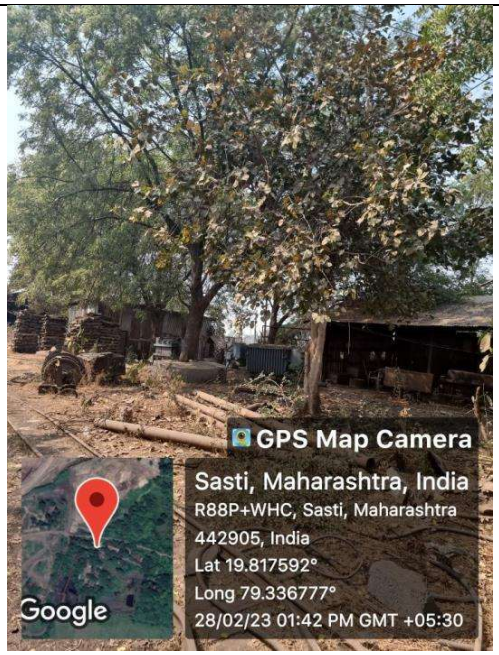




Quadrate 9 19.820129°N, 79.341036°E			**Quadrate 10, 19°49'17.58"N, 79°20'44.92"E**		
S. N	Species	Scientific name	Number	GBH (in cm)	Height (m)
1	Khair	*Acacia catechu*	1	40	9
2	Jungle Khekar	*Prosopis juliflora*	1	30	8
3	Maharuk	*Ailanthus excelsa*	1	40	8
	Shrub				
1	Wild sage	*Lantana camera*	2		2
	Herb				
1	Pignut	*Mesosphaerum suaveolens*	3		
	Quadrate 10, 19°49'17.58"N, 79°20'44.92"E				
1	Sagwan	*Tectona grandis*	1	50	11
2	Yellow Gulmohur	*Peltophorum pterocarpum*	3	10- 30	3-5
	Herb				
1	Pignut	*Mesosphaerum suaveolens*	5		
2	Chirchita	*Achyranthus aspera*	2		
3	Kakajunga	*Peristrophe bicayculata*	3		

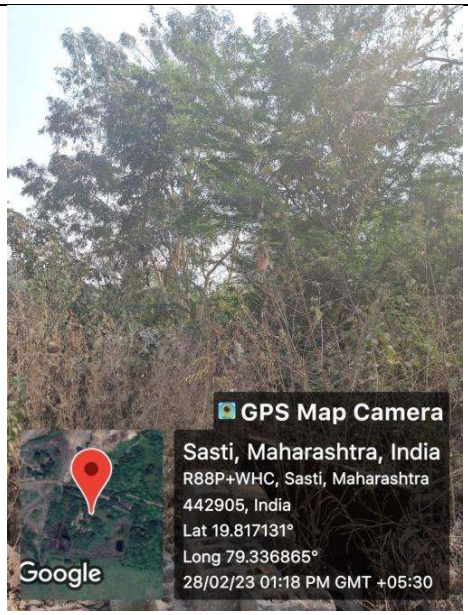
Quadrate 11and Quadrate 12





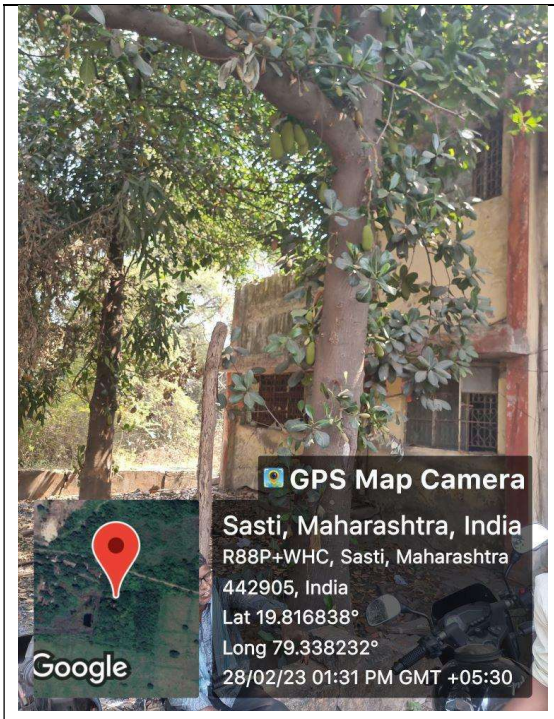
Quadrate 11, 19.826296°N, 79.340137°E			**Quadrate 12, 19.817592°N, 79.336777°E**		
S. N	Species	Scientific name	Number	GBH (in cm)	Height (m)
1	Peepal	*Ficus religiosa*	1	200	12
	Herb				
1	Congress ghas	*Parthenium hysterophorus*	4		
2		*Heylandia latebrosa*	1		
3	Pignut van tulasi	*Mesosphaerum suaveolens(= (Hyptis suaveolens)*	1		
	Grass				
1	Congo grass	*Apluda mutica*	5		
2	Dhup grass	*Cyanodon dactylon*	3		
	Quadrate 12, 19.817592°N, 79.336777°E				
1	Bargath	*Ficus benghalensis*	1	50	5
2	Neem	*Azadirachta indica*	2	60,80	8,9
	Herb				
3	Pignut	*Mesosphaerum suaveolens*	1		

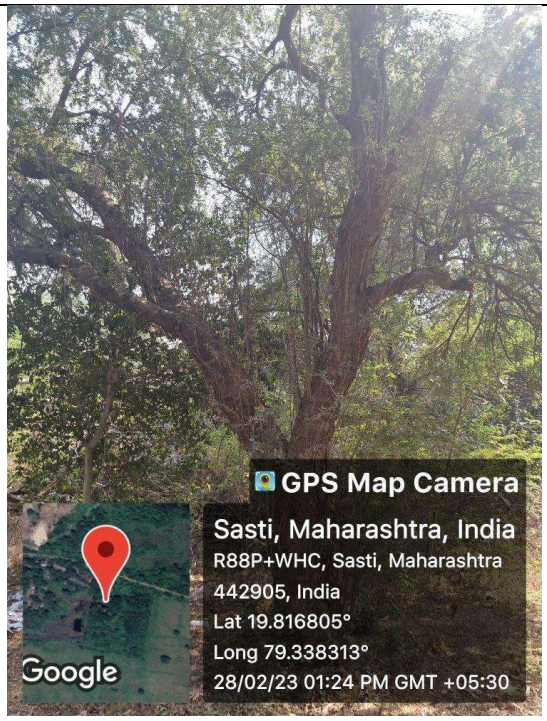
Quadrate 13 and Quadrate 14



Quadrate 13, 19°49'32.67"N, 79°20'22.50"E			**Quadrate 14, , 19.817131°N, 79.336865°E**		
S. N	Species	Scientific name	Number	GBH (in cm)	Height (m)
1	Peepal	Ficus religiosa	1	80	12
2	Subabul	Leucaena leucocephala	1	60	9
3	Jungli khekar	Prosopis juliflora	1	50	10
	Herb				
1	Congress ghas	Parthenium hysterophorus	4		
2		Heylandia latebrosa	1		
3	Pignut	Mesosphaerum suaveolens	1		
	Grass				
1	Congo grass	Apluda mutica	5		
2	Dhup grass	Cyanodon dactylon	2		
	Quadrate 14, , 19.817131°N, 79.336865°E				
1	Bluegum	*Eucalyptus tereticornis*	1	100	15
2	Subabul	*Leucaena leucocephala*	1	30	8
3	Jungli khekar	*Prosopis juliflora*	1	20	6
	Shrub				
1	Wild sage	*Lantana camera*	4		
	Herb		1		
1	Pignut	*Mesosphaerum suaveolens*	1		
	Grass				
1	Eng bara grass	*Pennisetum pedicellatum*	5		

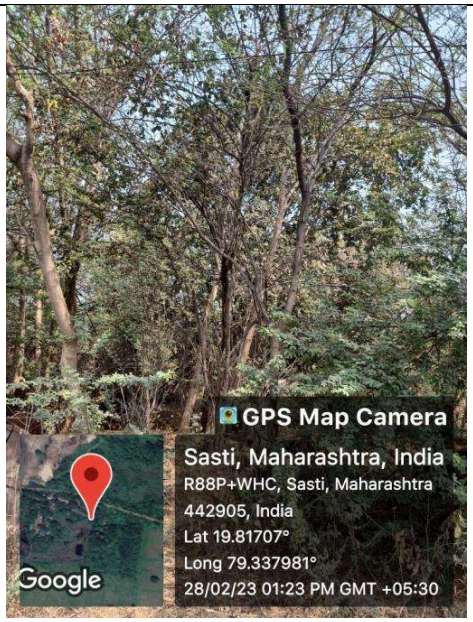
Quadrate 15 and Quadrate 16





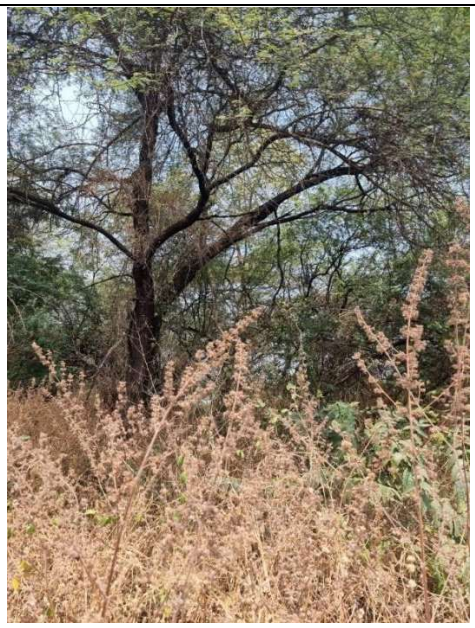
Quadrate 15, 19.816838°N, 79.338232°E			**Quadrate 16, , 19.816805°N, 79.338313°E**		
S. N	Species	Scientific name	Number	GBH (in cm)	Height (m)
1	Peepal	*Artocarpus heterophyllus*	1	100	13
2	Polyalthia	*Monoon longifolium*	1	80	11
	Herb				
1	Congress ghas	*Parthenium hysterophorus*	4		
2	Pignut	*Mesosphaerum suaveolens*	1		
	Grass				
1	Congo grass	Apluda mutica	5		
2	Dhup grass	Cyanodon dactylon	2		
	Quadrate 16, , 19.816805°N, 79.338313°E				
1	Jungli jilebe	*Pithecellobium dulce*	1	200	15
2	Sihora	*Streblus asper*	1	25	6
3		*Morinda coriae*	1	20	4
4	Curry leaf	*Murraya koenigi*	1	20	3
	Grass				
1	Eng bara grass	*Pennisetum pedicellatum*	5		

Quadrate 17 and Quadrate 18



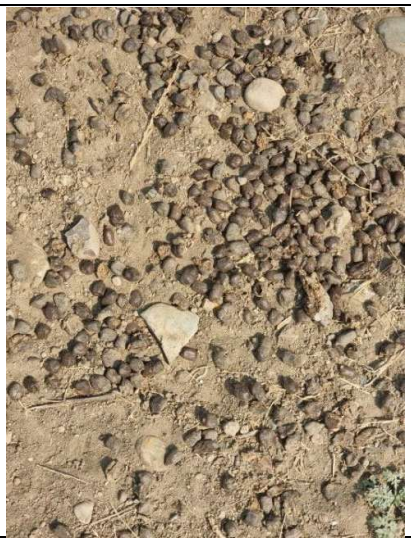
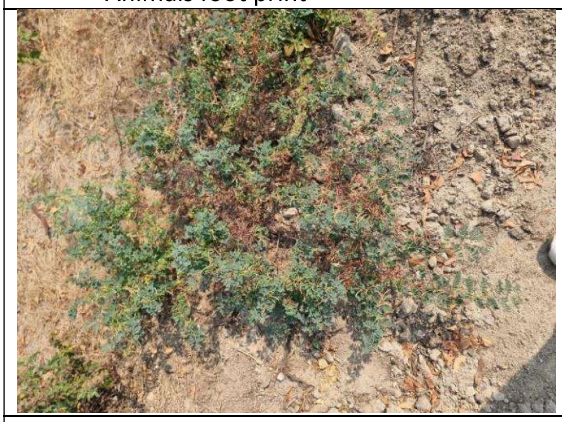
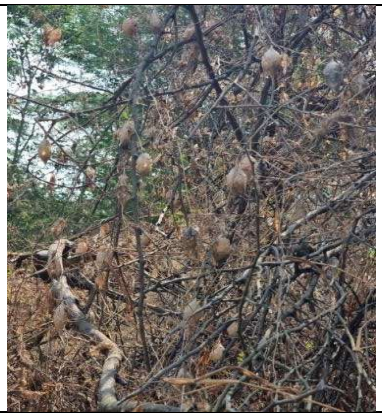
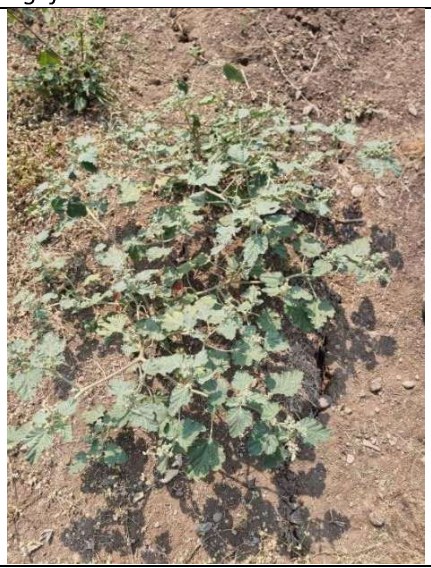
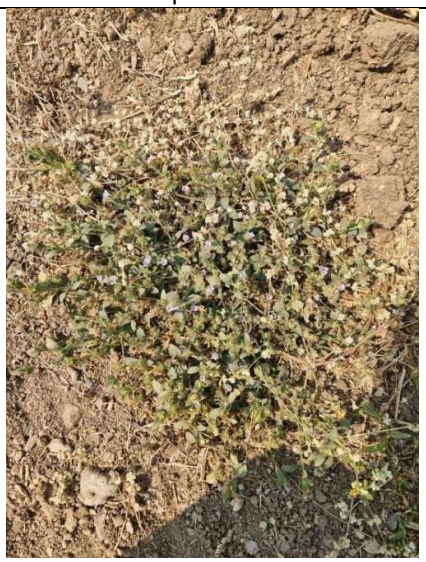
Quadrate 17, 19.81707°N, 79.337981°E			**Quadrate 18, ,** 19°49'10.69"N, 79°19'57.89"E		
S. N	Species	Scientific name	Number	GBH (in cm)	Height (m)
1	Rain tree	*Albizia saman*	1	100	12
2	Neem	*Azadirachta indica*	1	110	10
3	Subabul	*Leucaena leucocephala*	1	20	9
4	Amaltas	*Cassia fistula*	1	20	2
	Herb				
1	Congress ghas	*Parthenium hysterophorus*	4		
2		*Heylandia latebrosa*	1		
3	Pignut	*Mesosphaerum suaveolens*	1		
	Grass				
1	Congo grass	Apluda mutica	5		
2	Dhup grass	Cyanodon dactylon	4		
	Quadrate 18, 19°49'10.69"N, 79°19'57.89"E				
1	Ceylone tea	*Casine glauca*	1	40	12
2	Jungly khekar	*Prosopis juliflora*	8	25-30	8,9
3	Karanj	*Pongamia pinnata*	4	30,40	12
	Climber		1	20	3
1	Clusterd morning glory	*Ipomoea staphylina*	1		12

Quadrate 19 and Quadrate 20



Quadrate 19, 19.81707°N, 79.337981°E			**Quadrate 20, ,** 19°49'26.58"N, 79°20'32.85"E		
S. N	Species	Scientific name	Number	GBH (in cm)	Height (m)
1	Siamese cassia	*Senna siamea*	2	50,30	7
2	Devils'fig	*Ficus hispida*	8	30	4
3	Jungly khekar	*Prosopis juliflora*	3	20	5
	Herb				
1	Long stalked sida	*Sida cordata*	4		
2	Round leaf bind weed	*Evolvulus nummularis*	4		
3	Broadleaf button weed	*Spermacoce ocymoides*	5		
	Quadrate 20, 19°49'26.58"N, 79°20'32.85"E				
1	Babul	*Vachillia nilotica*	1	100	11
1	Pignut	*Mesosphaerum suaveolens*	5		
2	Broad leaved blepharis	*Blepharis boerhaviifolia*	2		
3	Lady flower	*Dicliptera paniculata*	3		

Figure 4.2 Evidences for presence of faunal species and medicinal herbs

	
Animals foot print	Deer excreta
	
Indigofera tinctoria –medicinal herb	Wild parval
	
Crozophora rottleri Herb Euphorbiaceae	Alternanthera – highly spreading exotic weed

4.2 Biodiversity Status of Plantation Sites:

Simpson's Diversity Index (D), is a measure of diversity which takes into account the number of species present, as well as the relative abundance of each species. As species richness and evenness increase, so diversity increases. The value of D ranges between 0 and 1, with 1 representing infinite diversity and 0 representing no diversity. This index is often used in ecology to compare the diversity of different communities. It can also be used to track changes in diversity over time.

The Shannon diversity index (H), also known as the Shannon-Wiener index, is a measure of biodiversity that takes into account both the number of species present and the relative abundance of each species. A community with a high value of H has a high number of species and a more even distribution of abundance among the species. A community with a low value of H has a low number of species and a few very abundant species.

The Margalef richness index (M), is a measure of species richness that is commonly used to compare ecological communities in terms of the diversity of their species. The index is a simple measure of species richness that is not affected by the size of the sample. This means that it can be used to compare communities of different sizes. The index also takes into account the number of species present, as well as the relative abundance of each species. This means that it can be used to distinguish between communities that have a high number of species but a few very abundant species, and communities that have a lower number of species but a more even distribution of abundance. The index is often used in conjunction with other measures of diversity, such as the Shannon diversity index, to get a more complete picture of the health of an ecosystem.

For the estimation of bio-diversity, the study area has been stratified into three stratums namely Ecological Monitoring Station 1 (Young Age Plantations), Ecological Monitoring Station 2 (Moderate Age Plantations) and Ecological Monitoring Station 3 (Old Age Plantations). The biodiversity index in the different stratums of the study area are provided hereunder. There are 6 number of quadrates laid over Ecological Monitoring Station 1, also 7 number of quadrates laid over Ecological Monitoring Station 2 and 7 number of quadrates laid over Ecological Monitoring Station 3. Thus, overall 20 number of quadrates were laid in the mine reclaimed sites to assess the biodiversity of the plantations.

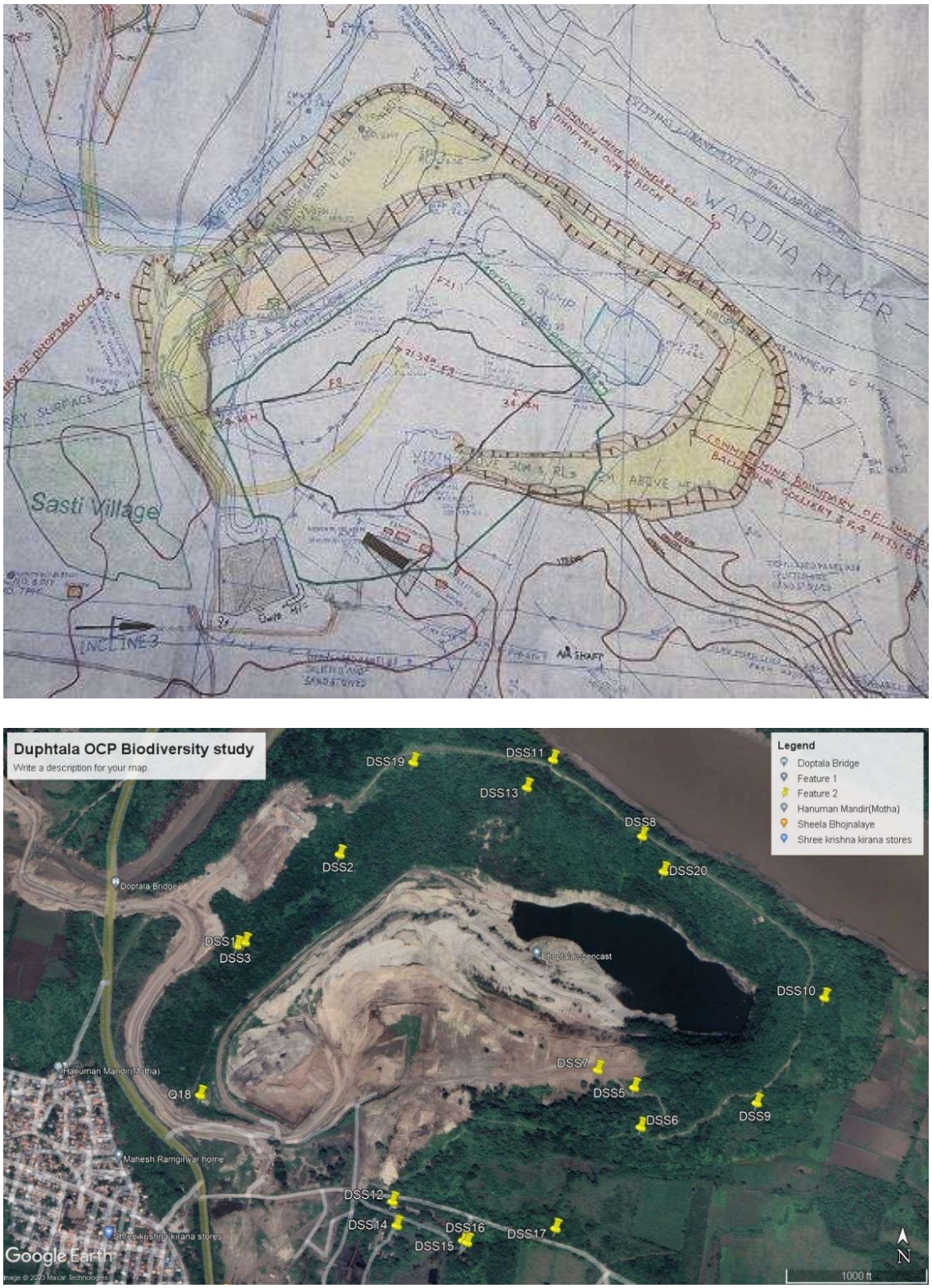


Figure 4.3 Geo-location of quadrate laid in the study area and Map of the study area

The mine expansion has started in 2022 only. OB Dump plantation has not yet been taken. The mine is located adjacent to the Wardha river. The bund between the mine area and the river is nearly 1000 m wide and has trees about 29 species of trees as per the quadrat studies. An old mine quarry also seen between the bund and the present mine. A 10 x 10m quadrat study as detailed in section 4.1 is carried out to study the tree diversity and its carbon sequestration potential.

The calculation of each of the biodiversity index is provided hereunder:

Table 4.3: Biodiversity index of Study Area

Plantation Stratum	No. of trees in the stratum	Tree Density/ha	Simpson's Diversity Index (D)	Shannon Index (H)	Margalef Richness Index (M)
EMS 1 (2-5 years Young plantations)	64	1067	0.679	1.71	3.37
EMS 2 (5-15 years old plantations) Moderate Age Plantations	31	443	0.813	2.07	3.79
EMS 3 (beyond 15 years old plantations) Old Plantations	21	300	0.958	2.58	4.67

The old plantation sites in Ecological Monitoring Station 3 has shown higher value of Simpson's diversity index, while Moderate age plantation sites in Ecological Monitoring Station 2 has also shown, good diversity index. The average Simpson's biodiversity index is 0.816 and average Shannon index is 2.12, which indicates the good to moderate diversity index for the overall reclaimed mine plantations sites. The values of Margalef richness index ranges between 0-5. Greater than 5 value represents integrated diversity, 2.05-5 represents semi-disturbed diversity and 2.05-0 represents disturbed diversity. For the quadrate survey, in each of the three Ecological Monitoring Stations, the value of Margalef richness index is greater than 2.05 and average value is 3.94. This indicates the semi-disturbed diversity in the study area due to rapid proliferation of prosopis species in the plantation sites.

There are 29 different varieties of 116 tree species found in the study area representing 12 families. The most dominant families being *Fabaceae*. The dominant tree species in the study area are *Prosopis juliflora* and *Leucaena leucocephala* and co-dominated by *Pongomia pinnata, Albizia lebbeck, Peltophorum pterocarpum , Dalbergia sissoo and Azadirachta indica.*

A total of 6 shrub species namely *Lantana camera, Phyllanthus reticulatus Calotropis gigantean, Ipomoea staphylina, Cocculus hirshutus and Acacia holocerecea* observed in the reclaimed mine site area. A total of 12 herbs & climber species namely *Achyranthus aspera, Mesosphaerum suaveolens, Peristrophe bicayculata, Blepharis boerhaviifolia, Dicliptera paniculata, Evolvulus nummularis, Heylandia latebrosa, Parthenium hysterophorus, Sida cordata, Spermacoce ocymoides, Synedrella nodiflora* and *Waltheria indica are* observed in the reclaimed mine site area. A total of 10 grass species namely Apluda mutica, Cyanodon dactylon, *Pennisetum pedicellatum,* Setaria pumila, *Aristida setaceae, Dactylactenium aegyptium, Panicum virgatum, Chloris barbata, Parthenium hysterophorus, and Saccharum spontaneum are* observed in the reclaimed mine site area.

Important Value Index: Trees with higher IVI area Jungle Khekar - *Prosopis juliflora* 58.92, Neem - *Azadirachta indica* 20.97, Peepal - *Ficus religiosa* 18.85, Jungli jilebe - *Pithecellobium dulce* 16.14, Devils fig - *Ficus hispida* 14.71. Leguminosae family is represented by 11 species. Moraceae (Ficus) family is represented by 5 species. 29 tree species, 3 shrubs, 3 climbers, 12 species of herbs, 4 grasses are identified from the 20 quadrat study areas.

Table 4.4 : List of trees observed in the study area:

Tree species Important value index (IVI)							
	Common name	*Botanical name*	Tot	Rel Dens	Rel Domi	Rel frequ	IVI
1.	Khair	*Acacia catechu*	2	3.773585	1.680672	1.161844	6.616101
2.	Maharuk	*Ailanthus excelsa*	4	7.54717	3.361345	1.961075	12.86959
3.	Sirish	*Albizia lebbeck*	1	1.886792	0.840336	7.263376	9.990505
4.	Rain tree	*Albizia saman*	1	1.886792	0.840336	7.263376	9.990505
5.	Peepal	*Artocarpus heterophyllus*	1	1.886792	0.840336	7.263376	9.990505
6.	Neem	*Azadirachta indica*	9	9.433962	7.563025	3.977651	20.97464
7.	Ceylone tea	*Casine glauca*	1	1.886792	0.840336	1.161844	3.888973
8.	Amaltas	*Cassia fistula*	1	1.886792	0.840336	0.288611	3.01574
9.	*Sesham*	*Dalbergia sissoo*	1	1.886792	0.840336	4.647377	7.374505
10.	Bluegum	*Eucalyptus tereticornis*	1	1.886792	0.840336	7.263376	9.990505
11.	Bargath	*Ficus benghalensis*	1	1.886792	0.840336	1.813069	4.540197
12.	Devils fig	*Ficus hispida*	10	5.660377	8.403361	0.651225	14.71496
13.	Peepal	*Ficus religiosa*	2	3.773585	0.840336	14.23814	18.85206
14.	Gliricidia	*Gliricidia sepium*	3	3.773585	2.521008	0.743728	7.038322
15.	Indian elm	*Holoptelea integrifolia*	1	1.886792	0.840336	1.161844	3.888973

16.	Subabul	*Leucaena leucocephala*	10	1.886792	8.403361	0.651225	10.94138
17.	Polyalthia	*Monoon longifolium*	1	1.886792	0.840336	4.647377	7.374505
18.		*Morinda coriae*	1	1.886792	0.840336	0.288611	3.01574
19.	Curry leaf	*Murraya koenigi*	1	1.886792	0.840336	0.288611	3.01574
20.	Yellow Gulmohur	*Peltophorum pterocarpum*	3	1.886792	2.521008	0.288611	4.696412
21.	Jungli jilebe	*Pithecellobium dulce*	1	3.773585	0.840336	11.53334	16.14726
22.	Karnj	*Pongamia pinnata*	7	3.773585	5.882353	1.161844	10.81778
23.	Jungle Khekar	*Prosopis juliflora*	47	18.86792	39.4958	0.566122	58.92984
24.	Siamese cassia	*Senna siamea*	3	3.773585	2.521008	1.406053	7.700647
25.	Sihora	*Streblus asper*	1	1.886792	0.840336	0.488419	3.215547
26.	Jamun	*Syzygium cumini*	3	1.886792	2.521008	3.16362	7.571421
27.	Imli	*Tamarindus indica*	1	1.886792	0.840336	10.4603	13.18743
28.	Sagwan	*Tectona grandis*	1	3.773585	1.680672	4.195959	9.650217

Table 4.5: List of Shrubs, Grasses and climber species observed in the study area:

S.No	***Botanical name***	**Common name**	**Total**	**Aver**	**Fam av**	**Min**
	Common name	*Botanical name*	Total	Ave	FamAver	Mini
	Climbers/Shrubs					
1.	Acacia	*Acacia holocerecea*	2			2
2.	Aak	*Calotropis gigantea*	2			2
3.	Binding vine	*Coculus hirshutus*	2			2
4.	Clusterd morning glory	*Ipomoea staphylina*	2	1.5		1
5.	Wild sage	*Lantana camera*	12	2.4		1
6.	Kambojini	*Phyllanthus reticulatus*	2			2
	Herbs					
7.	Chirchita	*Achyranthus aspera*	2			2
8.	Broad leaved blepharis	*Blepharis boerhaviifolia*	2		2.66	2
9.	Lady flower	*Dicliptera paniculata*	3		2.66	3
10.	Round leaf bind weed	*Evolvulus nummularis*	4			2
11.	*Heylandia*	*Heylandia latebrosa*	3	1		1
12.	Pignut	*Mesosphaerum suaveolens*	17	2.4		1
13.	Congress ghas	*Parthenium hysterophorus*	4	4	3.75	4
14.	Kakajunga	*Peristrophe bicayculata*	3		2.66	3
15.	Long stalked sida	*Sida cordata*	4		3.5	2
16.	Broadleaf button weed	*Spermacoce ocymoides*	5			3
17.	Chindrella weed	*Synedrella nodiflora*	3		3.75	3
18.	*Waltheria*	*Waltheria indica*	3		3.5	3
	Grasses					
19.	Congo grass	*Apluda mutica*	15	5	4.11	5
20.	Dhup grass	*Cyanodon dactylon*	9	3	4.11	2

21.	Eng Bara grass	*Pennisetum pedicellatum*	8	4	4.11	3
22.	Soft bristle grass	*Setaria pumila*	5		4.11	5

4.3 Status of Aquatic Ecosystem:

Plankton's are tiny organisms that live in the water column of aquatic ecosystems. They play a vital role in the food chain, as they are the primary producers of food for many other organisms. Plankton populations are affected by a number of factors, including water quantity and quality. Water quantity refers to the amount of water in an aquatic ecosystem. In general, phytoplankton populations are higher in areas with abundant water, as this provides them with more space to grow and reproduce. Zooplankton populations, on the other hand, are often higher in areas with less water, as this provides them with more food and shelter from predators. Water quality refers to the physical, chemical, and biological characteristics of water. Pollutants can disrupt the balance of nutrients in the water, which can lead to the growth of harmful algae blooms. These blooms can produce toxins that can kill phytoplankton and zooplankton, as well as other animals in the ecosystem.

In a balanced ecosystem, there should be a healthy balance between phytoplankton and zooplankton populations. However, when water quantity or quality is compromised, this balance can be disrupted. This can lead to changes in the composition and abundance of plankton populations, which can have a cascading effect on the entire food chain.

In the present study, water samples were collected from mine quarries as well as wardha river for phytoplankton and zooplankton study. A summary of plankton populations is provided in the table below:

Table 4.6: Summary of Plankton's populations in the study area:

	Phytoplanktons	Wardha river	Mine quarry
1	Green algae - Chlorophyta	20	8
2	Diatoms - Bacillariophyta	18	12
3	Blue green algae - Cyanophyta	11	7
4	Euglenophyceae – Uni Flagellate	4	1
	Zooplanktons	53	28
1	Protozoa	14	9
2	Rotifer	13	9
3	Cladocera	6	4
4	Copepoda	10	7
5	Ostracoda	3	2
		46	31

	Total	99	59
The river water is shallow and maintains its ecosystem for several years and rich in biodiversity and plankton population, contains 99 species of Planktons. The mine quarry is isolated from natural water body and is deeper, plankton species observed is 59.			

4.3.1 Phytoplankton's Observations

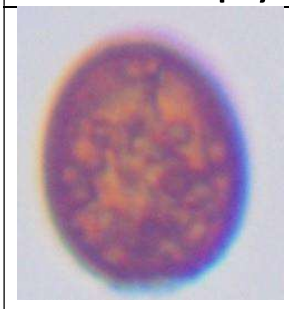
Table 4.7: Presence of Phytoplankton's in the study area

S.N.	Scientific name of species	Wardha river	Mine quarry
	Chlorophyta _ Green Algae		
1.	*Actiniastrum*	+	+
2.	*Chlorella vulgaris*	+	+
3.	*Closterium quadratulum*	+	
4.	*Cosmarium corda*	+	+
5.	*Cosmarium margaritatum*	+	+
6.	*Cosmarium formosulum*	+	+
7.	*Cosmarium moniliformae*	+	
8.	*Cladophora glomerata*	+	
9.	*Eudorina*	+	
10.	*Pandorina*	+	+
11.	*Pledorina*	+	+
12.	*Pediastrum simplex*	+	+
13.	*Pediastrum angulosum*	+	+
14.	*Gloeocystis gigas*	+	+
15.	*Oedogonium*	+	
16.	*Scenedesmus*	+	
17.	*Spirogyra porticalis*	+	
18.	*Staurastrum manfeldtii*	+	+
19.	*Ulothrix zonata*	+	+
20.	*Zygnema*	+	
		20	12
	Bacillariophyta - Diatoms		
1.	*Navicula viridula*	+	
2.	*Asterionella formosa*	+	+
3.	*Bacillaria paxillifer*	+	+
4.	*Cymbella*	+	+
5.	*Diatoma vulgaris*	+	
6.	*Eunotia*	+	+
7.	*Stauronis conspicua*	+	
8.	*Fragillaria crotensis*	+	+
9.	*Fragilaria pinnata*	+	
10.	Gyrosigma spencerii	+	+
11.	*Gomphonema acuminatum*	+	+
12.	*Nitzschia obtusa*	+	+

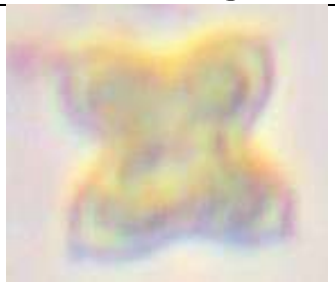
13.	*Nitzschia sp*	+	+
14.	*Pinnularia pisciculus*	+	+
15.	*Pinnularia gibba*	+	+
16.	*Synedra acus*	+	
17.	*Synedra ulna*	+	+
18.	*Tabellaria sp*	+	
		18	12
	Blue green Algae Cyanophyta		
1.	*Aphanothece elasticha*	+	+
2.	*Phormidium purpurascence*	+	
3.	*Chrococcus turgidus*	+	
4.	*Oscillatoria rubescens*	+	+
5.	*Oscillatoria subbrevis*	+	+
6.	*Limnoraphis*	+	+
7.	*Lyngbya ventricosa*	+	
8.	*Microcystis sp*	+	+
9.	*Spirulina*	+	+
10.	*Synechocystis*	+	+
11.	*Merismopedia*	+	
		11	7
	EUGLENOPHYCEAE		
1	*Euglena acus*	+	+
2	*Lepocinclis sp.*	+	
3	*Phacus caudatus*	+	
4	Trachelomonas	+	
		4	1

4.3.2 Microscopic photographs of Phytoplankton species found in aquatic ecosystem

Wardha river phytoplankton – Green algae Chlorophyta

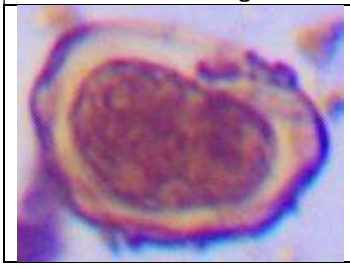


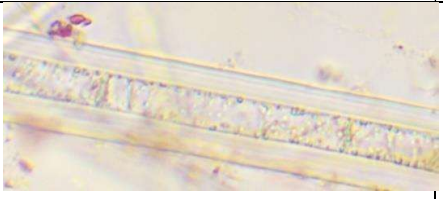
Trachelomonas - Euglenoid

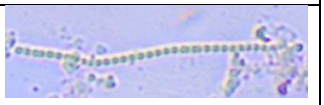


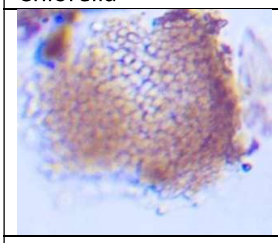
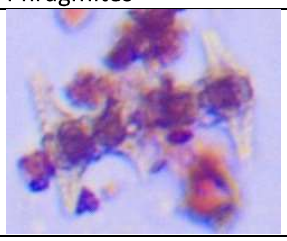
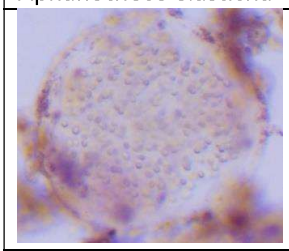
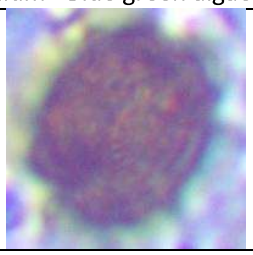
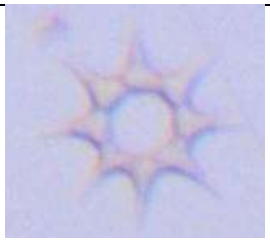
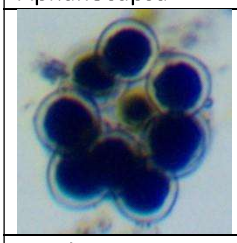
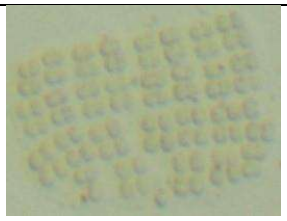
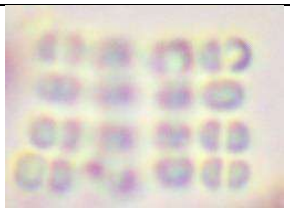
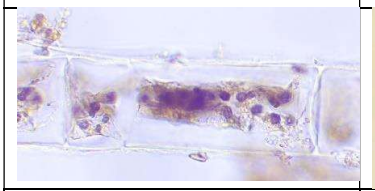
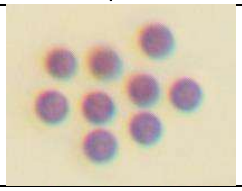
Tetraedron minimum

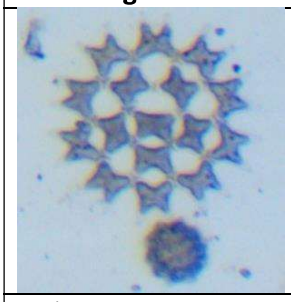
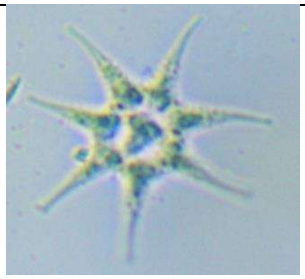
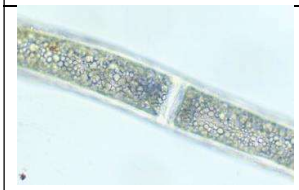
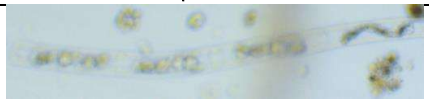
Eudorina

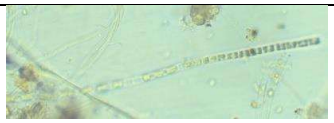
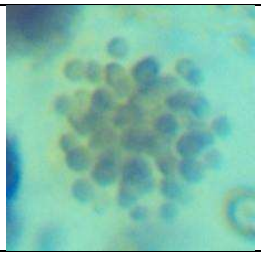
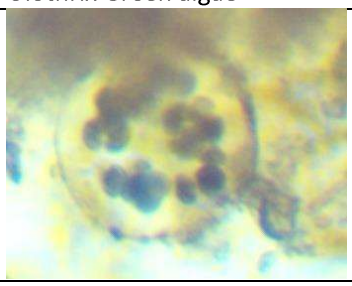
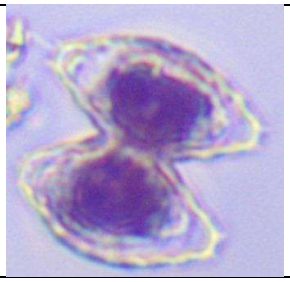
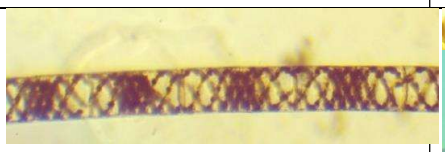


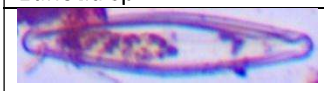
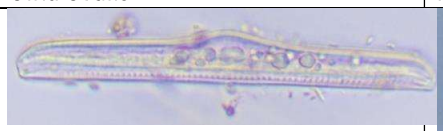
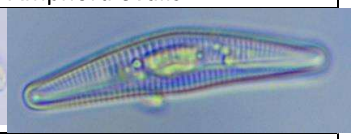
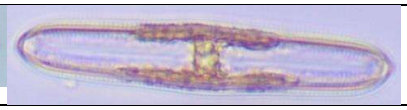


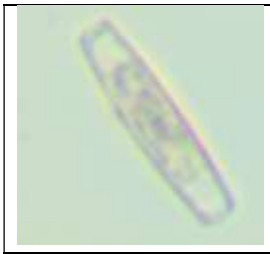
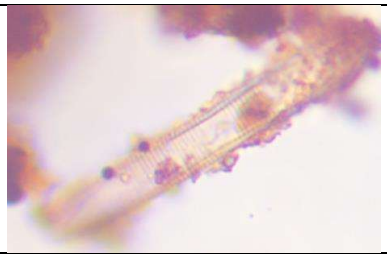
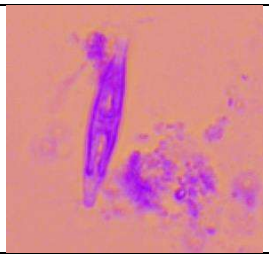
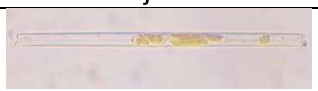
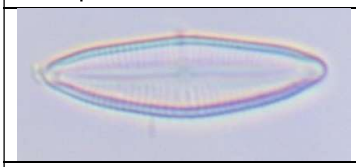
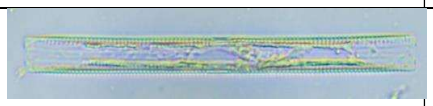
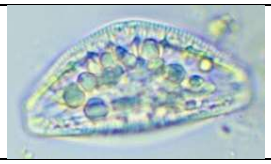
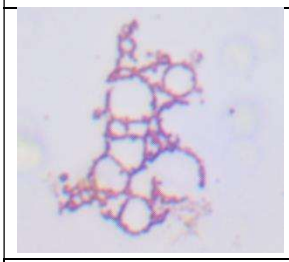
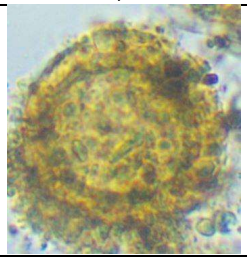
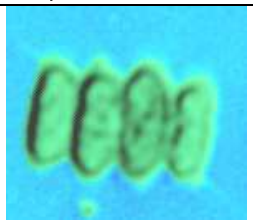


Chlorella	Spirogyra	Phragmites
		
Aphanothece elasticha	Phormidium - Blue green algae	Storastrum
		
Aphanocapsa	Cosmarium	Pediastrum
		
Pandorina	Merismopedia	Merismopedia minima
		
Oedogonium	Gonium formosum	Euglena

Green algae continued		
		
Pediastrum araneosum	Pediastrum simplex	Pediastrum angulosum
		
Oedogonium	Zygnema	Chaetophora elegans

		
Cladophora	Ulothrix Green algae	Pledorina
		
Closterium sp 1	Eudorina	Cosmarium - green algae
		
Lepocynchlis Euglenophyta	Spirogyra	Closterium subulatum

Diatoms - Bacillariophyta – Golder green algae		
		
Eunotia sp	Ulna ovalis	Amphora ovalis
		
Navicula trivialis	Acanthidium sp	Cymbella affinis
		
Nitscia	Pinnularia	Diatoma vulgaris colony

		
49)Pinnularia viridis	Pinnularia sp.	Stauroneis javanica
		
Gomphonema truncata	Nitzschia acicularis	Fragillaria crotensis
		
Craticula subminuscula	Bacillaria paxillifer	Encyonema minutum
		
Anabaena flosaque	Cyclotella meneghiniana	*Scenedesmus armatus*

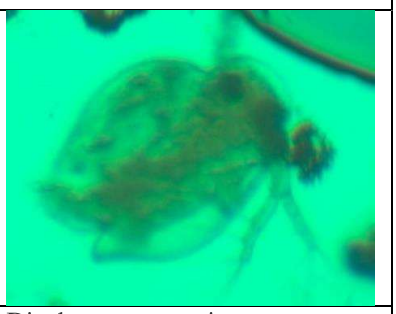
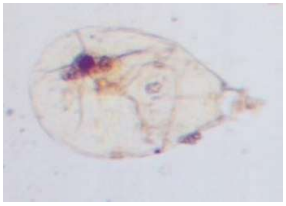
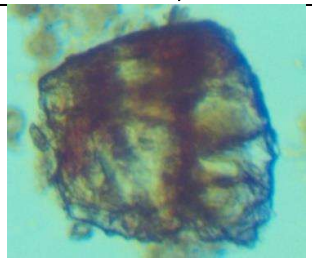
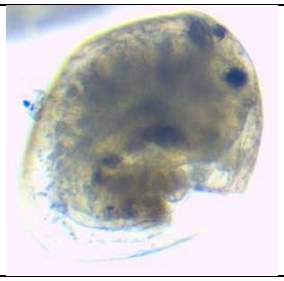
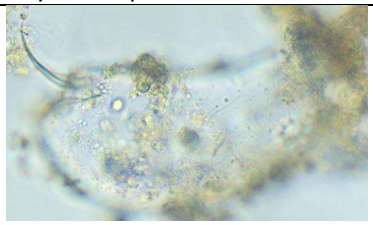
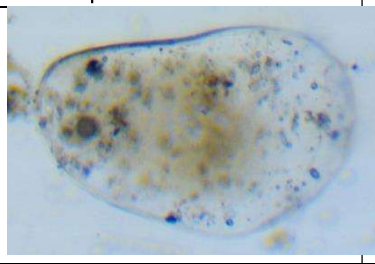
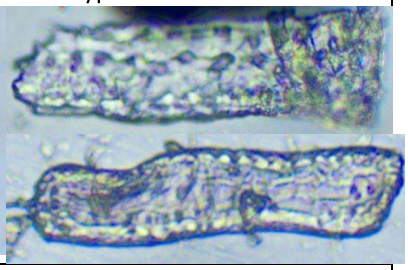
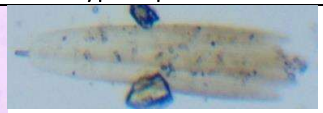
4.3.3 Zooplankton's Observation:

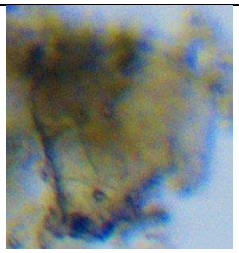
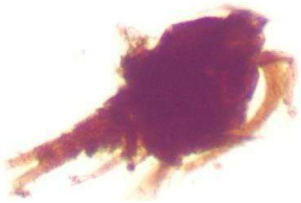
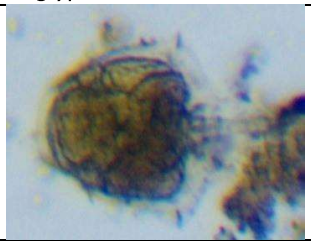
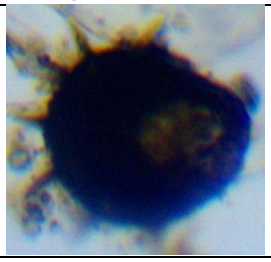
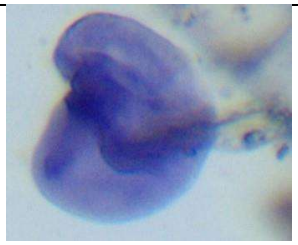
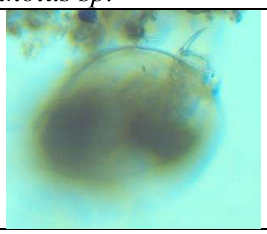
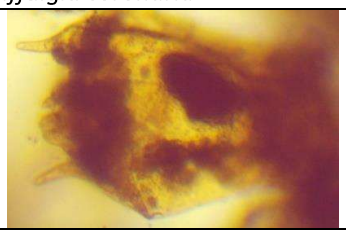
Table 4.8 Presence of Phytoplanktons in the study area

Zooplanktons			
	Scientific name of species	**Warda river**	**Mine quarrty**
	Protozoa		
1.	*Alexandrium affine*	+	
2.	*Centropyxis ecornis*	+	+
3.	*Diffulgia coronaria*	+	+
4.	*Diffulgia tuberculata*	+	+
5.	*Euglypha tuberculata*	+	+
6.	*Favella taraikaensis*	+	+
7.	*Gymnodinium aeruginosum*	+	
8.	*Galerophora discoides*	+	+
9.	*Habrotrocha rosa*	+	+
10.	*Paramecium caudatum*	+	
11.	*Salpingella acuminata*	+	+
12.	*Tintinopsis compressa*	+	+

13.	*Uroleptus longicaudatus*	+	
14.	*Hydra* - Cylindirata	+	
	Rotifer	14	9
15.	*Nothocla acuminata*	+	+
16.	*Brachionus calyciflorus*	+	
17.	*Cephalodella*	+	
18.	*Dactylobiotus sp.*		+
19.	Euchlanis dilatata	+	
20.	Filinia longiseta	+	+
21.	*Lecane inopinata*		+
22.	*Monostylia lunaris*	+	+
23.	*Keratella quadrata*	+	+
24.	*Polyarthra vulgaris*	+	+
25.	Salpingella acuminata	+	
26.	*Testudinella patina*	+	+
27.	*Trichotria tetractis*		+
		13	9
	Cladocera		
28.	*Bosmina longirostris*	+	+
29.	*Ceriodaphnia reticulata*	+	+
30.	*Daphnia pulex*	+	
31.	*Daphnia similis*	+	+
32.	*Diaphnosoma excisum*	+	+
33.	*Halicyclops tenuispina*	+	
		6	3
	Copepod		
34.	*Aglodiaptomus*	+	+
35.	*Barnacle nauplius*	+	
36.	*Cyclops*	+	+
37.	*Eucyclops agilis*	+	+
38.	*Heleodiaptomus viduus*	+	
39.	*Moina daphnia*	+	+
40.	*Mesocyclops*	+	+
41.	*Parvoclanus crossirostris*	+	
42.	*Protoperidinium latissimum*	+	+
43.	*Thermocyclops crassus*	+	
44.	*Thermocyclops decipiens*	+	+
		10	7
	Ostracoda		
45.	*Cypris subglobosa*	+	+
46.	*Stenocypris sp*	+	+
47.	*Cyprinotus sp.*	+	
48.		3	2

4.3.4 Microscopic photographs of Phytoplankton species found in aquatic ecosystem

Zooplanktons		
		
Sida crystallina	Cladocera – Daphnia similis	Diaphanosoma excisum
		
Difflugia acuminata- Proto	*Centropyxis ecornis*	Chydorus sphaericus
		
Cyperotinus flavescens	Simocephalus vetulus	Stenocypris orientalis ostracad
		
Galerophora discoides	Stenocypris sp- Ostracod	Difflugia oblongata - Protozoa
		
Euchlanis dilatata	Nothocla sp	Cyclops larvae

Zooplankton continued		
		
Hydra	Monostyla lunaris Rotifer	Euglypha tuberculata
		
Cyclops sp.	Diffulgia acuminata	Brachionus
		
Cyprinotus sp.	*Diffulgia coronaria*	Noctiluca scintilianus
		
Chydorus sphaericus	Brachionus calyciflorus	Thermocyclops decipiens
		
Synchaeta okai	Felinia terminalis	Habrotrocha rosa

4.4 Carbon Sequestration Potential of Plantation Sites:

Plantations have the potential to sequester significant amounts of carbon from the atmosphere. The amount of carbon that can be sequestered depends on the type of plantation, the age of the trees, and the management practices used.

There are five main carbon pools in terrestrial ecosystems:

- **Aboveground biomass:** This includes the living biomass of trees, shrubs, and other plants.
- **Belowground biomass:** This includes the living biomass of roots, rhizomes, and other underground plant parts.
- **Litter:** This includes dead leaves, twigs, and other plant material that has fallen to the ground.
- **Woody debris:** This includes dead branches, logs, and other woody material.
- **Soil organic matter:** This includes the organic matter that is found in the soil, such as humus and dead microorganisms.

The carbon content of each pool is used to calculate the total carbon stock of an ecosystem. The total carbon stock is an important measure of the amount of carbon that is stored in an ecosystem. The biomass assessment is done based on quadrate sampling and the allometric equations are used to calculate below ground biomass, above ground biomass and biomass expansion factor for litter and woody debris. Soil Organic carbon is estimated by collecting soil sample from the sites and then its laboratory analysis is done.

Table 4.9: Summary of Biomass estimation and Carbon Sequestration

Plantation Stratum	Mean Tree Biomass/Ha	Mean C stock/Ha	Mean CO2e Seq/Ha	Avg C Stock/ha	Avg. CO2 Seq/Ha	SOC	Total C stock/ha
EMS 1 (2-5 years old plantations) Young Plantations upto 25 cm GBH	13.397443	6.03	22.13	13.55	49.73	35.80	49.36
EMS 2 (5-15 years old plantations) Moderate Age Plantations upto 25-40 cm GBH	16.800610	7.56	27.75				

EMS 3 (beyond 15 years old plantations) Old Plantations Greater than 40 cm GBH	60.144588	27.07	99.33				

4.5 Status Soil Nutrient of Plantation Sites:

The soil quality report from the reclaimed mine plantation sites of study area is presented below:

Table 4.10: Status of Soil Nutrients in the Study Area

Area: Dhuptala-Mines					
Location: Ballarpur Area, WCL					
Date of Sampling: February, 2023					
Sl. No.	**Parameters**	**Depth of Sampling 0-30 cm**			
		Unit	**Sample I**	**Sample II**	**Sample III**
1	pH	-	6.9	7.9	8.5
2	Organic Carbon	%	1.05	1.02	0.26
3	Available Phosphorous	Kg/ha			
4	Electrical Conductivity	ms/cm	0.523	0.516	0.316
8	Texture (Clay)	%	25	52.5	10
9	Texture (Sand)	%	47.5	20	82.5
10	Texture (Silt)	%	27.5	27.5	7.5
11	Soil Texture		Sandy Clay Loam	Clay	Loamy Sand
12	Available Nitrogen	Kg/ha	50.17	62.72	37.63

4.6 Faunal Status of Study Sites:

For, the present study, Line Transect walks is done for 1km in the study area for collection of direct and indirect evidences of faunal population in day and evening time. Further, local consultation with project officials, neighbouring villagers and concerned forest division was done to collect secondary data. Based on both primary observation and secondary literature, a list of faunal species presented in the Table 4.8 below

Table 4.11: Status of Faunal Population observed in the Study Area

S No	Name			WPA, 2022 Status	IUCN Status
	English	**Common / Hindi**	**Scientific**		
Mammal					
1.	Spotted deer		*Axis axis*	II	LC
2.	Indian Hare		*Lepus nigricolis*		
3.	Field Rat	Chuha	*Bandicota bengalensis*	IV/ V	LC
4.	Jackal	Geedhad	*Canis aureus*	I	LC
5.	Common Jungle Cat	Jangli Billi	*Felis chaus*	II	LC
6.	Jungle Palm Squirrel	Gilahari	*Funambulus trisstriatus*	II	LC
7.	Nilgai		*Boselaphus tragocamelus*		
8.	Indian bush rat	Chuha	*Golunda ellioti*	IV/ V	LC
9.	Common Mongoose	Nevla	*Urva edwardsii*	I	LC
10.	Small spotted mangoose		*Urva atropunctata*	I	NT
11.	Common Indian Porcupine	Sahi	*Hystrix indica*	I	LC
12.	Common Indian Hare	Khargosh	*Lepus nigricollis*	IV	LC
13.	Rhesus macaque	Bandar	*Macaca mulatta*	II	LC
14.	Indian Field Mouse	Chuha	*Mus booduga*	IV/ V	LC
15.	Tiger	Bagh	*Panthera tigris*	I	VU
16.	Common langur	Langur	*Semnopithecus entellus*	II	VU
17.	Common House Rat	Chuha	*Rattus rattus*	IV/ V	LC
18.	Flying fox		*Pteropus poliocephalus*	II	LC
19.	Big flying fox		*Pteropus giganteus*	II	LC
20.	Musk-shrew	Chuchundar	*Suncus murinus*	-	LC
21.	Indian Wild Boar	Suar	*Sus scrofa*	II	LC
22.	Common Krait	Sanmp	*Bungarus caeruleus*	-	-
23.	Garden Lizard	Girgit	*Calotes versicolor*	-	-
24.	House Lizard	Chipkali	*Hemidactylus sp.*	-	LC
25.	Cobra	Cobra	*Naja Naja*	I	DD

A total of 25 different varieties of faunal species are found to be using the habitat developed in mine plantation sites. The presence of six Schedule I species namely Tiger (rarely), Jackal, Common Mongoose, Spotted Mongoose, Porcupine and Cobra species in the plantation sites is due to the adjoining wardha river, buffer zone of Tadoba Andheri Tiger reserve approx. 12 km in Northern side and thick edge plantation sites with minimal human disturbances.

The study area plantation sites have been found to have 18 varieties of butterfly species and 15 different types of insects as lister in Table 4.12 below. The most common butterfly species in the study area were Common Mormon, Lime butterfly, Red Helen, Plain tiger, Common leopard and Indian snail.

Table 4.12: List of Insects and Butterflies Population observed in the Study Area

S.N.	English Name	Common Name	*Scientific Name*
1	Dragon Flies	Vyaadh-Patang	*Anisoptera*
2	Housefly		*Musca domestica*
3	mosquito		*Aedes Aegypti*
4			*Anopheles*
5			*Culex*
6	Moth	Phulpakharu	*Antheria mylita*
3	Grasshopper	Tidda	*Bacillus rossii*
7	Dragonfly		*Sympetrum flaveolum*
8			*Potamarcha congener*
9	Hill honey bee		*Apis cerana indica*
10	Honey bee		*Apis mellifera*
11			*Apis florea*
12	Grass cross spider		*Argiope catenulata*
13	Mealybug		*Phenacoccus solenopsis*
14	Milliped		*Eurymerodesmus*
15	Centiped		*Scutigera coleoptrata*
	Butterflies		
1	Common Emigrant	Titli	*Catopsilia pomona (Fabricius)*
2	Blue Tiger	Titli	*Tirumala limniace leopardus (Butler)*
3	Common mormon		*Papilio polytes,*
4	Lime butterfly		*Papilio demoleus*
5	Lime blue		*Chilades lajus*
6	Common Quaker		*Neopithecops zalmora,*
8	Apefly		*Spalgis epius,*
9	Red Helen		*Papilio helenus,*
10	Blue Mormon		*Papilio polymnestor,*
11			*Papilio crino*
12	Plain tiger		*Danaus chrysippus*
13	Common leopard		*Phalanta phalanta*
14	Freshwater pearl mussel		*Margaritifera margaritifera*
15	Indian snail		*Macrochlymus indica*
16	snails		*Subulina octona*
17	Screw snail		*Zootecus insularis*
18	Screw snail		*Huttonella bicolor*

4.7 Faunal and Avi-faunal Status of Plantation Sites:

The faunal and avifaunal assessments are done through field surveys to collect direct and indirect data on faunal and avifaunal populations. This method involves walking transects and observing animals in their natural habitat, as well as identifying species through visual and auditory cues. For, the present study, Line Transect walks is done for 1km in the study area for collection of direct and indirect evidences of faunal & avifaunal population. The observation were carried out by using a field binocular during the morning and in the evening and identification of species was done with the help of standard literature.

Avi-faunal population are also good indicators of ecosystem health because they play an important role in many ecological processes, such as pollination, seed dispersal, and pest control. When an ecosystem is restored, the avifaunal population will often increase. This is because the restoration process will create a more hospitable environment for birds, with more food, shelter, and nesting sites. Additionally, the restoration process will often remove pollutants and other stressors that can harm birds.

In the present study, a total of 43 avi-faunal species are observed through direct sightings/calls and it is expected more than 50 avi-faunal species visit the habitat developed in mine spoil area through plantations and other reclamation activities due to presence of adjoining wardha river and thick plantation cover in mined out areas.

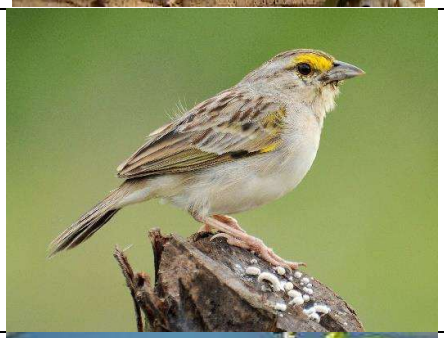
The details of number of individual species observed in the study area is provided in Table 4.13 below:

Table 4.13: Direct/Indirect Sighting/observation of Avi-faunal Species in the Study Area

S.N.	Bird Name	Scientific Name	No. of species observed	Birds Image
1	Indian Pond-Heron -	*Ardeola grayii*	12	

S.N.	Bird Name	Scientific Name	No. of species observed	Birds Image
2	Purple-rumped Sunbird -	*Leptocoma zeylonica*	20	
3	Oriental Magpie-Robin -	*Copsychus saularis*	8	
4	Purple Sunbird -	*Cinnyris asiaticus*	10	
5	Cattle Egret -	*Bubulcus ibis*	12	
6	Pied Cuckoo	*Clamator jacobinus*	2	

S.N.	Bird Name	Scientific Name	No. of species observed	Birds Image
7	Great Cuckoo	*Centropus sinensis*	1	
8	Wired Tailed Swallow	*Hirundo smithii*	1	
9	Pied Buschat	*Saxicola caprata*	2	
10	Indian Robin	*Saxicoloides fulicatus*	3	
11	Black Kite	Milvus migrans	4	

S.N.	Bird Name	Scientific Name	No. of species observed	Birds Image
12	Indian Golden Oriole	*Oriolus kundoo*	1	
13	Shikara	*Accipiter badius*	1	
14	Spotted Dove -	*Spilopelia chinensis*	10	
15	Yellow Sparrow	*Ammodramus aurifrons*	6	
16	Coppersmith Barbet	*Megalaima haemacephala*	4	

S.N.	Bird Name	Scientific Name	No. of species observed	Birds Image
17	Red wattled Lapwing	*Vanellus indicus*	10	
18	White throated Kingfisher	*Halcyon smyrnensis*	1	
19	Oriental Darter	*Anhinga melanogaster*	1	
20	Dove	*Spilopelia chinensis*	6	
21	White Wagtail	*Motacilla alba*	1	

S.N.	Bird Name	Scientific Name	No. of species observed	Birds Image
22	Sunbird	*Cinnyris asiaticus*	6	
23	Peacock	*Pavo cristatus*	2	
24	Common Tailored Bird	*Orthotomus sutorius*	12	
25	Small Minivet	*Pericrocotus cinnamomeus*	2	
26	Rock Pigeon	*Columba livia*	10	

S.N.	Bird Name	Scientific Name	No. of species observed	Birds Image
27	Barn Swallow	*Hirundo rustica*	6	
28	Red vented Bulbul	*Pycnonotus cafer*	10	
29	Great Cormorant	*Phalacrocorax carbo*	12	
30	Little Cormorant	*Microcarbo niger*	4	
31	Humes Leaf Warbles	*Phylloscopus humei*	1	

S.N.	Bird Name	Scientific Name	No. of species observed	Birds Image
32	Verdites Flycatcher	*Eumyias thalassinus*	2	
33	Prinia	*Prinia familiaris*	4	
34	Little Grebe	*Tachybaptus ruficollis*	6	
35	Green Bee Eater	*Merops orientalis*	25	
36	Common Stonechat	*Saxicola rubicola*	1	

S.N.	Bird Name	Scientific Name	No. of species observed	Birds Image
37	Red rumped swallow	*Cecropis daurica*	1	
38	Bat	*Chiroptera*	4	
39	Common Stonechat	*Saxicola rubicola*	1	
40	Red rumped swallow	*Cecropis daurica*	1	
41	Brahminy myna	*Sturnia pagodarum*	2	
42	Baya Weaver	*Ploceus philippinus*	8	

S.N.	Bird Name	Scientific Name	No. of species observed	Birds Image
43	Indian Silverbill	*Euodice malabarica*	4	

Reference: Some Photos and secondary information is taken from e-bird website

Chapter-5 Summary and Conclusion

This chapter summarizes the conclusions drawn and recommendations made for further improvement the ecology of the mining area based on findings as presented in chapter 4

5.1 Summary of Ecology & Biodiversity Assessment

5.1.1: Terrestrial Ecosystem Diversity:

The average Simpson's biodiversity index of the study area is coming out to be 0.816 which reflects good diversity of the study area. The old plantation sites in Ecological Monitoring Station 3 has shown higher value of Simpson's diversity index, while Young plantation sites in Ecological Monitoring Station 1 has shown, moderate diversity index due to dominance of *Prosopis juliflora* species. The overall biodiversity in each of the ecological monitoring station is found to be good and average Shannon diversity index is coming out to be 2.12. The different biodiversity index of study area in three ecological monitoring station is provided in the Graph below;

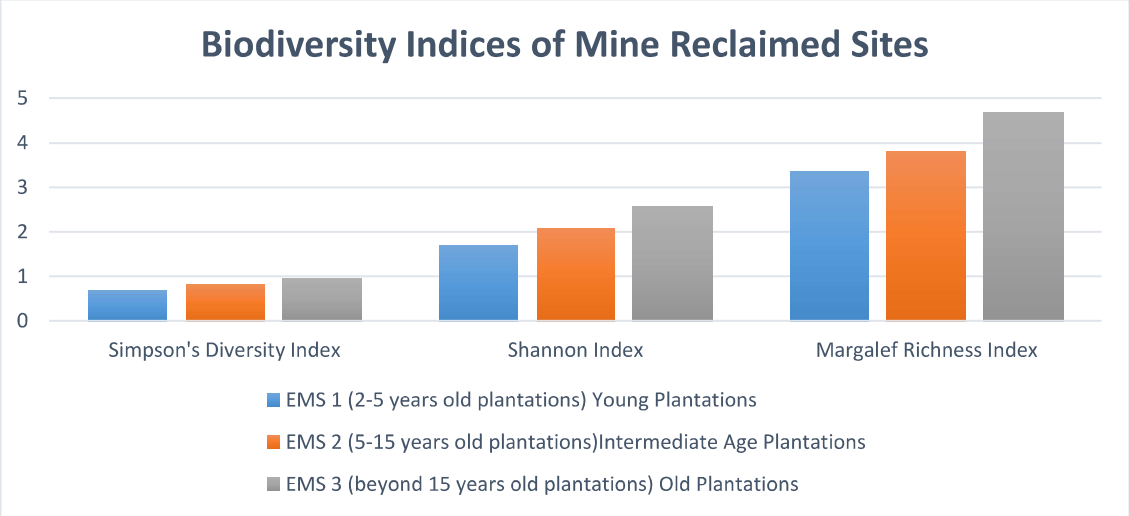


Figure 5.1: Summary of Biodiversity indices in the study area

There are 29 different varieties of 116 tree species found in the study area representing 12 families. The most dominant families being *Fabaceae*. The dominant tree species in the study area are *Prosopis juliflora* and *Leucaena leucocephala* and co-dominated by *Pongomia pinnata, Albizia lebbeck, Peltophorum pterocarpum Dalbergia sissoo and Azadirachta indica.*

A total of 6 shrub species namely *Lantana camera, Phyllanthus reticulatus Calotropis gigantean, Ipomoea staphylina, Cocculus hirshutus and Acacia holocerecea* observed in the reclaimed mine site area. A total of 12 herbs & climber species namely *Achyranthus aspera, Mesosphaerum suaveolens, Peristrophe bicayculata, Blepharis boerhaviifolia, Dicliptera paniculata, Evolvulus nummularis, Heylandia latebrosa, Parthenium hysterophorus, Sida cordata, Spermacoce ocymoides, Synedrella nodiflora* and *Waltheria indica are* observed in the reclaimed mine site area. A total of 10 grass species namely Apluda mutica, Cyanodon dactylon, *Pennisetum pedicellatum,* Setaria pumila, *Aristida setaceae, Dactylactenium aegyptium, Panicum virgatum, Chloris barbata, Parthenium hysterophorus, and Saccharum spontaneum are* observed in the reclaimed mine site area.

5.1.2 Aquatic Ecosystem Diversity:

In the present study, water samples were collected from mine quarries as well as wardha river for phytoplankton and zooplankton study. The river water is shallow and maintains its ecosystem for several years and rich in biodiversity and plankton population, contains 99 species of Planktons. The mine quarry is isolated from natural water body and is deeper, plankton species observed is 59. A summary of plankton populations is provided in the table below:

Table 5.1: Summary of Plankton's populations in the study area:

	Phytoplanktons	Warda river	Mine quarry
1	Green algae - Chlorophyta	20	8
2	Diatoms - Bacillariophyta	18	12
3	Blue green algae - Cyanophyta	11	7
4	Euglenophyceae – Uni Flagellate	4	1
	Zooplanktons	53	28
1	Protozoa	14	9
2	Rotifer	13	9
3	Cladocera	6	4
4	Copepoda	10	7
5	Ostracoda	3	2
		46	31
	Total	99	59

5.1.3: Faunal Diversity

There is no direct sighting of any terrestrial mammal species, however indirect evidences of wild animals were found in the plantation sites. Also, through local consultations it is found that few wild animals are occasionally found in the study area. Based on physical survey and secondary information, the following faunal species are found to use the reclaimed habitat are presented in the Table 5.2 below:

A total of 25 different varieties of faunal species are found to be using the habitat developed in mine plantation sites. The presence of six Schedule I species namely Tiger (rarely), Jackal, Common Mongoose, Spotted Mongoose, Porcupine and Cobra species in the plantation sites is due to the adjoining wardha river, buffer zone of Tadoba Andheri Tiger reserve approx. 12 km in North and thick edge plantation sites with minimal human disturbances.

Table 5.2: Summary of Faunal populations in the study area:

S No	Name			WPA, 2022 Status	IUCN Status
	English	**Common / Hindi**	**Scientific**		
Mammal					
1.	Spotted deer		*Axis axis*	II	LC
2.	Indian Hare		*Lepus nigricolis*		
3.	Field Rat	Chuha	*Bandicota bengalensis*	IV/ V	LC
4.	Jackal	Geedhad	*Canis aureus*	I	LC
5.	Common Jungle Cat	Jangli Billi	*Felis chaus*	II	LC
6.	Jungle Palm Squirrel	Gilahari	*Funambulus trisstriatus*	II	LC
7.	Nilgai		*Boselaphus tragocamelus*		
8.	Indian bush rat	Chuha	*Golunda ellioti*	IV/ V	LC
9.	Common Mongoose	Nevla	*Urva edwardsii*	I	LC
10.	Small spotted mangoose		*Urva atropunctata*	I	NT
11.	Common Indian Porcupine	Sahi	*Hystrix indica*	I	LC
12.	Common Indian Hare	Khargosh	*Lepus nigricollis*	IV	LC
13.	Rhesus macaque	Bandar	*Macaca mulatta*	II	LC
14.	Indian Field Mouse	Chuha	*Mus booduga*	IV/ V	LC
15.	Tiger	Bagh	*Panthera tigris*	I	VU
16.	Common langur	Langur	*Semnopithecus entellus*	II	VU
17.	Common House Rat	Chuha	*Rattus rattus*	IV/ V	LC
18.	Flying fox		*Pteropus poliocephalus*	II	LC
19.	Big flying fox		*Pteropus giganteus*	II	LC
20.	Musk-shrew	Chuchundar	*Suncus murinus*	-	LC
21.	Indian Wild Boar	Suar	*Sus scrofa*	II	LC

22.	Common Krait	Sanmp	*Bungarus caeruleus*	-	-
23.	Garden Lizard	Girgit	*Calotes versicolor*	-	-
24.	House Lizard	Chipkali	*Hemidactylus sp.*	-	LC
25.	Cobra	Cobra	*Naja Naja*	I	DD

5.1.3: Avi-faunal & Butterfly Diversity

For, the present study, Line Transect walks is done for 1km in the study area for collection of direct and indirect evidences of faunal & avifaunal population. A total of 43 avi-faunal species are observed through direct sightings and it is expected more than 50 avi-faunal species visit the habitat developed in mine spoil area through plantations and other reclamation activities.

The study area plantation sites have been found to have 18 varieties of butterfly species and 15 different types of insects as lister in Table 4.12 below. The most common butterfly species in the study area were Common Mormon, Lime butterfly, Red Helen, Plain tiger, Common leopard and Indian snail.

5.1.4: Carbon Sequestration Potential

Estimation of carbon stock in the trees is estimated using a stepwise procedure as per the standard methodology. The total carbon stock is an important measure of the amount of carbon that is stored in an ecosystem. The biomass assessment is done based on quadrate sampling and the allometric equations are used to calculate below ground biomass, above ground biomass and biomass expansion factor for litter and woody debris. Soil Organic carbon is estimated by collecting soil sample from the sites and then its laboratory analysis is done.

The Summary of mean tree biomass, mean C stock, CO2 equavalents sequestration and Soil Organic Carbon is provided in the Table below. It is found that mean tree biomass/C stock is very low in young plantations in (EMS 1), while it is highest in Old Plantation sites (EMS 3). As per Indian State of Forest Report, 2021, the per hectare C stock and SOC in the state of Maharashtra Forest is 88.91 and 51.41 respectively. The average C stock and SOC in the plantation sites is coming out to be 49.36 and 35.80 tons of CO2 e per hectare respectively. Thus, the C stock per hectare in reclaimed sites has reached upto 55.51% of C stock/ha value of state forests sequestration potential and soil organic carbon is restored upto 69.63 % of C stock/ha value of state forests.

Table 5.2: Summary of mean tree biomass, mean C stock, CO2 equivalents sequestration and Soil Organic Carbon

Plantation Stratum	Mean Tree Biomass/Ha	Mean C stock/Ha	Mean CO2e Seq/Ha	Avg C Stock/ha	Avg. CO2 Seq/Ha	SOC	Total C stock/ha
EMS 1 (2-5 years old plantations) Young Plantations upto 25 cm GBH	13.397443	6.03	22.13	13.55	49.73	35.80	49.36
EMS 2 (5-15 years old plantations) Moderate Age Plantations upto 25-40 cm GBH	16.800610	7.56	27.75				
EMS 3 (beyond 15 years old plantations) Old Plantations Greater than 40 cm GBH	60.144588	27.07	99.33				

5.2 Enhancement in Ecology and Biodiversity:

The following is suggested to improve and enrich the biodiversity of the study area:

- Findings of the study indicate that efforts made from the project have resulted in the enrichment in terrestrial floral and faunal diversity and overall ecology of the mine site areas.
- Roots of seedlings of suggested species for plantation need to be fortified with biofertilizers inoculants (Vesicular Arbuscular Mycorizhae (VAM fungi), Azosprillium, Phosphobacterium, Rbizobium, etc) and bio control agents(Trichoderma viride, T. harzianum, pseoudomonos fluorescence , Bacillus megaterium, B. velezensis, etc.) for better establishment and growth.
- The gap filling in the existing plantations may be carried out with 1.5 to 2 years old, tall and healthy seedlings of native species.

- The study area is dominated by plantations of *Prosopis juliflora* species which is invasive in nature. Therefore, it is suggested to plant more varieties of native species and species suitable for harsh mining conditions are provided in Table 5.3

5.3 Monitoring and Evaluation of restoration sites

Third party monitoring and evaluation of eco-restoration works may be carried out once in three years from the reputed scientific organization/institute for knowing the results or status of efforts made by project proponent and midterm corrections required, if any.

5.4 Development of Green Belt Development Plan:

For development of green belt, it is recommended that plantation should be done in the peripheral areas and open spaces along route of proposed canal. This will help in enhancing the aesthetic value around canal and will increase faunal diversity of the area. The expected rate of survival for saplings is assumed at 80%. To improve the survival rate in the adverse climate condition, necessary consultation would be taken from the Forest department. Proposed plantation area shall be fenced properly for improving the survival rate. Native plant species will be planted for greenbelt development.

5.4.1 Criteria for Selection of Plant/Tree Species

Keeping in view the climatic condition, status of soil (Agro climatic zone) and vegetation types, the following plant species are suitable for plantation for the proposed project site. Table below represents plant species for green belt development.

TABLE 5.3: Lists of Plant Species for Green Belt Development

Scientific Name	Common Name	Family	Sensitive / Tolerant to pollution	Habit	Regeneration	Evergreen / Deciduous
Adina cordifolia	Karam	Rubiaceae	T	Tree	By seeds	Deciduous
Aegle marmelos	Bell tree	Rutaceae	T	Tree	By seed & root cutting	Evergreen
Alangium salvifolium	Ankola	Alangiaceeae	T	Tree	By seeds	Deciduous

Alianthus excelsa	Maharuk	Simarubaceae		Tree	By seed	Deciduous
Albizia lebbeck	Sirish	Leguminosae	T	Tree	By seed	Deciduous
Albizia procera	Safed sirish	Leguminosae	T	Tree	By seed	Deciduous
Albizia odorattisima	Kala sirish	Leguminosae	T	Tree	By seed	Deciduous
Artocarpus heterophyllus	Kathal	Moraceae	T	Tree	By seeds	Semi evergreen
Azadirachta indica	Neem	Meliaceae	T	Tree	By seed	Deciduos
Bauhinia racemosa	Kachnar	Caesalpinaceae	T	Tree	By seeding	Semi evergreen
Butea monosperma	Palas	Fabaceae	T	Tree	By seeds	Deciduous
Cassia fistula	Golden shower	Caesalpinaceae	T	Tree	By seeds	Deciduous
Citrus aurantium	Nebu	Rutaceae	T	Tree/ shrub	By seeds, Stem cutting	Evergreen
Dalbergia sissoo	Sissoo	Leguminosae	T		By seeds, Root & Slum cuttings	Evergreen
Emblica officinalis	Awala	Euphorbiaceae	T	Tree	By seeds, cuttings, budding, inarching	Deciduous
Ehretia laevis	Harapan	Boraginaceae	T	Tree	Seeds	Semi deciduous
Erythrina indica	Coral tree	Leguminosae	T	Tree	By cutting seeds	Deciduous
Ficus benghalensis	Bargad	Moraceae	T	Tree	By cutting seeds	Evergreen
Ficus racemosa	Goolar	Moraceae	T	Tree	Seeds	Evergreen
Ficus religiosa	Pipal	Moraceae	T	Tree	Through seeds, cutting	Deciduous
Holoptelea integrifolia	Indian elm	Ulmaceae	T	Tree	By seeds	Deciduous
Lannaea coromandelica	Mohin	Anacardiaceae	T	Tree	By stem cutting/seeds	Deciduous
Madhuca lingifolia	Mahua	Sapotaceae	T	Tree	By seeds	Deciduous
Mangifera indica	Mango	Anacardiaceae	T	Tree	By seeds, transplantation, grafting, budding, air layering, root	Evergreen

					cutting, marcutting	
Jacaranda mimosaefolia	Blue Gulmohar	Bignoniaceae	S	Tree	By seeds	Deciduous
Pterocarpus marsupium	Bijay	Leguminosae	T	Tree	By seeds	Deciduous
Shorea roxburghii	Sarai	Dipterocarpaceae	T	Tree	By seeds	Deciduous
Syzygium cumini	Jamun	Myrtaceae	T	Tree	By seed, cutting, Grafting, Budding	Evergreen
Tamarindus indica	Imli	Caesalpinaceae	T	Tree	By seed	Evergreen
Tectona grandis	Teak	Verbenaceae	T	Tree	By seeds	Deciduous
Other Native Trees in consultation with local forest department						

5.4.2 Pit Preparation & Plantation

The plant species identified for greenbelt development should be planted using dug-pit technique. The pit size should be in between 45 cm x 45 cm x 45 cm to 60 cm x 60 cm x 60 cm depending on the soil quality. Soil proposed to be used for filling the pit should be mixed with well decomposed farm yard manure or sewage sludge at the rate of 3.6 kg (on dry weight basis).The filling of soils should be completed at least 5-10 days before the actual plantation. Healthy seedlings of identified species should be planted in each pit. Proper density of plants (no. per hectare) should be maintained within the greenbelt.

The minimum distance between two plantations should be dependent on the choice of species and compatibility of different species to grow together. The distance should be in between 2.5 m to 5 m for plantation in greenbelt.

Roadside plantation

Minimum of two rows of plants are required for plantation on roadside to minimize the pollution effects. A three tier plantation approach on road side is most suitable to provide green barrier to dust pollution and noise pollution.

5.4.3 Post Plantation Management

Post plantation care-

- Protection from grazing and fire.
- Watering at least once a fortnight during dry spells.
- Manuring.
- Weeding (weed eradication like Lantana / Prosopis juliflora / Xanthium indicum in phases) three times in the first year and twice a year, during the subsequent two years and soil working.
- Protection from pests.
- This post plantation care will be undertaken at least for three years after the plantation.
- Pruning of tree species may be performed after three year.

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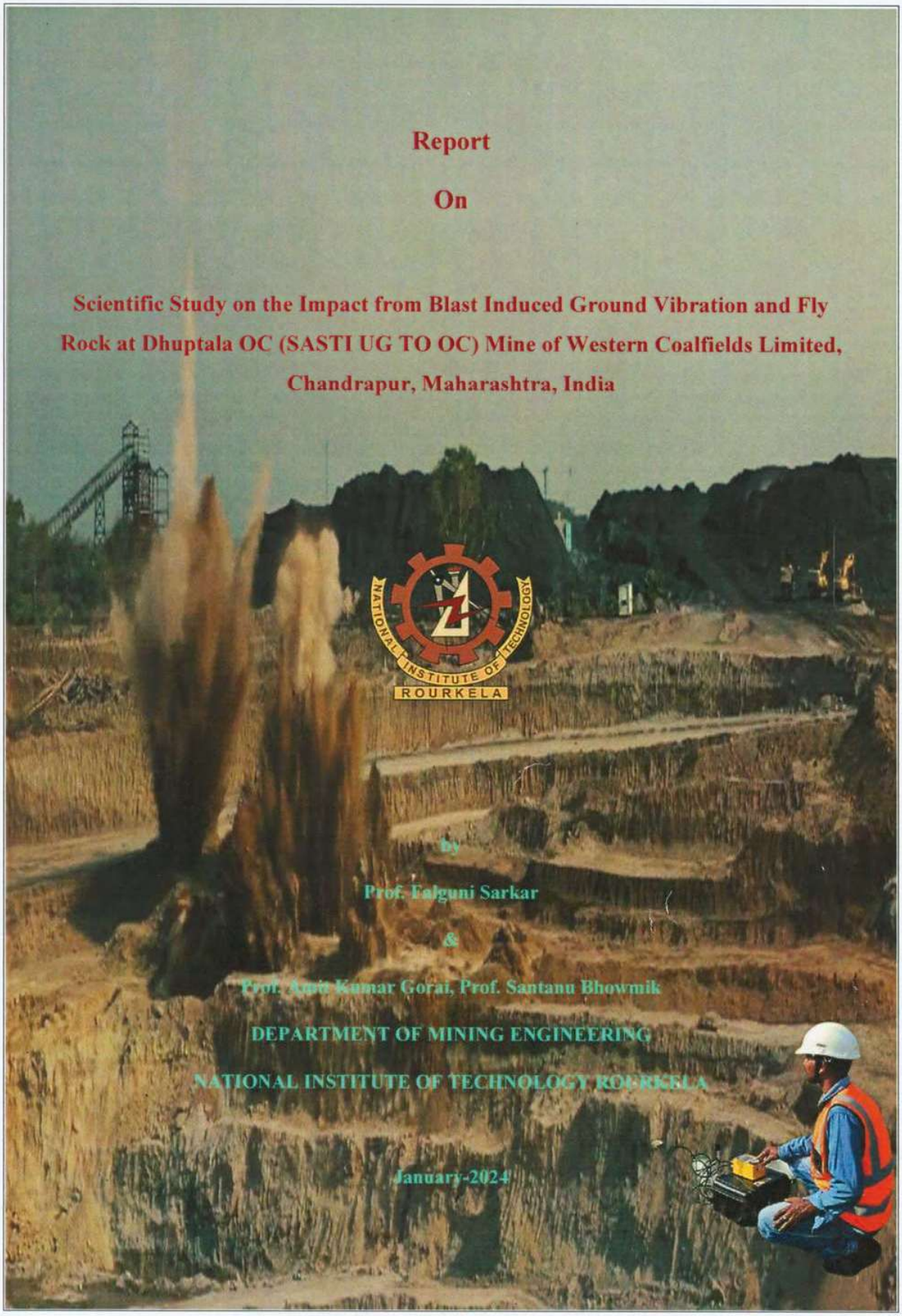
Report
On
Scientific Study on the Impact from Blast Induced Ground Vibration and Fly Rock at Dhuptala OC (SASTI UG TO OC) Mine of Western Coalfields Limited, Chandrapur, Maharashtra, India
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Project Code: C3/23/MN/011, SRICCE, NIT-Rourkela **Date:02.02.2024**

DISCLAIMER

It is appropriate to mention here that ***"Scientific study on the impact from blast induced ground vibration and fly rock at* Dhuptala OC (Sasti UG to OC) Mine *of* Western Coalfields Limited, *Chandrapur, Maharashtra"*** was conducted by team comprising Prof. Falguni Sarkar, Prof. Amit Kumar Gorai, Prof. Santanu Bhowmik and two research associates from Department of Mining Engineering, National Institute of Technology, Rourkela during 01.06.2023 to 07.06.2023 and 27.11.2023. The study was conducted by following the existing blasting pattern already being used in the mine and also considering few recommended blast designs. The ground vibration characteristics and fly rock propagation range were studied during blasting. Based on the peak particle velocity data obtained at the specific distances from the blasting faces, the report was derived. The authors would be in no way held responsible for any untoward incident, if occurred in actual blast related field operation in future. The data is based on the indicative value. This report is highly confidential and made for only **Dhuptala OC (Sasti UG to OC) Mine** of **Western Coalfields Limited**, Chandrapur, Maharashtra**.** No part of this report can be reproduced or circulated to any outside agency without prior permission of the author. Authors reserve the right to publish the results of the study for benefit of his professional or academic career, if required without putting the name of the mine concerned.

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1. Introduction

The work of "S*cientific study on the impact from blast induced ground vibration and fly rock"* at **Dhuptala OC (Sasti UG to OC) Mine** of **Western Coalfields Limited.,** ***Chandrapur, Maharashtra***, was entrusted to NIT Rourkela as per WO no.- WCL/BA/AGM/OPERATION/2023/414 dated **03.02.2023**. For this purpose, a detailed investigation on blast vibration was performed (Project Registration no. C3/23/MN/011, SRICCE, NIT-Rourkela) to assess the present condition of ground vibration during the blasting operations. Characteristics of propagation of fly rock and sound pressure levels during the blasting operations were also studied for a total of 14 individual blasts to examine the present blasting practices of the mine. Based on readings and observations, appropriate site condition analysis was performed for vibration propagation. This report presents the observations, analysis and recommendations from the analysis of regular blasting operations at Dhuptala OC (Sasti UG TO OC) Mine.

1.1 Location and extent of the mine area:

Topography:

The Dhuptala Geological Block of the Wardha Valley Coalfield is located in southern bank of the Wardha river near Ballarpur in Chandrapur district of Maharashtra. The Wardha coalfield is bounded by Latitude 200 29' 06" to 200 48' 22" and Longitudes 790 09' 15" to 790 26' 39"and located in the central part of India and occupies an area of about 5225.36 sq.km and falls mainly in Yavatmal and Chandrapur districts of Maharashtra.

The block under reference is represented by paddy fields and small forests. Major part of the block is however, covered by paddy fields. Wardha river is flowing west to east in the northern boundary of the block separates the block from Ballarpur blocks. On the other hand Dhuptala nala is flowing north to south through eastern part of the block along with many other small nala cris cross within the block. The general topography of the block is undulating and is used for agricultural purpose and some patches of barren lands are also featuring in the block. The general altitude of the block is varying from 170 metres to 190 metres.

Lease Details

Name of mine: Dhuptala OC (Sasti UG TO OC) Mine**.** Ref. toposheet No.- 56 M/5, Total lease area /applied area: 1070.49 Hectares in villages & Mouzas - Dhuptala, Sasti, Bhadangpuri, Gadpadkhami, Kolgaon, Manoli Bk, Thana –Rajura, District – Chandrapur, State – Maharashtra.

District headquarter Chandrapur, is at a distance of about 25 km from the block. The Sasti Colliery (Rajura- Ballarpur) all weather road passes through the block. The block is approachable

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from Rajura town (7km) via Sasti Colliery road and 08 km from Ballarpur Township via new bridge on Wardha River near Ballarpur OC mine. Rajura is located in south east side of the block and is connected to Ballarpur (12km). The Ballarpur, in turn, is connected to Nagpur (165km) by State Highway no.-264 via. Chandrapur and Warora. Ballarshah Railway station is located at a distance of about 08 km from the block. The area is also approachable from Manikgarh Railway station situated in south eastern side at a distance of around 10 km.

1.2 Geology of lease area.

Dhuptala Geological Block of the Wardha Valley Coalfield is located in southern bank of the Wardha river near Ballarpur in Chandrapur district of Maharashtra. The entire Dhuptala Block has been divided into eight Sectors namely Sector A, B, C, D, E, F, G & H on the basis of disposition of faults. Sector A to C have already been worked out in the old Dhuptala OC Mine. Later on, it was proposed to convert the underground working of the Sasti Colliery into opencast working.

A thick composite seam occurs in middle Barakar formation in Dhuptala Block. This composite seam is divided into two coaly sections namely Top Split and Bottom Split separated by a parting of shale, carbacenous shale and intercalation of shale and sandstone. The thickness range of partings is 2.37 m to 3.35 m and the average parting is 2.86 m. Hence for opencast purposes, the seam Top Split along with parting and bottom Split has been named as composite seam and quality has been re-estimated accordingly. The thickness of composite seam ranges from 12.77 m (CMWD-41) to 17.18 m (MWS-16).

The top Split of composite seam is relatively more banded than the bottom Split. However, disposition of these bands are highly irregular. The seam quality has been estimated by including all in seam dirt bands irrespective of thickness and nature. The strike and dip of the coal seam in the proposed mining block is based on the sub-surface data. Floor contour of the composite seam has been drawn at 10 m interval from which it would be seen that the amount of dip and strike direction is quite variable. The strike of the seam is NE-SW to N-S and gradient is 1 in 10 to 1 in 18 due east. The interpretation of faults is based on the sub-surface data i.e truncation of seam and difference in floor reduced level of coal seam on either side of the fault. Details of the faults are explained in Table 1. Pillar layout of Dhuptala (Sasti UG to OC) Mine is shown in Figure1.

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Table 1: Description of faults

Sl. No.	Fault Name	Trend	Direction and Amount of throw (m)	Evidences
1	F1-F1	NW-SE	SW, 75-170 m	1. Encountered in the underground mine workings of Sasti UG. 2. In CMWS-10 and MWS-170, seam is faulted 3. Difference in FRL values in either side of the fault
2	F2-F2	ENE- WSW	SSE, 25 m	1. Encountered in the underground mine workings of Sasti UG. 2. Difference in FRL values in either side of the fault.
3	F4-F4	NE – SW	SE, 5-25m	1. Encountered in the underground mine workings of Sasti UG. 2. Difference in FRL values in either side of the fault.
4	F5-F5	NE – SW	NW, 14-55m	1. Encountered in the underground mine workings of Sasti UG. 2. Difference in FRL values in either side of the fault.
5	F6-F6	WNW- ESE	SSW, 30m	1. Encountered in the underground mine workings of Sasti UG. 2. Difference in FRL values in either side of the fault.
6	F7-F7	NW –SE	NE, 6-12 m	1. Encountered in the underground mine workings of Sasti UG.
7	F8-F8	WNW-ESE	SSW, 20 m	1. Difference in FRL values in either side of the fault.
8	F9-F9	NE-SW	NW, 10-15m	1. Difference in FRL values in either side of the fault.
9	F10- 10	NW – SE	NE. 25-35m	4. Encountered in the underground mine workings of Sasti UG. 5. Difference in FRL values in either side of the fault.
10	F11-F11	E – W	S, 5-17m	3. Encountered in the underground mine workings of Sasti UG. 4. Difference in FRL values in either side of the fault.
11	F12-F12	NE –SW	SE, 10m	1. Difference in FRL values in either side of the fault.

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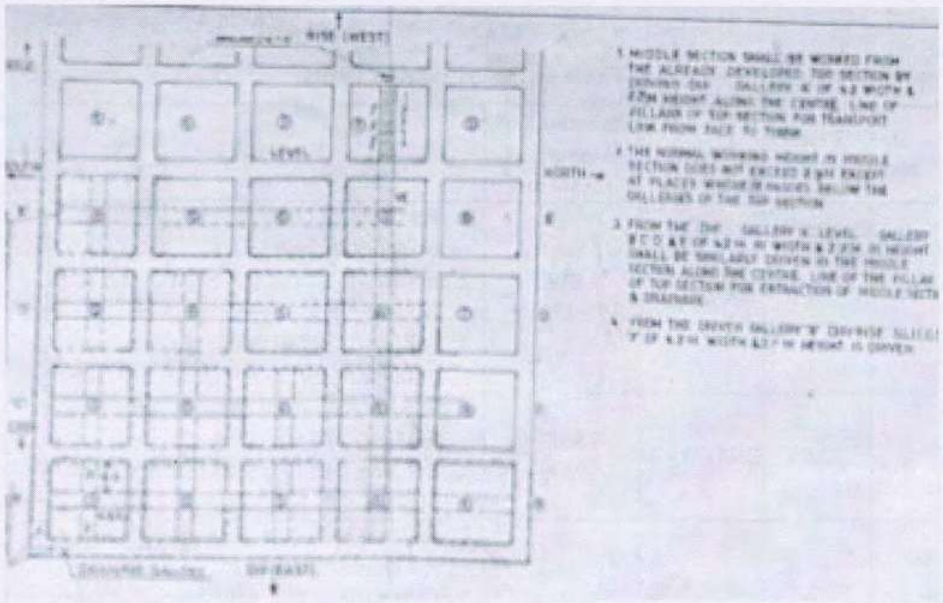

Figure1: Pillar layout of Dhuptala OC (Sasti UG to OC) Mine

2. Study Objectives

The objectives of the proposed study are

a) To suggest the Maximum Charge Per Delay (MCPD) for limiting the Peak Particle Velocity (PPV) of ground vibration within different permissible limits as applicable to such structures if any belonging/not belonging to the owner which are located in the proximity of blasting face.

b) To recommend appropriate method to control fly rock generated during the blasting operation.

3. Method of working

The Coal deposit exists in this area near to the surface (average depth of coal seam lies between 10-15 m from surface). The excavation is being carried out in fully mechanised methods. The sequence of mining operation is

a) Cutting and removal of soil & morrum by shovel dumper combination.

b) ***Drilling of bench using DTH drills in harder strata***: 165 mm diameter holes with average depth of 05mtr-06mtr depth are drilled in staggered pattern by wagon drills for blasting of hard over burden (OB) and coal benches.

c) ***Charging and blasting of holes***: Depending upon the nature / hardness of the strata, drilling pattern is required to be varied. However, the most common pattern follows spacing: 06 mtr

& burden: 05 mtr. The trial blasts have been conducted using Site Mix emulsion/ SME (SME purchased from M/s Solar Industries India Limited or M/s Ideal Industrial Explosives Limited or M/s Regenesis Industries Private Limited with average cup density between 1.1 to 1.3). The NONEL detonators (TLD: 25ms and DTH: 250ms) and ED (Electronic Detonator) (TLD: 17ms/25ms) have been used to achieve sequential firing (for reducing noise & vibration) between the rows and between the holes. Various drilling and charging patterns, which have been tested during the trial blasts, are shown in **Annexure 2**.

d) Handling of hard OB & ROM (Run of Mine)/coal by shovel dumper combination.
e) Overburden is also removed by Shovel dumper combination and kept by construction of temporary dumps near the mine.
f) The bigger OB and coal lumps are being broken secondary blasting/rock braker if required.
g) Transporting of Coal to the Railway siding is done after crushing.

4. Methodology followed during trial blast

Drilling and blasting are one of the cheapest methods of rock breakage in mining and is practiced throughout the globe. While an explosive column is detonated in a blast hole, huge amount of energy in the form of pressure and temperature is liberated in an around the hole within a fraction of seconds. Though significant developments have taken place in explosive technology, the explosive energy utilization has not made much progress due to complexity of various rock parameters. Only 20-30 percent of the total energy is utilized for actual breakage and displacement of rock mass and the rest of the energy get dissipated resulting undesirable side effects like ground vibrations, air blasts, noise, back breaks, fly rocks and dusts etc., which may further cause annoyance to the people living near the mining areas. Also, it may cause severe damage to structures and plants nearby. Therefore, a vibration control study plays an important role in the minimization of adverse effects of blasting in mines. According to the studies, blast induced vibration level at any location is dependent on various factors such as the distance of the site form the blast location, weight of charge per delay, dominant frequency of vibration, the blast design and to some extent the delay layout. Other transmission factors such as rock type, rock density, rock layering, nature of the terrain, blast hole conditions, and hydrological conditions are dependent on site and are not in the miner's control in most cases. For effectively monitoring ground vibrations, it is important to consider a combined effect of factors such as site characteristics propagation of surface and body waves in the ground, and the response of structures. Effective control of vibration-related problems requires a proper assessment of the attenuation characteristics of various vibrations.

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Vibrations during the blasting operations travel in two modes. Firstly, the vibrations of the blast propagate through the ground in form of ground waves. These waves are similar to seismic waves during an earthquake, and in some cases can cause serious damage to the surrounding civil structures and sites. Secondly, the vibrations travel through the air in form of sound or air overpressure waves. These waves are capable of creating uncomfortable sounds, and in some cases are capable of shattering window glasses and other resonating artifacts. A good measurement criterion for the ground waves is by recording the dominant frequency of the vibration, and its peak particle velocity (PPV). The measurement of air overpressure can be done by measuring the sound pressure intensity in dB(L).

An attempt has been made to develop mathematical model of blast vibration with data collected from Dhuptala OC (Sasti UG to OC) Mine. The proposed model can be very useful for predicting the ground vibrations with the input of independent parameters. Ground vibration is generated due to the passing of seismic wave through a rock medium which puts its entire particle in motion. So, vibrations are repeated movement of particles about the position of rest and are represented by particle velocity which in turn is defined as the rate of change of particle displacement with respect to time.

The maximum velocity from the position of rest is termed as peak particle velocity (PPV) and is expressed in mm/sec. This PPV is closely related to ground vibration. In this study evaluation of ground vibration is discussed through the prediction of PPV using regression analysis techniques.

The performance evaluation of the blasting operation has been ascertained on the basis of blast results achieved during normal production blasts and trial blasts. The blast induced PPV has been recorded at different distances from the blasting location/faces.

The blasts were carried out at different benches located in mine. The strata conditions were medium hard. Drilling patterns along with vertical section shown in **Annexure-2** have been used for the trail blast. The fly rock propagation was accessed by high resolution videography and visual observations. The peak particle velocity was recorded using **Mini-Seis III Pro & SV1** instrument (specifications given at **Annexure-1**). **Figure (4), (5)** and pictures attached in **Annexure 5** depict the setting up of instruments for ground vibration study at various mine locations.

Prior to each blast a reconnaissance survey was conducted to identify the important structures and their conditions. All the other permanent structures of significance like public road and electrical poles, domestic structures/buildings (including kuccha* houses) etc. found between 150m to 900m from the mine pits were considered as the observation points during the blast vibration measurement.

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The site plan of the case study area with demarcation of danger zones is shown in **Figure 2**. The record of peak particle velocity along with the measuring distance from the blast face is presented in Table 3.

5. Case study and Data acquisition

The lease area of **Dhuptala OC (Sasti UG to OC) Mine** is located at toposheet No.- 56M/5. The geological zone which more or less forms the lease area of **Dhuptala OC (Sasti UG to OC) Mine** is polygon shaped. The detailed geology of the rock mass was studied. It was observed that no water body was in the mine site. The rock was moderately strong. The blasting operations were carried out in different benches. Locations of instrument **Mini-Seis III Pro & SV1** set up for ground vibration study around the mine are shown in **Figure 2 and Figure 3**. All the data were collected from the site during normal production and trial blast. The raw data sets have been converted into the usable form in accordance with the requirement and the same have been presented in the Table 3 and Table 4.

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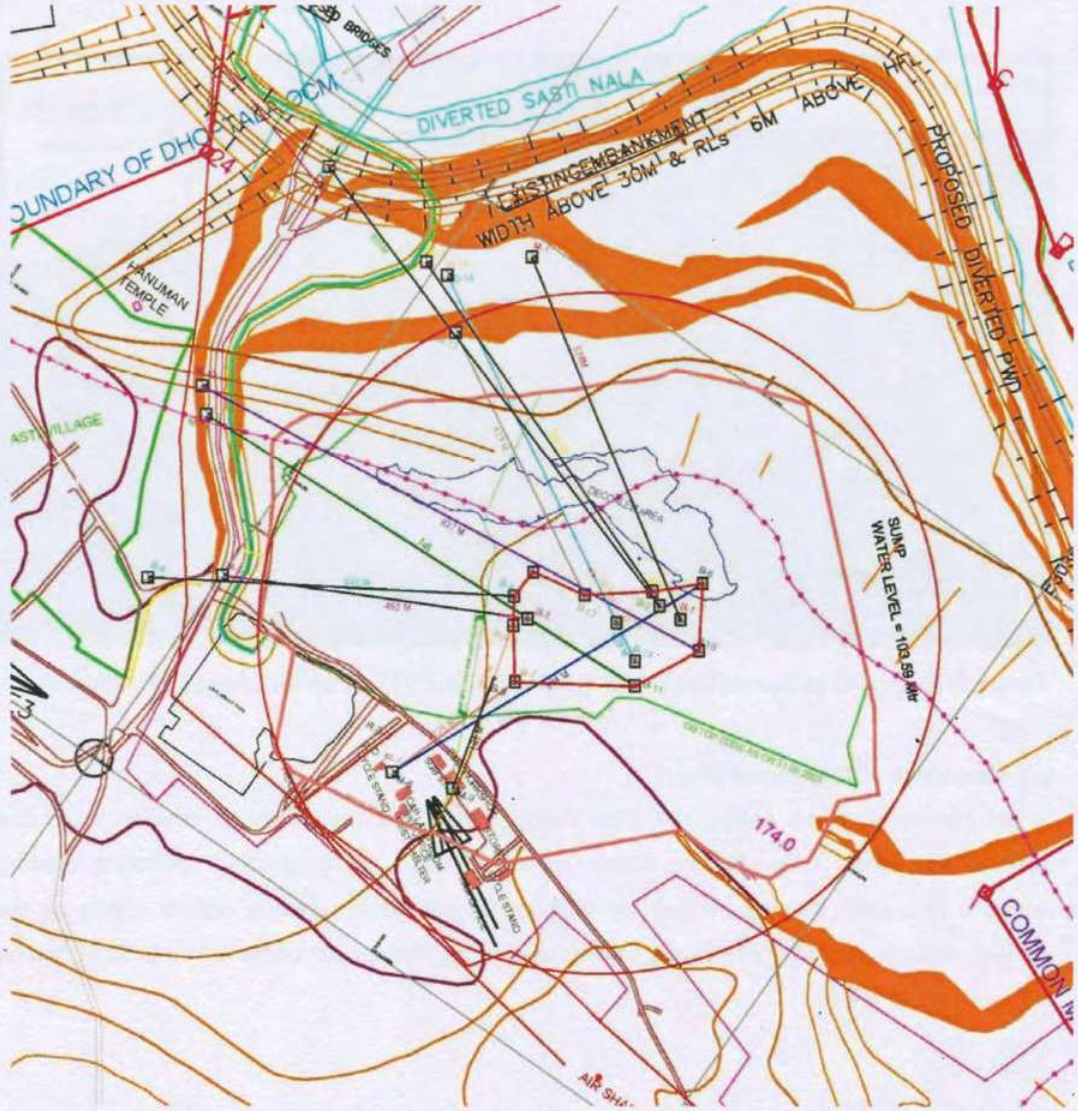

Figure 2: Blasting and vibration monitoring plan of Dhuptala OC (SASTI UG TO OC) Mine

Legend:

LEGEND

1.) MACHIN LOCATION SHOWN THUS----------

2.) BLASTING LOCATION SHOWN THUS----------

3.) DISTANCE BETWEEN MACHINE & BLASTING LOCATION SHOWN THUS----------

4.) OUT LINE OF BLATING LOCATION SHOWN THUS----------

5.) CIRCLE OF 500M RADIUS FROM CENTER POINT OF BLASTING AREA SHOWN THUS------

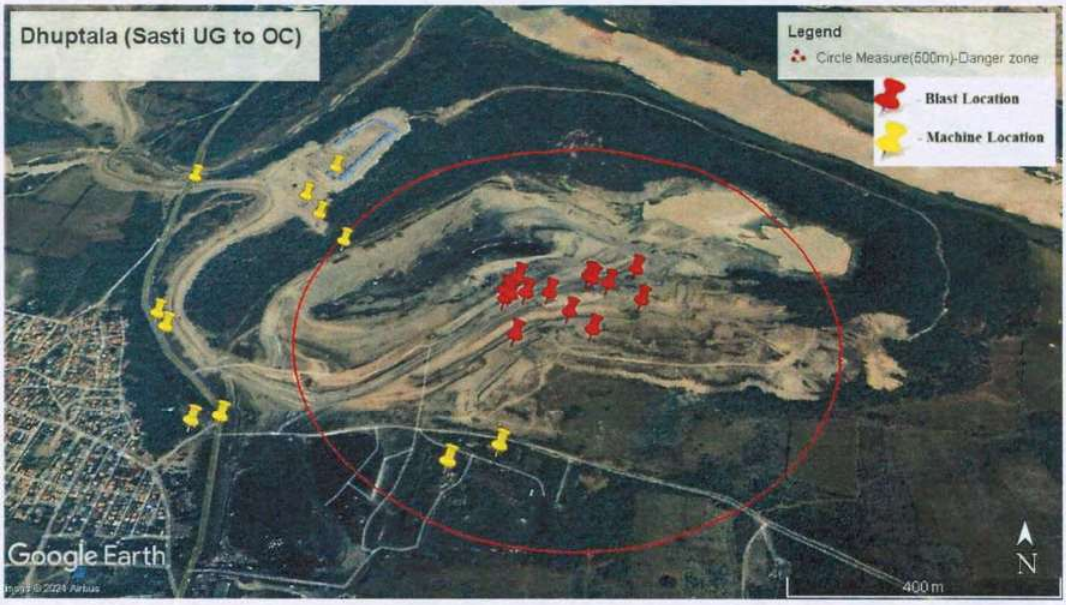

Figure 3: Locations of instrument (Mini-Seis III Pro & SV1) set up for ground vibration study around the mine

6. Formulation of Regression Model

In the present study an analysis of blast vibration data has been done to develop a suitable mathematical model to predict the future course of action for conducting controlled blasting operation in a mine keeping in view the variation of dependent variables and its effects on the stability of structures. The different parameters used in the formulation of the model (USBM criteria followed) are as follows:

Fig (4 & 5): Setting up of microphone and geophones sensors the measurement of Peak Particle Velocity.

Notations:

V_m . = Peak particle velocity in mm per sec.

Q = The maximum charge per delay in Kg.

D = Distance of the monitoring point form the blast site in mts.

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K, b = Site Constants dependent upon the rock types, type of explosives and blast design parameters.

$D/\sqrt{Q}$ = Scaled distance.

The fundamental predictor equation of ground vibration is represented in the following form:

$$V_m = K (D/\sqrt{Q})^{-b} \quad (1)$$

Taking natural log on both the sides of the equation (1), we get

$$Ln (V_m) = ln (K) - b * ln (D/\sqrt{Q}) \quad (2)$$

This equation (2) can be written in the form of a straight line as

$$Y = mX + c \quad (3)$$

Where,

$Y = ln (V_m)$

$X = ln (D/\sqrt{Q})$

$c = ln (K)$

$m = -b$

The X-Y relationship in equation (3) is obviously a straight line with the slope 'm' and the Y intercept 'c' in order to plot the line, the values of X and Y are calculated using the values of V_m, D and Q.

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7. Statutory Provisions

a) Blast induced ground vibration: *DGS (Tech) (S&T) Circular No. 7 of 1997 Dhanbad, dated the 29th August, 1997.* (thresholds are **Shown in Table 2)**

b) *(Cir. Tech. 2/1985 & 2/1990) – It is recommended that while blasting in hot strata (either in OB or coal) some specific precautionary measures should be adopted.*

Table 2: Threshold of PPV (in mm/s) for different structures (DGMS, 1997)

	Frequency of the ground vibration (Hz)		
	< 8 Hz	**8-25 Hz**	**>25Hz**
Domestic structures/buildings (including kuccha* houses)	5	10	15
Industrial structures/buildings	10	20	25
Sensitive structures or sites of historical importance	2	5	10

8. Observations

At different benches of the case study pit, drilling followed by blasting was carried out with 25-180 number of holes. The detailed observations are shown in Table 3. The acquired blast vibration reports are attached in **Annexure 4.**

It can be observed from the vibration results in Table 3, both the dominant frequency and the PPV values are well within the limits of the threshold as per DGMS circular provided in Table 2. It is also found that all dominant frequencies associated with 14 number of blast observations are ranging from 1.1 Hz to 6.6 Hz (Table 3). Again, the reconnaissance survey depicts that there are public roads and domestic structures/buildings (including kuccha* houses) present within the 500m of the pit boundaries. In this context, the threshold limit of PPV value may be considered as **05 mm/sec or less** for safe blasting operation. Therefore, the **Maximum Charge per Delay (MCPD)** has been calculated by taking threshold limits of PPV as 05mm/sec (Shown in Table 5) and 10mm/sec (Shown in Table 6). The mine authority can use these recommended PPV values as per the situation based requirements to comply the statutes.

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Table 3: On-site observations

Observation No.	Blast Date	Distance (m)	PPV (mm/sec)	Dominant Frequency (Hz)	Acoustic (dB)	MCPD (Kg)	Delay (ms) /DTH	Spacing (m)	Burden (m)	No. of Hole	Avg. charge/ hole (kg)	Total Charge (kg)	Average hole Depth (m)	Average Stemming (m)	Charge Length (m)	Hole Diameter (mm)
1	01.06.2023	574	1.33	6.4	133	144	25/250	6	5	25	48	1200	6	3.6	2.4	165
2	01.06.2023	805	0.474	4.8	131.1	240	25/250	6	5	174	48	8352	6	3.6	2.4	165
3	01.06.2023	585	2.26	1.1	99.7	240	25/250	6	5	114	48	5472	6	3.6	2.4	165
4	02.06.2023	537	2.96	4.3	132.6	210	25/250	5	5	80	42	3360	5.5	3.1	2.4	165
5	02.06.2023	452	4.77	5.6	124.8	240	25/250	5	5	55	48	2640	6	3.6	2.4	165
6	03.06.2023	534	3.97	6.6	125.3	240	25/250	5	5	100	48	4800	6	3.6	2.4	165
7	03.06.2023	226	6.07	3.8	122.1	250	25/250	5	5	60	62.5	3750	10	5.4	4.6	165
8	03.06.2023	257	4.49	5.2	128.4	183.6	25/250	5	5	90	45.9	4131	6	3.7	2.3	165
9	03.06.2023	162	20.7	1.6	84.3	183.6	25/250	5	5	180	45.9	8262	6	3.7	2.3	165
10	05.06.2023	827	0.86	3.6	133.1	211.8	25	5	4.5	165	42.36	6990	5.2	3	2.2	165
11	05.06.2023	745	0.958	3.7	140.3	256	25/250	5	4	100	51.2	5120	5.7	3.2	2.5	165
12	07.06.2023	429	5.09	5.1	135.8	234	25/250	5	5	175	46.8	8190	6	3.6	2.4	165
13	07.06.2023	567	2.47	5	130	235	25/250	6	5	135	47	6345	6	3.6	2.4	165
14	07.06.2023	629	1.54	3.8	120.5	107.4	25/250	4.5	4	40	35.8	1432	5	3.2	1.8	165

Table 4: Detailed analysis of blasting results

Observation No.	MCPD	Distance	PPV	SD	LN(SD)	LN(PPV)
1	144	574	1.33	47.833	3.868	0.285
2	240	805	0.474	51.963	3.951	-0.747
3	240	585	2.26	37.762	3.631	0.815
4	210	537	2.96	37.057	3.612	1.085
5	240	452	4.77	29.176	3.373	1.562
6	240	534	3.97	34.470	3.540	1.379
7	250	226	6.07	14.293	2.660	1.803
8	183.6	257	4.49	18.967	2.943	1.502
9	183.6	162	20.7	11.956	2.481	3.030
10	211.8	827	0.86	56.825	4.040	-0.151
11	256	745	0.958	46.563	3.841	-0.043
12	234	429	5.09	28.045	3.334	1.627
13	235	567	2.47	36.987	3.611	0.904
14	107.4	629	1.54	60.694	4.106	0.432

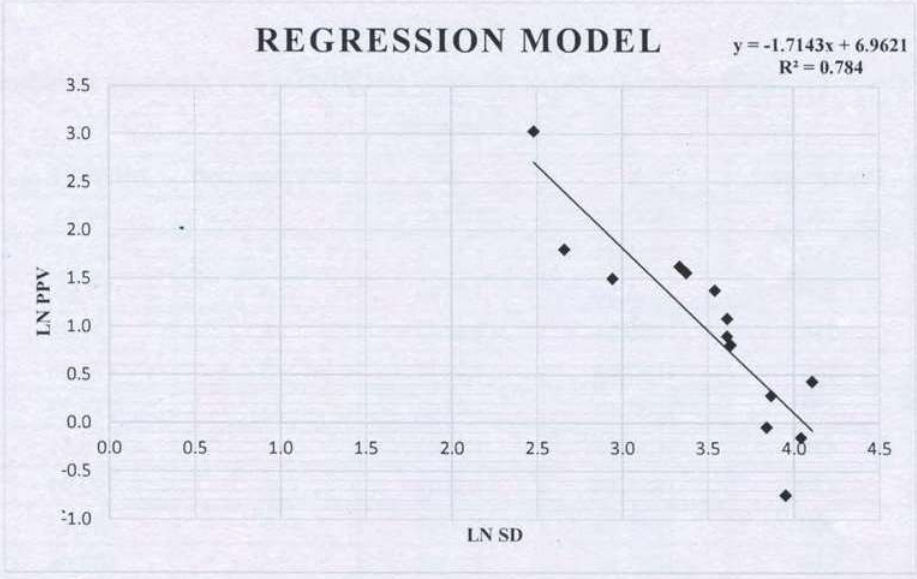

Figure 6: Linear regression analysis for determination of site constant

With the help of the acquired field data (analysis shown in Table 4), the regression model has been established for predicting PPV of particular locations around the mine. The regression model (shown in Figure 6) depicts a good correlation between ln (PPV) and ln(D/√Q), with coefficient of determination (R^2) value of **0.784**. The values of site constants **K** and **b** are found to be **1055.84** and **1.7143** respectively. By the regression analysis, the empirical equation for blast vibration values and patterns of Dhuptala (Sasti UG to OC) Mine has been derived (equation 4). With the help of the empirical equation obtained, the PPV values of future blasts can also be estimated with a decent accuracy by creating relevant data structure shown in Table 4.

$$PPV = 1055.84\left(\frac{D}{\sqrt{Q}}\right)^{-1.7143} \quad (4)$$

9. Recommendation

9.1 MCPD Recommendation:

Based on the empirical equation obtained from the above analysis as depicted in Eq. (4), appropriate values of PPV and Q_{max} can be predicted for various distance points from the blasting face, and compared with the threshold limits of PPV provided in the DGMS guidelines. For instance, the maximum allowable charge per delay according to the site equation 4 has been calculated by keeping the PPV values 05mm/sec and 10mm/sec at varying observation points. The results are listed in Table 5 and Table 6.

Table 5: Predicted maximum charge per delay (MCPD) for PPV 5 mm/sec at different distances.

Distance(m)	k	b	PPV(mm/sec)	MCPD(Kg)
100	1055.84	1.7143	5	19.41
150	1055.84	1.7143	5	43.67
200	1055.84	1.7143	5	77.63
250	1055.84	1.7143	5	121.29
300	1055.84	1.7143	5	174.66
350	1055.84	1.7143	5	237.73
400	1055.84	1.7143	5	310.51
450	1055.84	1.7143	5	392.99
500	1055.84	1.7143	5	485.17
550	1055.84	1.7143	5	587.06
600	1055.84	1.7143	5	698.65

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Table 6: Predicted maximum charge per delay(MCPD) for PPV 10 mm/sec at different distances.

Distance(m)	k	b	PPV(mm/sec)	MCPD(Kg)
100	1055.84	1.7143	10	43.57
150	1055.84	1.7143	10	98.03
200	1055.84	1.7143	10	174.27
250	1055.84	1.7143	10	272.29
300	1055.84	1.7143	10	392.10
350	1055.84	1.7143	10	533.69
400	1055.84	1.7143	10	697.07
450	1055.84	1.7143	10	882.23
500	1055.84	1.7143	10	1089.17
550	1055.84	1.7143	10	1317.89
600	1055.84	1.7143	10	1568.40

The allowable maximum charge per delay values presented in Table 5 and 6 are not simply recommended values of charge per delays. These values are an indication of the maximum possible charge per delay that can be theoretically used for obtaining a PPV value of 05 mm/sec, 10 mm/sec or less. These relationships serve as a good guide for choosing a ceiling of charge value during proximity blasting operation.

9.2 Total Charge per Round Recommendation:

With the help of the acquired field data (shown in Table 3) and data analysis shown in Table 7, the regression model has been established for calculating maximum permissible charge per round for conducting the blasting at various locations in the mine. The regression model (shown in Figure 7) depicts a good correlation between ln (PPV) and ln(D/√TQ), with coefficient of determination (R^2) value of **0.6178**. The values of site constants $\mathbf{K_t}$ and $\mathbf{b_t}$ are found to be **32.13** and **1.2656** respectively. The equation no. 5 has been developed by replacing total charge (TQ) of individual blast observations used during the trial blast.

PPV = Peak particle velocity in mm per sec., TQ = Total charge per round in Kg.

D = Distance of the monitoring point form the blast site in mtr.

$\mathbf{K_t}$, $\mathbf{b_t}$ = Site Constants dependent upon the rock types, type of explosives and blast design parameters.

$$PPV = 32.13 \left(\frac{D}{\sqrt{TQ}}\right)^{-1.2656}$$

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Table 7: Detailed analysis of blasting results

Observation No.	Total Charge(kg) TQ	Distance	PPV	D/SQRT TQ	LN(D/SQRT TQ)	LN(PPV)
1	1200	574	1.33	16.570	2.808	0.285
2	8352	805	0.474	8.808	2.176	-0.747
3	5472	585	2.26	7.908	2.068	0.815
4	3360	537	2.96	9.264	2.226	1.085
5	2640	452	4.77	8.797	2.174	1.562
6	4800	534	3.97	7.708	2.042	1.379
7	3750	226	6.07	3.691	1.306	1.803
8	4131	257	4.49	3.999	1.386	1.502
9	8262	162	20.7	1.782	0.578	3.030
10	6990	827	0.86	9.892	2.292	-0.151
11	5120	745	0.958	10.412	2.343	-0.043
12	8190	429	5.09	4.740	1.556	1.627
13	6345	567	2.47	7.118	1.963	0.904
14	1432	629	1.54	16.622	2.811	0.432

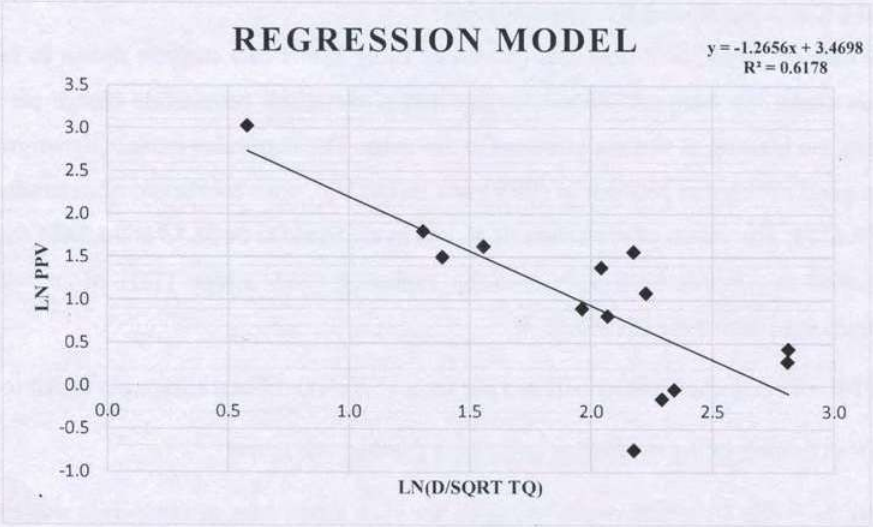

Figure 7: Linear regression analysis (using total charge) for determination of site constant

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Based on the empirical equation obtained from the above analysis, the maximum allowable charge per round according to the site equation (5) has been calculated by keeping the PPV at 05 mm/sec and 10mm/sec for varying observation points and shown in Table 8 and Table 9.

Table 8: Predicted Maximum Charge Per Round for PPV 5 mm/sec at different distances.

Distance(m)	K_t	b_t	PPV(mm/sec)	Maximum Allowable Charge Per Round (Kg)
100	32.13	1.2656	5	528.72
150	32.13	1.2656	5	1189.63
200	32.13	1.2656	5	2114.90
250	32.13	1.2656	5	3304.52
300	32.13	1.2656	5	4758.52
350	32.13	1.2656	5	6476.87
400	32.13	1.2656	5	8459.58
450	32.13	1.2656	5	10706.66
500	32.13	1.2656	5	13218.10
550	32.13	1.2656	5	15993.90
600	32.13	1.2656	5	19034.06

Table 9: Predicted Maximum Charge Per Round for PPV 10 mm/sec at different distances.

Distance(m)	K_t	b_t	PPV(mm/sec)	Maximum Allowable Charge Per Round (Kg)
100	32.13	1.2656	10	1581.03
150	32.13	1.2656	10	3557.32
200	32.13	1.2656	10	6324.12
250	32.13	1.2656	10	9881.44
300	32.13	1.2656	10	14229.27
350	32.13	1.2656	10	19367.62
400	32.13	1.2656	10	25296.48
450	32.13	1.2656	10	32015.85
500	32.13	1.2656	10	39525.75
550	32.13	1.2656	10	47826.15
600	32.13	1.2656	10	56917.07

During the blasting operations the fly rock propagation were assessed by predominantly on visual measurement basis, but few high resolution videographies have also been investigated for realization of fly rock propagation scenario. It was seen that maximum fly rock propagation was within 80 m range in all directions for all the blasts.

Air Overpressure Monitoring: During trial blasts air overpressure (air blast) was also monitored and the details of measurements are given in Table 3. It can be observed from Table 3 that the highest air overpressure was **140.3 dB**. As the value is lower than the recommended limits, the effects of air overpressure can be considered insignificant.

Based on the analysis conducted, the following are the main recommendations:

i. ***Recommendations for blasting operation*:**

- As per the vibration readings and analysis, ground vibrations levels generated during trial blasts are within the DGMS guidelines provided for the blast induced ground vibration. Hence the blast designs, Nonel tie up sequence, drilling and blasting parameters followed during the trial blasts can be continued in future for normal blasting operations in mine. However, authors of this report suggest a safe level of ground vibration of 05 mm/sec or less for safety of surface structures not belonging to owner and also for surface structures belonging to owner at the vicinity of Dhuptala OC (Sasti UG TO OC) Mine as suggested in DGMS based PPV criteria.
- As per the observations during trial blasts, 165mm diameter holes can be continued for regular blasting for bench heights of 03m-06m (vertical section at **Annexure 2**). For these bench heights, recommended drilling and blast design details, such as distance from the blasting face, maximum possible charge per delay, hole diameter, spacing, burden and drilling pattern are mentioned in Table 10. However, authors of this report suggest to restrict maximum hole numbers per round of blast up to **175- 200** (keeping MCPD as described in Table 10) for safe level of ground vibration and avoid the superimposition effects of wave forms generated during the blasting.

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Table 10: Recommended design parameters for drilling and blasting

Distance form blasting face (m)	MCPD (for 5 mm/sec) (Kg)	Maximum allowable charge per round(for 5mm/sec) (Kg)	MCPD (for 10 mm/sec) (Kg)	Maximum allowable charge per round(for 10mm/sec) (Kg)	Hole Diameter (mm)	Hole depth (m)	Spacing and Burden (m) (S x B)	Drilling Pattern
100	19.41	528.72	43.57	1581.03	165	4-6	4m X 2.5m	As per Annex-3
150	43.67	1189.63	98.03	3557.32	165	4-6	4m X 2.5m	
200	77.63	2114.90	174.27	6324.12	165	6	6m X 5m	
250	121.29	3304.52	272.29	9881.44	165	6	6m X 5m	
300	174.66	4758.52	392.10	14229.27	165	6	6m X 5m	
350	237.73	6476.87	533.69	19367.62	165	6	6m X 5m	
400	310.51	8459.58	697.07	25296.48	165	6	6m X 5m	
450	392.99	10706.66	882.23	32015.85	165	6	6m X 5m	
500	485.17	13218.10	1089.17	39525.75	165	6	6m X 5m	
550	587.06	15993.90	1317.89	47826.15	165	6	6m X 5m	
600	698.65	19034.06	1568.40	56917.07	165	6	6m X 5m	

- For the surface tie-ups, the patterns shown in Annexure 3 with 17ms, 25ms and 42ms trunk line delays and 250ms DTH/450ms DTH delay can be continued in future for the blasting operation associated with production requirements. **Tie-ups should ensure not more than 02-04 holes fall under 08ms window to avoid transgression of maximum charge per delay recommendations**.
- The quality of explosives used should be maintained and consistently checked. Use of old/out of date explosives should be avoided.
- Site equation (Equation 4) derived from the analysis can be used to predict peak particle velocity for different blasting conditions.
- A section wise charging method (layer wise variation of explosive density and decking) can be established in the cases of layered rock strata to ensure proper blasting and avoid blowouts. Mine management may explore the application of **segregation blasting** system during the blasting of coal layers and OB layers concurrently.
- In any case of changes from regular blasting practices, significant geological changes, or change of explosive and/or blast designs, appropriate vibration monitoring should be carried out for these blasts near critical civil locations such as hutments, public roads and HT lines, to ensure DGMS guidelines are being followed. A blast induced ground vibration monitoring equipment can be kept at the site for these situations.

- Aspects of the blasting operations may be included in Safety Management Plan and a comprehensive Standard Operating Procedure (SOP) may be implemented for safe blasting operations.

ii. ***Recommendations for controlling fly rocks***

- It must be ensured that post drilling, holes are being properly cleared of any chippings and appropriate depths of holes are maintained.
- It should be ensured that the top of the drilled bench is made devoid of rock fragments and cleaned properly before commencement of blasting to reduce the fly rock problems.
- Muffling or covering of holes by using wire mesh nets, old belt conveyors and sand filled bags should be done as per the requirement to contain the distance of travel of flying rock fragments, particularly, when blasting will be conducted within the danger zone as specified by DGMS.
- It has been observed that the fly rock, particularly, towards high wall side, was effectively controlled by maintaining the height of stemming column in all holes greater than the effective burden wherever possible. The height of stemming column should be 01 to 1.2 times the true burden in all holes. If fly rock towards the free face side is also to be contained then the blasting should be done using the technique of buffer blasting along with muffling in which case a buffer of blasted rock of 04-06 m thickness should be left against the next round of blast.
- NONEL and ED systems should be used because of less scattering in delay timing in relays and also reduce chances of misfires.

10. Conclusion

An extensive study for the analysis of ground vibration during controlled blasting operations was conducted at the Dhuptala OC (SASTI UG TO OC) Mine. The blasting study consisted of 14 blasts at different locations of the mine. The blast vibration analysis was done at varying observation distances from blast faces. Based on readings, dedicated site equations were established, which also helped in predicting safe charge limits when working within close proximity of less than 350m distance.

Based on the observation of all the 14 blasts, it is seen that vibrations from 11 blasts are under the limits as per DGMS regulations i.e. under the 05 mm/sec limit as mentioned in Table 2. Thus, present blasting can be continued for normal mining activities in future.

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Annexure 1

Vibration Monitoring (with Standard Triaxial Geophone) Instruments Specifications

1A. Specifications of Mini-Seis III Pro

Channels	
	Standard – three seismic channels and acoustic channel. Optional – three additional seismic channels and one additional acoustic channel (8 channel model). Support is available for non – standard sensors.
Seismic	
Range	Standard 260 mm/s (10.24 in/s). Other ranges may be customized at the factory.
Resolution	0.008 mm/s (0.0003 in/s) depending on the range.
Frequency Range (ISEE)	2 to 250 Hz at 1024 sample rate as per ISEE Seismograph Performance Specifications for Blasting Seismographs 2017 Edition. The upper frequency limit is ¼ the sample rate.
Frequency Range (DIN)	From 1 to 315 Hz.
Accuracy (DIN)	DIN 45669-1 Standard.
Transducer Density	Approximately 2.01 g/cc (125 lb/ft^3)
Acoustic	
Weighting	Linear overpressure.
Range	0.0156 Pa (0.000156 Mb) depending on range.
Frequency Range	2 to 250 Hz at 1024 sample rate as per ISEE Seismograph Performance Specifications for Blasting Seismographs 2017 Edition. The upper frequency limit is ¼ the sample rate.
Linear Accuracy	Conforms with ISEE Performance Specifications for Blasting Seismographs 2017 Edition.
General	
Storage Capacity	Up to 4096 waveform and histogram records of any duration.
External Data Storage	Write to USB thumb drive.
System Log	The system log tracks on/off times, changes to setup parameters and system operation.
Operating Modes	Waveform, histogram, histogram/waveform and manual.
Data Reporting	Waveform and histogram events can be reported without needing to deactivate the current operating mode.
Data Retrieval	Data can be downloaded without deactivation of the current mode.

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1B. Specifications of Blast & Environmental Vibration Analyser (SV1)

Operating System	Win CE 5.0	**Communication**	Serial, Wireless(WiFi), CDMA Communication
CPU	PXA320 (806MHz)	**USB Interface**	1 Host, 1 Device
LCD	7" TFT-LCD +TSP	**Power**	5V, 3A
Flash memory	NAND 128MB	**International protection**	IP64
System Memory	DDR SDRAM 128MB	**Operating temperature**	-20~ 50 (-4 ~ 122)
External memory slot	SD/MMC Slot	**Humidity**	5% ~ 95% Non-condensing

DAQ Specifications

A/D Converter	24 Bit
Input Channel	4channel (3ch for Vibration and 1ch for Sound)
Sensor Type	IEPE
Sampling Frequency	Vibration : 1024 Hz for each channel / Sound : 16384Hz
Input Range	± 5V(peak)
Dynamic Range	Sound : 30~140 dB(50mV/Pa) Vibration : 37~146 dB(± 2g Full Scale), 46~156 dB(± 6g Full Scale)
Frequency Range	Vibration : 0.5 ~ 500Hz(3dB) / Sound : 0.5 ~ 8000 Hz(3dB)
Signal to Noise Ratio	>= 120dB

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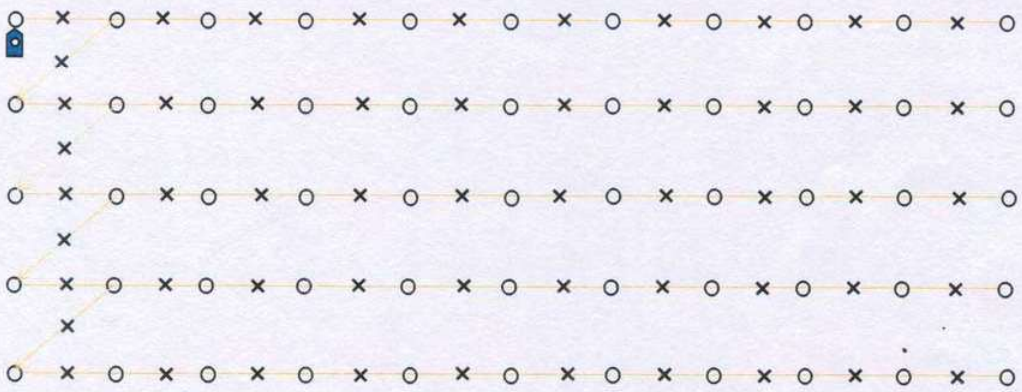
Annexure 2

Blasting patterns followed during trial blast



Spacing – 6m, Burden – 5m

Hole depth- 6m

Delay- x → 25ms

MCPD: 05 holes x Charge per hole

N.B. MCPD: Maximum Charge per Delay

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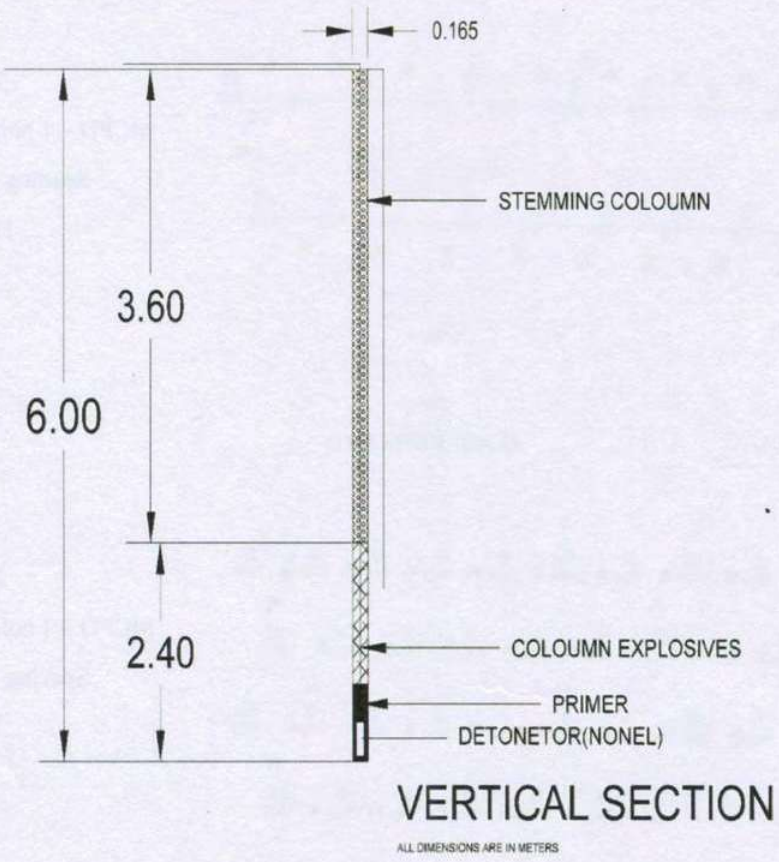
Recommended vertical section of charged hole



N.B.

a. All the dimensions in meters.
b. Stemming column may be kept within (0.5-0.7), where L is depth of hole.
c. All the trial blasts have been conducted by keeping stemming length between 3-3.6 meter

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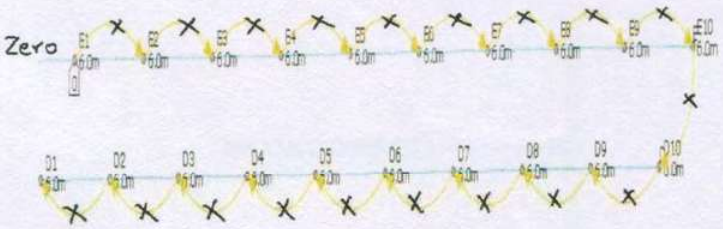
Annexure 3

Recommended Blasting patterns

BLAST PATTERN 1



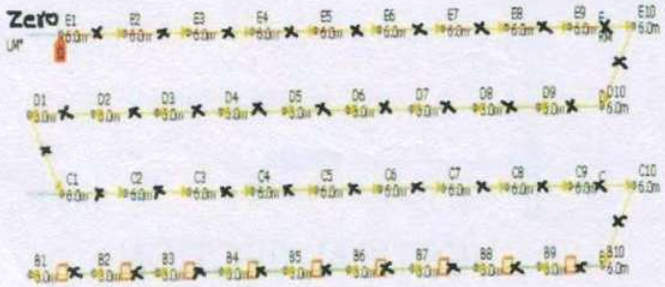
X ⟶ 17 ms/25Ms

MCPD – 1 hole x Charge per hole

Spacing – 5m, Burden – 4m

Hole depth : 5 -6.5m

BLAST PATTERN 2



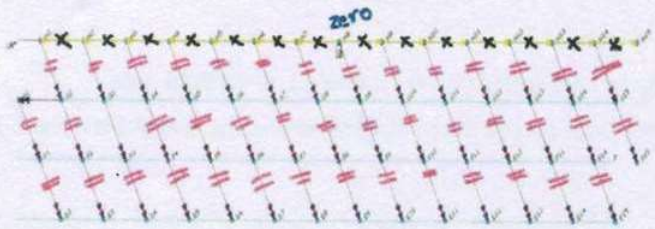
X ⟶ 17 ms/25Ms

MCPD – 1 hole x Charge per hole

Spacing – 5m, Burden – 4m

Hole depth: 5-6.5m

BLAST PATTERN 3



X ⟶ 17 ms

// ⟶ 42 ms

MCPD – 4 hole x Charge per hole

Spacing – 5m, Burden – 4m

Hole depth: 5-6.5m

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BLAST PATTERN 4

X → 17 ms

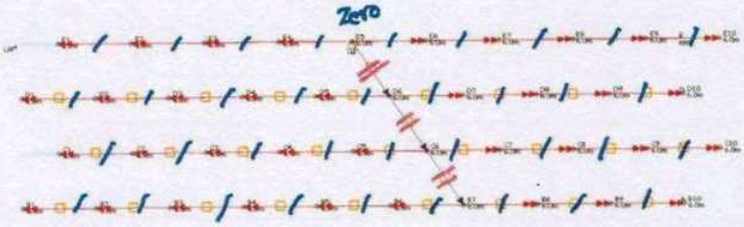
/ → 25 ms

MCPD – 2 hole x Charge per hole

Spacing – 5m, Burden – 4m

Hole depth: 5-6.5m

BLAST PATTERN 5



/ → 25 ms

// → 42 ms

MCPD – 2 hole x Charge per hole

Spacing – 5m, Burden – 4m

Hole depth: 5-6.5m

BLAST PATTERN 6

X → 17 ms

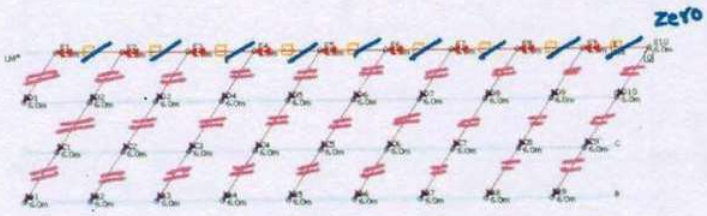
// → 42 ms

MCPD – 4 hole x Charge per hole

Spacing – 5m, Burden – 4m

Hole depth: 5-6.5m

BLAST PATTERN 7



/ → 25 ms

// → 42 ms

MCPD – 3 hole x Charge per hole

Spacing – 5m, Burden – 4m

Hole depth: 5-6.5m

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Annexure 4

Observation No.1

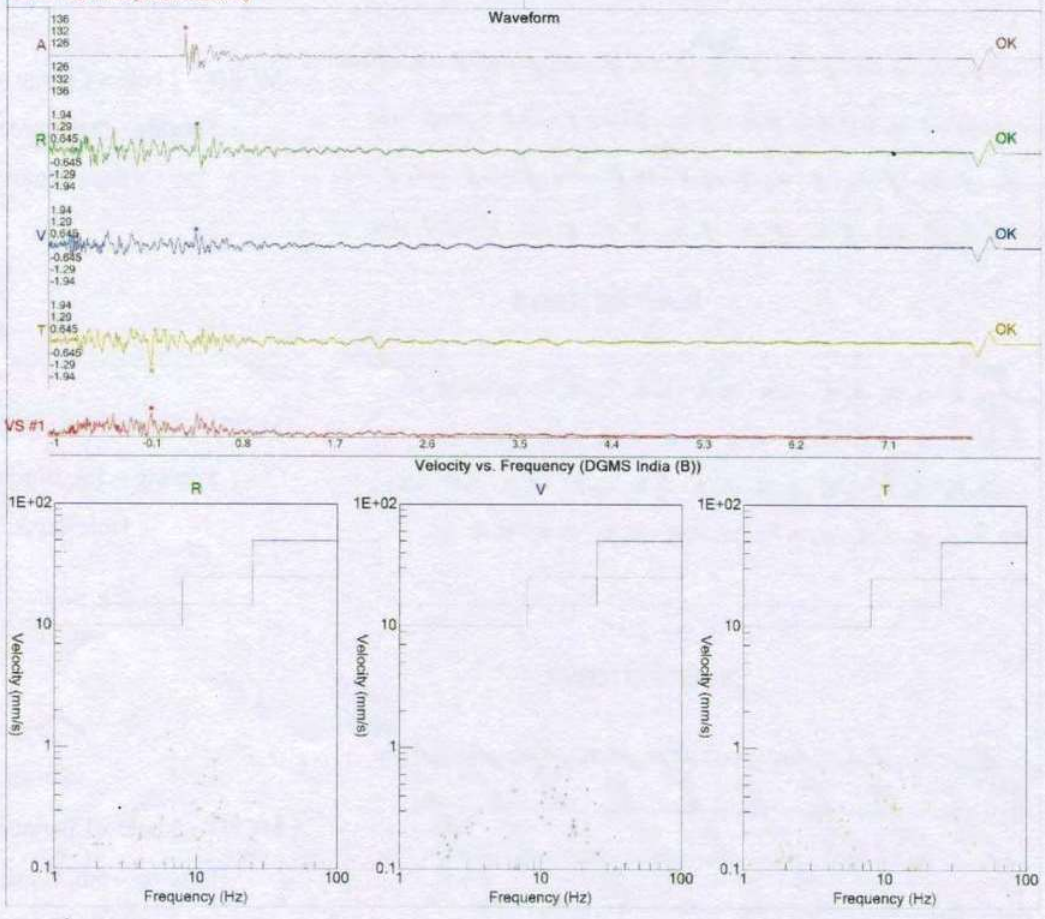
Record: 104372023060116200000688.proevt
Number: 688
Seismograph: Mini-Seis III Pro 10437
Type of Record: Waveform
Date: 01-06-2023 16:20:00
Duration: 9.00 Seconds
Sample Rate: 1024
Pre-Trigger: 1 Seconds
Seismic Trigger: 1.27 mm/s
Acoustic Trigger: 130.0 dB
Seismic Gain: 260.096
Acoustic Gain: 148.2 dB
Voltage: 6.46

Peaks and Frequencies

PPV Maximum (Geo #1): 1.29 mm/s
Acoustic #1: 133.0 dB @ 21.3 Hz (0.3291016 s)
Radial #1: 1.25 mm/s @ 6.4 Hz (0.4433594 s)
Vertical #1: 0.699 mm/s @ 13.1 Hz (0.4326172 s)
Transverse #1: 1.29 mm/s @ 9.1 Hz (0.0009765625 s)
VS #1: 1.33 mm/s (0.0009765625 s)

Graph Information

Time Range: -1 s to 8 s, Intervals: 0.9000 Seconds

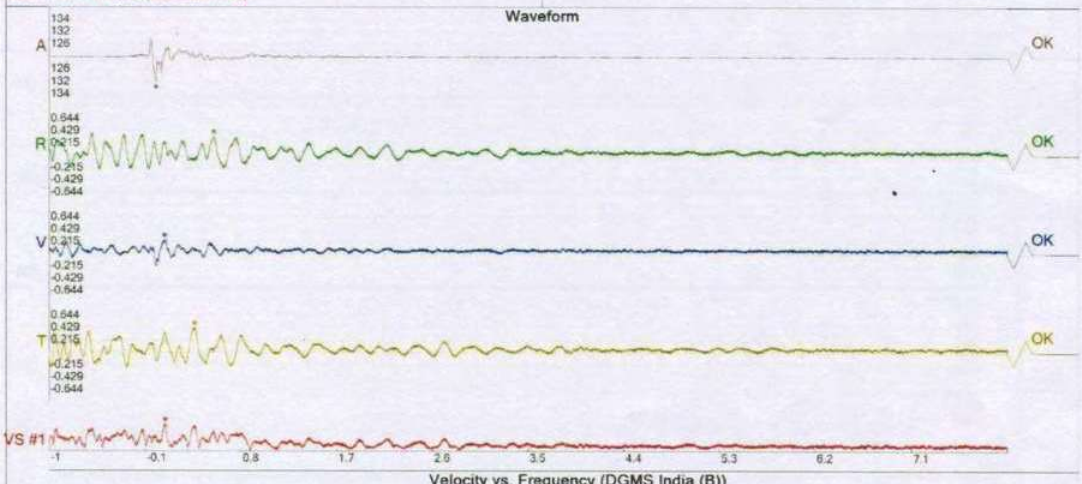


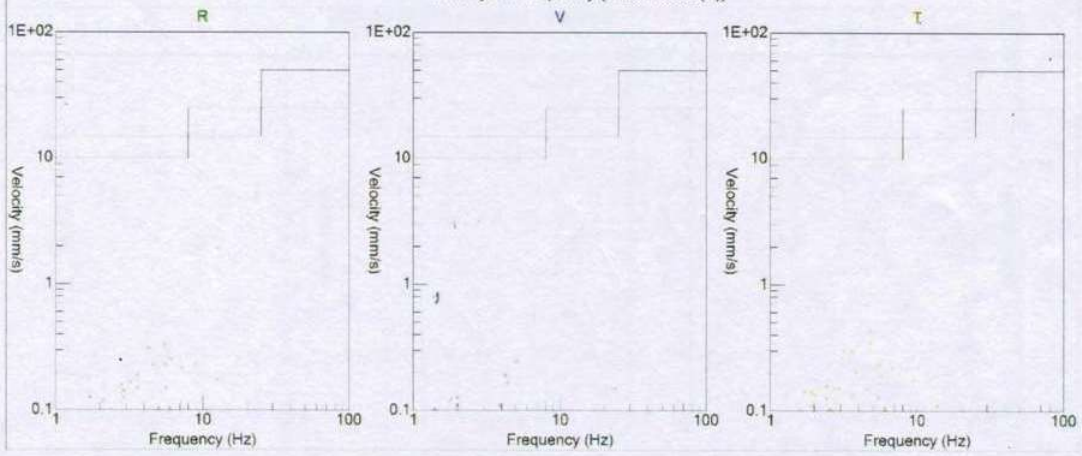
White Seismograph Data Analysis V13

Observation No.2

Record: 1043720230601163529O690.proevt
Number: 690
Seismograph: Mini-Seis III Pro 10437
Type of Record: Waveform
Date: 01-06-2023 16:35:29
Duration: 9.00 Seconds
Sample Rate: 1024
Pre-Trigger: 1 Seconds
Seismic Trigger: 1.4 mm/s
Acoustic Trigger: 130.0 dB
Seismic Gain: 260.096
Acoustic Gain: 148.2 dB
Voltage: 6.39

Peaks and Frequencies	Graph Information
PPV Maximum (Geo #1): 0.429 mm/s	Time Range: -1 s to 8 s, Intervals: 0.9000 Seconds
Acoustic #1: 131.1 dB @ 5.2 Hz (0.004882813 s)	
Radial #1: 0.333 mm/s @ 5.5 Hz (0.5439453 s)	
Vertical #1: 0.246 mm/s @ 5.0 Hz (0.08300781 s)	
Transverse #1: 0.429 mm/s @ 4.8 Hz (0.3632813 s)	
VS #1: 0.474 mm/s (0.08886719 s)	





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Observation No.3

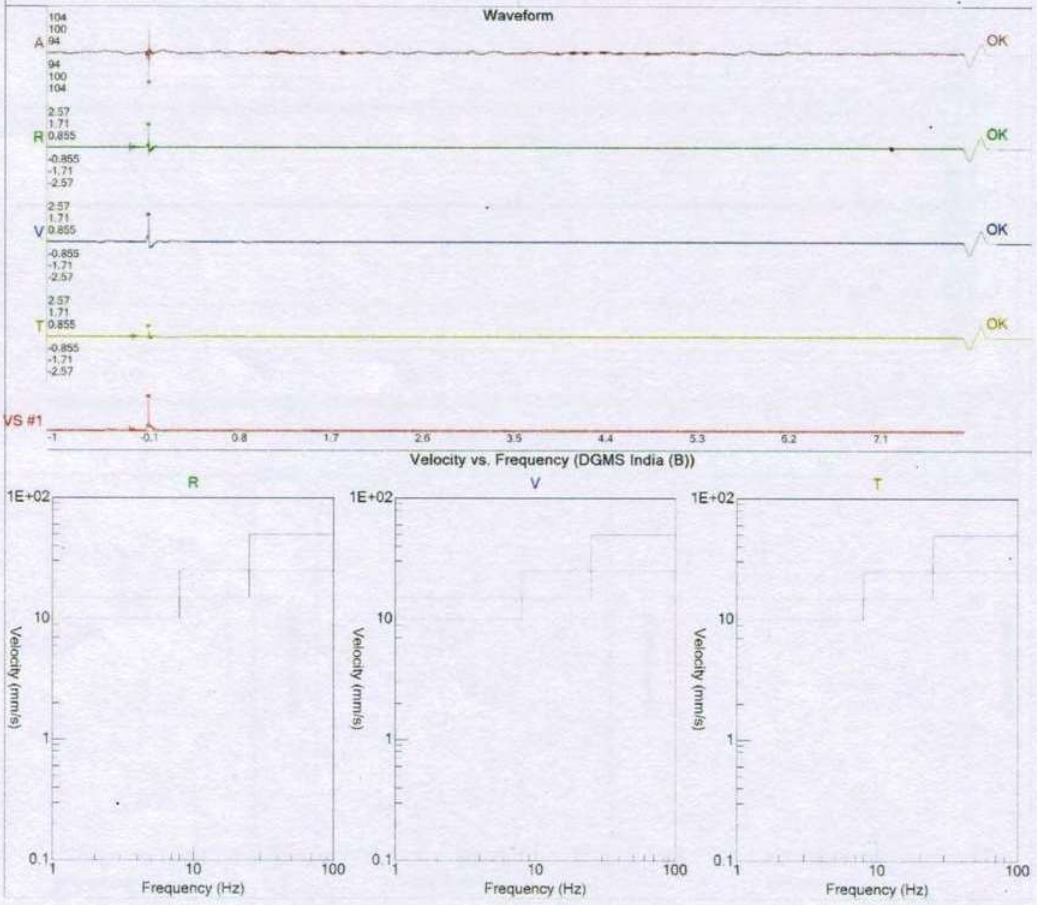
Record: 104372023060116384106 93.proevt
Number: 693
Seismograph: Mini-Seis III Pro 10437
Type of Record: Waveform
Date: 01-06-2023 16:38:41
Duration: 9.00 Seconds
Sample Rate: 1024
Pre-Trigger: 1 Seconds
Seismic Trigger: 1.4 mm/s
Acoustic Trigger: 130.0 dB
Seismic Gain: 260.096
Acoustic Gain: 148.2 dB
Voltage: 6.38

Peaks and Frequencies

PPV Maximum (Geo #1): 1.71 mm/s
Acoustic #1: 99.7 dB @ 58.9 Hz (0.0009765625 s)
Radial #1: 1.38 mm/s @ 3.3 Hz (0 s)
Vertical #1: 1.71 mm/s @ 1.1 Hz (0 s)
Transverse #1: 0.508 mm/s @ 26.9 Hz (0 s)
VS #1: 2.26 mm/s (0 s)

Graph Information

Time Range: -1 s to 8 s, Intervals: 0.9000 Seconds



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Observation No.4

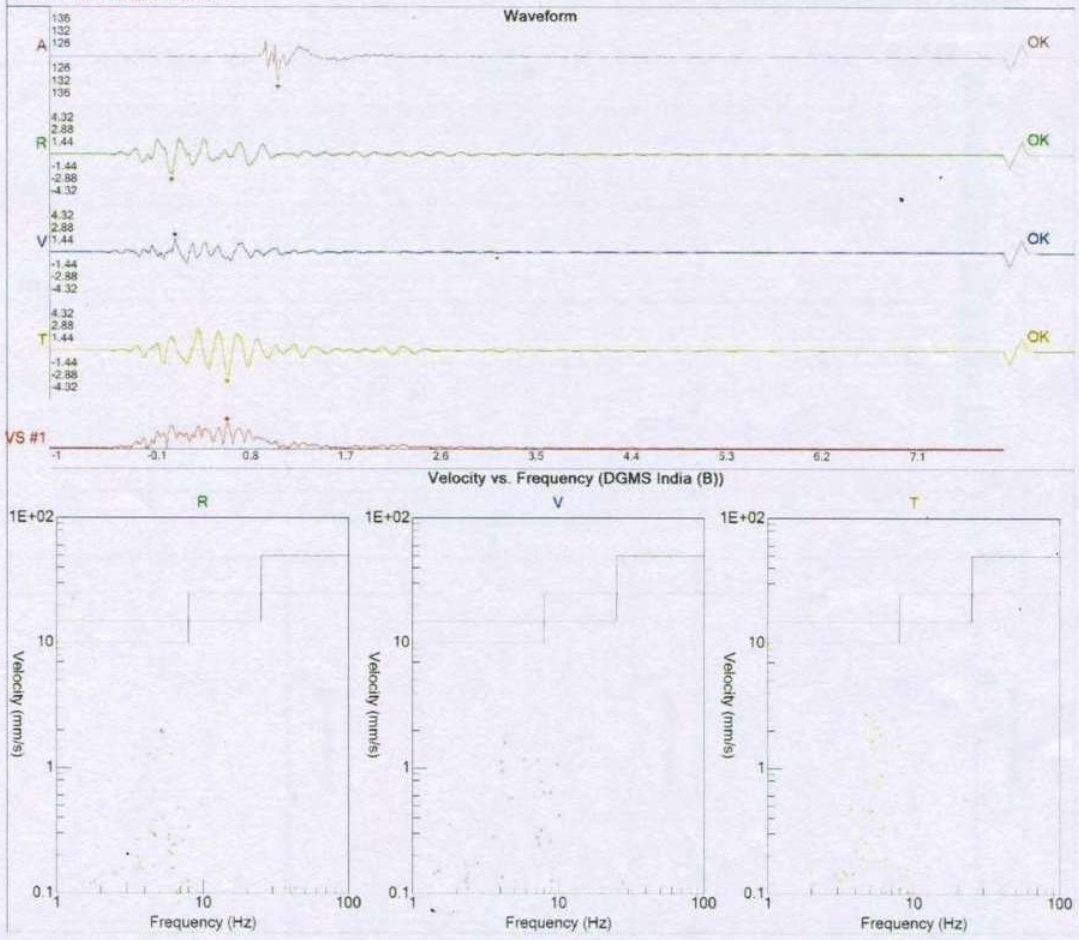
Record: 104372023060216034007O2.proevt
Number: 702
Seismograph: Mini-Seis III Pro 10437
Type of Record: Waveform
Date: 02-06-2023 16:03:40
Duration: 9.00 Seconds
Sample Rate: 1024
Pre-Trigger: 1 Seconds
Seismic Trigger: 1.4 mm/s
Acoustic Trigger: 130.0 dB
Seismic Gain: 260.096
Acoustic Gain: 148.2 dB
Voltage: 6.43

Peaks and Frequencies

PPV Maximum (Geo #1): 2.88 mm/s
Acoustic #1: 132.6 dB @ 8.0 Hz (1.151367 s)
Radial #1: 2.29 mm/s @ 5.7 Hz (0.1503906 s)
Vertical #1: 1.6 mm/s @ 4.3 Hz (0.1796875 s)
Transverse #1: 2.88 mm/s @ 5.8 Hz (0.6699219 s)
VS #1: 2.96 mm/s (0.6699219 s)

Graph Information

Time Range: -1 s to 8 s, Intervals: 0.9000 Seconds



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Observation No.5

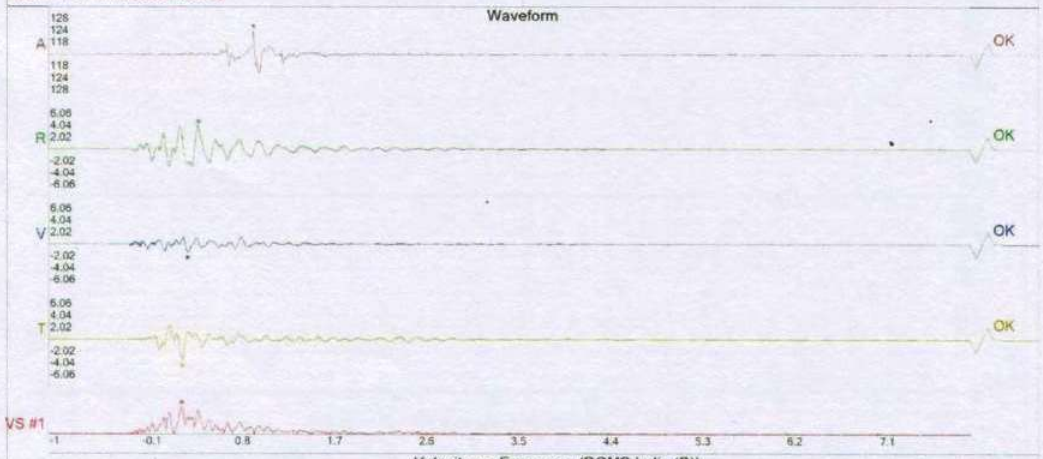
Record: 1043720230602161503070 3.proevt
Number: 703
Seismograph: Mini-Seis III Pro 10437
Type of Record: Waveform
Date: 02-06-2023 16:15:03
Duration: 9.00 Seconds
Sample Rate: 1024
Pre-Trigger: 1 Seconds
Seismic Trigger: 1.4 mm/s
Acoustic Trigger: 130.0 dB
Seismic Gain: 260.096
Acoustic Gain: 148.2 dB
Voltage: 6.40

Peaks and Frequencies

PPV Maximum (Geo #1): 4.04 mm/s
Acoustic #1: 124.8 dB @ 4.9 Hz (0.9951172 s)
Radial #1: 4.04 mm/s @ 5.6 Hz (0.4570313 s)
Vertical #1: 1.36 mm/s @ 7.4 Hz (0.3564453 s)
Transverse #1: 3.54 mm/s @ 7.9 Hz (0.3027344 s)
VS #1: 4.77 mm/s (0.2949219 s)

Graph Information

Time Range: -1 s to 8 s, Intervals: 0.9000 Seconds



White Seismograph Data Analysis V13

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Observation No.6

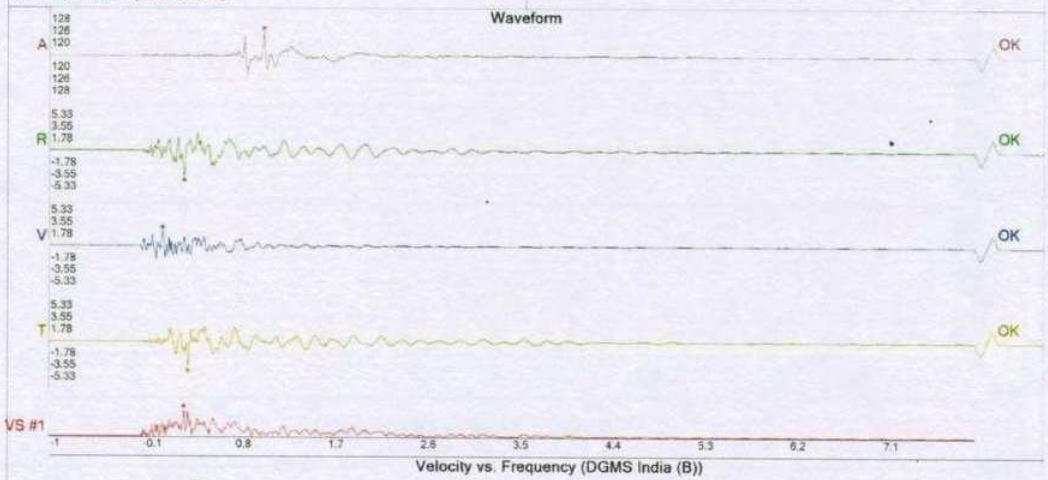
Record: 104372023060316311707l0.proevt
Number: 710
Seismograph: Mini-Seis III Pro 10437
Type of Record: Waveform
Date: 03-06-2023 16.31.17
Duration: 9.00 Seconds
Sample Rate: 1024
Pre-Trigger: 1 Seconds
Seismic Trigger: 1.4 mm/s
Acoustic Trigger: 130.0 dB
Seismic Gain: 260.096
Acoustic Gain: 148.2 dB
Voltage: 6.48

Peaks and Frequencies

PPV Maximum (Geo #1): 3.55 mm/s
Acoustic #1: 125.3 dB @ 12.2 Hz (1.081055 s)
Radial #1: 3.55 mm/s @ 8.0 Hz (0.3085938 s)
Vertical #1: 2.21 mm/s @ 14.6 Hz (0.1015625 s)
Transverse #1: 3.53 mm/s @ 6.6 Hz (0.3476563 s)
VS #1: 3.97 mm/s (0.3085938 s)

Graph Information

Time Range: -1 s to 8 s, Intervals: 0.9000 Seconds



White Seismograph Data Analysis V13

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Observation No.7

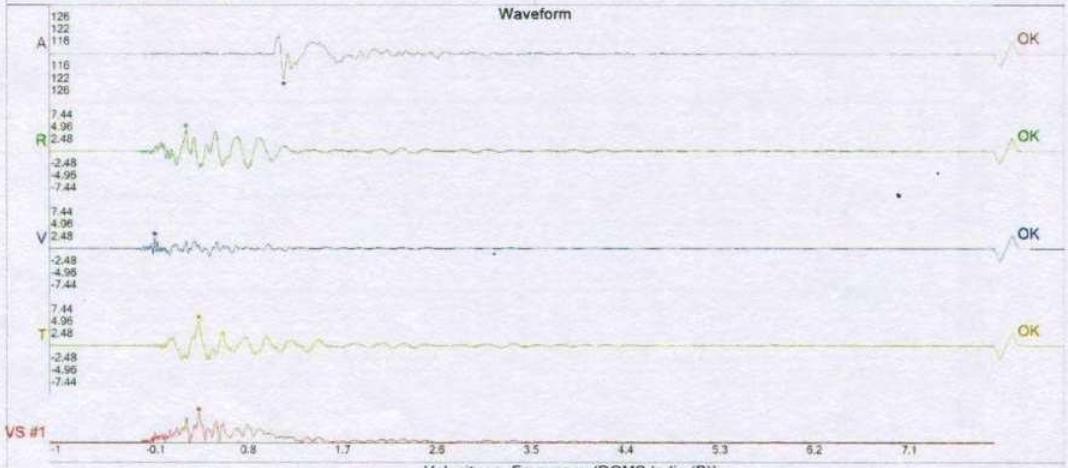
Record: 1043720230603163846071 2.proevt
Number: 712
Seismograph: Mini-Seis III Pro 10437
Type of Record: Waveform
Date: 03-06-2023 16:38:46
Duration: 9.00 Seconds
Sample Rate: 1024
Pre-Trigger: 1 Seconds
Seismic Trigger: 1.4 mm/s
Acoustic Trigger: 130.0 dB
Seismic Gain: 260.096
Acoustic Gain: 148.2 dB
Voltage: 6.47

Peaks and Frequencies

PPV Maximum (Geo #1): 4.96 mm/s
Acoustic #1: 122.1 dB @ 8.5 Hz (1.231445 s)
Radial #1: 4.28 mm/s @ 6.2 Hz (0.3007813 s)
Vertical #1: 2.16 mm/s @ 30.1 Hz (0.002929688 s)
Transverse #1: 4.96 mm/s @ 3.8 Hz (0.4179688 s)
VS #1: 6.07 mm/s (0.4199219 s)

Graph Information

Time Range: -1 s to 8 s, Intervals: 0.9000 Seconds



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Observation No. 8

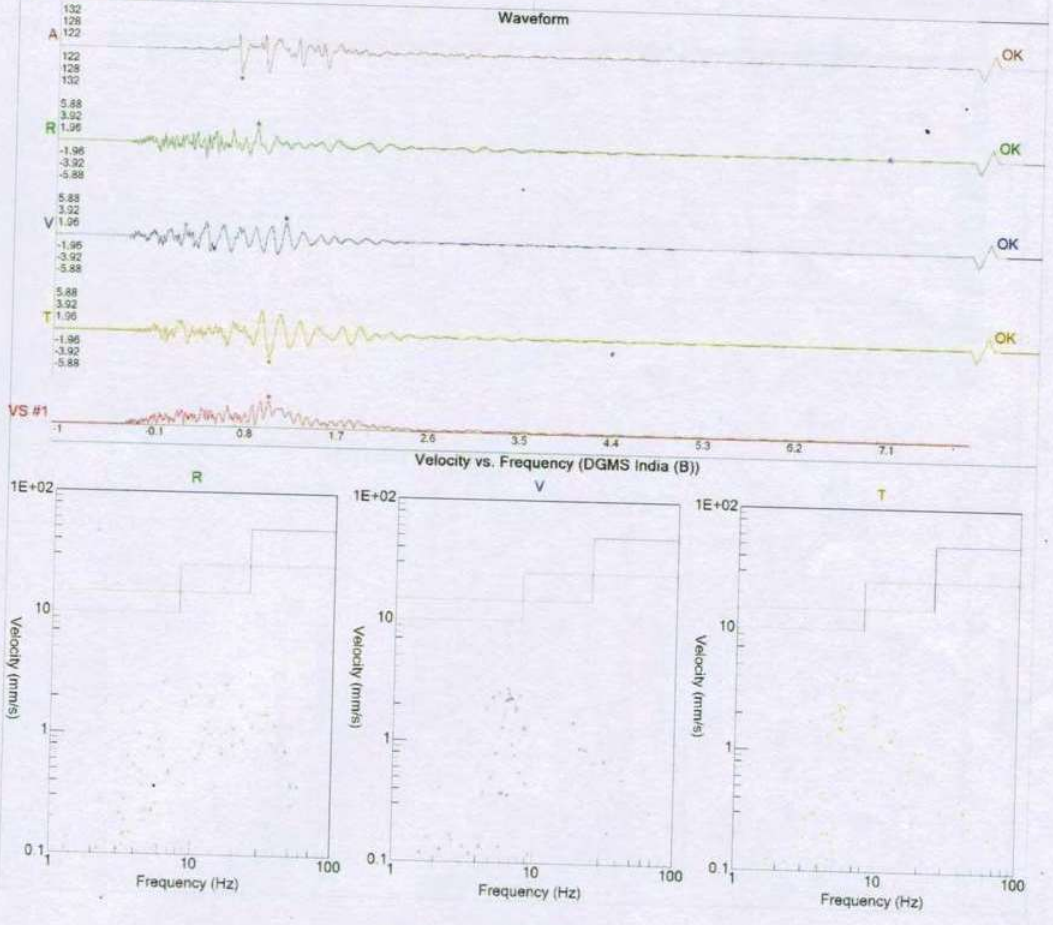
Record: 104372023060316464507 13.proevt
Number: 713
Seismograph: Mini-Seis III Pro 10437
Type of Record: Waveform
Date: 03-06-2023 16:46:45
Duration: 9.00 Seconds
Sample Rate: 1024
Pre-Trigger: 1 Seconds
Seismic Trigger: 1.4 mm/s
Acoustic Trigger: 130.0 dB
Seismic Gain: 260.096
Acoustic Gain: 148.2 dB
Voltage: 6.42

Peaks and Frequencies

PPV Maximum (Geo #1): 3.92 mm/s
Acoustic #1: 128.4 dB @ 6.9 Hz (0.7910156 s)
Radial #1: 2.64 mm/s @ 6.3 Hz (0.9599609 s)
Vertical #1: 2.77 mm/s @ 6.5 Hz (1.254883 s)
Transverse #1: 3.92 mm/s @ 5.2 Hz (1.115234 s)
VS #1: 4.49 mm/s (1.119141 s)

Graph Information

Time Range: -1 s to 8 s, Intervals: 0.9000 Seconds



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Observation No. 9

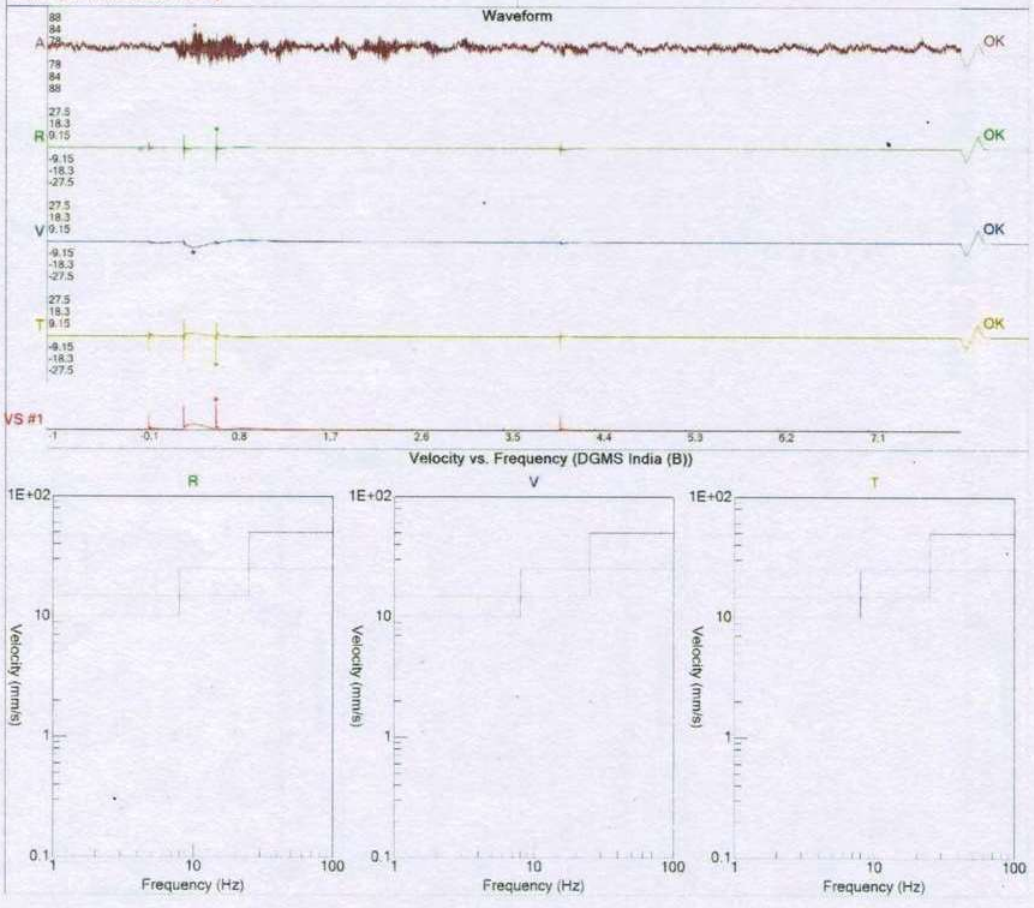
Record: 104372023060316471107l4.proevt
Number: 714
Seismograph: Mini-Seis III Pro 10437
Type of Record: Waveform
Date: 03-06-2023 16:47:11
Duration: 9.00 Seconds
Sample Rate: 1024
Pre-Trigger: 1 Seconds
Seismic Trigger: 1.4 mm/s
Acoustic Trigger: 130.0 dB
Seismic Gain: 260.096
Acoustic Gain: 148.2 dB
Voltage: 6.42

Peaks and Frequencies

PPV Maximum (Geo #1): 18.3 mm/s
Acoustic #1: 84.3 dB @ 28.4 Hz (0.4482422 s)
Radial #1: 11.2 mm/s @ 170.7 Hz (0.6640625 s)
Vertical #1: 4.21 mm/s @ 1.6 Hz (0.4384766 s)
Transverse #1: 18.3 mm/s @ 128.0 Hz (0.6621094 s)
VS #1: 20.7 mm/s (0.6621094 s)

Graph Information

Time Range: -1 s to 8 s, Intervals: 0.9000 Seconds



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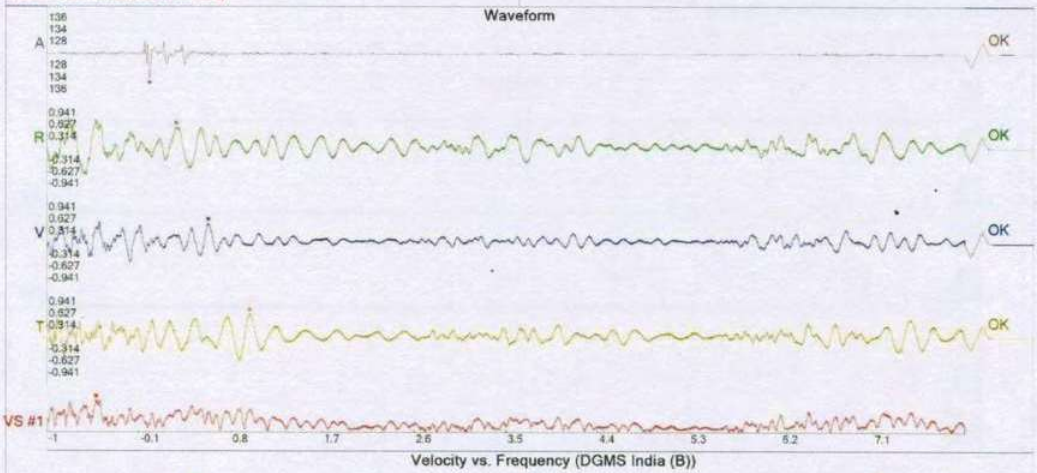
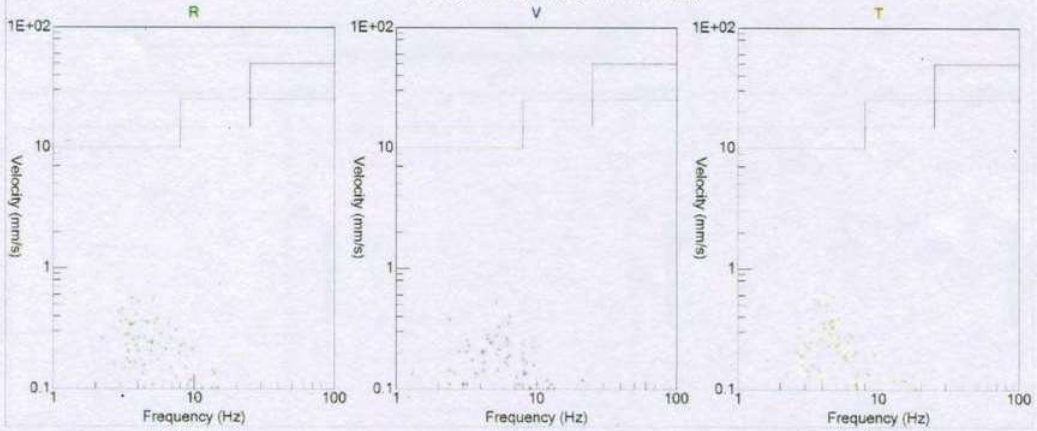
Observation No. 10

Record: 104372023060516082607 27.proevt
Number: 727
Seismograph: Mini-Seis III Pro 10437
Type of Record: Waveform
Date: 05-06-2023 16:08:26
Duration: 9.00 Seconds
Sample Rate: 1024
Pre-Trigger: 1 Seconds
Seismic Trigger: 1.4 mm/s
Acoustic Trigger: 130.0 dB
Seismic Gain: 260.096
Acoustic Gain: 148.2 dB
Voltage: 6.49

Peaks and Frequencies	Graph Information
PPV Maximum (Geo #1): 0.627 mm/s	Time Range: -1 s to 8 s, Intervals: 0.9000 Seconds
Acoustic #1: 133.1 dB @ 15.5 Hz (0.005859375 s)	
Radial #1: 0.564 mm/s @ 3.6 Hz (0.2666016 s)	
Vertical #1: 0.524 mm/s @ 5.2 Hz (0.5771484 s)	
Transverse #1: 0.627 mm/s @ 4.2 Hz (0.9833984 s)	
VS #1: 0.86 mm/s (-0.5195313 s)	





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Observation No. 11

Record: 104372023060516173807 29.proevt
Number: 729
Seismograph: Mini-Seis III Pro 10437
Type of Record: Waveform
Date: 05-06-2023 16:17:38
Duration: 9.00 Seconds
Sample Rate: 1024
Pre-Trigger: 1 Seconds
Seismic Trigger: 1.4 mm/s
Acoustic Trigger: 130.0 dB
Seismic Gain: 260.096
Acoustic Gain: 148.2 dB
Voltage: 6.47

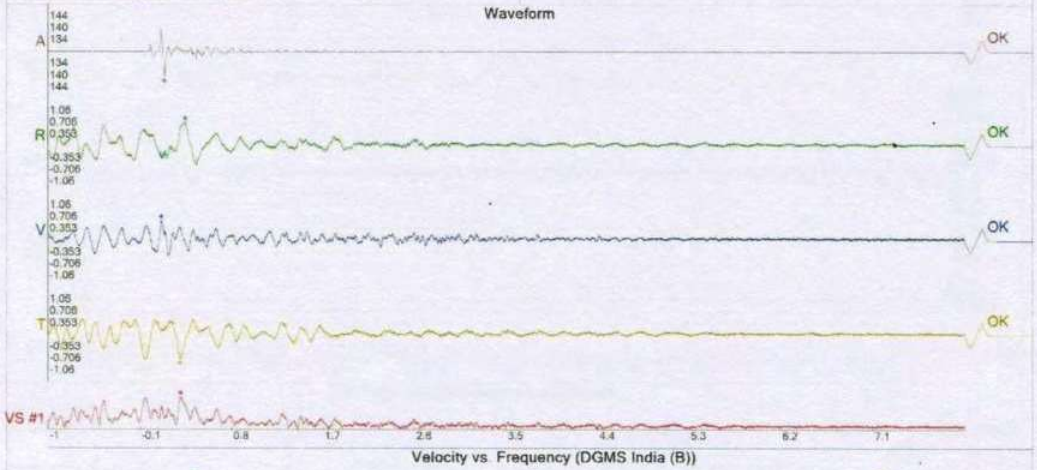
Peaks and Frequencies

PPV Maximum (Geo #1): 0.706 mm/s
Acoustic #1: 140.3 dB @ 12.8 Hz (0.1425781 s)
Radial #1: 0.706 mm/s @ 3.7 Hz (0.34375 s)
Vertical #1: 0.579 mm/s @ 6.7 Hz (0.109375 s)
Transverse #1: 0.683 mm/s @ 4.7 Hz (0.2919922 s)
VS #1: 0.958 mm/s (0.2978516 s)

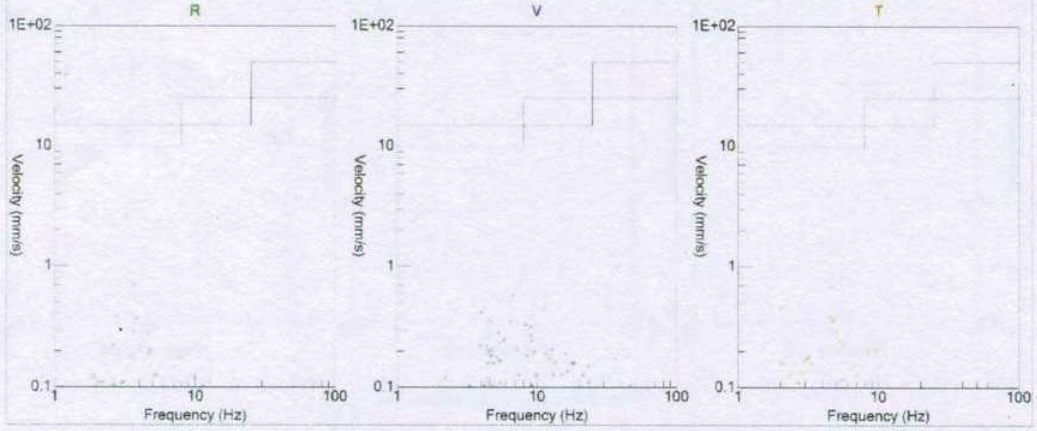
Graph Information

Time Range: -1 s to 8 s. Intervals: 0.9000 Seconds

Waveform



Velocity vs. Frequency (DGMS India (B))



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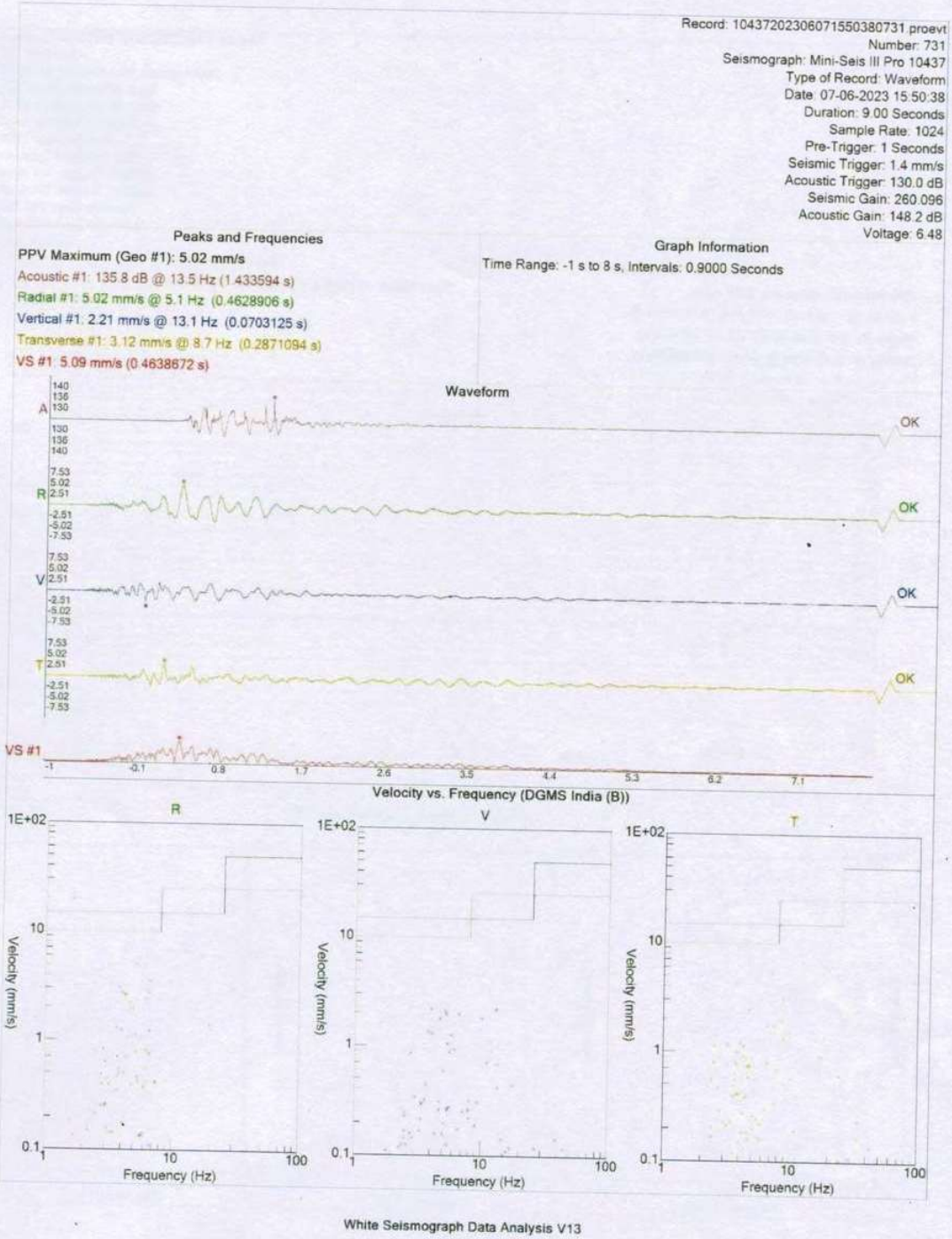
Observation No. 12



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Observation No. 13

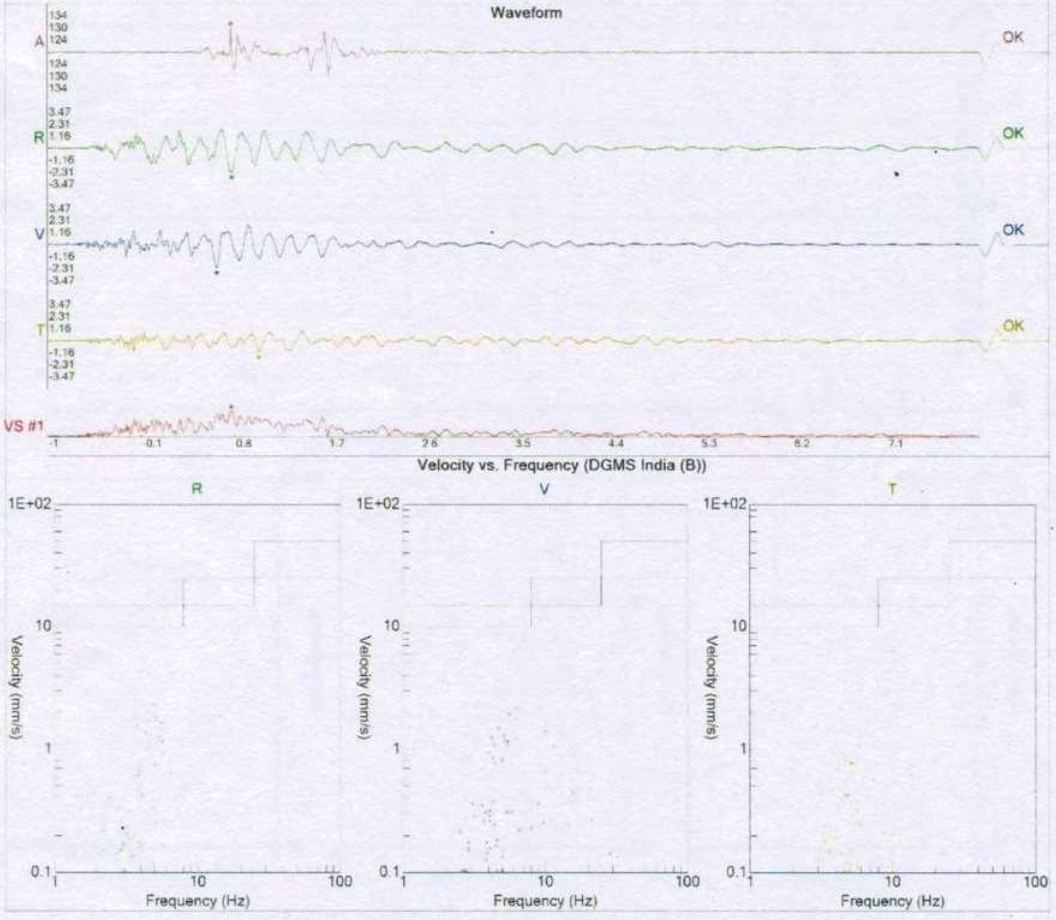
Record: 104372023060715553007 33.proevt
Number: 733
Seismograph: Mini-Seis III Pro 10437
Type of Record: Waveform
Date: 07-06-2023 15:55:30
Duration: 9.00 Seconds
Sample Rate: 1024
Pre-Trigger: 1 Seconds
Seismic Trigger: 1.4 mm/s
Acoustic Trigger: 130.0 dB
Seismic Gain: 260.096
Acoustic Gain: 148.2 dB
Voltage: 6.43

Peaks and Frequencies

PPV Maximum (Geo #1): 2.31 mm/s
Acoustic #1: 130.0 dB @ 28.4 Hz (0.7685547 s)
Radial #1: 2.31 mm/s @ 5.0 Hz (0.7763672 s)
Vertical #1: 2.17 mm/s @ 6.3 Hz (0.6318359 s)
Transverse #1: 1.06 mm/s @ 5.8 Hz (1.03418 s)
VS #1: 2.47 mm/s (0.7695313 s)

Graph Information

Time Range: -1 s to 8 s, Intervals: 0.9000 Seconds



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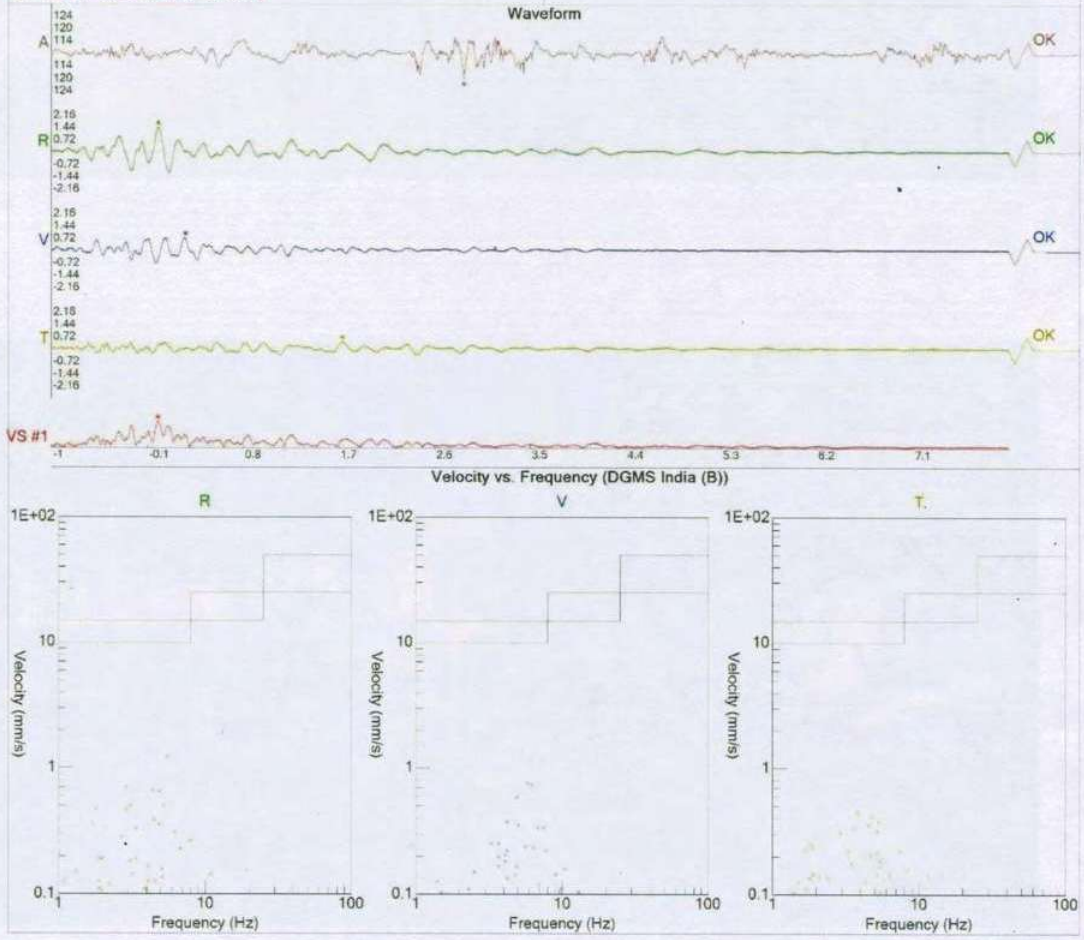
Observation No. 14

Record: 1043720230607155736073 8.proevt
Number: 738
Seismograph: Mini-Seis III Pro 10437
Type of Record: Waveform
Date: 07-06-2023 15:57:36
Duration: 9.00 Seconds
Sample Rate: 1024
Pre-Trigger: 1 Seconds
Seismic Trigger: 1.4 mm/s
Acoustic Trigger: 130.0 dB
Seismic Gain: 260.096
Acoustic Gain: 148.2 dB
Voltage: 6.41

Peaks and Frequencies	Graph Information
PPV Maximum (Geo #1): 1.44 mm/s	Time Range: -1 s to 8 s, Intervals: 0.9000 Seconds
Acoustic #1: 120.5 dB @ 8.7 Hz (2.874023 s)	
Radial #1: 1.44 mm/s @ 4.9 Hz (0.002929688 s)	
Vertical #1: 0.762 mm/s @ 5.8 Hz (0.2548828 s)	
Transverse #1: 0.445 mm/s @ 3.8 Hz (1.733398 s)	
VS #1: 1.54 mm/s (-0.0009765625 s)	



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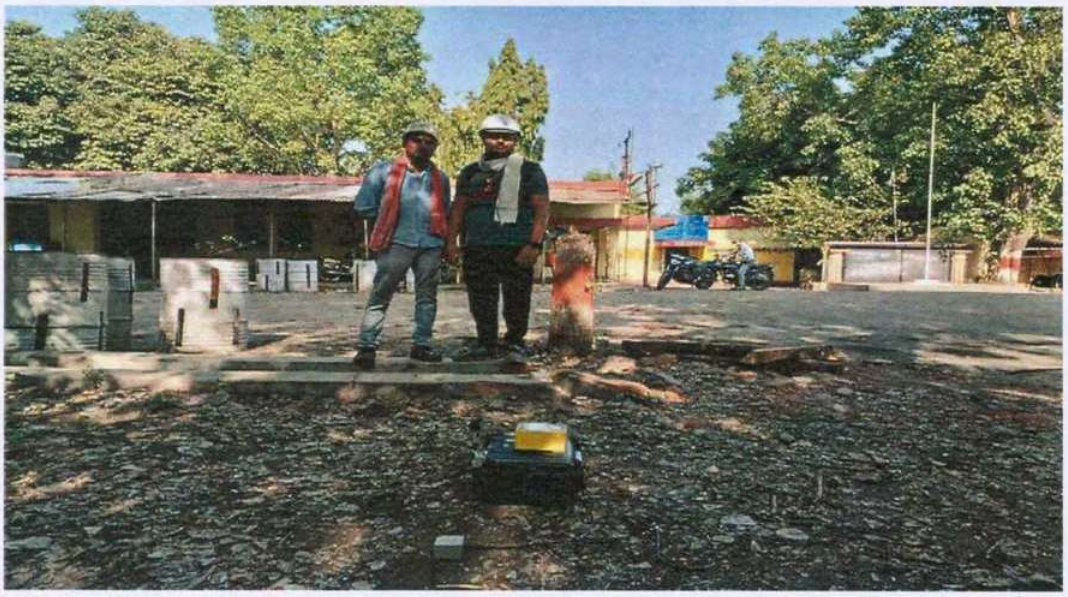
Annexure 5

Blasting Photo Gallery



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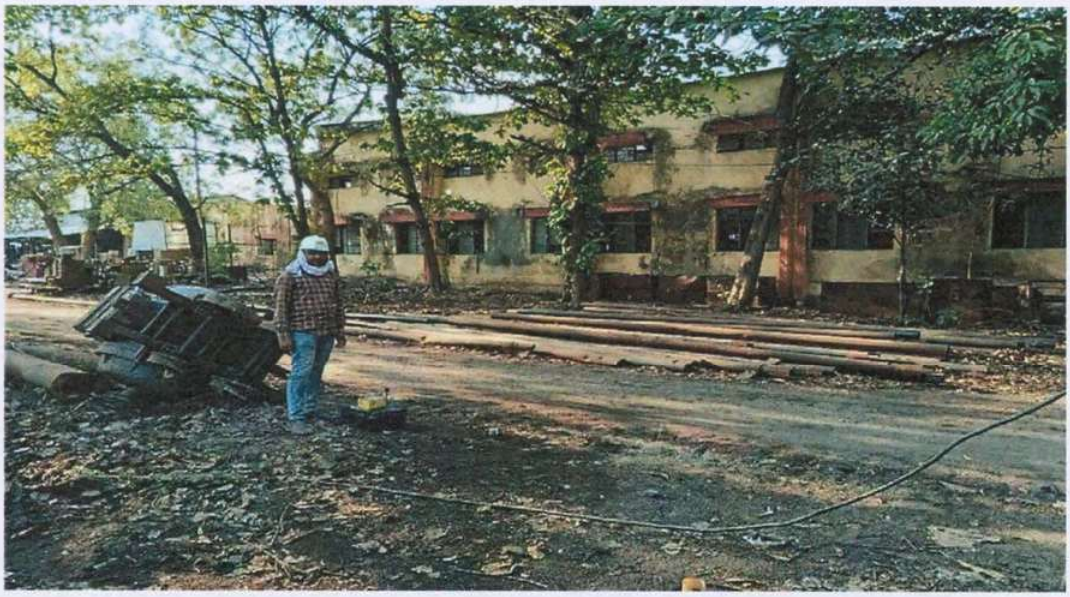

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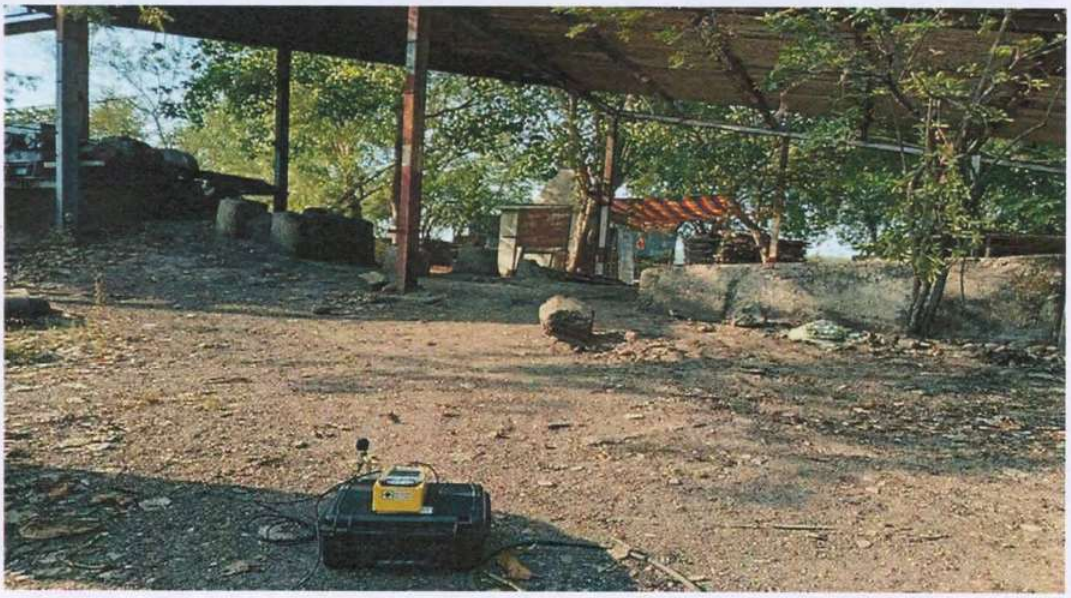

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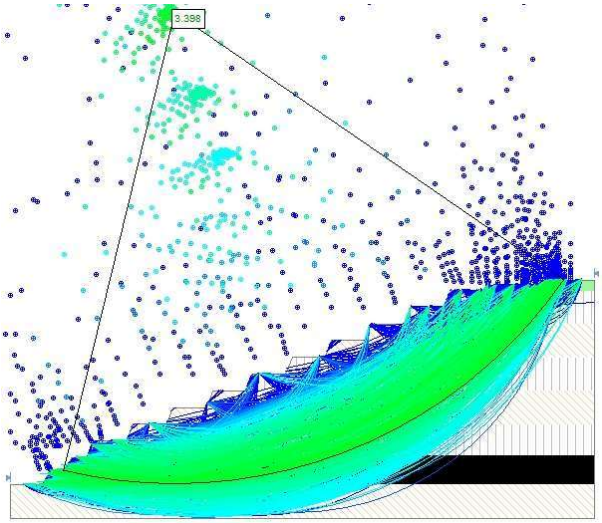
STABILITY ANALYSIS OF PIT AND OVERBURDEN DUMP SLOPES AT DHOPTALA OPENCAST MINE

Prepared for

WESTERN COALFIELDS LIMITED



INDIAN INSTITUTE OF ENGINEERING SCIENCE AND TECHNOLOGY, SHIBPUR

Howrah-711103

October 2022

WCL Ref No: WCL/BA/AGM/SAFETY/2021/290

IIEST Project Code: DRC/WCL-CON/MIN/PD/000/21-22

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6.1 GENERAL CONCLUSIONS AND RECOMMENDATIONS FROM THE SCIENTIFIC STUDY 25
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This is to certify that the Department of Mining Engineering of Indian Institute of Engineering Science and Technology, Shibpur carried out the scientific study “Stability Analysis of Pit and Overburden Dumps at Dhoptala Opencast Mines” for Western Coalfields Limited. The study was carried out as per the requirements of Regulation 106 of Coal Mines Regulations 2017 and associated Technical Circulars.

Best possible scientific judgements were exercised in carrying out the study based on information available from the mine, assessments made during site visits, laboratory analysis of rock samples, and subsequent slope stability modelling studies.

It is advised that the mine should follow the design parameters of pits and overburden dumps, operational advices, and the slope monitoring recommendations for safe operation of the mine.

Dutta

Md. Mirajul Islam

(Pratik Dutta)

Professor

(Md Mirajul Islam)

Assistant Professor, Gr. I

1 INTRODUCTION

As per Regulation No 106 (2) of Coal Mines Regulations 2017, "*before starting a mechanised opencast working, the owner and agent of the mine shall ensure that the mine, including its method of working, ultimate pit slope, dump slope and monitoring of slope stability, has been planned, designed and worked as determined by a scientific study*". Further specifications on width and height of benches are elaborated in other sub-regulations of Reg 106. Specific provisions for design of spoil-banks and dumps are contained in Reg 108. Accordingly, Western Coalfields Limited (WCL) issued Work Order No. WCL/BA/AGM/SAFETY/2021/290 in favour of Indian Institute of Engineering Science and Technology, Shibpur (IIEST) as the Scientific Agency entrusted with taking up slope stability study at Dhoptala opencast mine of Ballarpur Area. The scope of work, as indicated by WCL in its Work Order, necessitated a scientific study for stability of pits and overburden (OB) dumps. The client further asked the Consultants to suggest slope design parameters, precautions for maintaining stability of slopes, and the method of slope monitoring.

The Consultants from IIEST visited the mine to see the mine working and collect relevant information for the study. Detailed discussions were held with the mine officials for requirement of relevant information. The consultants also guided mine officials about the process of or rock samples collection from pits and dumps. Subsequently, upon receipt of the required information and the samples from the mine, detailed scientific analysis was then carried out pertaining to the scope of the study. The report contains findings of the scientific study along with specific recommendations. In carrying out the study, specific references were made to the provisions contained in Coal Mine Regulations (CMR) 2017, Regulation No 106 (2), which mandates every opencast coal mine to ensure its "method of working, ultimate pit slope, dump slope and monitoring of slope stability has been planned, designed, and worked as determined by a scientific study". Furthermore, provisions of Regulation 108 of CMR 2017, circulars 02 of 2020 and 03 of 2020 issued by Director General of Mines Safety (DGMS), which are relevant to the study and have been included within the scope of work.

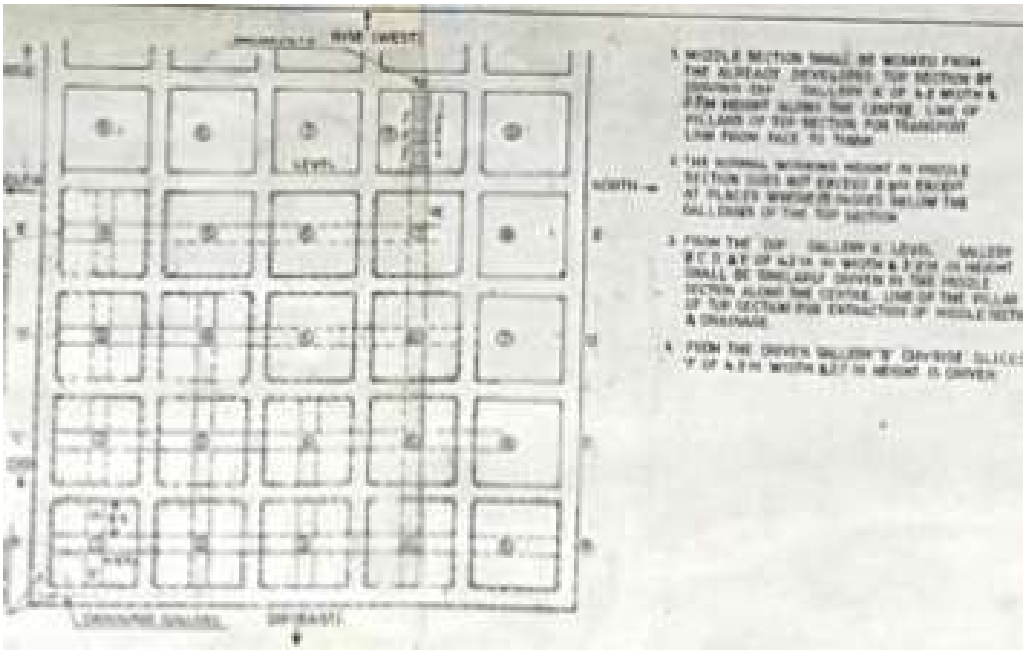
2 BRIEF DESCRIPTION OF DHOPTALA OPENCAST MINE

The Dhoptala OCM is located in the Ballarpur Area of Western Coalfields Limited. The Dhoptala geological block is eight sectors, A to G, on the basis of deposition of faults. The mine is to be developed by converting the erstwhile Sasti underground mine in sectors D, E, F, G, and H of the Dhoptala Geological block. As per the Project Report (PR), the mine will have a production capacity of 2.50 million ton per annum.

2.1 Geological and Mining conditions

Dhoptala Geological Block of the Wardha Valley Coalfield is located in southern bank of the Wardha river near Ballarpur in Chandrapur district of Maharashtra. Sector A to F of the coal block was identified as amenable to opencast mining. Sector A to C have already been worked out in the old Dhoptala OCM. Later on, it was proposed to convert the underground working of the Sasti mine into opencast working.

There is a composite coal seam (Ballarpur seam) of 5.3 m to 19.3 m (average 16 m) thickness inter-banded with carbonaceous shale and sandstone in the area. The seam is split into two sections with an average parting of 2.86 m. Strike of the seam is NNE-SSW and the dip varies between 1 in 15 to 1 in 20 towards East. For working of the seam during underground mining, the seam was worked in three sections- the top section of 2.7 m, followed by the middle section of 2.1 m, a parting of 3.243 m, and finally the bottom section of 2.7 m. The pillars and galleries in the top and middle sections are staggered in a fashion, shown in the sketch below. The bottom section, below the parting is developed independently. In this geological block, sector E is partially depillared in all the three sections of the composite seam through panels R1 and R2. Sector F has similarly been partially worked out through R3, R3 extension, and R3 extension II. Four panels- R4A, R5A, R5B, and R5C have been completely depillared and isolated in sector H. The remaining parts of the sectors D, E, F, G, and H have been developed in major portion by underground bord and pillar method.



The boundary of the mine is defined as below:

West (Rise side): Half incrop of the composite seam

East (dip side): 150 m depth in Sector H and 175 m safe distance from Dhoptala nala

North- 175 m safe distance from Wardha river and merging with the quarry floor of the old Dhoptala OC in Sector C

South- 60 m distance from the surface of Sasti expansion OC

Average strike length of the mine will be 1700 m on the surface and 1400 m on the floor. Average width will be 1700 m on the surface and 1500 m on the floor.

2.2 Method of working

The total mineable reserve in the block is estimated to be 53.73 million ton. The mine will be worked by shovel-dumper combination by inclined slicing method. Both coal and OB extraction will be completely outsourced. The working plan of Dhoptala OCM and the proposed dumping area are shown in Figure 1 and Figure 2, respectively. The average stripping ratio is calculated to be 5.20 m^3/ton.

Sasti village is located on the rise side of the block, which would be rehabilitated after a few years. Therefore, initially the quarry surface boundary is proposed at a safe distance of 300 m from the village. After rehabilitation of the village, the rise side of the quarry would be extended towards the village.

For accessing the seam, the access trench will be driven at a gradient of 1 in 16 on the western side. The major portion of the access trench will be over the full thickness of the coal seam in Sector E. This is necessitated due to the existence of the Sasti village and the need to keep a safe distance of 300 m from the village. Due to this limitation, the full thickness of the mine is expected to be touched at 45 m depth from surface. After touching the seam, the box cut will be created in Sector E and the mine will be deepened along the dip direction by opening strike length of the mine. After working in Sector E, the quarry will extend to Sector F, G, balance part of Sector E (after rehabilitation of Sasti village), and finally to Sector H up to 150 m.

2.2.1 Dumping strategy

It is planned to extract about 279.5 Mm^3 of in situ OB from the mine, out of which 34.30 Mm^3 will be black cotton (BC) soil and 245.20 Mm^3 will be hard OB. In addition, 9.66 Mm3 OB from the old Dhoptala OCM worked in Sector C and dumped into Sector D, E, and H of the proposed quarry area needs to be rehandled. The entire OB will be dumped into the external dumps, to be created, as shown in Figure 2.

While removing OB from the mine in Sector E near the Sasti village, proper controlled blasting technique needs to be adopted along with ground vibration monitoring to rule out any damage

to the structures in the village and also to avoid fly rocks. For this purpose, a scientific study needs to conducted for proper planning of drilling and blasting technique to be adopted while working near the village. Throughout the mine deep-hole drilling with SME or similar bulk explosives is recommended. However, depending on the availability or convenience, ANFO with cast boosters and shock tube initiation system can also be used.

2.2.2 Width and height of benches

For overburden, keeping the bench height of 10 m, the width of working and non-working benches is kept at 30 m and 20 m, respectively. Haul road would be constructed on the floor of the quarry at a gradient of 1 in 16 with a width sufficient for dumper movement, dozer path, drainage, electrification etc. Flank roads shall be developed on eastern and western batter for transport from different horizons. Height of benches in BC soil has been considered to be 3 m. However, the width of final benches is proposed to be kept 10 m.

2.2.3 Slope of benches and quarry

The slope of individual benches in top soil is proposed to be 45^{o} and 70^{o} in hard strata. The overall slope of quarry on the dip side during mining operation will vary between 18^{o} to 22^{o}. At the end of the quarry, the overall angle of batter is proposed to be 37^{o} both on the dip and rise sides.

2.2.4 Mining strategy

Access trench will be driven at a gradient of 1 in 16 to touch the floor of the composite seam at full thickness and at a depth of 45 m. After making the access trench, a box cut would be made in sector E and then deepen the mine along the dip direction by opening the total strike length of the mine. Sector E would be worked first leaving 300 m distance from the Sasti village for rehabilitation of the village. This will be followed by working in the sector F, balance part of sector F, G, balance part of sector E (after rehabilitation of Sasti village), and finally in sector H up to 150 m depth.

The coal seam is partially extracted in most of the sectors. As mentioned in section 2.1, in some areas only development has been done while in other areas, both development and depillaring with sand stowing have been done in all the three sections of the seam. Therefore, special care may be needed while working the coal seam. The following steps are suggested for safe working over the developed pillars.

- Before commencing extraction of the coal seam, it must be ensured that the underground working plan is accurate. The exact positions of the underground galleries for all the sections of the seam should be marked on the quarry plan.
- As the quarry operations proceed towards the dip side, before developing the coal benches, it is to be ensured that the depth of cover over the coal seam is not less than 4 m.

- Position of galleries and junction shall be marked clearly on the ground with different colours for the three sections of the working. Marching of drill shall, as far as practicable, be over the solid pillar and not over the galleries and junctions.
- In most of the places, all the three sections of the seam have been developed. The top and middle sections are almost consecutive, which make the two section to be considered as a single composite section. The parting between this composite section and the bottom section is much less than the required parting of 6 m for developing two benches separately for the two sections. Therefore, the entire seam has to be blasted as a whole along with the top overburden parting of 4 m. Holes are to be drilled up to the floor of the bottom section from the top of the 4 m cover of the overburden. However, the entire drilling operation has to be closely supervised. The holes above the galleries, however, should terminate at least 1.5 m above the galleries. The entire composite layers of overburden and coal can then be blasted at once.
- Test holes shall be drilled to ascertain the thickness of top parting before commencement of the actual drilling operation.
- The holes shall be charged with water ampules or with moist sand of around 1 m length at the bottom of the hole.
- Slurry or emulsion explosives shall be used in blasting with detonating fuse.
- Adequate precaution should be exercised while working and before exposing the coal seam to prevent chance of spontaneous heating of coal by leakage of air into the worked-out galleries. There may be multiple options for taking this precaution. A fire retardant DGMS-approved bitumen-based sealant, if available, can be used in the coal benches to minimize leakage of air. Use of OB as blanketing material can also be tried. Additionally, pipelines can be laid along the strike length on the edge of the working with flexible hoses for fire-fighting.

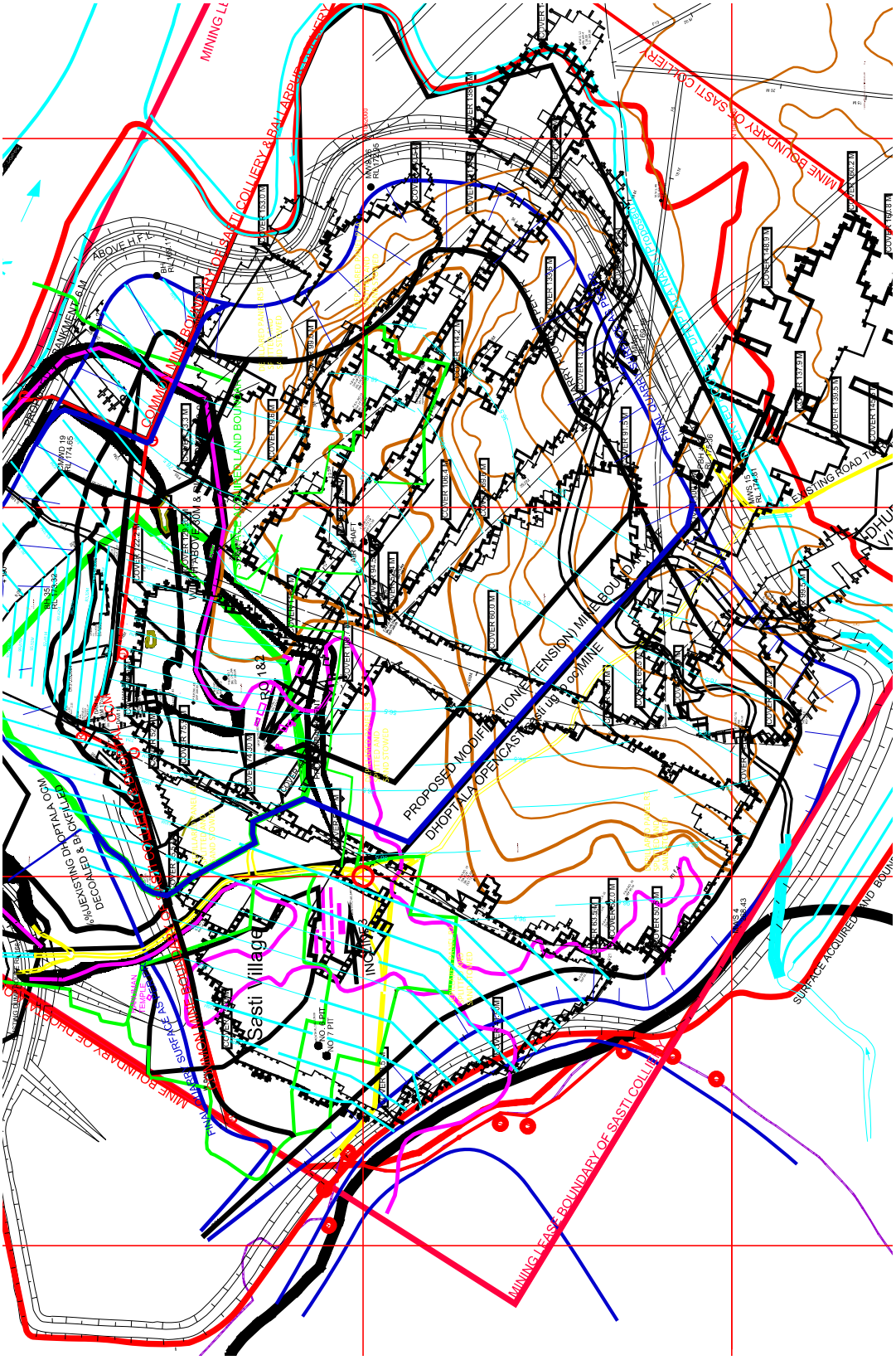


Figure 2: Plan of Dhoptala opencast mine

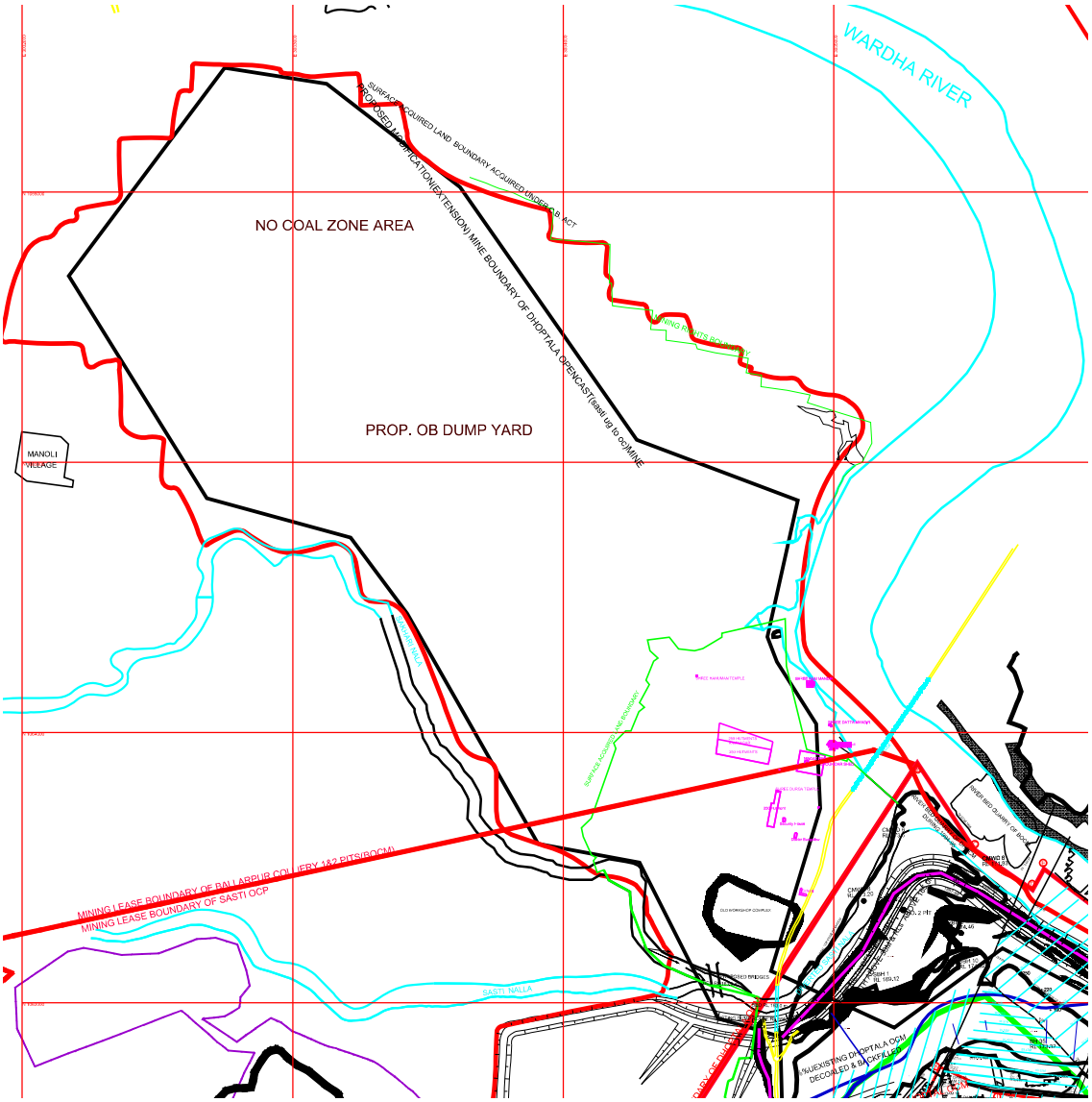
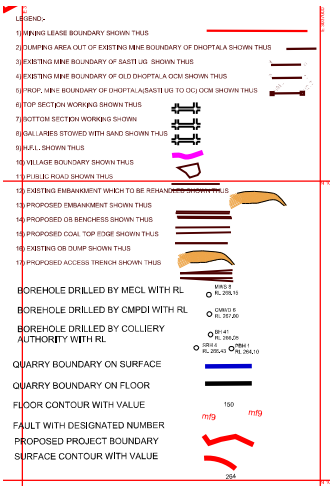


Figure 2: The dumping area



3 STUDY APPROACH AND METHODOLOGY

For undertaking the study, the Consultants proposed a phased approach to fulfil the requirement of the scope of work outlined by WCL through their Work Order. The work elements undertaken in each phase is described in the following sections.

3.1 Phase 1: Review Phase

The Consultants upon receiving the work order requested WCL to provide details of the mine, its working methodology & geology, operational parameters, and other baseline data. However, since Dhoptala OCM is a new mine and was yet to start operations, very few operating information other than the project report was available.

The data received during initial stage of work were compiled to get a brief understanding on the uniqueness of project area, its regional setting, size and type of mining operation, excavation and mechanization to be adopted, waste management practice, etc. The Consultants then undertook the site visit to verify the information in reference to the proposed mine working, waste rock management, and operational activities.

3.2 Phase 2: Site Investigation and Sampling Phase

The prime objective of this phase was to make a comprehensive site investigation to verify the ground truth, operational practice to be adopted, and finally identify representative samples from different locations and material types for laboratory testing.

Since the mine was yet to start operation, not much was visible. However, the Consultants visited the access trench, which was under development; the leasehold area where the mine would develop, and the proposed dumping area. Some of the photographs of the observation during site visit are presented in Figure 3 to Figure 6.

The Consultants also identified a few locations from where soil and rock samples are to be collected and briefed Mine Management on the process of sample collection, preservation, and transport. Subsequently, the mine management collected blocks of rocks from the old Dhoptala OCM and delivered the samples to IIEST laboratory for subsequent geotechnical experiments.

Figure 3: Proposed dumping area

Figure 4: Proposed dumping area with Sasti OCM dump in the foreground

Figure 5: Proposed mine expansion area

Figure 6; Access area of the mine

4 GEOMECHANICAL INVESTIGATIONS

Dhoptala OCM mine management collected coal and rock blocks as per the advice of the consultants from the old Dhoptala OCM and transported those to the laboratory of IIEST. Specifically, samples were obtained from three different lithologies- coarse grained sandstone, Intercalation of shale and sandstone, and coal. NX size cores were extracted from the blocks and samples were prepared for triaxial compression tests. Since the mine is yet to be operational, the *in-situ* rock conditions at the mine are still not known. However, similar conditions are expected in Dhoptala OCM as existing in the old Dhoptala mine from which the blocks were collected. Specific reference was also made to the conditions existing at the Sasti and Ballarpur opencast mines, where IIEST, Shibpur has carried out similar scientific studies. The rock mass was assumed to be fractured and were evaluated by the Generalized Hoek-Brown strength equation.

Although the two OB materials, Coarse Grained Sandstone and Intercalation of shale and sandstone were evaluated separately, the properties were averaged to get representative values for the entire OB material. The OB dump material received from the adjacent Ballarpur OCM, mine were analyzed for grain size and content. They were classified as Category 2 material as explained by Siemmons and Macmanus (2004) with a description- unsaturated, primarily sand, matrix supported. Accordingly, density, cohesion, and angle of internal friction were calculated as 18 kN/m^3, 30 kPa, and 28 ^{o}, respectively. Table 1 lists the characteristics of top soil, OB, coal, and dump materials.

Table 1: Geomechanical properties of different rock mass

Rock type	Density (kN/m^3)	Uniaxial compressive strength (MPa)	Hoek-Brown Constants		
			m_b	s	a
Coarse grained Sandstone	21.37	8.55	1.677	0.011	0.501
Intercalation of shale and sandstone	21.97	33.65	2.012	0.011	0.501
Coal	12.70	14.65	1.006	0.011	0.501

5 LIMIT EQUILIBRIUM STABILITY ANALYSES

5.1 Methodology

Two-dimensional Limit Equilibrium Analyses (LEA) were undertaken with the aim of considering the stability of individual benches, final overall pit configurations, and the geometry of the OB dumps. An industry-standard software, RocScience's SLIDE 2 was used for the analyses. An LEA considers vertical slices of ground bounded by ground level and failure slip surfaces and calculates the Factor of Safety (FoS) based on the resisting and driving forces acting upon that slice of ground. The slip surfaces can be both circular and non-circular and a number of algorithms are available to search for the critical slip surfaces. Both circular and non-circular slip surfaces were considered for pit slopes while only circular slip surfaces were analysed for the OB dumps. After defining the slip surface, the LEA was carried out using the more rigorous Spencer and Generalized Limit Equilibrium (GLE) methods.

Presence of groundwater may destabilize the benches substantially. Detailed hydrological information about the mine was not available. However, existence of an aquifer cannot be completely ruled out. Therefore, a water table was introduced in the pits to analyse the effect of groundwater on stability of the slopes. Since the OB dumps with high porosity can transmit run off water, it is unlikely to accumulate water within the dumps. But, some perched water tables were also considered on the OB dump benches. Additionally, to model the scenario of water accumulation on the floor and the body of the dump, a 5-meter high water level was also introduced on the base of the dumps.

Pseudo-static analysis was carried out to factor in the dynamic loading induced by earthquake and blasting. Although earthquake is a rare phenomenon, the sudden loading induced by earthquake may have consequences on the stability of pit slopes and dumps. On the other hand, the effect of blasting is more pronounced on the pit slopes than dumps. Pseudo-static analysis is the preferred approach to analyze the seismic response of slopes. Generally, horizontal and vertical pseudo-static (seismic) coefficients, K_h and K_v respectively, are used to calculate the horizontal and vertical forces induced by the seismic events. However, for slope stability analysis, the horizontal coefficient is more important. The choice of K_h for slope design is very subjective and varies across different regions of the world from 0.05 to about half the peak horizontal acceleration (PHA). As the seismic potential areas are divided into various zones by Government of India (GoI), it becomes convenient to use those maps for a preliminary assessment of seismic potential. As the project area is located in the central part of India, it can be seen from the seismic map of India that it falls in Zone III. Following IS:1893, the equation for calculating the horizontal seismic co-efficient is:

$K_h = \beta . I . \alpha_o$

Where, β is a Co-efficient depending on the foundation system and can be considered as 1.0 here, I is a factor depending on importance of the structure and the value may be taken as 1.0 considering the importance of the structures, α_o is the basic horizontal seismic co-efficient and for Zone III the values is 0.03. Therefore, the computed value of K_h comes out to be 0.03. Considering effect of blasting on top of the earthquake effects, the K_h value for the pit slopes has been considered to be 0.05, while that at the dumps has been considered as 0.03. It may be mentioned here that a Kh value of 0.05 indicates an additional 5 % continuous horizontal load acting on the slopes irrespective of whether a seismic event exists or not. This is a conservative but safe approach to consider for evaluating the stability of slopes.

5.2 Acceptable Factor of Safety (FoS)

Provision in the DGMS Technical Circular 03/2020 was followed. Accordingly, for both the pit slopes and the OB dumps the acceptable FoS values was 1.3.

5.3 Stability analysis of pit

As per CMR 2017, he width of the bench should be calculated based on the maximum of the following:

a) Width of the widest machine plying on the bench plus 2 m

b) 3 times the width of the dumper

c) Height of the bench

As per Reg 106 (5) of CMR 2017, the requirement of bench width is to be determined in line with the above criteria. For top soil, as per Reg 106 (4), the height of bench should not exceed 3 m and the width shall not be less than 3 times the height of the bench.

The Dhoptala OCM has just commenced development and the benches are yet to be developed. As per plan, the mine will operate under hiring of equipment scheme. The exact details of equipment to be deployed on coal and OB benches are, therefore, not known yet. However, as per the project report the following bench specifications are envisaged.

Cutting area	***Width (m)***	***Height (m)***	***Side slope***
BC soil (running bench)	30/40	3	45°
BC soil (final bench)	10	3	45°
Hard OB (running bench)	20	10	70°
Hard OB (final bench)	10	10	70°
Coal bench	10	10	70°

Considering the above two pit geometries were constructed- one for the running stage of the mine and the other for the final stage of the mine. The geometries for the above two stages are shown in Figure 7 and Figure 8, respectively.

Other than coal, two distinct litho-types were identified in the mine, the rock blocks collected, and tested for the relevant geotechnical properties as presented in Table 1. OB consists of a weaker coarse-grained sandstone (CGS) and a stronger intercalation of shale and sandstone (Intercalation). The maximum depth of the pit at the final level is envisaged to be ~120 m. The average thickness of BC soil is 6 m and that of coal seam is 16 m. Therefore, the following benches were constructed into the model:

- Two BC soil benches, each 3 m high
- Ten OB benches, each 10 m high
- Two coal benches, each 10 m high (although in practice, it may actually be 8 m each)

The above configuration makes the pit about 126 m deep. The width of the benches is different during the running and final stages of the mine, as mentioned above, which are depicted in Figure 7 and Figure 8. The overall slope angle, as can be seen from the figures, are 22° and 34° for the two stages, respectively.

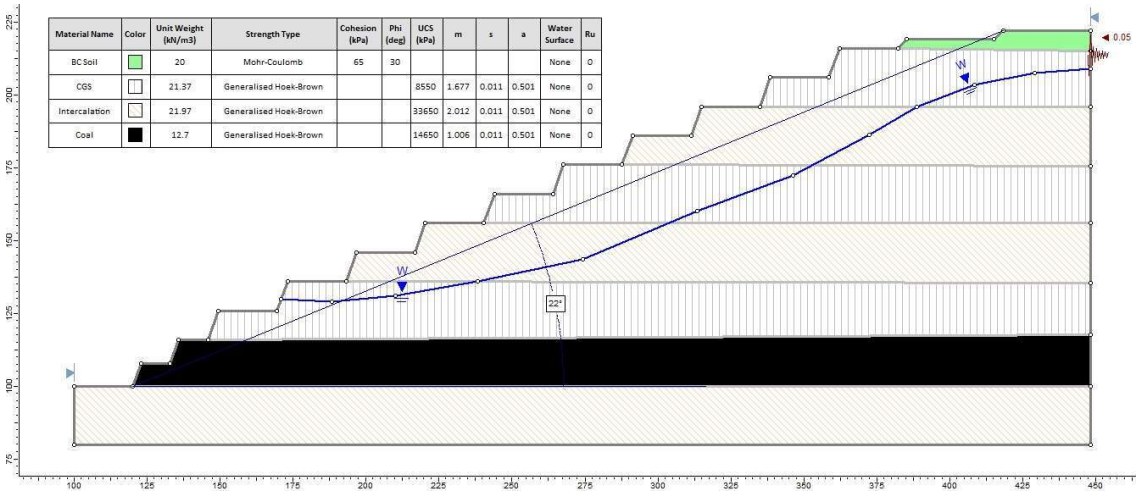


Figure 7: Bench geometry and material model for the running stage of the mine

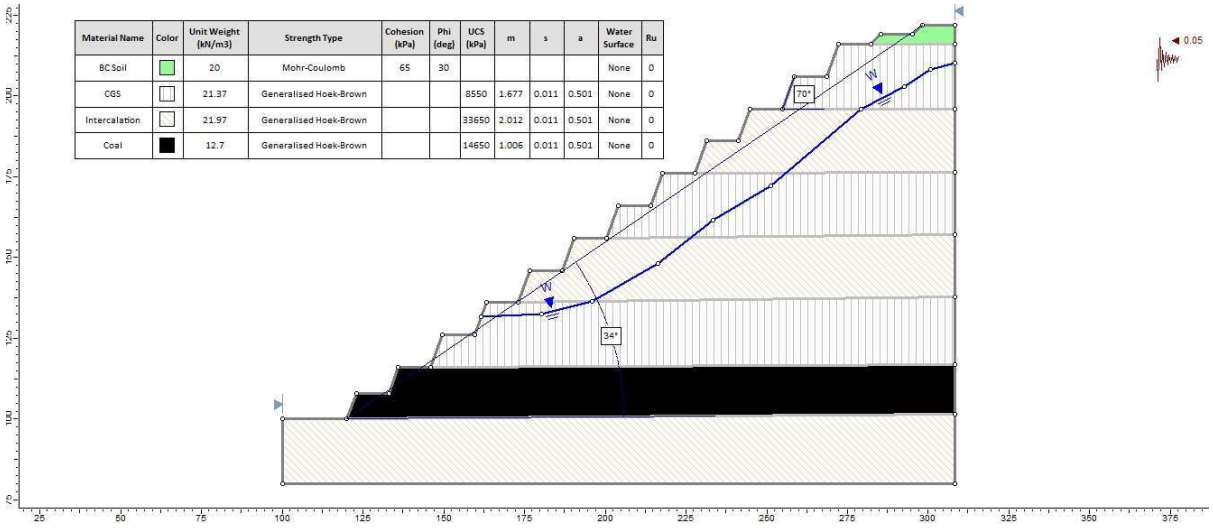


Figure 8: Bench geometry and material model for the final stage of the mine

The effect of groundwater was incorporated in the model by assuming a water table existing within the pits. Dynamic loading as an effect of blasting and probable earthquake was also incorporated as explained in section 5.1.

The LE analysis was then run in SLIDE 2. The results of analysis for the running stage of the mine by the Spencer and GLE methods are presented in Figure 9. As can be seen from the figure, FoS are 3.406 and 3.389 by the Spencer and GLE methods, respectively. The figure also shows various failure surfaces considered for the analysis. It clearly indicates by the colour scheme of the FoS legend, the FoS for the other surfaces are indeed very high. The surface with the least FoS is indicated in the figure, which is considered to the FoS of the pit. The results of analysis clearly indicate that the FoS is very high and much above the acceptable level.

Similar analysis was carried out for the bench geometry during the final stage of the mine and presented in Figure 8 and the results of analysis are presented in Figure 10. Other than the pit geometry, keeping all other modelling conditions same as before, the FoS by the Spencer and GLE methods are 2.577 and 2.564, respectively; both the values are much higher than the specified minimum acceptable value for FoS.

Therefore, it can reasonably be inferred that the bench geometries for the running and final stages of the mine, as proposed in the project report, can be followed in the mine.

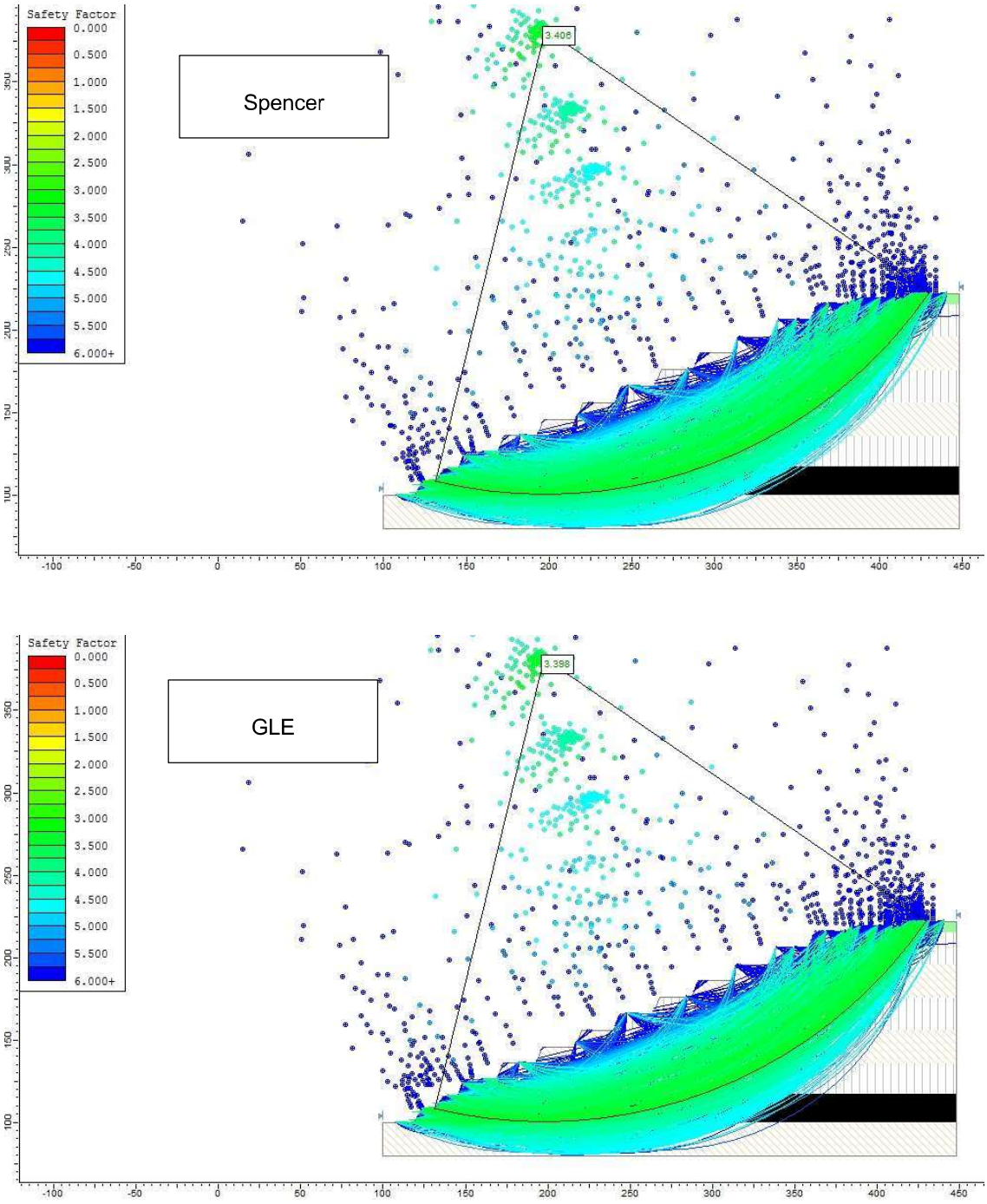


Figure 9: Results of LE analysis for the pit geometry during running stage of the mine by Spencer and GLE methods

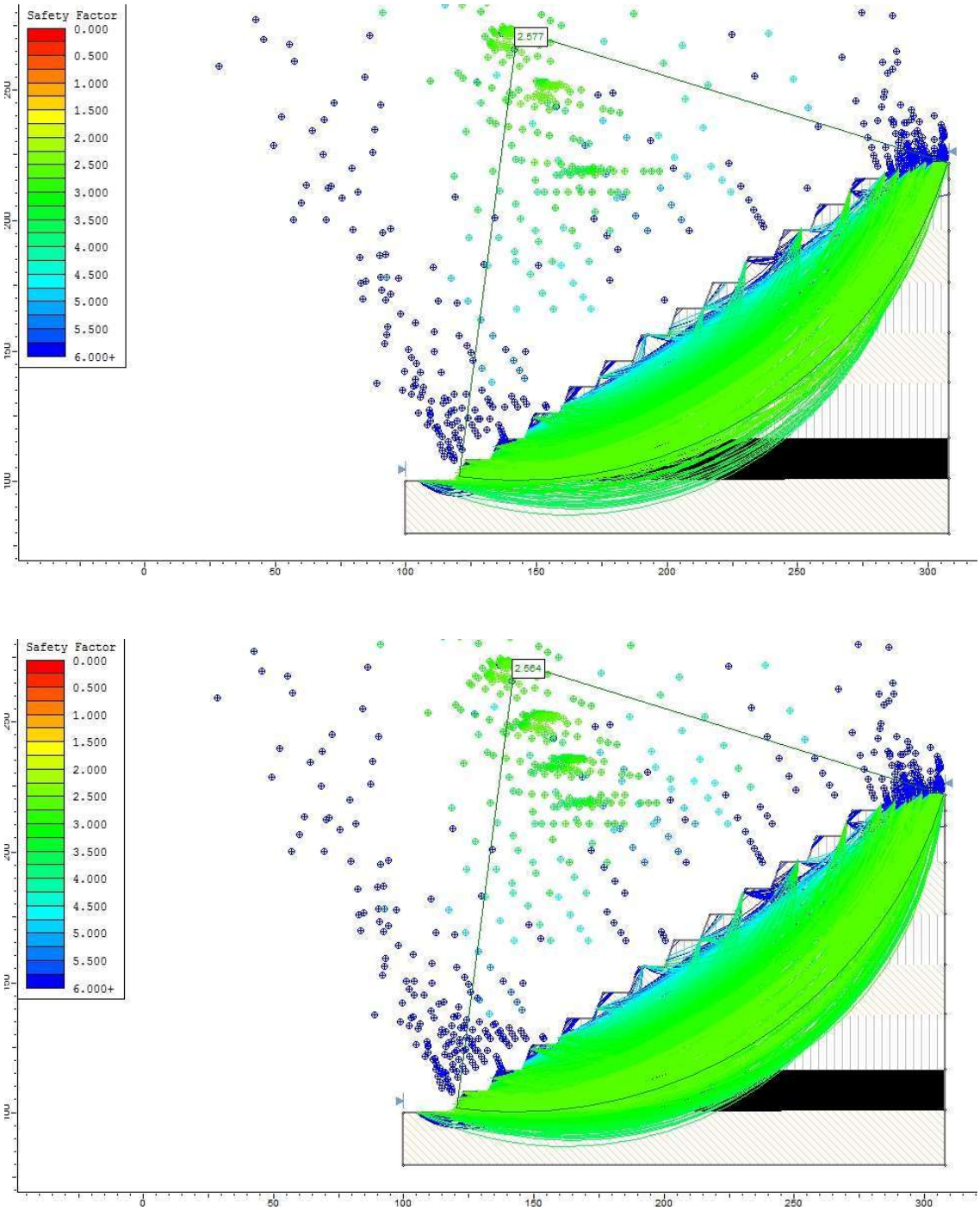


Figure 10: Results of LE analysis for the pit geometry during final stage of the mine by Spencer and GLE methods

5.4 Stability analysis of OB dumps

An external hard OB dump is to be constructed north of the Sasti nala as shown in Figure 2. The dump is to be constructed over virgin area containing BC soil as can be seen from Figure 2 and Figure 3. As per Reg 108 (1) of CMR 2017, the angle of bench in OB dump should not be more than 37.5° unless permitted based on a scientific study. Reg 108 (4) states that an OB dump exceeding 30 m in height should be benched so that no bench exceeds 30 m in height and the overall slope does not exceed 1 vertical to 1.5 horizontal.

The PR of the Dhoptala OCM specifies a 90-meter high hard OB dump maintaining benches of 20 m width, 10 m height, and individual bench angle of 37°. This proposed configuration of the hard OB dump was first constructed in SLIDE 2, which is shown in Figure 11. It has 9 benches, each 10-meter-high, 20-meter-wide, and individual bench angle of 37.5°. The width of the dump on the half section (from toe to top) is 277 m, giving it a width: height ratio of 3.07, which is much higher than the required value of 1.5. The material model is also shown in the figure. Other than the OB material, the cohesion and angle of friction of which were considered as stated in section 4, a weak layer of interface rock material was also put on the base of the dump. A BC soil layer is then put as the base of the entire dump. A 5-meter high water level was assumed on the base of the dump and the effect of dynamic loading was incorporated with a horizontal seismic co-efficient of 0.03.

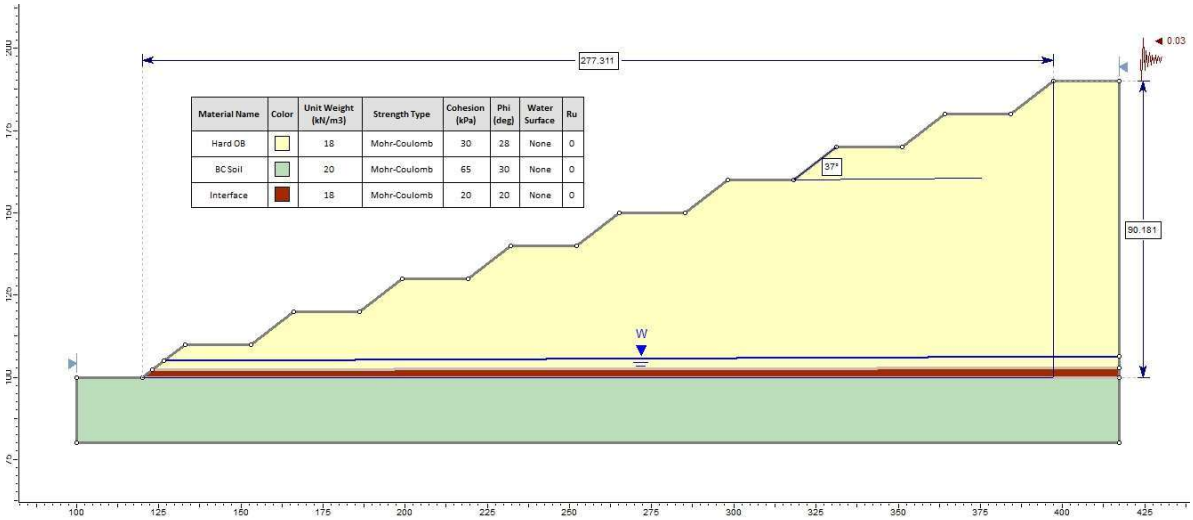


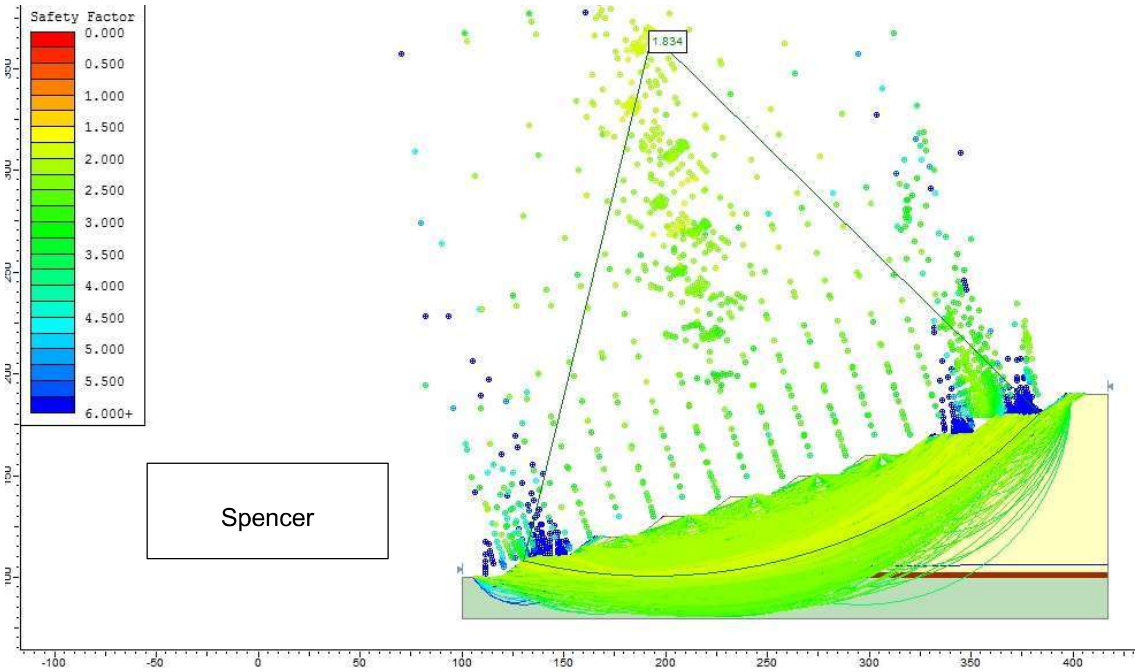
Figure 11: OB dump geometry and material model

The results of LE analysis are presented in Figure 12. The figure shows FoS of 1.834 and 1.833 by the Spencer and GLE methods, respectively, which are acceptable as per the DGMS-specified standards.

However, to take care of the uncertainties in the input parameters, especially in the geomechanical properties of the dump material, as the dump is yet to be constructed, a probabilistic slope stability analysis was also carried out. Both the values of cohesion and the angle of internal friction were randomly varied within a certain relative maximum and minimum. With random values of the parameters varied 1000 times, the FoS values were determined each time and the average probabilistic FoS along with the probability of failure was also

calculated. All other conditions remained the same as was done during the deterministic analysis. The result of this probabilistic analysis is presented in Figure 13. It shows that the FoS obtained through the probabilistic analysis is 1.818, which is quite comparable to the FoS obtained through the deterministic method as shown above. Furthermore, the probability of failure is also zero, which gives a reasonable confidence that the dump would be stable with the geometry considered for the analysis.

Therefore, it can be inferred from the analysis of the external hard OB dump stability that, the Dhoptala OCM can build an external OB dump on the designated site up to a height of 90 meter and maintaining nine benches, each 10 m high and 20 m wide with individual bench angle of 37°.



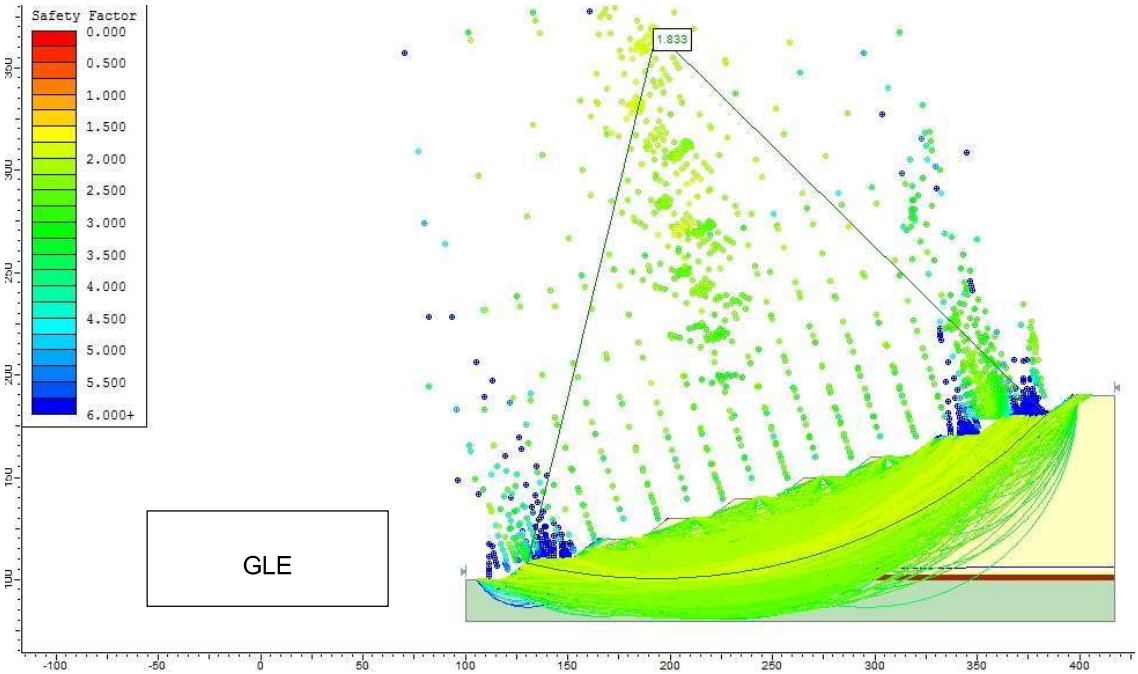


Figure 12: Results of the LE analysis of hard OB dump

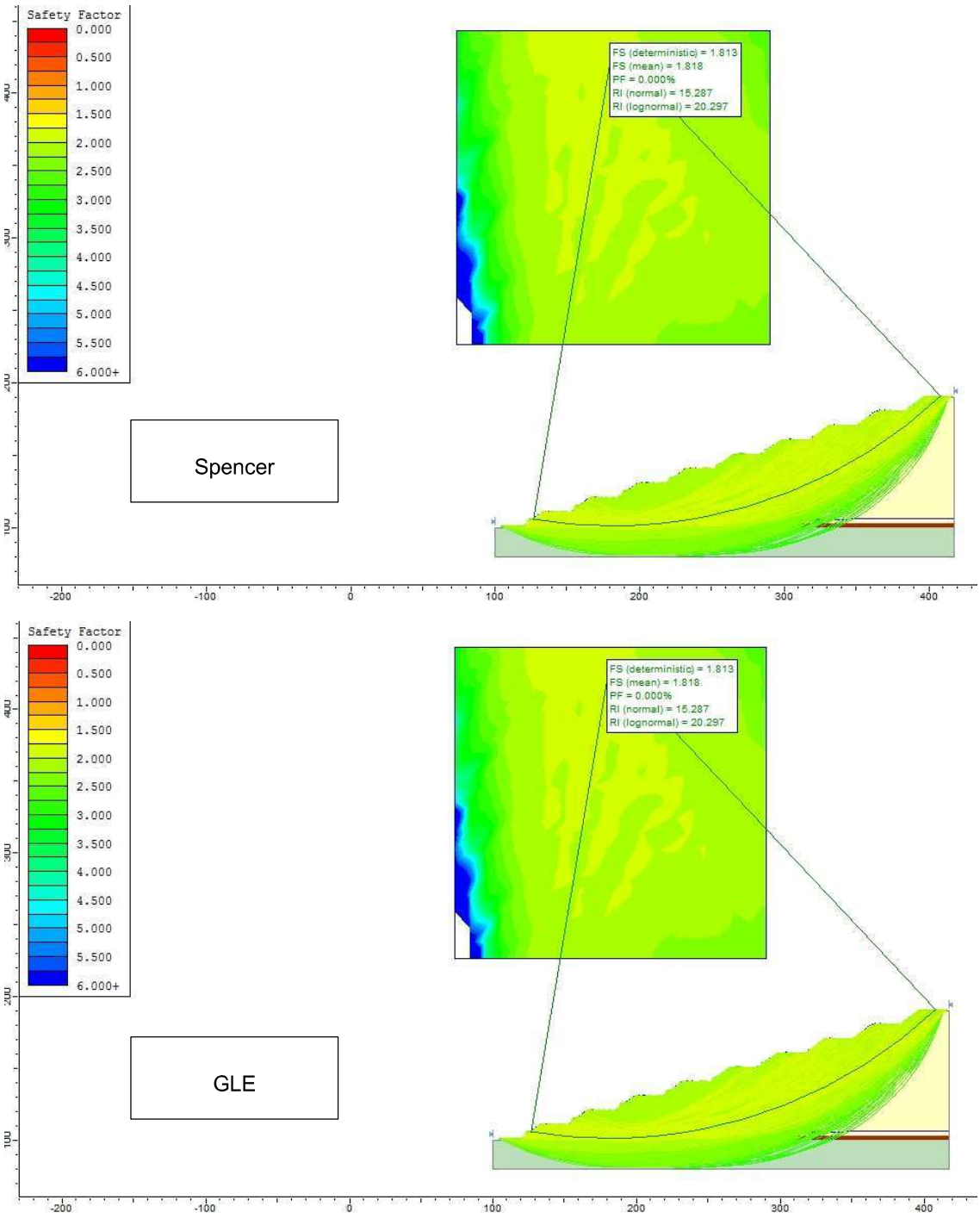


Figure 13: Results of probabilistic slope stability analysis of the hard OB dump

6 CONCLUSION AND RECOMMENDATIONS

6.1 General conclusions and recommendations from the scientific study

This scientific study on the stability analysis of the pits and overburden dumps at the Dhoptala OCM was carried out as per the requirement of Reg 106 of CMR 2017. Specific provisions as contained in the relevant regulations in the CMR 2017 along with the associated Technical Circulars. The study was carried out using best possible scientific judgement under the given conditions. Relevant information regarding the mine and its operating parameters as available with the mine management was utilised for the study. The consultants from IIEST made visit to the site. Under advice of the consultants, mine management collected block of rock samples from the old Dhoptala OCM and transported those to IIEST for analysis. Standard protocols were observed while preparing samples for geomechanical studies in the Rock Mechanics laboratory of IIEST. As the mine is yet to develop the benches, specific references were made by the consultants to similar scientific studies in the adjacent mines like Ballarpur OCM and Sasti OCM. The pit and dump geometries proposed in the project report of the Dhoptala OCM were considered for analysis. Two-dimensional limit equilibrium analysis with an industry-standard software SLIDE 2 were carried out for the pit and hard OB dumps. Curvilinear slip surfaces within the rock mass were considered as the possible mode of instability in the pit and dumps. The limit equilibrium analysis was made in pseudo-static mode to incorporate the effects of dynamic loading induced by blasting and earthquake. Multiple search methods for failure surface and rigorous analysis methods like Spencer and GLE were utilised in the analysis. Additionally, probabilistic slope stability analysis for the dump was also carried out. Wherever, there was data insufficiency, the same was assumed taking a conservative approach. Presence of water can substantially influence stability. No information on hydrological regime of the mine was available. However, this factor was incorporated into the analysis assuming presence of water table. Acceptable FoS was 1.3 was considered for all the analysis. The following specific conclusions can be made from the study:

i) The following bench geometries, as mentioned in the project report, can be maintained while developing the mine and extraction of coal:

Cutting area	***Width (m)***	***Height (m)***	***Side slope***
BC soil (running bench)	30/40	3	45º
BC soil (final bench)	10	3	45º
Hard OB (running bench)	20	10	70º
Hard OB (final bench)	10	10	70º
Coal bench	10	10	70º

ii) Two benches in coal with the maximum width, height, and slope angle as given above can be made. Similarly, a maximum of ten hard OB and two BC soil benches of the above configuration can be maintained. However, if operational reasons so warrant, lower bench height than that specified above can be maintained.

iii) While selecting machinery for winning coal and hard OB in the mine, it should be ensured that Reg 106 (5) of CMR 2017 are complied with the bench width and height constrained as above.

iv) The working over the developed pillars need special care and strategies. The suggested method of working over the developed pillars are enumerated in section 2.2.4 and summarised below:

- Before developing the coal benches, it is to be ensured that a parting of at least 4 m is left over the coal seam.
- Position of galleries and junction shall be marked clearly on the ground with different colours for all sections of the working. Marching of drill shall, as far as practicable, be over the solid pillar and not over the galleries and junctions.
- The entire seam has to be blasted as a whole along with the top overburden parting of 4 m. Holes are to be drilled up to the floor of the bottom section from the top of the 4 m cover of the overburden. However, the entire drilling operation has to be closely supervised. The holes above the galleries, however, should terminate at least 1.5 m above the galleries.
- Test holes shall be drilled to ascertain the thickness of top parting before commencement of the actual drilling operation.
- The holes shall be charged with water ampules or with moist sand of around 1 m length at the bottom of the hole.
- Slurry or emulsion explosives shall be used in blasting with detonating fuse.
- Adequate precaution should be exercised while working and before exposing the coal seam to prevent chance of spontaneous heating of coal by leakage of air into the worked-out galleries. There may be multiple options for taking this precaution. A fire retardant DGMS-approved bitumen-based sealant, if available, can be used in the coal benches to minimize leakage of air. Use of OB as blanketing material can also be tried. Additionally, pipelines can be laid along the strike length on the edge of the working with flexible hoses for fire-fighting.

The following specific operating advices are also made.

i) A water table was assumed in carrying out the stability analysis of the pit slopes. If moderate to heavy water seepage is observed, it would be advisable to make specific arrangement should be made for dewatering the strata by making boreholes to the strata where such seepage is observed.

ii) No accumulation of water is advisable at the base of the OB dumps. Proper garlanding must be maintained to drain out run off water.

iii) It is recommended to keep to OB dump layers/lift height to ~1m during dumping. It shall be done with an intention to improve the compaction and bulk density of the overburden materials.

iv) The black cotton soil of at least 3 meters should be removed at the base of the OB dump before dumping. It is recommended to have more effective drainage control to eliminate possible risk of liquefaction of BC soil due to excessive level of moisture content in it.

6.2 Slope monitoring recommendations

Failure in any men-made slope often triggers with prior indications in the form increased rates of deformation, cracking and/or settlement of the base; bulging of the face; bulging of the toe or bulging or heaving of the foundation in front of the toe; seepage on the face; increased pore pressure in the foundation or embankment. Many of these warning signs can be observed visually. For visual inspection or supervision, special attention shall be taken in appointing an experienced person, as the perception of visual inspection is subjective in nature. This visual inspection should be carried out as frequently as possible and the results of such inspection should be recorded.

Best possible scientific analysis, under the given conditions, has been carried out in this study. But, it indeed is very difficult to eliminate inherent uncertainties in determining the geotechnical parameters especially for a dump composed of such heterogeneous materials. Therefore, regular monitoring of slopes is of paramount importance here. Other than the visual inspection, proper instrumentation should be installed for regular monitoring of the dump slopes. Use of total station or other suitable modern survey instrument is recommended. Specific recommendations on slope monitoring are given as hereunder.

i) Monitoring of ground movement on pit slopes with survey total stations or laser scanners should be carried out at least once in a month. However, if through visual inspection any sign of movement is observed, the frequency of monitoring should be increased to once a week. However, this monitoring near the fault plane should be carried out preferably twice a month.

ii) The OB dump should likewise be monitored with total station or laser scanner twice in a month in addition to regular visual inspection. Frequency of monitoring should be increased to once a week if signs of movement on the dump are observed by visual inspection. This should even be carried out more closely if regular monitoring indicates appreciable ground movement.

ANNEXURE IV

भारत सरकार
जल शक्ति मंत्रालय
जल संसाधन, नदी विकास
और गंगा संरक्षण विभाग
केन्द्रीय भूमि जल प्राधिकरण
Government of India
Ministry of Jal Shakti
Department of Water Resources,
River Development & Ganga Rejuvenation
Central Ground Water Authority

(भूजल निकासी हेतु अनापत्ति प्रमाण पत्र)
NO OBJECTION CERTIFICATE (NOC) FOR GROUND WATER ABSTRACTION

Project Name:	Dhuptala Oc Mine		
Project Address:	Village-dhuptala, Tehsil-rajura		
Town:	Dhopatala (ct)	Block:	Rajura
District:	Chandrapur	State:	Maharashtra
Pin Code:			
Communication Address:	General Manager (env), Wcl (hq), Coal Estate, Civil Lines, Nagpur, Nagpur, Maharashtra - 440001		
Address of CGWB Regional Office :	Central Ground Water Board Central Region, N.s. Building, Civil Lines, Nagpur, Maharashtra - 440001		

1.	**NOC No.:**	CGWA/NOC/MIN/ORIG/2022/16353			
2.	Application No.:	21-4/2602/MH/MIN/2020	3.	Category: (GWRE 2020)	Safe
4.	Project Status:	New Project	5.	NOC Type:	New
6.	**Valid from:**	19/09/2022	7.	**Valid up to:**	18/09/2024

8. Ground Water Abstraction Permitted:

Fresh Water		Saline Water		Dewatering		Total	
m³/day	m³/year	m³/day	m³/year	m³/day	m³/year	m³/day	m³/year
0.00	0.00			2137.00	780005.00		

9. Details of ground water abstraction /Dewatering structures

	Total Existing No.:0						**Total Proposed No.:0**					
	DW	DCB	BW	TW	MP	MPu	DW	DCB	BW	TW	MP	MPu
Dewatering Structure*	0	0	0	0	0	0	0	0	0	0	0	2

*DW- Dug Well; DCB-Dug-cum-Bore Well; BW-Bore Well; TW-Tube Well; MP-Mine Pit;MPu-Mine Pumps

10.	Ground Water Abstraction/Restoration Charges paid (Rs.):	3900025.00

11.	Number of Piezometers(Observation wells) to be constructed/ monitored & Monitoring mechanism.	No. of Piezometers	Monitoring Mechanism		
			Manual	DWLR**	DWLR With Telemetry
	**DWLR - Digital Water Level Recorder	2	0	1	1

(Compliance Conditions given overleaf)

This is an auto generated document & need not to be signed.

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

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

Mandatory conditions:

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

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

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

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

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

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

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

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

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

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

General conditions:

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

ANNEXURE V

REPORT ON

MONITORING OF GROUND WATER LEVEL

OF

EXPN. OF DHUPTALA OC MINE,

BALLARPUR AREA

(M.S)

WESTERN COALFIELDS LTD.

PERIOD- DEC 2022 (POST-MONSOON), JAN-FEB -2023 (WINTER) , MAY-2023 (PRE-MONSOON) AUG-23 (MONSOON) NOV 2023 (POST-MONSOON) ,JAN 2024 (WINTER) ,MAY 2024(PRE MONSOON), AUG 2024 (MONSOON), NOV (POST-MONSOON) 2024 & JAN 2025 (WINTER)

M/s Anacon Laboratories Pvt. Ltd., Nagpur

MoEF&CC (GOI) Recognized Laboratory
ISO 9001:2015, ISO 14001:2015, ISO 45001:2018
Lab. & Consultancy: FP-34, 35, Food Park,
MIDC, Butibori, Nagpur – 441122
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Email: ***ngp@anacon.in***
Website: ***www.anaconlaboratories.com***

Report No. ANqr /PD/20A/2023/199

2023-24 & 2024-25

Certificate

Groundwater level monitoring has been conducted with due diligence, and a comprehensive report on the monitoring of groundwater levels in all observation wells has been prepared as per the scope of work outlined in work order no. वेकोलि/मुख्यालय/पर्यावरण/14-L/77, dated 08.12.2022 & second extension of work vide reference no. वेकोलि/मुख्यालय/पर्यावरण /48-60 Dated-01.01.2025 for the Jan 2025 (winter) Period.

The report includes the monitoring of groundwater levels and water quality analysis of observation wells pertaining to the EXPN. OF DHUPTALA OC, Mine in the Ballarpur Area of Chandrapur District, Maharashtra.

The groundwater level monitoring was meticulously carried out by Anacon Laboratories Pvt. Ltd., and the analysis of the samples was performed by Skylab Analytical Laboratory, Bhiwandi, Kalyan a NABL Accredited Laboratory. (NABL Certificate no. TC-5150)

Anacon Laboratories Pvt. Ltd. gratefully acknowledges the full cooperation rendered by the concerned WCL officials, which facilitated the timely completion of the project.

Atharva Nayab
(Geologist)

Gyanchand Bohra
NABET Accredited EIA Expert
for Hydrogeology & Geology

ANACON LABORATORIES PVT. LTD. NAGPUR

Nagpur
Jan-2025

(Dr. D. G. Garway)
Head of Organization
Anacon Laboratories Pvt. Ltd., Nagpur

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ANACON LABORATORIES PVT. LTD. NAGPUR

INTRODUCTION

WCL is one of the eight Subsidiary Companies of Coal India Limited (CIL) which is under administrative control of Ministry of Coal. The Company incorporated under the Companies Act, 1956 has its registered office at Coal Estate, Civil Lines, Nagpur–440001. WCL has been conferred "Mini-ratna" status on 15 March 2008. It has mining operation spread over the states of Maharashtra (in Nagpur, Chandrapur & Yeotmal Districts) and Madhya Pradesh (in Betul and Chhindawara Districts). It has been divided into 10 administrative areas. The Company is a major source of supplies of coal to the industries located in Western India in the States of Maharashtra, Madhya Pradesh, Gujarat and also in Southern India in the States of Andhra Pradesh, Tamil Nadu, Karnataka and Kerala. A large numbers of Power Houses under Maharashtra, Madhya Pradesh, Gujarat, Karnataka, Punjab and Uttar Pradesh - Electricity Boards are major consumers of its coal along with cement, steel, chemical, fertilizer, paper and brick Industries in these states.

M/s Anacon Laboratories Pvt. Ltd. has been awarded the Work of "Groundwater level Monitoring (i.e. bore well / piezometer Water levels) and Water quality analysis (as per IS10500) for 76 projects / mines of WCL (situated in the state of Madhya Pradesh – Chhindwara & Betul districts and Maharashtra – Nagpur, Chandrapur & Yeotmal districts) for one year as per condition stipulated in Environmental Clearance letters issued by MoEF & CC & NOC issued by CGWA" vide work order वेकोलि/मुख्यालय/पर्यावरण/14-L/77 on date: 08.12.2022 & second extension of work vide reference no. वेकोलि/मुख्यालय/पर्यावरण /14-L/48-60 Dated- 01.01.2025 for the Jan 2025 (winter) Period.

This Ground Water Level Monitoring report is prepared for EXPN. OF DHUPTALA OC MINE, of Ballarpur Area of WCL for 10 seasons i.e **PERIOD- DEC 2022 (POST-MONSOON), JAN-FEB -2023 (WINTER) , MAY-2023 (PRE-MONSOON) AUG-23 (MONSOON) NOV 2023 (POST-MONSOON) ,JAN 2024 (WINTER) ,MAY 2024(PRE MONSOON), AUG 2024 (MONSOON), NOV (POST-MONSOON) 2024 & JAN 2025 (WINTER)** These mine is located in Chandrapur District of Maharashtra.

GENERAL HYDROGEOLOGICAL CONDITION

The major water bearing formations in the district are Alluvium, Lower Gondwana Sandstones, Deccan Trap Basalt, Vindhyan Limestone and Archean metamorphic. Amongst these, the lower Gondwana Sandstones, particularly Kamthi Sandstone forms the most potential aquifer.

A. HARD ROCK FORMATIONS

ARCHEAN METAMORPHICS

Archeans, which comprise granite and granitic gneiss, occur in most of the eastern part of the district extending north-south from Nagbhid to Gondpipri. 6 These rocks are generally devoid of primary porosity, but weathering, jointing, fracturing, shearing etc., create secondary porosity, within which the ground water generally occurs in phreatic conditions. The depth of weathering ranges from 4 to 12 m bgl and dugwells are generally tapping this zone with yields of up to 30 m3 /day. Contrary to the general perception, the possibility of deep seated fracture zone exists in the area because of tectonic disturbances manifested in the form of dykes observed in the area. Therefore borewells in the depth range of 40-70 m bgl are also successful in this formation

at suitable places with yield of 1000 to 35000 lph. High yielding dugwells are generally located in fractured granites.

VINDHYAN LIMESTONE

In Vindhyans, Limestones are water bearing formation while Sandstone due to their hard and compact nature, has poor ground water potential. The Vindhyan sedimentares mainly occur in north central part of the district around Tadoba and Nagbhid in parts of Chimur, Sindewahi, Bhadravati and Nagbhid talukas and in south eastern part of the district in parts of Chandur and Rajura talukas. Limestones as such are massive but wherever they are cavernous and fractured they are capable of holding water and the ground water generally occurs under phreatic condition in these formations and the discharge in general is poor (up to 15 m3 /day). The borewells drilled by State Govt. agencies in the depth range of 30 to 40 m bgl are successful only at few places where discharge of 10000 lph or above has been observed.

DECCAN TRAP BASALT

Deccan Trap Basalt is observed in small area in the north eastern and south eastern peripheral parts of the district and does not form a promising aquifer in the district. Weathered, jointed and fractured Massive and Vesicular Basalt forms the aquifer in the area. Ground water occurs in phreatic conditions within the depth of 10-15 m, however, borewells drilled have shown presence of fracture zones and thus forming deeper confined and semi-confined aquifers at places. The dugwells yield varies from 15-30 m3 /day when favourably located, whereas borewells yield 1 to 3 lps.

B. <u>SOFT ROCK FORMATIONS</u>

GONDWANA SANDSTONE

Gondwana formation comprising of Kamthi and Barakar Sandstone and Maleri and Talchir Shale occupy north-south extending elongated stretch in cental and southern parts of the district in parts of Warora, Bhadravati, Chandrapur, Ballarpur, Rajura and Gondpipri talukas. Sandstone is usually friable and possesses primary porosity due to its granular nature. They are most productive water bearing formations in the district. The ground water occurs under phreatic as well as confined conditions in Kamthi Sandstone up to the depth of 80 to 120 m bgl with thickness varying from 34 to 102 m. Barakar Sandstone occurs below Kamthi formation and three granular zones are observed with cumulative thickness of about 72 m within a 300 m thick sandstone-shale sequence. Comparatively Kamthi Sandstone has more ground water potential with yields of up to 20 lps. The other Gondwana formations i.e., Maleri Series (upper Gondwana) and Talchirs (lower Gondwana) have very poor ground water potential and ground water occurs in phreatic condition.

ALLUVIUM

Alluvium of fluvial origin occurs in narrow patches along the banks of Wardha and Wainganga Rivers and consists of clay, silt with lenticular bodies of sand and gravel. Ground water generally occurs under phreatic conditions down to the depth of 10-15 m. The area in the north eastern part of the district near Brahmapuri along the western bank of Wainganga River and having a spread of about 100 sq. km. forms the most potential alluvial area. The Allluvium in this part is occurs down to 30-35 m and the basement is reported to be formed by Granitic Gneisses. The dugwells yield up to 50 m3 /day when favourably located, whereas shallow tubewells yield varies from 5 to 15 lps.

EXPN. OF DHUPTALA OC MINE,

BALLARPUR AREA

WESTERN COALFIELDS LTD.

PERIOD- DEC 2022 (POST-MONSOON), JAN-FEB -2023 (WINTER) , MAY-2023 (PRE-MONSOON) AUG-23 (MONSOON) NOV 2023 (POST-MONSOON) ,JAN 2024 (WINTER) ,MAY 2024(PRE MONSOON), AUG 2024 (MONSOON), NOV (POST-MONSOON) 2024 & JAN 2025 (WINTER)

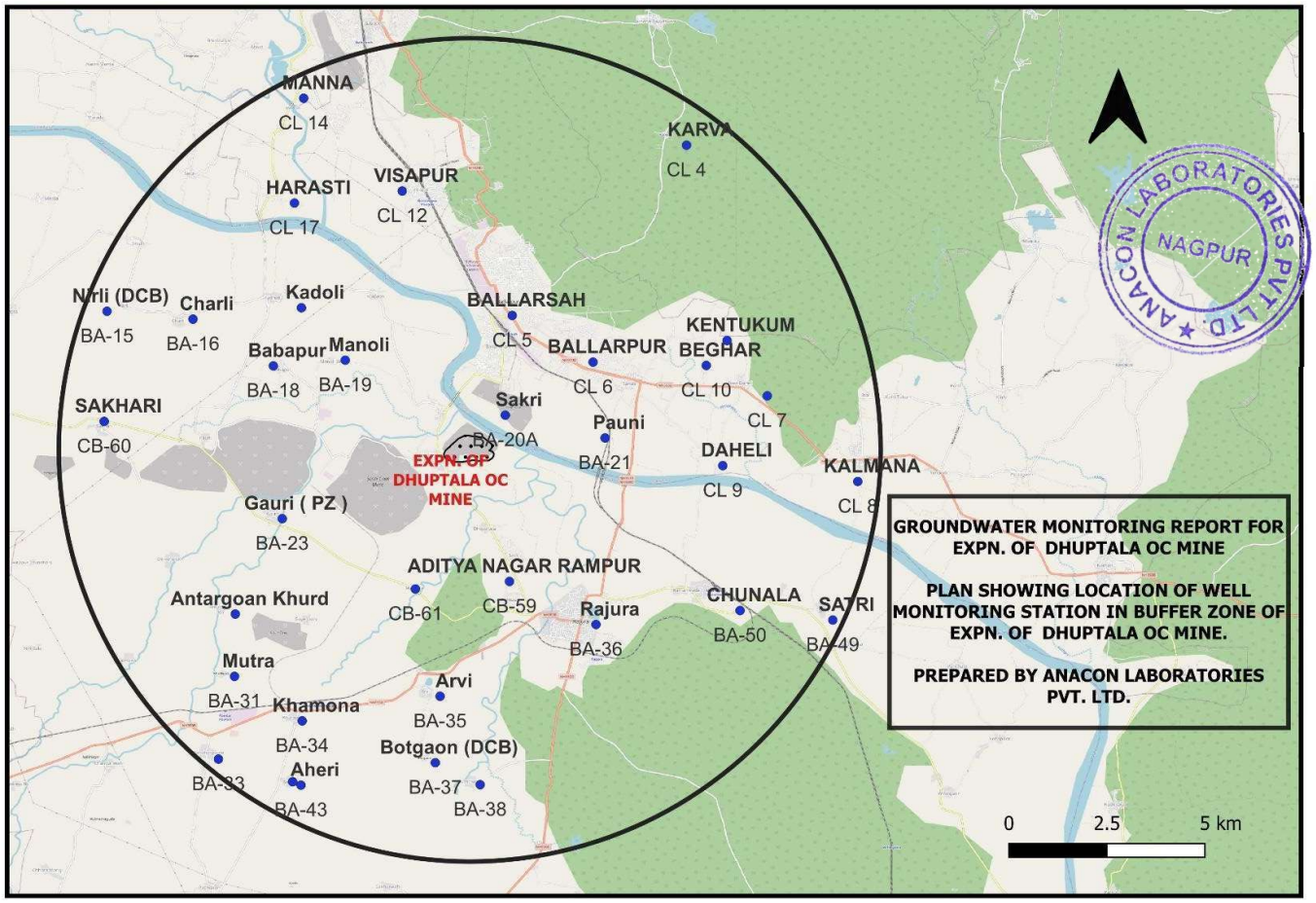

FIGURE IX: GROUND WATER MONITORING STATION (OBSERVATION WELLS IN AND AROUND OF EXPN. OF DHUPTALA OC)

Table-I: Ground water level monitoring data from dugwells/piezometers in buffer zone of Expn. of Dhuptala-OC Ballarpur Area, WCL

SR.NO	Well No. BA	Name of village	Well location	Latitude	Longitude	R.L. in m	Well depth (m bmp)	Well dia (m)	Height of measuring point (m agl)	Depth to water level (m.bgl)										UTILITY	G/F
										Dec-22	JAN-FEB-23	May-23	Aug-23	Nov-23	Jan-24	May-24	Aug-24	Nov-24	Jan-25		
1	BA-15	Nirli (DCB)	East side of village, about 20m west of the road to Didsi	19°51'16.4"	79°15'1.4''	229	15.45	2.84	0.41	4.15	4.35	9.7	4.00	3.60	4.10	8.50	3.80	4.00	4.20	agriculture	laterite
2	BA-16	Charli	Near Bajarang Bali Mandir, Southern edge of the village	19°51'9.5"	79°16'16.7''	234	14.83	4.28	0.77	3.45	3.5	10.8	3.90	3.95	4.40	8.50	3.30	3.60	4.30	agriculture	basalt
3	BA-17	Kadoli	East of village, outside near Mata mandir, 150 m S of Kadoli-Kolgaon Road	19°51'19.4"	79°17'51.7''	186	6.44	3.94	0.81	3.25	3.5	4	4.00	4.30	4.00	5.00	3.80	4.10	4.05	agriculture	laterite
4	BA-18	Babapur	N of the village near the temple	19°50'28.6"	79°17'27.1''	187	7.33	2.88	0.89	3	4.65	5.75	3.10	3.70	4.20	5.50	2.90	3.60	4.00	agriculture	limestone
5	BA-19	Manoli	E of the village near to Gram Panchayat office	19°50'33.6"	79°18'30.1''	191	9.26	2.31	0.71	4.35	5.15	6	4.50	4.60	5.00	6.20	4.10	4.45	5.10	agriculture	basalt
6	BA-20A	Sakri	West of the village near to school	19°49'45.5"	79°20'50.3''	236	12.27	2.79	1.13	3.5	4.85	7.9	4.00	4.40	4.80	7.50	3.70	4.50	4.70	Domestic	limestone
7	BA-21	Pauni	N edge of the village, about 70 m south of Gauri - Nandgaon road.	19°49'25.6"	79°22'17.7''	219	8.39	3.42	0.96	4.15	4.45	5.85	4.25	4.80	5.00	6.00	4.00	4.85	5.10	Domestic	basalt
8	BA-23	Gauri (PZ)	About 200m east of the village, near to village road junction in	19°48'15"	79°17'34.9''	188	9.68	3.15	0.76	5	5.35	5.8	3.60	3.90	5.05	5.50	3.50	4.00	4.90	Domestic	limestone

SR.NO	Well No. BA	Name of village	Well location	Latitude	Longitude	R.L. in m	Well depth (m bmp)	Well dia (m)	Height of measuring point (m agl)	Depth to water level (m.bgl)											
										Dec-22	JAN-FEB-23	May-23	Aug-23	Nov-23	Jan-24	May-24	Aug-24	Nov-24	Jan-25	UTILITY	G/F
			agricultural field																		
9	BA-28A	Goigaon(Hand pump tw)	Ghyanvi Vidhate House	19°44'25"	79°17'44''	231	7.15	2.95	0.75	2.15	3.25	9	4.15	4.80	3.50	5.60	4.00	4.50	4.40	agriculture	laterite
10	BA-29	Antargoan Khurd	NE side ,at the entrance of village	19°46'51.6"	79°16'53.8''	178	9.45	3.49	0.73	4.65	5	7.1	5.50	6.10	6.00	7.00	5.20	6.00	6.35	agriculture	laterite
11	BA-31	Mutra	SW side of village, near to school	19°45'57.1"	79°16'53.1''	186	8.14	4.17	0.54	5.15	6.35	7	5.65	6.00	6.50	7.30	5.50	5.70	6.40	agriculture	laterite
12	BA-33	Panderpon i	Centre of village, near Ganesh Krishi Kendra	19°44'44.8"	79°16'39''	205	13.88	2.88	0.45	3.45	3.95	7	3.80	4.40	4.80	6.50	3.40	4.30	4.60	agriculture	laterite
13	BA-34	Khamona	Northern side of the village(outside). About 120 m S of culvert on Rajura-Chandur road	19°45'18.2"	79°17'52.4''	171	11.42	4.65	0.67	4.85	6.1	9.2	5.10	6.00	6.40	8.40	4.90	5.80	6.50	agriculture	limestone
14	BA-35	Arvi	Northern side of village, adjacent to school compound.	19°45'39.7"	79°19'53.2''	176	9.14	1.96	0.83	5	6.35	7.9	4.50	5.10	6.00	8.00	4.20	5.05	5.90	agriculture	limestone
15	BA-36	Rajura	Near Bhgawani Mandir, 50 m south of Rajura-Awarpur road, near Nala Bridge	19°46'42.5"	79°22'9.8''	243	10.88	2.83	0.93	6.15	6.35	7.2	5.50	4.20	5.00	6.80	5.10	4.30	4.90	agriculture	laterite

SR.NO	Well No. BA	Name of village	Well location	Latitude	Longitude	R.L. in m	Well depth (m bmp)	Well dia (m)	Height of measuring point (m agl)	Depth to water level (m.bgl)											
										Dec-22	JAN-FEB-23	May-23	Aug-23	Nov-23	Jan-24	May-24	Aug-24	Nov-24	Jan-25	UTILITY	G/F
16	BA-37	Botgaon (DCB)	Western side of the village, near Chaupal (imli tree)	19°44'41.6"	79°19'49''	217	9.42	2.76	0.56	4.75	5.75	8.7	5.60	6.30	5.90	8.50	5.50	6.10	5.70	Domestic	limestone
17	BA-38	Somthana	Near Panchayat office, center of the village	19°44'22.4"	79°20'28.3''	189	12.91	3.14	0.56	3.65	5.35	9	4.65	5.50	5.70	7.90	4.40	5.10	5.60	limestone	Domestic
18	BA-43	Aheri	Eastern side of village near Hanuman temple	19°44'22''	79°17'51.3''	178	10.45	2.19	0.76	2.35	4.56	7.6	4.20	4.80	4.85	7.00	4.20	4.90	5.00	Domestic	limestone
19	BA-49	SATRI	Centre of village Basant Rao Bardis house	19°46'46.4"	79°25'37.2''	192	9.44	1.98	0.63	3.15	4.25	6	3.95	4.50	4.90	6.20	3.90	4.70	4.95	limestone	Domestic
20	BA-50	CHUNALA	At the entry point of Indira Nagar ward no.1	19°46'54.7"	79°24'16''	241	8.76	1.56	0.64	2.75	3.65	5.85	2.90	3.80	3.85	5.50	2.75	3.65	4.00	laterite	agriculture
21	CL 4	KARVA	Karva Nurseri	19°53'41.6"	79°23'29.1''	216	12.07	1.02	1.04	6.25	8.65	8.6	6.40	7.00	6.40	7.90	6.00	6.06	6.30	agriculture	laterite
22	CL 5	BALLARSAH	In church campus infront of Nagar Parishad	19°51'12.7"	79°20'56.4''	179	7.68	2.96	0.72	2.65	4	6.8	3.70	4.15	5.00	6.20	3.40	4.00	4.80	Domestic	basalt
23	CL 6	BALLARPUR	In the campus of Ice Sai Baba Factory Rajura Road	19°50'31.9"	79°22'7.2''	184	13.14	4.42	0.93	4.35	5.95	6.6	3.85	5.00	5.60	6.50	3.50	4.20	5.30	Domestic	basalt
24	CL 7	NAV DAHLI	Opposite Budha Vihar	19°50'2.4"	79°24'39.8''	196	8.84	2.83	0.24	4.25	5.85	5.5	3.65	4.10	4.90	6.00	3.80	4.10	4.60	agriculture	laterite

SR.NO	Well No. BA	Name of village	Well location	Latitude	Longitude	R.L. in m	Well depth (m bmp)	Well dia (m)	Height of measuring point (m agl)	Depth to water level (m.bgl)											
										Dec-22	JAN-FEB-23	May-23	Aug-23	Nov-23	Jan-24	May-24	Aug-24	Nov-24	Jan-25	UTILITY	G/F
25	CL 8	KALMANA	Behind School & Grampanchyat office in the village	19°48'47.5"	79°25'59.1''	182	9.64	2.71	0.63	3.65	4.15	5.6	4.00	4.60	4.80	5.10	3.50	4.30	4.70	agriculture	basalt
26	CL 9	DAHELI	In the village on west side	19°49'1.4"	79°24'0.8''	177	9.55	2.49	0.87	1.55	6.45	6.4	4.30	4.80	5.30	6.45	4.00	4.90	5.20	agriculture	laterite
27	CL 10	BEGHAR	In the Junction of Vahmini	19°50'29"	79°23'46.4''	226	11.39	3.24	0.61	3.45	8.25	9.1	5.70	4.00	5.50	8.30	6.00	5.20	5.40	agriculture	laterite
28	CL 11	KENTUKUM	Infront of Temple in the village	19°50'50.8"	79°24'4.6''	216	12.43	2.23	0.66	2.85	4.15	7.6	4.00	4.30	4.50	4.50	3.80	4.50	5.00	agriculture	laterite
29	CL 12	VISAPUR	Out of Campus of Zila School	19°53'1.5"	79°19'20''	195	18.93	3.91	0.91	7	9	8.7	6.35	5.40	6.50	8.50	6.00	5.80	6.03	Domestic	laterite
30	CL 17	HARASTI	In front of Hanuman temple	19°52'51"	79°17'45.6''	203	10.44	3.86	0.64	3.05	5.85	6.9	4.75	5.10	6.00	7.00	4.00	5.00	5.80	agriculture	basalt
31	CB-59	ADITYA NAGAR RAMPUR	CENTER OF THE VILLAGE NEAR CHOUDARY KIRANA STORE	19°47'20.11''	79°20'53.95''	220	10.6	4.8	0.4	2.5	5.1	8.49	3.00	4.30	4.90	5.80	2.65	3.90	4.50	domestic	basalt
32	CB-60	SAKHARI	SOUTH 100M FROM PODE KIRANA STORE.	19°49'40.08''	79°14'58.92''	245	8.9	4.6	0.4	3.5	4.9	7.58	3.30	4.10	4.50	7.00	3.00	4.15	4.40	domestic	basalt

SR.NO	Well No. BA	Name of village	Well location	Latitude	Longitude	R.L. in m	Well depth (m bmp)	Well dia (m)	Height of measuring point (m agl)	Depth to water level (m.bgl)										UTILITY	G/F
										Dec-22	JAN-FEB-23	May-23	Aug-23	Nov-23	Jan-24	May-24	Aug-24	Nov-24	Jan-25		
33	CB-61	MATHARA	NORTH-WEST 3OOM FROM VILLAGE, IN THE AGRICULTURE LAND.	19°47'13.49"	79°19'31.56''	205	9.6	4.2	0.3	3.6	5.8	8.46	4.75	5.40	6.10	7.80	4.60	5.20	5.90	agriculture	basalt
34	CL 14	MANNA	Inside village by side of house Bapuji Motghare	19°54'22.62"	79°17'53.69''	230	11.17	3.51	0.45	1.85	7.35	10.15	2.72	4.70	5.40	8.70	2.30	4.50	5.10	agriculture	laterite

ANACON LABORATORIES PVT. LTD. NAGPUR

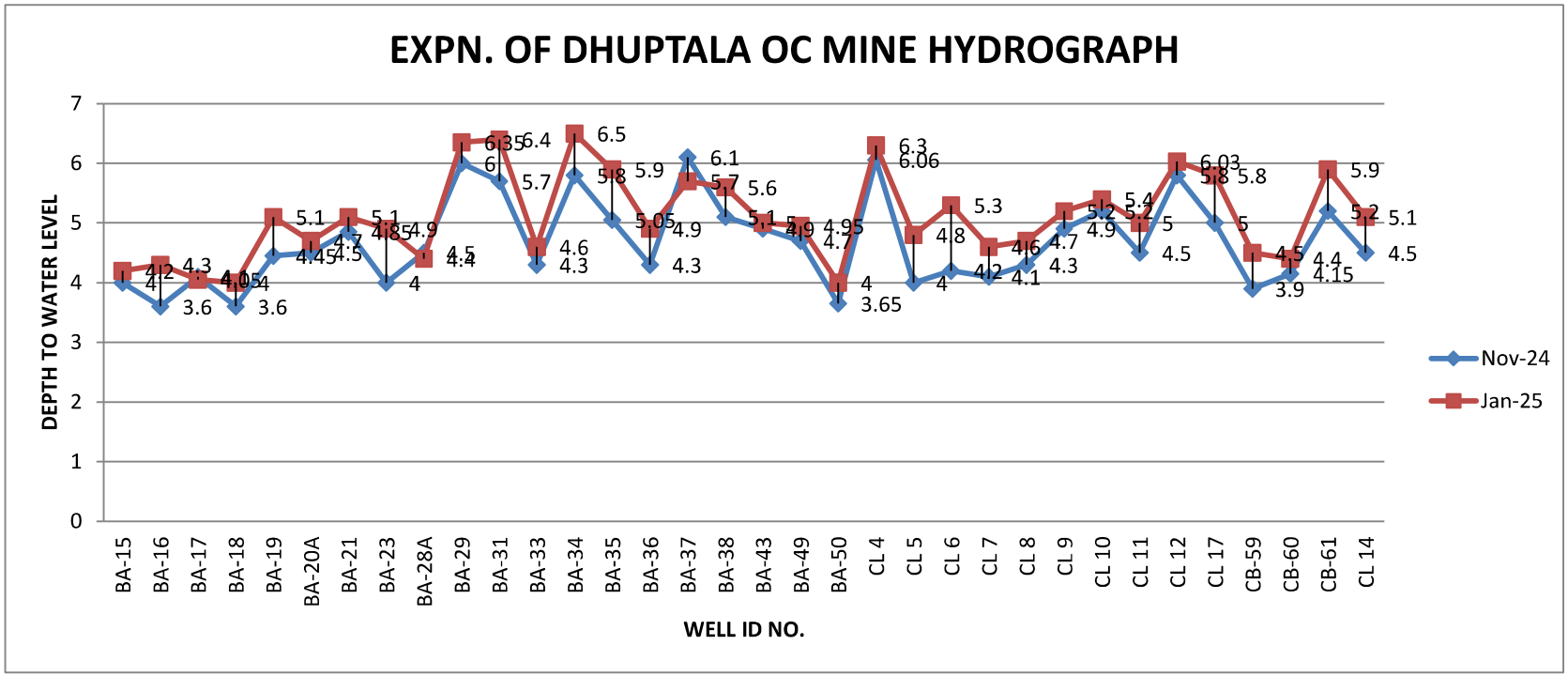

FIGURE-II: HYDROGRAPHS OF THE WATER LEVEL (OBSERVATION WELLS IN AND AROUND EXPN. OF DHUPTALA OC MINE)

ANACON LABORATORIES PVT. LTD. NAGPUR

Photographs of these RTRWHS are provided below in **Figure 6.5 - Figure 6.12.**

Figure 6.5:Roof Top Rainwater Harvesting at Area General Manager's Office, Ballarpur Area

Figure 6.6:Roof top rain harvesting structure at Sub area Manager's office, Gauri Sub area, Ballarpur area

Figure 6.7:Roof top rain water harvesting structure at Manager's office, Gauri Deep OC, Ballarpur area

Figure 6.8:Roof top rainwater harvesting structure at Officer's Guest House, Sasti Colony.

Figure 6.9: Roof top rainwater harvesting and recharge pit at E&M Workshop, Gauri Deep OC, Ballarpur area

Figure 6.10:RWH structure at Manager's Office, Ballarpur UG Expn. Mine

ANNEXURE VII

वेस्टर्न कोलफील्ड्स लिमिटेड
Western Coalfields Limited
पंजी.का.: कोयला विहार, सिविल लाइन्स, नागपुर (महाराष्ट्र)-440001
Regd. Off.: Coal Estate, Civil Lines, Nagpur (MS) – 440001
CIN - U10100MH1975GOI018626 www.westerncoal.in

कंपनी सचिव का कार्यालय
Office of the Company Secretary
email - companysecretary.wcl@coalindia.in
/FAX: 0712 – 2511216

BOARD MATTER
CONFIDENTIAL

REF: WCL/Office of CS/BM-341/2021-22/**974** DATE: 22.03.2022.

Reproduced below is the relevant excerpt from the minutes of 341st meeting of the Board of Directors of WCL held on 09th March, 2022:

"ITEM NO.341/ C-4
SUB Approval of Mining Plan including Mine Closure Plan for Dhuptala OC (Sasti UG to OC) Phase I, II & III, Ballarpur Area.

i) While deliberating on the proposal brought out in the agenda note, Shri Jai Prakash Dwivedi, Director (Technical) apprised the salient features of Mining Plan of Dhuptala OC (Sasti UG to OC) Phase I, II & III, Ballarpur Area to the Board.

ii) The Board, after deliberation, accorded approval to the Mining Plan including Mine Closure Plan of Dhuptala OC (Sasti UG to OC) Mine Phase I, II & III, Ballarpur Area for 2.50 MTY Capacity within 1070.49 Ha land without any additional capital and land of approved project report as brought out in the agenda note.

iii) General Manager (P&P) to take necessary action in the matter."

22/3/2022

COMPANY SECRETARY

GENERAL MANAGER (P&P)

CC: DIRECTOR (PERSONNEL)
DIRECTOR (TECHNICAL) OP
DIRECTOR (FINANCE)
DIRECTOR (TECHNICAL) P&P

GM (ENV)

Sl. No.	Particulars	Area (ha) as per Approved EC, 2013	Area (ha) as per present Mining Plan
4	Embankment	90	60
5	For nala diversion	15	15
6	Rationisation Boundary /Blasting Zone / Land for Future Coal Extraction and OB Dumping	327.57	117.85
7	Green Belt		130
		1244.25	**1013.83**
	Outside Mine Leasehold Boundary		
8	Colony	3	3
9	For Village Rehabilitation	15	15
10	Existing Combined Township	38.66	38.66
	TOTAL	**1300.91**	**1070.49**

18.0 MINE CLOSURE PLANNING

Mine closure planning has to be done at the starting point of the mining operations and needs periodic review and revision during its life cycle to cope with the market due to geo-technical constraints, safety and economic risks, social & environmental challenges.

18.1 MINE CLOSURE COST

Mine closure planning has to be carried out at the starting of the mine and needs periodic reviewing and revision during its life cycle to cope with the geo-technical constraints, safety and economic risks, social & environmental challenges. For the Mine Closure activities, a corpus fund is created by opening an escrow account with the coal controller organization in nationalized bank. For opencast mine, an amount @ Rs 9.00 lakhs per Ha of the project area and for underground mine, an amount @ Rs 1.50 lakhs per Ha of the project area is required to be deposited in this account for final mine closure. The above rate has been adopted as per Circular No. 34011/28/2019-CPAM, GOI, Ministry of Coal, dated 29th May 2020.

The proposed PR of Dhuptala OC (Sasti UG to OC) mine has envisaged the conversion of Sasti UG mine into an opencast mine. The zero date for the proposed Mining Plan has been considered as 01.04.2022 and it is envisaged

that Mining Plan approval and different notifications for acquisition of tenancy land will be completed prior to zero date.

Closure corpus for proposed opencast mine will be deposited from 2022-23 onwards for 25 years life (4 years for Phase-I and 21 years for Phase-II & III).

The total land in proposed Dhuptala OC (Sasti UG to OC) mine is estimated as 1013.83 ha respectively and closure cost for the mine has been estimated for this land, which is detailed below. For the purpose of closure cost 1013.83 ha land has been considered, as for the entire land of Ballarpur NW OC, separate escrow account will be opened.

Closure Cost Calculation

Sl. No.	Details	
1	WPI for All Commodities for Apr 2019 (New series)	121.10
2	WPI for All Commodities for Nov, 2021 (New series)	143.70
3	Ratio of WPI =(2) / (1)	1.1866226
4	Total land area requirement for the project (ha) =	1013.83
5	Mine closure cost @ Rs 9 lacs/ha (Rs in Lakhs) =	9124.47
6	Mine closure cost after indexing from Apr'19 to Nov'21 (Rs. In Lakhs) = (5) x (3) =	10827.30
7	Mine closure cost escalated @ 5% per year for 2022-23 (Rs in Lakhs)	11368.67
8	Life of Dhuptala OC (Sasti UG to OC) mine in years starting from 1st year (2022-23)	25
9	Annual Contribution to Escrow fund as on 2022-23 (Rs in Lakhs) = (9) / (10)	454.75

The annual Mine Closure Cost with 5% escalation in subsequent years is tabulated below:

Annual Mine Closure Cost

Year		Annual Production (Mty)	Corpus Fund (Rs. in Lakhs)	Mine Closure Cost (Rs /t)
1	2022-23	0.20	454.75	227.38
2	2023-24	0.50	477.49	95.50

Year		Annual Production (Mty)	Corpus Fund (Rs. in Lakhs)	Mine Closure Cost (Rs /t)
3	2024-25	1.00	501.36	50.14
4	2025-26	1.50	526.43	35.10
Total (Phase-I)		**3.20**	**1960.03**	
5	2026-27	2.00	552.75	27.64
6	2027-28	2.50	580.39	23.22
7	2028-29	2.50	609.41	24.38
8	2029-30	2.50	639.88	25.60
9	2030-31	2.50	671.87	26.87
10	2031-32	2.50	705.47	28.22
11	2032-33	2.50	740.74	29.63
12	2033-34	2.50	777.78	31.11
13	2034-35	2.50	816.67	32.67
14	2035-36	2.50	857.50	34.30
15	2036-37	2.50	900.37	36.01
16	2037-38	2.50	945.39	37.82
17	2038-39	2.50	992.66	39.71
18	2039-40	2.50	1042.30	41.69
Total (Phase-II)		**37.70**	**12793.20**	
19	2040-41	2.50	1094.41	43.78
20	2041-42	2.50	1149.13	45.97
21	2042-43	2.50	1206.59	48.26
22	2043-44	2.50	1266.92	50.68
23	2044-45	2.50	1330.26	53.21
24	2045-46	2.50	1396.78	55.87
25	2046-47	0.41	1466.61	357.71
Total (Phase-III) (1st to 25th Year)		**53.11**	**21703.90**	

18.2 BREAK-UP OF CLOSURE FUND FOR VARIOUS CLOSURE ACTIVITIES

The corpus amount deposited in the Escrow A/c will be utilized for various mine closure activities and the break-up of closure fund for various activities is tabulated below :

Activity wise Break-up of Closure Fund

Total Corpus Fund = Rs. 1960.03 Lakhs (upto Phase-I) + Rs. 19743.87 Lakhs (Phase-II & III) = Rs 21703.90 Lakhs

Sl. No.	Activity	Weighted % of Mine Closure Cost			Mine Closure Amount (Rs. in Lakhs)
		Progressive	Final	Average	
A	**Dismantling of structure**	0.00	8.50	4.25	922.42
	Service Building				
	Residential Building				
	Industrial Structure				
B	**Safety & Security**	6.50	3.20	4.85	1052.64
	Random rubble mansory / concrete wall				
	Toe wall around dump/Gabbion wall				
	Barbed wire fencing				
	Fencing/Boundary wall, fencing around water body				
	Garland Drains				
C	**OB Dumping Reclamation**				
C. 1	**Technical Reclamation**	60.5	60.50	60.50	13130.86
	Re-handling of OB				
	Levelling by Dozer				
	Grading				
	Levelling and Grading of highwall slopes and OB Dump				
C. 2	**Biological Reclamation & Plantation**	15.0	11.70	13.35	2897.47
	Top Soil Management				
	Grassing of OB Dump				
	Plantation around virgin area, safety zone, green belt over external dump and internal reclamation area				
	Plantation post care (incl. manpower)				
	Plantation over cleared area obtained after dismantling				
D	Landscaping of the open space in leasehold area for improving its esthetic. Drain, pipe lines, peripheral road, gates, View points, cemented steps on bank	4.00	5.50	4.75	1030.94
	Development of Agriculture Land				
E	**Environment Mitigation ans Manpower**	12.0	1.50	6.75	1465.01
	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	1.60	347.62
	Air Quality				
	Water Quality				
	Power Cost				
	Manpower cost and supervision				

Sl. No.	Activity	Weighted % of Mine Closure Cost			Mine Closure Amount (Rs. in Lakhs)
		Progre-ssive	Final	Aver-age	
G	Enterpreneurship Development (Vocational/Skill development training for sustainable income of affected people)	1.00	0.50	0.75	162.78
H	Miscellaneous & Other measures like Golden Handshake, one time financial grant, alternative jobs, other services etc.	1.00	5.40	3.20	694.16
	TOTAL	**100**	**100**	**100**	**21703.90**

1. Mining is to be carried out in a phased manner initiating afforestation / reclamation work in the mined out area.

2. Upto 80% of the total deposited amount including interest accrued in the ECSROW account may be released after every 5 years. The amount released should be equal to expenditure incurred on Progressive Mine closure in past 5 years or 80% whichever is less.

3. The above cost/expenditure will be met from the corpus fund deposited in the escrow account by the mine operator. However, the additional amount beyond the escrow account will be provided by the mine operator after estimating the final mine closure cost (as per the mine closure guideline).

4. The amount indicated separately under each head in the above table is indicative only and based on actual expenditure the amount may change.

19.0 MANPOWER

The manpower requirement for proposed Dhuptala OC (Sasti UG to OC) mine has been calculated on the basis of 3 shift operation for 330 days in a year. The manpower requirement for this project has been detailed in Appendix-B and B.1 of the project report. The manpower to be deployed in the proposed project for Out-sourcing option is 174.

The manpower requirement of this project has been summarised as follows:

Manpower Requirement (Out-sourcing Option)

COMPLAINCE OF PREVIOUS PUBLIC HEARING

Sr no.	Assurances made during previous Public Hearing	Compliance status
1	The physically handicapped person didn't submitted application for employment within stipulated time. Hence, employment was not given to him.	Employment is being given based on CIL R&R policy 2012.
2	All acquired land will not be used for coal excavation. Some land will be kept reserved for OB dumping.	Land Use has been done as per Environment Clearance, in which 396 Ha have been earmarked for External OB Dump. OB being stacked at two earmarked OB dump sites during life of mine. In addition once the dumps get inactive, biological reclamation shall also be carried. Compliance status will be submitted along with six monthly compliance reports. The "Stability Analysis of Pit & Overburden Dump Slopes at Dhoptala Opencast Mine ", has been conducted by IIEST, Shibpur, West Bengal and documented in the Scientific study report of October 2022.
3	Every year before monsoon, drains are checked for proper disposal of runoff.	5.11 km of catch drains of 3.5 m x 1.5 m size have been provided all along periphery of existing OB dump to arrest silt and sediment flow from the respective dump sites. Cleaning of drains every year before the onset of monsoon.
4	Most of the employment cases are solved and few are remaining due to different reasons. In one or two cases, candidates were medically unfit. In other case, nomination was changed. Few cases are pending due to some technical drawbacks in documents provided by the candidate. All pending cases will be solved as soon as possible.	Employment is being given based on CIL R&R policy 2012.

<table>
<tr><td>5</td><td>Royalty for mining is regularly paid to Government.</td><td>Details of Royalty, NMET and DMF paid for FY 23-24 is as follows:<table><tr><th>Sr no</th><th>Royalty
Rs. lakhs</th><th>NMET
Rs. lakhs</th><th>DMF
Rs. lakhs</th></tr><tr><td>1</td><td>6302.09</td><td>126.04</td><td>1890.63</td></tr></table></td></tr>
<tr><td>6</td><td>Remaining land will be acquired in future expansion projects of WCL.</td><td>Land is being aquired based on mining plan and requirement of project. Further acquisition of Land is proposed in Future Expansion project for Dhuptala OC mine, which includes Rehabilitation of Sasti village.</td></tr>
<tr><td>7</td><td>Driving training was given by WCL to some of the villagers under Corporate Social Responsibility for self-employment. Issue of employment to these people will be considered positively.</td><td>Consideration have been made for employment of locals in WCL vehicles which are on hired basis.</td></tr>
<tr><td>8</td><td>If new revised rates for land are implemented by Government, the same will be followed.</td><td>Compensation is being done based on Rates fixed by Government for Irrigated, Non-Irrigated and Barren Land.</td></tr>
<tr><td>9</td><td>Blasting will be carried out strictly according to safety norms</td><td>Controlled blasting is done based on Scientific study conducted.

Deep hole blasting is being done using NONEL down the hole initiation system. Connectorsare used to provide hole to hole delay in blasting sequence, that reduce overall vibration due to Blasting. Vibrators are being used t measure ground vibrations.</td></tr>
<tr><td>10</td><td>Help will be provided by WCL regarding water supply.</td><td>Water is being provided through tankers to nearby villages I.e Sasti and Dhuptala village based on requirement or as per demand from grampanchayats.</td></tr>
</table>

केवल नागपूर कोर्ट के अधिकार क्षेत्र में

Under Jurisdiction of Nagpur Court only

वेस्टर्न कोलफील्ड्स लिमिटेड

Western Coalfields Limited

(मिनीरत्न कंपनी) (A Miniratna Company)

(कोल इंडिया लि. की अनुषंगी कंपनी)

(A Subsidiary of Coal India Limited)

पर्यावरण विभाग | **Environment Department**

आईएसओ 9001:2015 प्रमाणित | **ISO 9001:2015 Certified**

Email- gmenvironment@westerncoal.gov.in | **TELE/FAX: 0712 -2510151**

CIN - U10100MH1975GOI018626 | *www.westerncoal.nic.in*

पंजी. का. : कोयला विहार, सिविल लाइन्स, नागपुर (महाराष्ट्र) - 440001/ Regd. Off. : Coal Estate, Civil Lines, Nagpur (MS) - 440001

संदर्भ संख्या /Ref.No.: वेकोलि/ मुख्यालय/ पर्यावरण/15-A/ 14-E/ 373-385 दिनांक /Date :13.03.2024

प्रति,

1. क्षेत्रीय महाप्रबंधक,
वेस्टर्न कोलफील्ड्स लिमिटेड,
बल्लारपुर /वणी / वणी नॉर्थ / चंद्रपुर / माजरी /
नागपुर / उमरेड / कन्हान / पाथाखेडा एवं पैंच क्षेत्र

2. महाप्रबंधक, सेन्ट्रल वर्कशॉप, टडाली ।

विषय:- Corporate Environment Policy (CEP) 2023 of Coal India Limited ratified in WCL Board meeting held on 24th February'2024 for its implementation in WCL.

संदर्भ :- Relevant excerpt from the minutes of 361st meeting of the Board of Directors of WCL held on 24th February'2024 issued vide no. WCL/ Office of CS/BM-361/2023-24/1187 dated 06.03.2024

Dear Sir,

This has reference to the Corporate Environment Policy - (CEP) 2023 (Revision of CEP – 2018) of Coal India Limited which has been approved by CIL Board in its 460th Meeting of Board of Directors held on 29th Dec'2023 and further ratified the same in the 361st meeting of the Board of Directors of WCL held on 24th February'2024 for its implementation in WCL (Annexure – A).

In view of the above, please find attached herewith copy of Corporate Environment Policy - (CEP) 2023 (Annexure-B) for wide circulation among the employees for implementation of the same and updating the progress of implementation, every month for intimating / submitting the same in every board meeting.

Enclosed as above.

भवदीय,

13.03.2024

महापबंधक / विभागाध्यक्ष (पर्यावरण)

-

प्रतिलिपि :

1. तकनिकी सचिव - निदेशक (तकनिकी) / संचालन, वेकोलि (मु॰), नागपुर.
2. तकनिकी सचिव - निदेशक (तकनिकी) परियोजना एवं योजना, वेकोलि (मु॰), नागपुर.

COAL INDIA LIMITED

CORPORATE ENVIRONMENT POLICY

2023

Back Ground:

Coal India Limited subscribes to the view of Sustainable Development. Unless the environment can sustain all the developmental activities, any pursuit of development in isolation can cause irreparable damage to the ecosystem and associated environmental attributes. Keeping this view in mind, Coal India Limited attaches top priority towards sustainable development and approved its 'Corporate Environmental Policy' in December 1995, which was subsequently revised in 2012 and 2018. The present policy is the revision of the Corporate Environment Policy 2018 and is complimentary to the National Environmental Policy, 2006.

This modification in the present policy is the outcome of the experience gained since 2018 keeping in view the modifications / amendments made time to time in environmental policies and additional stipulations notified by MoEF&CC (Ministry ofEnvironment, Forest& Climate Change) and other organizations concerning mine closure, reclamation of degraded land, environmental clearance etc. and also with the objective of revisiting the corporate policy. Government of India is signatory to few international conventions/agreements relevant to CIL amongst others and activities associated with such conventions/agreements are embodied in the present policy

This Policy has a vision of Green Mining and mission of 100% compliance of environmental statutes applicable to coal mining industry.

Policy Statement:

Coal India Limited (CIL) is committed to promote low carbon, sustainable and socially inclusive coal mining by protecting the environment through integrated project planning & design, prevention/mitigation of pollution, conservation of natural resources, restoration of ecology & biodiversity, recycling/ proper disposal of wastes, addressing climate change and inclusive growth. It also aims to bringing awareness amongst its stakeholders for continual improvement in environmental performances following good environmental practices.

Objectives:

CIL shall endeavor to-

1. *Plan & design projects with due consideration to environmental and social concerns for Sustainable Development and reduction in emission intensity of its operations.*

2. *Conduct mining and associated operation in an environmentally responsible manner to comply with applicable laws and other requirements related to environmental aspects.*
3. *Prevent pollution in surrounding habitation by continuous monitoring and adopting suitable measures for environment protection.*
4. *Ensure effective implementation of Environment Management Plans (EMPs) in all our mines / projects to mitigate pollution, conservation of natural resources and restoration of ecology& biodiversity.*
5. *Ensure compliance of all statutory conditions prescribed by regulatory agencies.*
6. *Ensure waste management in each unit on the principle of REDUCE, REUSE, RECYCLE and SAFE DISPOSAL.*
7. *Put special thrusts on efficient energy utilization / renewable energy and other measuresto reduce carbon foot-print.*
8. *Strive for continual improvement in our environmental performances by setting targets, measuring progress and taking corrective action.*
9. *Take measures to gainful repurposing of land and render productive post mining land use for ensuring environmentally sustainable and socially acceptable closure of mine.*
10. *Ensure implementation of activities applicable to CIL arising out of InternationalConventions.*
11. *Create environmental awareness and ensure environmental education among the employees, local communities and other stakeholders through pro-active communication and training.*
12. *Promote R&D projects/innovations addressing various environmental concerns like minimization of carbon footprints of CIL and environmental issues in mining & surrounding areas.*
13. *Ensure transparency in Environmental reporting / disclosure to stakeholders.*

Review of Environmental Policy:

In view of the present fast changing social, economic and environmental scenario, this policy shall be reviewed every 5 years to incorporate the changes in the legal, technical, environmental, economic and social inputs prevailing at that time. Whenever, there is change in National Environmental Policy or other National / State relevant policies, Acts etc, this Corporate Environmental Policy would be reviewed and suitably revised.

ANNEXURE - A

वेस्टर्न कोलफील्ड्स लिमिटेड
Western Coalfields Limited
पंजी.का.: कोयला विहार, सिविल लाइन्स, नागपूर (महाराष्ट्र)-440001
Regd. Off.: Coal Estate, Civil Lines, Nagpur (MS) – 440001
CIN - U10100MH1975GOI018626 www.westerncoal.in

कंपनी सचिव का कार्यालय
Office of the Company Secretary
email - companysecretary.wcl@coalindia.in
☎/FAX: 0712 - 2511216

BOARD MATTER
CONFIDENTIAL

REF. WCL/Office of CS/BM-361/2023-24/ 1187 DATE: 06.03.2024.

Reproduced below is the relevant excerpt from the minutes of 361st meeting of the Board of Directors of WCL held on 24th February, 2024:

"ITEM NO.361/ C-6
SUB Proposal for ratification of Corporate Environment Policy (CEP) 2023 of Coal India Limited in WCL Board for its implementation in WCL.

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i) While deliberating on the proposal, Shri Anil Kumar Singh, Director (Technical) P&P apprised the salient features of the Corporate Environment Policy (CEP) 2023 of Coal India Limited to the Board.

ii) Shri Balram Nandwani, Independent Director enquired about the strategy built up by WCL for implementation of Corporate Environment Policy (CEP), 2023 in the Company and suggested for updating the progress of implementation of such policy in every Board meeting.

iii) Shri Binod Bihari Dash, Independent Director enquired about steps taken by Company on reduction of carbon emission. It was informed that it is incorporated in EC conditions of some mines to deploy at least 20% of overall fleet of dumpers / trucks / other vehicles as electrical or CNG/LNG based for transportation of Coal / OB etc.

iv) The Board, after deliberation ratified the Corporate Environment Policy - 2023 (CEP - 2023) approved by CIL Board in its 460th meeting held on 29.12.2023, for circulation among employees for its implementation in WCL as brought out in the agenda note with a directive for keeping its updated/progressive implementation status in every Board Meeting.

v) General Manager (Environment) to take necessary action in the matter."

6/3/2024
COMPANY SECRETARY

GENERAL MANAGER (ENVIRONMENT)

CC: DIRECTOR (TECHNICAL) OP
DIRECTOR (FINANCE)
DIRECTOR (TECHNICAL) P&P
DIRECTOR (PERSONNEL)

कंपनी सचिव/मुख्यालय (पर्या.)/मुख्यालय/नागपुर
WCL/GM (Env)/HQ/Nagpur
प्राप्ती/Rec. 93 दिनांक/Date 6/3/24

केवल नागपूर कोर्ट के अधिकार क्षेत्र में

Under Jurisdiction of Nagpur Court only

वेस्टर्न कोलफील्ड्स लिमिटेड

Western Coalfields Limited

(मिनीरत्न कंपनी) (A Miniratna Company)

(कोल इंडिया लि. की अनुषंगी कंपनी)

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पर्यावरण विभाग | **Environment Department**

आईएसओ 9001:2015 प्रमाणित | **ISO 9001:2015 Certified**

Email- gmenvironment@westerncoal.gov.in | **TELE/FAX: 0712 -2510151**

CIN - U10100MH1975GOI018626 | *www.westerncoal.nic.in*

पंजी. का. : कोयला विहार, सिविल लाइन्स, नागपुर (महाराष्ट्र) - 440001/ Regd. Off. : Coal Estate, Civil Lines, Nagpur (MS) - 440001

संदर्भ संख्या /Ref.No.: वेकोलि/ मुख्यालय/ पर्यावरण/15-A/ 14-E/ 373-385 दिनांक /Date :13.03.2024

प्रति,

1. क्षेत्रीय महाप्रबंधक,
वेस्टर्न कोलफील्ड्स लिमिटेड,
बल्लारपुर /वणी / वणी नॉर्थ / चंद्रपुर / माजरी /
नागपुर / उमरेड / कन्हान / पाथाखेडा एवं पैंच क्षेत्र

2. महाप्रबंधक, सेन्ट्रल वर्कशॉप, टडाली ।

विषय:- Corporate Environment Policy (CEP) 2023 of Coal India Limited ratified in WCL Board meeting held on 24th February'2024 for its implementation in WCL.

संदर्भ :- Relevant excerpt from the minutes of 361st meeting of the Board of Directors of WCL held on 24th February'2024 issued vide no. WCL/ Office of CS/BM-361/2023-24/1187 dated 06.03.2024

Dear Sir,

This has reference to the Corporate Environment Policy - (CEP) 2023 (Revision of CEP – 2018) of Coal India Limited which has been approved by CIL Board in its 460th Meeting of Board of Directors held on 29th Dec'2023 and further ratified the same in the 361st meeting of the Board of Directors of WCL held on 24th February'2024 for its implementation in WCL (Annexure – A).

In view of the above, please find attached herewith copy of Corporate Environment Policy - (CEP) 2023 (Annexure-B) for wide circulation among the employees for implementation of the same and updating the progress of implementation, every month for intimating / submitting the same in every board meeting.

Enclosed as above.

भवदीय,

13.03.2024

म. महापबंधक / विभागाध्यक्ष (पर्यावरण)

-

प्रतिलिपि :

1. तकनिकी सचिव - निदेशक (तकनिकी) / संचालन, वेकोलि (मु.), नागपुर.
2. तकनिकी सचिव - निदेशक (तकनिकी) परियोजना एवं योजना, वेकोलि (मु.), नागपुर.

COAL INDIA LIMITED

CORPORATE ENVIRONMENT POLICY

2023

Back Ground:

Coal India Limited subscribes to the view of Sustainable Development. Unless the environment can sustain all the developmental activities, any pursuit of development in isolation can cause irreparable damage to the ecosystem and associated environmental attributes. Keeping this view in mind, Coal India Limited attaches top priority towards sustainable development and approved its 'Corporate Environmental Policy' in December 1995, which was subsequently revised in 2012 and 2018. The present policy is the revision of the Corporate Environment Policy 2018 and is complimentary to the National Environmental Policy, 2006.

This modification in the present policy is the outcome of the experience gained since 2018 keeping in view the modifications / amendments made time to time in environmental policies and additional stipulations notified by MoEF&CC (Ministry ofEnvironment, Forest& Climate Change) and other organizations concerning mine closure, reclamation of degraded land, environmental clearance etc. and also with the objective of revisiting the corporate policy. Government of India is signatory to few international conventions/agreements relevant to CIL amongst others and activities associated with such conventions/agreements are embodied in the present policy

This Policy has a vision of Green Mining and mission of 100% compliance of environmental statutes applicable to coal mining industry.

Policy Statement:

Coal India Limited (CIL) is committed to promote low carbon, sustainable and socially inclusive coal mining by protecting the environment through integrated project planning & design, prevention/mitigation of pollution, conservation of natural resources, restoration of ecology & biodiversity, recycling/ proper disposal of wastes, addressing climate change and inclusive growth. It also aims to bringing awareness amongst its stakeholders for continual improvement in environmental performances following good environmental practices.

Objectives:

CIL shall endeavor to-

1. *Plan & design projects with due consideration to environmental and social concerns for Sustainable Development and reduction in emission intensity of its operations.*

2. *Conduct mining and associated operation in an environmentally responsible manner to comply with applicable laws and other requirements related to environmental aspects.*
3. *Prevent pollution in surrounding habitation by continuous monitoring and adopting suitable measures for environment protection.*
4. *Ensure effective implementation of Environment Management Plans (EMPs) in all our mines / projects to mitigate pollution, conservation of natural resources and restoration of ecology& biodiversity.*
5. *Ensure compliance of all statutory conditions prescribed by regulatory agencies.*
6. *Ensure waste management in each unit on the principle of REDUCE, REUSE, RECYCLE and SAFE DISPOSAL.*
7. *Put special thrusts on efficient energy utilization / renewable energy and other measuresto reduce carbon foot-print.*
8. *Strive for continual improvement in our environmental performances by setting targets, measuring progress and taking corrective action.*
9. *Take measures to gainful repurposing of land and render productive post mining land use for ensuring environmentally sustainable and socially acceptable closure of mine.*
10. *Ensure implementation of activities applicable to CIL arising out of InternationalConventions.*
11. *Create environmental awareness and ensure environmental education among the employees, local communities and other stakeholders through pro-active communication and training.*
12. *Promote R&D projects/innovations addressing various environmental concerns like minimization of carbon footprints of CIL and environmental issues in mining & surrounding areas.*
13. *Ensure transparency in Environmental reporting / disclosure to stakeholders.*

Review of Environmental Policy:

In view of the present fast changing social, economic and environmental scenario, this policy shall be reviewed every 5 years to incorporate the changes in the legal, technical, environmental, economic and social inputs prevailing at that time. Whenever, there is change in National Environmental Policy or other National / State relevant policies, Acts etc, this Corporate Environmental Policy would be reviewed and suitably revised.

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ENVIRONMENTAL MONITORING REPORT

NEW DHOPTALA OC

BALLARPUR AREA

WESTERN COALFIELDS LTD.

JOB NO. 4094423068

MAY 2025

Environment Laboratory
NABL Accredited vide Cert. No. TC-7102
CMPDI
REGIONAL INSTITUTE-IV, KASTURBA NAGAR,
JARIPATKA, NAGPUR, PIN – 440 014

AN ISO 9001:2015 COMPANY

Environment Laboratory CMPDI RI-IV, NAGPUR	Test Report	TC-7102

TEST REPORT NO.	RIN/TR/MAY-25/45		DATE OF ISSUE	25.06.2025
NAME OF CUSTOMER	GM(ENV.), WCL(HQ), NAGPUR			
TEST REQUIRED	SPM: IS 5182 (Part-4), PM-10: IS-5182 (Part 23), PM2.5: IS 5182 (Part 24), NO2: IS 5182 (Part-06), SO2:IS 5182 (Part-2)			
SAMPLE DESCRIPTION	AIR SAMPLE		SAMPLING PLAN :	LQR 47
SAMPLING METHOD : LSOP 4	PERIOD OF PERFORMANCE OF LAB ACTIVITIES:			16-05-25 TO 15-06-25

SAM OFFICE- DHOPTALA SUB AREA		BNDOA1					
DATE(dd:mm:yy) OF SAMPLING		PARAMETERS (24 hourly values in µg/m^3)					ENVIRONMENT CONDITIONS (Sky/Wind)
		SPM	PM_{10}	$PM_{2.5}$	No_2	So_2	
FROM	TO	5	5	2	6	10	
06.05.2025	07.05.2025	305	175	54	19	12	Sunny / Light Breeze
20.05.2025	21.05.2025	298	174	57	21	10	Sunny / Light Breeze
STANDARDS FOR COAL MINE, GSR 742(E), dt. 25TH September 2000		**600**	**300**	**-**	**120**	**120**	

MANAGER OFFICE-DHOPTALA OC		BNDOA2					
DATE(dd:mm:yy) OF SAMPLING		PARAMETERS (24 hourly values in µg/m^3)					ENVIRONMENT CONDITIONS (Sky/Wind)
		SPM	PM_{10}	$PM_{2.5}$	No_2	So_2	
FROM	TO	5	5	2	6	10	
06.05.2025	07.05.2025	332	220	69	21	12	Sunny / Light Breeze
20.05.2025	21.05.2025	360	245	57	25	14	Sunny / Light Breeze
STANDARDS FOR COAL MINE, GSR 742(E), dt. 25TH September 2000		**600**	**300**	**-**	**120**	**120**	

SASTI COLONY		BSUA3				
DATE(dd:mm:yy) OF SAMPLING		PARAMETERS (24 hourly values in µg/m^3)				ENVIRONMENT CONDITIONS (Sky/Wind)
		PM_{10}	$PM_{2.5}$	No_2	So_2	
FROM	TO	5	2	6	10	
04.05.2025	05.05.2025	84	28	10	BDL	Sunny / Light Breeze
05.05.2025	06.05.2025	79	32	9	BDL	Sunny / Light Breeze
11.05.2025	12.05.2025	92	36	12	BDL	Sunny / Light Breeze
12.05.2025	13.05.2025	86	34	14	BDL	Sunny / Light Breeze
18.05.2025	19.05.2025	80	46	13	BDL	Sunny / Light Breeze
19.05.2025	20.05.2025	76	30	10	BDL	Sunny / Light Breeze
25.05.2025	26.05.2025	72	29	12	BDL	Sunny / Light Breeze
26.05.2025	27.05.2025	86	45	15	BDL	Sunny / Light Breeze
30.05.2025	31.05.2025	92	48	11	BDL	Sunny / Light Breeze
31.05.2025	01.06.2025	82	35	10	BDL	Sunny / Light Breeze
NAAQS, 2009		**100**	**60**	**80**	**80**	

MUTHRA VILLAGE		BGDO2				
DATE(dd:mm:yy) OF SAMPLING		PARAMETERS (24 hourly values in µg/m^3)				ENVIRONMENT CONDITIONS (Sky/Wind)
		PM_{10}	$PM_{2.5}$	No_2	So_2	
FROM	TO	5	2	6	10	
02.05.2025	03.05.2025	60	28	8	BDL	Sunny /Light Breeze
03.05.2025	04.05.2025	71	35	10	BDL	Sunny /Light Breeze
09.05.2025	10.05.2025	76	30	14	BDL	Sunny /Light Breeze
10.05.2025	11.05.2025	64	26	12	BDL	Sunny /Light Breeze
16.05.2025	17.05.2025	59	25	14	BDL	Sunny /Light Breeze
17.05.2025	18.05.2025	78	37	13	BDL	Sunny /Light Breeze
23.05.2025	24.05.2025	75	42	14	BDL	Sunny /Light Breeze
24.05.2025	25.05.2025	66	40	12	BDL	Sunny /Light Breeze
28.05.2025	29.05.2025	59	27	11	BDL	Sunny /Light Breeze
29.05.2025	30.05.2025	71	32	10	BDL	Sunny /Light Breeze
NAAQS, 2009		**100**	**60**	**80**	**80**	

Analysed by

Environment Laboratory CMPDI RI-IV, NAGPUR	Test Report	TC-7102

SAMPLE DESCRIPTION	Water sample	
Test Required	pH: IS 3025 -(Part 11), TSS: IS 3025-(Part 17), COD: APHA (24th Edition) 5220 C , O & G: IS 3025-(Part 39) & BOD: IS 3025 (Part 44)	
SAMPLING METHOD	LSOP 5	PERIOD OF PERFORMANCE OF LAB ACTIVITIES : 16-05-25 TO 15-06-25

MINE WATER DISCHARGE:	BNDOW1			
DATE OF SAMPLE COLLECTION	ANALYSIS RESULTS			
	pH	TSS (in mg/l)	COD(in mg/l)	O & G(in mg/l)
DETECTION LIMIT	2	10	4	2
06.05.2025	7.38	28	48	BDL
20.05.2025	7.56	18	40	BDL
STANDARDS FOR COAL MINE, GSR 742E, dt. 25/09/2000	5.5 - 9.0	100	250	10

Analysed by

Environment Laboratory CMPDI RI-IV, NAGPUR	Test Report	TC-7102

NOISE LEVEL MONITORING DATA

SAMPLE DESCRIPTION	NOISE SAMPLE
Test Required	CPCB PROTOCOL FOR AMBIENT NOISE MEASUREMENT
SAMPLING METHOD	LSOP 6

CHP:		BNDON1	
MONTH	DATE OF SAMPLE COLLECTION	NOISE LEVEL IN dB(A)	
		DAY TIME	NIGHT TIME
	DETECTION LIMIT	20	20
MAY'25	11.05.2025	68.7	61.6
MAY'25	28.05.2025	67.7	61.6
NOISE POLLUTION (REGULATION AND CONTROL) RULES		**75**	**70**

SASTI COLONY:		BSUN2	
MONTH	DATE OF SAMPLE COLLECTION	NOISE LEVEL IN dB(A)	
		DAY TIME	NIGHT TIME
	DETECTION LIMIT	20	20
MAY'25	11.05.2025	46.6	42.5
MAY'25	28.05.2025	47.6	42.8
NOISE POLLUTION (REGULATION AND CONTROL) RULES		**55**	**45**

Yogesh Pidurkar
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ENVIRONMENTAL MONITORING REPORT

NEW DHOPTALA OC

BALLARPUR AREA

WESTERN COALFIELDS LTD.

JOB NO. 4094423068

APRIL 2025

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Environment Laboratory CMPDI RI-IV, NAGPUR	Test Report	TC-7102

TEST REPORT NO.	RIN/TR/APRIL-25/45	DATE OF ISSUE		25-05-2025
NAME OF CUSTOMER	GM(ENV.), WCL(HQ), NAGPUR			
TEST REQUIRED	SPM: IS 5182 (Part-4), PM-10: IS-5182 (Part 23), PM2.5: IS 5182 (Part 24), NO2: IS 5182 (Part-06), SO2:IS 5182 (Part-2)			
SAMPLE DESCRIPTION	AIR SAMPLE		SAMPLING PLAN :	LQR 47
SAMPLING METHOD : LSOP 4	PERIOD OF PERFORMANCE OF LAB ACTIVITIES:			16-04-25 TO 15-05-25

SAM OFFICE- DHOPTALA SUB AREA		BNDOA1					
DATE(dd:mm:yy) OF SAMPLING		PARAMETERS (24 hourly values in µg/m^3)					ENVIRONMENT CONDITIONS (Sky/Wind)
		SPM	**PM_{10}**	**$PM_{2.5}$**	**No_2**	**So_2**	
FROM	TO	5	5	2	6	10	
06-04-2025	07-04-2025	280	160	55	18	11	clear sky / light breeze
20-04-2025	21-04-2025	269	177	59	16	10	clear sky / light breeze
STANDARDS FOR COAL MINE, GSR 742(E), dt. 25TH September 2000		**600**	**300**	**-**	**120**	**120**	

MANAGER OFFICE-DHOPTALA OC		BNDOA2					
DATE(dd:mm:yy) OF SAMPLING		PARAMETERS (24 hourly values in µg/m^3)					ENVIRONMENT CONDITIONS (Sky/Wind)
		SPM	**PM_{10}**	**$PM_{2.5}$**	**No_2**	**So_2**	
FROM	TO	5	5	2	6	10	
06-04-2025	07-04-2025	330	214	59	21	14	clear sky / light breeze
20-04-2025	21-04-2025	302	198	62	19	12	clear sky / light breeze
STANDARDS FOR COAL MINE, GSR 742(E), dt. 25TH September 2000		**600**	**300**	**-**	**120**	**120**	

SASTI COLONY		BSUA3				
DATE(dd:mm:yy) OF SAMPLING		PARAMETERS (24 hourly values in µg/m^3)				ENVIRONMENT CONDITIONS (Sky/Wind)
		PM_{10}	**$PM_{2.5}$**	**No_2**	**So_2**	
FROM	TO	5	2	6	10	
04-04-2025	05-04-2025	89	36	12	BDL	clear sky / light breeze
05-04-2025	06-04-2025	69	31	7	BDL	clear sky / light breeze
11-04-2025	12-04-2025	77	33	9	BDL	clear sky / light breeze
12-04-2025	13-04-2025	92	41	11	BDL	clear sky / light breeze
18-04-2025	19-04-2025	60	22	8	BDL	clear sky / light breeze
19-04-2025	20-04-2025	78	33	9	BDL	clear sky / light breeze
25-04-2025	26-04-2025	78	36	10	BDL	clear sky / light breeze
26-04-2025	27-04-2025	70	34	7	BDL	clear sky / light breeze
NAAQS, 2009		**100**	**60**	**80**	**80**	

MUTHRA VILLAGE		BGDO2				
DATE(dd:mm:yy) OF SAMPLING		PARAMETERS (24 hourly values in µg/m^3)				ENVIRONMENT CONDITIONS (Sky/Wind)
		PM_{10}	**$PM_{2.5}$**	**No_2**	**So_2**	
FROM	TO	5	2	6	10	
02-04-2025	03-04-2025	69	35	9	BDL	clear sky / light breeze
03-04-2025	04-04-2025	72	29	8	BDL	clear sky / light breeze
09-04-2025	10-04-2025	74	34	9	BDL	clear sky / light breeze
10-04-2025	11-04-2025	83	31	11	BDL	clear sky / light breeze
16-04-2025	17-04-2025	72	28	9	BDL	clear sky / light breeze
17-04-2025	18-04-2025	68	32	10	BDL	clear sky / light breeze
23-04-2025	24-04-2025	75	39	11	BDL	clear sky / light breeze
24-04-2025	25-04-2025	69	27	8	BDL	clear sky / light breeze
NAAQS, 2009		**100**	**60**	**80**	**80**	

Analysed by

Environment Laboratory CMPDI RI-IV, NAGPUR	Test Report	TC-7102

FUGITIVE DUST MONITORING

TEST REQUIRED	SPM: IS 5182 (Part-4), PM-10: IS-5182 (Part 23), PM2.5: IS 5182 (Part 24)		
SAMPLE DESCRIPTION	Air sample(Fugitive)		
SAMPLING METHOD : LSOP 4	PERIOD OF PERFORMANCE OF LAB ACTIVITIES:	16-04-25 TO 15-05-25	

WEIGH BRIDGE		BNDOF1		
DATE(dd:mm:yy) OF SAMPLING		PARAMETERS (24 hourly values in µg/m^3)		ENVIRONMENT CONDITIONS (Sky/Wind)
		SPM	PM_{10}	
FROM	TO	5	5	
18-04-2025	19-04-2025	422	320	Cloudy Sky /Light Breeze

CHP/Coal Mine Point		BNDOF2		
DATE(dd:mm:yy) OF SAMPLING		PARAMETERS (24 hourly values in µg/m^3)		ENVIRONMENT CONDITIONS (Sky/Wind)
		SPM	PM_{10}	
FROM	TO	5	5	
25-04-2025	26-04-2025	536	457	Cloudy Sky /Light Breeze

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Environment Laboratory CMPDI RI-IV, NAGPUR	Test Report	TC-7102

SAMPLE DESCRIPTION	Water sample	
Test Required	pH: IS 3025 -Part 11, TSS: IS 3025-Part 17, COD: APHA (24th Edition) 5220 C ,O&G: IS 3025-Part 39 & BOD: IS 3025 (Part 44)	
SAMPLING METHOD	LSOP 5	PERIOD OF PERFORMANCE OF LAB ACTIVITIES : 16-04-25 TO 15-05-25

MINE WATER DISCHARGE:	BNDOW1			
DATE OF SAMPLE COLLECTION	ANALYSIS RESULTS			
	pH	TSS (in mg/l)	COD(in mg/l)	O & G(in mg/l)
DETECTION LIMIT	2	10	4	2
08-04-2025	7.46	24	40	BDL
22-04-2025	7.67	16	28	BDL
STANDARDS FOR COAL MINE, GSR 742E, dt. 25/09/2000	5.5 - 9.0	100	250	10

Analysed by

Environment Laboratory CMPDI RI-IV, NAGPUR	Test Report	TC-7102

NOISE LEVEL MONITORING DATA

SAMPLE DESCRIPTION	NOISE SAMPLE
Test Required	CPCB PROTOCOL FOR AMBIENT NOISE MEASUREMENT
SAMPLING METHOD	LSOP 6

CHP:		BNDON1	
MONTH	DATE OF SAMPLE COLLECTION	NOISE LEVEL IN dB(A)	
		DAY TIME	NIGHT TIME
	DETECTION LIMIT	20	20
APRIL'25	11-04-2025	69.9	68.2
APRIL'25	25-04-2025	67.4	60.5
NOISE POLLUTION (REGULATION AND CONTROL) RULES		**75**	**70**

SASTI COLONY:		BSUN2	
MONTH	DATE OF SAMPLE COLLECTION	NOISE LEVEL IN dB(A)	
		DAY TIME	NIGHT TIME
	DETECTION LIMIT	20	20
APRIL'25	11-04-2025	42.8	40.3
APRIL'25	25-04-2025	45.7	41.6
NOISE POLLUTION (REGULATION AND CONTROL) RULES		**55**	**45**

Yogesh Pidurkar
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Environment Laboratory CMPDI RI-IV, NAGPUR	Test Report	TC-7102

TEST REPORT NO.	RIN/TR/JULY-25/45		DATE OF ISSUE	25-08-2025
NAME OF CUSTOMER	GM(ENV.), WCL(HQ), NAGPUR			
TEST REQUIRED	SPM: IS 5182 (Part-4), PM-10: IS-5182 (Part 23), PM2.5: IS 5182 (Part 24), NO2: IS 5182 (Part-06), SO2:IS 5182 (Part-2)			
SAMPLE DESCRIPTION	AIR SAMPLE		SAMPLING PLAN :	LQR 47
SAMPLING METHOD : LSOP 4	PERIOD OF PERFORMANCE OF LAB ACTIVITIES:			16-07-25 TO 15-08-25

SAM OFFICE- DHOPTALA SUB AREA		BNDOA1					
DATE(dd:mm:yy) OF SAMPLING		PARAMETERS (24 hourly values in µg/m^3)					ENVIRONMENT CONDITIONS (Sky/Wind)
		SPM	PM_{10}	$PM_{2.5}$	No_2	So_2	
FROM	TO	5	5	2	6	10	
05-07-2025	06-07-2025	267	184	42	12	10	CLOUDY/CALM
19-07-2025	20-07-2025	222	146	34	10	BDL	CLOUDY/CALM
STANDARDS FOR COAL MINE, GSR 742(E), dt. 25TH September 2000		**600**	**300**	**-**	**120**	**120**	

MANAGER OFFICE-DHOPTALA OC		BNDOA2					
DATE(dd:mm:yy) OF SAMPLING		PARAMETERS (24 hourly values in µg/m^3)					ENVIRONMENT CONDITIONS (Sky/Wind)
		SPM	PM_{10}	$PM_{2.5}$	No_2	So_2	
FROM	TO	5	5	2	6	10	
05-07-2025	06-07-2025	253	171	42	14	11	CLOUDY/CALM
19-07-2025	20-07-2025	209	121	37	11	BDL	CLOUDY/CALM
STANDARDS FOR COAL MINE, GSR 742(E), dt. 25TH September 2000		**600**	**300**	**-**	**120**	**120**	

SASTI COLONY		BSUA3				
DATE(dd:mm:yy) OF SAMPLING		PARAMETERS (24 hourly values in µg/m^3)				ENVIRONMENT CONDITIONS (Sky/Wind)
		PM_{10}	$PM_{2.5}$	No_2	So_2	
FROM	TO	5	2	6	10	
03-07-2025	04-07-2025	74	25	8	BDL	CLOUDY/CALM
04-07-2025	05-07-2025	70	22	8	BDL	CLOUDY/CALM
10-07-2025	11-07-2025	82	28	10	BDL	CLOUDY/CALM
11-07-2025	12-07-2025	79	26	9	BDL	CLOUDY/CALM
17-07-2025	18-07-2025	68	19	7	BDL	CLOUDY/CALM
18-07-2025	19-07-2025	79	22	8	BDL	CLOUDY/CALM
24-07-2025	25-07-2025	54	15	7	BDL	RAINY/CALM
25-07-2025	26-07-2025	61	18	8	BDL	RAINY/CALM
29-07-2025	30-07-2025	69	20	7	BDL	CLOUDY/CALM
30-07-2025	31-07-2025	75	25	9	BDL	CLOUDY/CALM
NAAQS, 2009		**100**	**60**	**80**	**80**	

MUTHRA VILLAGE		BGDO2				
DATE(dd:mm:yy) OF SAMPLING		PARAMETERS (24 hourly values in µg/m^3)				ENVIRONMENT CONDITIONS (Sky/Wind)
		PM_{10}	$PM_{2.5}$	No_2	So_2	
FROM	TO	5	2	6	10	
01-07-2025	02-07-2025	83	30	10	BDL	CLOUDY/CALM
02-07-2025	03-07-2025	79	24	9	BDL	CLOUDY/CALM
08-07-2025	09-07-2025	67	20	8	BDL	RAINY/CALM
09-07-2025	10-07-2025	58	17	7	BDL	RAINY/CALM
13-07-2025	14-07-2025	88	25	10	BDL	CLOUDY/CALM
14-07-2025	15-07-2025	75	21	9	BDL	CLOUDY/CALM
22-07-2025	23-07-2025	68	19	8	BDL	RAINY/CALM
23-07-2025	24-07-2025	70	22	7	BDL	RAINY/CALM
27-07-2025	28-07-2025	74	27	7	BDL	CLOUDY/CALM
28-07-2025	29-07-2025	80	30	10	BDL	CLOUDY/CALM
NAAQS, 2009		**100**	**60**	**80**	**80**	

Analysed by

Environment Laboratory CMPDI RI-IV, NAGPUR	Test Report	TC-7102

FUGITIVE DUST MONITORING

TEST REQUIRED	SPM: IS 5182 (Part-4), PM-10: IS-5182 (Part 23), PM2.5: IS 5182 (Part 24)		
SAMPLE DESCRIPTION	Air sample(Fugitive)		
SAMPLING METHOD : LSOP 4	PERIOD OF PERFORMANCE OF LAB ACTIVITIES:	16-07-25 TO 15-08-25	

WEIGH BRIDGE		BNDOF1		
DATE(dd:mm:yy) OF SAMPLING		PARAMETERS (24 hourly values in µg/m^3)		ENVIRONMENT CONDITIONS (Sky/Wind)
		SPM	PM_{10}	
FROM	TO	5	5	
02-07-2025	03-07-2025	329	213	CLOUDY/CALM

CHP/Coal Mine Point		BNDOF2		
DATE(dd:mm:yy) OF SAMPLING		PARAMETERS (24 hourly values in µg/m^3)		ENVIRONMENT CONDITIONS (Sky/Wind)
		SPM	PM_{10}	
FROM	TO	5	5	
01-07-2025	02-07-2025	350	244	CLOUDY/CALM

Analysed by

Environment Laboratory CMPDI RI-IV, NAGPUR	Test Report	TC-7102

SAMPLE DESCRIPTION	Water sample	
Test Required	pH: IS 3025 -(Part 11), TSS: IS 3025-(Part 17), COD: APHA (24th Edition) 5220 C , O & G: IS 3025-(Part 39) & BOD: IS 3025 (Part 44)	
SAMPLING METHOD	LSOP 5	PERIOD OF PERFORMANCE OF LAB ACTIVITIES : 16-07-25 TO 15-08-25

MINE WATER DISCHARGE:	BNDOW1			
DATE OF SAMPLE COLLECTION	ANALYSIS RESULTS			
	pH	TSS (in mg/l)	COD(in mg/l)	O & G(in mg/l)
DETECTION LIMIT	2	10	4	2
13-07-2025	8.02	24	40	BDL
28-07-2025	7.87	20	36	BDL
STANDARDS FOR COAL MINE, GSR 742E, dt. 25/09/2000	5.5 - 9.0	100	250	10

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Environment Laboratory CMPDI RI-IV, NAGPUR	Test Report	TC-7102

NOISE LEVEL MONITORING DATA

SAMPLE DESCRIPTION	NOISE SAMPLE
Test Required	CPCB PROTOCOL FOR AMBIENT NOISE MEASUREMENT
SAMPLING METHOD	LSOP 6

CHP:	BNDON1		
MONTH	DATE OF SAMPLE COLLECTION	NOISE LEVEL IN dB(A)	
		DAY TIME	NIGHT TIME
	DETECTION LIMIT	20	20
JULY'25	12-07-2025	68.7	63.8
JULY'25	28-07-2025	66.6	64.6
NOISE POLLUTION (REGULATION AND CONTROL) RULES		**75**	**70**

SASTI COLONY:	BSUN2		
MONTH	DATE OF SAMPLE COLLECTION	NOISE LEVEL IN dB(A)	
		DAY TIME	NIGHT TIME
	DETECTION LIMIT	20	20
JULY'25	12-07-2025	45.9	40.5
JULY'25	28-07-2025	47.9	43.5
NOISE POLLUTION (REGULATION AND CONTROL) RULES		**55**	**45**

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ENVIRONMENTAL MONITORING REPORT

NEW DHOPTALA OC

BALLARPUR AREA

WESTERN COALFIELDS LTD.

JOB NO. 4094423068

AUGUST 2025

Environment Laboratory
NABL Accredited vide Cert. No. TC-7102
CMPDI
REGIONAL INSTITUTE-IV, KASTURBA NAGAR,
JARIPATKA, NAGPUR, PIN – 440 014

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Environment Laboratory CMPDI RI-IV, NAGPUR	Test Report	TC-7102

TEST REPORT NO.	RIN/TR/AUG-25/45		DATE OF ISSUE	25-09-2025
NAME OF CUSTOMER	GM(ENV.), WCL(HQ), NAGPUR			
TEST REQUIRED	SPM: IS 5182 (Part-4), PM-10: IS-5182 (Part 23), PM2.5: IS 5182 (Part 24), NO2: IS 5182 (Part-06), SO2:IS 5182 (Part-2)			
SAMPLE DESCRIPTION	AIR SAMPLE		SAMPLING PLAN :	LQR 47
SAMPLING METHOD : LSOP 4	PERIOD OF PERFORMANCE OF LAB ACTIVITIES:			16-08-25 TO 15-09-25

SAM OFFICE- DHOPTALA SUB AREA		BNDOA1					
DATE(dd:mm:yy) OF SAMPLING		PARAMETERS (24 hourly values in µg/m^3)					ENVIRONMENT CONDITIONS (Sky/Wind)
		SPM	PM_{10}	$PM_{2.5}$	No_2	So_2	
FROM	TO	5	5	2	6	10	
08-08-2025	09-08-2025	234	147	34	11	BDL	RAINY/CALM
22-08-2025	23-08-2025	262	179	40	13	10	RAINY/CALM
STANDARDS FOR COAL MINE, GSR 742(E), dt. 25TH September 2000		**600**	**300**	**-**	**120**	**120**	

MANAGER OFFICE-DHOPTALA OC		BNDOA2					
DATE(dd:mm:yy) OF SAMPLING		PARAMETERS (24 hourly values in µg/m^3)					ENVIRONMENT CONDITIONS (Sky/Wind)
		SPM	PM_{10}	$PM_{2.5}$	No_2	So_2	
FROM	TO	5	5	2	6	10	
08-08-2025	09-08-2025	249	163	37	12	10	RAINY/CALM
22-08-2025	23-08-2025	217	127	29	11	BDL	RAINY/CALM
STANDARDS FOR COAL MINE, GSR 742(E), dt. 25TH September 2000		**600**	**300**	**-**	**120**	**120**	

SASTI COLONY		BSUA3				
DATE(dd:mm:yy) OF SAMPLING		PARAMETERS (24 hourly values in µg/m^3)				ENVIRONMENT CONDITIONS (Sky/Wind)
		PM_{10}	$PM_{2.5}$	No_2	So_2	
FROM	TO	5	2	6	10	
06-08-2025	07-08-2025	85	31	9	BDL	CLOUDY/CALM
07-08-2025	08-08-2025	76	24	7	BDL	CLOUDY/CALM
12-08-2025	13-08-2025	80	30	10	BDL	CLOUDY/CALM
13-08-2025	14-08-2025	63	20	7	BDL	RAINY/CALM
20-08-2025	21-08-2025	57	17	6	BDL	RAINY/CALM
21-08-2025	22-08-2025	87	33	8	BDL	CLOUDY/CALM
27-08-2025	28-08-2025	55	17	7	BDL	RAINY/CALM
28-08-2025	29-08-2025	63	22	8	BDL	RAINY/CALM
NAAQS, 2009		**100**	**60**	**80**	**80**	

MUTHRA VILLAGE		BGDO2				
DATE(dd:mm:yy) OF SAMPLING		PARAMETERS (24 hourly values in µg/m^3)				ENVIRONMENT CONDITIONS (Sky/Wind)
		PM_{10}	$PM_{2.5}$	No_2	So_2	
FROM	TO	5	2	6	10	
04-08-2025	05-08-2025	74	24	8	BDL	CLOUDY/CALM
05-08-2025	06-08-2025	82	29	10	BDL	CLOUDY/CALM
10-08-2025	11-08-2025	70	20	8	BDL	CLOUDY/CALM
11-08-2025	12-08-2025	77	26	9	BDL	CLOUDY/CALM
18-08-2025	19-08-2025	55	16	6	BDL	RAINY/CALM
19-08-2025	20-08-2025	78	24	8	BDL	CLOUDY/CALM
25-08-2025	26-08-2025	70	20	7	BDL	CLOUDY/CALM
26-08-2025	27-08-2025	74	23	8	BDL	CLOUDY/CALM
NAAQS, 2009		**100**	**60**	**80**	**80**	

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Environment Laboratory CMPDI RI-IV, NAGPUR	Test Report	TC-7102

SAMPLE DESCRIPTION	Water sample	
Test Required	pH: IS 3025 -(Part 11), TSS: IS 3025-(Part 17), COD: APHA (24th Edition) 5220 C , O & G: IS 3025-(Part 39) & BOD: IS 3025 (Part 44)	
SAMPLING METHOD	LSOP 5	PERIOD OF PERFORMANCE OF LAB ACTIVITIES : 16-08-25 TO 15-09-25

MINE WATER DISCHARGE:	BNDOW1			
DATE OF SAMPLE COLLECTION	ANALYSIS RESULTS			
	pH	TSS (in mg/l)	COD(in mg/l)	O & G(in mg/l)
DETECTION LIMIT	2	10	4	2
08-08-2025	7.73	24	40	BDL
22-08-2025	7.71	20	36	BDL
STANDARDS FOR COAL MINE, GSR 742E, dt. 25/09/2000	5.5 - 9.0	100	250	10

Analysed by

Environment Laboratory CMPDI RI-IV, NAGPUR	Test Report	TC-7102

NOISE LEVEL MONITORING DATA

SAMPLE DESCRIPTION	NOISE SAMPLE
Test Required	CPCB PROTOCOL FOR AMBIENT NOISE MEASUREMENT
SAMPLING METHOD	LSOP 6

CHP:	BNDON1		
MONTH	DATE OF SAMPLE COLLECTION	NOISE LEVEL IN dB(A)	
		DAY TIME	NIGHT TIME
	DETECTION LIMIT	20	20
AUG'25	12-08-2025	68.7	64.6
AUG'25	26-08-2025	67.7	63.6
NOISE POLLUTION (REGULATION AND CONTROL) RULES		**75**	**70**

SASTI COLONY:	BSUN2		
MONTH	DATE OF SAMPLE COLLECTION	NOISE LEVEL IN dB(A)	
		DAY TIME	NIGHT TIME
	DETECTION LIMIT	20	20
AUG'25	12-08-2025	46.5	42.9
AUG'25	26-08-2025	45.6	41.7
NOISE POLLUTION (REGULATION AND CONTROL) RULES		**55**	**45**

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ENVIRONMENTAL MONITORING REPORT

NEW DHOPTALA OC

BALLARPUR AREA

WESTERN COALFIELDS LTD.

JOB NO. 4094423068

SEPTEMBER 2025

Environment Laboratory
NABL Accredited vide Cert. No. TC-7102
CMPDI
REGIONAL INSTITUTE-IV, KASTURBA NAGAR,
JARIPATKA, NAGPUR, PIN – 440 014

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Environment Laboratory CMPDI RI-IV, NAGPUR	Test Report	TC-7102

TEST REPORT NO.	RIN/TR/SEPT-25/45		DATE OF ISSUE	25-10-2025
NAME OF CUSTOMER	GM(ENV.), WCL(HQ), NAGPUR			
TEST REQUIRED	SPM: IS 5182 (Part-4), PM-10: IS-5182 (Part 23), PM2.5: IS 5182 (Part 24), NO2: IS 5182 (Part-06), SO2:IS 5182 (Part-2)			
SAMPLE DESCRIPTION	AIR SAMPLE		SAMPLING PLAN :	LQR 47
SAMPLING METHOD : LSOP 4	PERIOD OF PERFORMANCE OF LAB ACTIVITIES:			16-09-25 TO 15-10-25

SAM OFFICE- DHOPTALA SUB AREA		BNDOA1					
DATE(dd:mm:yy) OF SAMPLING		PARAMETERS (24 hourly values in µg/m^3)					ENVIRONMENT CONDITIONS (Sky/Wind)
		SPM	PM_{10}	$PM_{2.5}$	No_2	So_2	
FROM	TO	5	5	2	6	10	
06-09-2025	07-09-2025	276	195	49	14	10	CLOUDY/CALM
20-09-2025	21-09-2025	255	170	38	11	BDL	CLOUDY/CALM
STANDARDS FOR COAL MINE, GSR 742(E), dt. 25TH September 2000		**600**	**300**	**-**	**120**	**120**	

MANAGER OFFICE-DHOPTALA OC		BNDOA2					
DATE(dd:mm:yy) OF SAMPLING		PARAMETERS (24 hourly values in µg/m^3)					ENVIRONMENT CONDITIONS (Sky/Wind)
		SPM	PM_{10}	$PM_{2.5}$	No_2	So_2	
FROM	TO	5	5	2	6	10	
06-09-2025	07-09-2025	296	212	56	17	14	CLOUDY/CALM
20-09-2025	21-09-2025	277	192	48	15	13	CLOUDY/CALM
STANDARDS FOR COAL MINE, GSR 742(E), dt. 25TH September 2000		**600**	**300**	**-**	**120**	**120**	

SASTI COLONY		BSUA3				
DATE(dd:mm:yy) OF SAMPLING		PARAMETERS (24 hourly values in µg/m^3)				ENVIRONMENT CONDITIONS (Sky/Wind)
		PM_{10}	$PM_{2.5}$	No_2	So_2	
FROM	TO	5	2	6	10	
03-09-2025	04-09-2025	77	25	9	BDL	CLOUDY/CALM
04-09-2025	05-09-2025	87	29	10	BDL	CLOUDY/CALM
10-09-2025	11-09-2025	91	34	11	BDL	CLOUDY/CALM
11-09-2025	12-09-2025	82	30	10	BDL	CLOUDY/CALM
17-09-2025	18-09-2025	73	22	8	BDL	CLOUDY/CALM
18-09-2025	19-09-2025	88	28	9	BDL	CLOUDY/CALM
23-09-2025	24-09-2025	75	21	7	BDL	CLOUDY/CALM
24-09-2025	25-09-2025	89	28	9	BDL	CLOUDY/CALM
28-09-2025	29-09-2025	67	18	7	BDL	RAINY/CALM
29-09-2025	30-09-2025	78	24	8	BDL	CLOUDY/CALM
NAAQS, 2009		**100**	**60**	**80**	**80**	

MUTHRA VILLAGE		BGDO2				
DATE(dd:mm:yy) OF SAMPLING		PARAMETERS (24 hourly values in µg/m^3)				ENVIRONMENT CONDITIONS (Sky/Wind)
		PM_{10}	$PM_{2.5}$	No_2	So_2	
FROM	TO	5	2	6	10	
01-09-2025	02-09-2025	55	17	7	BDL	RAINY/CALM
02-09-2025	03-09-2025	61	20	8	BDL	RAINY/CALM
08-09-2025	09-09-2025	57	16	8	BDL	RAINY/CALM
09-09-2025	10-09-2025	76	24	9	BDL	CLOUDY/CALM
13-09-2025	14-09-2025	64	21	7	BDL	RAINY/CALM
16-09-2025	17-09-2025	77	24	8	BDL	CLOUDY/CALM
21-09-2025	22-09-2025	80	29	10	BDL	CLOUDY/CALM
22-09-2025	23-09-2025	72	19	8	BDL	CLOUDY/CALM
27-09-2025	28-09-2025	51	15	6	BDL	RAINY/CALM
28-09-2025	29-09-2025	65	19	7	BDL	RAINY/CALM
NAAQS, 2009		**100**	**60**	**80**	**80**	

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Environment Laboratory CMPDI RI-IV, NAGPUR	Test Report	TC-7102

SAMPLE DESCRIPTION	Water sample	
Test Required	pH: IS 3025 -(Part 11), TSS: IS 3025-(Part 17), COD: APHA (24th Edition) 5220 C , O & G: IS 3025-(Part 39) & BOD: IS 3025 (Part 44)	
SAMPLING METHOD	LSOP 5	PERIOD OF PERFORMANCE OF LAB ACTIVITIES : 16-09-25 TO 15-10-25

MINE WATER DISCHARGE:	BNDOW1			
DATE OF SAMPLE COLLECTION	ANALYSIS RESULTS			
	pH	TSS (in mg/l)	COD(in mg/l)	O & G(in mg/l)
DETECTION LIMIT	2	10	4	2
07-09-2025	9.14	24	32	BDL
20-09-2025	8.64	32	40	BDL
STANDARDS FOR COAL MINE, GSR 742E, dt. 25/09/2000	5.5 - 9.0	100	250	10

Analysed by

Environment Laboratory CMPDI RI-IV, NAGPUR	Test Report	TC-7102

NOISE LEVEL MONITORING DATA

SAMPLE DESCRIPTION	NOISE SAMPLE
Test Required	CPCB PROTOCOL FOR AMBIENT NOISE MEASUREMENT
SAMPLING METHOD	LSOP 6

CHP:	BNDON1		
MONTH	DATE OF SAMPLE COLLECTION	NOISE LEVEL IN dB(A)	
		DAY TIME	NIGHT TIME
	DETECTION LIMIT	20	20
SEPT'25	12-09-2025	67.6	62.6
SEPT'25	26-09-2025	67.8	63.7
NOISE POLLUTION (REGULATION AND CONTROL) RULES		**75**	**70**

SASTI COLONY:	BSUN2		
MONTH	DATE OF SAMPLE COLLECTION	NOISE LEVEL IN dB(A)	
		DAY TIME	NIGHT TIME
	DETECTION LIMIT	20	20
SEPT'25	12-09-2025	46.5	41.6
SEPT'25	26-09-2025	45.7	41.5
NOISE POLLUTION (REGULATION AND CONTROL) RULES		**55**	**45**

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DRINKING WATER MONITORING REPORT

BALLARPUR AREA

WESTERN COALFIELDS LTD.

JOB NO.4094423068

QE-SEPTEMBER 2025

Environment Laboratory
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Environment Laboratory CMPDI RI-IV, NAGPUR	Test Report Drinking water quality monitoring data	TC-7102

TEST REPORT NO.	RIN/TR/SEPT-25/DW16	DATE OF ISSUE	25-10-2025
NAME OF CUSTOMER	GM(ENV.), WCL(HQ), NAGPUR	SAMPLE DESCRIPTION	WATER SAMPLE
NAME OF AREA	BALLARPUR	SAMPLING METHOD: LSOP 5	
NAME OF PROJECT	AMALAGAMATED OF GOURI PAUNI OC	SAMPLING PLAN: LQR 47	
NO. OF PAGES	2		

NAME OF LOCATION:	FILTER PLANT	SAMPLING DATE:	13-07-2025

SL. NO.	PARAMETER	TEST METHOD	DETECTION LIMIT	ANALYSIS RESULT	IS 10500:2012	
					REQUIREMENT (ACCEPTABLE LIMIT)	PERMISSIBLE LIMIT IN THE ABSENCE OF ALTERNATE SOURCE
1	Colour (Hazen)	IS 3025 Part-4 Pt-Co Method	1	1	5	15
2	Odour	IS 3025 Part-5	Qualitative	Unobjectionable	Agreeable	Agreeable
3	Turbidity (NTU)	IS 3025 Part-10 Neplometric Method	1	1	1	5
4	pH Value	IS 3025 Part-11 Electrometric Method	2	7.95	6.5 to 8.5	No relaxation
5	Total Hardness (as $CaCO_3$) - mg/l	IS 3025 Part-21 EDTA Method	4	292	200	600
6	Iron (as Fe) -mg/l	IS 3025 Part-53 AAS Flame Method	0.06	BDL	0.3	No relaxation
7	Chlorides (as Cl^-)- mg/l	IS 3025 Part-32 Argentometric Method	2	58	250	1000
8	Residual Chlorine -mg/l	APHA, 24th Edition 4500-G DPD Colorometric method	0.02	BDL	0.2	1
9	Fluoride (as F^-)- mg/l	APHA, 24th Edition 4500-FD SPADNS Method	0.02	0.45	1	1.5
10	TDS -mg/l	IS 3025 Part-16 Gravimetric Method	25	590	500	2000
11	Calcium (as Ca) -mg/l	IS 3025 Part-40	1.6	60.8	75	200
12	Magnesium (as Mg) -mg/l	APHA (24th Ed.) 3500 B, Calculation Method	3	34.02	30	100
13	Copper (as Cu) -mg/l	IS 3025 Part-42 AAS Flame Method	0.03	BDL	0.05	1.5
14	Manganese as (Mn)- mg/l	IS 3025 Part-59, AAS Flame Method	0.02	BDL	0.1	0.3
15	Sulphate (as SO_4^{-2}) -mg/l	APHA (24th Edition) 4500E Turbidimetric Method	2	88.47	200	400

16	Nitrates (as NO3) - mg/l	APHA (24th Edition) 4500-NO3-B UV Spectrophotometric method	0.5	12.43	45	No relaxation
17	Cadmium as (Cd)- mg/l	APHA, 24th Edition 3113 B AAS GTA Method	0.0005	BDL	0.003	No relaxation
18	Lead as (Pb) -mg/l	APHA, 24th Edition 3113 B AAS GTA Method	0.005	BDL	0.01	No relaxation
19	Selenium (Se) –mg/l	IS 3025 P 56	0.005	BDL	0.01	No relaxation
20	Arsenic (As)-mg/l	APHA, 24th Edition 3114 C AAS-VGA Method	0.005	BDL	0.05	No relaxation
21	Zinc as (Zn) -mg/l	IS 3025 Part-49 AAS Flame Method	0.01	BDL	5	15
22	Total Chromium -mg/l	IS 3025 Part-52 Clause 6, AAS Flame Method	0.03	BDL	0.05	No relaxation
23	Boron as (B) -mg/l	APHA, 24th Edition 4500 B-C Carmine Method	0.002	BDL	0.5	1
24	Alkalinity -mg/l	IS 3025 Part-23	4	120	200	600
25	Nickel-mg/l	APHA, 24th Edition 3113 B AAS FLAME Method	0.005	BDL	0.02	No relaxation
26	Aluminum (Al)-mg/l	IS 3025 P 55	0.005	BDL	0.1	0.2

BDL: BELOW DETECTION LIMIT

SCIENTIFIC ASSISTANT

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Environment Laboratory CMPDI RI-IV, NAGPUR	Test Report Drinking water quality monitoring data	TC-7102

TEST REPORT NO.	RIN/TR/SEPT-25/DW17	DATE OF ISSUE	25-10-2025
NAME OF CUSTOMER	GM(ENV.), WCL(HQ), NAGPUR	SAMPLE DESCRIPTION	WATER SAMPLE
NAME OF AREA	BALLARPUR	SAMPLING METHOD: LSOP 5	
NAME OF PROJECT	SASTI OC	SAMPLING PLAN: LQR 47	
NO. OF PAGES	2		

NAME OF LOCATION:	FILTER PLANT	SAMPLING DATE:	13-07-2025

SL. NO.	PARAMETER	TEST METHOD	DETECTION LIMIT	ANALYSIS RESULT	IS 10500:2012	
					REQUIREMENT (ACCEPTABLE	PERMISSIBLE LIMIT IN THE ABSENCE OF
1	Colour (Hazen)	IS 3025 Part-4 Pt-Co Method	1	1	5	15
2	Odour	IS 3025 Part-5	Qualitative	Unobjectionable	Agreeable	Agreeable
3	Turbidity (NTU)	IS 3025 Part-10 Neplometric Method	1	2	1	5
4	pH Value	IS 3025 Part-11 Electrometric Method	2	7.94	6.5 to 8.5	No relaxation
5	Total Hardness (as $CaCO_3$) - mg/l	IS 3025 Part-21 EDTA Method	4	464	200	600
6	Iron (as Fe) -mg/l	IS 3025 Part-53 AAS Flame Method	0.06	BDL	0.3	No relaxation
7	Chlorides (as Cl^-)- mg/l	IS 3025 Part-32 Argentometric Method	2	48	250	1000
8	Residual Chlorine -mg/l	APHA, 24th Edition 4500-G DPD Colorometric method	0.02	BDL	0.2	1
9	Fluoride (as F^-)- mg/l	APHA, 24th Edition 4500-FD SPADNS Method	0.02	0.80	1	1.5
10	TDS -mg/l	IS 3025 Part-16 Gravimetric Method	25	760	500	2000
11	Calcium (as Ca) -mg/l	IS 3025 Part-40	1.6	118.4	75	200
12	Magnesium (as Mg) -mg/l	APHA (24th Ed.) 3500 B, Calculation Method	3	41.8	30	100
13	Copper (as Cu) -mg/l	IS 3025 Part-42 AAS Flame Method	0.03	BDL	0.05	1.5
14	Manganese as (Mn)- mg/l	IS 3025 Part-59, AAS Flame Method	0.02	0.024	0.1	0.3
15	Sulphate (as SO_4^{-2}) -mg/l	APHA (24th Edition) 4500E Turbidimetric Method	2	90.68	200	400

16	Nitrates (as NO3) - mg/l	APHA (24th Edition) 4500-NO3-B UV Spectrophotometric method	0.5	15.52	45	No relaxation
17	Cadmium as (Cd)- mg/l	APHA, 24th Edition 3113 B AAS GTA Method	0.0005	BDL	0.003	No relaxation
18	Lead as (Pb) -mg/l	APHA, 24th Edition 3113 B AAS GTA Method	0.005	BDL	0.01	No relaxation
19	Selenium (Se) –mg/l	IS 3025 P 56	0.005	BDL	0.01	No relaxation
20	Arsenic (As)-mg/l	APHA, 24th Edition 3114 C AAS-VGA Method	0.005	BDL	0.05	No relaxation
21	Zinc as (Zn) -mg/l	IS 3025 Part-49 AAS Flame Method	0.01	BDL	5	15
22	Total Chromium -mg/l	IS 3025 Part-52 Clause 6, AAS Flame Method	< 0.03	BDL	0.05	No relaxation
23	Boron as (B) -mg/l	APHA, 24th Edition 4500 B-C Carmine Method	< 0.002	BDL	0.5	1
24	Alkalinity -mg/l	IS 3025 Part-23	220	64	200	600
25	Nickel-mg/l	APHA, 24th Edition 3113 B AAS FLAME Method	BDL	BDL	0.02	No relaxation
26	Aluminum (Al)-mg/l	IS 3025 P 55	BDL	BDL	0.1	0.2

BDL: BELOW DETECTION LIMIT

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Environment Laboratory CMPDI RI-IV, NAGPUR	Test Report Drinking water quality monitoring data	TC-7102

TEST REPORT NO.	RIN/TR/SEPT-25/DW18	DATE OF ISSUE	25-10-2025
NAME OF CUSTOMER	GM(ENV.), WCL(HQ), NAGPUR	SAMPLE DESCRIPTION	WATER SAMPLE
NAME OF AREA	BALLARPUR	SAMPLING METHOD: LSOP 5	
NAME OF PROJECT	NEW DHOPTALA OC	SAMPLING PLAN: LQR 47	
NO. OF PAGES	2		

NAME OF LOCATION:	MANAGER OFFICE	SAMPLING DATE:	13-07-2025

SL. NO.	PARAMETER	TEST METHOD	DETECTION LIMIT	ANALYSIS RESULT	IS 10500:2012	
					REQUIREMENT (ACCEPTABLE	PERMISSIBLE LIMIT IN THE ABSENCE OF
1	Colour (Hazen)	IS 3025 Part-4 Pt-Co Method	1	2	5	15
2	Odour	IS 3025 Part-5	Qualitative	Unobjectionable	Agreeable	Agreeable
3	Turbidity (NTU)	IS 3025 Part-10 Neplometric Method	1	2	1	5
4	pH Value	IS 3025 Part-11 Electrometric Method	2	7.93	6.5 to 8.5	No relaxation
5	Total Hardness (as $CaCO_3$) - mg/l	IS 3025 Part-21 EDTA Method	4	536	200	600
6	Iron (as Fe) -mg/l	IS 3025 Part-53 AAS Flame Method	0.06	BDL	0.3	No relaxation
7	Chlorides (as Cl^-)- mg/l	IS 3025 Part-32 Argentometric Method	2	70	250	1000
8	Residual Chlorine -mg/l	APHA, 24th Edition 4500-G DPD Colorometric method	0.02	BDL	0.2	1
9	Fluoride (as F^-)- mg/l	APHA, 24th Edition 4500-FD SPADNS Method	0.02	1.08	1	1.5
10	TDS -mg/l	IS 3025 Part-16 Gravimetric Method	25	890	500	2000
11	Calcium (as Ca) -mg/l	IS 3025 Part-40	1.6	128	75	200
12	Magnesium (as Mg) -mg/l	APHA (24th Ed.) 3500 B, Calculation Method	3	52.49	30	100
13	Copper (as Cu) -mg/l	IS 3025 Part-42 AAS Flame Method	0.03	BDL	0.05	1.5
14	Manganese as (Mn)- mg/l	IS 3025 Part-59, AAS Flame Method	0.02	0.029	0.1	0.3
15	Sulphate (as SO_4^{-2}) -mg/l	APHA (24th Edition) 4500E Turbidimetric Method	2	93.46	200	400

16	Nitrates (as NO3) - mg/l	APHA (24th Edition) 4500-NO3-B UV Spectrophotometric method	0.5	17.31	45	No relaxation
17	Cadmium as (Cd)- mg/l	APHA, 24th Edition 3113 B AAS GTA Method	0.0005	BDL	0.003	No relaxation
18	Lead as (Pb) -mg/l	APHA, 24th Edition 3113 B AAS GTA Method	0.005	BDL	0.01	No relaxation
19	Selenium (Se) –mg/l	IS 3025 P 56	0.005	BDL	0.01	No relaxation
20	Arsenic (As)-mg/l	APHA, 24th Edition 3114 C AAS-VGA Method	0.005	BDL	0.05	No relaxation
21	Zinc as (Zn) -mg/l	IS 3025 Part-49 AAS Flame Method	0.01	BDL	5	15
22	Total Chromium -mg/l	IS 3025 Part-52 Clause 6, AAS Flame Method	0.03	BDL	0.05	No relaxation
23	Boron as (B) -mg/l	APHA, 24th Edition 4500 B-C Carmine Method	0.002	BDL	0.5	1
24	Alkalinity -mg/l	IS 3025 Part-23	4	92	200	600
25	Nickel-mg/l	APHA, 24th Edition 3113 B AAS FLAME Method	0.005	BDL	0.02	No relaxation
26	Aluminum (Al)-mg/l	IS 3025 P 55	0.005	BDL	0.1	0.2

BDL: BELOW DETECTION LIMIT

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Environment Laboratory CMPDI RI-IV, NAGPUR	**Test Report** Drinking water quality monitoring data	TC-7102

TEST REPORT NO.	RIN/TR/SEPT-25/DW19	DATE OF ISSUE	25-10-2025
NAME OF CUSTOMER	GM(ENV.), WCL(HQ), NAGPUR	SAMPLE DESCRIPTION	WATER SAMPLE
NAME OF AREA	BALLARPUR	SAMPLING METHOD: LSOP 5	
NAME OF PROJECT	BALLARPUR UG	SAMPLING PLAN: LQR 47	
NO. OF PAGES	2		

NAME OF LOCATION:	FILTER PLANT	SAMPLING DATE:	13-07-2025

SL. NO.	PARAMETER	TEST METHOD	DETECTION LIMIT	ANALYSIS RESULT	IS 10500:2012	
					REQUIREMENT (ACCEPTABLE LIMIT)	PERMISSIBLE LIMIT IN THE ABSENCE OF ALTERNATE SOURCE
1	Colour (Hazen)	IS 3025 Part-4 Pt-Co Method	1	1	5	15
2	Odour	IS 3025 Part-5	Qualitative	Unobjectionable	Agreeable	Agreeable
3	Turbidity (NTU)	IS 3025 Part-10 Neplometric Method	1	1	1	5
4	pH Value	IS 3025 Part-11 Electrometric Method	2	8.13	6.5 to 8.5	No relaxation
5	Total Hardness (as $CaCO_3$) - mg/l	IS 3025 Part-21 EDTA Method	4	236	200	600
6	Iron (as Fe) -mg/l	IS 3025 Part-53 AAS Flame Method	0.06	BDL	0.3	No relaxation
7	Chlorides (as Cl^-)- mg/l	IS 3025 Part-32 Argentometric Method	2	62	250	1000
8	Residual Chlorine -mg/l	APHA, 24th Edition 4500-G DPD Colorometric method	0.02	BDL	0.2	1
9	Fluoride (as F^-)- mg/l	APHA, 24th Edition 4500-FD SPADNS Method	0.02	0.42	1	1.5
10	TDS -mg/l	IS 3025 Part-16 Gravimetric Method	25	550	500	2000
11	Calcium (as Ca) -mg/l	IS 3025 Part-40	1.6	46.4	75	200
12	Magnesium (as Mg) -mg/l	APHA (24th Ed.) 3500 B, Calculation Method	3	29.16	30	100
13	Copper (as Cu) -mg/l	IS 3025 Part-42 AAS Flame Method	0.03	BDL	0.05	1.5
14	Manganese as (Mn)- mg/l	IS 3025 Part-59, AAS Flame Method	0.02	BDL	0.1	0.3
15	Sulphate (as SO_4^{-2}) -mg/l	APHA (24th Edition) 4500E Turbidimetric Method	2	68.39	200	400

16	Nitrates (as NO3) - mg/l	APHA (24th Edition) 4500-NO3-B UV Spectrophotometric method	0.5	11.77	45	No relaxation
17	Cadmium as (Cd)- mg/l	APHA, 24th Edition 3113 B AAS GTA Method	0.0005	BDL	0.003	No relaxation
18	Lead as (Pb) -mg/l	APHA, 24th Edition 3113 B AAS GTA Method	0.005	BDL	0.01	No relaxation
19	Selenium (Se) –mg/l	IS 3025 P 56	0.005	BDL	0.01	No relaxation
20	Arsenic (As)-mg/l	APHA, 24th Edition 3114 C AAS-VGA Method	0.005	BDL	0.05	No relaxation
21	Zinc as (Zn) -mg/l	IS 3025 Part-49 AAS Flame Method	0.01	0.015	5	15
22	Total Chromium -mg/l	IS 3025 Part-52 Clause 6, AAS Flame Method	0.03	BDL	0.05	No relaxation
23	Boron as (B) -mg/l	APHA, 24th Edition 4500 B-C Carmine Method	0.002	BDL	0.5	1
24	Alkalinity -mg/l	IS 3025 Part-23	4	112	200	600
25	Nickel-mg/l	APHA, 24th Edition 3113 B AAS FLAME Method	0.005	BDL	0.02	No relaxation
26	Aluminum (Al)-mg/l	IS 3025 P 55	0.005	BDL	0.1	0.2

BDL: BELOW DETECTION LIMIT

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ENVIRONMENTAL MONITORING REPORT
w.r.t. HEAVY METALS IN AMBIENT AIR

BALLARPUR AREA

WESTERN COALFIELDS LTD.

HALF YEARLY (APR 25 - SEPT 25)

Environment Laboratory
NABL Accredited vide Cert. No. TC-7102

CMPDI

REGIONAL INSTITUTE-IV, KASTURBA NAGAR,
JARIPATKA, NAGPUR, PIN – 440 014

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Environment Laboratory CMPDI RI-IV, NAGPUR	**Test Report** **Ambient Air Quality Monitoring Data** **For Heavy Metals**	TC-7102

TEST REPORT NO.	RIN/TR/JUNE /HM46	DATE OF ISSUE	25-09-2025
NAME OF CUSTOMER	GM(ENV.),WCL(HQ), NAGPUR	SAMPLE DESCRIPTION	AIR SAMPLE
CUSTOMER LETTER REFERENCE NO.	WCL/HQ/ENV/14-I/206-220 DATED: 25.03.2022		
TEST REQUIRED	Heavy metals (As, Pb, Ni, Cr & Cd) in air samples (ASTM D 4185)		
NAME OF AREA	BALLARPUR	SAMPLING METHOD : LSOP 4	
NAME OF PROJECT	GOURI DEEP	SAMPLING PLAN : LQR 47	
No. of Pages	1		

Sl No.	Name of location	Location Code	Date of sampling
1	MANAGER OFFICE	BGDOA-1	08-04-2025
2	MUTRA VILLAGE	BGDOA-2	02-04-2025
3	GOYEGAON VILLAGE	BGDOA-3	02-04-2025
4	RAILWAY SIDING	BGDOA-4	08-04-2025

Sl. No.	Parameter	Method of analysis	Detection limit	Observed Value				National Ambient Air Quality Standard NAAQS, 2009
				BGDOA-1	BGDOA-2	BGDOA-3	BGDOA-4	
1	Arsenic, µg/m^3	ASTM D 4185	0.0007 µg/m^3	BDL	BDL	BDL	BDL	0.006 µg/m^3 (Annual average)
2	Lead, µg/m3	IS 5182 PART 22	7.0 µg/m^3	BDL	BDL	BDL	BDL	1.0 µg/m^3 (24 Hourly average)
3	Nickle, µg/m^3	ASTM D 4185	0.007 µg/m^3	BDL	BDL	BDL	BDL	0.02 µg/m3 (Annual average)
4	Total Chromium, µg/m^3	ASTM D 4185	0.0045 µg/m^3	BDL	BDL	BDL	BDL	**
5	Cadmium, µg/m^3	ASTM D 4185	0.0015 µg/m^3	BDL	BDL	BDL	BDL	**
6	Mercury, µg/m3	ASTM D 4185	0.0007 µg/m^3	BDL	BDL	BDL	BDL	**

BDL: BELOW DETECTION LIMIT

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Environment Laboratory CMPDI RI-IV, NAGPUR	**Test Report** **Ambient Air Quality Monitoring Data** **For Heavy Metals**	TC-7102

TEST REPORT NO.	RIN/TR/JUNE /HM48	DATE OF ISSUE	25-09-2025
NAME OF CUSTOMER	GM(ENV.),WCL(HQ), NAGPUR	SAMPLE DESCRIPTION	AIR SAMPLE
CUSTOMER LETTER REFERENCE NO.	WCL/HQ/ENV/14-I/206-220 DATED: 25.03.2022		
TEST REQUIRED	Heavy metals (As, Pb, Ni, Cr & Cd) in air samples (ASTM D 4185)		
NAME OF AREA	BALLARPUR	SAMPLING METHOD : LSOP 4	
NAME OF PROJECT	PAUNI II OC	SAMPLING PLAN : LQR 47	
No. of Pages	1		

Sl No.	Name of location	Location Code	Date of sampling
1	MINE OFFICE	BP2OA-1	13-04-2025
2	SUBSTATION	BP2OA-2	13-04-2025
3	SAKHRI VILLAGE	BP2OA-3	04-04-2025
4	WORKSHOP PAUNI OC	BP2OA-4	13-04-2025

Sl. No.	Parameter	Method of analysis	Detection limit	Observed Value				National Ambient Air Quality Standard NAAQS, 2009
				BP2OA-1	BP2OA-2	BP2OA-3	BP2OA-4	
1	Arsenic, µg/m^3	ASTM D 4185	0.0007 µg/m^3	BDL	BDL	BDL	BDL	0.006 µg/m^3 (Annual average)
2	Lead, µg/m3	IS 5182 PART 22	7.0 µg/m^3	BDL	BDL	BDL	BDL	1.0 µg/m^3 (24 Hourly average)
3	Nickle, µg/m^3	ASTM D 4185	0.007 µg/m^3	BDL	BDL	BDL	BDL	0.02 µg/m3 (Annual average)
4	Total Chromium, µg/m^3	ASTM D 4185	0.0045 µg/m^3	BDL	BDL	BDL	BDL	**
5	Cadmium, µg/m^3	ASTM D 4185	0.0015 µg/m^3	BDL	BDL	BDL	BDL	**
6	Mercury, µg/m3	ASTM D 4185	0.0007 µg/m^3	BDL	BDL	BDL	BDL	**

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Environment Laboratory CMPDI RI-IV, NAGPUR	**Test Report** **Ambient Air Quality Monitoring Data** **For Heavy Metals**	TC-7102

TEST REPORT NO.	RIN/TR/JUNE /HM49	DATE OF ISSUE	25-09-2025
NAME OF CUSTOMER	GM(ENV.),WCL(HQ), NAGPUR	SAMPLE DESCRIPTION	AIR SAMPLE
CUSTOMER LETTER REFERENCE NO.	WCL/HQ/ENV/14-I/206-220 DATED: 25.03.2022		
TEST REQUIRED	Heavy metals (As, Pb, Ni, Cr & Cd) in air samples (ASTM D 4185)		
NAME OF AREA	BALLARPUR	SAMPLING METHOD : LSOP 4	
NAME OF PROJECT	Amagamalation Gouri I & Pauni OC	SAMPLING PLAN : LQR 47	
No. of Pages	1		

Sl No.	Name of location	Location Code	Date of sampling
1	MANAGER OFFICE -GOURI -I O/C	BGOA-1	08-04-2025
2	SAM OFFICE -GOURI SUB AREA	BGOA-2	08-04-2025
3	GOURI VILLAGE	BGOA-4	02-04-2025

Sl. No.	Parameter	Method of analysis	Detection limit	Observed Value			National Ambient Air Quality Standard NAAQS, 2009
				BGOA-1	BGOA-2	BGOA-4	
1	Arsenic, µg/m^3	ASTM D 4185	0.0007 µg/m^3	BDL	BDL	BDL	0.006 µg/m^3 (Annual average)
2	Lead, µg/m3	IS 5182 PART 22	7.0 µg/m^3	BDL	BDL	BDL	1.0 µg/m^3 (24 Hourly average)
3	Nickle, µg/m^3	ASTM D 4185	0.007 µg/m^3	BDL	BDL	BDL	0.02 µg/m3 (Annual average)
4	Total Chromium, µg/m^3	ASTM D 4185	0.0045 µg/m^3	0.0048	BDL	BDL	**
5	Cadmium, µg/m^3	ASTM D 4185	0.0015 µg/m^3	BDL	BDL	BDL	**
6	Mercury, µg/m3	ASTM D 4185	0.0007 µg/m^3	BDL	BDL	BDL	**

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Environment Laboratory CMPDI RI-IV, NAGPUR	**Test Report** **Ambient Air Quality Monitoring Data** **For Heavy Metals**	TC-7102

TEST REPORT NO.	RIN/TR/JUNE /HM51	DATE OF ISSUE	25-09-2025
NAME OF CUSTOMER	GM(ENV.),WCL(HQ), NAGPUR	SAMPLE DESCRIPTION	AIR SAMPLE
CUSTOMER LETTER REFERENCE NO.	WCL/HQ/ENV/14-I/206-220 DATED: 25.03.2022		
TEST REQUIRED	Heavy metals (As, Pb, Ni, Cr & Cd) in air samples (ASTM D 4185)		
NAME OF AREA	BALLARPUR	SAMPLING METHOD : LSOP 4	
NAME OF PROJECT	SASTI OC	SAMPLING PLAN : LQR 47	
No. of Pages	1		

Sl No.	Name of location	Location Code	Date of sampling
1	GOURI COLONY /FILTER PLANT	BSOA-3	04-04-2025
2	SAM OFFICE -SASTI OC	BSOA-1	06-04-2025
3	AREA STORE	BSOA-2	06-04-2025

Sl. No.	Parameter	Method of analysis	Detection limit	Observed Value			National Ambient Air Quality Standard NAAQS, 2009
				BSOA-3	BSOA-1	BSOA-2	
1	Arsenic, µg/m^3	ASTM D 4185	0.0007 µg/m^3	BDL	BDL	BDL	0.006 µg/m^3 (Annual average)
2	Lead, µg/m3	IS 5182 PART 22	7.0 µg/m^3	BDL	BDL	BDL	1.0 µg/m^3 (24 Hourly average)
3	Nickle, µg/m^3	ASTM D 4185	0.007 µg/m^3	BDL	BDL	BDL	0.02 µg/m3 (Annual average)
4	Total Chromium, µg/m^3	ASTM D 4185	0.0045 µg/m^3	BDL	BDL	BDL	**
5	Cadmium, µg/m^3	ASTM D 4185	0.0015 µg/m^3	BDL	BDL	BDL	**
6	Mercury, µg/m3	ASTM D 4185	0.0007 µg/m^3	BDL	BDL	BDL	**

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Environment Laboratory CMPDI RI-IV, NAGPUR	**Test Report** **Ambient Air Quality Monitoring Data** **For Heavy Metals**	TC-7102

TEST REPORT NO.	RIN/TR/JUNE /HM52	DATE OF ISSUE	25-09-2025
NAME OF CUSTOMER	GM(ENV.),WCL(HQ), NAGPUR	SAMPLE DESCRIPTION	AIR SAMPLE
CUSTOMER LETTER REFERENCE NO.	WCL/HQ/ENV/14-I/206-220 DATED: 25.03.2022		
TEST REQUIRED	Heavy metals (As, Pb, Ni, Cr & Cd) in air samples (ASTM D 4185)		
NAME OF AREA	BALLARPUR	SAMPLING METHOD : LSOP 4	
NAME OF PROJECT	SASTI UG	SAMPLING PLAN : LQR 47	
No. of Pages	1		

Sl No.	Name of location	Location Code	Date of sampling
1	SASTI COLONY	BSUOA-3	04-04-2025
2	SASTI VILLAGE	BSUOA-4	04-04-2025

Sl. No.	Parameter	Method of analysis	Detection limit	Observed Value		National Ambient Air Quality Standard NAAQS, 2009
				BSUOA-3	BSUOA-4	
1	Arsenic, µg/m^3	ASTM D 4185	0.0007 µg/m^3	BDL	BDL	0.006 µg/m^3 (Annual average)
2	Lead, µg/m3	IS 5182 PART 22	7.0 µg/m^3	BDL	BDL	1.0 µg/m^3 (24 Hourly average)
3	Nickle, µg/m^3	ASTM D 4185	0.007 µg/m^3	BDL	BDL	0.02 µg/m3 (Annual average)
4	Total Chromium, µg/m^3	ASTM D 4185	0.0045 µg/m^3	BDL	BDL	**
5	Cadmium, µg/m^3	ASTM D 4185	0.0015 µg/m^3	BDL	BDL	**
6	Mercury, µg/m3	ASTM D 4185	0.0007 µg/m^3	BDL	BDL	**

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Environment Laboratory CMPDI RI-IV, NAGPUR	**Test Report** **Ambient Air Quality Monitoring Data** **For Heavy Metals**	TC-7102

TEST REPORT NO.	RIN/TR/JUNE /HM53	DATE OF ISSUE	25-09-2025
NAME OF CUSTOMER	GM(ENV.),WCL(HQ), NAGPUR	SAMPLE DESCRIPTION	AIR SAMPLE
CUSTOMER LETTER REFERENCE NO.	WCL/HQ/ENV/14-I/206-220 DATED: 25.03.2022		
TEST REQUIRED	Heavy metals (As, Pb, Ni, Cr & Cd) in air samples (ASTM D 4185)		
NAME OF AREA	BALLARPUR	SAMPLING METHOD : LSOP 4	
NAME OF PROJECT	NEW DHOPTALA OC	SAMPLING PLAN : LQR 47	
No. of Pages	1		

Sl No.	Name of location	Location Code	Date of sampling
1	SAM OFFICE DHOPTALA SUB AREA	BDOA-1	06-04-2025
2	MANAGER OFFICE - DHOPTALA OC	BDOA-2	06-04-2025

Sl. No.	Parameter	Method of analysis	Detection limit	Observed Value		National Ambient Air Quality Standard NAAQS, 2009
				BDOA-1	BDOA-2	
1	Arsenic, µg/m^3	ASTM D 4185	0.0007 µg/m^3	BDL	BDL	0.006 µg/m^3 (Annual average)
2	Lead, µg/m3	IS 5182 PART 22	7.0 µg/m^3	BDL	BDL	1.0 µg/m^3 (24 Hourly average)
3	Nickle, µg/m^3	ASTM D 4185	0.007 µg/m^3	BDL	BDL	0.02 µg/m3 (Annual average)
4	Total Chromium, µg/m^3	ASTM D 4185	0.0045 µg/m^3	BDL	BDL	**
5	Cadmium, µg/m^3	ASTM D 4185	0.0015 µg/m^3	BDL	BDL	**
6	Mercury, µg/m3	ASTM D 4185	0.0007 µg/m^3	BDL	BDL	**

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Environment Laboratory CMPDI RI-IV, NAGPUR	**Test Report** **Ambient Air Quality Monitoring Data** **For Heavy Metals**	TC-7102

TEST REPORT NO.	RIN/TR/JUNE /HM54	DATE OF ISSUE	25-09-2025
NAME OF CUSTOMER	GM(ENV.),WCL(HQ), NAGPUR	SAMPLE DESCRIPTION	AIR SAMPLE
CUSTOMER LETTER REFERENCE NO.	WCL/HQ/ENV/14-I/206-220 DATED: 25.03.2022		
TEST REQUIRED	Heavy metals (As, Pb, Ni, Cr & Cd) in air samples (ASTM D 4185)		
NAME OF AREA	BALLARPUR	SAMPLING METHOD : LSOP 4	
NAME OF PROJECT	BALLARPUR UG	SAMPLING PLAN : LQR 47	
No. of Pages	1		

Sl No.	Name of location	Location Code	Date of sampling
1	MANAGER OFFICE -BALLARPUR UG	BBUOA-1	07-04-2025
2	FILTER PLANT COLONY	BBUOA-4	02-04-2025

Sl. No.	Parameter	Method of analysis	Detection limit	Observed Value		National Ambient Air Quality Standard NAAQS, 2009
				BBUOA-1	BBUOA-4	
1	Arsenic, µg/m^3	ASTM D 4185	0.0007 µg/m^3	BDL	BDL	0.006 µg/m^3 (Annual average)
2	Lead, µg/m3	IS 5182 PART 22	7.0 µg/m^3	BDL	BDL	1.0 µg/m^3 (24 Hourly average)
3	Nickle, µg/m^3	ASTM D 4185	0.007 µg/m^3	BDL	BDL	0.02 µg/m3 (Annual average)
4	Total Chromium, µg/m^3	ASTM D 4185	0.0045 µg/m^3	BDL	BDL	**
5	Cadmium, µg/m^3	ASTM D 4185	0.0015 µg/m^3	BDL	BDL	**
6	Mercury, µg/m3	ASTM D 4185	0.0007 µg/m^3	BDL	BDL	**

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Environment Laboratory CMPDI RI-IV, NAGPUR	**Test Report** **Ambient Air Quality Monitoring Data** **For Heavy Metals**	TC-7102

TEST REPORT NO.	RIN/TR/JUNE /HM55	DATE OF ISSUE	25-09-2025
NAME OF CUSTOMER	GM(ENV.),WCL(HQ), NAGPUR	SAMPLE DESCRIPTION	AIR SAMPLE
CUSTOMER LETTER REFERENCE NO.	WCL/HQ/ENV/14-I/206-220 DATED: 25.03.2022		
TEST REQUIRED	Heavy metals (As, Pb, Ni, Cr & Cd) in air samples (ASTM D 4185)		
NAME OF AREA	BALLARPUR	SAMPLING METHOD : LSOP 4	
NAME OF PROJECT	BALLARPUR OC	SAMPLING PLAN : LQR 47	
No. of Pages	1		

Sl No.	Name of location	Location Code	Date of sampling
1	PREMISES OF SUB AERA OFFICE	BBOA-3	07-04-2025
2	SUBSTATION -BALLARPUR OC	BBOA-2	07-04-2025

Sl. No.	Parameter	Method of analysis	Detection limit	Observed Value		National Ambient Air Quality Standard NAAQS, 2009
				BBOA-3	BBOA-2	
1	Arsenic, µg/m^3	ASTM D 4185	0.0007 µg/m^3	BDL	BDL	0.006 µg/m^3 (Annual average)
2	Lead, µg/m3	IS 5182 PART 22	7.0 µg/m^3	BDL	BDL	1.0 µg/m^3 (24 Hourly average)
3	Nickle, µg/m^3	ASTM D 4185	0.007 µg/m^3	BDL	BDL	0.02 µg/m3 (Annual average)
4	Total Chromium, µg/m^3	ASTM D 4185	0.0045 µg/m^3	BDL	BDL	**
5	Cadmium, µg/m^3	ASTM D 4185	0.0015 µg/m^3	BDL	BDL	**
6	Mercury, µg/m3	ASTM D 4185	0.0007 µg/m^3	BDL	BDL	**

BDL: BELOW DETECTION LIMIT

SCIENTIFIC ASSISTANT

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Environment Laboratory CMPDI RI-IV, NAGPUR	**Test Report** **Ambient Air Quality Monitoring Data** **For Heavy Metals**	TC-7102

TEST REPORT NO.	RIN/TR/JUNE /HM57	DATE OF ISSUE	25-09-2025
NAME OF CUSTOMER	GM(ENV.),WCL(HQ), NAGPUR	SAMPLE DESCRIPTION	AIR SAMPLE
CUSTOMER LETTER REFERENCE NO.	WCL/HQ/ENV/14-I/206-220 DATED: 25.03.2022		
TEST REQUIRED	Heavy metals (As, Pb, Ni, Cr & Cd) in air samples (ASTM D 4185)		
NAME OF AREA	BALLARPUR	SAMPLING METHOD : LSOP 4	
NAME OF PROJECT	Amagamalation Gouri & Pauni OC	SAMPLING PLAN : LQR 47	
No. of Pages	1		

Sl No.	Name of location	Location Code	Date of sampling
1	CHP/ Coal unloading point	BGOF-1	19-04-2025
2	W. Bridge	BGOF-2	19-04-2025

Sl. No.	Parameter	Method of analysis	Detection limit	Observed Value		National Ambient Air Quality Standard NAAQS, 2009
				BGOF-1	BGOF-2	
1	Arsenic, µg/m^3	ASTM D 4185	0.0007 µg/m^3	BDL	BDL	0.006 µg/m^3 (Annual average)
2	Lead, µg/m3	IS 5182 PART 22	7.0 µg/m^3	BDL	BDL	1.0 µg/m^3 (24 Hourly average)
3	Nickle, µg/m^3	ASTM D 4185	0.007 µg/m^3	0.0078	0.0076	0.02 µg/m3 (Annual average)
4	Total Chromium, µg/m^3	ASTM D 4185	0.0045 µg/m^3	0.0047	BDL	**
5	Cadmium, µg/m^3	ASTM D 4185	0.0015 µg/m^3	BDL	BDL	**
6	Mercury, µg/m3	ASTM D 4185	0.0007 µg/m^3	BDL	BDL	**

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Environment Laboratory CMPDI RI-IV, NAGPUR	**Test Report** **Ambient Air Quality Monitoring Data** **For Heavy Metals**	TC-7102

TEST REPORT NO.	RIN/TR/JUNE /HM58	DATE OF ISSUE	25-09-2025
NAME OF CUSTOMER	GM(ENV.),WCL(HQ), NAGPUR	SAMPLE DESCRIPTION	AIR SAMPLE
CUSTOMER LETTER REFERENCE NO.	WCL/HQ/ENV/14-I/206-220 DATED: 25.03.2022		
TEST REQUIRED	Heavy metals (As, Pb, Ni, Cr & Cd) in air samples (ASTM D 4185)		
NAME OF AREA	BALLARPUR	SAMPLING METHOD : LSOP 4	
NAME OF PROJECT	SASTI OC	SAMPLING PLAN : LQR 47	
No. of Pages	1		

Sl No.	Name of location	Location Code	Date of sampling
1	Main CHP	BSOF-1	25-04-2025
2	W. Bridge	BSOF-2	25-04-2025

Sl. No.	Parameter	Method of analysis	Detection limit	Observed Value		National Ambient Air Quality Standard NAAQS, 2009
				BSOF-1	BSOF-2	
1	Arsenic, µg/m^3	ASTM D 4185	0.0007 µg/m^3	BDL	BDL	0.006 µg/m^3 (Annual average)
2	Lead, µg/m3	IS 5182 PART 22	7.0 µg/m^3	BDL	BDL	1.0 µg/m^3 (24 Hourly average)
3	Nickle, µg/m^3	ASTM D 4185	0.007 µg/m^3	0.0079	0.0072	0.02 µg/m3 (Annual average)
4	Total Chromium, µg/m^3	ASTM D 4185	0.0045 µg/m^3	BDL	BDL	**
5	Cadmium, µg/m^3	ASTM D 4185	0.0015 µg/m^3	BDL	BDL	**
6	Mercury, µg/m3	ASTM D 4185	0.0007 µg/m^3	BDL	BDL	**

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Environment Laboratory CMPDI RI-IV, NAGPUR	**Test Report** **Ambient Air Quality Monitoring Data** **For Heavy Metals**	TC-7102

TEST REPORT NO.	RIN/TR/JUNE /HM60	DATE OF ISSUE	25-09-2025
NAME OF CUSTOMER	GM(ENV.),WCL(HQ), NAGPUR	SAMPLE DESCRIPTION	AIR SAMPLE
CUSTOMER LETTER REFERENCE NO.	WCL/HQ/ENV/14-I/206-220 DATED: 25.03.2022		
TEST REQUIRED	Heavy metals (As, Pb, Ni, Cr & Cd) in air samples (ASTM D 4185)		
NAME OF AREA	BALLARPUR	SAMPLING METHOD : LSOP 4	
NAME OF PROJECT	BALLARPUR OC	SAMPLING PLAN : LQR 47	
No. of Pages	1		

Sl No.	Name of location	Location Code	Date of sampling
1	CHP/Coal moni. Point	BBOF-1	18-04-2025
2	W. Bridge	BBOF-2	18-04-2025
3	Rly. Siding	BBOF-3	18-04-2025

Sl. No.	Parameter	Method of analysis	Detection limit	Observed Value			National Ambient Air Quality Standard NAAQS, 2009
				BBOF-1	BBOF-2	BBOF-3	
1	Arsenic, µg/m^3	ASTM D 4185	0.0007 µg/m^3	BDL	BDL	BDL	0.006 µg/m^3 (Annual average)
2	Lead, µg/m3	IS 5182 PART 22	7.0 µg/m^3	BDL	BDL	BDL	1.0 µg/m^3 (24 Hourly average)
3	Nickle, µg/m^3	ASTM D 4185	0.007 µg/m^3	0.0078	0.0084	0.0079	0.02 µg/m3 (Annual average)
4	Total Chromium, µg/m^3	ASTM D 4185	0.0045 µg/m^3	BDL	0.0048	BDL	**
5	Cadmium, µg/m^3	ASTM D 4185	0.0015 µg/m^3	BDL	BDL	BDL	**
6	Mercury, µg/m3	ASTM D 4185	0.0007 µg/m^3	BDL	BDL	BDL	**

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Environment Laboratory CMPDI RI-IV, NAGPUR	**Test Report** **Ambient Air Quality Monitoring Data** **For Heavy Metals**	TC-7102

TEST REPORT NO.	RIN/TR/JUNE /HM61	DATE OF ISSUE	25-09-2025
NAME OF CUSTOMER	GM(ENV.),WCL(HQ), NAGPUR	SAMPLE DESCRIPTION	AIR SAMPLE
CUSTOMER LETTER REFERENCE NO.	WCL/HQ/ENV/14-I/206-220 DATED: 25.03.2022		
TEST REQUIRED	Heavy metals (As, Pb, Ni, Cr & Cd) in air samples (ASTM D 4185)		
NAME OF AREA	BALLARPUR	SAMPLING METHOD : LSOP 4	
NAME OF PROJECT	GOURI DEEP OC	SAMPLING PLAN : LQR 47	
No. of Pages	1		

Sl No.	Name of location	Location Code	Date of sampling
1	WEIGH BRIDGE	BGDOF1	19-04-2025
2	CHP	BGDOF2	19-04-2025

Sl. No.	Parameter	Method of analysis	Detection limit	Observed Value		National Ambient Air Quality Standard NAAQS, 2009
				BGDOF1	BGDOF2	
1	Arsenic, µg/m^3	ASTM D 4185	0.0007 µg/m^3	BDL	BDL	0.006 µg/m^3 (Annual average)
2	Lead, µg/m3	IS 5182 PART 22	7.0 µg/m^3	BDL	BDL	1.0 µg/m^3 (24 Hourly average)
3	Nickle, µg/m^3	ASTM D 4185	0.007 µg/m^3	0.0075	0.0073	0.02 µg/m3 (Annual average)
4	Total Chromium, µg/m^3	ASTM D 4185	0.0045 µg/m^3	BDL	BDL	**
5	Cadmium, µg/m^3	ASTM D 4185	0.0015 µg/m^3	BDL	BDL	**
6	Mercury, µg/m3	ASTM D 4185	0.0007 µg/m^3	BDL	BDL	**

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Environment Laboratory CMPDI RI-IV, NAGPUR	**Test Report** **Ambient Air Quality Monitoring Data** **For Heavy Metals**	TC-7102

TEST REPORT NO.	RIN/TR/JUNE /HM59	DATE OF ISSUE	25-09-2025
NAME OF CUSTOMER	GM(ENV.),WCL(HQ), NAGPUR	SAMPLE DESCRIPTION	AIR SAMPLE
CUSTOMER LETTER REFERENCE NO.	WCL/HQ/ENV/14-I/206-220 DATED: 25.03.2022		
TEST REQUIRED	Heavy metals (As, Pb, Ni, Cr & Cd) in air samples (ASTM D 4185)		
NAME OF AREA	BALLARPUR	SAMPLING METHOD : LSOP 4	
NAME OF PROJECT	PAUNI II OC	SAMPLING PLAN : LQR 47	
No. of Pages	1		

Sl No.	Name of location	Location Code	Date of sampling
1	CHP/ Coal unloading point	BP2OF-1	20-04-2025
2	W. Bridge	BP2OF-2	20-04-2025

Sl. No.	Parameter	Method of analysis	Detection limit	Observed Value		National Ambient Air Quality Standard NAAQS, 2009
				BP2OF-1	BP2OF-2	
1	Arsenic, µg/m^3	ASTM D 4185	0.0007 µg/m^3	BDL	BDL	0.006 µg/m^3 (Annual average)
2	Lead, µg/m3	IS 5182 PART 22	7.0 µg/m^3	BDL	BDL	1.0 µg/m^3 (24 Hourly average)
3	Nickle, µg/m^3	ASTM D 4185	0.007 µg/m^3	0.0081	0.0083	0.02 µg/m3 (Annual average)
4	Total Chromium, µg/m^3	ASTM D 4185	0.0045 µg/m^3	0.0048	0.0046	**
5	Cadmium, µg/m^3	ASTM D 4185	0.0015 µg/m^3	BDL	BDL	**
6	Mercury, µg/m3	ASTM D 4185	0.0007 µg/m^3	BDL	BDL	**

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Environment Laboratory CMPDI RI-IV, NAGPUR	**Test Report** **Ambient Air Quality Monitoring Data** **For Heavy Metals**	TC-7102

TEST REPORT NO.	RIN/TR/JUNE /HM59a	DATE OF ISSUE	25-09-2025
NAME OF CUSTOMER	GM(ENV.),WCL(HQ), NAGPUR	SAMPLE DESCRIPTION	AIR SAMPLE
CUSTOMER LETTER REFERENCE NO.	WCL/HQ/ENV/14-I/206-220 DATED: 25.03.2022		
TEST REQUIRED	Heavy metals (As, Pb, Ni, Cr & Cd) in air samples (ASTM D 4185)		
NAME OF AREA	BALLARPUR	SAMPLING METHOD : LSOP 4	
NAME OF PROJECT	NEW DHOPTALA OC	SAMPLING PLAN : LQR 47	
No. of Pages	1		

Sl No.	Name of location	Location Code	Date of sampling
1	WEIGH BRIDGE	BNDOF-1	18-04-2025
2	CHP /COAL MINE POINT	BNDOF-2	25-04-2025

Sl. No.	Parameter	Method of analysis	Detection limit	Observed Value		National Ambient Air Quality Standard NAAQS, 2009
				BNDOF-1	BNDOF-2	
1	Arsenic, µg/m^3	ASTM D 4185	0.0007 µg/m^3	BDL	BDL	0.006 µg/m^3 (Annual average)
2	Lead, µg/m3	IS 5182 PART 22	7.0 µg/m^3	BDL	BDL	1.0 µg/m^3 (24 Hourly average)
3	Nickle, µg/m^3	ASTM D 4185	0.007 µg/m^3	0.0082	0.0077	0.02 µg/m3 (Annual average)
4	Total Chromium, µg/m^3	ASTM D 4185	0.0045 µg/m^3	BDL	BDL	**
5	Cadmium, µg/m^3	ASTM D 4185	0.0015 µg/m^3	BDL	BDL	**
6	Mercury, µg/m3	ASTM D 4185	0.0007 µg/m^3	BDL	BDL	**

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