



SPEED POST

Ref: HZL/Kayad/ENV/MOEF/2023-24/17

May 24, 2023

To, The Deputy Director (S) /Scientist -C Ministry of Environment, Forest & Climate Change, Integrated Regional Office, A-209&218,Aranya Bhawan, Jhalana Institutional area Jaipur-302004

Sub: Six monthly environmental compliance report from October-2022 to March 2023. Ref: Env clearance vide No. : J-110115/47/2012-IA.II (M) dated 5th Feb, 2018.

Dear Sir / Madam,

Please find enclosed herewith the compliance status report of above referred Environmental Clearance granted by the Ministry of Environment, Forest and Climate Change for the period of **October- 2022 to March- 2023** is for your kind perusal. Soft copy of compliance is also mailed and uploaded in the website.

Thanking you,

Yours faithfully

Director dustan Zinc Ltd (K.C. Meena) All Mine-305023 Director- SBU Kayad W Dist.-Ajmer (Raj.)

Cc to: In -Charge (Zonal office) Central Pollution Control Board, Vithal Market, Paryavaran Parisar, E-5, Arera Colony, Bhopal, – 462 016 (MP)

Member Secretary Rajasthan Pollution Control Board 4 Institutional Area, Jhalana Doogri Jaipur (Raj) -302004

The Regional officer Rajasthan Pollution Control Board Regional Office, SPL-II, RIICO Industrial Area, Phase-V, Kishangarh, Dist. Ajmer-305801



Hindustan Zinc limited, Kayad Mine, Village – Kayad, Ajmer -305023, Rajasthan, INDIA T- 01456626231 www.hzlindia.com CIN L27204RJ1966PLC001208

Hindustan Zinc Limited Kayad Mine, Ajmer

Environment Clearance Compliance Report: -

Name of the project: Kayad Lead- Zinc Underground Mine, M/S Hindustan Zinc Limited, Village kayad, Distt. Ajmer, Rajasthan.

Environmental Clearance letter no: J-11015/47/2012-IA.II (M) dated 5th Feb, 2018. Period of Compliance report: October -2022 to March 2023

S.no	A. Specific Conditions	Compliance Status
1.	Environmental Clearance is Granted Subject to Under Hon'ble Supreme Court Judgment Date 02.08.2017	Noted
2.	Environmental Clearance is Granted Subject to Final Outcome of Hon'ble Supreme Court of India, Hon'ble High Court of Rajasthan and other Court of Law, if any, as May be Applicable to this project.	Noted
3.	This Environmental Clearance is subject to obtaining Requisite NBWL Clearance from the Standing Committee of National Board for Wildlife, if any, Applicable for this Mining Project	Not Applicable
4.	No Mining Activities Will be Allowed in Forest area, if any, for which the Forest Clearance is not Available.	No forest involved in mine lease area.
5.	This Project Shall obtain Consent to Operate from the State Pollution Control Board, Rajasthan and effectively implement all the Conditions Stipulated therein.	Consent to Operate was granted by Rajasthan State Pollution Control Board Vide Ir no. F(Mines)/Ajmer(Ajmer)/303(1) /2017-2018 / 9550 - 9554 dated 17.02.2018 valid till 31.01.2023. F(Mines)/Ajmer(Ajmer)/303(1) /2017-2018/5559-5563 dated 06/01/2023 and valid till 31.01.2028 Annexure -VI(A&B) All the conditions are being implemented effectively.
6.	The Proponent should install online Ambient Air Quality Monitoring System and there should be system for display of digital AAQ data within 03 months at least at three locations as per wind direction. Online provisions of pH and Turbidity meters at discharge points of STP and ETP and also at water storage pond in the mining area may be made; Project Proponent should display the result digitally in front of the main Gate of the mine site.	Online Ambient Air Quality Monitoring system installed and AAQ data digital displayed outside gate. pH and Turbidity meters at discharge point of STP and at a water storage pond in mining area installed and result

		digitally displayed. Annexure- VIII, No ETP at Kayad Mine .
7.	The Project Proponent has to take care of gullies formed on slopes. Dump mass should be consolidated with proper filling/leveling with the help of dozer/compactors. The report on slope and stability monitoring should be sent to MoEF & CC and its Regional office every six- month.	Waste generated from Mining operations is being reused for back filling. No waste is accumulated at site.
8.	The reclamation at waste dump sites shall be ecologically sustainable. Scientific reclamation has been followed. The local species may be encouraged and species are so chosen that the slope, bottom of the dumps and top of the dumps are able to sustain these species. The aspect of the dump is also a factor which regulates some climatic parameters and allows only species adapted to that micro climate. This may be recommended to be studied by hiring Expert Ecology Group.	Waste generated from Mining operations is being reused for back filling. No waste is accumulated at site.
9.	There is need for regular monitoring of invertebrates and aquatic life of water bodies including the reservoir located close to the mining lease to establish that fish and other animals including the water is not 'contaminated with heavy metal. There could be a research on "bio accumulation of heavy metals in invertebrates" to completely establish that there is no impact of mining.	Study get done from M/s NEERI Nagpur and Report submitted. Annexure -VII
10.	A specialized Institution may be hired to carry out ecological survey on the plant species to evaluate their growth in terms of stunted, deformed and seed viability. The sensitive species and indicator species to heavy metal pollution may be screened out and plantation accordingly designed. Similarly, uptake of Zinc, Cadmium and lead etc. by crops and vegetables grown in the crop lands around the mining lease may be studied. Bottom sediment analysis of ponds, wells and Rivers to ascertain the level of accumulation of heavy metal may be done.	Study get done from specialized Institution M/s National Environmental Engineering Research Institute (NEERI), Nagpur and Report submitted.
11.	The Proponent shall conduct an Occupational health study with respect to the pressure impact on ear drums as person goes underground and implement the recommendations.	Occupational health study with respect to the pressure impact on ear drums as person goes underground conducted inhouse as well as from M/s
12.	Project Proponent shall carry out vibration studies well before approaching any such habitats or other buildings to evaluate the zone of influence and impact of blasting on the neighborhood. Within 500 meters of such sites vulnerable to blasting vibrations, avoidance of use of	Blasting being carried out during day time only and the vibration study is being done regularly by M/s CIMFR, Dhanbad. Annexure-XV

	explosives and adoption of alternative means of mineral extraction. A provision for monitoring of each blast should be made so that the impact of blasting on nearby habitation and dwelling units could be ascertained. The covenant of lease deed under Rule 31 of MCR 1960 provides that no mining operations shall be carried out within 50 meters of public works such as public roads and buildings or inhabited sites except with the prior permission from the Competent Authority.	No secondary blasting being carried out at site.
13.	Main haulage road in the mine should be provided with permanent water sprinklers and other roads should be regularly wetted with water tankers fitted with sprinklers. The material transfer points should invariably be provided with Bag filters and or dry fogging system. Belt-conveyors should be fully covered to avoid air borne dust; Use of effective sprinkler system to suppress fugitive dust on haul roads and other transport roads shall be ensured,	Mine haul road is being wetted through water tankers fitted with sprinklers. Annexure-XI No Permanent water sprinkler. Belt-conveyor at CRF is fully covered to avoid air borne dust. Ensured effective sprinkling system to suppress fugitive dust on haul and transport roads.
14.	The monitoring of PM2.5 in the vehicle emission shall be conducted to improve the mine environment and report submitted to the Regional Office of the MoEFCC.	The monitoring of PM2.5 in ambient air near vehicular movement is conducted but not able to monitor PM 2.5 in vehicular emission due unavailability of technology/ instruments.
15.	The Project Proponent reported that there are seven Schedule-1 species viz. Peafowl (Pavo cristatus), Osprey (Pandion haliaetus), Tawny eagle (Aquila rapax), Crested honey buzzard (Pernisptilorhynchus), Shikra (Accipiter badius), Leopard (Pantherapardus), Indian pangolin (Manis crassicaudata) in the study area. The PP shall implement the Conservation Plan and enhance the budget for implementation of Conservation Plan for Schedule I Specie and also increase the budget for plantation/green development. The Proponent shall implement the Wildlife Conservation Plan along with the funds so allocated with consultation of Chief Wild Life Warden of the State Govt. A copy of action plan shall be submitted to the Ministry of Environment, Forest and Climate Change and its Regional Office, Lucknow and the Chief Wild Life Warden of the State Govt.	Conservation plan has been developed for Schedule-1 namely Peafowl (Pavo cristatus) and has been approved by the additional Principal Chief Conservation of Forest and Chief wildlife warden Jaipur, Rajasthan and implemented the same. Action plan along with its implementation status report being submitted to RO MOEF & CC & Chief wild life warden of State Government.
16.	Proponent shall carry out monitoring of lead in the blood samples of the employees and the villagers in the areas surrounding the mine in their schedule of health check-up. The nearby water bodies shall be monitored every six months and report submitted to Regional office of the MoEFCC to ascertain impact due to lead contamination.	Lead in the blood samples of the employees carried out during their PME and villagers are monitored. Water samples analysis of nearby water bodies carried out regularly and report submitted.
17.	Implementation of Action Plan on the issues raised during the Public Hearing shall be ensured. The Project Proponent shall	Being implemented

	complete all the tasks as per the Action Plan submitted with budgetary provisions during the Public Hearing.	
18.	Implementation of the outcome of study with regard to "optimization of blast design parameter for the safety and stability of surface structures and subsequent monitoring of vibration on the surface structures for their long term stability" which was carried out by Central Institute of Mining and Fuel Research should be ensured.	 The Implementation of CIMFR study report is being ensured. Regular vibration studies conducted through CIMFR Peak Particle Velocity within ranging between 1.0 to 15.00 mm/sec Due care is taken in blast design, explosives use, selection of detonators and delay to ensure safe vibration limit.
19.	Continuous monitoring of radioactive elements, if any, shall be undertaken till entire mine is dewatered and report has to be submitted to MoEFCC Regional Office. Periodic monitoring of any adverse impact of Radon and its daughter products on any worker should be included in the Occupational Health Monitoring Programmed.	The monitoring of radioactive element done, and report already submitted to MoEFCC Regional Office. No radioactive element trace in analysis. Periodic monitoring of any adverse impact of Radon and its daughter products on any worker included in the Occupational Health Monitoring Programmed
	B. Standard conditions	
1.	A Final Mine Closure Plan along with details of Corpus Fund shall be submitted to the Ministry of Environment, Forest and Climate Change 5 years in advance of final mine closure for approval.	A Final Mine Closure Plan along with details of Corpus Fund shall be submitted 5 years in advance.
2.	No change in mining technology and scope of working should be made without prior approval of the Ministry of Environment, Forest and Climate Change.	Assured to comply
3.	No change in the calendar plan including excavation, quantum of mineral and waste should be made.	Being ensured as per Mine Plan.
4.	The project proponent shall obtain necessary prior permission of the competent authorities for drawl of requisite quantity of water (surface water and ground water) for the project.	Renewal application submitted for permission. Recommendation by CGWB to CGWA done. NOC approved and valid till 09/10/2024. Surface water monitoring report attached Annexure XVI
5.	Mining shall be carried out as per the provisions outlined in mining plan approved by Indian Bureau of Mines (IBM) as well as by abiding to the guidelines of Directorate General Mines Safety (DGMS).	Ensuring the Mining as per the Mine Plan approved by IBM and as per the guideline of DGMS
6.	The lands which are not owned by Proponent, mining will be carried out only after obtaining the consents from all the concerned land owners as per the provisions of the Mineral Concession Rules, 1960 and MMDR Act, 1957.	Ensured to comply

7.	Digital processing of the entire lease area using remote sensing technique shall be carried out regularly once in three years for monitoring land use. Pattern and report submitted to Ministry of Environment, Forest and Climate Change its Regional Office.	Digital processing of the entire lease area using remote sensing technique carried out M/s J.M. Envionet Pvt. Ltd. and Report submittedvide letter no HZL/Kayad/Enc/MoEF/22-23/94 dated 23 /11/2023 Annexure -XIV
3.	The critical parameters as per the Notification 2009 such as Pm, .10,. PM 2.5 NOx and Sox etc. in the ambient air within the impact zone, peak particle velocity at 300m distance or within the nearest habitation, whichever is closer shall be monitored periodically. Further, quality of discharged water shall also be monitored [(TDS, DO, PH and Total Suspended Solids (TSS)]. The monitored data shall be uploaded on the website of the company as well as displayed on a display board at the project site at a suitable location near the main gate of the Company in public domain. The circular No. 3-20012/1/2006-IA.II (M) dated 27.05.2009 issued by Ministry of Environment, Forest and Climate Change shall also be referred in this regard for its compliance.	The critical parameters such as PM10, PM 2.5, NOx and Sox etc. in the ambient air are being monitored within the impact zone, peak particle velocity at Kayad Village being monitored regularly. Zero discharge is being maintained. PM 10, PM 2.5, NOx monitoring data and peak particle velocity data are being uploaded on website of the company as well as display board on main gate of the company.
•	Effective safeguard measures such as regular water sprinkling shall be carried out in critical areas prone to air pollution and having high levels of Phyllo and PM2.5 such as haul road, loading and unloading point and transfer points. Fugitive dust emissions from all the sources shall be controlled regularly. It shall be ensured that the Ambient Air Quality parameters conform to the norms prescribed under National Ambient Air Quality Standards (NAAQS) or by the Central Pollution Control Board in this regard. Monitoring of Ambient Air Quality to be carried out based on the Notification 2009, as amended from time to time by the Central Pollution Control Board.	An effective safeguard measure has been taken and regular water spraying on the haul road, loading and unloading area are being carried out. Ambient Air Quality parameters maintained and monitored as per National Ambient Air Quality Standards (NAAQS) or by the Central Pollution Control Board. Monitoring data enclosed as Annexure-II
Э.	Regular monitoring of ground water level and quality shall be carried out in and around the mine lease by establishing a network of existing wells and constructing new piezometers during the mining operation. The project proponent shall ensure that no natural water course and/or water resources shall be obstructed due to any mining operations. The monitoring shall be carried out four times in a year pre- monsoon (April-May), monsoon (August), post-monsoon (November) and winter (January) and the data thus collected may be sent regularly to Ministry of Environment, Forest and Climate Change and its Regional Office, Central Ground Water Authority and Regional Director, Central Ground Water Board.	Regular monitoring of ground water level and quality is being carried out in and around the mine lease by establishing a network of existing wells and piezometers. No natural water course / water resources obstructed due to mining operations. The Water level and water quality Annexure -I.
1.	Regular monitoring of the flow rate of the springs and perennial allays flowing in and around the mine lease shall be carried out and records maintain. The natural water bodies and or streams which are flowing in an around the village	No springs and perennial allay flowing in and around the mine lease.

2		should not be disturbed, The Water Table should be nurtured	
		so as not to go down below the pre-mining period. In case of any water scarcity in the area, the Project Proponent has to provide water to the villagers for their use. A provision for regular monitoring of water table in open dug wall located in village should be incorporated to ascertain the impact of mining over ground water table	
	12.	Regular monitoring of water quality upstream and downstream of water bodies shall be carried out and record of monitoring data should be maintained and submitted to the Ministry of Environment, Forest and Climate Change and its Regional Office, Central Ground Water Authority, Regional Director, Central Ground Water Board, State Pollution Control Board and Central Pollution Control Board.	Regular monitoring of water quality upstream and downstream of water bodies carried out and analysis report Enclosed Annexure-I
	13.	Transportation of the minerals by road passing through the village shall not be allowed. A 'bypass' road should be constructed (say, leaving a gap of at least 200 meters) for the purpose of transportation of the minerals so that the impact of sound, dust and accidents could be mitigated. The project proponent shall bear the cost towards the widening and strengthening of existing public road network in case the same is proposed to be used for the Project. No road movement should be allowed on existing village road network without appropriately increasing the carrying capacity of such roads.	Transportation of the lead & zinc ore is being done by road which is passing through Highways.
	14.	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.	Ensured the biological clock of the villagers by orienting the floodlights/ masks away from the villagers and keeping the noise levels well within the prescribed limit for day and night. Annexure-III.
	15.	Main haulage road in the mine should be provided with permanent water sprinklers and other roads should be regularly wetted with water tankers fitted with sprinklers. The material transfer points should invariably be provided with Bag filters and or dry fogging system. In case of Belt-conveyors facilities the system should be fully covered to avoid air borne dust; Use of effective sprinkler system to suppress fugitive dust on haul roads and other transport roads shall be ensured.	Mine haul road is being wetted through water tankers fitted with sprinklers. Annexure- XI No Permanent water sprinkler. Effective sprinkling system is in place to suppress fugitive dust on haul road. Belt-conveyor at CRF is fully covered to avoid air borne dust.
	16.	Sufficient number of Gullies to be provided for better management of water. Regular Monitoring of pH shall be included in the monitoring plan and report shall be submitted to the Ministry of Environment, Forest and Climate Change and its Regional Office on six monthly bases.	Mine water monitored regularly, and report attached as Annexure - IV. Regular pH Monitoring Report enclosed Annexure-V.
	17.	There shall be planning, developing, and implementing facility	Rainwater harvesting is being

	implementation of conservation measures to augment ground water resources in the area in consultation with Central Ground Water Board.	structure made in consultation with CGWA. Annexure- XII
18.	The Project Proponent has to take care of gullies formed on slopes. Dump mass should be consolidated with proper filling/leveling with the help of Dozer/compactors.	No dump mass, all the waste used in backfilling purpose.
19.	The reclamation at waste dump sites shall be ecologically sustainable. Scientific reclamation shall be followed. The local species may be encouraged and species are so chosen that the slope, bottom of the dumps and top of the dumps are able to sustain these species. The aspect of the dump is also a factor which regulates some climatic parameters and allows only species adapted to that micro climate.	No waste dumps. All the mine waste reused for backfilling in underground.
20.	The top soil, if any, shall temporarily be stored at earmarked site(s) only and it should not be kept unutilized for long. The topsoil shall be used for land reclamation and plantation. The over burden (OB) generated during the mining operations shall be stacked at earmarked dump site(s) only and it should not be kept active for a long period of time. The maximum height of the dumps shall not exceed 8m and width 20 m and overall slope of the dumps shall be maintained to 45°. The OB dumps should be scientifically vegetated with suitable native species to prevent erosion and surface runoff. In critical areas, use of geo textiles shall be undertaken for stabilization of the dump. The entire excavated area shall be backfilled and afforested. Monitoring and management of rehabilitated areas should continue until the vegetation becomes self- sustaining. Compliance status shall be submitted to the Ministry of Environment, Forest and Climate Change and its Regional Office on six monthly basis.	The top soil stored at earmark location of 9000 CuM soil in 645 Sq M and developed a beautiful garden on it. All the waste utilized in the mine void refilling. No such OB Dump.
1.	Catch drains and siltation ponds of appropriate size shall be constructed around the mine working, mineral and OB dumps to prevent run off of water and flow of sediments directly into the river and other water bodies. The water so collected should be utilized for watering the mine area, roads, Green belt development etc. The drains shall be regularly desilted Particularly after monsoon and maintained properly. The drains, settling tanks and check dams of appropriate size, gradient and length shall be constructed both around the mine pit and over burden dumps to prevent run off of water and flow of 'sediments directly into the river and other Water bodies and sump capacity should be designed keeping 50% safety margin over and above peak sudden rainfall (based on 50 years data) and maximum discharge in the area adjoining the mine site. Sump capacity should also provide adequate retention period to allow proper settling of silt Material. Sedimentation pits shall be constructed at the	Catch drains and siltation ponds constructed to collect and prevent run off water and flow of sediments directly into the river and other water bodies. Water so collected used for dust suppression in mine area haul roads, green belt development, recharge etc . The drain and settling pond are being regularly de-silted and maintained properly.

22.	Plantation shall be raised in a 7.5m wide green belt in the safety zone around the mining lease, backfilled and reclaimed area, around water body, along the roads etc. by planting the native species in consultation with the local DFO/Agriculture Department and as per CPCB Guidelines. The density of the trees should be around 2500 plants per ha. Greenbelt shall be developed all along the mine lease area in a phased manner and shall be completed within first five years.	Plantation has been raised around boundary of acquired area along the road etc. and included the native species. More than 33% Greenbelt has been developed in mine area. Annexure -XIII
23.	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", if any, applicable to the project.	Being ensured
24.	The Project Proponent shall make necessary alternative arrangements, where required, in consultation with the State Government to provide alternate areas for livestock grazing, if any. In this context, Project Proponent should implement the directions of the Hon'ble Supreme Court with regard to acquiring grazing land. The sparse trees on such grazing ground, which provide mid-day shelter from the scorching sun, should be scrupulously guarded against felling and plantation of such trees should be promoted.	Ensured
25.	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.	A nursery has been developed within mine area for rare plant's species and other medicinal plants. Same being included in yearly plantation program to improve their existence.
26.	As per the Company Act, the CSR cost should be 2 % of average net profit of last three years. Hence CSR expenses should be as per the Company Act/Rule for the Socio Economic Development of the neighborhood Habitats which could be planned and ,executed by the Project Proponent more systematically based on the 'Need based door to door survey' by established Social Institutes/Workers. The report shall be submitted to the Ministry of Environment, Forest and Climate Change and its Regional Office on six monthly bases.	The baseline needs assessment Survey done.
27.	Provision shall be made for the housing of construction labor within the site with all necessary infrastructure and facilities such as Mel for cooking, mobile toilets, mobile STP, safe drinking water, medical health care, crèche etc. The housing may be in the form of temporary structures to be removed After the completion of the project.	The facilities are provided like Canteen, Toilets, STP Annexure IX, and safe drinking water and a permanent Doctor for their health care and crèche etc.

28.	Measures should be taken for control of noise levels below 85 dBA in the work environment. Workers engaged in operations of HEMM, etc. should be provided with ear plugs / muffs.	Regular monitoring of the noise in work environment is being carried out and workers engaged in operations of HEMM are being ensured with ear muffs.
29.	Industrial waste water (workshop and waste water from the mine) should be properly collected, treated so as to conform to the standards prescribed under GSR 422 (E) dated 19th May, 1993 and 31st December, 1993 or as amended from time to time. Oil and grease trap should be installed before discharge of workshop effluents.	Oil and grease trap have been installed at vehicle washing area and clean water reuse for vehicle washing- Annexure-X. Mine water reused for drilling and dust suppression, CRF Plant. Zero discharge Maintained.
30.	Personnel working in dusty areas should wear protective respiratory devices and they should also be provided with adequate training and information on safety and health aspects.	Job specific PPE are mandatory for all workers and regular training being given on safety and health aspect.
31.	A separate environmental management cell with suitable qualified personnel should be set-up under the control of a Senior Executive, who will report directly to the Head of the Organization.	A separate environmental management department is in place under control of SBU Director.
32.	The funds earmarked for environmental protection measures should be kept in separate account and should not be diverted for other purpose. Year wise expenditure should be reported to the Ministry and its Regional Office.	The funds earmarked for environmental protection measures and kept in separate account. The expenditure from October 2022 to April 2023 has been incurred Rs 46.58 Lacs to implement the Environmental Management Plan.
33.	The project authorities should inform to the Regional Office regarding date of financial closures and final approval of the project by the concerned authorities and the date of start of land development work.	No additional land is required for proposed expansion.
34.	The project proponent shall submit six monthly reports on the status of the implementation of the stipulated environmental safeguards to the Ministry of Environment, Forest and Climate Change, its Regional Office, Central Pollution Control Board and State Pollution Control Board.	Being Complied
35.	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.	The project will extend full cooperation to the officer (s) of the Regional Office by furnishing the requisite data / information / monitoring reports.
36.	A copy of clearance letter will be marked to concerned Panchayat / local NGO, if any, from whom suggestion / representation has been received while processing them proposal.	Complied
37.	State Pollution Control Board should display a copy of the clearance letter at the Regional office, District Industry Centre and Collector's office/Tehsildar's Office for 30 days.	Complied

38.	The project authorities should advertise at least in two local newspapers widely circulated, one of which shall be in the vernacular language of the locality concerned, within 7 days of the issue of the clearance letter informing that the project has been accorded environmental clearance and a copy of the clearance letter is available with the State Pollution Control Board and also at web site of the Ministry of Environment, Forest and Climate Change at www.environmentclearance.nic.inand a copy of the same should be forwarded to the Regional Office.	Complied
14.	The Ministry or any other competent authority may alter/modify the above conditions or stipulate any further condition in the interest of environment protection.	Assured to comply
15.	Concealing factual data or submission of false/fabricated data and failure to comply with any of the conditions mentioned above may result in withdrawal of this clearance and attract action under the Provisions of the Environment (Protection) Act. 1986.	Assured to Comply
16.	The above conditions will be enforced inter-alia, under the provisions of the Water (Prevention & Control of Pollution) Act, 1974, the Air (Prevention & Control of Pollution) Act, 1981, the Environment (Protection) Act, 1986 and the Public Liability Insurance Act, 1991 along with their amendments and rules made there under and also any other orders passed by the Hon'ble Supreme Court of India/ High Court of Rajasthan and any other Court of Law relating to the subject matter.	Assured to Comply
17.	Any appeal against this environmental 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.	Assured to Comply

K.C. MEENA Director (SBU) Hindustan Zinc Ltd. Kayad Mine-305023 Dist.-Ajmer (Raj.)

Annexure | (1/3)

HINDUSTAN ZINC LIMITED KAYAD MINE

PIEZOMETER WATER ANALYSIS REPORT

	P-1		-d	2	Ъ-	3	Ъ.	4	P-	5
Parameters	Dec-22	Feb-23								
Hd	6.92	7.2	7.48	7.17	7.73	7.18	7.86	7.2	6.9	7.29
Hardness	788.46	4903.85	1019.05	3461	5673.08	5096.15	1086.54	4903.85	826.92	4326.92
Iron	BDL	0.11	0.03	0.07	0.09	0.1	0.04	0.13	0.02	0.07
Chloride	2660.88	4856.85	542.03	2768.29	4829	4031.02	719.42	9324.77	2397.13	3302.52
TDS	5388	13293	2594	7534	8428	11348	2972	12934	5816	9242
Copper	BDL	0.04	BDL	0.02	BDL	0.04	BDL	0.05	BDL	0.03
Sulphate	495	2175	158	1293.75	1475	1762.5	182	2150	180	1518.75
Cadmium	BDL									
Lead	BDL	0.04	BDL	BDL	0.01	0.05	BDL	0.07	BDL	0.03
Zinc	BDL	BDL	0.07	0.45	3.39	0.03	0.21	0.02	BDL	BDL
Alkalinity	388	258.9	485	397.7	443.9	407.4	543.2	349.2	562.6	339.5
Nickel	BDL	0.05	BDL	0.02	BDL	0.06	BDL	0.06	BDL	0.05
Cyanide	BDL									
Cobalt	BDL	0.07	BDL	0.04	BDL	0.06	BDL	0.06	BDL	0.04
TSS	21	171	9	118	57	175	13	138	36	121
Total solid	5409	13464	2603	7652	8485	11523	2985	13072	5852	9363

All figureas are in mg/l except pH

to to

Annexure I (2/3)

HINDUSTAN ZINC LIMITED KAYAD MINE GROUND WATER ANALYSIS REPORT

					1 111	n Ic	Cha	tri Villape D.	/5	Loha	agal Village L	J/S
Parameters	Kay	rad Village L	1/5	Gagw	vana village	c/n		CC 200	Cah.73	Raceline	Dec-22	Feb-23
5	Raceline	Dec-22	Feb-23	Baseline	Dec-22	Feb-23	Baseline	Dec-22	C7-021		1636	7.64
	1	000	7 89	11	8.13	6.7	7.5	7.77	1.9	ת מ	70.1	
Id	/	0.00		200	155 77	320	1366	740.38	720	1233	495.19	530
Hardness	245	126.92	DCT	010	IUD	BDI	0.2	0.03	0.05	0.18	BDL	BDL
Iron	0.33	0.08	0.04	AT.U	BUL	1000	CVOL	51015	624.8	1060	315.56	389.97
Chloride	92	47.3	51.98	536	41.3	CD.RZT	7407	22010		1513	1719	1872
1101100	E DO	301	370	812	281	813	4746	1936	TATT	7704	00.17	01 01
TDS	060	TOO	1100		15.47	26.73		56.07	63.18	1	44.39	01.10
Mg	e.	QN.51	CT.ZT			iua	<0.01	BDL	BDL	<0.01	BDL	BDL
Copper	0.03	BDL	BDL		BUL	100	10.01	1453	139.1	666.8	75.8	112.98
Sulphate	54.9	53.5	73.62	302	28.08	13.33	0.210	100	ICIa	<0.01	BDL	BDL
minim per	<0.01	BDL	BDL	<0.01	BDL	BDL	10.0>	DUL	DUL	10.0	100	ICa
Caumun	1000	i C c	ICa	<0.01	BDL	BDL	<0.01	BDL	BDL	TO'N>	DUL	
Arsenic	10.02	BUL	100	10.00	100	ICIA	0.01	BDL	BDL	0.01	BDL	BDL
Lead	0.01	BDL	BUL	TN'A	ם הר	100	0.00	N DE	0.09	0.32	0.19	0.15
Zinc	2.76	BDL	BDL	0.1	BDL	BUL	0.00		UQL	186	573.8	510
A I La Date.	CLC	121 97	160	456	118.34	290	524	71.107	700	207	r	U
AIKAUTILY	717		c		4	2	7	2	6	è	,	S
TSS	E.	٥	ni	i	100	IUN	BDI	BDL	BDL	BDL	BDL	BDL
Cobalt	BDL	BDL	BUL	DUL	201		RDI	ICA	3DL	<0.001	BDL	BDL
Mercury	<0.001	BDL	BDL	100.05	BUL	BUL		100	ina	<0.07	BDL	BDL
Cuanido	<0.02	BDL	BDL	<0.02	BDL	BDL	BUL	DUL	201	10.0	IUd	IUA
chaille		100	ICa	ICB	BDL	BDL	0.02	BDL	BDL	BUL	BUL	
Nickel	BUL	DUL		2	100	818	3260	1943	1920	i.	1726	18/8
Total solid	,	307	3/3	1	C07	DT D	2				(1
										ł	PAR-	

All figureas are in mg/l except pH

		Water level of Pi	ezometers 8	k open wells				An	nexure I (3	(3)
S.No.	Source Code	Location with land mark	Lattitude	Longitude	0ct-22	Nov-22	Dec-22	Jan-23	Feb-23	Mar-23
-1	L.4	Piezometer-1, near VTC- HZL	N26'31'44.1"	E74*41'19.2"	19.4	21.8	23.6	25.4	26.1	27.5
2	6-2	Near mine dumped area, HZL fuel pump	N26*31'56.9"	E74°41'41 1"	24.4	25.1	28.5	26.1	27	27.2
м	p-3	Plantation area, nursery, near other collapsed bore well	"C.01'25°32'N	E74°41'44.4"	13.5	14.1	16.9	16.5	16.8	17.2
4	p-4	New drilled bore well, near ANFO Mixing plant, HZL boundary wall corner	26°32'02.0''	74*41'45.2"	6.1	8.3	8.9	9.5	10.1	10.8
S	P-5	New drilled bore well, DG Set area	26°31'40.3"	74°41'29.1"	13.1	13.5	14.1	14.9	15.1	15.6
Q	T-W	Man Singh Raghuveer singh Chandawal, Kayar/ Naeem Bhutta	N26*33'25.7"	E74°41'45.9"	11.2	12.1	14.5	14.1	15.7	15.1
7	2- W	Gurjar Well Near Abkar Minar and ARG opp SK associates	N26°32'48.5"	E74°42'24.8"	15.2	15.8	17.1	14.3	15.2	18.5
00	W-3	Near Talab area, land planning by propoerty dealers/ poltary farm	N26*32'08.3"	E74°42'27.7"	16.4	17.4	17.1	18.2	1.9.1	18.8
σ	W-4	Viohan Gurjar Well Kayad	N26°31'11.7"	E74°41'02.7"	9.5	10.8	11.5	13.5	12.9	12.7
10	W-5	Near outside HZL boundary wali, near outside HZL road area	N26*31'52.7"	E74°41'36.0"	17.3	21.8	22.2	22.9	21.8	21.4
11	W-6	Near Govt. School/Mr. Sultan Master, Kamurdin Nizam ji Kaya	N26*31'38.7"	E74°41'11.3"	16.1	16.9	16.4	17.1	15.7	19.2
									and a state	

June -

HINDUSTAN ZINC LIMITED KAYAD MINE

AMRIENT AIR MONITORING

1

AMBIENT AIR MONITORING												Annexure-II		
Location->				Mine Ar	ea (CRF)					Ka	yad			
month-year	Forthnight	SPM	PM ₁₀	PM2.5	SO ₂	NOx	со	SPM	PM ₁₀	PM2.5	SO2	NOa	CO	
	Ist	138.15	64.78	30.91	3.19	12.09	320.00	160.88	75.21	31.10	5.97	12.86	290.00	
Oct-22	IInd	135.48	52.74	28.55	3.37	13.17	340.00	134.68	69.91	28.44	3.24	10.33	270.00	
	İst	156.31	73.26	28.29	5.71	14.38	350.00	148.85	69.47	31.26	6.47	12 17	290.00	
Nov-22	IInd	169.07	65.27	32.30	3.21	13.76	270.00	162.53	56.74	31.11	3.29	13.60	320.00	
	lst	173.79	82.42	30.62	3.85	12.99	380.00	182.32	74.95	37.91	3.87	12.77	360.00	
Dec-22	IInd	153.62	69.27	33.43	5.13	12.46	370.00	153.48	71.39	36.56	4.01	14.08	260.00	

Location->				Loh	agal			Gagwana						
month-year	Forthnight	SPM	PM ₁₀	PM2.5	SO ₂	NOs	СО	SPM	PM10	PM2.5	SO_2	NO3	CO	
	İst	158.63	66.29	28.10	4.67	10.02	230.00	159.57	60.38	30.40	5.89	13.43	250.00	
Oct-22	lind	157.14	59.68	25.93	3.48	10.76	230.00	161.19	65.91	29.83	5.55	13.95	350.00	
	lst	143.25	63.18	28.51	5.26	13.50	250.00	157.46	75.20	32.68	6.37	13.95	280.00	
Nov-22	IInd	162.57	61.54	29.13	3.90	12.57	280.00	159.67	58.34	30.20	3.08	12.59	260.00	
(Anni Annani)	İst	169.89	73.01	25.22	3.16	12.95	340.00	175.47	76.68	30.20	3.97	12.98	350.00	
Dec-22	llnd	170.02	77.24	31.16	4.03	13.69	290.00	129.24	58.10	25.95	3.63	12.91	280.00	

Location->		Chatri										
month-year	Forthnight	SPM	PM ₁₀	PM2.5	SO ₂	NOx	со					
001	Ist	148.17	57.93	24.91	4.20	10.67	210.00					
Oct-22	IInd	150.63	69.92	24.99	4.14	15.68	280.00					
	lst	146.37	75.81	28.75	4.92	12.76	250.00					
N0v-22	lind	162.29	62.05	32.96	2.99	12.27	270.00					
	lst	173.19	74.65	25.53	3.16	13.43	330.00					
Dec-22	lind	151.66	65.89	28.15	4.09	14.94	280.00					

HINDUSTAN ZINC LIMITED KAYAD MINE

AMBIENT AIR MONITORING

AMBIE	NT AIR	MONIT	ORING									Annexur	e-1]
Location-	>			Mine Ar	ea (CRF)					Ka	yad		
month-yes	Forthnigh	SPM	PM ₁₀	PM2.5	SO ₂	NOx	CO	SPM	PM ₁₀	PM2.5	SO ₂	NO _x	со
Inn 22	lst	153.78	66.67	35.84	5.29	12.87	380.00	151.52	73.76	31.16	7.25	13.21	250.00
Jan-23	lind	93.00	42.94	17.56	3.08	11.69	190.00	64.73	36.26	16.19	3.00	12.33	170.00
12.1. 32	lst	138.66	66.89	32.92	5.45	14.02	340.00	131.34	71.14	35.27	5.42	11.48	260.00
F (D-23	IInd	160.97	79.01	44.14	5.55	12.97	350.00	143.61	73.00	46.93	6.08	12.45	290.00
\$4	lst	148.60	70.62	35.03	4.09	13.76	370.00	146.64	73.19	30.46	4.73	13.46	290.00
WINF-23	lind	145.67	67.33	24.99	4.89	14.50	320.00	123.69	60.88	33.20	3.64	14.80	290.00

Location->	>			Loh	agal		10	Gagwana							
month-yes	Forthnigh	SPM	PM ₁₀	PM2.5	SO2	NOx	CO	SPM	PM ₁₀	PM2.5	SO_2	NOx	CO		
Inn 77	lst	148.67	73.30	43.42	5.79	13.65	280.00	169.86	77.61	32.77	5.70	13.20	270.00		
Jan-23	IInd	78.62	42.78	21.05	2.69	11.16	190.00	81.48	29.85	16.32	2.17	11.81	160.00		
P.L. 22	lst	146.16	69.00	34.97	5.22	15.98	280.00	143.48	83.02	36.05	5.67	15.18	270.00		
r cD-43	lInd	148.89	73.26	33.62	2.03	13.82	280.00	149.43	69.60	33.02	6.62	12.46	260.00		
V	lst	159.72	70.50	37.64	4.93	12.53	290.00	143.85	70.65	32.37	4.42	13.19	260.00		
star-23	lInd	132.96	67.51	27.11	5.40	14.83	340.00	124.17	61.69	29.31	3.00	14.31	280.00		

Location-	ocation-> Near ANFO							Near Sub Station							
month-ye:	Forthnigh	SPM	PM ₁₀	PM2.5	SO2	NO _x	со	SPM	PM ₁₀	PM2.5	SO ₂	NO _x	со		
1	lst	157.05	75.54	33.90	4.02	14.27	360.00	141.20	78.41	32.87	5.66	12.59	280.00		
Jan-23	lind	109.11	57.12	19.17	3.70	12.32	270.00	91.74	48.17	16.31	3.12	13.96	210.00		
E.L. 33	lst	147.90	73.08	26.32	6.32	14.47	310.00	143.86	75.80	29.74	5.67	14.09	320.00		
PE0-23	lInd	136.94	72.55	36.27	4.09	12.85	370.00	154.95	83.99	31.40	5.56	12.98	340.00		
Mar 17	lst	156.13	79.63	42.35	4.28	14.98	360.00	138.63	64.09	40.81	5.31	14.73	350.00		
Mar-23	lInd	128.96	67.29	30.25	4.21	14.56	330.00	136.27	73.21	26.58	6.53	13.53	340.00		

		-			HINDUS		LIMITED		_	_			1
	1							1	-		I	Annex	ure-III
		N	ioise Leve	l Monito	ring Rep	ort for Q	uarter O	et-22 to N	1ar 2023)			
S.No	Location	Oct-22	Nov-22	Dec-22	Jan-23	Feb-23	Mar-23	Oct-22	Nov-22	Dec-22	Jan-23	Feb-23	Mar-23
N-1	South West Corner of Mine Boundary	56.5	<u>Day 11m</u> 57.7	60.7	62.7	<u>/300(/4)</u> 60.7	59.8	48.3	50.8	51.8	55.5	51.9	50.5
N-2	East Side Boundary Near West Dump	61.2	58.3	63.3	65.3	64.4	60.8	49.5	49.6	54.2	57.4	53.7	50.6
N-3	North East Corner of Mine Boundary	58.7	59.6	59.2	63.7	61.2	58.5	50.0	51.2	.51.3	55.8	50.5	50.2
N-4	North West Corner of Mine Boundary	58.2	58.8	62.7	60.5	62.7	59.1	47.9	50.6	53.8	51.7	52.5	48.1
N-5	West Side Towards Kayad Village	57.6	61.4	61.5	64.2	62.3	57.8	46.4	52.4	50.9	53.4	53.4	46.6
N-6	South East East Corner	60.7	62.8	64.3	61.3	60.3	61.2	51.3	53.8	53.3	62.7	50.2	51.6
S.No	Location		Day Time	e Residen	cial Limi	t 55dB(A)		1	Night Tim	e Reside	ncial Lim	it 45dB(A)
N-7	Kayad Village	53.3	52.8	52.3	52.6	53.8	52.7	41.2	41.3	42.2	43.8	43.3	42.5
N-8	Lohagal Village	51.8	53.4	51.7	53.9	54.2	50.6	40.6	41.5	41.9	41.2	43.8	40.4
N-9	Gagwana	50.8	53.6	53.2	52.7	52.7	53.8	41.2	42.5	43.7	41.3	42.5	43.5

- frost

Annexure	IV
-	

		KAYAD	MINE			
	MINEV	VATER ANA	LYSIS REP	PORT		
			Dac 22	lan-73	Feb-23	Mar-23
Parameters	Oct-22	7.20	6 00	7 24	7.49	7.42
рН	7.29	7.36	0.75	2070	3873	3926
fotal Disolved Solod	3778	3846	1870	20/0	28	24
Fotal Suspended Solid	28	25	86	2016	3801	3950
Fotal Solid	3806	3871	7964	3910	201 07	837.68
Chloride	973.81	906.67	3206,45	858.17	091.92	<0.05
Cyanide	< 0.05	< 0.05	< 0.05	<0.05	000.3	1000 8
Hardness	1059	1067.96	3137.25	970.3	980.2	010 5.0
Sulphate	794	813	1400	857	886	920.57
Arsenic	BDL	BDL	BDL	BDL	BDL	BDL
Cadmium	BDL	BDL	0.1	BDL	BDL	BDL
Cobalt	BDL	BDL	0.1	BDL	BDL	BDL
Copper	0.05	0.04	0.07	0.13	0.08	0.07
Copper	0.07	0.09	0.06	0.05	0.05	0.05
Iron	BDI	BDL	0.32	BDL	BDL	BDL
Lead	2.09	BDL	1.7	0.14	0.85	1.13
Zinc	76.9	87 12	104.76	81.48	55.68	88.32
Alkalinity	70.0	67.82	71 44	52.64	76.51	69.82
MG	/8.58	07.02	BDI	BDI	BDL	BDL
Hg	BDL	BDL	0.14	0.12	0.12	0.14
Ni	0.22	BUL	0.14	1 0.12		10

				Hindu	stan Zinc	Limited Kayad	Mine			Annovire-V	
				pH monitorin	g report	October 2022-	Mar 2023		-u T	Month	InH
Aonth	рН	Month	рН	Month	pH	Month	pH T OD	Month	7 90	01/03/2022	7.
01/10/2022	7.88	01/11/2022	7.51	01/12/2022	7.28	01/01/2023	7.88	01/02/2022	7.00	02/03/2022	7
02/10/2022	7.83	02/11/2022	7.50	02/12/2022	7.27	02/01/2023	7.83	02/02/2022	7.99	03/03/2022	7
03/10/2022	7.90	03/11/2022	7.49	03/12/2022	7.26	03/01/2023	7.90	03/02/2022	7.00	04/03/2022	7
04/10/2022	7.77	04/11/2022	7.45	04/12/2022	7.25	04/01/2023	7.77	04/02/2022	7.00	05/03/2022	7
05/10/2022	7.79	05/11/2022	7.43	05/12/2022	7.24	05/01/2023	1.79	05/02/2022	7.13	05/03/2022	7 7
6/10/2022	1.79	06/11/2022	7.40	06/12/2022	7.19	06/01/2023	1.79	05/02/2022	7.43	07/03/2022	2 7
07/10/2022	7.29	07/11/2022	7.35	07/12/2022	2 7.41	07/01/2023	7.29	08/02/2022	7.40	08/03/202:	2 7
08/10/2022	7.29	08/11/2022	7.34	08/12/2023	2 7.41	08/01/2023	7.29	00/02/2022	7.36	09/03/202:	2 7
09/10/2022	2 7.72	09/11/2022	2 7.30	09/12/2023	2 7.40	09/01/2023	7.90	10/02/2022	7.34	10/03/202:	2
10/10/2022	7.80	10/11/2022	2 7.29	10/12/2023	2 7.30	10/01/2023	7.80	11/02/2022	7 30	11/03/202	2
11/10/2022	2 7.30	11/11/2023	2 7.29	11/12/202	2 7.90	11/01/2023	7.30	12/02/2022	7.29	12/03/202	2
12/10/2023	2 7.29	12/11/202	2 7.31	12/12/202	2 7.90	12/01/2023	7.23	12/02/2022	7 79	13/03/202	2
13/10/2022	2 7.28	13/11/2023	2 7.30	13/12/202	2 7.77	13/01/2023	7.20	10/02/2022	7 31	14/03/202	2
14/10/2023	2 7.26	14/11/202	2 7.29	14/12/202	2 7.79	14/01/2023	3 7.27	15/02/2022	7.30	15/03/202	2
15/10/202	2 7.29	15/11/202	2 7.28	15/12/202	2 7.79	15/01/202:	5 7.30	15/02/2022	7.50	16/03/202	2
16/10/202	2 7.23	16/11/202	2 7.27	16/12/202	2 7.29	16/01/202:	3 7.29	10/02/2022	7 10	17/03/202	2
17/10/202	2 7.30	17/11/202	2 7.26	17/12/202	2 7.29	17/01/202	3 7.28	17/02/202	7.20	19/02/202	0
18/10/202	2 7.17	18/11/202	2 7.25	18/12/202	2 7.72	18/01/2023	3 7.26	18/02/202	7.21	10/03/202	2
19/10/202	2 7.20	19/11/202	2 7.24	19/12/202	2 7.80	19/01/202	3 7.29	19/02/202	2 7.20	20/03/202	
20/10/202	2 7.82	20/11/202	2 7.83	20/12/202	2 7.30	20/01/202	3 7.23	20/02/202	2 7.20	20/03/202	2
21/10/202	2 7.82	21/11/202	2 7.90	21/12/202	2 7.29	21/01/202	3 7.30	21/02/202	7.24	72/03/202	2
2.2/10/202	2 7.83	22/11/202	2 7.43	22/12/202	2 7.28	22/01/202	3 7.17	22/02/202	2 7.23	22/03/202	27
23/10/202	2 7.30	23/11/202	2 7.42	23/12/202	2 7.26	23/01/202	3 7.20	23/02/202	2 7.20	23/03/202	12
24/10/202	2 7.29	24/11/202	2 7.40	24/12/202	2 7.29	24/01/202	3 7.82	24/02/202	2 7.25	24/03/202	22
25/10/202	2 7.29	25/11/202	2 7.36	25/12/202	2 7.23	25/01/202	3 7.82	25/02/202	2 1.22	25/03/202	-4
26/10/202	2 7.31	26/11/202	2 7.34	26/12/202	2 7.30	26/01/202	3 7.83	26/02/202	2 7.20	26/03/202	
27/10/202	2 7.30	27/11/202	2 7.30	27/12/202	2 7.17	27/01/202	3 7.88	27/02/202	2 /.1/	21/03/202	
28/10/202	2 7.29	28/11/202	2 7.29	28/12/202	2 7.43	28/01/202	.3 7.89	28/02/202	2 7.19	28/03/202	-4
29/10/202	7.28	29/11/202	2 7.29	29/12/202	22 7.42	29/01/202	3 7.89	-		29/03/202	12
30/10/202	2 7.92	30/11/202	2 7.31	30/12/202	2 7.40	30/01/202	3 7.92		-	30/03/202	44
21/10/203	2 8 00		1	31/12/202	22 7.36	31/01/202	8.00			31/03/202	22

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TEAM TEST HOUSE



(Unit of Team Institute of Science & Technology Pvt. Ltd.)

Approved by Ministry of Environment and Forest, Government of India 25 Environmental Laboratory JDA/UDH

15O 45001:2018 (OH&S) ISO 14001:2015, ISO 9001:2015,

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TEST REPORT

Report No./Job Id. :	200000354 A
Date :	M/S Hindustan Zinc Limited (Kayad Mines)
Issued To	Village-Kayad
	District - Ajmer (Rajasthan)
an a film du notan a s	Mines
Type of Indusiry .	Potable and Domestic Water
Type of Sample :	15.02-2023
Date of Sample Collection/Monitoring :	10-02-2020
Date of Sample Receipt	16-02-2023 16-02-2023 TO 27-02-2023
Date of Test :	Sitaram Jangid
Sample Collected By : Point of Collection :	Mine Water

RESULTS

S.No	Parameters	Observed Value	Testing Protocol	
1 2 3	Radioactive Substances : Gross Alpha (Bq/I) Gross Beta (Bq/I)	BDL (< 0.0105) BDL (< 0.205)	IS 14194 (Part 2) : 2013 IS 14194 (Part 1) : 2013	

Notes :-

The results listed refer only to the lested sample (s) & parameters (s). Endorsement of products is neither inferred nor implied. #

This report is not to be reproduced wholly or in part and can not be used evidence in the court of law and should not be used in any advertising media without our special permission in writing. #

The samples will be destroyed after 15 days from the date of issue of test report unless otherwise specified. #

Senior Analyst

Authorized Signatory Q

(Report No. 100000354A)

Mechanism for addressing Environmental Issues

HZL has a Health Safety and Environment Policy, given below, signed by its CEO and forms the guidelines for the entire organization. A well laid mechanism is implemented uniformly across all units of HZL for the implementation of the policy.

All operating uints of Hindustan Zinc Limited are certified for ISO-14001 Environmental Management system (EMS). The Management Representative (MR) of the certification system is an experienced environmental officer with due authority to implement and drive a responsible EMS. The MR is duly supported by a committee constituting the operations and maintenance officers of the unit. The system has a well laid documented procedure for identification of all environmental aspect, Impacts and implementation of suitable mitigation measures.

The company has three level monitoring mechanism for addressing environmental concerns starting at unit level, HZL corporate level and Vedanta group company level. Depending on the scale and nature of the issue, the concern is escalated to different level right up to the Board of the company and also the shareholders of the company in the general body meetings.

The compliances to Environment Clearance and all environmental licenses are reviewed and monitored regularly and reports are submitted to the respective regulatory authorities at every unit, by a dedicated environmental professional, who reports directly to the unit head. The compliance is periodically reviewed and audited by Corporate Environment Department, which reports to the top management of the company. A Corporate Sustainability Committee, chaired by the CEO of the company, oversees all sustainability issues including Environment, Safety and Health and also reviewing any policy matters.

Any non-compliances/show cause/notices/complaints received from regulatory authority or any stakeholder is addressed jointly by the unit and corporate environment department. Such issues are also reported and the actions taken are reviewed by the top management every month. Further, all show cause, complaint letters and notices from any stakeholder, along with the action taken report is submitted to the Board Of Directors of the company every quarterly. All major concerns are reported to the stakeholders through the annual general body meetings of the company.

e ve	danta	HINDUSTAN ZINC
	HINDUST	TAN ZINC
H	lealth Safety & Environ	ment Policy (HSE Policy)
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6 HSE	reampowerse and occupation to stap any too seing carry values shall never be compromised.	od dutiti an ansate marrier.
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Health, Sa	fety & Environment (HSE) Policy	
Hindustan Zi Ita Tellowing era required	inc is committed to achieve excellence in Occupational I g policy which applies to all employees and directors, to the comply with the Policy when they act on behalf of the	Health, Safety and Environment 945ED management by implementing socialese partners, suppliers, consultants, and external advisors who studies. Zinc.
Hindustan 2	inc.will. No with applicable national regional, and local MSE	regulations and stabilizer obligations in the shappen for larki of
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P. Hata	a avareness by training employees, tusiness partners	, suppliers, and other stakeholders to adopt principles and practices
it all	provent with surpriscies.	
the Policy i	a part of the Verlanda Sustainability Pramework and	Hindustan Zivo shall implement this policy and its technical and of Directory. Bostones leaders will be baid extraordate by 1000 and
andativabilit	y performance and line managers are responsible	for the hull implementation of the related HSE and sustainability
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The p	stray is not any approach to be present data factor company a with	sprate but also to of the due 4 ligence mergers and could bland, and new rearranged
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		Anna Mahna
		Arun Misra
Date: 05	5 July, 2022	CED & Whole Time Director, HZL
		(F) to
	A 14	14 C 1 / C 2



Rajasthan State Pollution Control Board 4, Institutional Area, Jhalana Doongari, Jaipur-302 004 Phone: 0141-5159600,5159695Fax: 0141-5159697



Registered

File No F(Mines)/Ajmer(Ajmer)/303(1)/2017-2018/9550-9554

Order No 2017-2018/Mines/9712

Unit ld : 11,254

P.O.- Kayad, Almer- 305 023,

Date: 17/02/2018

District :Aimer

E-Mail: balwant.rathore@vedanta.co.in

M/s Hindustan Zinc Limited (Kayar Mine)

- Sub: Grant of Consent to Operate under section 21(4) of Air (Prevention & Control of Pollution) Act, 1981 and under section 25/26 of Water (Prevention & Control of Pollution) Act, 1974 for your Major Mineral Mine at near Village-Kayar, Tehsil-Ajmer, District-Ajmer (M.L.No-16/92).
- Ref: (1) Your applications dated 07/02/2018 (1) Received on 07/02/2018

Sir,

In view of the details submitted vide your above referred applications/ documents, the Consent to Operate under section 21(4) of Air (Prevention & Control of Pollution) Act, 1981 and under section 25/26 of Water (Prevention & Control of Pollution) Act, 1974 is hereby granted for carrying mining activities. This consent is subject to the following stipulations:-

¹ That this consent is being granted in favour of M/s. Hindustan Zinc Limited (Kayar Mine), a Mine of Major Mineral having M.L.No.- 16/92 in an area measuring 480.4500 Hectares at/near Village-Kayar, Tehsil-Ajmer, District-Ajmer.

2 That this consent is valid for a period from 17/02/2018 to 31/01/2023

3 That this consent is valid for following mining activities :-

Mineral		Permitted Mining Capitra		
1	LEAD & ZINC ORE (ROM)	12.0000 LAKH TPA		



Rajasthan State Pollution Control Board 4, Institutional Area, Jhalana Doongari, Jaipur-302 004 Phone: 0141-5159600,5159695Fax: 0141-5159697

Registered

File No F(Mines)/Almer(Almer)/303(1)/2017-2018/9550-9554

Order No 2017-2018/Mines/9712

Date: 17/02/2018

Unit Id : 11,254

4 That you shall achieve following standards in ambient air in mine area / mining activities.

Pollutant	Standards for Ambient Air	Standards for mining activity	
SPM	500 µg/M [#]	SPM = 600 µg/M ³ (To be measured between 3	
SOr	120 µg/M*		
NO.	120 µg/M ²	to 10 meters from mining	
CO	5000 µg/M ⁸	activity)	

- 5 That the Mining unit shall maintain zero discharge status of waste water from the premises. No trade effluent shall be discharged inside/outside mine premises.
- 6 That your mining will not intersect the Ground Water Table during the consent period and the permission from the Central Ground Water Authority shall be obtained for intersection of Ground Water Table/ abstraction of ground water, if any and submit a copy of the same to the Board.
- 7 That this Consent to Operate is for mining / processing / beneficiation of product as mentioned above in MLLNo.-16/92 and a separate Consent to Operate is required to be obtained for any other Mineral mining/ processing/ beneficiation Plant/process if any and for any addition/ modification/ alteration or change in process.
- 8 That the occupier/operator of mine shall ensure that all the conditions imposed in the Environmental Clearance granted by the Ministry of Environment, Forest & Climate Change, Government of India vide letter no. J-11015/47/2012-IA.II (M) dated 05/02/2018 are strictly complied with.
- 9 That this consent to operate is subject to the post audit of pollution control measures and consent conditions. In case the lessee is found to have flouted consent conditions or not having adequate pollution control measures during inspection, the consent will be revoked and directions shall be issued under section 31A of the Air Act/33A of the Water Act
- 10 The result of following monitoring systems provided in compliance of the conditions of Environment Clearance shall be submitted or access to online data shall be provided to the State Board also:
 - a) online AAQM. b) online monitoring of pH and turbidity meters at the outlets of STP and
 - ETP.
 - c) monitoring of ponds in the mining lease area.



d) monitoring of nearby water bodies.



Rajasthan State Pollution Control Board 4, Institutional Area, Jhalana Doongari, Jaipur-302 004 Phone: 0141-5159600,5159695Fax: 0141-5159697

Registered

File No F(Mines)/Ajmer(Ajmer)/303(1)/2017-2018/9550-9554

Order No 2017-2018/Mines/9712

Date: 17/02/2018

Unit Id : 11,254

- 11 That plantation shall be developed so as to cover at least 33% of the total land use for mining and allied activities as given in Approved Mining Plan and shall be maintained at all the time to maintain ambient air quality around the mine.
- 12 That mining operations shall be restricted to above ground water table and should not intersect ground water table. In case of working below the ground water table, prior approval of the Ministry of Environment, Forest & Climate Change, Government of India and Central round Water Authority shall be obtained.
- 13 That ground water shall not be extracted without prior permission of the Central Ground Water Authority (CGWA).
- 14 That haul roads should be regularly graded and compacted. Regular water sprinkling should be carried out on haul roads to minimise dust generations.
- 15 That adequate measures shall be taken for control of fugitive emissions from the areas prone to air poliution.
- 16 That no discharge of effluent shall be made within or outside the premises.
- 17 That mine will comply with the standards as prescribed vide Ministry of Environment, Forest and Climate Change notification no. GSR 826(E) dated 16th November, 2009 with respect to National Ambient Air Quality standards.
- 18 That all other general conditions enclosed as Annexure shall be strictly complied with.
- 19 That this Consent is subject to the conditions as stated above and general conditions as stated in Annexure. Further, the mining unit will comply with the provisions of the Air (Prevention & Control of Pollution) Act, 1981 & Water (Prevention & Control of Pollution) Act, 1974 and any such conditions as may be specified from time to time by the State Board under the provisions of the aforesaid Acts.
- 20 That the grant of this Consent to Operate is issued from the environmental angle only, and does not absolve the project proponent from the other statutory obligations prescribed under any other law or any other instrument in force. The sole and complete responsibility, to comply with the conditions laid down in all other laws for the time-being in force, rests with the industry/ unit/ project proponent.
- 21 That the grant of this Consent to Operate shall not, in any way, adversely affect or jeopardize the legal proceedings, if any, instituted in the past or that could be instituted against you by the State Board for violation of the provisions of the Act or the Rules made thereunder.





Rajasthan State Pollution Control Board 4, Institutional Area, Jhalana Doongari, Jaipur-302 004 Phone: 0141-5159600,5159695Fax: 0141-5159697

Registered

File No	F(Mines)/Ajmer(Ajmer)/303(1)/2017-2018/9550-9554		
Order No	2017-2018/Mines/9712	Date:	17/02/2018
Unit Id :	11,254		
	This bears approval of the competent authority.		
Ens	cl: As Above		

Yours Sincerely

EE

Copy To:-

- Director, Department of Mines & Geology, Government of Rajasthan, Shastri Circle, Udaipur..
- 2 Regional Officer, Regional Office, Rajasthan State Pollution Control Board, kishangarh-please expedite verification and monitoring
- 3 Mining Engineer, Department of Mines & Geology, Government of Rajasthan, Ajmer
- 4 Master File.



Feedly	Rejasthan State 4, Institutional Area, Jh	Office (Mines) Pollution Control Board salana Doongari, Jaipur-302 004	
	Phone: 0141-271681	4,2716813Fax: 0141-2716814	自然中的中
		Registered	
File No	F(Mines)/Ajmer(Ajmer)/303(1)/2017-2018/5	59-5563	
Order No	2022-2023/Mines/10692	Date:	96/01/2023
Unit Id :	11,254		
M/s Hind	lustan Zinc Limited (Kayar Mine)		
P.O Kaya	d, Ajmer- 305 023,		
District :A	imer		
E-Mall - B	action moreadhedanta co in		
Sub: Ci Pr Pr D	rant of Consent to Operate under Section illution) Act, 1981 and under Section 25 illution) Act, 1974 for your Major Mineral istrict-Ajmer (M.L.No-16/92.).	n 21(4) of Air (Prevention A i/26 of Water (Prevention & Mine at near Village-Kayar,	& Control of Control of Tehs8- <mark>Ajmer</mark> ,
Ref: ()	Your applications dated 23/09/2022) Received on 23/09/2022		
0	I) Received at Head office on 22/09/2022		
Sir,			
Act,1 in h stips 1	1981 and under Section 25/26 of Water (Pre- ereby granted for carrying mining activities dations:- That this consent is being granted in favour dine), a Mine of Major Mineral having 480.4500 Hectares at/near Village-Kayar ,Tehnil-	vention & Control of Pollution This consent is subject to of M/s. Hindustan Zinc Lin M.L.No 16/92 in an area Ajmer,District-Ajmer.	n) Act, 1974 the following nited (Kayar a measuring
2	That this consent is valid for a period from 01/02	/2023 to 31/01/2028	
3	That this consent is valid for following mining acth	vities >	
	Mineral	Permitted Mining Capaci	ity
	1 LEAD & ZINC ORE (ROM)	120000 LAKHS TONNES	S/ANNUM
•	That the project proponent will comply with Environment, Forest and Climate Change no 2009 with respect to National Ambient Air Quality	the Standard as prescribed vi tification no. GSR 826(E) data standards.	de the Ministry of ad 16th November,
		Signature valid Digitaly signed by them Chand Date: 2003.0 (1) (1) (1) Bestier: SetAdarded Leaster:	



Rajasthan State Pollution Control Board 4, Institutional Area, Jhalana Doongari, Jaipur-302 004 Phone: 0141-2716814,2716813Fax: 0141-2716814

Registered

File No F(Minex)/Ajmer(Ajmer)/303(1)/2017-2018/5559-5563

Order No 2022-2023/Mines/10692

Date: 06/01/2023

Unit Id : 11,254

- ⁵ That this consent to establish/consent to operate is only for carrying out mining of mineral/ore and not for any processing/benefication or crushing/grinding of ore/mineral for which a separate application for consent to establish and/or consent to operate should be submitted. The project proposent is required to obtain seprate consent to establish and consent to operate for carrying out mining of other minerals(s), if any or processing/beneficiation of such mineral(s) and for any addition/modification/alteration or change in process.
- ⁶ That this Consent to Operate is for mining / processing / heneficiation of product as mentioned above in M.L.No.-16/92 and a separate Consent to Operate is required to be obtained for any other Mineral mining/ processing/ beneficiation Plant/process if any and for any addition/ modification/ alteration or change in process.
- 7 That the occupier/operator of mine shall ensure that all the conditions imposed in the Environmental Clearance granted by MoEF&CC dated 05.02.2018.
- ^B That this consent is valid for production of Lead & Zinc Ore (ROM) @ 1.2 Million TPA Tonnes per Annum. For any change in product and/or increase in capacity/lease area, the mine has to seek fresh Environmental Clearance, consent to establish & consent to operate
- 9 That the lessee shall submit monitoring report of Ambient Air Quality within the lease area, once in 3 months
- 10 That plantation shall be developed so as to cover at least 33% of the total land use for mining and allied activities as given in Approved Mining Plan and shall be maintained at all the time to maintain ambient air quality around the mine.
- 11 That ground water shall not be abstracted without prior permission of the Central Ground Water Authority (CGWA).
- 12 That haul roads should be regularly graded and compacted. Regular water sprinkling should be carried out on haul roads to minimize dust generations
- 13 That adequate measure shall be taken for control of fugitive emissions from the areas prone to air pollution.
- 14 That you shall not operate any stone crusher/mineral grinding/mineral processing plant within said lease without obtaining prior consent of the State Board.
- 15 That this consent to Operate shall not be valid, if the lessee has not obtained permissions required, if any, from NBWL/Forest Department etc. with respect to Wild Life Sanchaary /National Parks/ Critical Tiger Habitats in compliance of various orders passed by any other law/act/rule/ regulation or order of MoEF&CC and/or any Court/Tribunal time to time







Rajasthan State Pollution Control Board 4, Institutional Area, Jhalana Doongari, Jatpur-302 004 Phone: 0141-2716814,2716813Fax: 0141-2716814

Registered

File No F(Mines)/Ajmer(Ajmer)/303(1)/2017-2018/5559-5563

Order No 2022-2023/Mines/10692

Date: 06/01/2025

Unit 1d : 11,254

- 16 That regular water sprinkling should be carried out in critical areas prone to air pollution and having high levels of SPM and RSPM such as on hanl road, loading and unloading points and transfer points.
- 17 That the mine shall install adequately designed rain water harvesting structure for prevention and recharge of ground water in and around the lease area.
- 10 That the mine shall not allow making any obstacles to any natural water flow Le, natural nallah/steam carrying rain water to any water body.
- 19 This the mine shall not allow unauthorized disposal of any solid waste on land inside or outside the premises.
- 20 That this consent to Operate shall be subject to compliance of direction/order passed by Courts of Law in the matter, if any
- 21 That the lessee should dump the overburden in such a manner that it does not get washed away to nearby water tanks and lakes etc. during rainy season
- 22 That the lease shall not intersect the ground water table without permission of CGWA.
- 23 This consent shall be subject to validity of mining lease.
- 24 That all other general conditions enclosed as Annexure shall be strictly complied with.
- 25 That this Consent is subject to the conditions as stated above and general conditions as stated in Amerura. Further, the mining unit will comply with the provisions of the Air (Prevention & Control of Pollution) Act, 1981& Water (Prevention & Control of Pollution) Act, 1974 and any such conditions as may be specified from time to time by the State Board under the provisions of the aforesaid Acts.
- 26 That the grant of this Consent to Operate is issued from the environmental angle only, and does not absolve the project proponent from the other statutory obligations prescribed under any other law or any other instrument in force. The sole and complete responsibility, to comply with the conditions laid down in all other laws for the time-being in force, rests with the industry/ unit/ project proponent.
 - 27 That the grant of this Consent to Operate shall not, in any way, adversely affect or jeopardize the legal proceedings, if any, instituted in the past or that could be instituted significant you by the State Board for violation of the provisions of the Act or the Rules made thereunder.





Rajasthan State Pollution Control Board 4, Institutional Area, Jhalana Doongari, Jalpur-302 004 Phone: 0141-2716814,2716813Fax: 0141-2716814

Registered

File No F(Mines)/Ajmer(Ajmer)/303(1)/2017-2018/5559-5563

Order No 2022-2023/Mines/10692

Unit ld : 11,254

Date: 06/01/2023

28 That the grant of this consent to establish/operate is issued from the environmental angle only, and does not absolve the project proponent from the other statutory obligations prescribed under any other law or any other legal instrument in force. The sole and complete responsibility, to comply with the conditons laid down in all other laws for the time-being in force, rests with the industry/unit/project proponent.

This bears approval of the competant authority.

Encl: As Above

Yours sincerely,

Group Incharge-Mines

(A) Copy Tes-

- Director, Department of Mines & Geology, Government of Rajasthan, Shastri Circle, Udalpur.
- 2 Regional Officer, Regional Office, Rajasthan State Pollution Control Board, Kishangarh-please ensure compliance of the consent conditions and monitor time to time
- 3 Mining Engineer, Department of Mines & Geology, Government of Rajasthan, Ajmer -To inform that this consent has been issued from the environmental angle only, and ensuring compliance of any other law/act/rule/regulation or order of any Coart /Tribunal is the sole responsibility of the project proponent and the concerned departments
- 4 Master File.
- (B)
- ¹ The Additional PCCF (WL) and Chief Wildlife Warden, Ananya Bhawan, Instants Institutional Area, Jalput/DCF (WL), Amer. To inform that this concent has been lossed from the emitronmental angle only and ensuring compliance of any other lawledinulainegulation or order of any Court (Tribunal is the sole responsibility of the project proponent and the concerned departments.

Group Incharge-Mines







Annexure -VIII



Annexure -IX



Annexure -X



Annexure -XI



Annexure -XII



Annexure -XIII





SPEED POST



Ref : HZL/Kayad/ENV/Mol.F/2022-23/93. 11

November 23, 2022

To, The Director Govt. of India Ministry of Environment, Forest & Climate Change Indira Paryavaran Bhavan, Aliganj, Jor Bag Road, New Delhi-110003

Sub: Submission of Land Use Pattern study report of Kayad Mine.

Ref: Environmental Clearance letter no: J-11015/47/2012-1A.II (M) dated 5/02/2018.

Dear Sir.

Please find enclosed herewith the study report of Land Use pattern Kayad Mine. This is for compliance of Environment Clearance's Standard condition no vii.

Thanking you,

Your faithfully

(K.C. Meena) Director SBU Kayad Mine

Celo:

The Deputy Director (S) /Scientist -C Ministry of Environment, Forest & Climate Change, Integrated Regional Office, A-209&218,Aranya Bhawan, Jhalana Institutional area Jaipur-302004

O/C Env.



Confidential CSIR-Central Institute of Mining and Fuel Research (Council of Scientific & Industrial Research) Barwa Road, Dhanbad – 826 001



REPORT ON

[STUDY PERIOD OCTOBER 01, 2022 to MARCH 31, 2023]

Study and advice for optimization of blast design parameters at Kayad underground mine of Hindustan Zinc Limited for the safety and stability of surface structures/dwelling of Kayad village and subsequent continuous monitoring of vibration for their long-term stability



PROJECT NO.: SSP/670/2022-23

MAY 2023

Introduction

Executive (Commercial), Hindustan Zinc Limited approached the Director, CSIR-Central Institute of Mining and Fuel Research, Dhanbad, vide PO No.: 3349794341 / 5100032603 dated 07.02.2022 for a scientific study and advice for optimization of blast design parameters at Kayad underground mine, Ajmer of M/s Hindustan Zinc Limited, Rajasthan, India with reference to control blast induced vibration within safe limits at Kayad village, surface structures and underground openings of the of the mine.

Rock Excavation Engineering Division Group (Erstwhile Blasting Department) of CSIR-CIMFR conducted 972 blasts at different locations for development drives, slot raises and ring during October 01, 2022 to March 31, 2023. The stopes include S1 OD1, S200Acess, N400 NOD, N50 – 875, S200 HWD, N400 NOD UH, N875 DH, N400, N795, N25 X 930, N50 – 875, S 375, N50 X975, N795, N25 X 930, N95 X 775, N95 X 705, N25 X 940, N25 X 975, & SL1-445 etc. Altogether 1942 vibration data were recorded for these blasts. Out of 1942 recorded vibration data, the instrument has not triggered for 1617 instances of ground vibration. In this case, the vibration level was below the pre-set level of the seismograph i.e. 0.5 mm/s. The vibrations were recorded at different locations in the mine premises area and in the periphery of the mine and in the Kayad village. The radial distances of blast vibration monitoring point from the blasting face were in the range of 200 m to 837 m. The depth of cover of the blasting locations varied between 41 m and 461 m. All the blasts were initiated with electronic delay detonators and with Nonel delay detonators in order to avoid nuisance to the inhabitants of the Kayad village. The report contains the results of the study, analyses of data, discussions, conclusions, and recommendation for safe and efficient blasting operations. Figure 1. depict the number of blasts (month wise) conducted at Kayad mine during 01.10.2022 to 31.03.2023.



Figure 1. No. of blasts conducted at Kayad UG mine, HZL from 01.10.2022 to 31.03.2022.

Instrumentations

Blast induced vibrations were monitored by seismographs namely MiniMate Plus and MiniMate Blaster (Made in Canada by M/s Instantel Inc.). MiniMate plus is eight as well as four channel seismographs provided with two/one tri-axial transducer(s) for monitoring vibration (in mm/s) and two/one channel(s) for monitoring air over-pressure/noise in dB(L). MiniMate Blaster is four channel seismographs provided with one tri-axial transducer for monitoring vibration (in mm/s) and one channel for monitoring of air over-pressure/noise in dB(L). All the seismographs record vibration in three directions i.e., Longitudinal (L), Vertical (V) and Transverse (T). They also record dominant peak frequency of vibration and compute the peak vector sum of the vibration.

DGMS Vibration standard to prevent damage of surface structures

Peak particle velocity has been globally used in practice for assessment of blast-induced damage to structures. Different countries adopt different standards depending on their type of industrial/residential buildings. In India, presently DGMS technical circular 7 of 1997 is considered as vibration standard for the safety of surface structures in mining areas. The DGMS standard is given in Table 1.

Type of structure	Dominant excitation frequency, Hz			
	< 8 Hz	8-25 Hz	> 25 Hz	
(A) Buildings/structures not belong to the owner				
1. Domestic houses/structures	5	10	15	
(Kuchcha, brick & cement)				
2. Industrial buildings	10	20	25	
3. Objects of historical importance and	2	5	10	
sensitive structures				
(B) Buildings belonging to owner with limited span of life				
1. Domestic houses/structures	10	15	25	
2. Industrial buildings	15	25	50	

Table 1. DGMS technical circular 7 of 1997 concerning to blast vibration standard, in mm/s for the safety of surface structures.

Blast vibration monitoring

Blast vibration monitoring locations were finalised in consultation with mine officials. Seismographs were placed at two to three locations. One seismograph was placed at the mine boundary near the important/concerned houses/structures of the Kayad village particularly near Sultan house/Regar house and other near the Administrative building/CRF Plant of Kayad Mine. The maximum vibration recorded was 13.4 mm/s with dominant peak frequency of 69.5 Hz at Mine boundary near Sultan House. In the same blast vibration recorded at Admin building of Kayad mine was 1.032 mm/s with dominant peak frequency of 60.13 Hz. The blast wave

recorded at Admin building of Kayad mine due to blast conducted at S425 UR R-10 on 16.10.2022 (PPV- 2.865 mm/s) is presented in Figure 2. The Fast Fourier Transform (FFT) analyses of frequency of vibration (as mention in Figure 2) is shown in Figure 3. The blast wave recorded on 05.12.2022 (PPV - 4.269 mm/s) at mine boundary near house of Mr. Sultan Ahmad due to blast conducted at N400 DD2 is depicted in Figure 4 and its Fast Fourier Transform (FFT) analyses of frequency of vibration is presented in Figure 5. Blast time history recorded on 25.02.2023 (PPV- 13.4 mm/s) near Regar house of Kayad village due to blast conducted at N400mrl Stope UH R-1 is depicted in Figure 6 and its Fast Fourier Transform (FFT) analyses of frequency of vibration is presented in Figure 7. It is evident from the figures that concentration of vibration energy was lie in the range of 25.0 – 100 Hz i.e. in high frequency zone (>25 Hz).



Figure 2. Blast time history recorded on 16.10.2022 at Admin building of Kayad mine.



Figure 3. The FFT analyses of frequency of vibration (as mention in Figure 2)



Figure 4. Blast time history recorded on 05.12.2022 at mine boundary near house of Mr. Sultan Ahmad.



Figure 5. The FFT analyses of frequency of vibration (as mention in Figure 4).



Figure 6. Blast time history recorded on 25.02.2023 near Regar house of Kayad village.

CSIR-Central Institute of Mining and Fuel Research (CIMFR), Dhanbad-826001



Figure 7. The FFT analyses of frequency of vibration (as mention in Figure 6).

The vibration data recorded due to the blast conducted at Kayad UG Mine during October 01, 2022- March 31, 2023 were analysed. The recorded peak particle velocity (PPV) data were in the range of 0.508 mm/s to 13.4 mm/s. The threshold velocity of vibration as per the DGMS standard is 15 mm/s for Kayad UG Mine considering the dominant frequency range of more than 25 HZ. Figure 8 depicts the plot of recorded vibration data with their corresponding dominant peak frequency. The view of different vibration monitoring locations in the periphery of the mine is shown in Photograph 1.



Figure 8. Blast vibration data recorded vibration in the periphery of Kayad UG Mine.



Photograph 1. Monitoring of blast induced ground vibration at different locations in the periphery of Kayad UG mine.

Conclusions and recommendations

- Altogether, 972 blasts were conducted for underground development face, slot raise and Ring blasts at different locations of the mine during October 01, 2022 - March 31, 2023. Attempt were made to record 1942 vibration data, out of which 1617 vibration data were below the pre-trigger level of seismograph i.e., 0.5 mm/s.
- The recorded blast induced ground vibration data were in the range of 0.508 mm/s to 13.4 mm/s. The radial distances of blast vibration monitoring point from the blasting face were in the range of 200 to 837 m.
- The maximum vibration recorded was 13.4 mm/s with dominant peak frequency of 69.5 Hz at Mine Boundary near Sultan House. In the same blast vibration recorded at Admin building of Kayad mine was 1.032 mm/s with dominant peak frequency of 60.13 Hz.
- The recorded dominant peak frequencies of vibration were in the range of 25.0 100 Hz. Hence, the safe limit of ground vibration (PPV) for the safety of houses and other structures at Kayad village has been taken as 15 mm/s as per the DGMS standard. The recorded vibration levels in the Kayad village due to blasting at Kayad mine were well within the safe limits.
- There is no danger of damage to the existing houses/structures of Kayad village from the blasting operations being carried out in underground development, raise and ring blasts of South and North section of Kayad underground mine.

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