ईस्टर्न कोलफील्ड्स लिमिटेड

राजमहल खनि समूह

महाप्रबंधक (प्रभारी) का कार्यालय

धनकुंडा, पोस्ट- बड़ा सिमरा, जिला- गोड्डा, झारखण्ड - 814165

पत्रांक- ईसीएल/राजमहल/मप्र(प्र.)/यो.नि.वि. व पर्या./ 657(A) दिनांक - 03.06.2021

सेवा में,

संयुक्त निदेशक / The Joint Director(s) ,

पर्यावरण, वन एवं जलवायु परिवर्तन मंत्रालय

Ministry of Environment, Forest & Climate Change,

क्षेत्रीय कार्यालय (पू.मध्य क्षेत्र) / Regional Office (E.C.Z)

Bungalow no – A2, Shyamali Colony, Doranda

रांची, (झारखण्ड) / Ranchi, (Jharkhand) – 834002

विषय – राजमहल खुली खदान परियोजना विस्तरित (23.80 MTY) के पर्यावरण स्वीकृति सह छमाही अनुपालन प्रतिवेदन से संबंधित।

(अवधि – अक्टूबर 2020 से मार्च 2021)

महोदय,

Please find enclosed herewith the Environmental Clearance compliance report cum half yearly compliance report in respect of Rajmahal Open Cast Project Expansion (23.80 MTY), one in hard copy and one in soft copy (preceding periods: October 2020 to March 2021).

कृपया पावती दें।

संलग्नक – यथोपरि।

भवदीय,

03/06/2021

क्षेत्रीय प्रबंधक (पर्यावरण)

राजमहल क्षेत्र, ईसीएल

प्रतिलिपि -

सदस्य सचिव, झारखण्ड राज्य प्रदूषण नियंत्रण बोर्ड, एच.ई.सी, धुर्वा, राँची- 834004 -आवश्यक दस्तावेजों के साथ सादर सूचनार्थ।

विभागाध्यक्ष (पर्यावरण), ईसीएल, बराचक हाउस, आसनसोल - आवश्यक दस्तावेजों के साथ सादर सूचनार्थ|

महाप्रबंधक (प्रभारी), राजमहल क्षेत्र - सादर सूचनार्थ|

महाप्रबंधक (परिचालन), राजमहल क्षेत्र - सादर सूचनार्थ|

Six Monthly Compliance report (Half yearly - End March 2021) of Environmental Clearance from Ministry of Environment, Forest & Climate Change, New Delhi in respect of Rajmahal Open Cast Project (23.80 MTPA) , E.C.L.

Specific Conditions		
S.No.	**Condition**	**Compliance**
i.	The recommendation is subject to approval of revalidation of previous EC dated 11thMay, 2005.	MoEF&CC has accorded approval for Revalidation of Environment Clearance dated 11th May 2005 vide letter no.J-11015/30/2004- IA. II(M) dt. 22nd January 2020.
ii.	EAC desired that the M.o.C may direct CIL subsidiaries to comply the EC/FC/CTO conditions strictly within certain time bound manner so that the mining operations will be environmentally sustainable/viable etc.	Conditions of EC/FC/CTO are being strictly complied in a time bound manner.
iii.	The project proponent shall obtain Consent to Establish/Operate from the State Pollution Control Boards for the proposed peak capacity of 23.80 MTPA prior to commencement of the increased production.	Consent to Establish and Consent to Operate for peak production capacity of 23.80 MTY has been obtained from JSPCB vide Ref. No: JSPCB/HO/RNC/ CTE-7106453/2020/177 dt. 03.05.2020 and Ref. No: JSPCB/HO/RNC/CTO-7106344/2020/1444 dt. 07.09.2020 respectively.
iv.	Transportation of coal from Coal Handling Plant shall be through covered trucks.	It is being followed.
v.	To control the production of dust at source, the crusher and in-pit belt conveyors shall be provided with mist type sprinklers.	Crusher has been provided with automatic sensor-based mist type sprinklers. Construction of In-pit belt crushing conveying arrangements is in progress and it will be provided with mist type sprinklers. (**Photograph-I**)
vi.	Mitigating measures shall be undertaken to control dust and other fugitive emissions all along the roads by providing sufficient water sprinklers. Adequate corrective measures shall be undertaken to control dust emissions, which would include mechanized sweeping, water sprinkling/mist spraying on haul roads and loading sites, long range misting/fogging arrangement, wind barrier wall and vertical greenery system, green belt, dust suppression arrangement at loading and unloading points, etc.	Sufficient numbers of high efficiency dust suppression system have been provided at input hopper, loading and unloading areas including all the transfer points maintained and operated which are as under: 1) Total 14 nos. of Mobile water sprinklers [20 KL(06), 28 KL(06) & 34 KL(02) capacity] have been provided for dust suppression at haul roads. 2) Automatic sensor based fine nozzle mist type water sprinklers has been installed at Crushing Hopper. 3) 02 nos. of highly efficient mist gun have been installed at Crushing Point. 4) Fixed type of water sprinklers has been installed near CHP and en-route to RJML railway siding. 5.) DSS systems for chutes at crushing point. 6.) Sprinkler for SM hopper and crusher hopper at crushing point. 7.) Service water line for dust cleaning near crushing point.
vii.	Continuous monitoring of occupational safety and other health hazards, and the corrective actions need to be ensured.	A person working in dusty areas is being given adequate training and information on safety and health aspects. They use protective respiratory devices judiciously. PME is being done to each worker at an interval of

Specific Conditions		
S.No.	**Condition**	**Compliance**
		five years under occupational health surveillance program as per norms at Central Hospital, Kalla, ECL If it is observed any contractions due to exposure to coal dust will be taken corrective measure, as per need. Periodical Medical Examinations (PME) of workers is being carried out at 5 years interval in which audiometric tests are carried out. Last 5 Year details are as under:- 2017 - 438 2018 - 447 2019 - 446 2020 – 443 2021 – 228 (Till March)
viii.	Persons of nearby villages shall be given training on livelihood and skill development to make them employable.	People of nearby villages are imparted training on livelihood and skill development which are as under: **i)** Skill Development Centre with ATDC at Rajmahal Area. (Project Cost: 18.8 Lakhs) **ii)** Operation and maintenance of OPJCC (ITI, Godda) (**Photograph-II**)
ix.	Thick green belt of adequate width at the final boundary in the down wind direction of the project site shall be developed to mitigate/check the dust pollution.	Thick green belt of adequate width has been developed to mitigate/ check the dust pollution.
x.	Efforts shall be made for utilizing alternate sources of surface water, abandoned mines or else whatsoever and thus minimizing the dependability on a single source.	The treated mine water is being supplied to nearby villages for their irrigation and domestic use. Also, excess mine water after sedimentation is being supplied to the ponds in peripheral villages for domestic and agricultural use of local villagers.
xi.	The company shall obtain approval of CGWA for use of groundwater for mining operations at its enhanced capacity of 23.8 MTPA.	Application has been submitted and it is under the scrutiny of CGWB Patna.
xii.	Continuous monitoring of occupational safety and other health hazards, and the corrective actions need to be ensured.	A person working in dusty areas is being given adequate training and information on safety and health aspects. They use protective respiratory devices judiciously. PME is being done for each worker at an interval of five years under occupational health surveillance program as per norms at Central Hospital, Kalla, ECL, If it is observed any contractions due to exposure to coal dust will be taken corrective measure, as per need. Periodical Medical Examinations (PME) of workers is being carried out at 5 year intervals in which audiometric tests are carried out. Last 5 Year-wise details are as under:- 2017 - 438 2018 - 447

Specific Conditions		
S.No.	**Condition**	**Compliance**
		2019 - 446 2020 – 443 2021 – 228 (Till March)
xiii.	A third—party assessment of EC compliance shall be undertaken once in every three years by agency like ICFRI /NEERI/IIT or any other expert agency identified by the Ministry.	Agreed.
xiv.	The activities and fund provisions for CER shall be made as per the guidelines issued by the ministry regarding CER on 1st May, 2018	Agreed.
xv.	Compliance of all the non-compliances and partially complied conditions by Regional Office, Ranchi for the project of EC dated 11th May, 2005.	All non-compliances and partially complied conditions as suggested by Regional Office are being complied.
xvi.	Project Proponent shall obtain blasting permission from DGMS for conducting mining operation near villages and also explore deployment of rock breakers of suitable capacity in the project to avoid blasting very near to Villages. There shall be no damages caused to habitation/structures due to blasting activity.	Dust permission has been obtained from DGMS for conducting mining operations.
xvii.	Project proponent to plant 100,000 nos. of native trees with broad leaves along the villages and transportation route to prevent the effect of air pollution. After completion of tree plantation, number of trees shall be duly endorsed from District Forest Officer.	It is being done in a phased manner.
xviii.	The Project Proponent shall comply with all the statutory requirements and judgment of Hon'ble Supreme Court dated the 2nd August 2017 in Writ Petition (Civil) No. 114 of 2014 in the matter of Common Cause versus Union of India and Ors. State Government shall ensure that the entire compensation levied, if any, for illegal mining paid by the Project Proponent through their respective Department in strict compliance of judgment of Hon'ble Supreme Court dated the 2nd August 2017 in Writ Petition (Civil) No. 1 14 of 2014 in the matter of Common Cause versus Union of India and Ors.	Agreed.
xix.	Project Proponent shall obtain the necessary prior permission from the Central Ground Water Authority (CGWA) in case of intersecting the Ground water table. The intersecting ground water table can only be commencing after conducting detailed hydrogeological study and necessary permission from the CGWA. The Report on six monthly basis on changes in Ground water level and quality shall be submitted to the Regional Office of the Ministry,	Agreed.

Specific Conditions		
S.No.	**Condition**	**Compliance**
	CGWA and State Pollution Control Board	
xx.	Proponent shall appoint an Occupational Health Specialist for Regular and Periodical medical examination of the workers engaged in the Project and maintain records accordingly; Also, Occupational health check—ups for workers having some ailments like BP, diabetes, habitual smoking, etc. shall be undertaken once in six months and necessary remedial/preventive measures taken accordingly. The Recommendations of National Institute for ensuring good occupational environment for mine workers shall be implemented; The prevention measure for burns, malaria and provision of anti-snake-venom including all other paramedical safeguards may be ensured before initiating the mining activities.	Periodical Medical Examinations (PME) of workers is being carried out at 5 year intervals in which audiometric tests are carried out. Last 5 Year-wise details are as under:- 2017 - 438 2018 - 447 2019 - 446 2020 – 443 2021 – 228 (Till March)
xxi.	Project Proponent shall follow the mitigation measures provided in Office Memorandum No. Z-11013/57/2014-IA. II(M). dated 29th October, 2014, titled "Impact of mining activities on Habitations-Issues related to the mining Projects wherein Habitations and Villages are the part of mine lease areas or Habitations and Villages are surrounded by the mine lease area".	Agreed.
xxii.	The illumination and sound at night at project sites disturb the Villages in respect of both human and animal population. Consequent sleeping disorders and stress may affect the health in the villages located close to mining operations. Habitations have a right for darkness and minimal noise levels at night. PPs must ensure that the biological clock of the Villages is not disturbed; by orienting the floodlights/ masks away from the villagers and keeping the noise levels well within the prescribed limits for day light/night hours.	Agreed.
xxiii.	The project proponent shall take all precautionary measures during mining operation for conservation and protection of endangered fauna, if any, spotted in the study area. Action plan for conservation of flora and fauna shall be prepared and implemented in consultation with the State Forest and Wildlife Department. A copy of action plan shall be submitted to the Ministry of Environment, Forest and Climate Change and its Regional Office.	Full efforts are being made during mining operation for conservation and protection of endangered fauna spotted in the study area in consultation with the forest officials. Action plan for conservation of Endangered Fauna has been prepared in consultation with concerned Divisional Forest Officer, Godda. Also, Nine (9) copies of Wildlife Conservation Plan, which has been prepared in consultation with Divisional Forest Officer, Godda and has been submitted to DFO office, Godda for its further submission to concerned authorities.
xxiv.	Loading and unloading of coal shall be done	Silo (2 in Nos.) of capacity 4000t each is already

Specific Conditions		
S.No.	**Condition**	**Compliance**
	with silo loading facility to enhance production and proposed facility should be installed in 1 year.	operational. Proposal for additional 10 MTY C.H.P which includes rapid loading system and construction of an additional silo of capacity 4000t is already in progress.
xxv.	Conditions stipulated during revalidation of EC i.e. letter dated 22nd January, 2020 is also to be complied.	Conditions stipulated during revalidation of EC i.e. letter dated 22nd January, 2020 are being complied.
xxvii.	Project proponent shall submit approved Wildlife Conservation Plan within six months i.e. by 30th September, 2020. PP shall also ensure that all the steps to be undertaken as committed by the project proponent to conserve and protect wildlife, failure to do so may be considered a case of non-compliance of EC conditions.	Nine (9) copies of Wildlife Conservation Plan, which has been prepared in consultation with Divisional Forest Officer, Godda has been submitted to DFO office, Godda for its further submission to concerned authorities.

Standard Conditions		
S.No.	**Condition**	**Compliance**
A. Statutory Compliance:		
i)	The project proponent shall obtain forest Clearance under the provisions of Forest (Conservation) Act, 1986, in case of the diversion of forest land for non—forest purpose involved in the project.	Approval under the Forest (Conservation) Act, 1980 for diversion of total 107.42 ha of forest land for non-forestry purposes has been obtained vide following M0EF&CC letter No: I) 8-303/89—FC dated 26.10.1993 for **17.64 Ha** in Phase-I II) 8-7/98-FC dated 10.12.2002 for **20.03 Ha** in Phase-II. III) 8-89/2003-FC dated 27.08.2004 for **69.75 Ha** in Phase-III.
ii)	The project proponent shall obtain clearance from the National Board for Wildlife, if applicable.	Not applicable.
iii)	The project proponent shall prepare a Site-Specific Conservation Plan / Wildlife Management Plan and approved by the Chief Wildlife Warden. The recommendations of the approved Site-Specific Conservation Plan/Wildlife Management Plan shall be implemented in consultation with the State Forest Department. The implementation report shall be furnished along with the six-monthly compliance report (in case of the presence of schedule—I species in the study area).	Full efforts are being made during mining operation for conservation and protection of endangered fauna spotted in the study area in consultation with the forest officials. Action plan for conservation of Endangered Fauna has been prepared in consultation with concerned Divisional Forest Officer, Godda. Also, Nine (9) copies of Wildlife Conservation Plan, which has been prepared in consultation with Divisional Forest Officer, Godda and is submitted to DFO office, Godda for its further submission to concerned authorities. At present there is no Schedule – I species present in the area.
iv)	The project proponent shall obtain Consent to Establish/Operate under the provisions of Air (Prevention & Control of Pollution) Act, 1981 and the Water (Prevention & Control of	Consent to Establish and Consent to Operate for peak production capacity of 23.80 MTY has been obtained from JSPCB vide Ref. No: JSPCB/HO/RNC/ CTE-7106453/2020/177 dt. 03.05.2020 and Ref.No:

Standard Conditions		
S.No.	**Condition**	**Compliance**
	Pollution) Act, 1974 from the concerned State pollution Control Board/ Committee.	JSPCB/HO/RNC/CTO-7106344/2020/1444 dt. 07.09.2020 respectively.
v)	The project proponent shall obtain the necessary permission from the Central Ground Water Authority.	Agreed.
vi)	Solid/hazardous waste generated in the mines needs to addressed in accordance to the Solid Waste Management Rules, 2016/Hazardous & Other Waste Management Rules, 2016.	Agreed.
B. Air quality monitoring and preservation:		
i)	Continuous ambient air quality monitoring station as prescribed in the statue be established in the core zone as well as in the buffer zone for monitoring of pollutants, namely PM_{10}, $PM_{2.5}$, $S0_2$ and NO_X. Location of the stations shall be decided based on the meteorological data, topographical features and environmentally and ecologically sensitive targets in consultation with the State Pollution Control Board. Online ambient air quality monitoring stations may also be installed in addition to the regular monitoring stations as per the requirement and/or in consultation with the SPCB. Monitoring of heavy metals such as Hg. As. Ni. Cd, Cr, etc to be carried out at least once in six months.	As per the guidelines of JSPCB, Continuous PM_{10} analyzer has been procured and in under the process of installation. Proposal for installation of CAAQMS has been initiated.
ii)	The Ambient Air Quality monitoring in the core zone shall be carried out to ensure the Coal Industry Standards notified vide GSR 742 (E) dated 25th September, 2000 and as amended from time to time by the Central Pollution Control Board. Data on ambient air quality and heavy metals such as Hg, As, Ni, Cd, Cr and other monitoring data shall be regularly reported to the Ministry/Regional Office and to the CPCB/SPCB.	Fortnightly AAQ Monitoring is done by CMPDI (Region – I), Asansol as per the Coal Industry Standards notified vide GSR 742 (E) dated 25th September, 2000 at 4 stations, in core and buffer zone. The monitory location of the stations had been decided based on the meteorological data, topographical features and environmentally and ecologically sensitive targets, in consultation with the representative of JSPCB, Ranchi. The stations are as under:- 1. Mine Dispatch Building. 2. CISF Camp. 3. Urjanagar Hospital. 4. ECL Rest House at Pirpainti Market. Monitoring is carried out on fortnightly basis and submitted regularly to the Regional Office of MoEF, Bhubaneswar once in six months, and to the JSPCB, Ranchi once in every three months and also once in a year with the Environmental Statement. Photo copy of Environmental monitoring report for **Jan'21** is enclosed with AAQ data in microgram per cubic meter for above quarter ending is as follows:- Pollutants Min. Max. $PM_{2.5}$ 31.2 56.3 PM_{10} 87.3 274.6

Standard Conditions		
S.No.	**Condition**	**Compliance**
		SO_2 BDL NO_x 15.8 19.4 Attached as **Annexure-I.**
iii)	Transportation of coal, to the extent permitted by road, shall be carried out by covered trucks/conveyors. Effective control measures such as regular water/mist sprinkling/rain gun etc. shall be carried out in critical areas prone to air pollution (with higher values of PM_{10}/ $PM_{2.5}$) such as haul road, loading/unloading and transfer points. Fugitive dust emissions from all sources shall be controlled regularly. It shall be ensured that the Ambient Air Quality parameters conform to the norms prescribed by the Central/State Pollution Control Board.	Transportation of coal is carried out by covered trucks. Construction of In-pit conveyor with mist sprinkling arrangements is under progress. Following dust suppression techniques are already in operation: 1) Automatic sensor based fine nozzle mist type water sprinklers have been installed at Crushing Hopper. 2) 02 nos. of highly efficient mist gun have been installed at Crushing Point. 3) Fixed type of water sprinklers has been installed near CHP. 4.) DSS systems for chutes at crushing point. 5.) Sprinkler for SM hopper and crusher hopper at crushing point. 6.) Service water line for dust cleaning near crushing point. 7.) Belt conveyors are fully covered to avoid air borne dust. 8.) Wet drilling is operational. Also, Ambient Air Quality parameters conform to the norms prescribed by the Central/State Pollution Control Board. **(Photograph-3)**
iv)	The transportation of coal shall be carried out as per the provisions and route envisaged in the approved Mining Plan or environment monitoring plan. Transportation of the coal through the existing road passing through any village shall be avoided. In case, it is proposed to construct a 'bypass' road, it should be so constructed so that the impact of sound, dust and accidents could be appropriately mitigated.	It is being strictly followed.
v)	Vehicular emissions shall be kept under control and regularly monitored. All the vehicles engaged in mining and allied activities shall operate only after obtaining "PUC" certificate from the authorized pollution testing centres.	Vehicular emissions are kept under control and are regularly monitored. Vehicles have obtained PUC certificates from authorized pollution testing centres.
vi)	Coal stock pile/crusher/feeder and breaker material transfer points shall invariably be provided with dust suppression system. Belt-conveyors shall be fully covered to avoid air borne dust. Side cladding all along the conveyor gantry should be made to avoid air borne dust. Drills shall be wet operated or fitted with dust extractors.	Following dust suppression techniques are already in operation: 1) Automatic sensor based fine nozzle mist type water sprinklers has been installed at Crushing Hopper. 2) 02 nos. of highly efficient mist gun have been installed at Crushing Point. 3) Fixed type of water sprinklers has been installed near CHP.

<table>
<tr><th colspan="3">Standard Conditions</th></tr>
<tr><th>S.No.</th><th>Condition</th><th>Compliance</th></tr>
<tr><td></td><td></td><td>4.) DSS systems for chutes at crushing point.
5.) Sprinkler for SM hopper and crusher hopper at crushing point.
6.) Service water line for dust cleaning near crushing point.
7.) Belt conveyors are fully covered to avoid air borne dust.
8.) Wet drilling is operational.
(Photograph 3)</td></tr>
<tr><td colspan="3">C. Water quality monitoring and preservation:</td></tr>
<tr><td>i)</td><td>The effluent discharge (mine waste water, workshop effluent) shall be monitored in terms of the parameters notified under the Water Act, 1974 Coal Industry Standards vide GSR 742 (E) dated 25th September, 2000 and as amended from time to time by the Central Pollution Control Board.</td><td>Effluent discharge (mine waste water, workshop effluent) is regularly monitored in terms of the parameters notified under the Water Act, 1974 Coal Industry Standards vide GSR 742 (E) dated 25th September, 2000 by CMPDIL.</td></tr>
<tr><td>ii)</td><td>The monitoring data shall be uploaded on the company’s website and displayed at the project site at a suitable location. The circular No.J-20012/1/2006-IA.II (M) dated27th May, 2009 issued by Ministry of Environment, Forest and Climate Change shall also be referred in this regard for its compliance.</td><td>The monitoring data is regularly uploaded on the company’s website and display board at the project site at a suitable location. The circular No. J-20012/1/2006-IA.II (M) dated 27th May, 2009 issued by Ministry of Environment, Forest and Climate Change is also referred in for its compliance.</td></tr>
<tr><td>iii)</td><td>Regular monitoring of ground water level and quality shall be carried out in and around the mine lease area by establishing a network of existing wells and constructing new piezometers during the mining operations. The monitoring of ground water levels shall be carried out four times a year i.e. pre-monsoon, monsoon, post-monsoon and winter. The ground water quality shall be monitored once a year, and the data thus collected shall be sent regularly to MOEF&CC/RO.</td><td>Regular monitoring of ground water level in five designated wells in vicinity of Rajmahal OCP is carried out on quarterly basis by CMPDIL, Asansol. The report is being submitted regularly as desired.

The Ground water level for Jan’21 is given below,
<table>
<tr><th>Site
(Date of Sampling)</th><th>Well water level from ground (m)</th></tr>
<tr><td>Bara Simra Rehab Site (28/01/2021)</td><td>8.05</td></tr>
<tr><td>Hijukitta Village (28/01/2021)</td><td>5.90</td></tr>
<tr><td>Lalmatia Chowk (28/01/2021)</td><td>6.80</td></tr>
<tr><td>Lohandia Bazar Village (28/01/2021)</td><td>10.30</td></tr>
<tr><td>Paharpur Village (28/01/2021)</td><td>NA</td></tr>
</table>
(Annexure-I)
02 nos. of Piezometers have been installed at following locations</td></tr>
</table>

Standard Conditions		
S.No.	**Condition**	**Compliance**
		<table><tr><th>S.No</th><th>Station Code and Location</th></tr><tr><td>1.</td><td>RPZ-1 (Old Workshop / Erection Yard)</td></tr><tr><td>2.</td><td>RPZ-2 (Lohandiya Panchyat Bhawan)</td></tr></table>
iv)	Monitoring of water quality upstream and downstream of water bodies shall been carried out once in six months and record of monitoring data shall be maintained and submitted to the Ministry of Environment, Forest and Climate Change/Regional Office.	It is being followed. Monitoring of water quality upstream and downstream of water bodies has been carried out is by CMPDIL, Asansol, which is NABL accredited company.
v)	Ground water, excluding mine water, shall not be used for mining operations. Rainwater harvesting shall be implemented for conservation and augmentation of ground water resources.	Ground water, excluding mine water, is not used for mining operations. Ponds (15 in Nos.) has been constructed within mine lease area and Rain water harvesting structures (7 in Nos.) has been constructed for conservation and augmentation of ground water resources. **(Annexure-II)**
vi)	Catch and/or garland drains and siltation ponds in adequate numbers and appropriate size shall be constructed around the mine working, coal heaps & OB dumps to prevent run off of water and flow of sediments directly into the river and water bodies. Further, dump material shall be properly consolidated/ compacted and accumulation of water over dumps shall be avoided by providing adequate channels for flow of silt into the drains. The drains/ ponds so constructed shall be regularly de-silted particularly before onset of monsoon and maintained properly. Sump capacity should provide adequate retention period to allow proper settling of silt material. The water so collected in the sump shall be utilized for dust suppression and green belt development and other industrial use. Dimension of the retaining wall constructed, if any, at the toe of the OB dumps within the mine to check run-off and siltation should be based on the rainfall data. The plantation of native species to be made between toe of the dump and adjacent field /habitation/water bodies.	Catch drain are present in the dumps to arrest silt and runoff. Garland drains are provided along the toe of dump for collecting and discharging rain water. Yearly cleaning of the drains is carried out under monsoon preparation. Storm water flowing through garland drains is collected in a pond which is de-silted as and when required. Second stage settling pond has also been developed. The water collected through these drains are utilized for watering the mine areas, roads and firefighting etc. Construction of more catch drains is under progress and will be ready soon. **(Photographs 4)**
vii)	Adequate groundwater recharge measures shall be taken up for augmentation of ground water. The project authorities shall meet water requirement of nearby village(s) after due treatment conforming to the specific requirement (standards).	Several Ponds has been constructed within mine lease area and 7 numbers of rainwater harvesting structures has been constructed for conservation and augmentation of ground water resources. Also, Rajmahal OCP do meet the water requirements of nearby needy villages regularly through (i) Water tankers, (ii) Supplying water by borehole pumping and (iii) Channelizing the

Standard Conditions		
S.No.	**Condition**	**Compliance**
		dewatered supply to village ponds. (iv) Lalmatia Filtration plant (by ECL) of capacity 10,000 GPH is solely to fulfill the drinking water requirements of nearby villages. (**Photograph-5**) Financial help is also provided on opening of new wells, their maintenance and installation of hand pumps.
viii)	Industrial waste water generated from CHP, workshop and other waste water, shall be properly collected and treated so as to conform to the standards prescribed under the standards prescribed under Water Act 1974 and Environment (Protection) Act, 1986 and the Rules made there under, and as amended from time to time. Adequate ETP /STP needs to be provided.	Industrial waste water (workshop and waste water from the mine) is being properly collected and analyzed, regularly and found conforming with the MoEF Schedule - VI Standards for discharge of mine effluents. Analysis results of CHP discharge for **Jan' 2021** are within permissible limit. Quality report for 4 parameters are as under:- <u>Location : Discharge from CHP</u> pH 7.28 TSS (mg/l) 20.4 TDS (mg/l) 458 Oil & Grease (mg/l) BDL COD (mg/l) 28 **(Annexure-I)**
ix)	The water pumped out from the mine, after siltation shall be utilized for industrial purpose viz. watering the mine area, roads, green belt development etc. The drains shall be regularly de-silted particularly after monsoon and maintained properly.	The water pumped out from the mine, is passed through multi-stage settling ponds and sedimentation tank before it is utilized for industrial purpose viz. watering the mine area, roads, green belt development etc. Also, the drains are regularly de-silted particularly after monsoon and maintained properly. (**Photographs-6**)
x)	The surface drainage plan including surface water conservation plan for the area of influence affected by the said mining operations, considering the presence of river/ rivulet/ pond/ lakes etc. shall be prepared and implemented by the project proponent. The surface drainage plan and/or any diversion of natural water courses shall be as per the approved Mining Plan/EIA/EMP report and with due approval of the concerned State/GoI Authority. The construction of embankment to prevent any danger against inrush of surface water into the mine should be as per the approved Mining Plan and as per the permission of DGMS or any other authority as prescribed by the law.	Hydro-geological report which incorporates drainage plan, has been prepared by CMPDI and is being implemented. It is as per EIA/EMP report.
xi)	The project proponent shall take all precautionary measures to ensure riverine/riparian ecosystem in and around the coal mine up to a distance of 5 km. A riverine/ riparian ecosystem conservation and management plan should be prepared and	There is no riverine/ riparian ecosystem near the coal mine up to a distance of 5 km.

Standard Conditions		
S.No.	**Condition**	**Compliance**
	implemented in consultation with the irrigation / water resource department in the state government.	
D. Noise and Vibration monitoring and prevention:		
i)	Adequate measures shall be taken for control of noise levels as per Noise Pollution Rules, 2016 in the work environment. Workers engaged in blasting and drilling operations, operation of HEMM, etc. shall be provided with personal protective equipment (PPE) like ear plugs/muffs in conformity with the prescribed norms and guidelines in this regard. Adequate awareness programme for users to be conducted. Progress in usage of such accessories to be monitored.	To control noise levels within prescribed standards the following steps are being taken :- 1. Noise monitoring is being carried out regularly and found to be within permissible levels. Noise level report (Day time) for **Jan'21** are appended below & photo copy is being attached. Minimum - 57.34 dB(A) Maximum - 86.83 dB(A) 2. All HEMM and light vehicles are provided with silencers. Workers engaged in blasting and drilling operations, operations of HEMM, etc., exposed to high sound levels are provided with ear muffs and their working hours are reduced to prevent long exposure time. In FY 2020-21, Ear plug – 901 (in Nos.) and safety helmet with ear muff - 80 (2020 and 2021) have been provided to the workers. **Annexure-I.**
ii)	Controlled blasting techniques shall be practiced in order to mitigate ground Vibrations, fly rocks, noise and air blast etc., as per the guidelines prescribed by the DGMS.	Yes, control blasting is been practiced, Vibration due to blasting is under limit as per DGMS guidelines. Report Attached as **Annexure-III.**
iii)	The noise level survey shall be carried out as per the prescribed guidelines to assess noise exposure of the workmen at vulnerable points in the mine premises, and report in this regard shall be submitted to the Ministry/RO on six-monthly basis.	Noise level survey is carried out in prominent noise generating sites in the mine, report is Attached as **Annexure -IV.** Also, noise monitoring is regularly done by CMPDIL. The report is submitted on six-monthly basis along with Half-yearly EC compliance report.**(Annexure-I)**
E. Mining Plan:		
i)	Mining shall be carried out under strict adherence to provisions of the Mines Act 1952 and subordinate legislations made there—under as applicable.	Mining is being carried out under strict adherence to provisions of the Mines Act 1952 and subordinate legislations made there—under as applicable.
ii)	Mining shall be carried out as per the approved mining plan (including Mine Closure Plan) abiding by mining laws related to coal mining and the relevant circulars issued by Directorate General Mines Safety (DGMS).	Mining is being carried out as per the approved mining plan (including Mine Closure Plan) abiding by mining laws related to coal mining and the relevant circulars issued by Directorate General Mines Safety (DGMS).
iii)	No mining shall be carried out in forest land without obtaining Forestry Clearance as per Forest (Conservation) Act, 1980.	Approval under the Forest (Conservation) Act, 1980 for diversion of total 107.42 ha of forest land for non-forestry purposes has been obtained vide following M0EF&CC letter No: I) 8-303/89—FC dated 26.10.1993 for **17.64 Ha** in Phase-I II) 8-7/98-FC dated

Standard Conditions		
S.No.	**Condition**	**Compliance**
		10.12.2002 for **20.03 Ha** in Phase-II. III) 8-89/2003-FC dated 27.08.2004 for **69.75 Ha** in Phase-III.
iv)	Efforts should be made to reduce energy and fuel consumption by conservation, efficiency improvements and use of renewable energy.	Agreed.
F. Land Reclamation:		
i)	Digital Survey of entire lease hold area/core zone using Satellite Remote Sensing survey shall be carried out at least once in three years for monitoring land use pattern and report in 1:50,000 scale or as notified by Ministry of Environment, Forest and Climate Change(MOEF&CC) from time to time shall be submitted to MOEF&CC/Regional Office (R0).	Satellite monitoring of entire lease hold area/core zone is done by CMPDIL. The report is being attached as **Annexure-V.**
ii)	The final mine void depth should preferably be as per the approved Mine Closure Plan, and in case it exceeds 40 m, adequate engineering interventions shall be provided for sustenance of aquatic life therein. The remaining area shall be backfilled and covered with thick and alive top soil. Post-mining land be rendered usable for agricultural/forestry purposes and shall be diverted. Further action will be treated as specified in the guidelines for Preparation of Mine Closure Plan issued by the Ministry of Coal dated 27th August, 2009 and subsequent amendments.	The final mine void depth will be as per the approved Mine Closure Plan.
iii)	The entire excavated area, backfilling, external OB dumping (including top soil) and afforestation plan shall be in conformity with the "during mining"/"post mining" land-use pattern, which is an integral part of the approved Mining Plan and the EIA/EMP submitted to this Ministry. Progressive compliance status Vis-a-vis the postmining land use pattern shall be submitted to the MOEF&CC/RO.	Backfilling, external OB dumping and afforestation shall be done as per the approved Mining Plan and the EIA/EMP submitted to this Ministry.
iv)	Fly ash shall be used for external dump of overburden, backfilling or stowing of mine as per provisions contained in clause (i) and (ii) of subparagraph (8) of fly ash notification issued vide SO 2804 (E) dated 3rd November, 2009 as amended from time to time. Efforts shall be made to utilize gypsum generated from Flue Gas Desulfurization (FGD), if any. Along with fly ash for external dump of overburden, backfilling of mines. Compliance report shall be submitted to Regional Office of MoEF&CC, CPCB and SPCB.	Feasibility of use of Fly-ash for external OB dump and backfilling of mine shall be explored as and when required as per the said fly ash notification under the guidance of DGMS.
v)	Further, it may be ensured that as per the time schedule specified in mine closure plan it should	At present, the top soil is being stacked at earmarked site near MIPL Camp and spreading is

Standard Conditions		
S.No.	**Condition**	**Compliance**
	remain live till the point of utilization. The topsoil shall temporarily be stored at earmarked site(s) only and shall not be kept unutilized. The top soil shall be used for land reclamation and plantation purposes. Active OB dumps shall be stabilized with native grass species to prevent erosion and surface run off. The other overburden dumps shall be vegetated with native flora species. The excavated area shall be backfilled and afforested in line with the approved Mine Closure Plan. Monitoring and management of rehabilitated areas shall continue until the vegetation becomes self-sustaining. Compliance status shall be submitted to the Ministry of Environment, Forest and Climate Change/ Regional Office.	done over slopes of backfilled area (RCML Patch) and internal OB dumps uniformly in the process of technical reclamation before plantation works. **(Photograph-7)**
vi)	The project proponent shall make necessary alternative arrangements, if grazing land is involved in core zone, in consultation with the State government to provide alternate areas for livestock grazing, if any. In this context, the project proponent shall implement the directions of Hon'ble Supreme Court with regard to acquiring grazing land.	Agreed, it will be complied as per the directions of Hon'ble Supreme Court of India.
G. Green Belt:		
i)	The project proponent shall take all precautionary measures during mining operation for conservation and protection of endangered/endemic flora/fauna, if any, spotted/reported in the study area. The Action plan in this regard, if any, shall be prepared and implemented in consultation with the State Forest and Wildlife Department.	Full efforts are being made during mining operation for conservation and protection of endangered fauna spotted in the study area in consultation with the forest officials. Action plan for conservation of Endangered Fauna has been prepared in consultation with concerned Divisional Forest Officer, Godda. Also, Nine (9) copies of Wildlife Conservation Plan, which has been prepared in consultation with Divisional Forest Officer, Godda and has been submitted to DFO office, Godda for its further submission to concerned authorities.
ii)	Greenbelt consisting of 3-tier plantation of width not less than 7.5 m shall be developed all along the mine lease area as soon as possible. The green belt comprising a mix of native species (endemic species should be given priority) shall be developed all along the major approach/ coal transportation roads.	Greenbelt consisting of 3-tier plantation has been developed all along the mine lease area. The green belt comprising a mix of native species (endemic species should be given priority) has been developed all along the major approach/ coal transportation roads.
H. Public Hearing and Human related issues:		
i)	Adequate illumination shall be ensured in all mine locations (as per DGMS standards) and monitored weekly. The report on the same shall be submitted to this ministry & it's RO on six—monthly basis.	Adequate illumination has been ensured at all mine location (as per DGMS standards) and monitored monthly. Report Attached as **Annexure-VI**.

Standard Conditions		
S.No.	**Condition**	**Compliance**
ii)	The project proponent shall undertake occupational health survey for initial and periodical medical examination of the personnel engaged in the project and maintain records accordingly as per the provisions of the Mines Rules, 1955 and DGMS circulars. Besides regular periodic health check-up, 20% of the personnel identified from workforce engaged in active mining operations shall be subjected to health check-up for occupational diseases and hearing impairment, if any, as amended time to time.	Agreed.
iii)	Personnel (including outsourced employees) working in core zone shall wear protective respiratory devices and shall also be provided with adequate training and information on safety and health aspects.	Person working in dusty areas are given adequate training and information on safety and health aspects. They use protective devices like safety helmets, safety shoes, pollution masks, ear plugs and ear muffs.
iv)	Implementation of the action plan on the issues raised during the public hearing shall be ensured. The project proponent shall undertake all the tasks/measures as per the action plan submitted with budgetary provisions during the public hearing. Land oustees shall be compensated as per the norms laid down in the R&R policy of the company/ State Government/Central Government, as applicable.	Regular action is taken on issues raised during public hearing. Land oustees are paid land compensation as per norms. The last five financial years payment details are as under:- 2016-17 - Rs. 217.7 Lakhs 2017-18 - Rs. 357.63 Lakhs 2018-19 - Rs. 3267.20 Lakhs. 2019-20 - Rs. 3667.00 Lakhs. 2020-21 - Rs. 904.164 Lakhs
v)	The project proponent shall follow the mitigation measures provided in this Ministry's OM No. Z-11013/57/2014—IA.II (M) dated 29thOctober. 2014, titled "Impact of mining activities on habitations—issues related to the mining projects Wherein habitations and villages are the part of mine lease areas or habitations and Villages are surrounded by the mine lease area."	Agreed.
I. Corporate Environment Responsibility:		
i)	The project proponent shall comply with the provisions contained in this Ministry's OM vide F.No.22-65/2017-IA.111 dated 1St May 2018, as applicable, regarding Corporate Environment Responsibility.	Agreed.
ii)	The company shall have a well laid down environmental policy duly approved by the Board of Directors. The Environment policy should prescribe for standard operating procedures to have proper checks and balances and to bring into focus any infringements/ deviation/ violation of the environmental/forest/wildlife norms/conditions. The company shall have defined system of reporting infringements/	The company has a well laid down environmental policy approved by board of directors.

Standard Conditions		
S.No.	**Condition**	**Compliance**
	deviation/ violation of the environmental/forest/wildlife norms/conditions and/or shareholders/stake holders.	
iii)	A separate Environmental Cell both at the project and company head quarter level, with qualified personnel shall be set up under the control of senior Executive, who will directly to the head of the organization.	**Company Level** :- There is a Separate Environmental Management Cell with suitable qualified personnel under the control of General Manager (Environment) of ECL, who reports directly to the Head of the organization. **Project level** :- A separate environmental management cell with suitable qualified personnel has been formed at Rajmahal Area.
iv)	Action plan for implementing EMP and environmental conditions along with responsibility matrix of the company shall be prepared and shall be duly approved by competent authority. The year wise funds earmarked for environmental protection measures shall be kept in separate account and not to be diverted for any other purpose. Year wise progress of implementation of action plan shall be reported to the Ministry/Regional Office along with the Six Monthly Compliance Report.	Action plan is prepared by the environment management cell on the basis of non-conformities with the conditions of E.C found during inter-area inspection conducted within ECL. The capital budget for environmental protection measures had been allocated as per Project Report and is kept as a separate fund. The revenue budget for OB Dump plantation, green belt development, is finalized annually as per the requirement. Total Rupees 21.24 Crores had been allocated till the end of mine life for Environmental Management.
v)	Self-environmental audit shall be conducted annually. Every three years, third party environmental audit shall be carried out.	Agreed.
J. Miscellaneous:		
i.	The project proponent shall make public the environmental clearance granted for their project along with the environmental conditions and safeguards at their cost by prominently advertising it at least in two local newspapers of the District or State Of which one shall be in the vernacular language within seven days and in addition this shall also be displayed in the project proponent's website permanently.	The environmental clearance granted for the project has been made public by advertising it in two newspapers of the district and the same has been displayed on the website of the company.
ii.	The copies of the environmental clearance shall be submitted by the project proponents to the Heads of local bodies, Panchayats and Municipal Bodies in addition to the relevant offices of the Government who in turn has to display the same for 30 days from the date of receipt.	The copies of the environmental clearance have been submitted by the project proponents to the Heads of local bodies, Panchayats and Municipal Bodies in addition to relevant offices of the government.
iii.	The project proponent shall upload the status of compliance of the stipulated environment clearance conditions, including results of monitored data on their website and update the same on half—yearly basis.	It is being followed.
iv.	The project proponent shall monitor the criteria pollutants level namely; PM_{10}, $S0_2$,NO_x (ambient	It is being followed.

Standard Conditions		
S.No.	**Condition**	**Compliance**
	levels) or critical sectoral parameters, indicated for the projects and display the same at a convenient location for disclosure to the public and put on the website of the company.	
v.	The project proponent shall submit six-monthly reports on the status of the compliance of the stipulated environmental conditions on the website of the ministry of Environment, Forest and Climate Change at environment clearance portal.	It is being followed strictly.
vi.	The project proponent shall follow the mitigation measures provided in this Ministry's OM No.Z-11013/57/2014-IA.II (M) dated 29th October, 2014, titled "Impact of mining activities on habitations—issues related to the mining projects wherein habitations and villages are the part of mine lease areas or habitations and villages are surrounded by the mine lease area".	Agreed.
vii.	The project proponent shall submit the environmental statement for each financial year in Form-V to the concerned State Pollution Control Board as prescribed under the Environment (Protection) Rules, 1986, as amended subsequently and put on the website of the company.	It is being strictly followed.
viii.	The project authorities shall inform to the Regional Office of the MoEF&CC regarding commencement of mining operations.	As the proposal was made for the expansion of existing project i.e. from 17.00 MTY to 23.80 MTY, mining operation was already in progress.
ix.	The project authorities must strictly adhere to the stipulations made by the State Pollution Control Board and the State Government.	It is being followed.
x.	The project proponent shall abide by all the commitments and recommendations made in the EIA/EMP report, commitment made during Public Hearing and also that during their presentation to the Expert Appraisal Committee.	Agreed.
xi.	No further expansion or modifications in the plant shall be carried out without prior approval of the Ministry of Environment, Forests and Climate Change.	Agreed.
xii.	Concealing factual data or submission of false/fabricated data may result in revocation of this environmental clearance and attract action under the provisions of Environment (Protection) Act, 1986.	Agreed.
xiii.	The Ministry may revoke or suspend the clearance, if implementation of any of the above conditions is not satisfactory.	Agreed.
xiv.	The Ministry reserves the right to stipulate	Agreed.

Standard Conditions		
S.No.	**Condition**	**Compliance**
	additional conditions if found necessary. The Company in a time bound manner shall implement these conditions.	
xv.	The Regional Office of this Ministry shall monitor compliance of the stipulated conditions. The project authorities should extend full cooperation to the officer(s) of the Regional Office by furnishing the requisite data/ information/ monitoring reports.	Full cooperation is extended to the officer(s) of the Regional Office who monitors the compliance of the stipulated conditions by furnishing the requisite data/ information/ monitoring reports.
xvi.	The above conditions shall 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, Hazardous and Other Wastes (Management and Trans-boundary Movement) Rules. 2016 and the Public Liability Insurance Act, 1991 along with their amendments and Rules and any other orders passed by the Hon'ble Supreme Court of India / High Courts and any other Court of Law relating to the subject matter.	Agreed.
Other Conditions		
i.	The proponent shall abide by all the commitments and recommendations made in the EIA/EMP report and also that during presentation to the EAC. All the commitments made on the issues raised during public hearing shall also be implemented in letter and spirit.	Agreed.
ii.	The proponent shall obtain all necessary clearances/approvals that may be required before the start of the project. The Ministry or any other competent authority may stipulate any further condition for environmental protection. The Ministry or any other competent authority may stipulate+ any further condition for environmental protection.	Agreed.
iii.	Any appeal against this Environment Clearance shall lie with the National Green Tribunal, if preferred, within a period of 30 days as prescribed under Section 16 of the National Green Tribunal Act, 2010.	Agreed.
iv.	The coal company/project proponent shall be liable to pay the compensation against the illegal mining, if any, and as raised by the respective State Governments at any point of time, in terms of the orders dated 2nd August 2017 of Hon'ble Supreme Court in WP (Civil) No.114/2014 in the matter of 'Common Cause Vs Union of India & others'.	Agreed.

Standard Conditions		
S.No.	**Condition**	**Compliance**
v.	The concerned State Government shall ensure no mining operations to commence till the entire compensation for illegal mining, if any, is paid by the project proponent through their respective Department of Mining & Geology, in strict compliance of the judgment of Hon'ble Supreme Court.	Agreed.
vi.	This Environment Clearance shall not be operational till such time the project proponent complies with the above said judgment of Hon'ble Supreme Court. As applicable, and other statutory requirements.	Agreed.

Thanking You.

Yours faithfully,

3/6/2021

General Manager (Operations),
Rajmahal Open Cast Project,
Rajmahal Group of Mines,ECL.

Date: 03.06.2021

Photographs related to EC Compliance of Rajmahal OCP (23.80 MTY)

Photograph-1: Automatic mist type sprinkler near hopper

Photograph-2: Apparel Training &Design Centre

Photograph-3(a) Mist cannon installed near crushing point

Photograph-3(b): Mist sprayng during unloading of coal at crusher

Photograph-3(c): Rotating fixed water sprinkler installed near silo dispatch

Photograph-4(a) : Garland drain

Photograph-4(b) : Toe walls and catch drains

Photograph-5(a) , 5(b) : Lalmatia filtration plant

Photograph-5(c) Water tankers for distribution of potable water to nearby villages

Photograph-6: Sedimentation tank

Photograph-7: Top soil preservation at earmarked location.

ANNEXURE -I

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

ENVIRONMENT MONITORING REPORT OF RAJMAHAL OCP

(FOR THE MONTH OF JANUARY, 2021)

(RAJMAHAL AREA)

Eastern Coalfields Limited

cmpdi
A Mini Ratna Company

Regional Institute-1
Asansol (WB)

CHAPTER - I
INTRODUCTION

1.0 The environmental monitoring has been carried out as per conditions laid down by MoEF&CC while granting environmental clearance to different projects. CMPDIL has trained manpower and well equipped laboratory to carry out monitoring, analysis and R&D work in the field of environment. Reports have been prepared for submission to MoEF&CC, SPCB and other statutory authorities.

CHAPTER-II
AMBIENT AIR QUALITY MONITORING

2.0 Ambient air quality sampling stations: Ambient air quality monitoring stations have been classified in to residential and industrial based on their locations in different clusters of mines. The sampling stations are as described below:

i) **Mine Dispatch Building (16A1): Industrial Area:** The sampler was placed at security post of mine dispatch building. This station was selected to assess the ambient air quality of industrial area in the core zone where coal transport activities are in progress.
ii) **CISF Camp (16A2):** The sampler was placed at CISF camp of Rajmahal. This station was selected to assess the ambient air quality of industrial area in the core zone where mining activities are in progress.
iii) **Urjanagar Hospital (16A3):**The sampler was placed at Rajmahal house near hospital at Ujranagar colony of Rajmahal project. This station was selected to assess the ambient air quality of Residential Area in the core zone of Rajmahal project.
iv) **Rajmahal Area Office (16A4):** The sampler was placed at Rajmahal area office. This site was selected to assess the present ambient air quality status in residential area of buffer zone of Rajmahal area.

2.1 Methodology of sampling and analysis: The air quality sampling stations have been chosen keeping in view predominant wind direction and have been classified as permanent, pre monsoon (April – September) & post monsoon (October – March) air sampling stations. Particulate Matter (PM_{10}), Fine Particulate Matter ($PM_{2.5}$), Sulphur Dioxide (SO_2) and Oxides of Nitrogen (NO_x) are monitored on fortnight basis. Heavy metals like Arsenic (As), Cadmium (Cd), Chromium (Cr), Mercury (Hg), Nickel (Ni) and Lead (Pb) are monitored half yearly.

The Respirable Suspended Particulate Matter (RSPM) Sampler & $PM_{2.5}$ Sampler machines are used for sampling of ambient air. The samples are collected and transported to Environmental Laboratory of CMPDI, RI-I, Asansol for analysis work.

2.2 Results & Interpretations: In industrial area PM_{10} varies from 136.8 to 274.6 µg/m^3 & in residential area from 87.3 to 134.9 µg/m^3. In industrial area $PM_{2.5}$ varies from 40.3 to 56.3 µg/m^3 & in residential area from 31.2 to 37.8 µg/m^3. In industrial area & in residential area SO_2 below 10 µg/m^3.In industrial area NO_x varies from 18.1 to 19.4 µg/m^3 & in residential area from 15.8 to 16.3 µg/m^3.

AMBIENT AIR QUALITY DATA

Name of the Customer: Eastern Coalfield Limited, Borachak House, P.O.-Sitarampur, Distt.-Paschim Bardhaman,

First fortnight:

Station Code	Station Name	Category of station	Date of Sampling	Parameter	Analytical Results (µg/m^3)	Name of method	Detection limit (µg/m^3)
16A1	Mine Dispatch Building	Industrial	7-Jan-21	PM_{10}	189.4	IS 5182 (Part 23): 2017	3.5
				$PM_{2.5}$	56.3	IS 5182 (Part 24): 2019	2.0
				SO_2	BDL	IS 5182 (Part 2): 2017	10
				NO_x	19.4	IS 5182 (Part 6): 2017	10
16A2	CISF Camp	Industrial	7-Jan-21	PM_{10}	161.3	IS 5182 (Part 23): 2017	3.5
				$PM_{2.5}$	49.8	IS 5182 (Part 24): 2019	2.0
				SO_2	BDL	IS 5182 (Part 2): 2017	10
				NO_x	18.1	IS 5182 (Part 6): 2017	10
16A3	Urjanagar Hospital	Residential	8-Jan-21	PM_{10}	98.2	IS 5182 (Part 23): 2017	3.5
				$PM_{2.5}$	37.1	IS 5182 (Part 24): 2019	2.0
				SO_2	BDL	IS 5182 (Part 2): 2017	10
				NO_x	15.8	IS 5182 (Part 6): 2017	10
16A4	Rajmahal Area Office	Residential	8-Jan-21	PM_{10}	99.3	IS 5182 (Part 23): 2017	3.5
				$PM_{2.5}$	37.8	IS 5182 (Part 24): 2019	2.0
				SO_2	BDL	IS 5182 (Part 2): 2017	10
				NO_x	16.3	IS 5182 (Part 6): 2017	10

Second fortnight:

Station Code	Station Name	Category of station	Date of Sampling	Parameter	Analytical Results (µg/m^3)	Name of method	Detection limit (µg/m^3)
16A1	Mine Dispatch Building	Industrial	19-Jan-21	PM_{10}	274.6	IS 5182 (Part 23): 2017	3.5
				$PM_{2.5}$	51.7	IS 5182 (Part 24): 2019	2.0
				SO_2	BDL	IS 5182 (Part 2): 2017	10
				NO_x	13.7	IS 5182 (Part 6): 2017	10
16A2	CISF Camp	Industrial	19-Jan-21	PM_{10}	136.8	IS 5182 (Part 23): 2017	3.5
				$PM_{2.5}$	40.3	IS 5182 (Part 24): 2019	2.0
				SO_2	BDL	IS 5182 (Part 2): 2017	10
				NO_x	12.7	IS 5182 (Part 6): 2017	10
16A3	Urjanagar Hospital	Residential	18-Jan-21	PM_{10}	87.3	IS 5182 (Part 23): 2017	3.5
				$PM_{2.5}$	31.2	IS 5182 (Part 24): 2019	2.0
				SO_2	BDL	IS 5182 (Part 2): 2017	10
				NO_x	14.6	IS 5182 (Part 6): 2017	10
16A4	Rajmahal Area office	Residential	18-Jan-21	PM_{10}	134.9	IS 5182 (Part 23): 2017	3.5
				$PM_{2.5}$	36.9	IS 5182 (Part 24): 2019	2.0
				SO_2	BDL	IS 5182 (Part 2): 2017	10
				NO_x	13.8	IS 5182 (Part 6): 2017	10

Environmental Standards for Ambient Air Quality (AAQ):

Station Category	Environmental standard for Raniganj Coalfield vide MOEF, Govt. of India, Gazette Notification No. GSR 742 (E) dated 25.09.2000 for 24 hourly samples at 500 meters from dust generating point			National Ambient Air Quality Standards (NAAQS), 2009 for industrial, residential and rural areas for 24 hours samples
	Pollutant Concentration (µg/m^3)			
	PM_{10}	SO_2	NO_x	$PM_{2.5}$
Industrial	300.0	120.0	120.0	60.0
Residential	100.0	80.0	80.0	

CHAPTER – III
WATER QUALITY MONITORING

3.1 **Mine water sampling stations:**

i) **OCP Discharge Effluent (16MW1):** This location has been selected to monitor the discharge quality of Mine effluent to natural surface streams after siltation pond.

ii) **Discharge from CHP (16MW2)**: This location has been selected to monitor the discharge quality of CHP effluent discharge to Dhulia Nallah.

iii) **100m U/S from Dhulia Nallah (16MW3)**: This location has been selected to monitor the water quality before discharge of CHP effluent to Dhulia Nallah.

iv) **100m D/S from Dhulia Nallah (16MW4)**: This location has been selected to monitor the Impact of water quality after discharge of CHP effluent discharge quality of mine effluent to natural surface streams.

v) **Discharge from O & G Trap at Workshop (16MW5)**: This location has been selected to monitor the discharge quality of Workshop effluent to natural surface streams after oil & grease trap.

3.2 **Methodology of sampling and analysis:** The water samples are collected as per standard practice and transported to environment laboratory for analysis work.

The mine water samples are collected and analysed for five parameters on fortnightly basis except during the month of September when mine water samples are analysed for 29 parameters.

The ground water samples were collected and analysed for 26 parameters during the month of May. Drinking water samples are collected and analysed during the month of September and March.

3.3 **Results & Interpretations**: The results are given in tabular form along with the applicable standards. Results are compared with General Standards for Discharge of Effluent (Schedule VI) in case of effluent/mine water sample and compared with IS.10500: 2012 in case of drinking/ground water samples.

First fortnight:

Sl. No.	Parameters	Analytical results (mg/l)			General Standards for Discharge of Effluent (Schedule VI)	Name of Method	Detection Limit (mg/l)
	Station Code	16MW1	16MW2	16MW3			
	Date of sampling	7-Jan-21	7-Jan-21	7-Jan-21			
1	pH value	7.89	7.28	7.52	5.5 - 9.0	IS 3025 (Part 11): 2017	0.01
2	TSS	17.2	20.4	19.2	100	IS 3025 (Part 17): 2017	10.0
3	TDS	343	458	351	Not specified	IS 3025 (Part 16): 2017	25.0
4	Oil & Grease	BDL	BDL	BDL	10	IS 3025 (Part 39): 2019	2.0
5	COD	20	28	32	250	APHA, 5220 C: 22nd Edition	4.0

Sl. No.	Parameters	Analytical results (mg/l)		General Standards for Discharge of Effluent (Schedule VI)	Name of Method	Detection Limit (mg/l)
	Station Code	16MW4	16MW5			
	Date of sampling	7-Jan-21	7-Jan-21			
1	pH value	7.81	7.01	5.5 - 9.0	IS 3025 (Part 11): 2017	0.01
2	TSS	15.4	15.2	100	IS 3025 (Part 17): 2017	10.0
3	TDS	420	471	Not specified	IS 3025 (Part 16): 2017	25.0
4	Oil & Grease	BDL	BDL	10	IS 3025 (Part 39): 2019	2.0
5	COD	24	16	250	APHA, 5220 C: 22nd Edition	4.0

Second fortnight:

Sl. No.	Parameters	Analytical results (mg/l)			General Standards for Discharge of Effluent (Schedule VI)	Name of Method	Detection Limit (mg/l)
	Station Code	16MW1	16MW2	16MW3			
	Date of sampling	19-Jan-21	19-Jan-21	19-Jan-21			
1	pH value	7.66	7.36	7.53	5.5 - 9.0	IS 3025 (Part 11): 2017	0.01
2	TSS	16.0	19.2	20.2	100	IS 3025 (Part 17): 2017	10.0
3	TDS	353	426	357	Not specified	IS 3025 (Part 16): 2017	25.0
4	Oil & Grease	BDL	BDL	BDL	10	IS 3025 (Part 39): 2019	2.0
5	COD	12	32	24	250	APHA, 5220 C: 22nd Edition	4.0

Sl. No.	Parameters	Analytical results (mg/l)		General Standards for Discharge of Effluent (Schedule VI)	Name of Method	Detection Limit (mg/l)
	Station Code	16MW4	16MW5			
	Date of sampling	19-Jan-21	19-Jan-21			
1	pH value	7.65	7.40	5.5 - 9.0	IS 3025 (Part 11):2017	0.01
2	TSS	18.2	13.8	100	IS 3025 (Part 17):2017	10.0
3	TDS	418	422	Not specified	IS 3025 (Part 16): 2017	25.0
4	Oil & Grease	BDL	BDL	10	IS 3025 (Part 39): 2019	2.0
5	COD	28	16	250	APHA, 5220 C: 22nd Edition	4.0

*BDL-Below Detection Limit

All values are expressed in mg/l except pH

Dugwell water level for the month of January, 2021

Sl. No.	Station Code	Location of Dugwell	Date of measurement	Water level (in Meters) Below Ground Level	MP (m)	Depth (m)	Dia (m)	Owner	Utility
1	16GWL1	Dugwell at Bara Simra Rehab Site	28-Jan-21	8.05	0.70	9.00	2.20	ECL	Domestic
2	16GWL2	Dugwell at Higukita Village	28-Jan-21	5.90	0.30	7.50	1.70	Private	Domestic
3	16GWL3	Dugwell at Lalmatia Chowk	28-Jan-21	6.80	0.40	10.00	2.00	Govt.	Domestic
4	16GWL4	Dugwell at Lohandia Bazar	28-Jan-21	10.30	0.80	10.10	4.05	Govt.	Domestic
5	16GWL5	Dugwell at Paharpur Village		Not Available	0.60	11.20	1.80	Private	Domestic

Piezometer water level for the month of January, 2021

3.4 **Location of Piezometer sites and their rationale:** Total 30 nos. of piezometers have been constructed by ECL at different locations in clusters and standalone projects for measurement of ground water level.

Ground water level is measured in all piezometers on quarterly basis to assess the impact of mining activities on ground water level. The following piezometer has been constructed in Rajmahal OC Project:

i) **Rajmahal (Rajmahal old workshop) (RPZ-01):** A piezometer has been constructed to measure the ground water level at Rajmahal OCP campus, Rajmahal area.

Sl. No.	Station Code	Location of Piezometer	Date of measurement	Water level (in Meters) Below Ground Level
1	RPZ-01	Rajmahal (Rajmahal Old workshop)		Closed

NOISE LEVEL QUALITY MONITORING

4.1 Location of sampling sites and their rationale

i) **Mine Dispatch Building (16N1)**: Noise level meter placed at mine dispatch building near security gate to assess the noise level where road transport for coal transport activity are in progress.

ii) **CISF Camp (16N2)**: Noise level meter placed at CISF camp to assess the impact of noise level mine site where mine activity are in progress.

iii) **Urjanagar Hospital (16N3)**: Noise level meter placed at Rajmahal house near Urjanagar hospital to assess the noise level in colony area.

iv) **Rajmahal Area Office (16N4)**: Noise level meter placed at Rajmahal Area Office to assess the noise level in Rajmahal area office premises.

4.2 Methodology of sampling and analysis: Noise level monitoring is being carried out on quarterly basis. Noise level measurements were taken in form of 'Leq' using Integrated Data Logging Sound Level Meter (Make: RION, Model: NL-52). Noise levels were measured for about one hour. Noise levels were measured in Decibels, 'A' weighted average, i.e. dB(A).

4.3 Results & Interpretations: Ambient noise levels were recorded during day time only. The observed values were compared with standards prescribed in NAAQS, 2009 in respect of noise for Industrial, Commercial and residential areas. The observed values at all the monitoring locations are found to be within permissible limits.

The monitored values are presented in tabular form along with the applicable standard permissible limits.

NOISE LEVEL DATA

Name of the Company: **Eastern Coalfield Limited** Month: **January.** Year: **2021.**

Name of the Project : **Rajmahal Area,**

First Fortnight:

Sl. No	Station Code	Station Name	Measurement Details			Permissible Limit of Noise level in dB(A)
			Date of sampling	Duration (In Hrs.)	Noise level dB(A) Leq	
1	16N1	Mine Dispatch Building	6-Jan-21 to 7-Jan-21	16.00 to 13.00	62.41	*75*
2	16N2	CISF Camp	6-Jan-21 to 7-Jan-21	16.00 to 16.00	73.08	*75*
3	16N3	Urjanagar Hospital	7-Jan-21 to 8-Jan-21	18.00 to 16.00	86.83	*75*
4	16N4	Rajmahal Area Office	7-Jan-21 to 8-Jan-21	16.00 to 9.00	69.83	*75*

Second Fortnight:

Sl. No	Station Code	Station Name	Measurement Details			Permissible Limit of Noise level in dB(A)
			Date of sampling	Duration (In Hrs.)	Noise level dB(A) Leq	
1	16N1	Mine Dispatch Building	18-Jan-21 to 19-Jan-21	17.00 to 16.00	57.34	*75*
2	16N2	CISF Camp	18-Jan-21 to 19-Jan-21	16.00 to 11.00	61.33	*75*
3	16N3	Urjanagar Hospital	19-Jan-21 to 20-Jan-21	16.00 to 15.00	60.15	*75*
4	16N4	Rajmahal Area Office	19-Jan-21 to 20-Jan-21	13.00 to 11.00	58.63	*75*

Noise Pollution (Regulation and Control) Rules published in Gazette of India, vide S. O. 123 (E) dated 14.02.2000 under Environment Protection Act, 1986.

Station Category	Limits for noise (Leq dB (A))	
	Day Time: 6.00 AM to 10.00 PM	Night Time: 10.00 PM to 6.00 AM.
Industrial	75.0	70.0
Commercial	65.0	55.0
Residential	55.0	45.0
Silence Zone	50.0	40.0

Annexure - II

Details of Water Bodies in lease area of Rajmahal OCP,ECL

S. No.	LOCATION	Area (in m*m)	Average Depth (in m)	Quantity of water (in cu. m.)
1.	Near Panpiya, Lohandiya Rehab Site.	97 x 90	6	52,380
2.	Near Charak Mandir, Lohandiya Rehab Site.	57 x 54	6	18,468
3.	Near Kabristan, Lohandiya Rehab Site.	80 x 64	4	20,480
4.	Near OB dump, Hatia Rehab Site.	270 x 83	8	1,79,280
5.	Near shiv mandir, Lohandia Bazaar. (Big)	163 x 123	2.75	55, 134.75
6.	Near shiv mandir, Lohandia Bazaar. (Small)	112 x 80	1.75	15,680
7.	Near Football ground, Bara simra.	50 x 45	2.50	5,625
8.	Near simra village, Bara simra	60 x 50	2.50	7,500
9.	Near lalmatia filtration plant, Lohartola rehab site.	54 x 43	8	18,576
10.	Near shiv mandir, Urjanagar colony.	78.5 x 62.5	6.90	33,853.125
11.	Near Hura-C Transit house, Urjanagar colony.	57 x 47	2.50	6,697.50
12.	Basua pond, Near forest range office	127 x 32	1.20	4,876.8
13.	Behind Rajmahal House, Urjanagar colony	75 x 32	3.50	8,400
14.	Near Baal Vatika, Urjanagar colony.	68 x 32	3.00	6,528
15.	Ganga Sagar Talab			8,24,269.095
	Part 1st	250 x 38	2.70	25650
	Part 2nd	384.5 x 381.3	2.70	3,95,846.595
	Part 3rd	117 x 1275	2.70	4,02,772

05/02/2020 AM (GM)

Area/mines-wise details of Rain water Harvesting arrangements, if any, in ECL for the period from 2013-14 to 2018-19 (upto 1st march).

Year	Name of the area mines and its location	Description with location	Area of covered under Harvesting/Arrangement in sqm.
2014-15	Rajmahal Area	Urjanagar Hospital under Rajmahal Area	480 sqm
2014-15	Rajmahal Area	Rajmahal House under Rajmahal Area	480 sqm.
2018-19	Rajmahal Area	Simlong Colliery	60 sqm.
2018-19	Rajmahal Area	Shopping complex under Urjanagar colony	160 sqm.
2018-19	Rajmahal Area	D.A.V. Public school , Urjanagar colony	450 sqm.
2018-19	Rajmahal Area	Town Admin. Office under Urjanagar colony	60 sqm.
2018-19	Rajmahal Area	Hurra "C" transit house, urja Nagar colony	140 sqm
		Total Area	**1830 sqm**

05/01/20

ANNEXURE III

(90)

Instantel Event Report

Date/Time	Long at 15:39:17 March 23, 2021
Trigger Source	Geo: 1.000 mm/s, Mic: 130.8 dB(L)
Range	Geo: 254.0 mm/s
Record Time	3.0 sec at 2048 sps
Operator/Setup:	Operator:RCML MAHAGAMA,MMB

Serial Number	UM11208 V 10-84 Micromate ISEE
Battery Level	3.7 Volts
Unit Calibration	September 24, 2020 by CIMFR Dhanbad
File Name	__TEMP.EVT

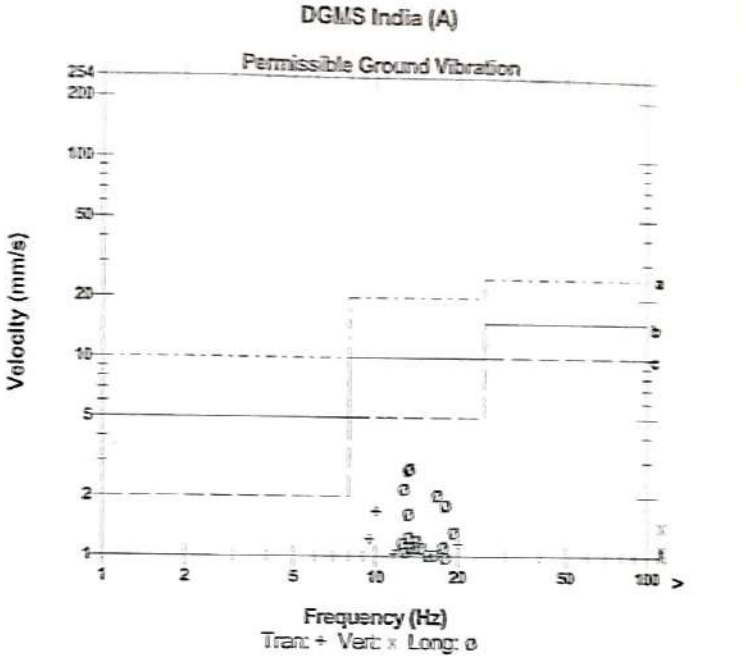
Notes

Location:	100 mL
Client:	RCML
User Name:	RCML
General:	Above 3seam/3seam/2seam/partin

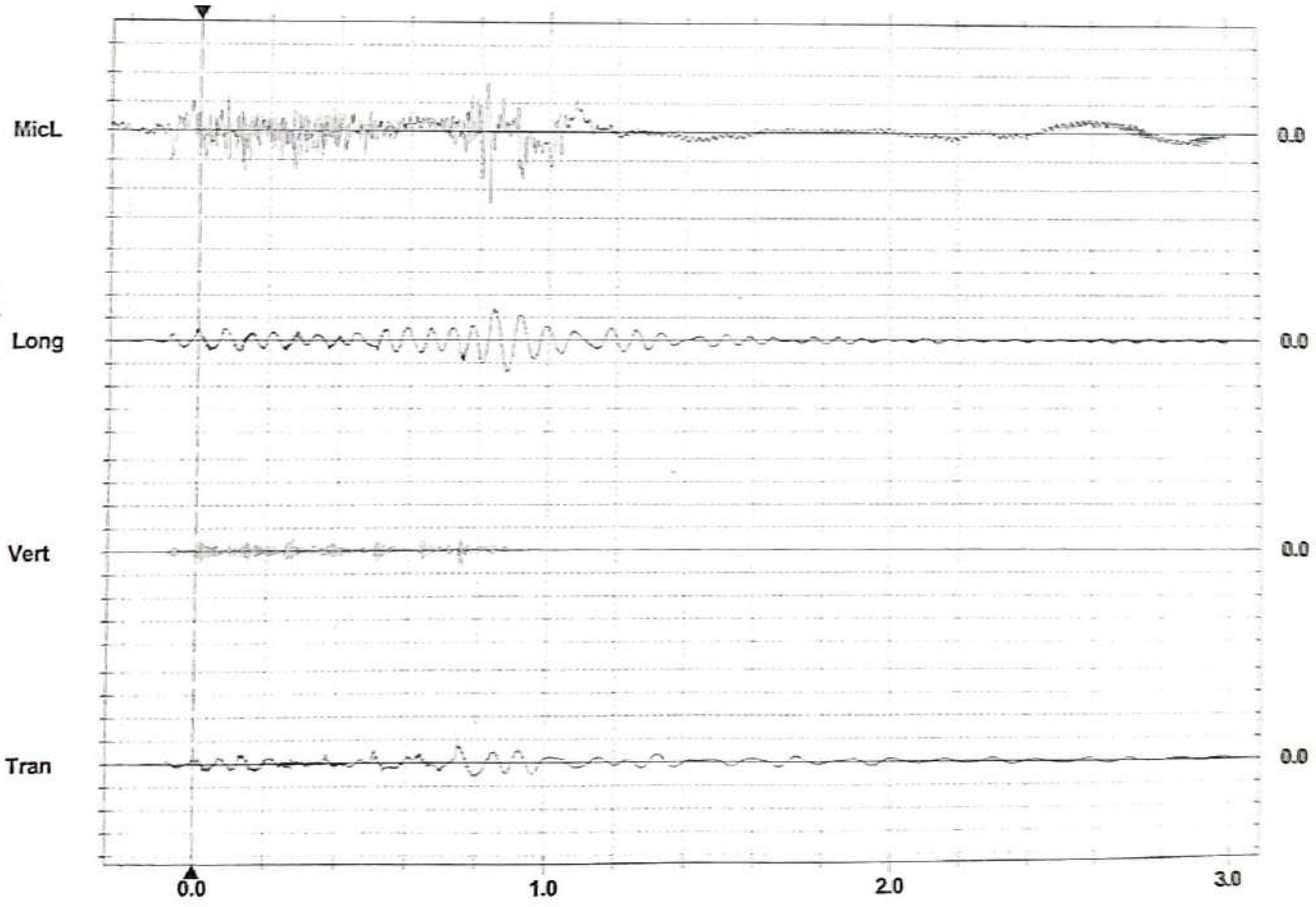
Microphone	Linear Weighting
PSPL	102.0 dB(L) at 0.828 sec
ZC Freq	25 Hz
Channel Test	Passed (Freq = 19.7 Hz Amp = 1298 mv)

	Tran	Vert	Long	
PPV	1.679	1.434	2.814	mm/s
ZC Freq	10.0	>200	13.3	Hz
Time (Rel. to Trig)	0.750	0.753	0.842	sec
Peak Acceleration	0.056	0.211	0.074	g
Peak Displacement	0.020	0.001	0.034	mm
Sensor Check	Passed	Passed	Passed	

Peak Vector Sum 2.921 mm/s at 0.842 sec



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



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

Instantel

Event Report

90

Date/Time	Vert at 15:24:31 March 24, 2021
Trigger Source	Geo: 1.000 mm/s, Mic: 130.8 dB(L)
Range	Geo: 254.0 mm/s
Record Time	3.0 sec at 2048 sps
Operator/Setup:	Operator/RCML MAHAGAMA.MMB

Serial Number	UM11208 V 10-84 Micromate ISEE
Battery Level	3.7 Volts
Unit Calibration	September 24, 2020 by CIMFR Dhanbad
File Name	__TEMP.EVT

Notes

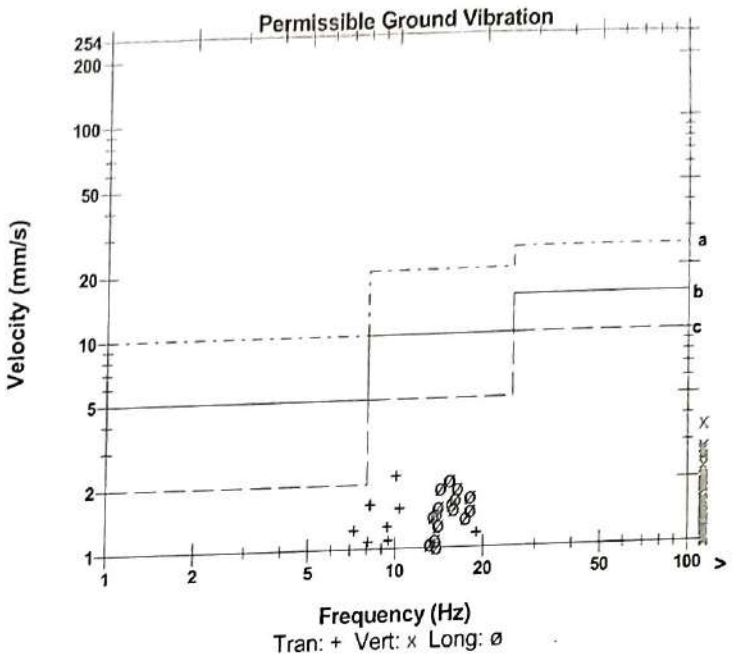
Location:	100 mt.
Client:	RCML
User Name:	RCML
General:	Above 3seam/3seam/2seam/partin

Microphone	Linear Weighting
PSPL	100.2 dB(L) at 1.132 sec
ZC Freq	3.2 Hz
Channel Test	Passed (Freq = 19.7 Hz Amp = 1272 mv)

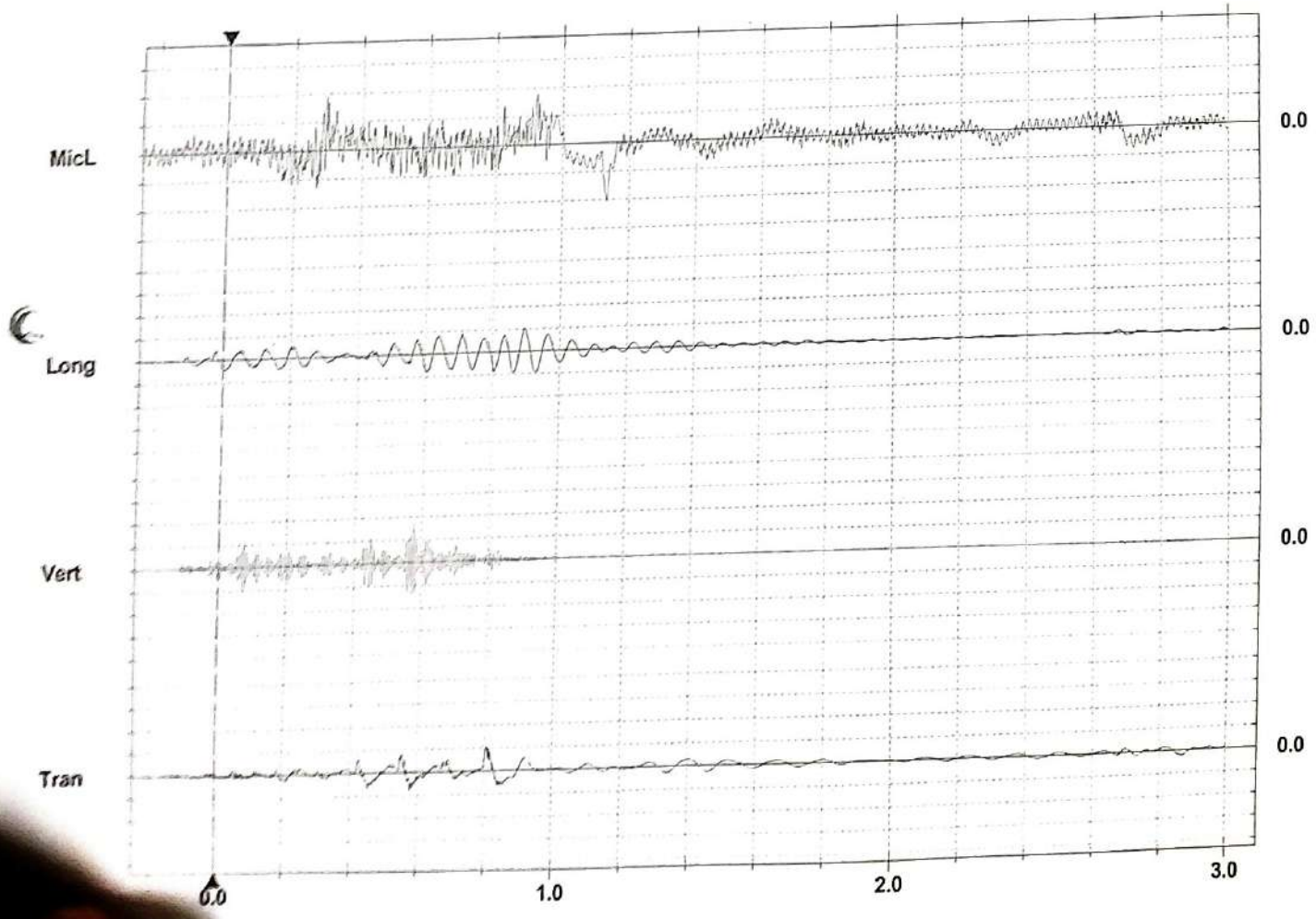
	Tran	Vert	Long	
PPV	2.175	3.555	2.065	mm/s
ZC Freq	10.0	128	15.3	Hz
Time (Rel. to Trig)	0.807	0.577	0.896	sec
Peak Acceleration	0.094	0.281	0.044	g
Peak Displacement	0.025	0.004	0.021	mm
Sensor Check	Passed	Passed	Passed	

Peak Vector Sum 3.800 mm/s at 0.577 sec

DGMS India (A)



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



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

Trigger = ▶ ◀

March 24, 2021 (V 10.72 - 10.72)

Instantel

Event Report

(74)

Instantel

Event Report

(78)

Date/Time	Long at 15:13:07 March 19, 2021
Trigger Source	Geo: 1.000 mm/s, Mic: 130.8 dB(L)
Range	Geo: 254.0 mm/s
Record Time	3.0 sec at 2048 sps
Operator/Setup:	Operator/RCML MAHAGAMA.MMB

Serial Number	UM11208 V 10-84 Micromate ISEE
Battery Level	3.8 Volts
Unit Calibration	September 24, 2020 by CIMFR Dhanbad
File Name	__TEMP.EVT

Notes

Location:	100 mt.
Client:	RCML
User Name:	RCML
General:	Above 3seam/3seam/2seam/partin

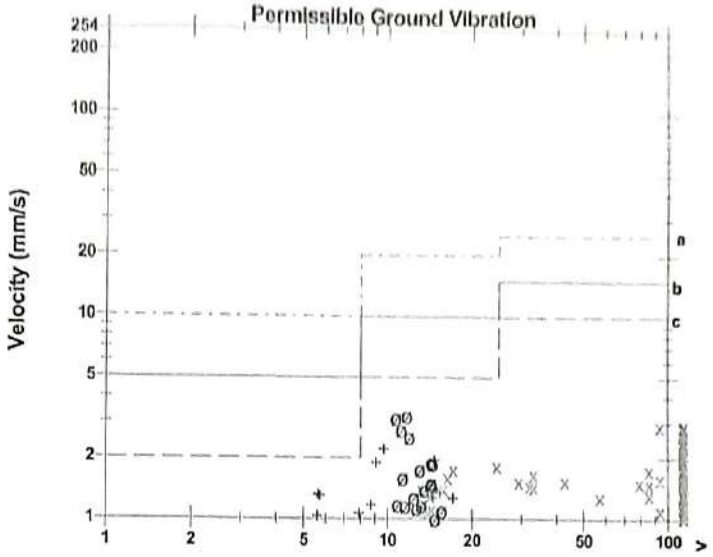
Microphone	Linear Weighting
PSPL	91.95 dB(L) at 2.883 sec
ZC Freq	11.9 Hz
Channel Test	Passed (Freq = 19.7 Hz Amp = 1253 mv)

	Tran	Vert	Long	
PPV	2.207	2.940	3.224	mm/s
ZC Freq	9.7	146	11.6	Hz
Time (Rel. to Trig)	0.946	0.417	0.094	sec
Peak Acceleration	0.069	0.290	0.035	g
Peak Displacement	0.031	0.014	0.046	mm
Sensor Check	Passed	Passed	Passed	

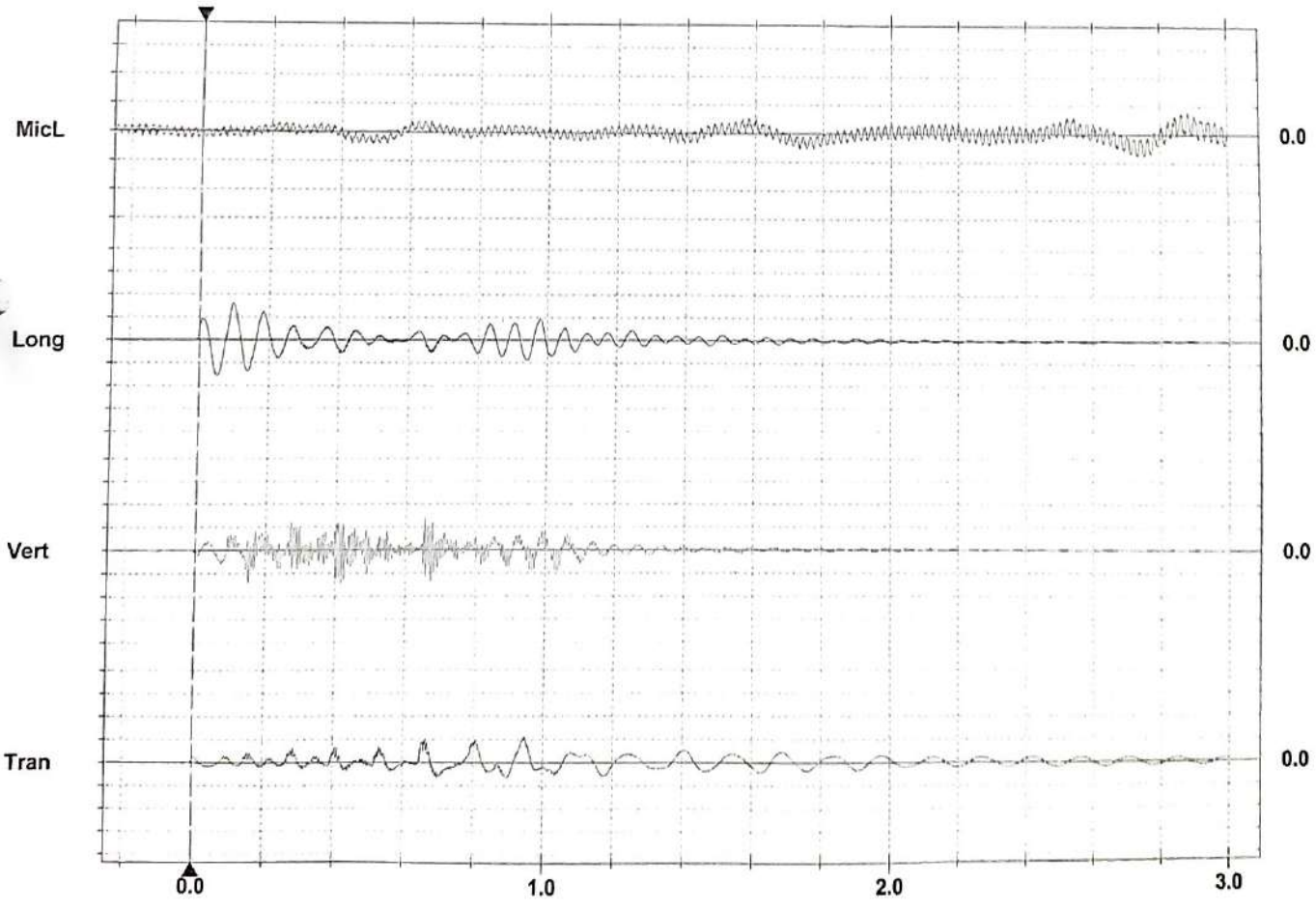
Peak Vector Sum 3.487 mm/s at 0.093 sec

DGMS India (A)

Permissible Ground Vibration



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



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

Instantel

Event Report

(74)

Date/Time	Tran at 15:27:45 March 18, 2021
Trigger Source	Geo: 1.000 mm/s, Mic: 130.8 dB(L)
Range	Geo: 254.0 mm/s
Record Time	3.0 sec at 2048 sps
Operator/Setup:	Operator/RCML MAHAGAMA MMB

Serial Number	UM11208 V 10-84 Micromate ISEE
Battery Level	3.8 Volts
Unit Calibration	September 24, 2020 by CIMFR Dhanbad
File Name	__TEMP EVT

Notes

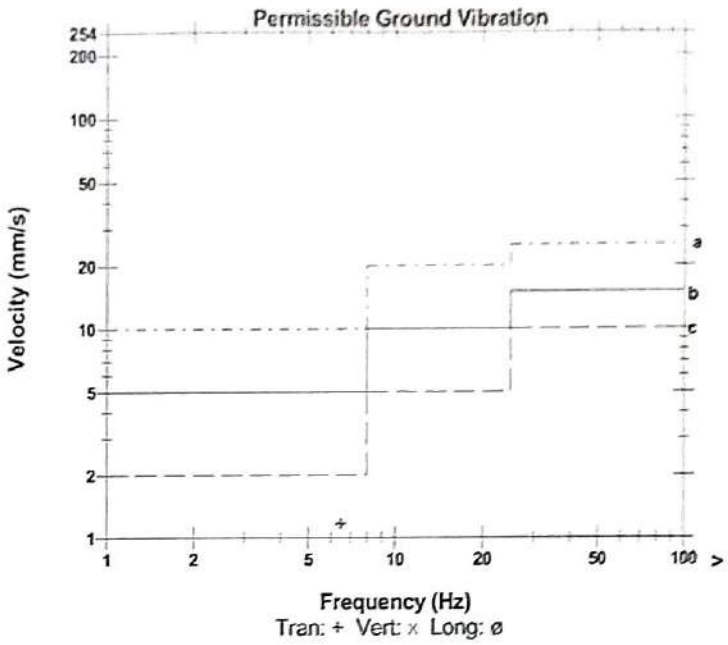
Location:	100 mL
Client:	RCML
User Name:	RCML
General:	Above 3seam/3seam/2seam/partin

Microphone	Linear Weighting
PSPL	<88 dB(L)
ZC Freq	43 Hz
Channel Test	Passed (Freq = 19.7 Hz Amp = 1261 mv)

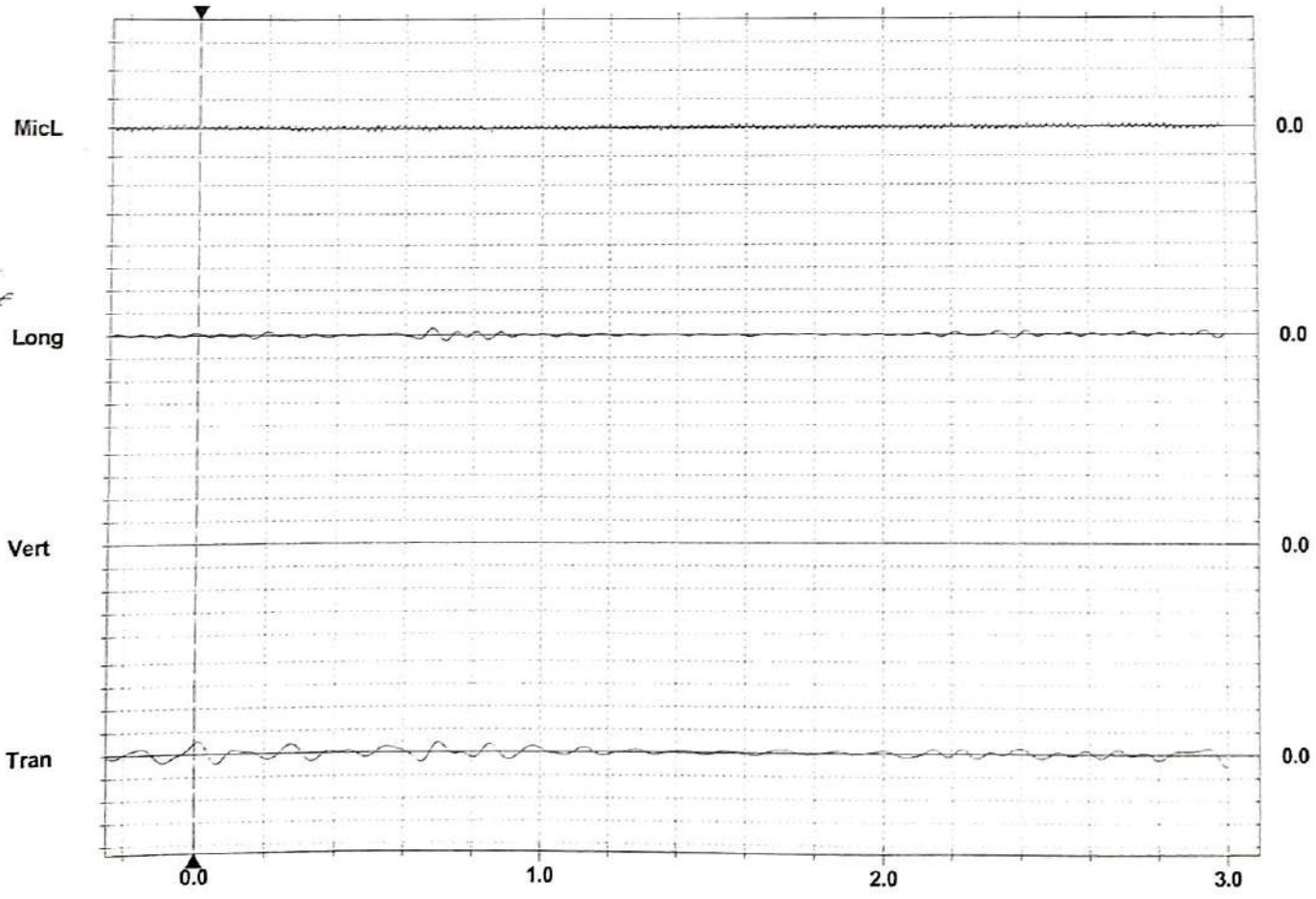
	Tran	Vert	Long	
PPV	1.167	0.102	0.638	mm/s
ZC Freq	6.5	54	11.8	Hz
Time (Rel. to Trig)	0.009	0.626	0.677	sec
Peak Acceleration	0.012	0.008	0.010	g
Peak Displacement	0.025	0.001	0.008	mm
Sensor Check	Passed	Passed	Passed	

Peak Vector Sum 1.174 mm/s at 0.009 sec
N/A: Not Applicable

DGMS India (A)



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



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

Instantel

Event Report

41

Date/Time	Vert at 15:26:07 March 7, 2021
Trigger Source	Geo: 1.000 mm/s, Mic: 130.8 dB(L)
Range	Geo: 254.0 mm/s
Record Time	3.0 sec at 2048 sps
Operator/Setup:	Operator/RCML MAHAGAMA.MMB

Serial Number	UM11208 V 10-84 Micromate ISEE
Battery Level	3.8 Volts
Unit Calibration	September 24, 2020 by CIMFR Dhanbad
File Name	__TEMP.EVT

Notes

Location:	100 mt.
Client:	RCML
User Name:	RCML
General:	Above 3seam/3seam/2seam/partin

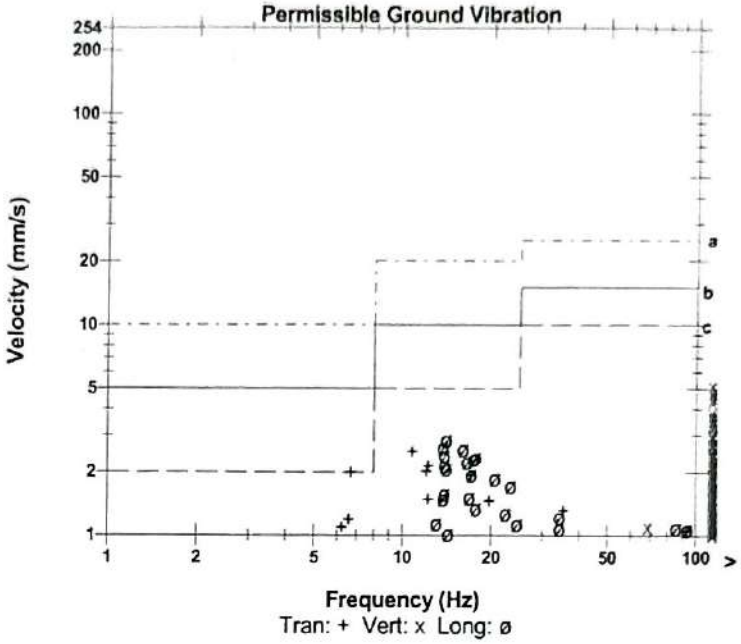
Microphone	Linear Weighting
PSPL	101.9 dB(L) at 0.933 sec
ZC Freq	11.4 Hz
Channel Test	Passed (Freq = 19.7 Hz Amp = 1268 mv)

	Tran	Vert	Long	
PPV	2.506	5.147	2.845	mm/s
ZC Freq	10.8	128	14.0	Hz
Time (Rel. to Trig)	0.820	0.549	0.917	sec
Peak Acceleration	0.127	0.457	0.095	g
Peak Displacement	0.034	0.006	0.031	mm
Sensor Check	Passed	Passed	Passed	

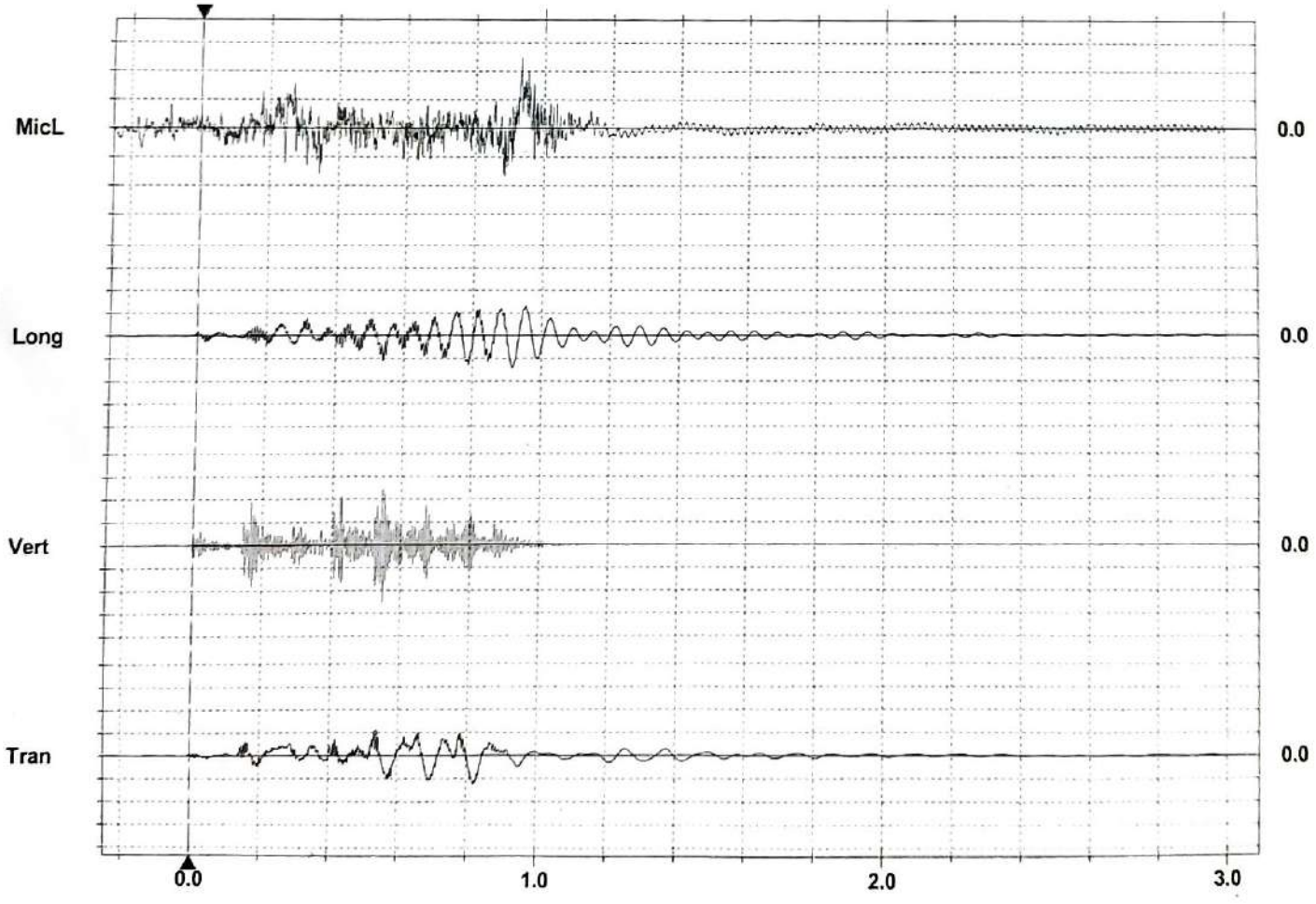
Peak Vector Sum 5.339 mm/s at 0.549 sec

DGMS India (A)

Permissible Ground Vibration



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



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

Instantel

Event Report

20

Date/Time	Long at 15:38:31 March 2, 2021
Trigger Source	Geo: 1.000 mm/s, Mic: 130.8 dB(L)
Range	Geo: 254.0 mm/s
Record Time	3.0 sec at 2048 sps
Operator/Setup	Operator/RCML MAHAGAMA.MMB

Serial Number	[illegible]
Battery Level	3.8 Volts
Unit Calibration	September 24, 2020 by CIMFR Dhanbad
File Name	TEMP.EVT

Notes

Location	100 mt
Client	RCML
User Name	RCML
General	Above 3seam/3seam/2seam/partin

Microphone	Linear Weighting
PSPL	<88 dB(L)
ZC Freq	114 Hz
Channel Test	Passed (Freq = 19.7 Hz Amp = 1272 mv)

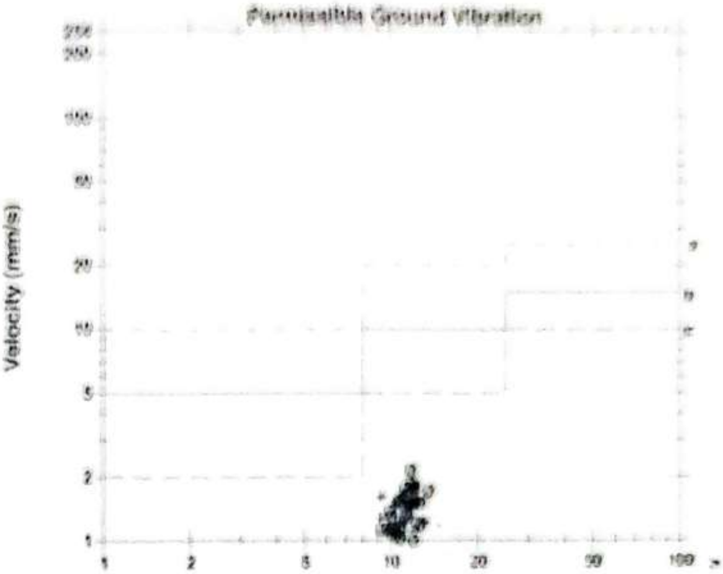
	Tran	Vert	Long	
PPV	1.592	0.891	2.183	mm/s
ZC Freq	9.2	146	11.6	Hz
Time (Rel. to Trig)	1.407	1.802	2.062	sec
Peak Acceleration	0.038	0.087	0.036	g
Peak Displacement	0.024	0.001	0.029	mm
Sensor Check	Passed	Passed	Passed	

Peak Vector Sum 2.341 mm/s at 2.062 sec

N/A: Not Applicable

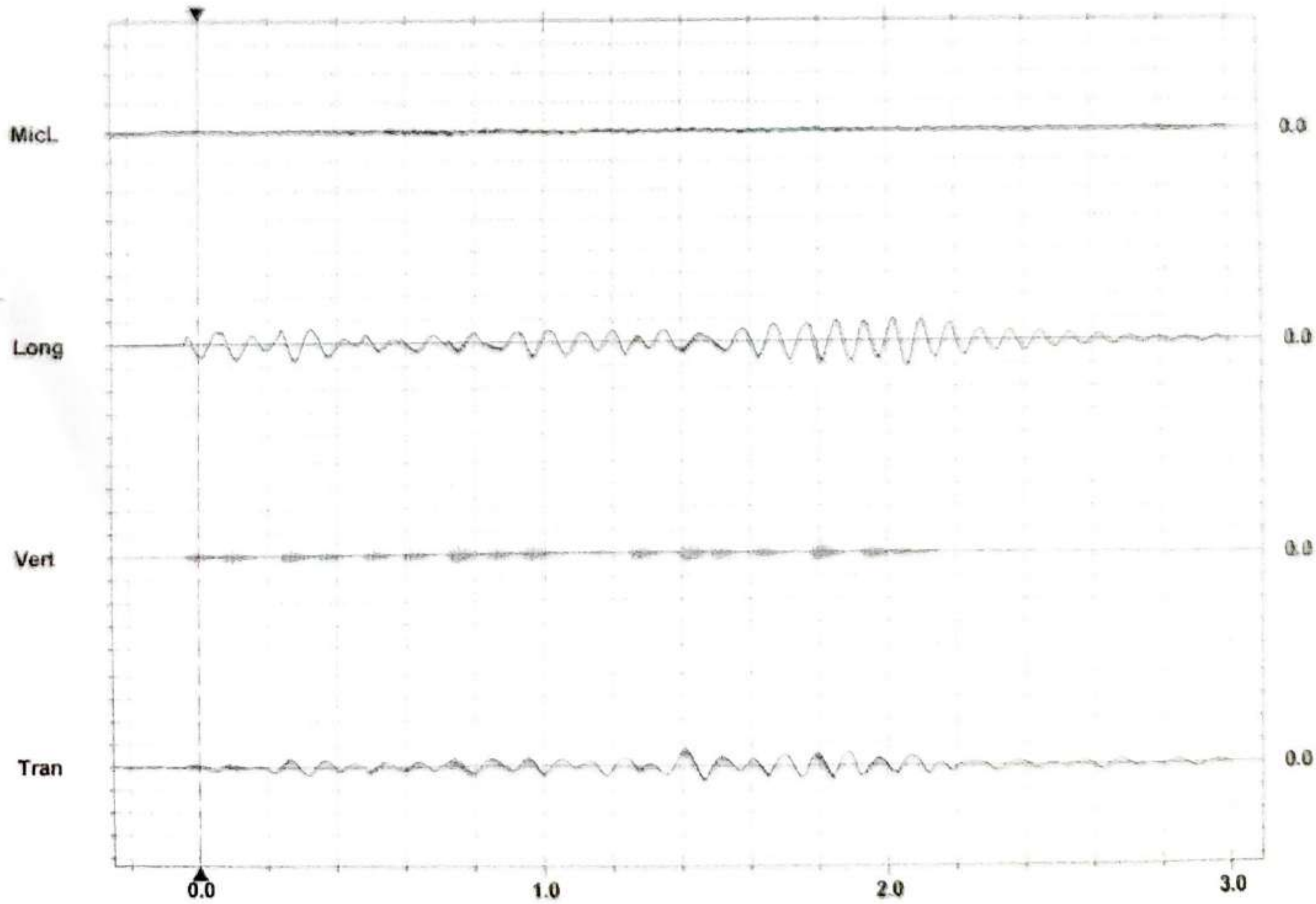
DGMS India (A)

Permissible Ground Vibration



Tran: + Vert: x Long: ø

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



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

Instantel

Event Report

Date/Time	Vert at 15:17:38 February 21, 2021
Trigger Source	Geo: 1.000 mm/s, Mic: 130.8 (dB(L)
Range	Geo: 254.0 mm/s
Record Time	3.0 sec at 2048 sps
Operator/Setup:	Operator/RCML MAHAGAMA MMB

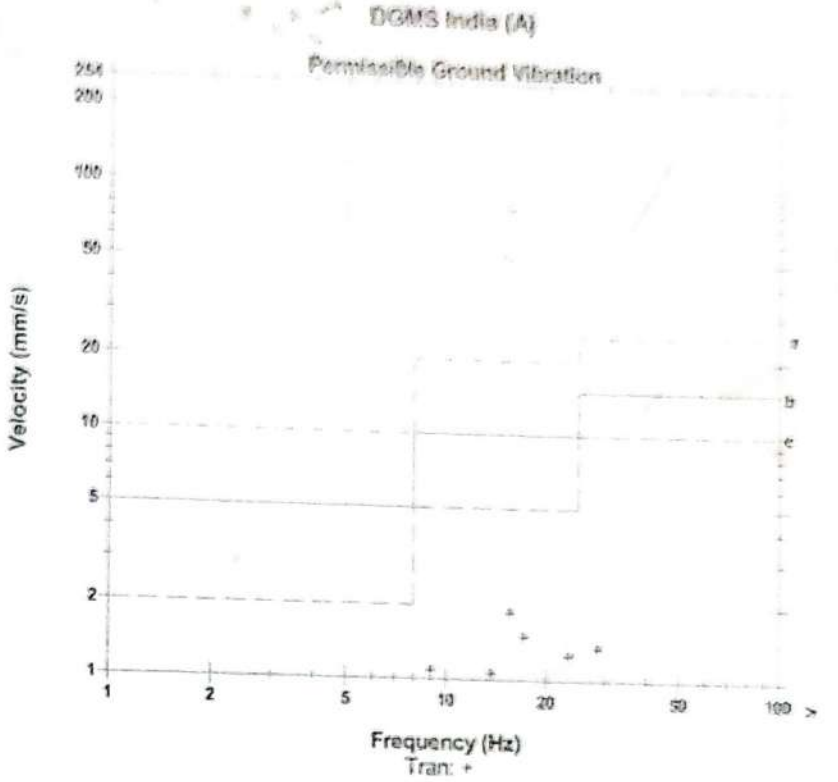
Serial Number	UM11208 V 10.64 Micromate ISEE
Battery Level	3.8 Volts
Unit Calibration	September 24, 2020 by CMRI R Dhanbad
File Name	TEMP.EVT

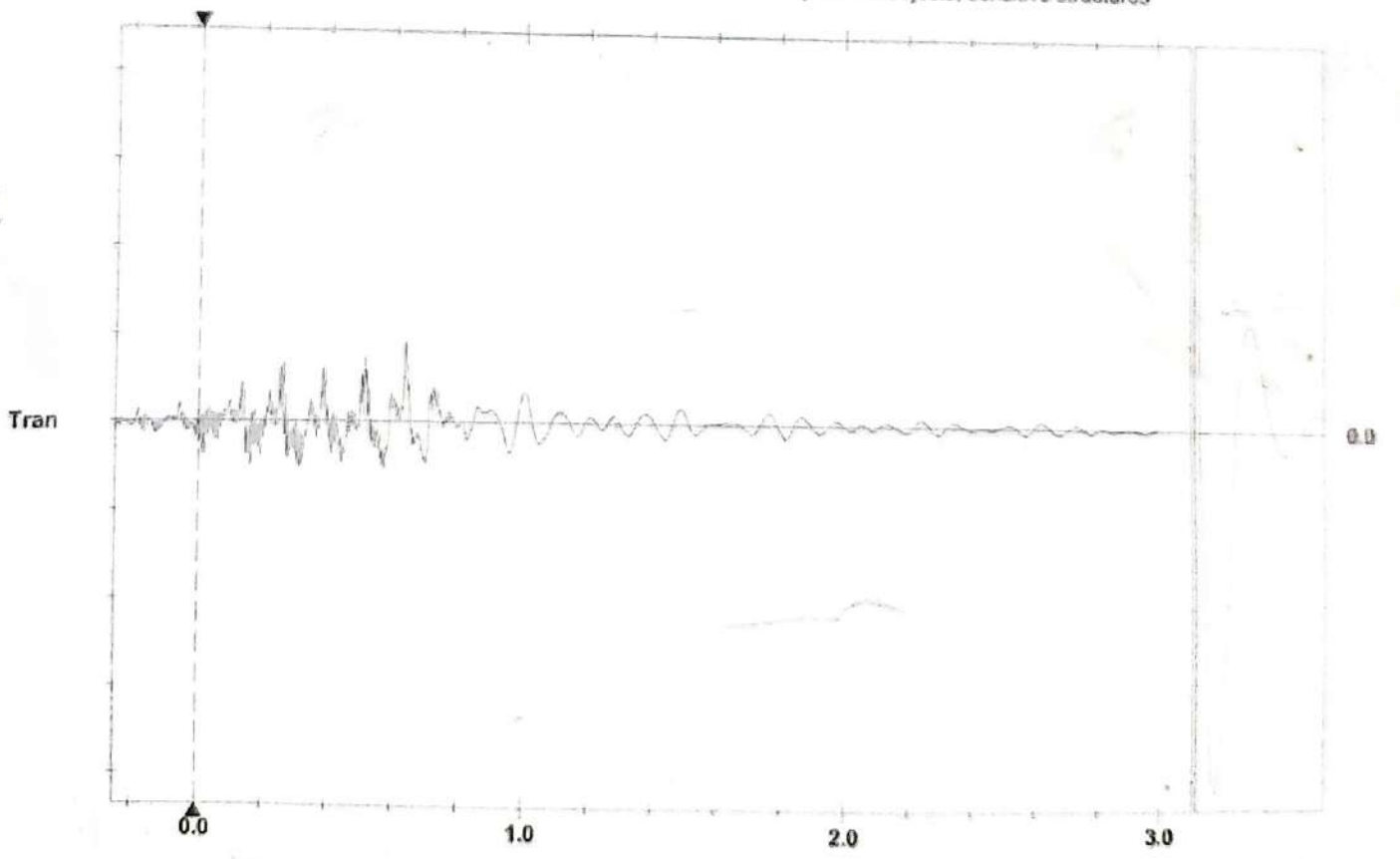
86

Notes

Location:	100 ml
Client	RCML
User Name	RCML
General	Above 3seam/3seam/2seam/partin

	Tran	
PPV	1.868	mm/s
ZC Freq	15.5	Hz
Time (Rel. to Trig)	0.633	sec
Peak Acceleration	0.090	g
Peak Displacement	0.014	mm
Sensor Check	Passed	
Frequency	7.5	Hz
Overswing Ratio	3.3	





Time Scale: 0.20 sec/div **Amplitude Scale:** Geo: 2.000 mm/s/div

Trigger = ▶——◀

Sensor Check

Instantel

Event Report

16

Date/Time	Vert at 15:39:45 January 29, 2021
Trigger Source	Geo: 1.000 mm/s, Mic: 130.8 dB(L)
Range	Geo: 254.0 mm/s
Record Time	3.0 sec at 2048 sps
Operator/Setup	Operator/RCML MAHAGAMA MMD

Serial Number	UM11208 V 10-84 Micromate ISEE
Battery Level	3.7 Volts
Unit Calibration	September 24, 2020 by CIMFR Dhanbad
File Name	TEMP.EVT

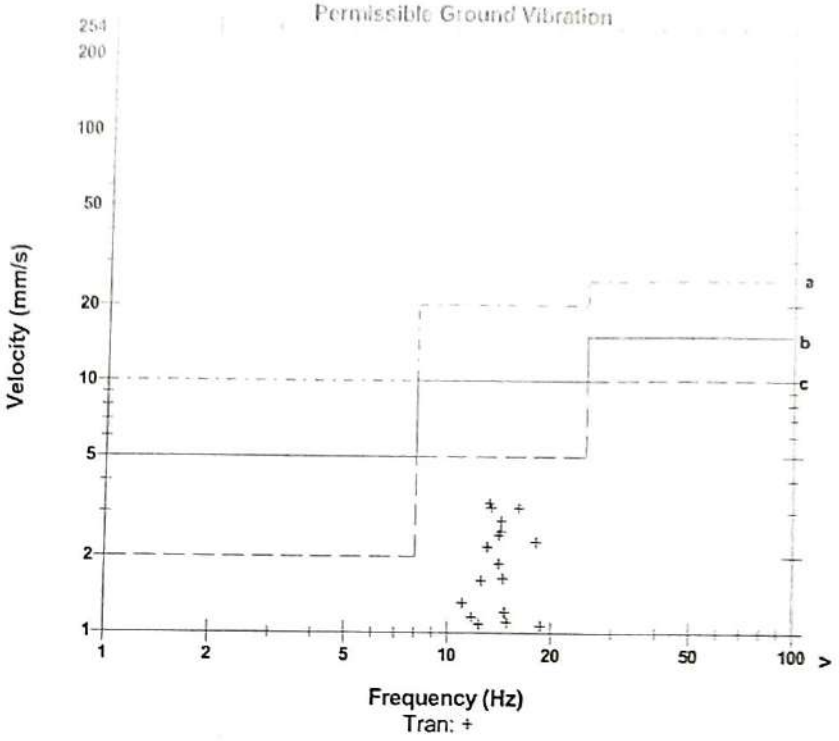
Notes:

Location:	100 mt
Client:	RCML
User Name:	RCML
General:	Above 3seam/3seam/2seam/partin

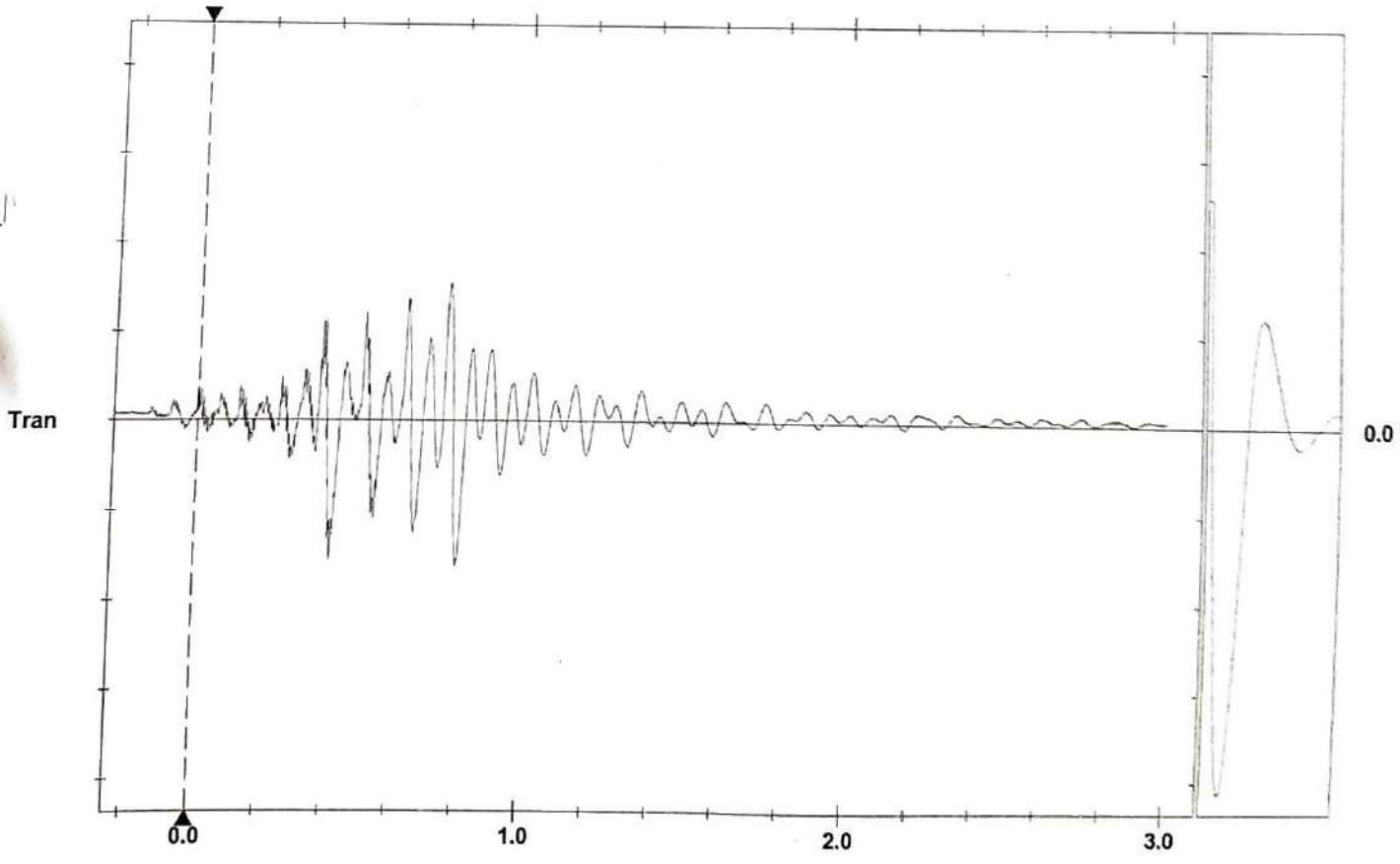
	Tran	
PPV	3.255	mm/s
ZC Freq	13.1	Hz
Time (Rel. to Trig)	0.797	sec
Peak Acceleration	0.100	g
Peak Displacement	0.039	mm
Sensor Check	Passed	
Frequency	7.5	Hz
Overswing Ratio	3.3	

DGMS India (A)

Permissible Ground Vibration



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



Time Scale: 0.20 sec/div **Amplitude Scale:** Geo: 2.000 mm/s/div

Trigger =

Sensor Check

Instantel

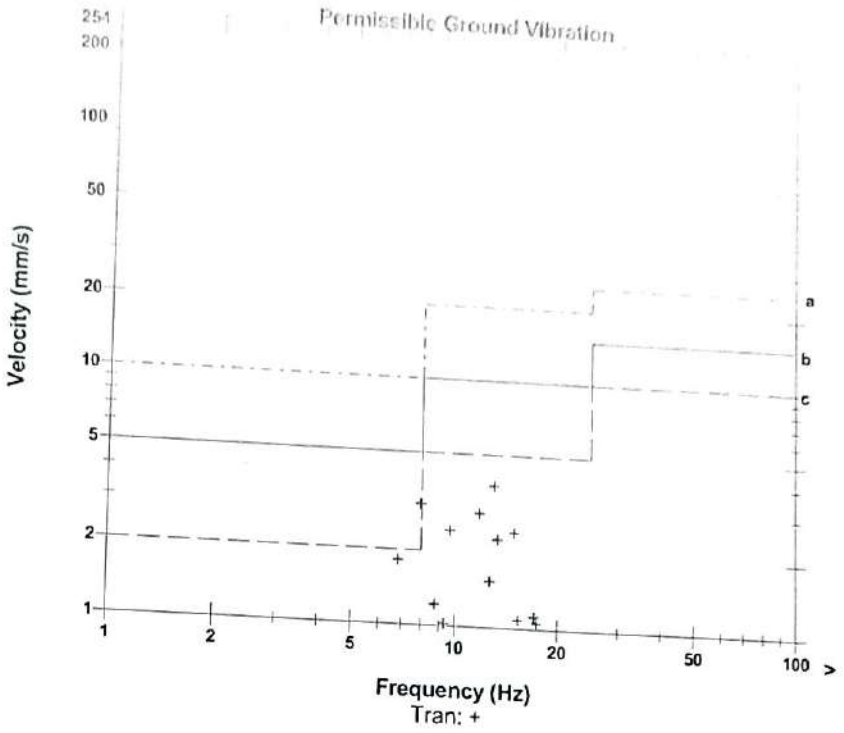
Event Report

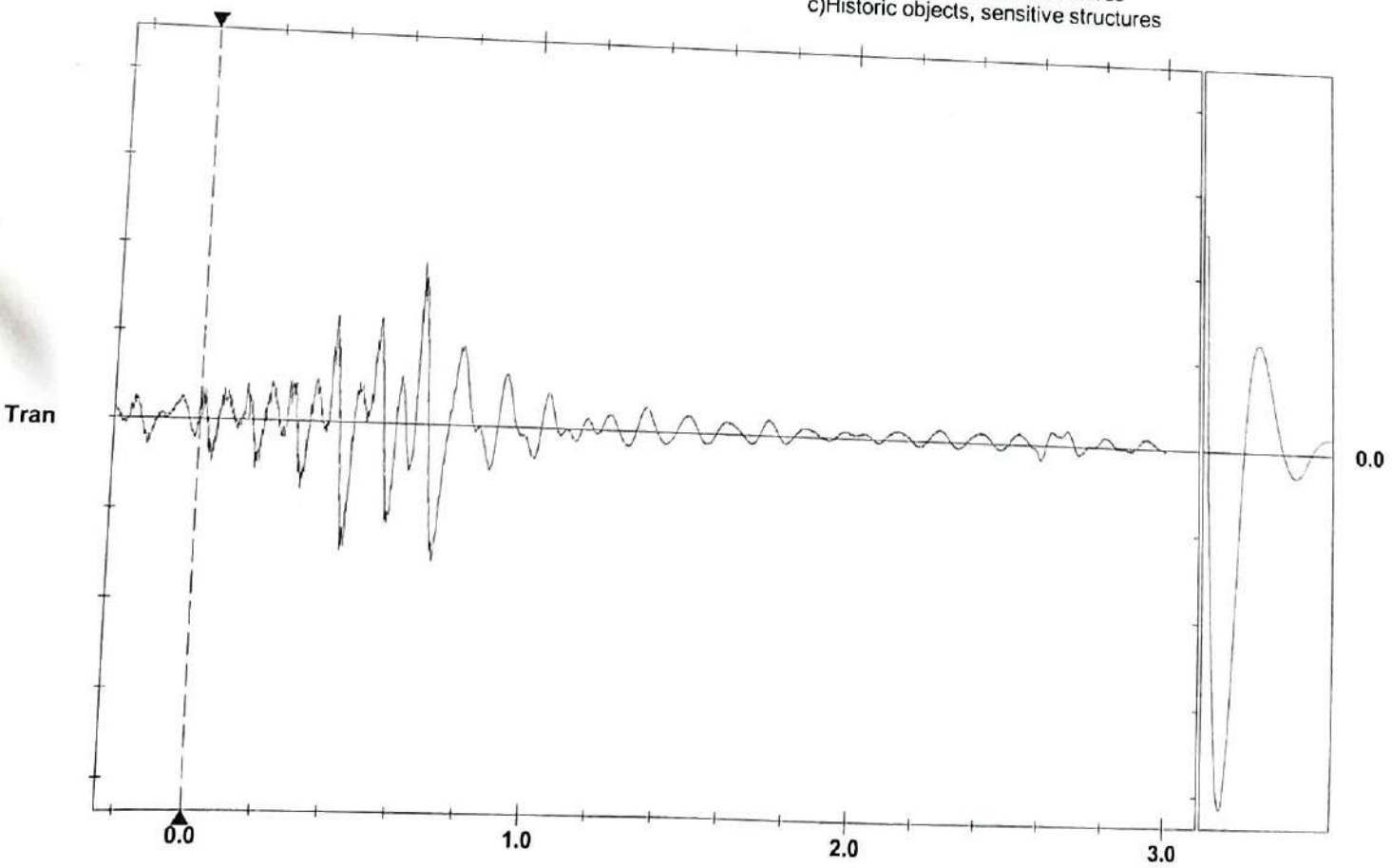
13

Date/Time	Vert at 15:47:06 January 28, 2021
Trigger Source	Geo: 1.000 mm/s, Mic: 130.8 dB(L)
Range	Geo: 254.0 mm/s
Record Time	3.0 sec at 2048 sps
Operator/Setup:	Operator:RCML MAHAGAMA UM
Notes	
Location	100 mt.
Client	RCML
User Name:	RCML
General:	Above 3seam/3seam/2seam/partin

Serial Number	UM11208 V 10-84 Micromate ISEE
Battery Level	3.7 Volts
Unit Calibration	September 24, 2020 by CIMFR Dhanbad
File Name	...TEMP.EVT

	Tran	
PPV	3.728	mm/s
ZC Freq	13.0	Hz
Time (Rel. to Trig)	0.661	sec
Peak Acceleration	0.097	g
Peak Displacement	0.052	mm
Sensor Check	Passed	
Frequency	7.5	Hz
Overswing Ratio	3.2	





Time Scale: 0.20 sec/div **Amplitude Scale:** Geo: 2.000 mm/s/div

Trigger = ▶———◀

Sensor Check

Instantel

Event Report

95

Date/Time	Vert at 15:43:23 January 22, 2021
Trigger Source	Geo: 1.000 mm/s, Mic: 130.8 dB(L)
Range	Geo: 254.0 mm/s
Record Time	3.0 sec at 2048 sps
Operator/Setup:	Operator/RCML MAHAGAMA.MMB

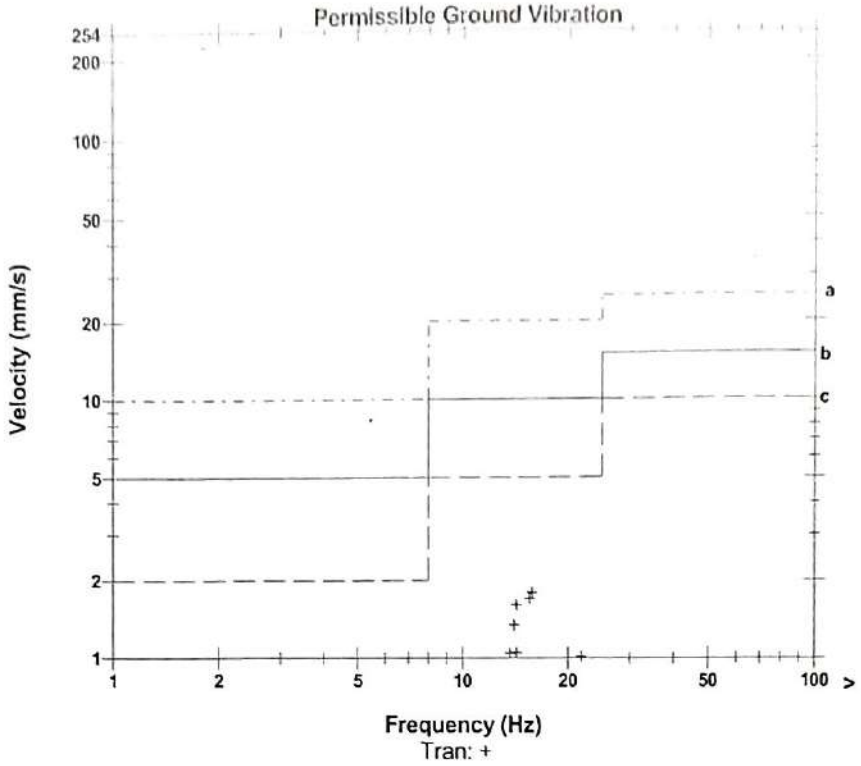
Serial Number	UM11208 V 10-84 Micromate ISEE
Battery Level	3.7 Volts
Unit Calibration	September 24, 2020 by CIMFR Dhanbad
File Name	_TEMP.EVT

Notes
Location: 100 mt.
Client: RCML
User Name: RCML
General: Above 3seam/3seam/2seam/partin

	Tran	
PPV	1.789	mm/s
ZC Freq	15.8	Hz
Time (Rel. to Trig)	0.830	sec
Peak Acceleration	0.067	g
Peak Displacement	0.017	mm
Sensor Check	Passed	
Frequency	7.5	Hz
Overswing Ratio	3.3	

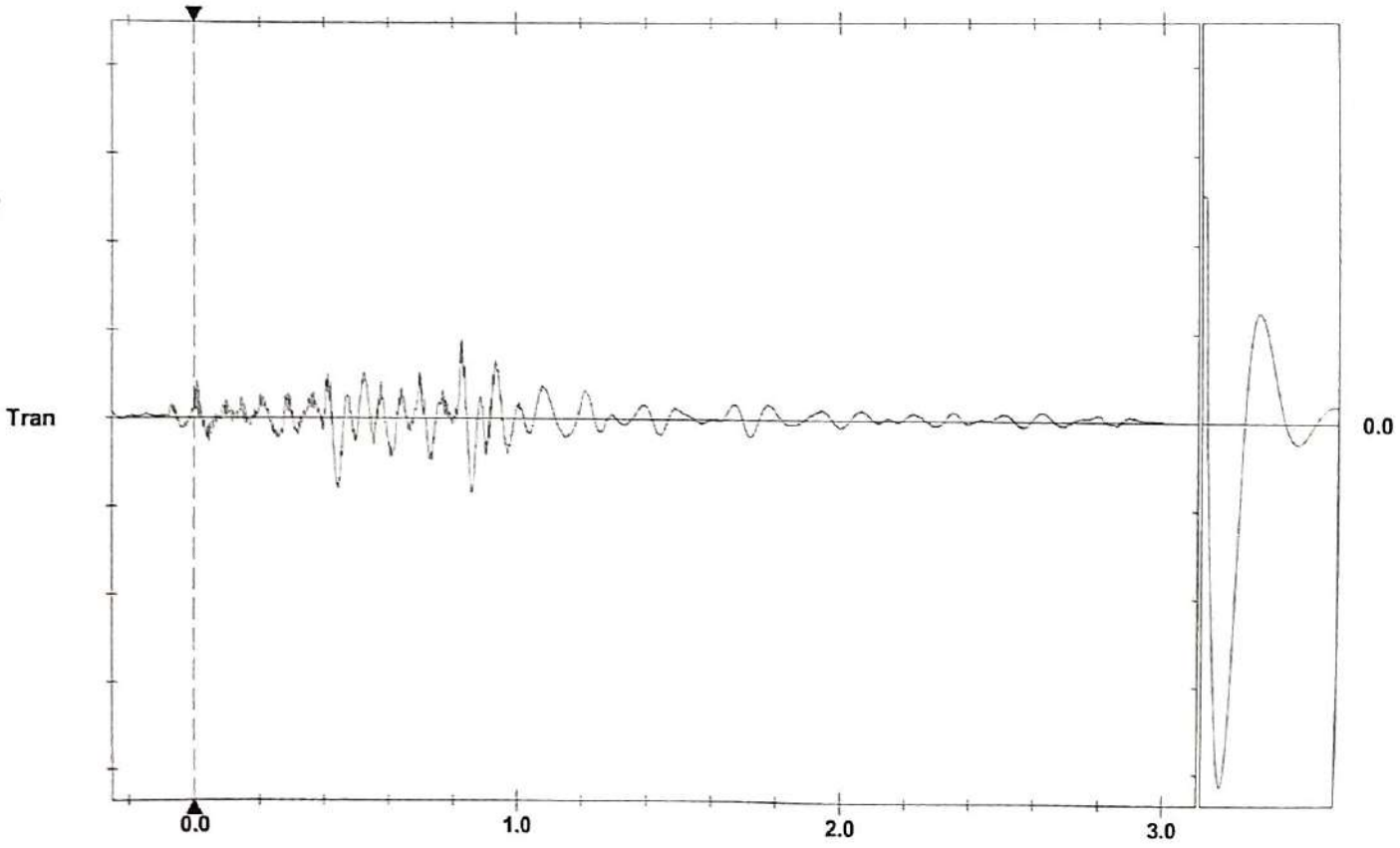
DGMS India (A)

Permissible Ground Vibration



Frequency (Hz)
Tran: +

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



Time Scale: 0.20 sec/div **Amplitude Scale:** Geo: 2.000 mm/s/div

Trigger = ▶— — —◀

Sensor Check

Instantel

Event Report

(69)

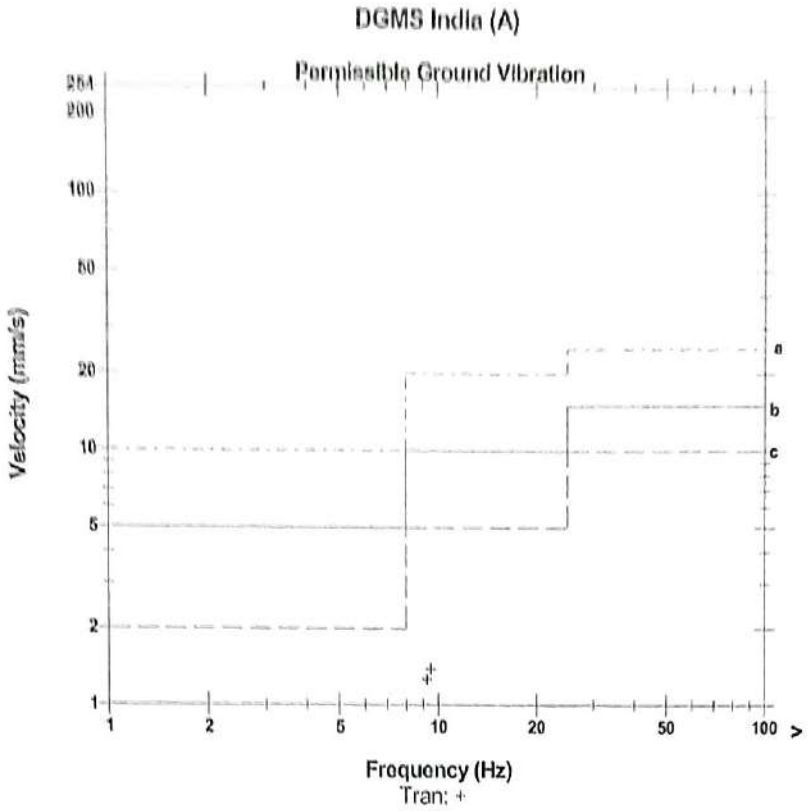
Date/Time	Tran at 14:05:54 January 12, 2021
Trigger Source	Geo: 1.000 mm/s, Mic: 130.8 dB(L)
Range	Geo: 254.0 mm/s
Record Time	3.0 sec at 2048 sps
Operator/Setup:	Operator/RCML MAHAGAMA MMB

Serial Number	UM11208 V 10-04 Micromate ISEE
Battery Level	3.7 Volts
Unit Calibration	September 24, 2020 by CIMFR Dhanbad
File Name	_TEMP.EVT

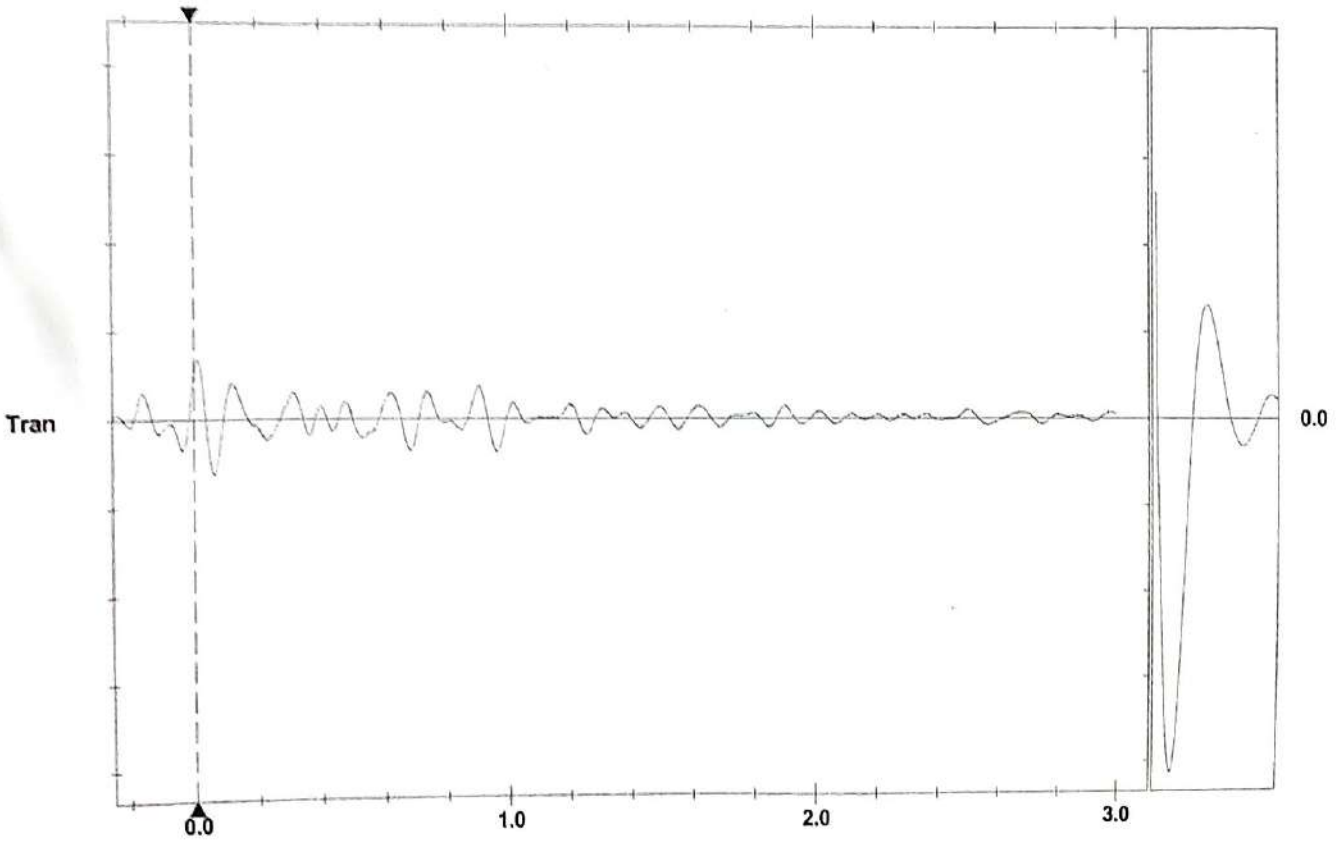
Notes

Location:	100 mt.
Client:	RCML
User Name:	RCML
General:	Above 3seam/3seam/2seam/partin

	Tran	
PPV	1.379	mm/s
ZC Freq	9.5	Hz
Time (Rel. to Trig)	0.011	sec
Peak Acceleration	0.013	g
Peak Displacement	0.022	mm
Sensor Check	Passed	
Frequency	7.3	Hz
Overswing Ratio	3.1	



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



Time Scale: 0.20 sec/div **Amplitude Scale:** Geo: 2.000 mm/s/div

Sensor Check

Trigger = ▶———◀

ANNEXURE- IV

FEBRUARY - 2021

Date
Page

Point of Survey	Reading in dB(A)	Average Reading	Remarks.
R. J. Siding	81.9, 79.6, 80.2	80.56 dB(A)	
Silo - 1	88.1, 87.4, 87.9.	87.8 dB(A)	
Silo - 2	85.2, 86.7, 88.8	86.9 dB(A)	
Interim CHP	78.0, 78.4, 78.2	78.2 dB(A)	
DMZ OB face	84.2, 83.4, 81.9	83.16 dB(A)	
AMPL Patch	77.1, 76.0, 80.2	77.76 dB(A)	
Dept. OB face	76.0, 77.1, 74.2	75.76 dB(A)	
Zero point	84.1, 85.6, 80.0	83.23 dB(A)	
WORKSHOP	86.9, 87.1, 87.4	87.13 dB(A)	
HAUL ROAD	74.0, 74.9, 75.0	74.63 dB(A)	
Supervisor OB face RCML	79.0, 79.7, 80.1	79.6 dB(A)	
Supervisor Coal face, RCML	90.0, 92.3, 87.4	90.56 dB(A)	
UTA Pump.	73.0, 71.0, 72.4	72.13 dB(A)	
Hy. Shovel. 35	78.0, 80.2, 83.4	80.53 dB(A)	

Date
Page

Point of Survey	Reading in dB(A)	Average Reading	Remarks.
P&H Shovel-RS-15	70.1, 72.0, 70.0	70.7 dB(A)	
Dozer - 77	90.2, 88.1, 89.0	89.1 dB(A)	
Dept. Supervisor OB face	89.6, 84.3, 84.5.	86.13 dB(A)	
Deep Mining Pumping Station.	65.7, 69.2, 70.1	68.33 dB(A)	
Reclam 16&17.	85.7, 89.0, 90.8	88.5 dB(A)	

NOVEMBER-2020

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POINT OF SURVEY	READING IN dB(A)	Remarks.
Dept. OB face.	77.4, 74.8, 72.7 Av. 74.96	Av. 74.96 dB(A)
RCML Coalface	83.5, 88.2, 86.9 Av. 862	Av. 862 dB(A)
DMZ OB face	79.9, 81.3, 83.7 Av. 81.63	Av. 81.63 dB(A)
Zero point	82.2, 78.6, 78.4 Av 79.73	Av. 79.73 dB(A)
AMPL patch	75.5, 81.4, 80.1 Av. 79.00	Av. 79.00 dB(A)
R.J. Siding	80.1, 78.8, 80.0 Av. 79.63	Av. 79.63 dB(A)
Silo-1	85.2, 87.6, 88.0 Av. 86.93	Av. 86.93 dB(A)
Silo-2	87.4, 87.0, 89.1 Av. 87.83	Av. 87.83 dB(A)
Interim CHP	78.0, 78.4, 78.1 - 78.16	Av. 78.16 dB(A)
WORKSHOP	87.2, 88.0, 89.1 -Av. 88.1	Av. 88.1 dB(A)
HAUL ROAD	73.0, 74.5, 73.2 Av. 73.57	Av. 73.57 dB(A)
Hy. Shovel - 36	82.1, 83.0, 82.5 Av. 247.6/3	Av. 82.53 dB(A)
Supervisor, COAL face, RCML	91.8, 92.4, 89.0 Av. 91.06	Av. 91.06 dB(A)

Date
Page

POINT OF SURVEY	READING IN dB(A)	Remarks.
Hy. Shovel-35	78.2, 78.0, 83.0 Av- 79.73	Av. 79.73 dB(A)
RECLAIM	77.0, 79.0, 79.2 Av. 78.2	Av. 782 dB(A)
Supervisor, Dept.	85.6, 89.0, 87.6 Av. 78.4.	Av. 784 dB(A)
Doger-76	89.0, 87.0, 84.2 Av. 86.73	Av. 86.73 dB(A)
UTA PUMP	72.0, 71.4, 70.6 Av. 71.33	Av. 71.33 dB(A)
Deep Mining Pumping Station (Sump)	69.0, 73.0, 71.2 Av. 71.06	Av. 71.06 dB(A)

21.12.2020

August
~~[illegible]~~
AUGUST-2020

Date
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Point of Survey	Reading In dB(A)	Remarks.
RS-15	86.6, 86.8, 89.3 Av. 87.56 dB(A)	
Supervisor	92.1, 87.7, 87.6 Av. 89.13 dB(A)	
RS-14	85.3, 86.2, 87.8 Av. 86.43 dB(A)	
Supervisor	90.1, 93.2, 89.6 Av. 90.96 dB(A)	
WB-95	92.5, 87.3, 79.8 Av. 88.33 dB(A)	
Drill-1.	79.2, 76.7, 77.1 Av. 77.66 dB(A)	
Drill-2.	79.2, 73.6, 79.8 ~~79.2, 76.7, 77.1~~ Av. 77.53 dB(A)	
PC 480 (4)	83.2, 82.7, 84.5 Av. 83.46 dB(A)	Survey done on 07.08.2020
PC-480 (5)	82.3, 83.8, 84.6 Av. 83.56 dB(A)	
PC No-1.	81.3, 77.6, 80.4 Av. 79.76 dB(A)	

[signature] 17.8.2020 [signature] 7/08/20

August
~~August~~

Date
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Point of Survey	Reading In dB(A)	Remarks.
PC No-02	77.6, 79.0, 80.3 Av. 78.96 dB(A)	
PC No.3	77.0, 80.4, 82.1 Av. 79.83 dB(A)	

[signature] 07/08/20 [signature] 17.8.2020

May - 2020

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Point of Survey	Reading in dB(A)	Remarks.
Dept. OB face.	71.00 dB(A)	
RCML OB face.	76.00 dB(A)	
OB Dump.	74.19 dB(A)	
DMZ face.	76.11 dB(A)	
RCML WORSHOP	80.00 dB(A)	
Zero point	74.00 dB(A)	
RCML CRUSHER	75.00 dB(A)	
RS - 1S	77.00 dB(A)	
RS - 11	79.00 dB(A)	
COAL face	82.00 dB(A)	
RJ Siding	81.00 dB(A)	
WORK SHOP	84.00 dB(A)	
Intrim CHP	82.00 dB(A)	
Silo 1 & 2	83.00 dB(A)	
Reclaim 16 & 17	80.00 dB(A)	

14.06.2020
SAFETY OFFICER
Rajmahal OCP

FEBRUARY'2020

Date
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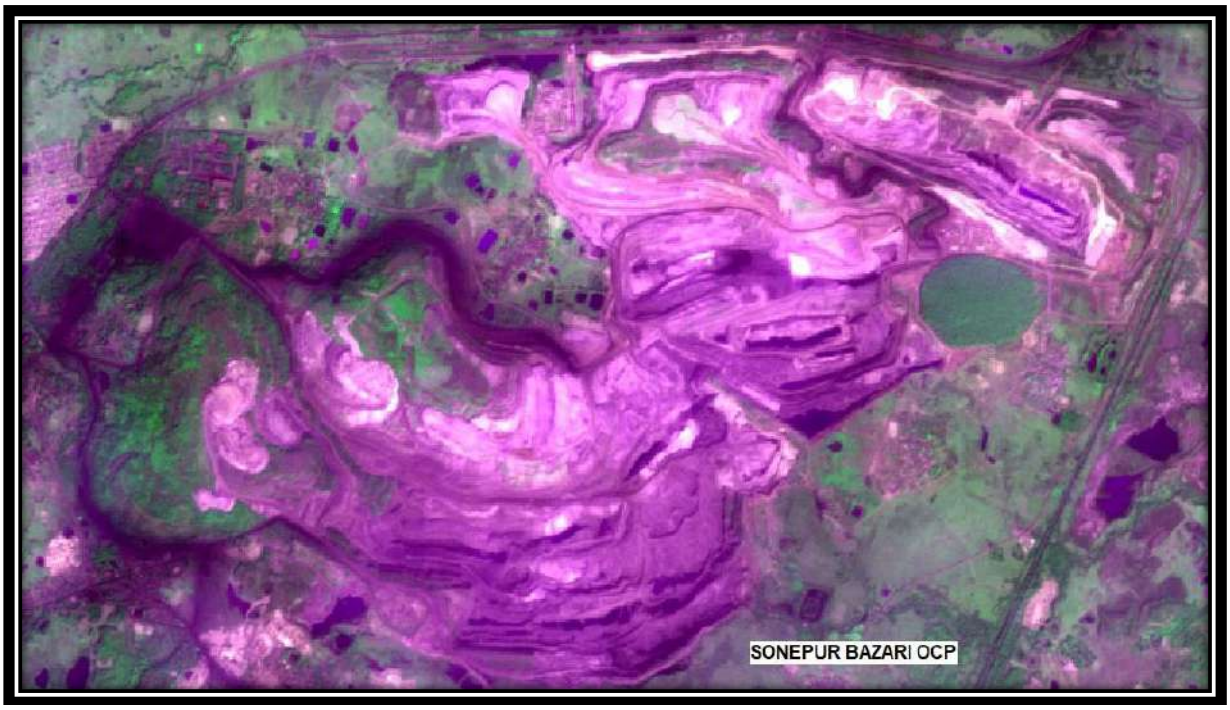
Point of Survey	Reading in dB(A)	Remarks.
Silo 129.	81.43 dB(A)	
Reclam	79.00 dB(A)	
Interim CHP.	74.00 dB(A)	
Crusher point	75.00 dB(A)	
Zero point	73.00 dB(A)	
Dozer Section.	76.00 dB(A)	
RS- 12	78.00 dB(A)	
RS- 16	79.00 dB(A)	
AMPL Patch	77.00 dB(A)	
COAL face.	79.48 dB(A)	
OB Dump	80.96 dB(A)	
Kendua coal Stock	82.00 dB(A)	
WORKSHOP	81.72 dB(A)	
HAUL ROAD	74.00 dB(A)	
Canteen.	67.00 dB(A)	

15.03.2020
SAFETY OFFICER
Rajmahal OCP

ANNEXURE- V

Land Reclamation/ Restoration Monitoring of Opencast Coal Mines of Eastern Coalfields Limited (ECL) producing more than 5 million cu. m (Coal+OB) based on Satellite Data of the Year 2020



Submitted to

Eastern Coalfields Limited

cmpdi

A Mini-Ratna Company

Land Reclamation/ Restoration Monitoring of Opencast Coal Mines of Eastern Coalfields Limited (ECL) producing more than 5 million cu. m (Coal+OB) based on Satellite Data of the Year 2020

March - 2021

Remote Sensing Cell
Geomatics Division
CMPDI, Ranchi

CONTENTS

Executive Summary

1.0 Project Land reclamation/ restoration monitoring of two opencast coal mines of Eastern Coalfields Ltd. (ECL) producing more than 5 million cu. m. (Coal + OB) per year, based on satellite data, regularly on annual basis.

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

3.0 Salient Findings

- Out of the total mine leasehold area of 40.69 km^2 of two OCPs namely, Rajmahal and Sonepur Bazari considered for monitoring during 2020-21, the total excavated area is only 16.53 Km^2, of which 2.67 Km^2 area (16.15%) has been planted (*Biologically Reclaimed*), 8.83 Km^2 area (53.42%) is under backfilling (under Technical Reclamation) and 5.03 Km^2 area (30.43%) is under active mining. It is evident from the analysis that, commutatively 69.57% area of the total excavated area has come under reclamation and balance 30.43% area is under active mining. Project wise details of reclamation are given in Table-1 & Fig -1.

- On comparing the status of land reclamation for the year 2020 with respect to the year 2019, it is evident from the analysis that the total area of reclamation has increased from 10.68 Km^2 (Yr. 2019) to 11.50 Km^2 (Yr. 2020). The area of biological reclamation also increased from 2.32 Km^2 (Yr. 2019) to 2.67 Km^2 (Yr. 2020). This increase in reclamation is mainly because of the increase in backfilling areas and plantation areas respectively, as a result of the efforts taken up by ECL towards land reclamation processes and environmental protection.

- Area under active mining in Rajmahal OCP reduced by 0.01 Km^2 only, as the progress of mine advancement is limited due to non availability of land.

- Analysis of satellite data indicates that 82.18% excavated area has come under reclamation in Rajmahal OC and 57.83% in Sonepur Bazari OC till 2020 monitoring time, based on satellite data.

Table 1

Project wise Land Reclamation Status in OC Projects of ECL based on Satellite Data of the Year 2020

(Projects producing more than 5 mcm of Coal + OB annaully)

(Area in Sq. Kms.)

Sl. No.	Project	Total/ Mine Lease hold Area		Technical Reclamation		Plantation						Area under Active Mining		Total Excavated Area		Total Area under Plantation (% Green Cover Generated in Leasehold Area)		Total Area under Reclamation	
						Biological Reclamation		Other Plantations											
				Area under Backfilling		Plantation on Excavated / Backfilled Area		Plantation on External Over Burden Dumps		Social Forestry, Avanue Plantation Etc.									
1	*2*	*3*		*4*		*5*		*6*		*7*		*8*		*9 (=4+5+8)*		*10 (=5+6+7)*		*11(=4+5)*	
		2019	*2020*	*2019*	*2020*	*2019*	*2020*	*2019*	*2020*	*2019*	*2020*	*2019*	*2020*	*2019*	*2020*	*2019*	*2020*	*2019*	*2020*
1	**Rajmahal**	17.75	17.75	4.44	4.75	1.74	1.80	0.06	0.06	0.54	0.60	1.52	1.42	7.70	7.97	2.34	2.46	6.18	6.55
				57.66%	59.60%	22.60%	22.58%					19.74%	17.82%			13.18%	13.86%	80.26%	82.18%
2	**Sonepur Bazari**	22.94	22.94	3.92	4.08	0.58	0.87	0.42	0.44	0.88	0.88	3.59	3.61	8.09	8.56	1.88	2.19	4.50	4.95
				48.45%	47.66%	7.17%	10.16%					44.38%	42.17%			8.20%	9.55%	55.62%	57.83%
	TOTAL	**40.69**	**40.69**	**8.36**	**8.83**	**2.32**	**2.67**	**0.48**	**0.50**	**1.42**	**1.48**	**5.11**	**5.03**	**15.79**	**16.53**	**4.22**	**4.65**	**10.68**	**11.50**
				52.94%	**53.42%**	**14.69%**	**16.15%**					**32.36%**	**30.43%**			**10.37%**	**11.43%**	**67.64%**	**69.57%**

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

Note: *In reference of the above Table-1, different parameters are classified as follows:*

1 *Leasehold area as per the EC boundary*

2 *Area under* ***Biological Reclamation*** *includes Area under Plantation done on Backfill only*

3 *Area under* ***Technical Reclamation*** *includes Area under Backfilling only*

4 *Area under* ***Active Mining*** *includes Coal Quarry, Quarry filled with water & Advance Quarry Site, if any. Coal dump is excluded*

5 *Social Forestry and Plantation on External OB dumps are not included in Biological Reclamation, and are put under separate categories*

6 *(%) calculated in the above table is in respect of total excavated area except for "Total area under plantation" where % is in terms of leasehold area.*

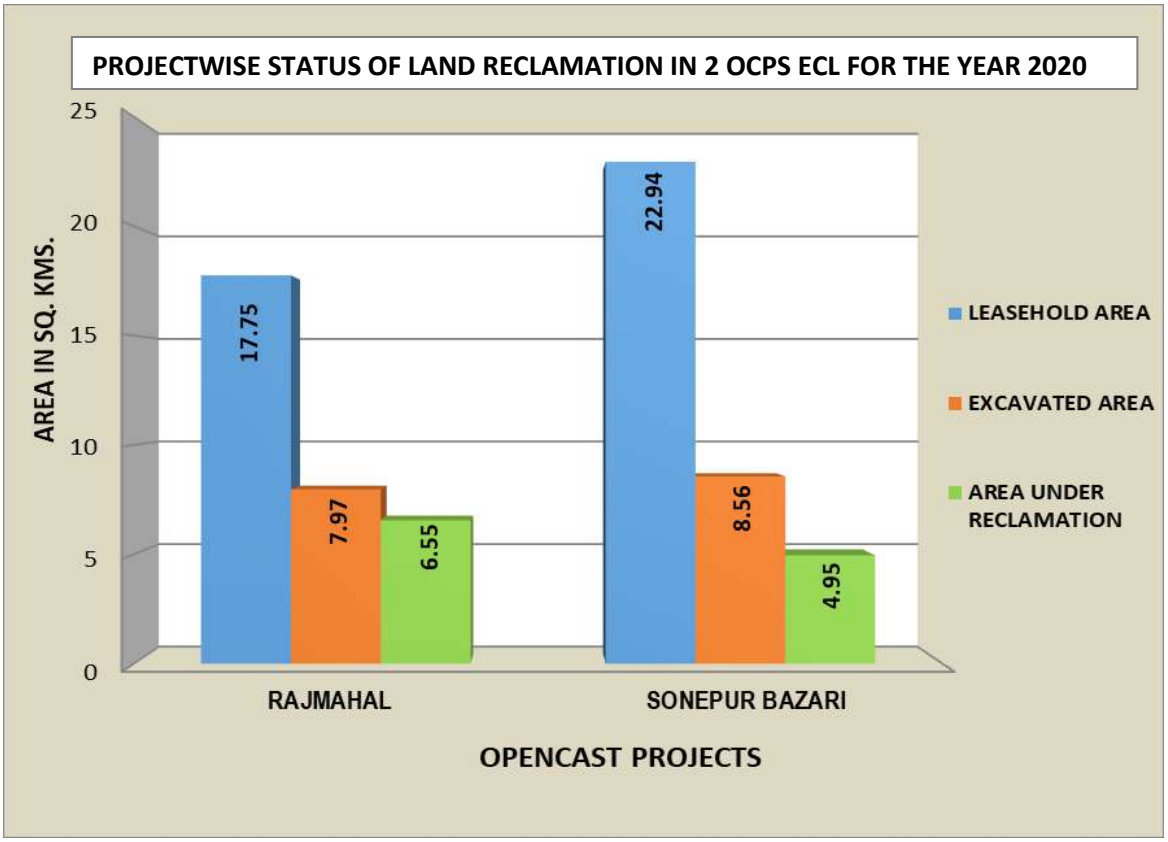


Fig - 1 Land Reclamation Status in 2 OC Project of ECL - 2020

1.0 Background

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

1.2 Keeping above in view, Coal India Ltd. (CIL) issued a work order vide letter no. CIL/WBP/ENV/2011 dated 12.10.2012 to Central Mine Planning & Design Institute (CMPDI), Ranchi, for monitoring of land reclamation status of all the opencast coal mines having production of more than 5 million m^3 per annum (Coal + OB taken together per annum) regularly on annual basis and for monitoring of less than 5 million m^3 per annum capacity (Coal +OB) projects at an interval of three years based on remote sensing satellite data for sustainable development of mining. The work order was renewed vide letter no. CIL/WBP/ENV/2017/DP/8477 dated 21.09.2017 for a period of 5 more years from 2017-18 to 2021-22. The result of land reclamation status of all such mines is to be put on the website of CIL, (www.coalindia.in), CMPDI (www.cmpdi.co.in) and the concerned coal companies in public domain. Detailed report has to be submitted to Coal India and respective subsidiary companies.

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

1.4 Present report is embodying the finding of the study based on satellite data of the year 2020, carried out for all the OC projects producing more than 5 mcm (Coal + OB) for Eastern Coalfields Ltd. Satellite data of 06-02-2020 of ResourceSat-2, LISS-4, multispectral, 5 Mtr. resolution was used for the present monitoring study.

2.0 Objective

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

3.0 Methodology

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

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

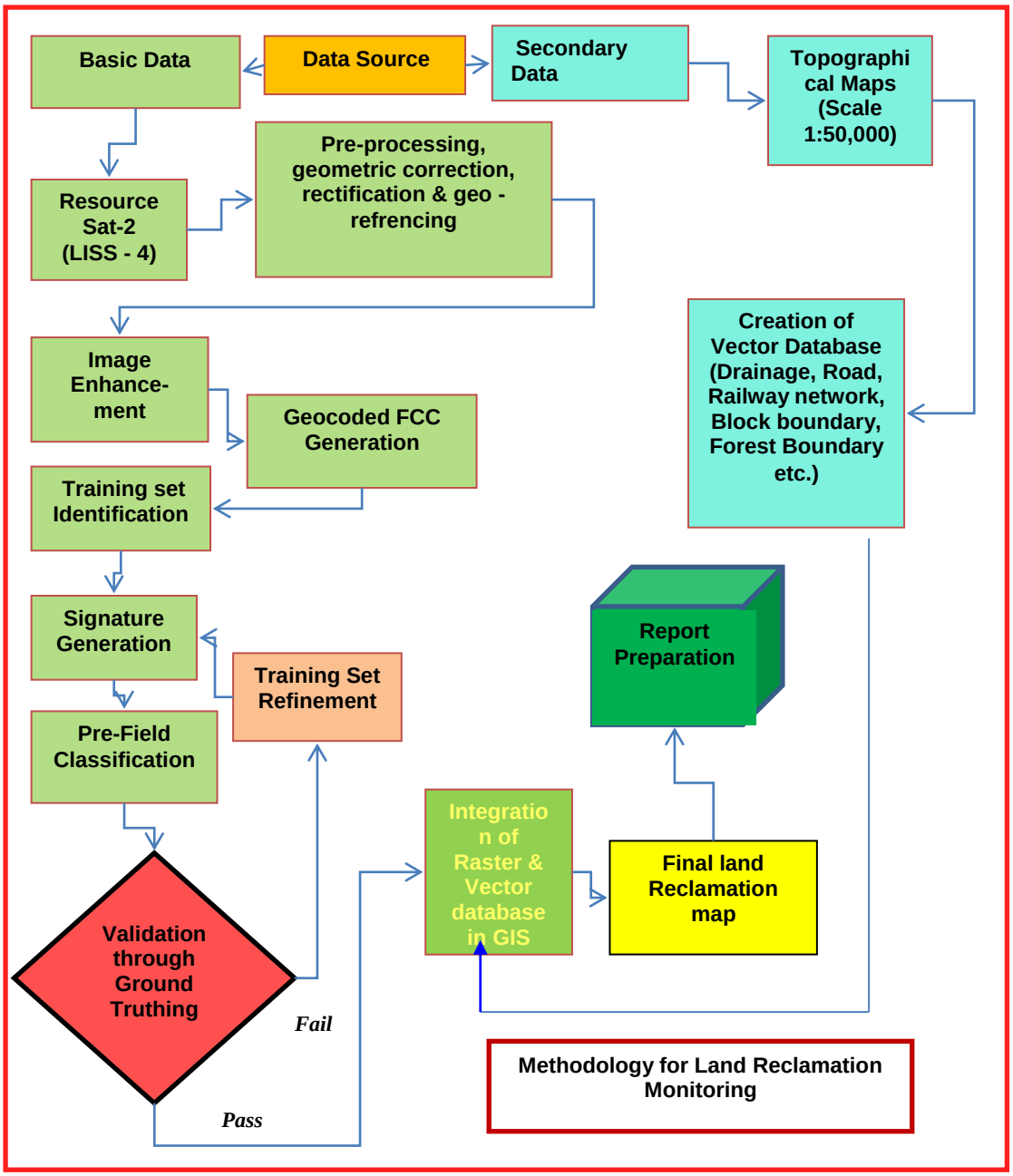


Fig. 2 : ***Methodology of Land Reclamation Monitoring***

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

- **Rectification & Geo-referencing:** Inaccuracies in digital imagery may occur due to 'systematic errors' attributed to earth curvature and rotation as well as 'non-systematic errors' attributed to satellite receiving station itself. Digital images may contain geometric distortions, which make them unusable

sometimes as maps. Therefore, proper geo-referencing is required for correction of image data using ground control points (GCP) to make it compatible to new series SoI toposheet (WGS-84). The processed images and the Maps thus prepared confirm to the WGS-84 datum and UTM projected co-ordinated system.

- **Image enhancement:**

  To improve the interpretability of the raw data, image enhancement is necessary. Local operations modify the value of each pixel based on brightness value of neighbouring pixels using ERDAS IMAGINE 14.0 s/w, and enhance the image quality for interpretation.

- **Training set selection**

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

- **Classification and Accuracy assessment**

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

- **Area calculation**

  The area of each land use class in the leasehold is determined using ERDAS IMAGINE 14.0 s/w.

- **Overlay of Vector data base**

  Vector data base is created based on secondary data. Vector layer like drainage, railway line, leasehold boundary, forest boundary etc. are superimposed on the image as vector layer in the Arc GIS 10.2 database.

- **Pre-field map preparation**

  Pre-field map is prepared for validation of the classification results.

3.3 Ground Truthing:

Selective ground verification of the land use classes are carried out in the field and necessary corrections where ever required, are incorporated before final map preparation.

3.4 Land reclamation database on GIS:

Land reclamation database is created on GIS platform to identify the temporal changes identified from satellite data of different cut - of dates. The database, boundary shape files (.shp), kml files and the Maps thus prepared confirm to the WGS-84 datum and UTM projected co-ordinated system.

4.0 Work Plan

Two opencast projects of ECL producing more than 5 million cubic m. (Coal + OB together) have been taken up for land reclamation/ restoration monitoring in 2020-21, based on the Resoursesat-2(L-IV) Satellite data, using ERDAS Imaging digital image processing s/w and ArcGIS 10.2 platform. Land reclamation monitoring will be carried out regularly on annual basis to assess the progressive status of land reclamation/ restoration in the above OC mines. The report of this study has been uploaded on the websites of CMPDI, CIL & ECL in public domain.

5.0 Land Reclamation Status in Eastern Coalfields Ltd.

5.1 Following two OC projects producing more than 5 million cubic m. (Coal + OB) annually have been taken up for land reclamation monitoring based on Satellite data of the year 2020

- **Rajmahal**
- **Sonepur Bazari**

5.2 Both the projects have been mapped earlier also during the periods of 2010 to 2019 on annual basis for assessing the progress of land reclamation.

5.3 Project wise Land Reclamation status in ECL for the year 2020 is given in Table-1 and shown graphically in Fig-1. Area statistics of different land classes present in OC projects for the year 2020 is given in Table 2. Land use/ cover maps derived from the satellite data are given in Plate no. 1 & 2. Changes in land use status are shown in Fig. 3 & 4.

5.4 Study reveals that 11.50 Km^2 (69.57%) of excavated area is under reclamation by ECL, out of which 8.83 Km^2 (53.42%) area is under backfilling (Technical Reclamation) and 2.67 Km^2 (16.15%) area has been revegetated (Biological Reclamation).

5.5 Area under active mining in Rajmahal OCP reduced by 0.01 Km^2 only, as the progress of mine advancement is limited due to non availability of land.

5.6 On comparing the status of land reclamation for the year 2020 with respect to the year 2019, it is evident from the analysis that the total area of land reclamation has increased from 10.68 Km^2 (Yr. 2019) to 11.50 Km^2 (Yr. 2020).

5.7 After analyzing the data of the year 2020, it is seen that the total area under plantation (Green Cover) which includes plantation carried out on backfilled area, OB dumps and plantation under social forestry/ avenue plantation in the two mines of ECL has increased from 4.22 Km^2 (Yr. 2019) to 4.65 Km^2 (Yr. 2020).

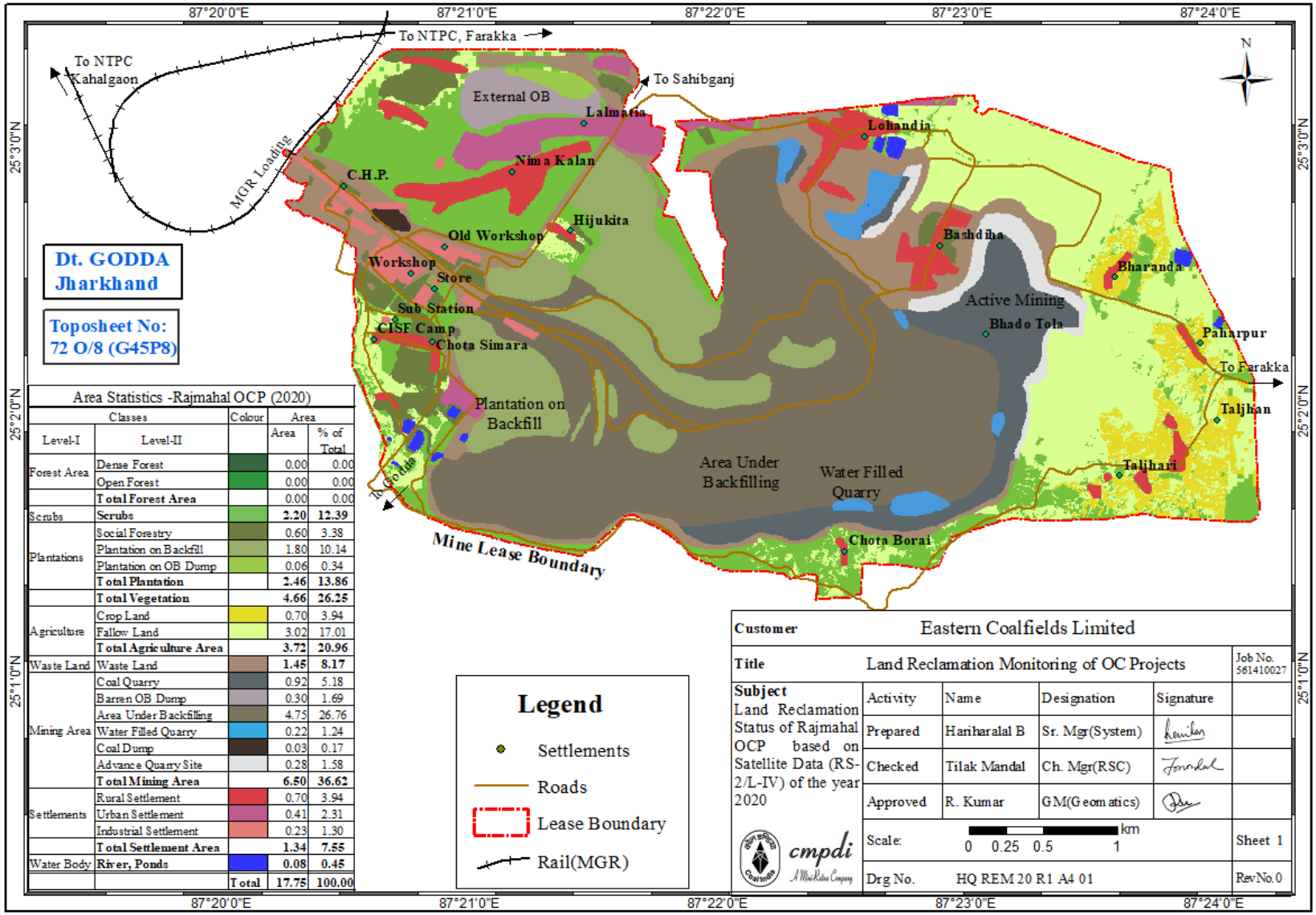
5.8 Of the two projects in ECL, Rajmahal OCP tops with 82.18% reclamation followed by Sonepur Bazari OCP with 57.83 % reclamation.

TABLE - 2

Project wise Area Statistics of Land Use/ Cover in OC Mines (>5m.cu.m) of ECL based on Satellite data of the Year 2020

(Area in Sq Km)

		RAJMAHAL		SONEPUR BAZARI		TOTAL	
		Area	%	Area	%	Area	%
FORESTS	Dense Forest	0.00	0.00	0.00	0.00	0.00	0.00
	Open Forest	0.00	0.00	0.32	1.39	0.32	0.79
	Total Forest(A)	0.00	0.00	0.32	1.39	0.32	0.79
	Scrubs(B)	2.20	12.39	4.01	17.48	6.21	15.26
PLANTATION	Social Forestry	0.6	3.38	0.88	3.84	1.48	3.64
	Plantation on OB Dump	0.06	0.34	0.44	1.92	0.50	1.23
	Plantation on Backfill(Biological Reclamation)	1.80	10.14	0.87	3.79	2.67	6.56
	Total Plantation *(C)*	2.46	13.86	2.19	9.55	4.65	11.43
	Total Vegetation (A+B+C)	**4.66**	**25.25**	**6.52**	**28.42**	**11.18**	**27.48**
ACTIVE MINING	Coal Quarry	0.92	5.18	3.12	13.6	4.04	9.93
	Advance Quarry Site	0.28	1.58	0.38	1.66	0.66	1.62
	Quarry Filled With Water	0.22	1.24	0.11	0.48	0.33	0.81
	Area under *Active Mining (D)*	**1.42**	**8.00**	**3.61**	**15.74**	**5.03**	**12.36**
E	Coal Dump	0.03	0.17	0.07	0.31	0.10	0.25
	Barren OB Dump	0.30	1.69	2.98	12.99	3.28	8.06
	Area Under Backfilling(Technical Reclamation)	4.75	26.76	4.08	17.79	8.83	21.70
	Total Area under *Mining Operation (D+E)*	**6.50**	**36.62**	**10.74**	**46.82**	**17.24**	**42.37**
WASTELANDS	Waste Lands	1.45	8.17	1.14	4.97	2.59	6.37
	Fly Ash Pond / Sand Body	0.00	0.00	0.00	0.00	0.00	0.00
	Total Wasteland	**1.45**	**8.17**	**1.14**	**4.97**	**2.59**	**6.37**
WATERBODIES	Reservoir, Nallah, Ponds	0.08	0.45	0.30	1.31	0.38	0.93
	Total Waterbodies	**0.08**	**0.45**	**0.30**	**1.31**	**0.38**	**0.93**
AGRICULTURE	Crop Lands	0.7	3.94	0.02	0.09	0.72	1.77
	Fallow Lands	3.02	17.01	3.25	14.17	6.27	15.41
	Total Agriculture	**3.72**	**20.96**	**3.27**	**14.25**	**6.99**	**17.18**
SETTLEMENTS	Urban Settlement	0.41	2.31	0.43	1.87	0.84	2.06
	Rural Settlement	0.7	3.94	0.17	0.74	0.87	2.14
	Industrial Settlement	0.23	1.3	0.37	1.61	0.60	1.47
	Total Settlement	**1.34**	**7.55**	**0.97**	**4.23**	**2.31**	**5.68**
	Grand Total	**17.75**	**100.00**	**22.94**	**100.00**	**40.69**	**100.00**



Area Statistics -Rajmahal OCP (2020)

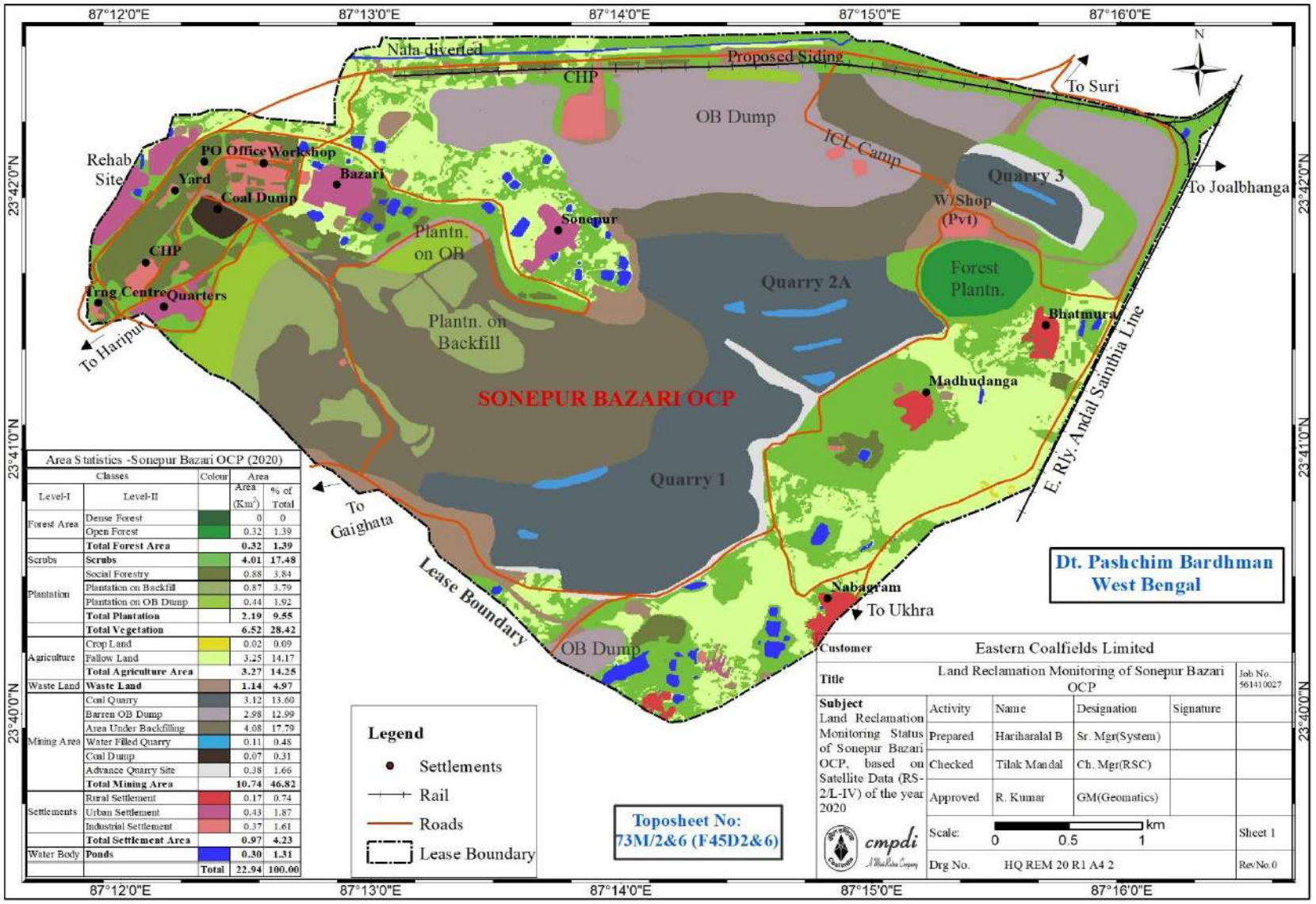
Classes		Colour	Area	
Level-I	Level-II		Area	% of Total
Forest Area	Dense Forest		0.00	0.00
	Open Forest		0.00	0.00
	Total Forest Area		0.00	0.00
Scrubs	**Scrubs**		**2.20**	**12.39**
Plantations	Social Forestry		0.60	3.38
	Plantation on Backfill		1.80	10.14
	Plantation on OB Dump		0.06	0.34
	Total Plantation		**2.46**	**13.86**
	Total Vegetation		**4.66**	**26.25**
Agriculture	Crop Land		0.70	3.94
	Fallow Land		3.02	17.01
	Total Agriculture Area		**3.72**	**20.96**
Waste Land	Waste Land		**1.45**	**8.17**
Mining Area	Coal Quarry		0.92	5.18
	Barren OB Dump		0.30	1.69
	Area Under Backfilling		4.75	26.76
	Water Filled Quarry		0.22	1.24
	Coal Dump		0.03	0.17
	Advance Quarry Site		0.28	1.58
	Total Mining Area		**6.50**	**36.62**
Settlements	Rural Settlement		0.70	3.94
	Urban Settlement		0.41	2.31
	Industrial Settlement		0.23	1.30
	Total Settlement Area		**1.34**	**7.55**
Water Body	**River, Ponds**		**0.08**	**0.45**
		Total	**17.75**	**100.00**

Legend

- Settlements
- Roads
- Lease Boundary
- Rail(MGR)

Customer	Eastern Coalfields Limited			
Title	Land Reclamation Monitoring of OC Projects			Job No. 561410027
Subject Land Reclamation Status of Rajmahal OCP based on Satellite Data (RS-2/L-IV) of the year 2020	Activity	Name	Designation	Signature
	Prepared	Hariharalal B	Sr. Mgr(System)	
	Checked	Tilak Mandal	Ch. Mgr(RSC)	
	Approved	R. Kumar	GM(Geomatics)	
	Scale: 0 0.25 0.5 1 km			Sheet 1
	Drg No. HQ REM 20 R1 A4 01			RevNo.0

Plate 1



Area Statistics -Sonepur Bazari OCP (2020)

Classes		Colour	Area	
Level-I	Level-II		Area (Km^2)	% of Total
Forest Area	Dense Forest		0	0
	Open Forest		0.32	1.39
	Total Forest Area		**0.32**	**1.39**
Scrubs	**Scrubs**		**4.01**	**17.48**
Plantation	Social Forestry		0.88	3.84
	Plantation on Backfill		0.87	3.79
	Plantation on OB Dump		0.44	1.92
	Total Plantation		**2.19**	**9.55**
	Total Vegetation		**6.52**	**28.42**
Agriculture	Crop Land		0.02	0.09
	Fallow Land		3.25	14.17
	Total Agriculture Area		**3.27**	**14.25**
Waste Land	**Waste Land**		**1.14**	**4.97**
Mining Area	Coal Quarry		3.12	13.60
	Barren OB Dump		2.98	12.99
	Area Under Backfilling		4.08	17.79
	Water Filled Quarry		0.11	0.48
	Coal Dump		0.07	0.31
	Advance Quarry Site		0.38	1.66
	Total Mining Area		**10.74**	**46.82**
Settlements	Rural Settlement		0.17	0.74
	Urban Settlement		0.43	1.87
	Industrial Settlement		0.37	1.61
	Total Settlement Area		**0.97**	**4.23**
Water Body	**Ponds**		**0.30**	**1.31**
		Total	**22.94**	**100.00**

Plate 2

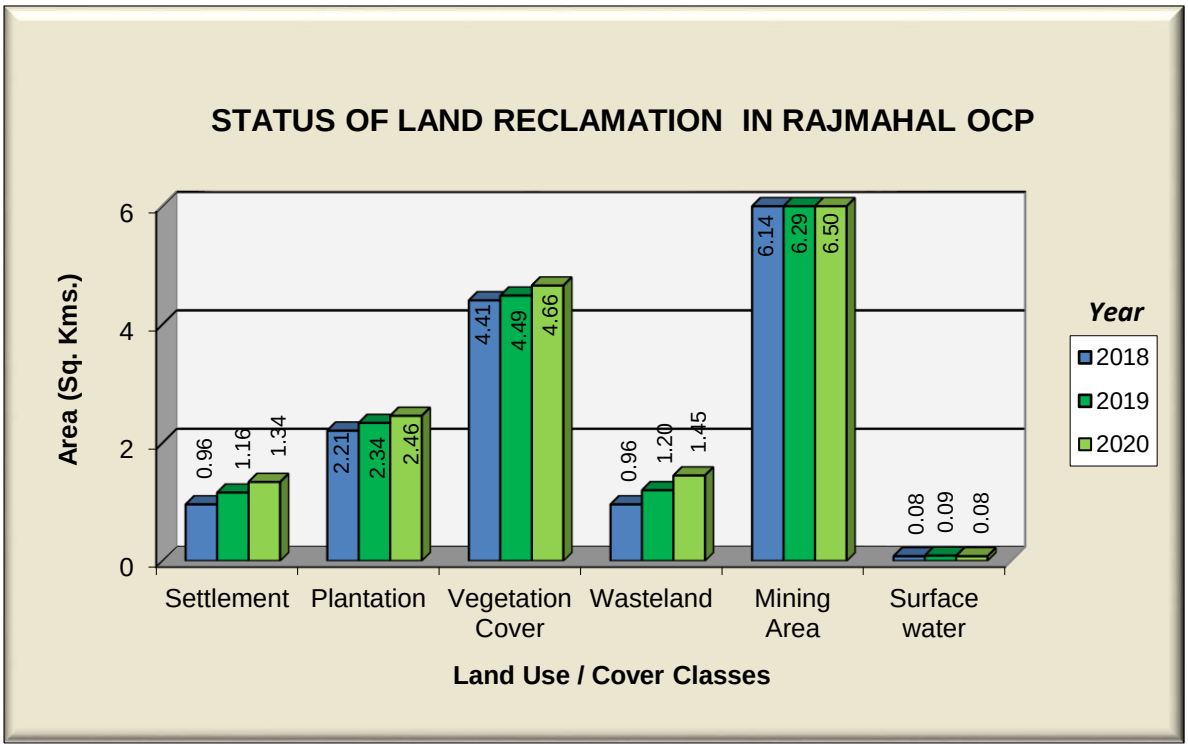

STATUS OF LAND RECLAMATION IN RAJMAHAL OCP
Area (Sq. Kms.)
0
2
4
6
0.96
1.16
1.34
2.21
2.34
2.46
4.41
4.49
4.66
0.96
1.20
1.45
6.14
6.29
6.50
0.08
0.09
0.08
Settlement
Plantation
Vegetation Cover
Wasteland
Mining Area
Surface water
Land Use / Cover Classes
Year
2018
2019
2020

Fig - 3

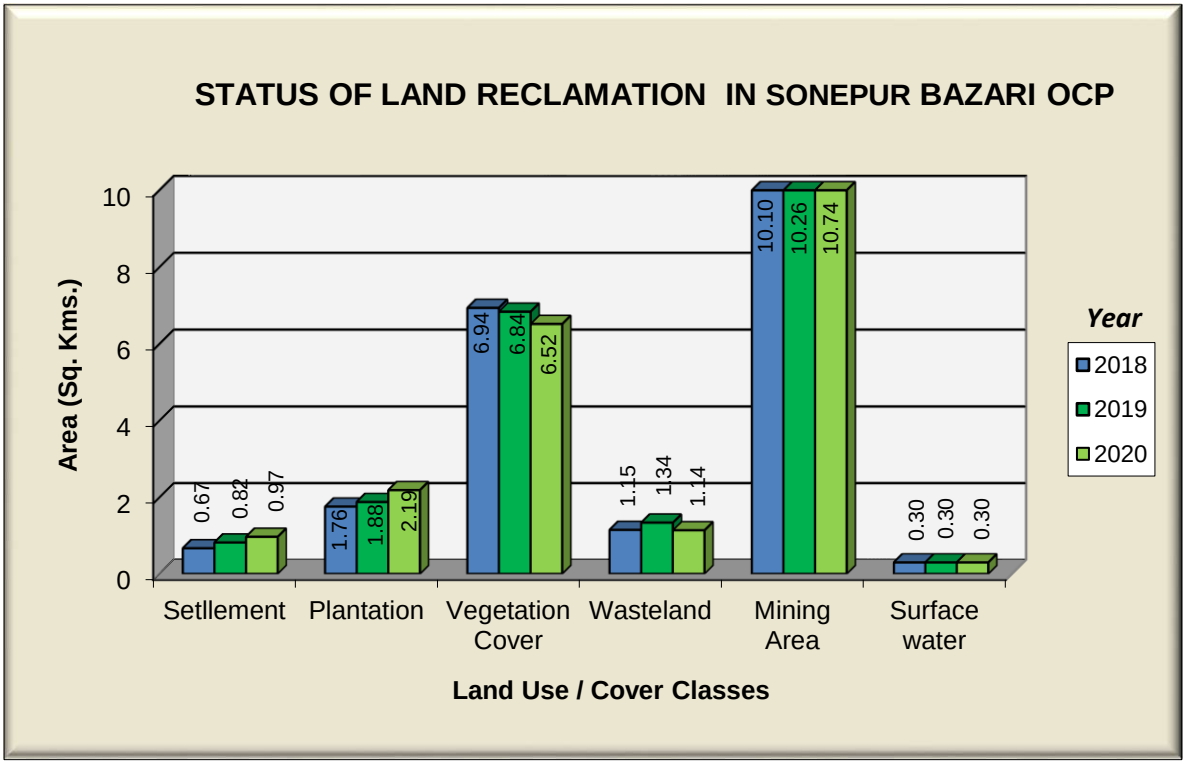

STATUS OF LAND RECLAMATION IN SONEPUR BAZARI OCP
Area (Sq. Kms.)
0
2
4
6
8
10
0.67
0.82
0.97
1.76
1.88
2.19
6.94
6.84
6.52
1.15
1.34
1.14
10.10
10.26
10.74
0.30
0.30
0.30
Setllement
Plantation
Vegetation Cover
Wasteland
Mining Area
Surface water
Land Use / Cover Classes
Year
2018
2019
2020

Fig - 4

Photo - 1 Plantation on Backfilled area in Rajmahal OCP, ECL

Photo - 2 Plantation on Backfilled area in Sonepur Bazari OCP, ECL

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

ANNEXURE - VI

LUX Meter reading at different location of Quarry at [illegible]

Sl. No.	Location	Horizontal	Vertical	Standard Lux (Horizontal)	Standard Lux (Vertical)	Remarks
1.	Departmental Ukkurd					
	R3 - 11	12	22	15	25	
	R3 - 12	13	19	15	25	
	R3 - 14	15	22	15	25	
	R3 - 15	6	14	15	25	
	R3 - 16	7	12	15	25	
2.	OB Dumping	11	13	15	15	
3.	Main Haul Road	18	....	10	....	
4	Pumping Station	45	....	40	....	
5	Sub-Station (Sirna)	75	....	150	50	
6	Rest Shelter (Departmental)	75	....	30	....	

LUX Meter reading at different location of Quarry at Rajmahal OCP as on 29/03/2021

Sl. No.	Location	Horizantal	Vertical	Standard Lux Required Horizantal	Standard Lux Required Vertical	Remark :- (Standard Value as per DGMS Circular no- 06, dt. 08.04.2016.
1	Departmental OB Banch					
	RS-11	13	23	15	25	
	RS-12	13	17	15	25	
	RS-14	15	22	15	25	
	RS-15	6	14	15	25	
	RS-16	7	12	15	25	
2	OB Dumping	11	13	15	15	
3	Main Haul Road	18	...	10	...	
4	Pumping station	45	...	40	...	
5	Sub-Station (Simra)	95	...	100	50	
6	Rest Shelter (Departmental Face)	35	...	30	...	

30.3.2021
Safety Officer
Rajmahal OCP.

30/3/21
(C. S. Prasad)
Sub-Engr((E&M),
Rajmahal OCP.

C.C. to :-

1 General Manager(OP), Rajmahal OCP.
2 AE(E&M), Rajmahal Area.
3 Chief Mgr(M)/Mgr, Rajmahal OCP.
4 CM(E&M), Rajmahal OCP.
5 Survey Officer, Rajmahal OCP.

प्राप्त हो ...

तारीख 28/1/2021

LUX Meter reading at different location of Quarry at Rajmahal OCP as on 28/01/2021

SL. No.	Location	LUX Horizontal	LUX Vertical	Standard Lux Required Horizontal	Standard Lux Required Vertical	Remarks :- (Standard Value as per DGMS Circular no- 06, d..08.04.2016
1	Departmental OB Bench					
	RS-11	13	23	15	25	
	RS-12	13	17	15	25	
	RS-14	13	17	15	25	
	RS-15	15	23	15	25	
	RS-16	15	22	15	25	
2	OB Dumping	11	13	15	15	
3	Main haul Road	18	..	10	..	
4	Pumping station	45	...	40	...	
5	Sub-Station (Sinna)	95	...	100	50	
6	Rest Shelter (Departmental Face)	35	...	30	...	

28/1/21

(C.S.Prasad)
Sub-Engr(E&M)
Rajmahal OCP

28.1.2021

Safety officer
Rajmahal OCP.

C.C. to :-
1) General Manager(OP), RJML OCP.
2) AE(E&M), Rajmahal Area.
3) Chief Mgr(M)/Manager OCP.
4) CM(E&M), OCP
5) Survey Officer, Rajmahal OCP.