स्टील अथॉरिटी ऑफ़ इंडिया लिमिटेड
STEEL AUTHORITY OF INDIA LIMITED
कोलियरीज डिवीज़न, चासनाला
COLLIERIES DIVISION, CHASNALLA

सेल SAIL

Ref: GM./Tasra/EC (Comp-Mine)/24/ 42 Date: 18.06.2024

To,
The Additional Director(s),
EI Division, MOEF & CC.
Paryavaran Bhawan, CGO Complex,
Lodhi Road, New Delhi – 110003

Sub: Status of Compliance to the Condition stipulated in the Environmental Clearance granted by MoEF for Tasra Coal Mining Project (4 MTPA), BSL-Colliereies, SAIL for the period Oct' 2023 to March.' 2024.

Ref: EC granted vide Ref. no. J-11015/122/2007-IA-II(M) dated 13th October, 2009.

Dear Sir,

Please find enclosed herewith the updated six monthly compliance report for the period Oct' 2023 to March.' 2024 with respect to the condition stipulated in the Environment Clearance granted by MoEF & CC, New Delhi vide letter no. J-11015/122/2007-IA-II (M) dated 13th October, 2009 for Tasra Coal Mine Project of M/s Steel Authority of India Limited for kind perusal.

Hard copy of the report is enclosed.

Thanking you,

Yours faithfully

18/6/24

General Manager (Tasra)
Tasra OCP, BSL- Collieries

महाप्रबंधक (तासरा)
General Manager (Tasra)
सेल–कोलियरीज प्रभाग
SAIL Collieries Division

Encl: As above

Copy to:
1. The Additional Director(s),
   MOEF&CC (Govt. of India),
   Integrated Regional office
   2nd Floor, Headquater- Jharkhand State Housing Board,
   Harmu Chock, Ranchi -834002
2. The member Secretary
   Central Pollution Control Board,
   Parivesh Bhawan, CBD-Cum Office complex,
   East Arjun Nagar, Delhi – 110032
3. The Member Secretary,
   JSPCB, Township Administration Building,
   Hec Complex, Dhurwa, Ranchi 834004.
4. The Regional Officer,
   Regional Office, JSPCB, Dhanbad-826001.

**Status of Compliance to the Condition stipulated in the Environmental Clearance granted byMoEF for Tasra Coal Mining Project (4 MTPA) for the period Oct.' 2023 to March.' 2024.**

**(EC granted vide Ref. no. J-11015/122/2007-IA-II(M) dated 13th October, 2009)**

**(A) Specific Conditions:-**

| Cond. No. | Conditions Imposed | Compliance Status as on March.' 2024 |
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| (i) | The Environmental Clearance is restricted to opencast operations only. A separate application shall be submitted for environmental clearance for Underground Mining Project proposed below 260m below ground level. | Noted for compliance.<br>Tasra Coal Mining Project is planned for opencast mining up to 260m below ground level. The life of the mine is 28 years including 2 years of construction i.e. development period. Reserves below 260m depth will be extracted by underground mining method for which a separate application will be submitted for grant of Environmental Clearance before underground mining operations are undertaken. Presently depth of mine is 55m only. |
| (ii) | An application for environmental clearance shall be made within 3 months for the establishment of Coal Washery of 3.5 MTPA Capacity proposed within the ML area. | Complied.<br>Environmental Clearance for Tasra Pit Head Coking Coal Washery for 3.5 MTPA has been obtained and granted/obtained vide letter no. J-11015/365/2009-IA.II (M) pt dated 30.03.2017. |
| (iii) | Mining shall be carried out maintaining a minimum distance of 100m between the river Damodar and Quarry edge along northern boundary. The embankment to be constructed along the river Damodar adjoining quarry shall be based on peak flow and shall be at least 3m above HFL. The slope of the embankment shall be at least 2:1 towards the ML, compacted and stone pitching down towards the river and shall be stabilized with plantation. Material such as OB shall be tested for strength before using for construction of embankment. | Noted.<br><br>MDO has been appointed, Construction of Embankment has been kept under the scope of MDO and shall be constructed as per the approved Mining Plan & all such compliances will be taken up as follow up:<br>1. MDO has been appointed by SAIL for development & operation of Tasra OCP on 08.09.2023. There is development period of two years as per Coal Mining Services Agreement.<br>2. After mobilization of resources mining operation started on Feb2024.<br>3. Application for acquisition of 202.7 acres of private land has been submitted for expansion of the mine which also includes the land required for construction of embankment. Public Hearing in Draft SIA has been successfully conducted and land acquisition process is under progress.<br><br>However, As per EC condition, Previously Mine was developed& maintaining a minimum distance of 100 m |

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| | | between river Damodar and the southern Quarry edge as per approved Mining Plan.<br><br>At present quarry edge wherein small scale mining is being carried out is at a distance of 600 meters from the bank of Damodar river. (was)<br><br>SAIL would have to acquire the intervening area for expansion of the project and simultaneously construct the embankment.<br><br>DGMS permission conditions also requires construction of embankment, when the natural RL of the adjoining area of Mine, is less than 1.5 m above the HFL.<br><br>The present natural RL all along the adjoin area being more than 1.5 M above HFL, embankment along the river Damodar is presently not required. |
| (iv) | The plan for diversion and realignment of the DomohaniJore and CilatuJore and modification of the natural surface drainage and design of the diversion canal shall be following the natural topography of the region to be done in consultation and approval of the concerned State Flood and Irrigation Department, dimension and depth of the nala shall be finalized based on the peak flow of the water. | As per the mining schedule of Tasra OCP, the diversion and realignment of DomohaniJore and CilatuJore is planned beyond 8$^{th}$year from the commencement of commercial production.<br><br>However, MDO has been appointed &Construction of Embankment has been kept under the scope of MDO and the diversion of and realignment of Domohani & CilatuJore has been kept under the scope of MDO & all such facilities will be taken up.<br><br>As such MDO has taken initiative for physical survey of the area and team of IIT- ISM has physically surveyed the area for submitting their quotation for preparationof Plan& feasibility report for realignment and realignment of DomohaniJore and CilatuJore. |
| (v) | Top soil shall be stacked properly with proper slope at earmarked site(s) and shall not be kept active and shall be used within a year of generation for reclamation and development of green belt. | Interim mining operation in Tasra OCP has been started in a very small scale from existing old quarry, previously worked by BCCL. After acquisition of 15.17 acres of land in December 2017 top soil was very minimal and the same was utilized partially for development of park at Chasnalla and remaining top soil has been stacked by the side of OB dump due to paucity of space.<br><br>However, MDO has been appointed and all compliance will be taken up.<br><br>Land acquisition process is being carried out through District Authority under LARR Act, 2013. On long term leases basis, SAIL has acquired 60 acres of FCIL land for the development and other purpose. |

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| | | Top soil is being stacked properly with proper slope at earmarked site near OB dump within lease hold area of Approved mine Plan.<br><br>Refer Photograph No. 1 |
| vi) | OB shall be stacked at earmarked external dump site within ML area of maximum height of 90m of 3 benches of 30m each. A garland drain of adequate capacity, and toe wall along the OB dump shall be created to arrest the silt flow from the dumps. In addition to the garland drain, a separate 4-6m channel to serve as storm water drain shall also be created all along the mine based on peak data. Silt arrestor shall be constructed for both garland drain and storm water drain and the drain shall be regularly de-silted.<br>Toe wall shall be constructed at the base of the dump shall be strengthened at critical patches with stones and compacted. Plantation using native species shall be developed between the dumps and River Damodar. For reclamation of dumps and quarry with plantation, no chemical fertilizer shall be used. The ultimate slope of the dump shall not exceed 28°. Reclamation of the OB Dumps of an area of 168.47 Ha with vegetation shall be completed by $10^{th}$ Year. Monitoring and management of the reclaimed dump site shall continue until the vegetation becomes self-sustaining compliance status shall be submitted to MoEF and its Regional Office located at Bhubneshwar on yearly basis. | As per approved Mining Plan and EIA/EMP submitted to MoEF& CC, OB was dumped at earmarked location within mining lease hold (ML) area.<br><br>Presently, the mine is in development stage,the OB generated during small scale miningwasused to fill up the old abandoned mine previously worked by M/S BCCL lying well within the earmarked OB dump area. As such it is submitted that presently from approved Mining Plan.<br><br>It is also submitted that SAIL in advance has taken up plantation activity in coordination with the Forest Department, Dhanbad along the northern bank of river Damodar (area intervening between the future bottom edge of future OB dump and northern bank of river).<br><br>Refer Photographs No.7. |

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| (vii) | Catch drain and siltation pond of appropriate size shall be constructed to arrest silt and sediment flows from soil, OB and mineral dumps. The water so collected shall be utilized for watering the mining area, road, greenbelt development etc. The drains shall be regularly de-silted and maintained properly.<br>Garland drains (size, gradient and length) and sump capacity shall be designed keeping safety margin over and above the peak sudden rainfall and maximum discharge in the area adjoining the mining site. Sump capacity shall also provide adequate retention period to allow proper settling of silt material. | Previously ,OBwas dumped to fill up old abandoned pit, previously worked by M/S BCCL as per approved Mining Plan. As such, there is no surface run off into the river Damodar.Catch drain has been constructed along the edge of OB dump facing the river and the surface runoff from the from the OB dump is channelized in the old abandoned quarry.Catch drain is terminating into siltation pond. Around some portion facing the river Damodar some low laying area has been created being used as siltation pond. As such, there is no surface run off into the river Damodar.<br><br>Catch Drain has been constructed along the southern side of the OB dump and the surface runoff from the from the OB dump is channelized in the old abandoned quarry. enclosed as Annexure- I- IV<br><br>The Garland drains has been regularly de-silted and maintained properly.<br>Refer Photographs No. 6<br><br>The rain water so collected at mine pit.<br>However regular monitoring of water analysis test is being carried out as per conditions stipulated in CTO conditions enclosed as Annexure- V |
| (viii) | Dimension of the retaining wall at the toe of the dumps and OB benches within the mine to check run-off and situation shall be based on rainfall data. | Noted for compliance.<br><br>Previously the OB was dumped to fill up at ground level of old abandoned pit previously worked by M/S BCCL as per approved Mining Plan. As such, there is no surface run off into the river Damodar.<br><br>Catch drain has been constructed along the edge of OB dump facing the river and the surface runoff from the from the OB dump is channelized in the old abandoned quarry.<br><br>Refer Photographs No. 02<br><br>Since OB dump is active, retaining wall shall be constructed once the height of OB is increased above ground level.<br><br>However, MDO has been appointed and all compliance will be taken up. |
| (ix) | The approach road shall be blacked topped. A three tire avenue plantation shall be developed along the main approach roads and haul roads. Entire | The mine is in initial development stage, temporary approach road is being maintained. Approach roads and haul roads are being maintained by road grader and continuous water sprinkling is being done for dust |

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| | mine transportation shall be by rail mode only. Mineral transportation from the mine to the railway siding shall be by closed belt conveyor only. The railway siding shall be provided with Silo rapid loading system. | Saperation.Natural plants are there at all along of the temporary approach road.<br><br>ROM Coal is transported from Tasra mine pit to CPP, Chasnalla by tarpaulin covered trucks. Entire coal is being transported by rail mode from railway siding of CCP to captive steel plant of SAIL.<br><br>1. Land acquisition process has been initiated through District Administration. After acquisition of land, lay out of permanent haul road shall be done and subsequently three tier plantations shall be done along the haul road.<br>**2.** FCIL Land for commissioning of washery and Coal Handling Plant has been identified and approval has been accorded by FCIL Board for setting up of Coal Washery. Leasing is under Process. Once Process of leasing is complete Commissioning of washery and construction of Railway siding with Silo Rapid shall be started by MDO. |
| (x) | Drills shall be wet operated only. | Complied. |
| (xi) | Controlled blasting shall be practiced with the use of delay detonators. The mitigate measures for control of ground vibration and to arrest the fly rocks and boulders shall be implemented. | Complied. |
| (xii) | Water sprinkling system shall be provided to check fugitive emissions from crushing operation, conveyor system, haulage roads, transfer points etc. Hopper of the coal crushing units and Washery unit shall be fitted with high efficiency bag filters and mist spray water sprinkling system shall be installed and operated effectively at all times of operation to check fugitive emissions from crushing operation, transfer point at railway siding. | Complied.<br><br>Refer Photographs No. 3 &4 |
| (xiii) | No ground water (bore well) shall be used for mining operations. Additional water if any required for the project shall be used from recycled water or from mine discharge water or rain water collected in rain water harvesting pits within the project area | Noted. |

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| (xiv) | Regular monitoring of ground water level and quality shall be carried out by establishing a network of existing wells and construction of new Piezometers. The monitoring of quantity shall be done four times a year in pre monsoon (May), Monsoon (August), post monsoon (November) and winter (January)seasons and for the quality in may Data thus collected shall be located to MoEF an d to the Central Pollution Control Board quarterly within one month of Monitoring. Rain water structures shall be erected in the core and buffer zone in case monitoring indicates a decline in water table. | Piezometer has been installed for ground water monitoring. Photograph & report are enclosed as Annexure - X<br><br>It is mentioned that Tasra Opencast Project was previously worked by M/s BCCL. There are numbers of old abandoned quarries within the project area, which are presently serving the purpose of rain harvesting cum-ground water recharge.<br><br>Further, mining is being carried out on very small scale and mining is being carried out at shallow depth i.e. 55 m. As such no noticeable reduction in ground water level has been observed and all the wells and tube wells located in the adjacent area to the Tasra Coal Mining Project area are functioning properly. As such there is no depletion of ground water resources<br><br>The Monitoring of quality of ground water, surface water (upstream& downstream of mine site) and mine water from core zone and buffer zone of Tasra mine have been regularly monitored. Copy of test reports enclosed as Annexure-V<br><br>However, 32 rainwater harvesting cum ground water recharge system is being constructed at Tasra/Chasnalla coal complex area at Chasnalla.<br><br>Refer Photographs No. 08 |
| (xv) | The project authorities shall meet water requirement of near villages(s) in case the village wells go dry due to dewatering of mine. | Noted for compliance. |

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| (xvi) | Sewage treatment plant of adequate capacity shall be installed in the colony. ETP shall also be provided for workshop and CHP wastewater. Treated wastewater meeting prescribed norms only shall be recycled for mining operations to the extent possible and permitted to be discharged to the natural water courses only if it meets the prescribed standards. | Noted for compliance.<br><br>It may be noted that the mine is still in development stage and interim mining was carried out in very small scale i.e. production level is to the tune of 8% of the Peak Rated Capacity i.e. 4 MTPA of Tasra Mine.<br><br>No residential colony has been constructed for Tasra Coal Mining Project and the construction of upcoming R&R colony is under the scope of work of MDO. However, MDO has been appointed and all compliance will be taken up.<br><br>**Action Plan:**<br>1. ETP for workshop shall be constructed upon expansion of the mine by MDO.<br>2. STP of adequate capacity shall be taken up once construction of R&R colony is taken up by MDO. |
| (xvii) | Total area that shall be brought under afforestation at the time of mine closure shall not be less than 444.49 Ha. which includes reclaimed topsoil dump area& external OB dump (168.47 ha.), backfilled area (276.02 ha.) along Mine Lease boundary, embankment, undisturbed area, along roads and infrastructure, green belt and in township outside the lease by planning native species in consultation with the local DFO/ Agriculture Dept. The density of the tree shall be around 2500 plant/Ha. | Noted for compliance.<br><br>Preparation of Mine Closure Plan has been kept under the scope of work of MDO. Mine closure activity is elaborated in the approved Mining Plan and is envisaged to start from sixth year of Operation.<br><br>OB generated during small scale mining was used to fill up the old abandoned mine previously worked by M/S BCCL lying well within the earmarked OB dump area.<br><br>Plantation has been carried out in consultation with local DFO/Agriculture Departments per approved Mining Plan and EIA/EMP.<br><br>It is also submitted that SAIL in advance has taken up plantation activity in coordination with the Forest Department, Dhanbad along the northern bank of river Damodar. (Area intervening between the future bottom edge of future OB dump and northern bank of river).<br><br>Refer Photographs No. 07 |
| (xviii) | A progressive Mine Closure Plan shall be implemented by reclamation of 276.02 ha, of the total quarry area of 371.33ha, which shall be backfilled and afforested by planting native plants species in consultation with the local DFO/ Agriculture Department. The density of the plants shall be around 2500 plants per ha. | Noted for compliance.<br><br>Preparation of Mine Closure Plan has been kept under the scope of work of MDO. Mine closure activity is elaborated in the approved Mining Plan and is envisaged to start from sixth year of Operation.<br><br>Pending preparation of Mine Closure Plan as required under statute, the amount on account of Mine Closure |

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<td>The balance 95.33 ha of de-coaled quarry area being converted into a water reservoir shall be gently sloped and the upper benches of the reservoir shall be terraced and stabilized with plantation. Only native species shall be used for plantation.</td>
<td>Activity is being deposited in Escrow account based on the tripartite agreement made between SAIL, Office of Coal Controller Kolkata, and IDBI Bank on 15.09.2017.<br><br>As per agreement made on 15.09.2017 we have deposited Seven installments towards Mine Closure Cost.<br><br>Details of amount deposited is as below :-<br><br>
<table>
<tr><th>Year</th><th>Deposited in escrow A/C( In Rs)</th></tr>
<tr><td>2017-2018</td><td>263.67 Lakh</td></tr>
<tr><td>2018-2019</td><td>276.85 Lakh</td></tr>
<tr><td>2019-2020</td><td>290.70 Lakh</td></tr>
<tr><td>2020-2021</td><td>305.23 Lakh</td></tr>
<tr><td>2021-2022</td><td>320.49 Lakh</td></tr>
<tr><td>2022-2023</td><td>336.52 Lakh</td></tr>
<tr><td>2023-2024</td><td>353.34 Lakh</td></tr>
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<br>Action Plan: Progressive Mine Closure Plan shall be prepared and get approved from MoChas been taken up.</td>
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<td>(xix)</td>
<td>Beside carrying out regular periodic heath check-up of their workers, 10% of workers identified from workforce engaged in active mining operation shall be subjected to health check-up for occupational diseases and hearing impairment if any, through an agency as NIOH, Ahmadabad within a period of 1 year and the results reported to this ministry and to DGMS.</td>
<td>Qualified Occupational Health Doctor has been appointed as per DGMS Norm.<br><br>No worker of Tasra OCP has been found to have occupational diseases or hearing impairment during a health check-up.<br><br>Workers are provided with PPE device and time to time training on safety and health aspects were provided.<br>Initial Medical Examination reports are enclosed as Annexure- XIV.</td>
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<td>(xx)</td>
<td>An amount of Rs. 600.60/- lakhs as capital cost and Rs. 35/- lakhs towards annual recurring cost has been earmarked for environmental protection measures. The details of which shall be uploaded on the company web site every year.</td>
<td>Noted for compliance.<br><br>Mine is in development stage, a small scale mining was carried out.<br><br>Capital Expenditure details for FY: 2023-24:- Rs. 1200000/- .<br><br>Earmarked capital cost has been given in the scope of MDO.<br><br>However, MDO has been appointed and all compliance will be taken up.</td>
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| (xxi) | A detailed R&R plan for the life of the project comprising land losers, homestead losers, and landless including tribal to be displaced from the project area shall be prepared and implemented in stipulated time-frame. A master plan for the R&R colony and specific plan for Phase – I consisting of 1642 PAF's shall be prepared within two months from the date of environmental clearance along with time schedule for completion of activities including construction of R&R colony and completion of various works for civic amenities in the colony. R&R shall include setting of an ITI for training & skill development amongst the persons to be employed and those not being absorbed for vocational training for alternate livelihood, particularly stimulation training for various skills, which may be for indirect employment. Annuities for the Vulnerable persons being displaces shall also be included in R&R person affected by double/triple displacement shall be compensated as per norms. R&R for Phase– I shall be completed within a year of grant of environmental clearance.<br>A sub-committee comprising of 3 Experts of Appraisal Committee shall monitor the compliance of implement-tation of Phase-I of R&R and beyond if required. | Acquisition of land & construction of R&R colony was under the scope of MDO and accordingly they had initiated the process of acquiring l6.60 Ha of private land at Asanbani Mouza. Pending construction of R&R colony, PAFs who were going to be displaced on account of acquisition of 6.14 Ha of land by SAIL, suggested for interim accommodation in the nearby quarters of M/s FCIL till they were finally rehabilitated at R&R colony. Villagers' request for interim accommodation was deliberated in the R&R Committee and it was ratified by R&R Committee in its meeting on 06.11.2017. Accordingly, SAIL took FCIL quarters on lease and 105 nos. of PAFs were provided interim accommodation. Post termination of contract with M/s LITL, basic amenities like water, electricity, sanitation, etc. are being provided at the interim accommodation site by SAIL.<br>A master plan for the R&R colony and specific plan for the phase –I consisting of 1642 PAF has been prepared and the same will be implemented in the due course after land acquisition. Process is initiated upon appointment of new MDO.<br>Detailed survey was carried out by District Administration under the provision of LARR Act, 2013. Draft R&R Policy was framed by R&R Administrator appointed by State Govt for Tasra OCP. Public hearing on Draft R&R scheme was held by District Administration and R&R Scheme was approved by R&R Commissioner, Govt. of Jharkhand on 05.10.2016. Based on fresh preliminary notification for land acquisition, fresh R&R Scheme will be formulated by R&R Administrator for the Project and approved by Govt. of Jharkhand.<br><br>R&R activities related to the project including establishment of R&R colony shall be taken up as per the approved R&R Plan by concerned Authority.<br>Socio-economic survey of the seven mouzas was carried out by Project & Development India Limited (PDIL) in 2009. As per PDIL report, there were 3455 nos. of Project Affected Families (PAFs). Based on PDIL Report'2009, R&R scheme for PAFs for Rs.219.53 Crore was approved by SAIL Board in its meeting held on 17 .03.2010.<br><br>MECON or any other consultant of repute shall be entrusted to prepare fresh DPR and Master plan for construction of R&R colony as per provisions of LARR'Act-2013 under appointment of MDO.<br>However, MDO has been appointed& all compliance will be taken up. |

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| (xxii) | Peripheral village of Parasbania, Chattabad, Orbetta, Kurtand, SindriBasti, Manohartand, Chasnallabasti, Manpur, Jharna, Bogla, and Chandankyari shall be taken for socio economic activity under CSR, for which a sum of Rs. 65/- Crores shall be earmarked for capital cost and Rs. 4/- Crore as revenue cost over the life of the project. The proponent shall continue VDC for monitoring the implementation of CSR. In addition the Sub-Committee of EAC shall also monitored if required. | Capital Expenditure details for FY :<br>1. 2023-24 : Rs. 392.5 Lakhs Approval for CSR of Collieries, Copy enclosed as Annexure- VIII<br>2. 2023-24: Rs 6219043/- for Environmental monitoring Copy enclosed as Annexure- VIII<br><br>As stated above mining operation is being carried out intermittently and on a very small scale.<br><br>The constitution of VDC is under progress. Although CSR activities are being carried out in the project affected area of Tasra Project.<br>Details of CSR activities under CSR Scheme for (FY 2023-24) is enclosed as Annexure - IX |
| (xxiii) | The project authority shall carry out a detailed pre-mining socio-economic survey based on the UNDP Human Development Report and quality of life parameters and monitor the socio-economic status once every three years and maintain record thereof and report in their annual report, the socio-economic report of R&R and CSR activities. The details of which shall be uploaded on the company's web site every year. A post of GM to exclusively look after R&R & CSR shall be created. | Noted for compliance.<br><br>PDIL i.e. Project Development India Limited, a Central Govt. PSU and by Abhiyan Samiti a Dhanbad based NGO in the year 2008 and 2009 respectively, i.e. prior to start of mining operation.<br>Again Socio economic survey was carried out by M/s MECON in 2017.<br>Again SIA study of mine project area has been completed. Copy of reports are enclosed as Annexure- XV<br><br>Further socio-economic survey will be carried out based on the UNDP Human Development Report and quality life parameters to monitor the socio-economic status.Record of CSR activities taken up is being maintained:<br><br>An Officer in the rank of GM has been posted at Unit level and AGM has been posted at project level to look after the CSR activity.<br><br>The CSR activities are being undertaken in consultation with the villagers of Project Affected Area. |
| (xxiv) | For monitoring land use pattern and post mining land use, a time series of land use maps based on satellite imagery (1:5000) of the core and buffer zone from the start of the project until end of the mine life shall be prepared once in three year from | In year 2018 Study has been done by M/s Edgeo resources Pvt. Copy of report is enclosed as Annexure- VII.<br><br>2. As on date there is no further significant change in land use map as mining activity is limited to 27 acres of land. |

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| | any one particular season which is consistent in the time series and the report submitted to MoEF and its regional office at Bhubneshwar. | However, MDO has been advised to for latest satellite imagery of the area. |
| (xxv) | A final mine closure plan along with details of Corpus Fund shall be submitted to the MoEF, 5 year in advance of the final mine closure for approval. | Noted for compliance. |

**General Conditions: -**

| Cond. No. | Conditions Imposed | Compliance Status as on March.' 2024 |
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| (i) | No change in technology and scope of work shall be made without prior approval of the Ministry of Environment and Forest | Noted for compliance. |
| (ii) | No change in the calendar plan including quantum of mineral coal and waste being produced shall be made. | Noted for compliance.<br>Quantum of mineral coal and waste dumping will be kept within the planned quantities as per approved mining plan. |
| (iii) | Four ambient quality monitoring stations shall be established in the core zone as well as in the buffer zone for monitoring SPM, RSPM, So2 and NOx. Locations of the stations should be decided based on the meteorological data, topographical features and environmentally and ecologically sensitive targets in consultation with the State Pollution Control Board. Monitoring of heavy metals such as Hg, As, Ni, Cd, Cr in SPM and RSPM etc., shall be carried out at-least once in 6 months | Quarterly Sampling and analysis of PM10, PM2.5, SO2 and NOx etc have been carried out from stations established in the core zone as well as buffer zone of Tasra OCP by an NABL Accredited/ISO9001:2008 and OHSAS 18001:2007 certified lab M/s Aditi R&D service (Recognized by Jharkhand State Pollution Control Board), Sindri, Dhanbad<br><br>Copy of reports is enclosed as Annexure- VI |
| (iv) | Data on ambient air quality (SPM, RSPM, So2 and NOx and heavy metals such as Hg, As, Ni, Cr etc.) and other monitoring data shall be regularly submitted to the Ministry including its Regional Office at Bhubaneswar and to the State Pollution Control Board and the Central Pollution Control Board once in six months. Random verification of samples through analysis from independent laboratories | Noted for compliance.<br>Monitoring of Environmental parameters is being carried out by an NABL Accredited/ISO9001:2008 and OHSAS 18001:2007 certified lab M/s Aditi R&D service (Recognized by Jharkhand State Pollution Control Board), Sindri, Dhanbad |

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| | recognized under the E (P) Rules, 1986 shall be furnished as part of compliance. | |
| (v) | Adequate measures shall be taken for control of noise level below 85 dBA in the work environment. Workers engaged in blasting operation, operation of HEMM etc. shall be provided with ear plugs/muffs. | Noted for compliance.<br>The report is duly monitored by an NABL Accredited/ISO9001:2008 and OHSAS 18001:2007 certified lab M/s Aditi R&D service (Recognized by Jharkhand State Pollution Control Board), Sindri, Dhanbad. Copy of Reports is enclosed as Annexure - XIII |
| (vi) | Industrial waste water (workshop and waste water from the mine) shall be properly collected treated so as to confirm to the standards including for heavy metals, before discharge prescribed under GSR+22 (E) dated 19 May, 1993 and 31st December, 1993 or as amended from time to time. Oil and grease trap shall be installed beforedischarge of workshop effluents. | Noted for compliance.<br><br>However, Tasra Open Cast Project is planned for Peak rated Capacity of 4 MTPA and is proposed to be developed through Mine Developer Cum Operator (MDO). |
| (vii) | Vehicular emission shall be kept under control and regularly monitored. Vehicles used for transportation of the mineral shall be covered with tarpaulins and optimally loaded. | Complied. |
| (viii) | Monitoring of environment quality parameters shall be carried out through establishment of adequate number and type of pollution monitoring and analysis equipment in consultation with the State Pollution Control Board and data got analyzed through a laboratory recognized under EP Rules, 1986. | Complied.<br>The monitoring of environment quality parameters has been duly monitored by an NABL Accredited/ISO9001:2008 and OHSAS 18001:2007 certified lab M/s Aditi R&D Service (Recognized by Jharkhand State Pollution Control Board) Sindri, Dhanbad. Copy of reports enclosed as Annexure- V& VI |
| (ix) | Personnel working in dusty areas shall wear protective respiratory devices and they shall also be provided with adequate training and information on safety and health aspects.<br>Occupational Health Surveillance Programme of the worker shall be undertaken periodically to observe any contractions due to exposure to dust and to take corrective measures, if required. | Complied.<br>On resumption of Mining Operation Persons working in dusty areas shall be provided protective respiratory devices and also provided with adequate training and information on safety and health aspects.<br>Occupational Health Surveillance Programme of the worker shall be undertaken periodically to observe any contractions due to exposure of dust and to take corrective measures, if required. |
| (x) | 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. | Separate Environmental Management Department has been set up and headed by GM (Environment) who reports directly to the Head of the Mine and also AGM (Environment) appointed at TasraProject Level.<br>In addition to this, SAIL is having a separate Corporate Environment Management Division (EMD) at Kolkata under the control of |

| | | |
|---|---|---|
| | | Executive Director, who facilitates in environmental management of all SAIL units. |
| (xi) | The fund earmarked for environmental protection measures shall 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 located at Bhubneshwar. | Noted for compliance. |
| (xii) | The project authorities shall advertise at least in two local newspapers widely circulated around the project, one of which shall be in the vernacular language of the locality concerned, within 7 day 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 website of the Ministry of Environment and Forest at http://www.envfor.nic.in | Complied.<br>Advertisement was issued in two local newspapers widely circulated around the project. |
| (xiii) | A copy of the clearance letter shall be marked to concerned Panchyat/ZilaParishad, Municipal Corporation or Urban Local Body and local NGO, if any, from whom suggestion/representation has been received while processing the proposal. A copy of the clearance letter also to be displayed on the company's website. | Compliance has been done as per the EC condition. A copy of clearance letter has also been displayed on the company's web site. |
| (xiv) | A copy of clearance letter shall be displayed on the website of the concerned State Pollution Control Board. The EC letter shall also be displayed at the Regional Office, District Industry Centre and Collector Office/Tehsildar Office for 30 days. | Compliance has been done as per the EC condition. |
| (xv) | The Clearance letter shall be uploaded on the Company's website. The compliance status of stipulated EC conditions shall also be uploaded by the project authorities on their website and updated at least once every six months so as to bring the same in the public domain. The monitoring data of environmental quality parameters (air, water, noise and soil) and critical poll-utants such as SPM, RPM, SO2, NOx (ambient and stack if any) and critical sectorial parameters shall be displayed at the entrance of the project premises and mine office and in corporate office and on the company's website. | Complied.<br>The Environmental Clearance has been uploaded on the company's website. The compliance status of stipulated EC conditions shall also be uploaded on the company's website and updated at least once in every six months after submission of the report to the concerned Authorities. The environmental monitoring data shall also be displayed at the entrance of the project premises and mines office and in corporate office and on the company's website.<br>Monitoring date display at entrance of mine as enclosed Annexure--XI |

| | | |
|---|---|---|
| (xvi) | The project proponent shall submit six monthly reports on the status compliance of the environmental clearance conditions (both in hard copy and e-mail) to the respective Regional Office of the MoEF, the respective Zonal Office of CPCB and the SPCB. | Being complied. |
| (xvii) | The Regional Officials of the Ministry located at Bhubneshwar shall monitor compliance of the stipulated conditions. The project authorities shall extend full cooperation to the officer (s) of the Regional Office by furnishing the requisite data information monitoring report. | Being complied. |
| (xviii) | The environmental statement for each financial year ending 31$^{st}$September Form V is mandate to be submitted by the Project proponent to the concerned State Pollution Control Board as prescribed under the Environment (Protection) Act, 1986 as amended subsequently, shall also be uploaded on the company's website along with the status of compliance of EC conditions and shall be sent to the respective Regional Offices of the MoEF by e-mail. | Noted for compliance.<br>On resumption of Mining Operation at Tasra OCP the Environmental Statement for each financial year shall be submitted to the concerned State Pollution Control Board and shall also be uploaded on the company's website along with the status of compliance of EC conditions and shall be sent to the respective Regional Offices of the MoEF by e-mail. |

**Note**: This for your kind information that presently small-scale mining operation at Tasra OCP.

It may be further submitted that Tasra Open Cast Project is an ambitious project of SAIL having annual peak rated capacity of 4MTPA. SAIL intends to develop this project through Mine Developer route and in this respect MDO has been appointed by SAIL for development and operation of Tasra Open Cast Project and CMSA (Coal Mine Service Agreement) has been executed between MDO and SAIL on 08.09.2023.

As per Scope of works MDO shall take necessary steps for compliance of all EC conditions on behalf of SAIL. Presently MDO is in the process of acquiring of land on behalf of M/s SAIL & setting up of necessary infrastructure for development and operation of the mine.

**Photographs:**

Photo No. 1

Top Soil at Tasra

Photo No.2

OB was dumped at Old Quarry located within earmarked OB dump Area as per Mining Plan of Tasra.

Photo No. 3


Installation of trolley mounted Fog Mist cannon at Tasra Siding

Photo No.4


Water sprinkling at Tasra

Photo No. 5


PM10 Analyzer installed at Tasra Siding

Photo No. 6


Garland Drain Cleaning nearTasra mine periphery area.

Photo No. 7

Plantation at River Damodar Edge at  Tasra Project Area.

Photo No. 8


Roof top rain harvesting at Chasnalla Coal Complex

**Annexure – I**

## Construction of Garland Drain is under progress

**Annexure – II**

## Construction of Siltation Ponds and Catch Drains

**ANNEXURE – III**

## EFFLUENT TREATMENT PLANT WITH PRIMARY TREATMENT

**ANNEXURE – IV**

## FLOODED BASIN TYPE WHEEL WASHING SYSTEM

# ADITI R&D SERVICES

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Annexure - V

## TEST REPORT OF DRINKING WATER FOR THE MONTH OF FEBRUARY 2024

| Ref. No. & Date | NAME AND ADDRESS OF THE CLIENT |
|---|---|
| ARDS/23-24/2057<br>Dt. 05/03/2024 | TASRA COAL MINING PROJECT, COLLIERIES DIVISION,<br>STEEL AUTHORITY OF INDIA LTD.<br>CHASNALLA – 828135, DIST. - DHANBAD |
| P.O. NO. & Date | 6000036592 & Date : 29.01.2024 |
| Season | POST MONSOON |
| Location of Sample | TASRA ( CORE ZONE ) |
| Sample Description | GROUND WATER |
| | Analysis Started on : 27/02/2024 |
| Date of Sample Collection: 26/02/2024 | Analysis completed on: 04/03/2024 |
| Test Procedure | IS:3025 |

### TEST RESULT

| Sl. No. | Parameters | Value | IS: 10500: 2012 | |
|---|---|---|---|---|
| | | | Accepted Limit | Permissible Limit |
| 1. | Colour Hazen units | 1 | 5 | 15 |
| 2. | Odour | Agreeable | Agreeable | Agreeable |
| 3. | Taste | Agreeable | Agreeable | Agreeable |
| 4. | Turbidity NTU Max | 2.4 | 1 | 5 |
| 5. | Total Dissolved Solids mg/l, Max | 720 | 500 | 2000 |
| 6. | pH Value | 7.3 | 6.5 to 8.5 | 6.5 to 8.5 |
| 7. | Total Hardness (as $CaCO_3$) mg/l, Max | 541.8 | 200 | 600 |
| 8. | Calcium (as Ca) mg/l, Max | 154.8 | 75 | 200 |
| 9. | Magnesium (as Mg)mg/l, Max | 37.3 | 30 | 100 |
| 10. | Copper (as Cu) mg/l, Max | 0.02 | 0.05 | 1.5 |
| 11. | Iron (as Fe) mg/l Max | 0.05 | 1.0 | NR |
| 12. | Manganese (as Mn) mg/l, Max | <0.001 | 0.1 | 0.3 |
| 13. | Chlorides (as Cl) mg/l, Max | 100.7 | 250 | 1000 |
| 14. | Sulphate (as $SO_4$) mg/l Max | 19.6 | 200 | 400 |
| 15. | Nitrate mg/l, (as $NO_3$) | 4.6 | 45 | NR |
| 16. | Fluoride (as F) mg/l | 0.42 | 1.0 | 1.5 |
| 17. | Phenolic Compounds (as $C_6H_5OH$) mg/l, Max | - | 0.001 | 0.002 |
| 18. | Mercury (as Hg)mg/l, Max | - | 0.001 | NR |
| 19. | Cadmium (as Cd) mg/l, Max | - | 0.01 | NR |
| 20. | Selenium (as Se mg/l, Max | - | 0.01 | NR |
| 21. | Arsenic (as As) mg/l, Max | <0.001 | 0.01 | 0.05 |
| 22. | Cyanide (as Cn) mg/l, Max | <0.001 | 0.05 | NR |
| 23. | Lead (As Pb) mg/l Max | <0.001 | 0.05 | NR |
| 24. | Zinc (as Zn) mg/l Max | 0.44 | 5.0 | 15 |
| 25. | Arionic detergents (as MBAS), mg/l, Max | - | 0.2 | 1.0 |
| 26. | Chromium (as $Cr+^6$) mg/l | 0.007 | 0.05 | NR |
| 27. | Mineral Oil mg/l, Max | - | 0.01 | NR |
| 28. | Residual, free chlorine mg/l, Min | NIL | 0.2 | 1.0 |

*Remarks: All the parameters of samples tested are within the permissible limit of Drinking Water Standard IS – 10500 : 2012*

*NR- No Relaxation*

Sr. Chemist
Aditi R&D Services

ADITI R&D SERVICES P.O.- DOMGARH DHANBAD SINDRI INDUSTRIAL AREA

Technical Manager
Aditi R&D Services, Sindri

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Phone: 0326-2952377 (O)
Mobile: 09471358492, 09431512608


## TEST REPORT OF DRINKING WATER FOR THE MONTH OF FEBRUARY 2024

| | |
|---|---|
| Ref. No. & Date | NAME AND ADDRESS OF THE CLIENT |
| ARDS/23-24/2058<br>Dt. 05/03/2024 | TASRA COAL MINING PROJECT, COLLIERIES DIVISION,<br>STEEL AUTHORITY OF INDIA LTD.<br>CHASNALLA – 828135, DIST. - DHANBAD |
| P.O. NO. & Date | 6000036592 & Date : 29.01.2024 |
| Season | POST MONSOON |
| Location of Sample | ROHRABANDH ( CORE ZONE ) |
| Sample Description | GROUND WATER |

Analysis Started on : 27/02/2024

| | | | |
|---|---|---|---|
| Date of Sample Collection | 26/02/2024 | Analysis completed on | 04/03/2024 |
| Test Procedure | IS:3025 | | |

**TEST RESULT**

| Sl. No. | Parameters | Value | IS: 10500: 2012 | |
|---|---|---|---|---|
| | | | Accepted Limit | Permissible Limit |
| 1. | Colour Hazen units | 1 | 5 | 15 |
| 2. | Odour | Agreeable | Agreeable | Agreeable |
| 3. | Taste | Agreeable | Agreeable | Agreeable |
| 4. | Turbidity NTU Max | 0.9 | 1 | 5 |
| 5. | Total Dissolved Solids mg/l, Max | 658 | 500 | 2000 |
| 6. | pH Value | 7.2 | 6.5 to 8.5 | 6.5 to 8.5 |
| 7. | Total Hardness (as $CaCO_3$) mg/l, Max | 403.2 | 200 | 600 |
| 8. | Calcium (as Ca) mg/l, Max | 120.96 | 75 | 200 |
| 9. | Magnesium (as Mg)mg/l, Max | 24.2 | 30 | 100 |
| 10. | Copper (as Cu) mg/l, Max | 0.04 | 0.05 | 1.5 |
| 11. | Iron (as Fe) mg/l Max | 0.08 | 1.0 | NR |
| 12. | Manganese (as Mn) mg/l, Max | <0.001 | 0.1 | 0.3 |
| 13. | Chlorides (as Cl) mg/l, Max | 64.58 | 250 | 1000 |
| 14. | Sulphate (as $SO_4$) mg/l Max | 54.30 | 200 | 400 |
| 15. | Nitrate mg/l, (as $NO_3$) | 7.7 | 45 | NR |
| 16. | Fluoride (as F) mg/l | 0.58 | 1.0 | 1.5 |
| 17. | Phenolic Compounds (as $C_6H_5OH$) mg/l, Max | - | 0.001 | 0.002 |
| 18. | Mercury (as Hg)mg/l, Max | - | 0.001 | NR |
| 19. | Cadmium (as Cd) mg/l, Max | - | 0.01 | NR |
| 20. | Selenium (as Se mg/l, Max | - | 0.01 | NR |
| 21. | Arsenic (as As) mg/l, Max | <0.001 | 0.01 | 0.05 |
| 22. | Cyanide (as Cn) mg/l, Max | <0.001 | 0.05 | NR |
| 23. | Lead (As Pb) mg/l Max | <0.001 | 0.05 | NR |
| 24. | Zinc (as Zn) mg/l Max | 0.56 | 5.0 | 15 |
| 25. | Arionic detergents (as MBAS), mg/l, Max | - | 0.2 | 1.0 |
| 26. | Chromium (as $Cr+^6$) mg/l | 0.01 | 0.05 | NR |
| 27. | Mineral Oil mg/l, Max | - | 0.01 | NR |
| 28. | Residual, free chlorine mg/l, Min | NIL | 0.2 | 1.0 |

*Remarks: All the parameters of samples tested are within the permissible limit of Drinking Water Standard IS – 10500 : 2012*

*NR- No Relaxation*

Sr. Chemist
Aditi R&D Services

ADITI R&D SERVICES P.O.- DOMGARH DHANBAD SINDRI INDUSTRIAL AREA

Technical Manager
Aditi R&D Services, Sindri

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Email ID: sindriaditi@gmail.com
Website: aditirndservices.com
Phone: 0326-2952377 (O)
Mobile: 09471358492, 09431512608


## TEST REPORT OF DRINKING WATER FOR THE MONTH OF FEBRUARY 2024

| Ref. No. & Date | NAME AND ADDRESS OF THE CLIENT |
|---|---|
| ARDS/23-24/2059<br>Dt. 05/03/2024 | TASRA COAL MINING PROJECT, COLLIERIES DIVISION,<br>STEEL AUTHORITY OF INDIA LTD.<br>CHASNALLA – 828135, DIST. - DHANBAD |
| P.O. NO. & Date | 6000036592 & Date : 29.01.2024 |
| Season | POST MONSOON |
| Location of Sample | KANDRA ( CORE ZONE ) |
| Sample Description | GROUND WATER |
| | Analysis Started on : 27/02/2024 |
| Date of Sample Collection: 26/02/2024 | Analysis completed on: 04/03/2024 |
| Test Procedure | IS:3025 |

### TEST RESULT

| Sl. No. | Parameters | Value | IS: 10500: 2012 | |
|---|---|---|---|---|
| | | | Accepted Limit | Permissible Limit |
| 1. | Colour Hazen units | 1 | 5 | 15 |
| 2. | Odour | Agreeable | Agreeable | Agreeable |
| 3. | Taste | Agreeable | Agreeable | Agreeable |
| 4. | Turbidity NTU Max | 3.0 | 1 | 5 |
| 5. | Total Dissolved Solids mg/l, Max | 804 | 500 | 2000 |
| 6. | pH Value | 7.1 | 6.5 to 8.5 | 6.5 to 8.5 |
| 7. | Total Hardness (as $CaCO_3$) mg/l, Max | 592.2 | 200 | 600 |
| 8. | Calcium (as Ca) mg/l, Max | 173.0 | 75 | 200 |
| 9. | Magnesium (as Mg)mg/l, Max | 38.3 | 30 | 100 |
| 10. | Copper (as Cu) mg/l, Max | 0.04 | 0.05 | 1.5 |
| 11. | Iron (as Fe) mg/l Max | 0.06 | 1.0 | NR |
| 12. | Manganese (as Mn) mg/l, Max | <0.001 | 0.1 | 0.3 |
| 13. | Chlorides (as Cl) mg/l, Max | 138.66 | 250 | 1000 |
| 14. | Sulphate (as $SO_4$) mg/l Max | 14.4 | 200 | 400 |
| 15. | Nitrate mg/l, (as $NO_3$) | 7.1 | 45 | NR |
| 16. | Fluoride (as F) mg/l | 0.62 | 1.0 | 1.5 |
| 17. | Phenolic Compounds (as $C_6H_5OH$) mg/l, Max | - | 0.001 | 0.002 |
| 18. | Mercury (as Hg)mg/l, Max | - | 0.001 | NR |
| 19. | Cadmium (as Cd) mg/l, Max | - | 0.01 | NR |
| 20. | Selenium (as Se mg/l, Max | - | 0.01 | NR |
| 21. | Arsenic (as As) mg/l, Max | <0.001 | 0.01 | 0.05 |
| 22. | Cyanide (as Cn) mg/l, Max | <0.001 | 0.05 | NR |
| 23. | Lead (As Pb) mg/l Max | <0.001 | 0.05 | NR |
| 24. | Zinc (as Zn) mg/l Max | 0.48 | 5.0 | 15 |
| 25. | Arionic detergents (as MBAS), mg/l, Max | - | 0.2 | 1.0 |
| 26. | Chromium (as $Cr+^{5}$) mg/l | 0.009 | 0.05 | NR |
| 27. | Mineral Oil mg/l, Max | - | 0.01 | NR |
| 28. | Residual, free chlorine mg/l, Min | NIL | 0.2 | 1.0 |

*Remarks: All the parameters of samples tested are within the permissible limit of Drinking Water Standard IS – 10500 : 2012*

*NR- No Relaxation*

Sr. Chemist
Aditi R&D Services

ADITI R&D SERVICES P.O.- DOMGARH DHANBAD SINDRI INDUSTRIAL AREA

Technical Manager
Aditi R&D Services, Sindri

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Phone: 0326-2952377 (O)
Mobile: 09471358492, 09431512608


## TEST REPORT OF SURFACE WATER FOR THE MONTH OF FEBRUARY 2024

| Ref. No. & Date | NAME AND ADDRESS OF THE CLIENT |
|---|---|
| ARDS/23-24/2065<br>Dt. 06/03/2024 | TASRA COAL MINING PROJECT, COLLIERIES DIVISION,<br>STEEL AUTHORITY OF INDIA LTD.<br>CHASNALLA – 828135, DIST. - DHANBAD |
| P.O. NO. & Date | 6000036592 & Date : 29.01.2024 |
| Season | POST MONSOON |

| Location of Sample Collection<br>UPSTREAM OF DAMODAR RIVER | | Analysis Started on | 28/02/2024 |
|---|---|---|---|
| Date & Time Sample Collection | 27/02/2024 | Analysis completed on | 05/03/2024 |
| Test Procedure | IS:3025 | | |

**TEST RESULT**

| Sl. No. | Parameters | Value | (IS :2296)<br>Surface Water Class "C"<br>Tolerance Limit |
|---|---|---|---|
| 1. | Colour Hazen units | 1 | 300 |
| 2. | Dissolved Oxygen, mg/l | 5.3 | 4 |
| 3. | B.O.D. (3 days at 27°C) | 1.7 | 3 |
| 4. | Total Dissolved Solids mg/l, Max | 352 | 1500 |
| 5. | pH Value | 8.1 | 6.5 – 8.5 |
| 6. | Conductivity (µs/CM) | 540 | |
| 7. | Turbidity (NTU) | 1.8 | |
| 8. | Phenolic Compounds (as $C_6H_5OH$) mg/l, Max | - | 0.005 |
| 9. | Oil and grease, mg/l | BDL | 0.1 |
| 10. | C.O.D., mg/l | 29.9 | - |
| 11. | Total Suspended Solids , mg/l | 32 | - |

***Remarks: All the parameters of samples tested are within the permissible limit of General standard.***
***BDL – Below Detection Limit***

Sr. Chemist
Aditi R&D Services

ADITI R&D SERVICES P.O.- DOMGARH DHANBAD SINDRI INDUSTRIAL AREA

Technical Manager
Aditi R&D Services, Sindri

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Mobile: 09471358492, 09431512608


## TEST REPORT OF SURFACE WATER FOR THE MONTH OF FEBRUARY 2024

| Ref. No. & Date | NAME AND ADDRESS OF THE CLIENT |
|---|---|
| ARDS/23-24/2061<br>Dt. 05/03/2024 | TASRA COAL MINING PROJECT, COLLIERIES DIVISION,<br>STEEL AUTHORITY OF INDIA LTD.<br>CHASNALLA – 828135, DIST. - DHANBAD |
| P.O. NO. & Date | **6000036592 & Date : 29.01.2024** |
| Season | **POST MONSOON** |

| Location of Sample<br>DOWNSTREAM OF DAMODAR RIVER | | Analysis Started on | 27/02/2024 |
|---|---|---|---|
| Date & Time Sample Collection | 26/02/2024 | Analysis completed on | 04/03/2024 |
| Test Procedure | IS:3025 | | |

**TEST RESULT**

| Sl. No. | Parameters | Value | (IS :2296)<br>Surface Water Class "C"<br>Tolerance Limit |
|---|---|---|---|
| 1. | Colour Hazen units | 1 | 300 |
| 2. | Dissolved Oxygen, mg/l | 5.1 | 4 |
| 3. | B.O.D. (3 days at 27°C) | 1.9 | 3 |
| 4. | Total Dissolved Solids mg/l, Max | 345 | 1500 |
| 5. | pH Value | 8.2 | 6.5 – 8.5 |
| 6. | Conductivity (µS/cm) | 530 | |
| 7. | Turbidity (NTU) | 2.0 | |
| 8. | Phenolic Compounds (as $C_6H_5OH$) mg/l, Max | - | 0.005 |
| 9. | Oil and grease, mg/l | BDL | 0.1 |
| 10. | C.O.D., mg/l | 22.5 | - |
| 11. | Total Suspended Solids , mg/l | 35 | - |

*Remarks: All the parameters of samples tested are within the permissible limit of General standard.*
*BDL – Below Detection Limit*

Sr. Chemist
Aditi R&D Services

ADITI R&D SERVICES P.O.- DOMGARH DHANBAD SINDRI INDUSTRIAL AREA

Technical Manager
Aditi R&D Services, Sindri

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**Air Monitoring Locations**


**Air Monitoring Locations**


**Air Monitoring Locations**


**Air Monitoring Locations**


**Noise Monitoring Locations**

**Noise Monitoring Locations**


**Noise Monitoring Locations**

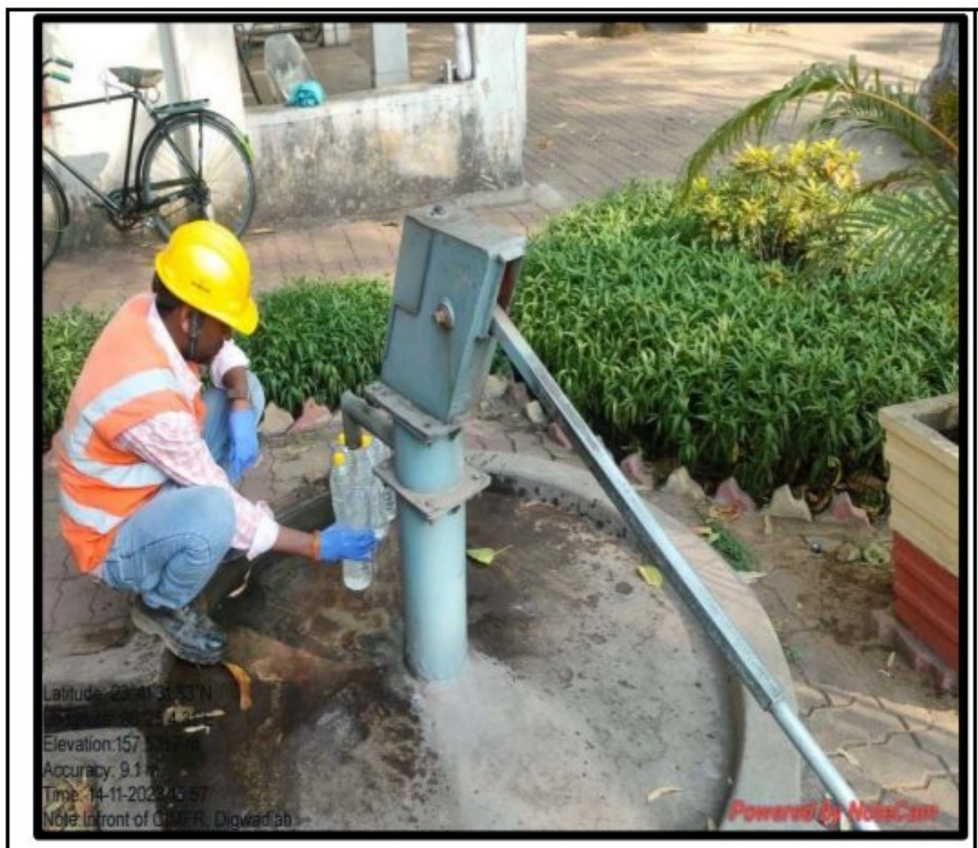

**Noise Monitoring Locations**


**Soil Monitoring Locations**


**Soil Monitoring Locations**


**Soil Monitoring Locations**


**Soil Monitoring Locations**



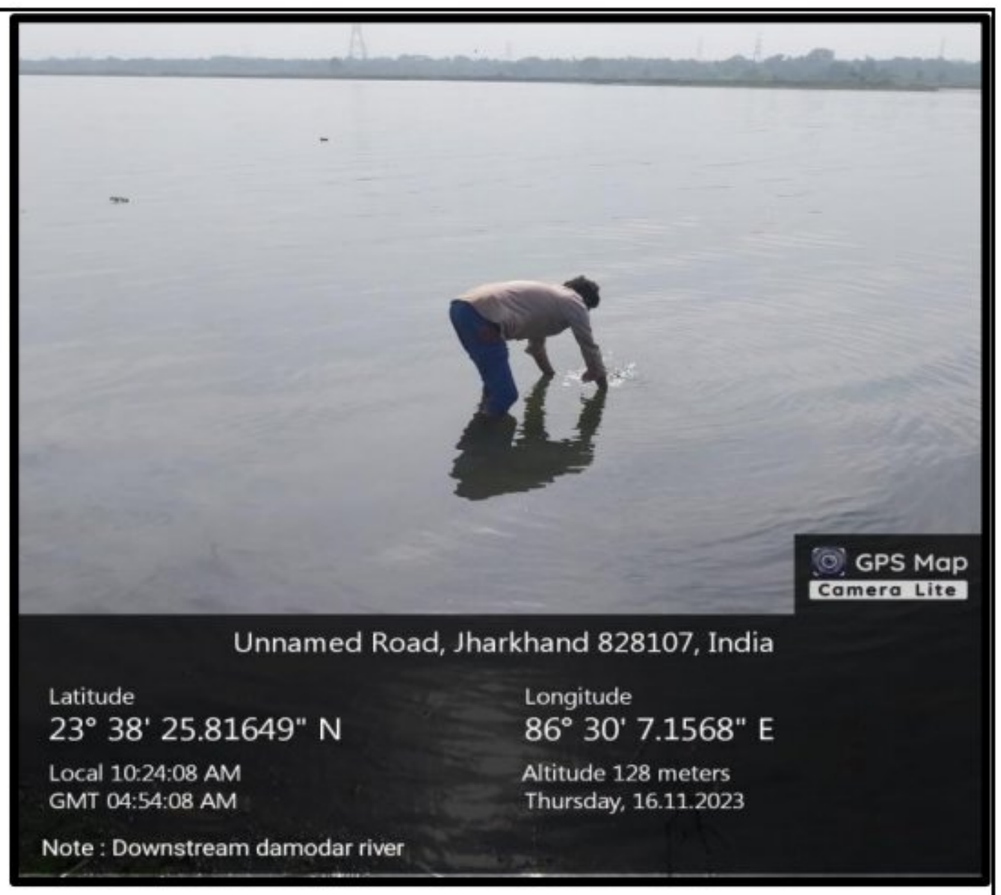

GW Monitoring Locations


GW Monitoring Locations

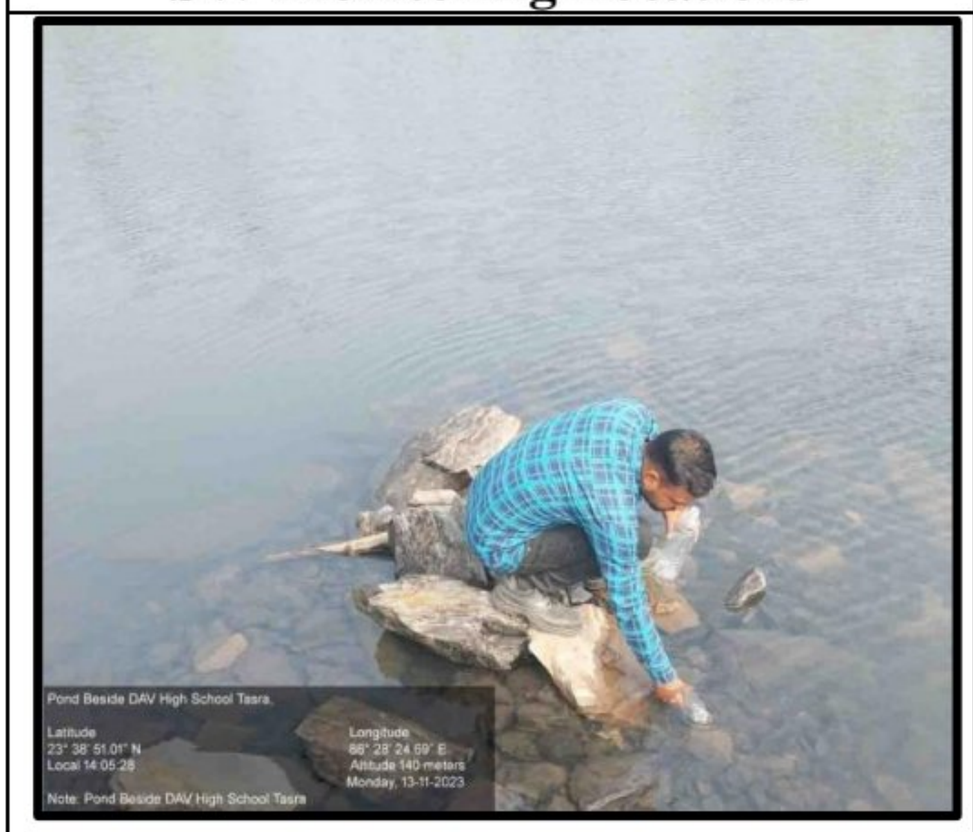

GW Monitoring Locations


GW Monitoring Locations

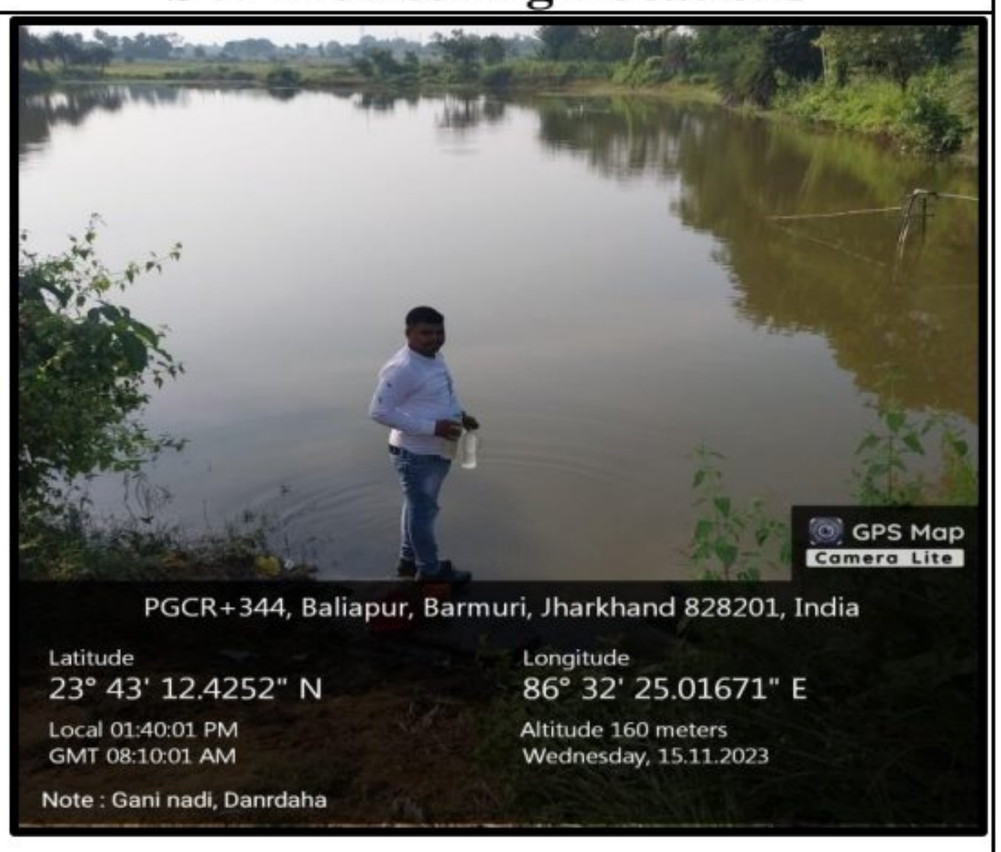

**SW Monitoring Locations**




**SW Monitoring Locations**




**SW Monitoring Locations**




**SW Monitoring Locations**


**Air Monitoring Locations**


**Air Monitoring Locations**


**Air Monitoring Locations**


**Air Monitoring Locations**


**Noise Monitoring Locations**

**Noise Monitoring Locations**


**Noise Monitoring Locations**

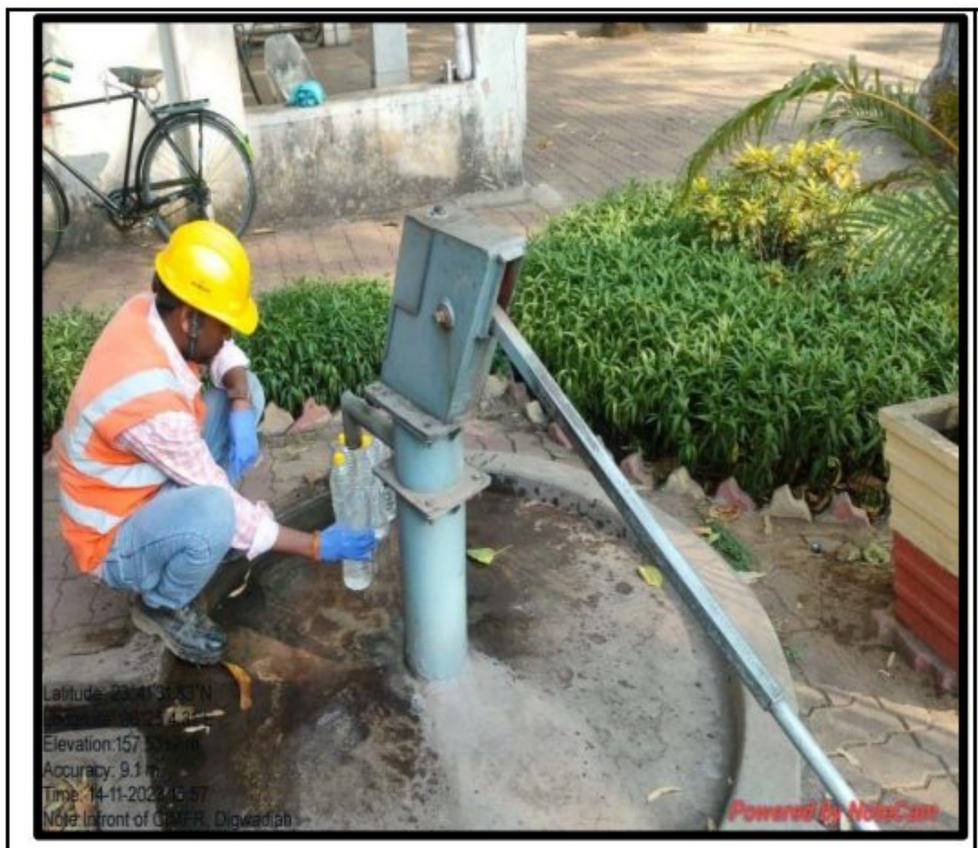

**Noise Monitoring Locations**


**Soil Monitoring Locations**


**Soil Monitoring Locations**


**Soil Monitoring Locations**


**Soil Monitoring Locations**



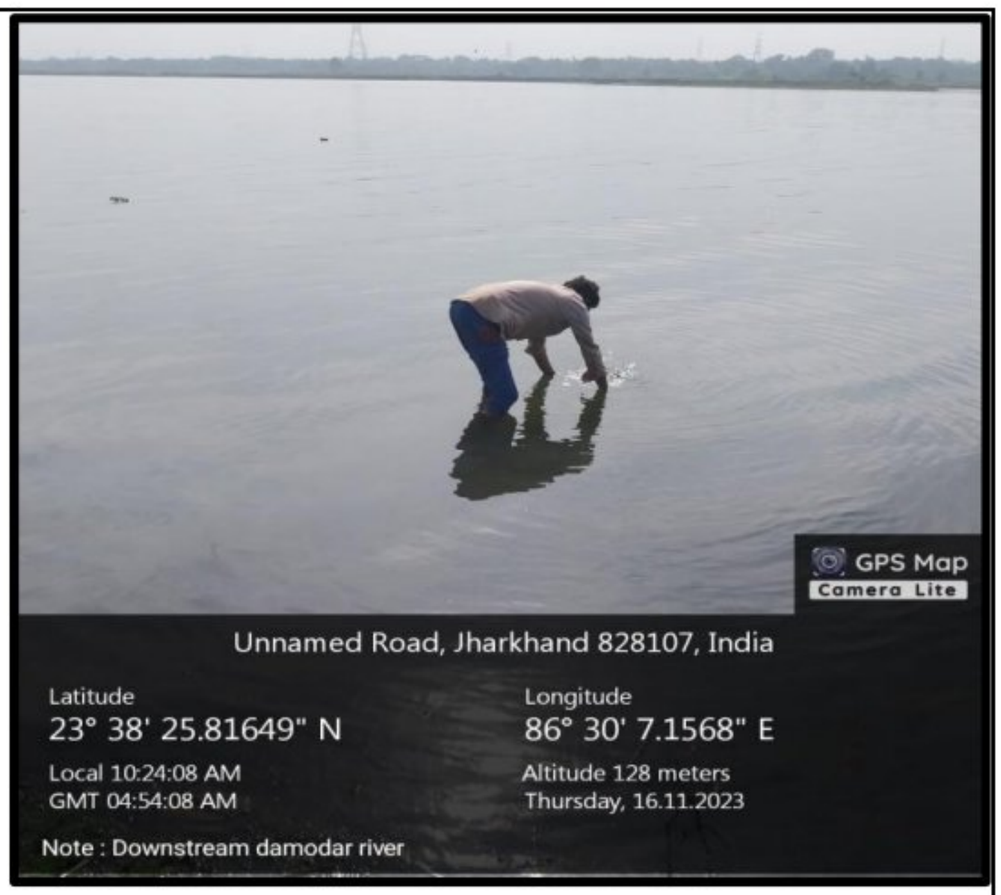

GW Monitoring Locations


GW Monitoring Locations

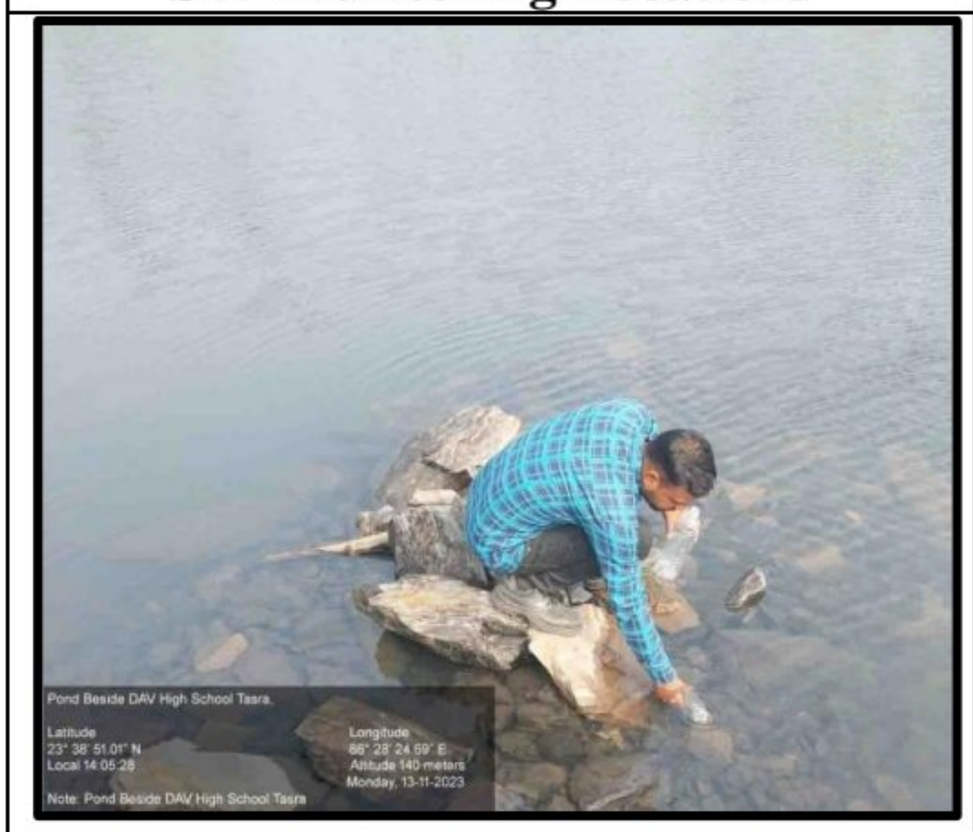

GW Monitoring Locations


GW Monitoring Locations

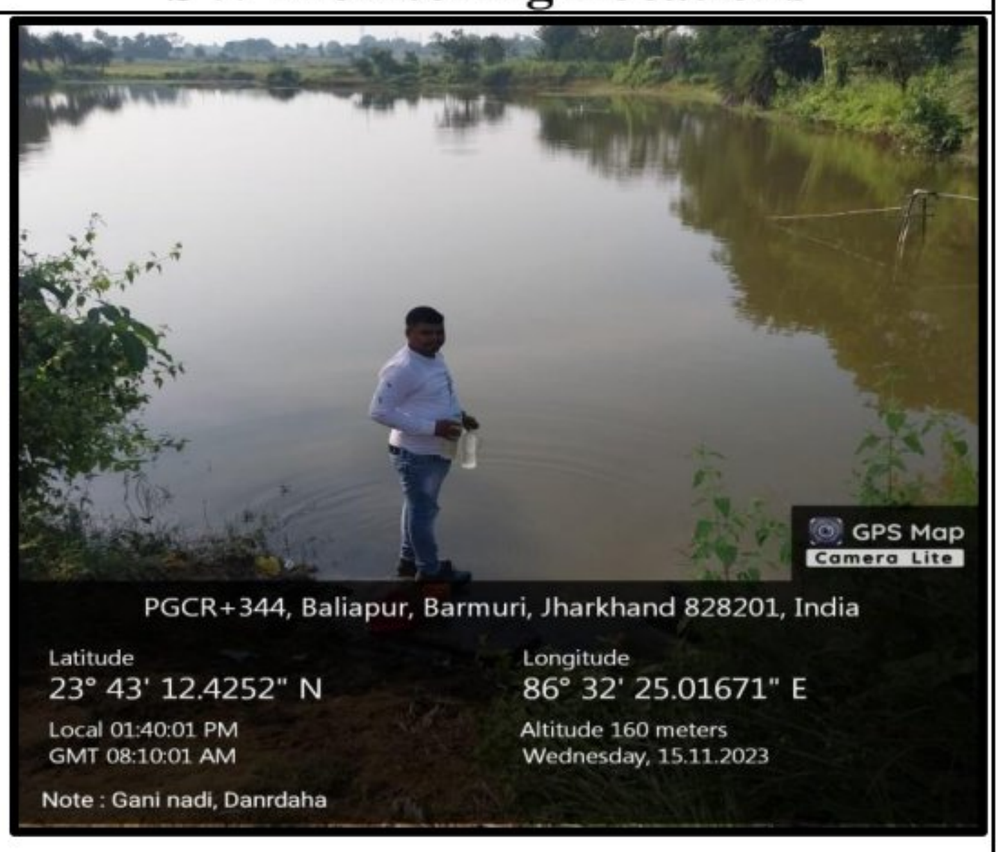

**SW Monitoring Locations**




**SW Monitoring Locations**




**SW Monitoring Locations**




**SW Monitoring Locations**

ANNEXURE - VI


# ADITI R&D SERVICES

**Testing Laboratory**

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**(A Constituent Board of Quality Council of India)**

**ISO/IEC 17025:2017, ISO 9001:2015,ISO (OHSAS) 45001:2018 Certified**

Plot No. - I-B-17 (P)
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Jharkhand - 828107
Email ID: sindriaditi@gmail.com
Website: aditirndservices.com
Phone: 0326-2952377 (O)
Mobile: 09471358492, 09431512608


Ref. No.: - ARDS/23-24/2039

Date: 02/03/2024

## TEST REPORT OF AMBIENT AIR QUALITY

- Name of the industry : TASRA COAL MINING PROJECT, COLLIERIES DIVISION, STEEL AUTHORITY OF INDIA LTD. CHASNALLA – 828135, DIST. – DHANBAD
- Work Order P.O. NO. & Date: 6000036592 & Date : 29.01.2024
- Date of Sample Collection: 26/02/2024 to 27/02/2024
- Date of Testing : 28/02/2024 to 01/03/2024
- Test Procedure : As per IS - 5182
- Sampling Location : TASRA (NEAR ARYA SAMAJ, SINDRI)

### TEST RESULTS

| | CORE ZONE | | | NAAQ - CPCB STANDARD |
|---|---|---|---|---|
| | Avg. Ambient Temperature | Average Relative Humidity (%) | Sample Location TASRA NEAR ARYA SAMAJ, SINDRI | |
| | 24 | 54 | | |
| Sl No. | Particulars | | Value | |
| 1. | Particulate Matter ($PM_{10}$), µg/m³ | | 77.63 | 100 µg/m³ |
| 2. | Particulate Matter ($PM_{2.5}$), µg/m³ | | 42.70 | 60 µg/m³ |
| 3. | $SO_2$, µg/m³ | | 33.86 | 80 µg/m³ |
| 4. | $NO_2$, µg/m³ | | 27.48 | 80 µg/m³ |
| 5. | $NH_3$, µg/m³ | | 16.36 | 400 µg/m³ |
| 6. | CO, mg/m³ | | 0.81 | 4 mg/m³ |
| 7. | Pb, µg/m³ | | B.D.L | 1 µg/m³ |
| 8. | As, ng/m³ | | BDL | 6ng/m³ |
| 9. | Ni, ng/m³ | | BDL | 20ng/m³ |
| 10. | Benzene, µg/m³ | | BDL | 5 µg/m³ |
| 11. | Benzoapyreneng/m³ | | BDL | 1ng/m³ |
| 12. | *Ozone*, µg/m³ | | 15.30 | 180 µg/m³ |

Sr. Chemist
Aditi R&D Services

ADITI R&D SERVICES P.O.- DOMGARH DHANBAD SINDRI INDUSTRIAL AREA

Technical Manager
Aditi R&D Services, Sindri

**Statements :**

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Ref. No.: - ARDS/23-24/2040

Date: 02/03/2024

## TEST REPORT OF AMBIENT AIR QUALITY

- Name of the industry : TASRA COAL MINING PROJECT, COLLIERIES DIVISION, STEEL AUTHORITY OF INDIA LTD. CHASNALLA – 828135, DIST. – DHANBAD
- **Work Order P.O. NO. & Date:** 6000036592 & Date : 29.01.2024
- **Date of Sample Collection:** **26/02/2024 TO 27/02/2024**
- **Date of Testing** : **28/02/2024 TO 01/03/2024**
- **Test Procedure** : **As per IS - 5182**
- **Sampling Location** : **KANDRA (COAL BOARD COLONY)**

### TEST RESULTS

| | CORE ZONE | | | NAAQ - CPCB STANDARD |
|---|---|---|---|---|
| | Avg. Ambient Temperature | Average Relative Humidity (%) | Sample Location KANDRA (COAL BOARD COLONY) | |
| | 24 | 54 | | |
| SI No. | Particulars | | Value | |
| 1. | Particulate Matter ($PM_{10}$), $\mu g/m^3$ | | 73.52 | 100 $\mu g/m^3$ |
| 2. | Particulate Matter ($PM_{2.5}$), $\mu g/m^3$ | | 40.44 | 60 $\mu g/m^3$ |
| 3. | $SO_2$, $\mu g/m^3$ | | 30.82 | 80 $\mu g/m^3$ |
| 4. | $NO_2$, $\mu g/m^3$ | | 26.42 | 80 $\mu g/m^3$ |
| 5. | $NH_3$, $\mu g/m^3$ | | 16.83 | 400 $\mu g/m^3$ |
| 6. | CO, $mg/m^3$ | | 0.77 | 4 $mg/m^3$ |
| 7. | Pb, $\mu g/m^3$ | | BDL | 1 $\mu g/m^3$ |
| 8. | As, $ng/m^3$ | | BDL | 6 $ng/m^3$ |
| 9. | Ni, $ng/m^3$ | | BDL | 20 $ng/m^3$ |
| 10. | Benzene, $\mu g/m^3$ | | BDL | 5 $\mu g/m^3$ |
| 11. | Benzoapyreneng/$m^3$ | | BDL | 1 $ng/m^3$ |
| 12. | *Ozone*, $\mu g/m^3$ | | 16.32 | 180 $\mu g/m^3$ |

Sr. Chemist
Aditi R&D Services

ADITI R&D SERVICES P.O.- DOMGARH DHANBAD SINDRI INDUSTRIAL AREA

Technical Manager
Aditi R&D Services, Sindri

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Ref. No.: - ARDS/23-24/2041

Date: 02/03/2024

## TEST REPORT OF AMBIENT AIR QUALITY

- Name of the industry : TASRA COAL MINING PROJECT, COLLIERIES DIVISION, STEEL AUTHORITY OF INDIA LTD. CHASNALLA – 828135, DIST. - DHANBAD
- Work Order P.O. NO. & Date: 6000036592 & Date : 29.01.2024
- Date of Sample Collection: 26/02/2024 TO 27/02/2024
- Date of Testing : 28/02/2024 TO 01/03/2024
- Test Procedure : As per IS - 5182
- Sampling Location : CHASNALLA (G.M. OFFICE)

### TEST RESULTS

| | CORE ZONE | | | NAAQ - CPCB STANDARD |
|---|---|---|---|---|
| | Avg. Ambient Temperature | Average Relative Humidity (%) | Sample Location CHASNALLA | |
| | 24 | 54 | | |
| Sl No. | Particulars | | Value | |
| 1. | Particulate Matter ($PM_{10}$), µg/m³ | | 75.48 | 100 µg/m³ |
| 2. | Particulate Matter ($PM_{2.5}$), µg/m³ | | 41.52 | 60 µg/m³ |
| 3. | $SO_2$, µg/m³ | | 36.56 | 80 µg/m³ |
| 4. | $NO_2$, µg/m³ | | 24.38 | 80 µg/m³ |
| 5. | $NH_3$, µg/m³ | | 16.84 | 400 µg/m³ |
| 6. | CO, mg/m³ | | 0.84 | 4 mg/m³ |
| 7. | Pb, µg/m³ | | BDL | 1 µg/m³ |
| 8. | As, ng/m³ | | BDL | 6ng/m³ |
| 9. | Ni, ng/m³ | | BDL | 20ng/m³ |
| 10. | Benzene, µg/m³ | | BDL | 5 µg/m³ |
| 11. | Benzoapyreneng/m³ | | BDL | 1ng/m³ |
| 12. | *Ozone*, µg/m³ | | 17.48 | 180 µg/m³ |

Sr. Chemist
Aditi R&D Services

ADITI R&D SERVICES P.O.- DOMGARH DHANBAD SINDRI INDUSTRIAL AREA

Technical Manager
Aditi R&D Services, Sindri

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Mobile: 09471358492, 09431512608


Ref. No.: - ARDS/23-24/2042

Date: 02/03/2024

## TEST REPORT OF AMBIENT AIR QUALITY

- Name of the industry : TASRA COAL MINING PROJECT, COLLIERIES DIVISION, STEEL AUTHORITY OF INDIA LTD. CHASNALLA – 828135, DIST. - DHANBAD
- Work Order P.O. NO. & Date: 6000036592 & Date : 29.01.2024
- Date of Sample Collection: 26/02/2024 TO 27/02/2024
- Date of Testing : 28/02/2024 TO 01/03/2024
- Test Procedure : As per IS - 5182
- Sampling Location : ROHRABANDH (NEAR LIC OFFICE BACK SIDE)

### TEST RESULTS

| | CORE ZONE | | | NAAQ - CPCB STANDARD |
|---|---|---|---|---|
| | Avg. Ambient Temperature | Average Relative Humidity (%) | Sample Location ROHRABANDH | |
| | 24 | 54 | | |
| Sl No. | Particulars | | Value | . |
| 1. | Particulate Matter ($PM_{10}$), µg/m³ | | 78.79 | 100 µg/m³ |
| 2. | Particulate Matter ($PM_{2.5}$), µg/m³ | | 46.28 | 60 µg/m³ |
| 3. | $SO_2$, µg/m³ | | 32.25 | 80 µg/m³ |
| 4. | $NO_2$, µg/m³ | | 26.38 | 80 µg/m³ |
| 5. | $NH_3$, µg/m³ | | 16.32 | 400 µg/m³ |
| 6. | CO, mg/m³ | | 0.76 | 4 mg/m³ |
| 7. | Pb, µg/m³ | | BDL | 1 µg/m³ |
| 8. | As, ng/m³ | | BDL | 6ng/m³ |
| 9. | Ni, ng/m³ | | BDL | 20ng/m³ |
| 10. | Benzene, µg/m³ | | BDL | 5 µg/m³ |
| 11. | Benzoapyreneng/m³ | | BDL | 1ng/m³ |
| 12. | *Ozone*, µg/m³ | | 16.25 | 180 µg/m³ |

Sr. Chemist
Aditi R&D Services

ADITI R&D SERVICES P.O.- DOMGARH DHANBAD SINDRI INDUSTRIAL AREA

Technical Manager
Aditi R&D Services, Sindri

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Mobile: 09471358492, 09431512608


Ref. No.: - ARDS/23-24/2053 Date: 05/03/2024

## TEST REPORT OF AMBIENT AIR QUALITY

- Name of the industry : TASRA COAL MINING PROJECT, COLLIERIES DIVISION, STEEL AUTHORITY OF INDIA LTD. CHASNALLA – 828135, DIST. - DHANBAD
- Work Order P.O. NO. & Date: 6000036592 & Date : 29.01.2024
- Date of Sample Collection: 28/02/2024 TO 29/02/2024
- Date of Testing : 01/03/2024 TO 04/03/2024
- Test Procedure : As per IS - 5182
- Sampling Location : DIGWADIH (JEALGORA GUEST HOUSE)

### TEST RESULTS

| | BUFFER ZONE | | | NAAQ - CPCB STANDARD |
|---|---|---|---|---|
| | Avg. Ambient Temperature | Average Relative Humidity (%) | Sample Location | |
| | 24 | 54 | DIGWADIH | |
| Sl No. | Particulars | | Value | |
| 1. | Particulate Matter ($PM_{10}$), µg/m³ | | 62.47 | 100 µg/m³ |
| 2. | Particulate Matter ($PM_{2.5}$), µg/m³ | | 35.48 | 60 µg/m³ |
| 3. | $SO_2$, µg/m³ | | 24.30 | 80 µg/m³ |
| 4. | $NO_2$, µg/m³ | | 28.45 | 80 µg/m³ |
| 5. | $NH_3$, µg/m³ | | 17.35 | 400 µg/m³ |
| 6. | CO, mg/m³ | | 0.57 | 4 mg/m³ |
| 7. | Pb, µg/m³ | | BDL | 1 µg/m³ |
| 8. | As, ng/m³ | | BDL | 6ng/m³ |
| 9. | Ni, ng/m³ | | BDL | 20ng/m³ |
| 10. | Benzene, µg/m³ | | BDL | 5 µg/m³ |
| 11. | Benzoapyreneng/m³ | | BDL | 1ng/m³ |
| 12. | *Ozone*, µg/m³ | | 20.42 | 180 µg/m³ |

Sr. Chemist
Aditi R&D Services

ADITI R&D SERVICES P.O.- DOMGARH DHANBAD SINDRI INDUSTRIAL AREA

Technical Manager
Aditi R&D Services, Sindri

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**ISO/IEC 17025:2017, ISO 9001:2015,ISO (OHSAS) 45001:2018 Certified**

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Mobile: 09471358492, 09431512608


Ref. No.: - ARDS/23-24/2054

Date: 05/03/2024

## TEST REPORT OF AMBIENT AIR QUALITY

- Name of the industry : TASRA COAL MINING PROJECT, COLLIERIES DIVISION, STEEL AUTHORITY OF INDIA LTD. CHASNALLA – 828135, DIST. - DHANBAD
- Work Order P.O. NO. & Date: 6000036592 & Date : 29.01.2024
- Date of Sample Collection: 28/02/2024 TO 29/02/2024
- Date of Testing : 01/03/2024 TO 04/03/2024
- Test Procedure : As per IS - 5182
- Sampling Location : BAGHMARA (NEAR MAA HOSPITAL)

### TEST RESULTS

| | BUFFER ZONE | | | NAAQ - CPCB STANDARD |
|---|---|---|---|---|
| | Avg. Ambient Temperature | Average Relative Humidity (%) | Sample Location | |
| | 24 | 54 | BAGHMARA | |
| Sl No. | Particulars | | Value | |
| 1. | Particulate Matter ($PM_{10}$), µg/m³ | | 54.29 | 100 µg/m³ |
| 2. | Particulate Matter ($PM_{2.5}$), µg/m³ | | 30.58 | 60 µg/m³ |
| 3. | $SO_2$, µg/m³ | | 22.82 | 80 µg/m³ |
| 4. | $NO_2$, µg/m³ | | 20.86 | 80 µg/m³ |
| 5. | $NH_3$, µg/m³ | | 17.48 | 400 µg/m³ |
| 6. | CO, mg/m³ | | 0.52 | 4 mg/m³ |
| 7. | Pb, µg/m³ | | BDL | 1 µg/m³ |
| 8. | As, ng/m³ | | BDL | 6ng/m³ |
| 9. | Ni, ng/m³ | | BDL | 20ng/m³ |
| 10. | Benzene, µg/m³ | | BDL | 5 µg/m³ |
| 11. | Benzoapyreneng/m³ | | BDL | 1ng/m³ |
| 12. | *Ozone*, µg/m³ | | 21.56 | 180 µg/m³ |

Sr. Chemist
Aditi R&D Services

ADITI R&D SERVICES P.O.- DOMGARH DHANBAD SINDRI INDUSTRIAL AREA

Technical Manager
Aditi R&D Services, Sindri

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Ref. No.: - ARDS/23-24/2055

Date: 05/03/2024

## TEST REPORT OF AMBIENT AIR QUALITY

- Name of the industry : TASRA COAL MINING PROJECT, COLLIERIES DIVISION, STEEL AUTHORITY OF INDIA LTD. CHASNALLA – 828135, DIST. - DHANBAD
- Work Order P.O. NO. & Date: 6000036592 & Date : 29.01.2024
- Date of Sample Collection: 28/02/2024 TO 29/02/2024
- Date of Testing : 01/03/2024 TO 04/03/2024
- Test Procedure : As per IS - 5182
- Sampling Location : BHOJUDIH (NEAR RAILWAY COLONY)

### TEST RESULTS

| | BUFFER ZONE | | | NAAQ - CPCB STANDARD |
|---|---|---|---|---|
| | Avg. Ambient Temperature | Average Relative Humidity (%) | Sample Location | |
| | 24 | 54 | BHOJUDIH | |
| Sl No. | Particulars | | Value | |
| 1. | Particulate Matter ($PM_{10}$), µg/m³ | | 64.36 | 100 µg/m³ |
| 2. | Particulate Matter ($PM_{2.5}$), µg/m³ | | 37.62 | 60 µg/m³ |
| 3. | $SO_2$, µg/m³ | | 23.52 | 80 µg/m³ |
| 4. | $NO_2$, µg/m³ | | 29.83 | 80 µg/m³ |
| 5. | $NH_3$, µg/m³ | | 17.64 | 400 µg/m³ |
| 6. | CO, mg/m³ | | 0.64 | 4 mg/m³ |
| 7. | Pb, µg/m³ | | BDL | 1 µg/m³ |
| 8. | As, ng/m³ | | BDL | 6ng/m³ |
| 9. | Ni, ng/m³ | | BDL | 20ng/m³ |
| 10. | Benzene, µg/m³ | | BDL | 5 µg/m³ |
| 11. | Benzoapyreneng/m³ | | BDL | 1ng/m³ |
| 12. | *Ozone*, µg/m³ | | 22.59 | 180 µg/m³ |

Sr. Chemist
Aditi R&D Services

ADITI R&D SERVICES P.O.- DOMGARH DHANBAD SINDRI INDUSTRIAL AREA

Technical Manager
Aditi R&D Services, Sindri

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Ref. No.: - ARDS/23-24/2056 Date: 05/03/2024

## TEST REPORT OF AMBIENT AIR QUALITY

- Name of the industry : TASRA COAL MINING PROJECT, COLLIERIES DIVISION, STEEL AUTHORITY OF INDIA LTD. CHASNALLA – 828135, DIST. - DHANBAD
- Work Order P.O. NO. & Date: 6000036592 & Date : 29.01.2024
- Date of Sample Collection: 28/02/2024 TO 29/02/2024
- Date of Testing : 01/03/2024 TO 04/03/2024
- Test Procedure : As per IS - 5182
- Sampling Location : JORADIH (NEAR TEMPLE)

### TEST RESULTS

| | BUFFER ZONE | | | NAAQ - CPCB STANDARD |
|---|---|---|---|---|
| | Avg. Ambient Temperature | Average Relative Humidity (%) | Sample Location | |
| | 24 | 54 | JORADIH (NEAR TEMPLE) | |
| SI No. | Particulars | | Value | |
| 1. | Particulate Matter ($PM_{10}$), µg/m³ | | 59.31 | 100 µg/m³ |
| 2. | Particulate Matter ($PM_{2.5}$), µg/m³ | | 34.57 | 60 µg/m³ |
| 3. | $SO_2$, µg/m³ | | 22.62 | 80 µg/m³ |
| 4. | $NO_2$, µg/m³ | | 30.56 | 80 µg/m³ |
| 5. | $NH_3$, µg/m³ | | 18.52 | 400 µg/m³ |
| 6. | CO, mg/m³ | | 0.53 | 4 mg/m³ |
| 7. | Pb, µg/m³ | | BDL | 1 µg/m³ |
| 8. | As, ng/m³ | | BDL | 6ng/m³ |
| 9. | Ni, ng/m³ | | BDL | 20ng/m³ |
| 10. | Benzene, µg/m³ | | BDL | 5 µg/m³ |
| 11. | Benzoapyreneng/m³ | | BDL | 1ng/m³ |
| 12. | *Ozone*, µg/m³ | | 21.62 | 180 µg/m³ |

Sr. Chemist
Aditi R&D Services

ADITI R&D SERVICES P.O.- DOMGARH DHANBAD SINDRI INDUSTRIAL AREA

Technical Manager
Aditi R&D Services, Sindri

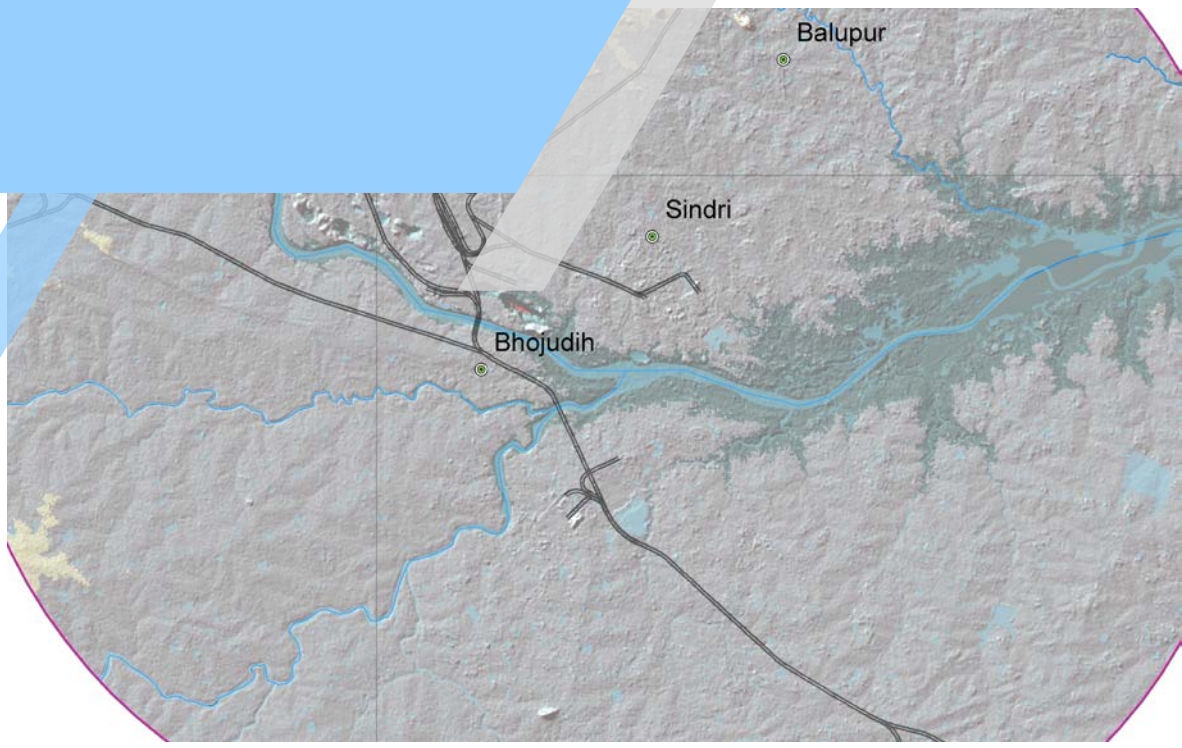
**Statements :**

1. The test report refers only to the particular item(s) submitted for testing.
2. The test results reported in this report are valid at the time of and under the stated condition of measurment.
3. This particular test report cannot be reproduced except in full without prior permission of Quality Manager of the laboratory.

ANNEXURE-VII

# Tasra Coal Mining Project

## Land Use / Land Cover study using Satellite Imageries




**Tasra Coal Mining Project**
**THRIVENI RAMKA MINING**
**Dhanbad, Jharkhand**

THRIVENI RAMKA MINING

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# Introduction

## RATIONALE OF THE STUDY

Land use/cover is two separate terminologies which are often used interchangeably. Land cover refers to the physical characteristics of earth's surface, captured in the distribution of vegetation, water, soil and other physical features of the land, including those influenced by human activities e.g., settlements.

The land use/cover pattern of a region is an outcome of natural and socio-economic factors and their utilization by man in time and space. Information on land use/cover and possibilities for their optimal use is essential for the selection, planning and implementation of land use schemes to meet the increasing demands for basic human needs and welfare.

The need for information on land use/ vegetation cover has gained importance due to the all-round concern on environmental impact of anthropogenic cause and especially mining. The information on land use/cover inventory that includes spatial distribution, aerial extent, location, rate and pattern of change of each category and is of paramount importance for assessing the impact of coal mining on vegetation cover.

Remote sensing data with its various spectral and spatial resolutions, offers comprehensive and accurate information for mapping and monitoring of land use/cover over a period. The advent of commercial high resolution, multispectral satellite data has opened a new avenue in supporting the field of mapping and monitoring of land use especially the vegetation cover.

Realizing the need of monitoring of land use/ vegetation cover in major coalfields like Tasra Coal Mining Project, Thriveni Ramka Mining has mandated edGeo Resources Pvt Ltd to prepare land use/vegetation cover map Tasra coalfields (see Location map at Figure 1). This Land Use data along with the subsequent Land Use maps using high resolution satellite data will help assessing the possible impact of coal mining on land use pattern and vegetation cover change using remote sensing data.

On specific terms, the work warrants a study for monitoring land use pattern and for post mining land use, a time series of land use maps, based on satellite imagery (on a scale of 1: 5,000) of the core zone and buffer zone. This must be done from the start of the project until end of mine life shall be prepared once in 3 years. This report is to be submitted to MOEF and its Regional office at Bhubaneswar in every three years.

Consistent to the best practices, Thriveni Ramka Mining is dedicated for maintaining the ecological balance in the region has initiated a massive plantation program on overburden dump, wasteland and eventually on backfilled areas. The location of the project site is given in Figure 1 below:

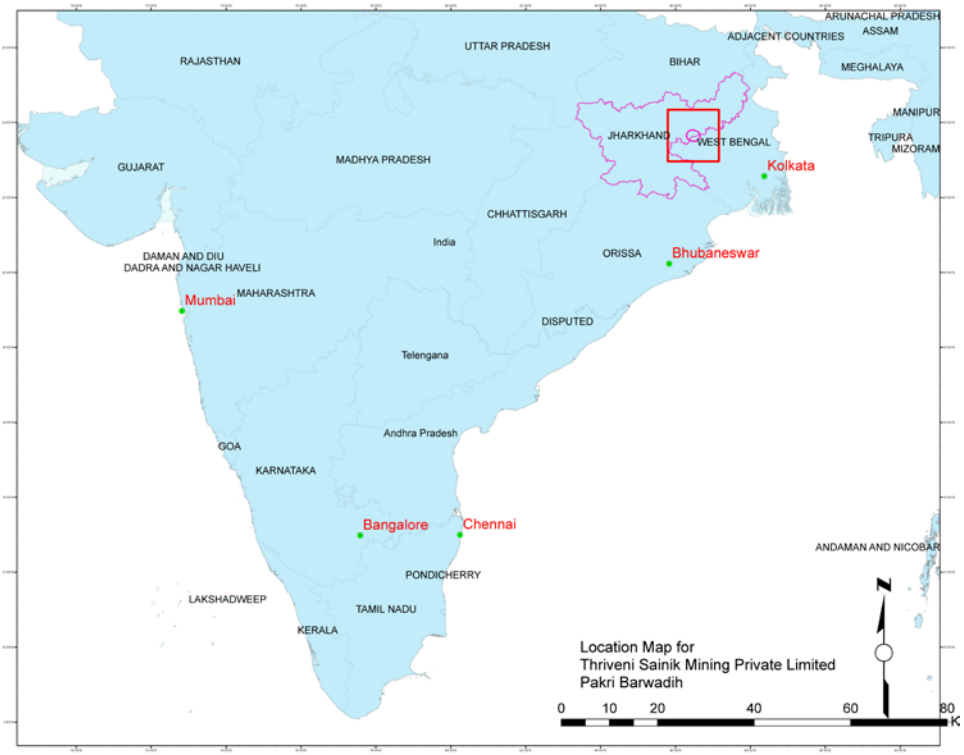



**Figure 1 Regional Location Map for Tasra Coal Mining Project**

## OBJECTIVES AND TECHNICAL SPECIFICATIONS

The objectives of present study to prepare land use/cover map of Tasra Project on a scale of 1:5,000, covering a core area of 8.6 km$^2$ and buffer zone of 15 km (making it a total area of 700 km$^2$) based on repetitive satellite data, for creating the geo-environmental data base in respect of land use, vegetation cover, drainage, mining area, infrastructure etc. The same process will be repeated for updating of data base at regular interval of three years to assess the impact of coal mining and other activities on land use and vegetation Cover in the Coalfield area.

The detailed technical specifications for the work is outlined in next paragraphs. The land use / land cover (LULC) study should be carried out for new / expansion coal mines as per the following methodology.

1. The work involves acquisition and digital image processing of satellite data for Core zone (project area) & Buffer zone (15 Km. radius around periphery of the project) for Tasra coal mining project.
2. The data to be processed using Remote Sensing and GIS technique to study and map present land use pattern and prepare historical land use / land cover maps.
3. To develop Land Use land cover study report for Core Zone and Buffer Zone of Mining Lease Area with all the details of the mapped features and change detection statistics.
4. Further, this data to be validated with topographical map in 1: 50,000 scales for the core and surrounding area.
5. A Digital Elevation Model for the area to be procured with all geomorphometric analysis of the landforms and analyzed in conjunction with the satellite image.

6. Automated drainage extraction from the DEM will be use with the results reported in classification of drainage network and Strahler's stream order.
7. Similarly, this data to be validated with drainage extracted from the topographical map in 1: 50,000 scales and satellite data from the High resolution and medium resolution datasets.
8. For Core Zone: The land use / land cover study within core zone shall be done using high resolution satellite image better or equivalent of IRS Cartosat-II data to ensure at least 1:5,000 scale output as per MoEF guidelines.
9. For Buffer zone: The land use / land cover study within buffer zone shall be done using medium resolution satellite image better or equivalent of Resoursesat-II Liss-4 FMX (5.8 m.) data.
10. The land use / land cover study in core/ buffer zone of the project to interpret various land use / land cover classes as per standard definition of various categories of land use.
11. Various infrastructure and land use / land cover to be demarcated and represented in the derived maps. Opencast working mines and areas used for surface use in working mine area.
12. This Report to contain all maps in digital format suitable for printing in A3 size. The Land Use Land Cover map of Core Zone to be preferably designed in 1: 5000 scales and that of Buffer zone in 1: 25,000 scale.
13. The study reports must be prepared as per MoEF requirements and should cover maps showing topography, drainage and categorization of land, visual interpretation of satellite data. The reports are being submitted in five copies along with the soft copy of satellite data and the interpreted data.

### Output of the study

Study aimed to produce the following database

1. Information on land use land cover change in the project site, the extent of mined areas and associated land use mapping and land cover conversions.
2. Both core and buffer zone wise temporal change analysis.
3. Spatial land use land cover change analysis over pre and post mining scenario with an aim of image acquisition and change analysis at least in a frequency of over 3 years.

# Project Site Information

## LOCATION AND ACCESSIBILITY

The Tasra coal block is in Dhanbad district of Jharkhand State. The block is located in the north-eastern part of North-Karanpura coal field, bounded by longitudes 86$^0$26'27"E to 86$^0$30'33"E and latitude 23$^0$40'3.3"N to 23$^0$38'13" N.

Tasra Block is the eastern most coal bearing area of Jharia coalfield located in the district of Dhanbad, Jharkhand. Jharia coalfield is the most. Important extensively developed coalfield and is also the have the resources of much needed and scarce coking coal in India. Mining right of Tasra Block & adjacent Chasnalla Block were entrusted to Steel Authority of India (SAIL). SAIL is doing mining in Chasnalla Block only by underground & opencast method but to start mining in Tasra Block.

The detailed location map of the area has been presented at Figure 2.

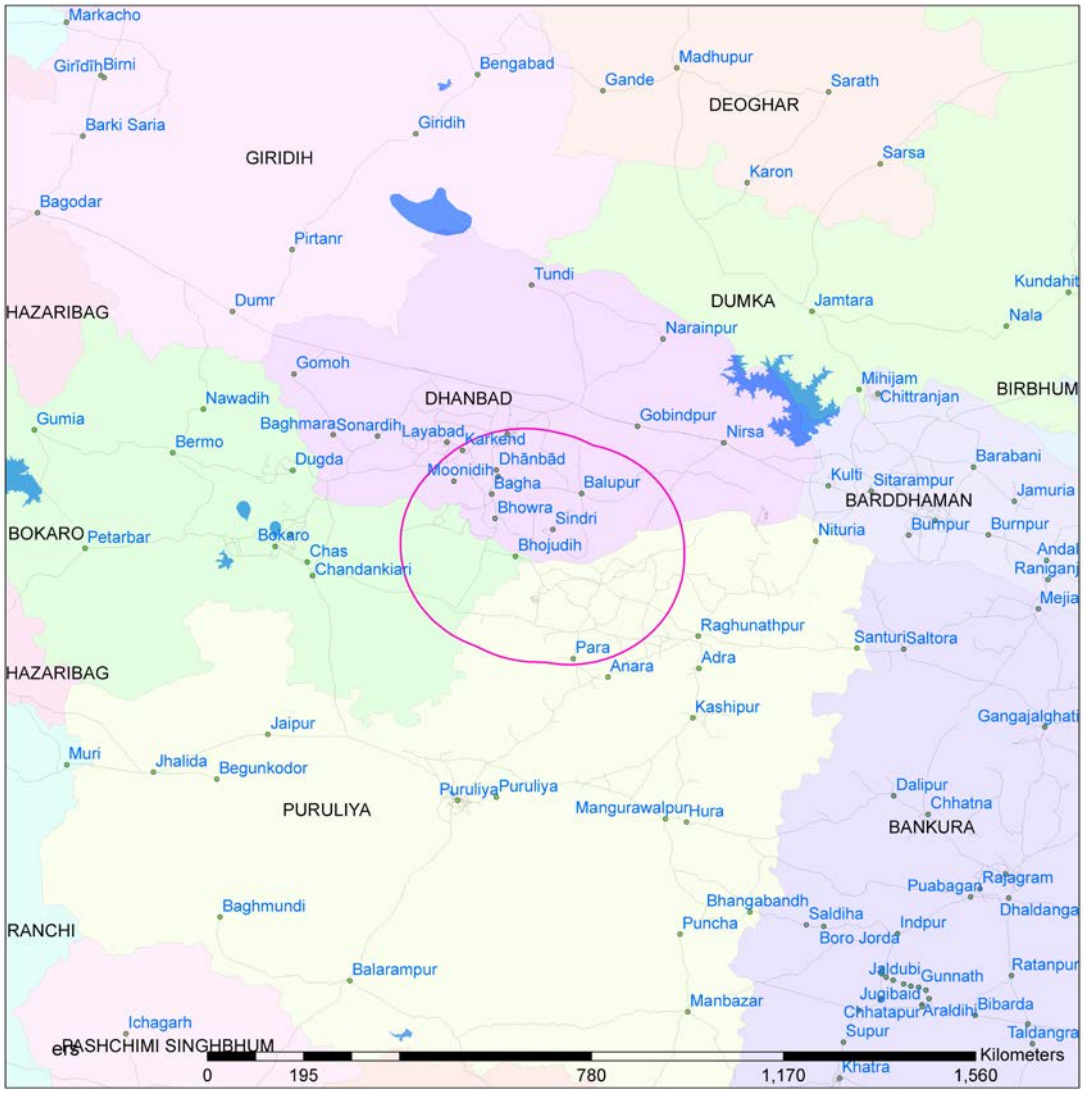



**Figure 2 Detailed location map of the study area**

The Project is situated at about 26km from Dhanbad town. A state highway linking Dhanbad with Sindri township passes along the northern limit of the block. Sindri township is located at about 5km towards the North-East of the block. See the accessibility options in the map shown in Figure 3 and given in the bulleted text below.

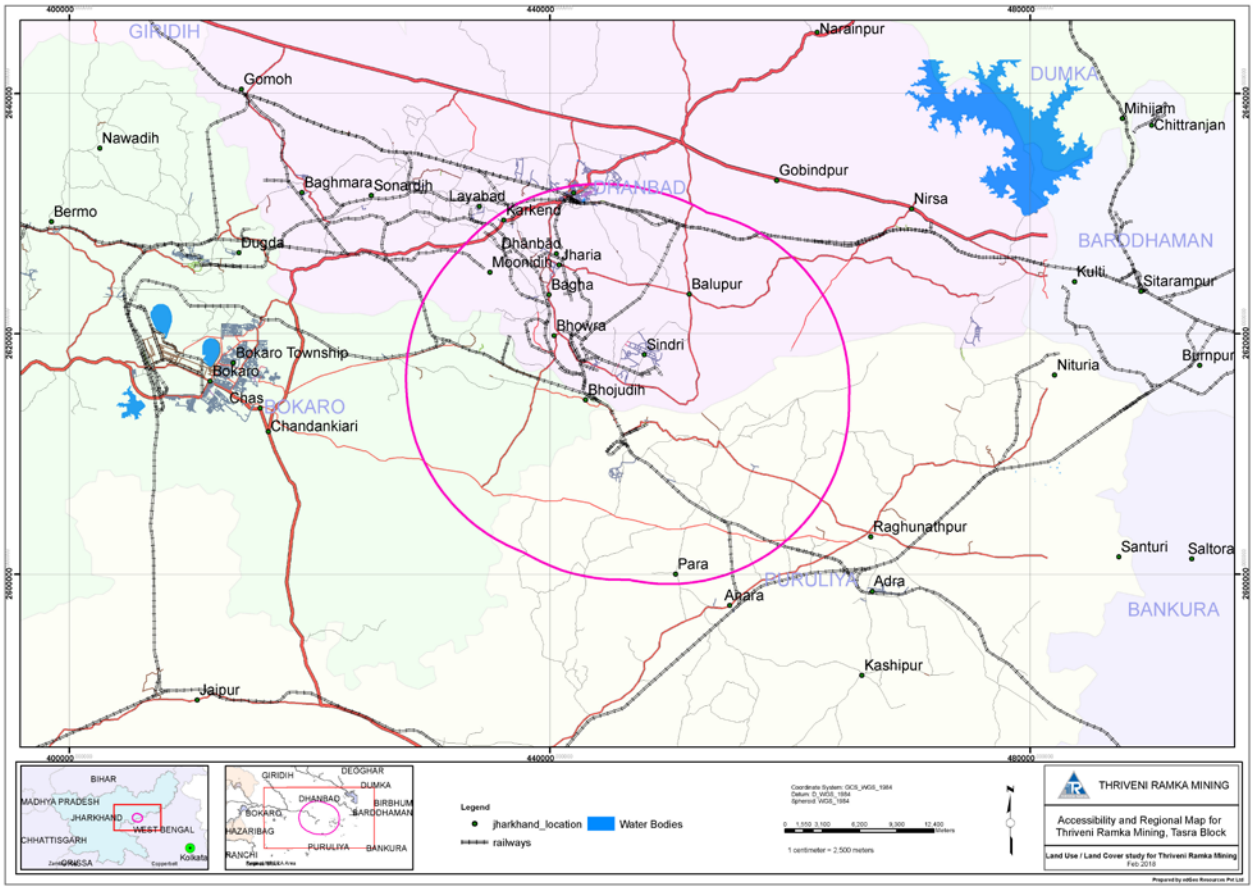



**Figure 3 Accessibility and Regional Map for Tasra Coal Project**

## Accessibility

- District and State: Dhanbad, Jharkand
- Village: Tasra, Near Sindri
- Lease Area (hectares): Total surface lease area required would be 860.59 hectares for mines, dumps · & infrastructure and additional 21 hectares for coal washery.
- Whether the area is recorded to be in forest: No land within the area applied for mining lease is recorded to be in forest.
- Public road: A state highway linking Dhanbad with Sindri township passes along the northern limit of the block. Sindri township is located at about 5 kms towards the North-East of the blocks.
- Tasra block includes villages namely Tasra, Rohraband, Kandra, in the core zone. Lease area does not include any forest land. The core zone is covered on all sides by villages having irrigated, un-irrigated cultivable and waste land.

- Agriculture, coal mining and coal based industrial activity are the major sector for occupation in the core and buffer zone.

### Climate and Rainfall

The climate of the area is dry humid and sub-tropical. It is characterized by hot and dry summer (March to June), rainy season (July to October) and winter (November to February).

Rainfall: Major rainfall occurs during monsoon, and maximum rainfall occurring in the months of the August. The average annual rainfall (2006) in the area is reported to be 866 mm and number of rainy days in a year is about 95 days. The long-term average annual rainfall of the area is around 1200 mm.

Temperature: The temperature rises to 42°C to 46.3°C on some summer days, and in winter, the temperature drops down to 5°C - 7°C at times. In summer months the temperature ranges from 28°C to 46.3°C. Oust storms are common in dry season (May and June) before the onset of monsoon with increase in temperature and wind speed in the afternoon coupled with low humidity.

Humidity: The average annual relative humidity is about 63% in summer months; the relative humidity varies between 32 to 72%.

### Flora and Fauna

The area is not very rich in floral and faunal diversity. There is no endangered species of flora and fauna in the core & buffer zone of the mining site.

The area contains large portion of agriculture, waste land, mining pit and dumping area. There is a large area for agricultural land across the site. Rice is the main staple food of the district and it is chiefly grown. Vegetables are also cultivated in some parts of the area. Paddy, fruits, and vegetables, cattle rearing, poultry, Piggery, etc. are the natural way of living. The miscellaneous flora consists of the following species: Khair, Asan, Karam , Guri, Sidha, Mahua, Gamhar, Bid, Semal, Piar, Bel, Dhaura, Salai, Kusum, Sisam, etc.

Snakes and lizard are quite common. Different varieties of birds are also observed in the winter season. Long mining history and disturbed surrounding area does not support growth of variety of faunal species. The fauna found in the area includes wild boar, jungle cat, civet cat black napped hare; squirrel, jackals and porcupines are also occasionally spotted. Amongst birds the bulbul, the whitebreasted kingfisher, magpie robin, spotted dove, myna, jungle bubbler are prominent. Amongst reptiles, several poisonous like cobra, viper, krait and nonpoisonous snakes (like boa, rat snakes, green whip, Bronze backed tree also seen). Variety of butterflies (like common grass yellow/common jezebel) and insects (such as beetles, spiders, red ants and flies) are spotted in abundance in the study zone.

### Topography & Drainage

Topographically the area is rather hilly and undulating in northern and north-west part of the block. The central and Eastern part of the block is characterized by flat terrain with gentle undulations. The ground in general slopes towards south. The topography of the area is shown in Figure 4 in this chapter.

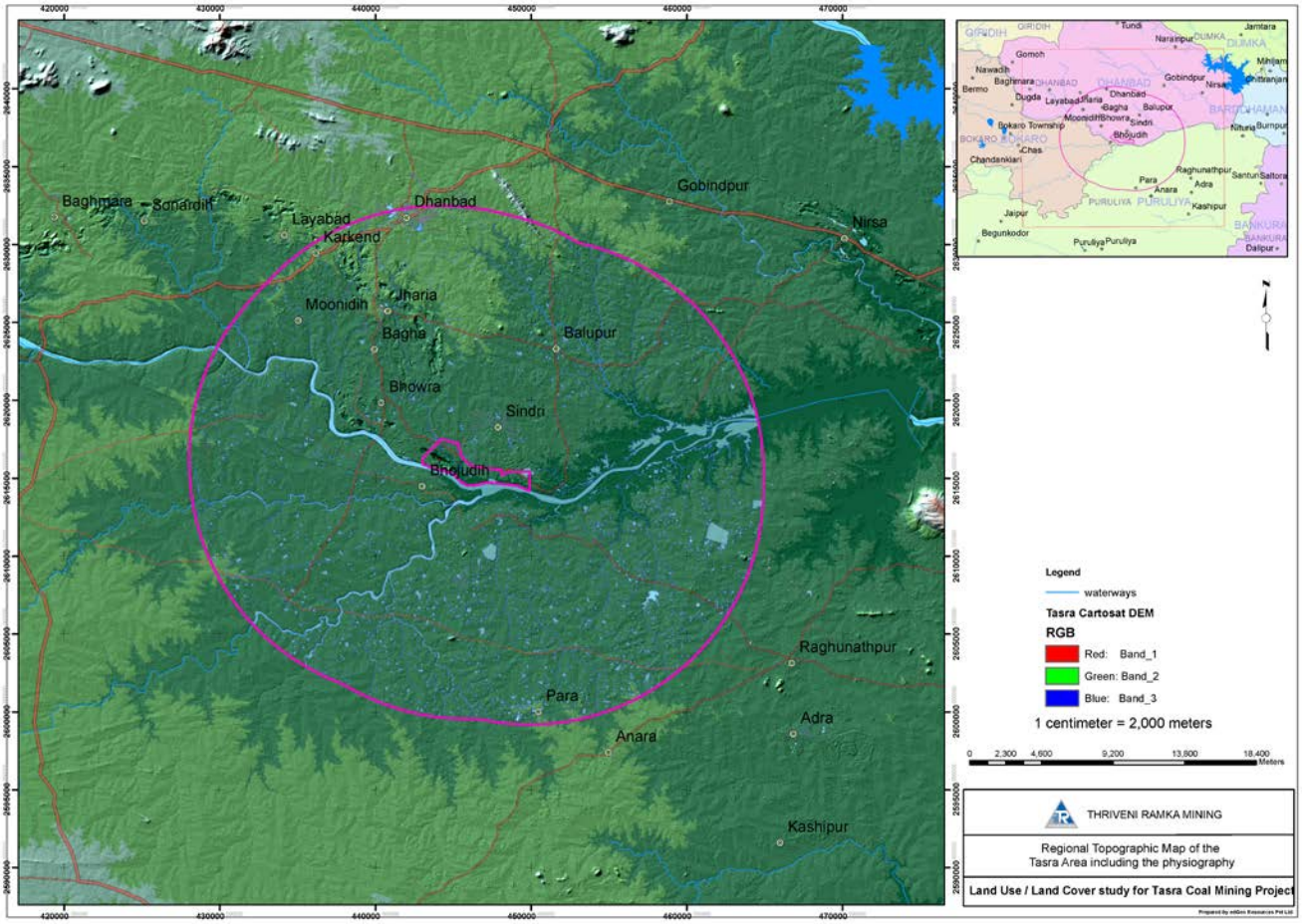



**Figure 4 Regional Topographic Map of the area including the physiography shown as Hillshade image**

The area has a flat to gently undulating topography with a general southerly slope towards Damodar River which flows west to east beyond the southern boundary of the block. The highest ground elevation is about 149m and the lowest elevation has been observed to be about 126m.

The drainage of the block is controlled by Sunrah river in the north, which finally joins to Badmahi river, which is one of the major tributary of Damodar river flowing in south central part of coalfield. The Damodar river is about 500m wide and the Highest Flood Line follows 132m above MSL contour close to the river.

Surface Water Regime: Damodar River which flows west to east beyond the southern boundary of the block is the main river in the region. The drainage of the area is controlled by the two-southerly flowing nallahs namely Domohani jore and Cilatu jore. The Domohani jore has been diverted into Cilatu jore in the central part of the block to facilitate mining. This is demarcated in the Figure 5 and Figure 6 for the regional and buffer area drainage map respectively.

Underground Water Regime: As greater part of the area around Tasra Block is underlain by Precambrian crystalline rocks, the weathered residual of hard rocks as well as the fractures, joints, fissures, faults and other zones of discontinuity are the principal repositories of groundwater in the area. Depth of water table in the hard rock of the area varies from 3.0m to 6.0m below ground level in pre-monsoon and 1.0-4.0m in monsoon.

The Gondwana sediments form the semi-consolidated formations and are better water potential zone. Groundwater occurs under unconfined condition in the weathered mantles with depth varying from 4-5m below ground level around the Tasra Block to 8-12m below ground level in some places.

Damodar River has been envisaged as source of water for the project in future. Water would be drawn from intake well and pumped to bulk water reservoir at the industrial site. This water would be treated through treatment plant at the industrial area and carried to the ground reservoir. From this ground reservoir, water would be pumped to overhead reservoir from which water will be distributed to the residential units, various industrial buildings, administrative complex & quarry sites and is proposed to be distributed by gravity to the point of consumption through a distribution network.

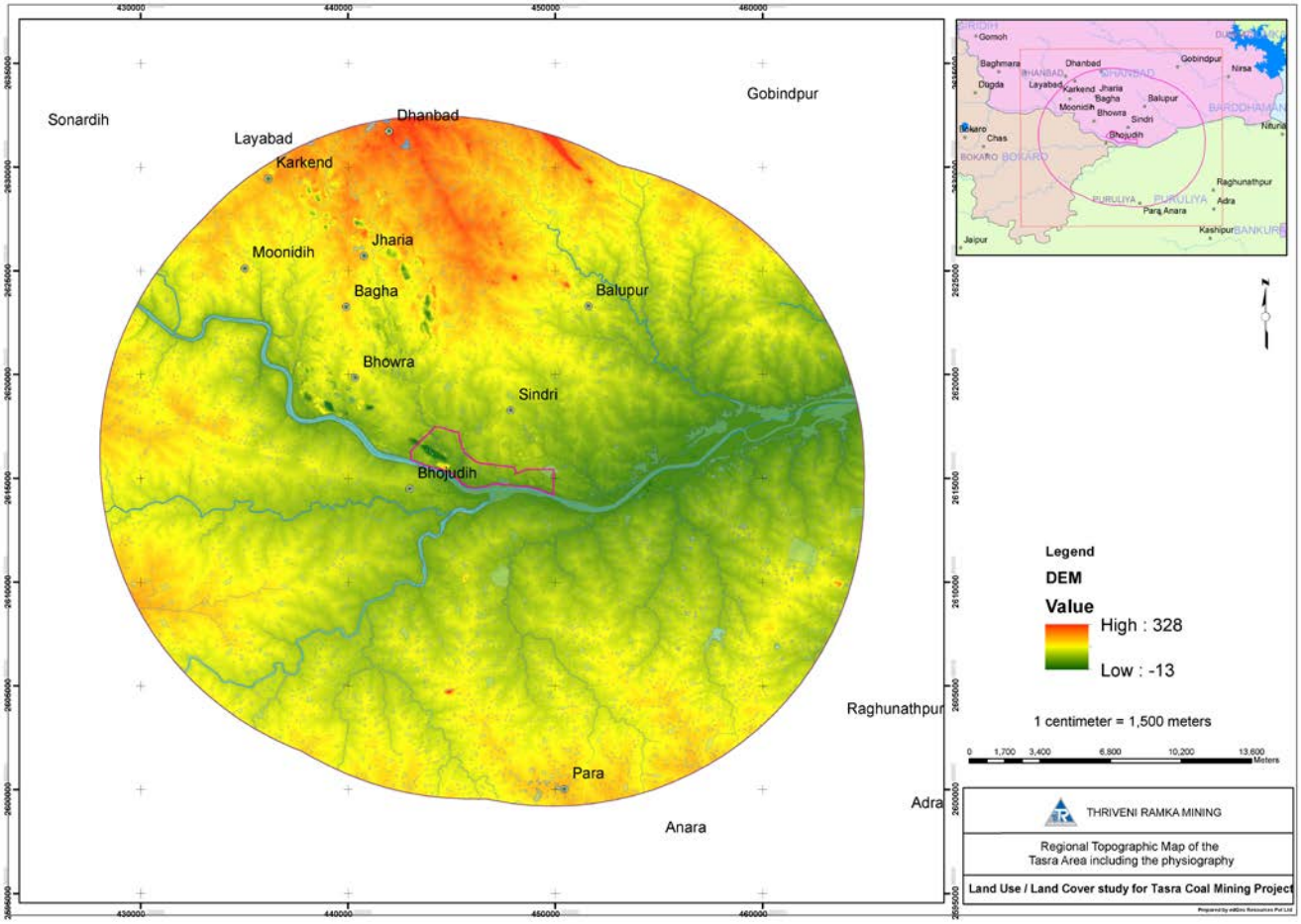



**Figure 5 Digital Elevation Details with Drainages of the Tasra Coal Project**

Besides these major nallahs of the block, there are many small streams & streamlets, which discharge their load into these major nallahs. All the nallahs of the block are seasonal and become dry during summer.

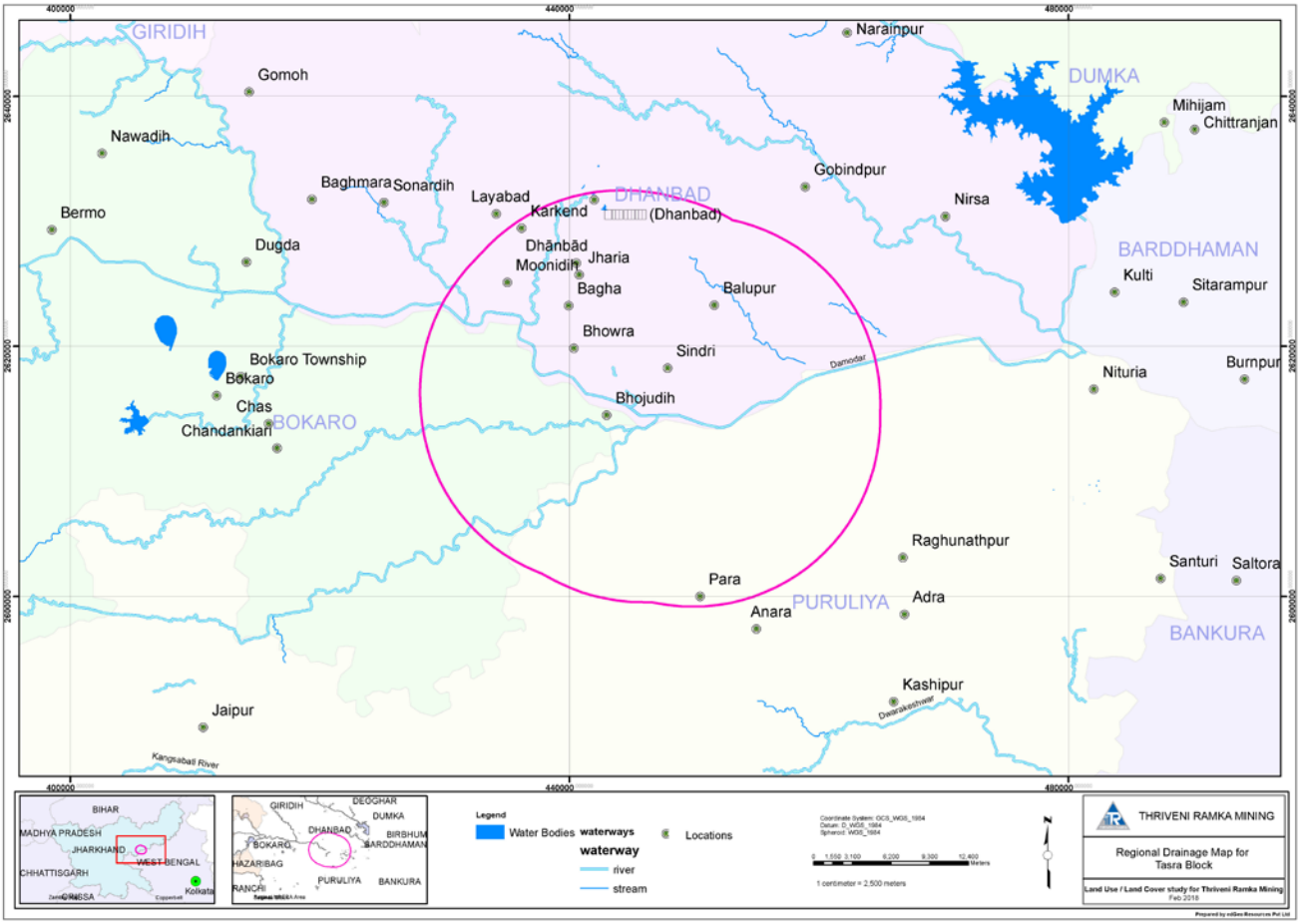



**Figure 6 Surface drainage for the regional Map for Tasra Coal Project**

## Drainage Stream Order Analysis

Stream ordering is a method of assigning a numeric order to links in a stream network. This order is a method for identifying and classifying types of streams based on their numbers of tributaries. Some characteristics of streams can be inferred by simply knowing their order.

The Strahler method is the most common stream ordering method. The stream order increases when streams of the same order intersect. Therefore, the intersection of two first-order links will create a second-order link, the intersection of two second-order links will create a third-order link, and so on. The intersection of two links of different orders, however, will not result in an increase in order.

In this work flow we have used the high-resolution Elevation Model from Bhuvan Portal and used the automated Drainage extraction and stream order analysis for the area and analyzed the drainage pattern. This Strahler stream order analysis and analyzed the drainage pattern with Elevation Model of Tasra Coal Mining Project is presented in the Figure 7 next page.

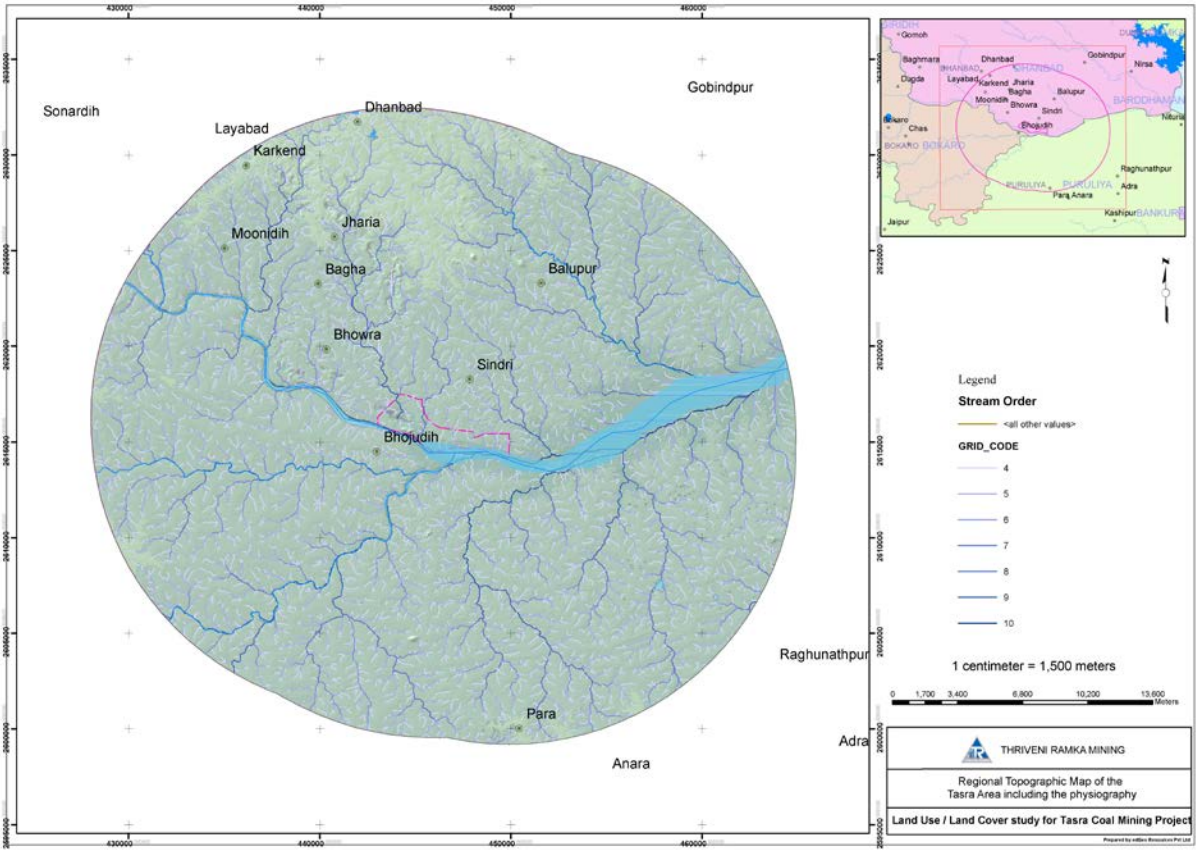



**Figure 7 Strahler stream order drainages on digital elevation model**

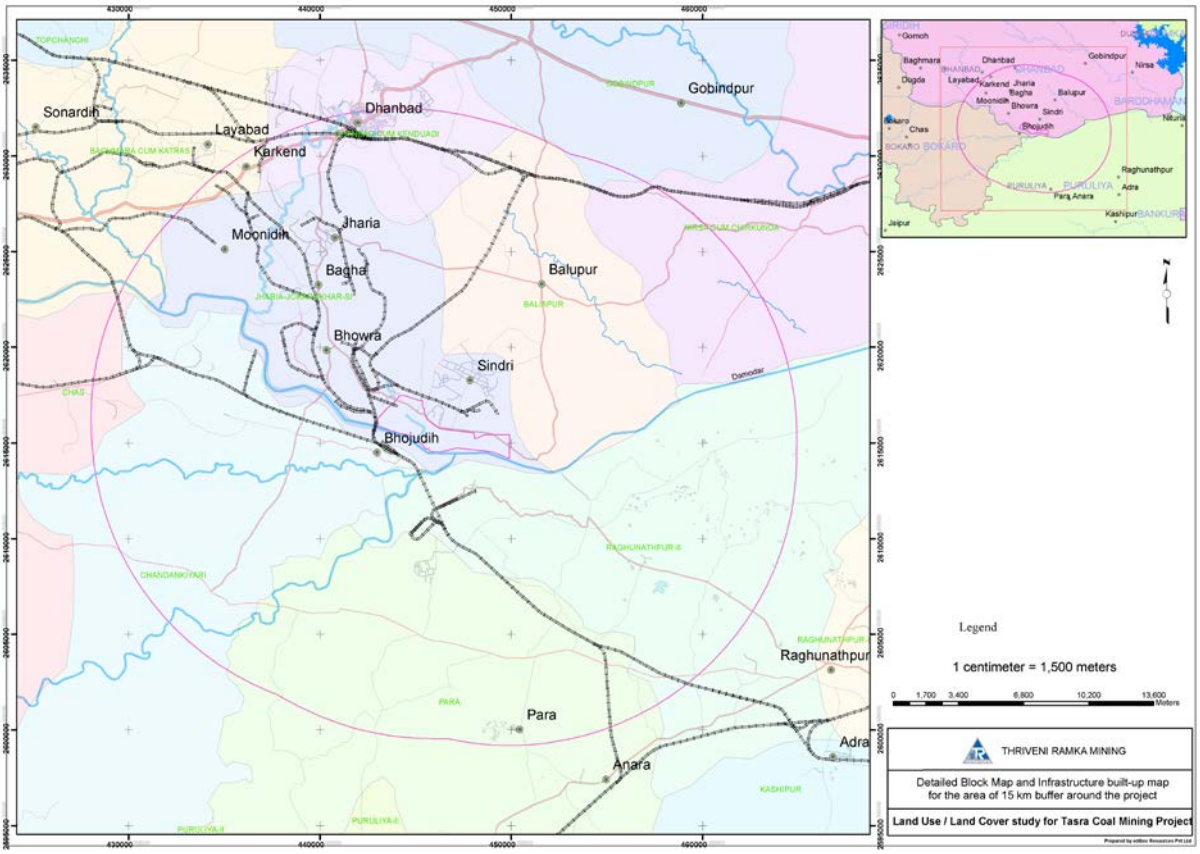



**Figure 8 Detailed Block Map and Infrastructure built-up map for the area of 15 km buffer around the project**

### Regional Geology

Tasra block lies in the eastern extremity of Jharia Coal field. Adjacent portion of Chasnalla Block, which has been included in the Tasra Project, lies in the south of the Tasra Block. The block is occupied by rocks of the Talchir Formation, Barakar Formation of the Gondwana Super group and Post-Gondwana intrusive, apart from soil and alluvium of recent era.

### Local Geological Set up

Jharia basin shows structurally a half-graben configuration, the southern boundary of which is delineated by a pronounced boundary fault, while the northern margin of the basin shows a normal contact of the Gondwana sediments with basement. The regional dip of the sediments is towards south for the major part. The sediments are affected by a network of intra-basinal faults and are also intruded by mica peridotite dykes and sills and dolerite dykes.

In Tasra area, which is the easternmost part of the Jharia Coalfield only the Barakar Formation is developed with high southerly dip ($45^0$) These Barakar sediments are faulted against the Metamorphic rocks to the north and east. The mining activity is restricted to opencast mines and shallow inclines from outcrop. As a result, prior to the exploration, little information regarding the disposition, structural setup and correlation of the coal seams were available.

The area is mostly under soil cover and the rock exposures are mainly along the two-south flowing nallahs. The exposures along the northern bank of the Damodar River are very limited and confined to the western end only. The exposures are generally of sandstones, intercalations, arenaceous shales and a few coal seams

Description of Formations: The following litho-units have been identified as forming the overburden strata:

- Soil/Alluvium: Tasra coal block is mostly covered with soil, with thickness up to 6m and is of residual nature.
- Weathered Mantle: The weathered mantle constitutes the soil and the weathered rocks belonging to Barakar Formation. The depth of the weathered mantle within the block ranges from 0.00 to 20.00m.
- Barakars: Barakars show transitional contact with the underlying Talchir Formation. Barakars comprise dominantly of sandstones with subordinate shales, carbonaceous shale and coal seams.

The generalized geological succession of coalfield is given in Table 3 below:

**Table 1 Generalized Geological Succession of Tasra Coalfield**

| | |
|---|---|
| Dolerite and Mica Peridotite | Intrusives |
| Damuda Group | Raniganj Formation Barren. Measure Formation |
| | Barakar Formation |
| | Karharbari Formation |
| | Talchir Formation. |
| ----------Unconformity---------- | |
| Archaean | |

# Land Use Land cover (LULC) Study

## LAND USE LAND COVER

Land use/cover change detection is very essential for better understanding of landscape dynamic during a known period having sustainable management. Changes in land cover by land use do not necessarily imply degradation of the land. However, many shifting land use patterns driven by a variety of natural phenomena, anthropogenic activities and social causes, result in land cover changes that affects biodiversity, water and radiation budgets and other processes that come together to affect climate and biosphere.

With the invent of Remote Sensing (RS) and Geographical Information System (GIS) techniques, land use/cover mapping has given a useful and detailed way to improve the selection of areas designed to agricultural, urban and/or industrial areas of a region. Application of remotely sensed data made possible to study the changes in land cover in less time, at low cost and with better accuracy in association with GIS that provides suitable platform for data analysis, update and retrieval.

The advent of high spatial resolution satellite imagery and more advanced image processing and GIS technologies and improved but low-cost hardware, LULC Study has resulted in a switch to more routine and consistent monitoring and modeling of land use/land cover patterns. Remote-sensing has been widely used in updating land use/cover maps and land use/cover mapping has become one of the most important applications of remote sensing.

### Approach of the LULC Mapping study

The present study to map Land Use and Land Cover (LULC) in the district has been carried out using multi-temporal high and medium resolution satellite imageries in digital form. LULC change assessment in the district has been supported with an intensive ground truth and reference to high resolution satellite data. The mining lease boundaries as provided by Survey and Mining Department has been used to qualitatively assess mining and associated activities in and around mine lease areas.

### Significance of Study

The land use and land cover change assessment based on the analysis of time series satellite data is a key input component for detailed analysis in the present study. As per the Terms of Reference (ToR), Land use and land cover (LULC) changes have been assessed over the project site for the year 2017 at 1:5,000 scale using high resolution satellite data. The area affected due to prior mining activities has been assessed for pre-mining for 2017, to identify the extent of prior mining. The area worked under previous mining activities and those used for waste dumps/industrial areas have been classified separately on the map.

Spatial change analysis will be done subsequently to assess the trend of changes in LULC categories due to mining and associated activities in study areas. Change matrix will be prepared in subsequent years to indicate the trends. Overall, the present study highlights the extent of land use land cover as on 2017.

## TECHNICAL SCOPE FOR IMAGE SELECTION

### Image Selection

1. Land use and land cover mapping being the primary objective for this project, we have carefully considered the suitable satellite image and period for effective mapping and best results.
2. The LULC Mapping project was designed for satellite image for the project in Jharkhand covering approximately 700 sq km based on the project license boundary provided and the requirement of 15 km buffer around the project.
3. Based on the requirements and working on a suitable image conforming to the project requirements, an in-depth image search was conducted on different resolution satellite and temporal data sets.
4. A five-band multispectral medium resolution satellite data is used for both unsupervised and supervised classification of the land use and landcover mapping. Both automatic and subsequent manual checking of the land use classes was conducted.
5. Results from high resolution and medium resolution data would be checked and combined for best classification and resolution of the digitized data.

The quality control for the images would be achieved by specifying the following parameters:

1. Medium/High resolution satellite images not more than 50 centimeters (at $0^0$ Nadir) spatial resolution for High resolution and not less than 5 m spatial resolution for medium resolution.
2. Less than 5 % of cloud cover images of the area
3. Recent image preferably acquired in late 2016 but not earlier than July 2017.
4. Nadir viewing angle of less than $30^0$.

### Technical Scope for Processing and Output

The scope of work for the LULC classification for current project is outlined below:

1. Review of the requirement and selection of satellite image according to the technical parameters supplied.
2. Acquisition and preprocessing (orthorectification, colour matching etc) of the satellite data.
3. Image processing with work flow of Pan Sharpening for high resolution data and natural colour matching.
4. Unsupervised and supervised classification of the land use and landcover mapping. Manual checking digitizing and finalized maps.
5. Detailed statistical analysis for land use land cover classification.
6. Professional quality map making with industry standard templates and designs and large-scale printing in high quality.

The project would be delivering the following at the end of the project:

1. 6-bit 4-band pan sharpened image and then an 8-bit color balanced image 4-band satellite image.
2. Data will be supplied on UTM WGS84 grid.
3. Metadata for all the images with details of the satellite data acquisition

4. Detail polygon map in soft copy for the satellite data analysis and LULC classification including the change detection images.
5. All the maps composed to the professional standards would be given in soft copy pdf format.

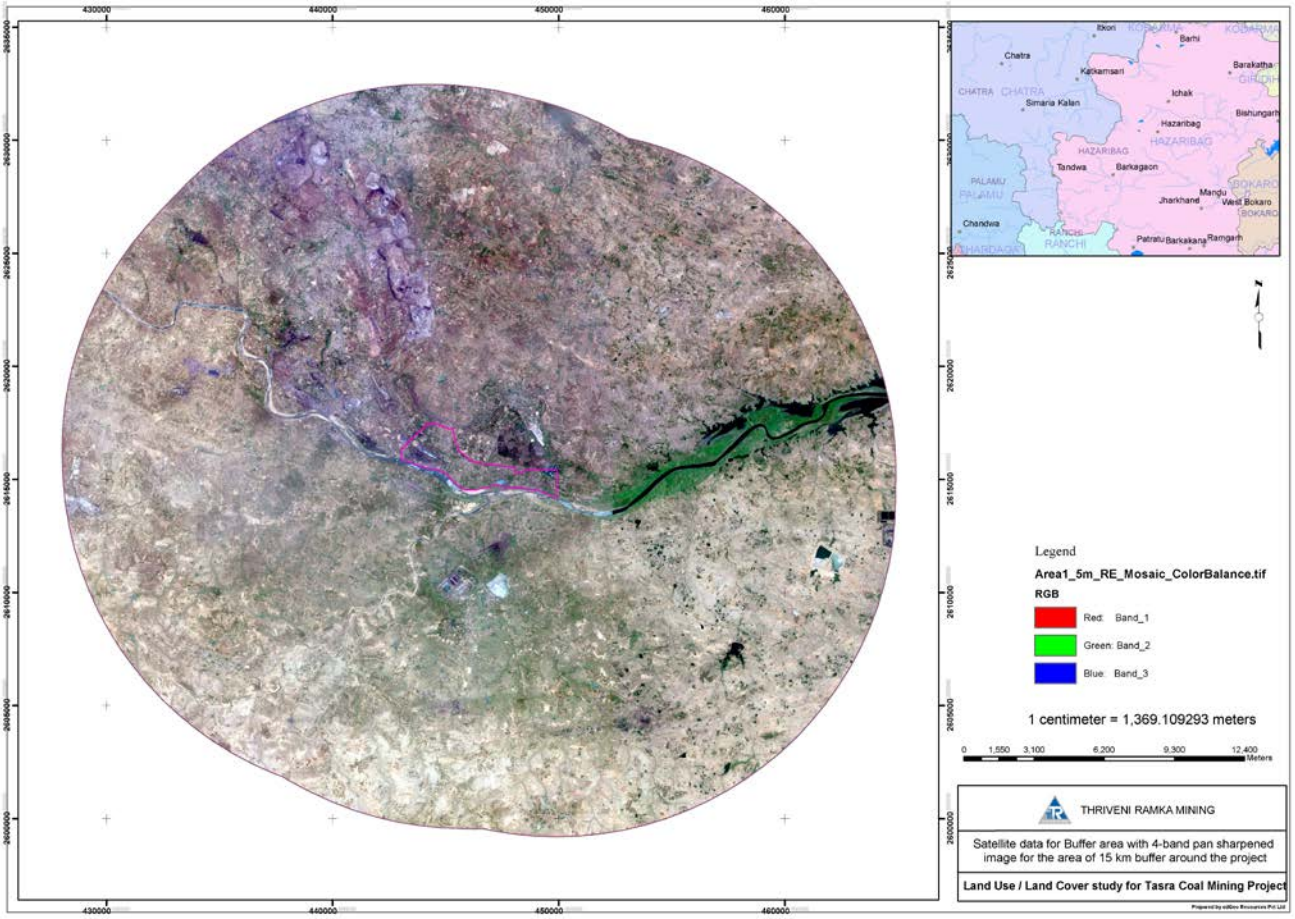



**Figure 9 Satellite data for Buffer area (700 sq km) with 4-band pan sharpened image on UTM WGS84 grid**

### Satellite Data and Software Used

On high and medium resolution satellite search suitable for the objectives, please find Table 2 for images selected and analyzed in this study. As indicated in the table, the data used for this project is Rapid-eye, and all of the high-resolution data from Pleiades (Spot 6/7).

**Table 2 Details of characteristics of Satellite Datasets Used for the Study**

| Sl no | Area | Image Procured | Buffer | Resolution | Satellite | Date | Area in Sq Km |
|---|---|---|---|---|---|---|---|
| **1** | Tasra Coal Project | Recent Landuse Mapping | 1 km | High 50 cm | Pleiades | Apr-2017 | 25 (min Order Size) |
| **2** | Tasra Coal Project | Recent Landuse Mapping | 15 km | Medium 5 m | Rapid-eye | Apr-2017 | 700 |

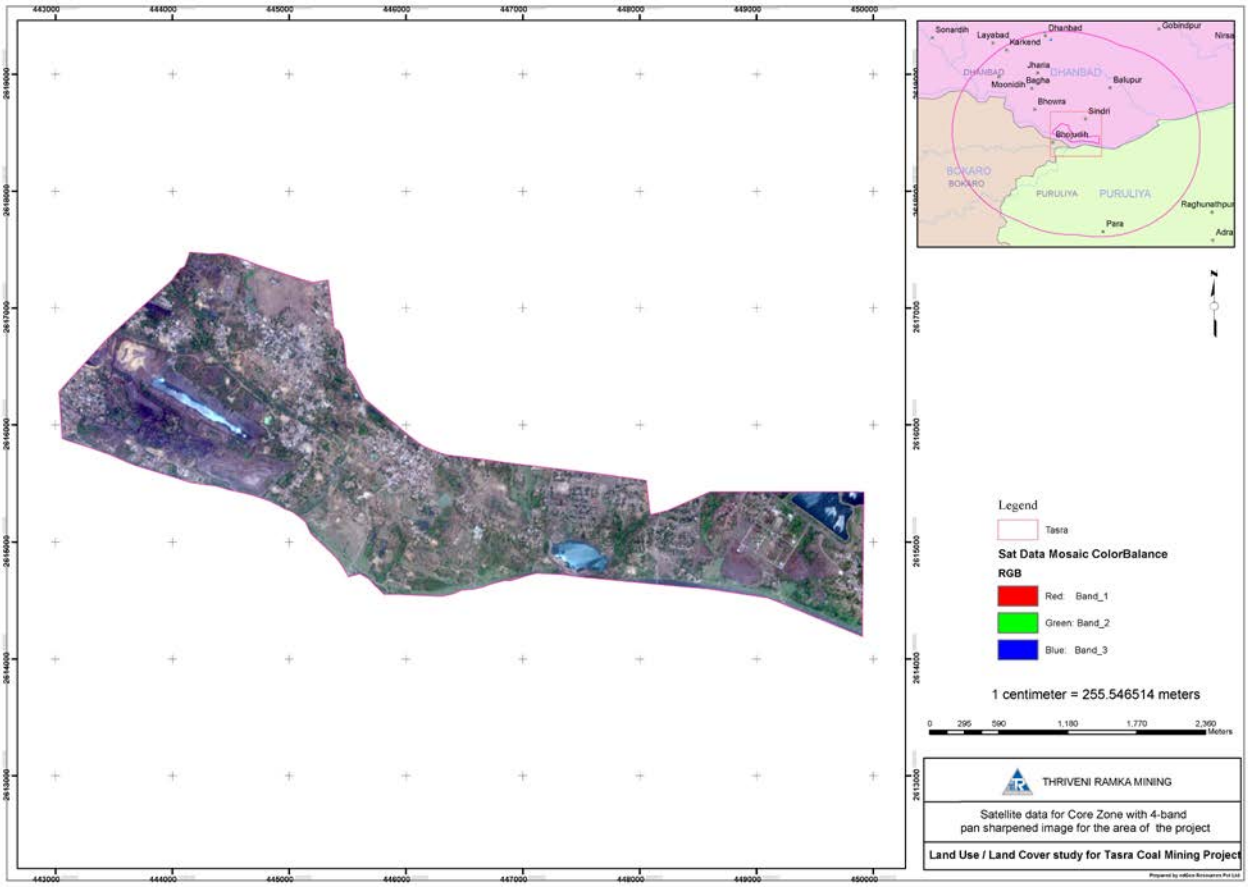



**Figure 10 Satellite data for Core area (8.6 sq km) with 4-band pan sharpened image on UTM WGS84 grid**

Outlined below is the system mission characteristics and image specifications for data procured above. One patch of WV and most of the high-resolution data from Pleiades (Spot 6/7). Details of the Specifications for Satellite Sensors of Rapid-eye(Table 5), WV(Table 6) and Pléiades 1A/B(Table 7), are given in the tables associated with them. For summarized metadata for the used satellite sensors and targeted image date with quality parameters, please refer to the data quality for selected satellite metadata.

RapidEye images procured are of level 3A processing and has been processed through the higher level of pre-processing including orthorectification with high quality reference data used (GCPs and DEMs). RapidEye Ortho (Level 3A) are orthorectified products with radiometric, geometric and terrain corrections in a map projection. RapidEye 3A have a locational accuracy of 10 m RMSE or better. The images are also edge-matched, and color matched with a seamless transition from one image date to the other and also suitable for visual interpretation and mapping of LULC classes.

For RapidEye data has 5 bands for the spectral resolution and the detailed band description is given in the below:

**Table 3 RapidEye System Mission Characteristics**

| MISSION CHARACTERISTIC | INFORMATION | |
|---|---|---|
| **Sensor Type** | Multi-spectral push broom imager | |
| **Spectra l Bands** | Capable of capturing all of the following spectral bands: | |
| | Band Name | Spectral Range (nm) |
| | Blue | 440-510 |
| | Green | 520-590 |
| | Red | 630-685 |
| | Red Edge | 690-730 |
| | **NIR** | 760-550 |
| **Pixel size (orthorectified)** | 5m | |
| **Dynamic Range** | 12 bit | |

**Table 4 Specifications for Pléiades 1A/B Satellite Sensor**

| Sensor Resolution | **Panchromatic 50 cm** |
|---|---|
| | Multispectral 2.0 m |
| **Sensor Bands** | Pan: 450-830 nm |
| | Blue: 430-550 nm |
| | Green: 500-620 nm |
| | Red: 590-710 nm |
| | Near IR: 740-940 nm |
| **Dynamic Range** | 10-bits per pixel |
| **Geolocation Accuracy(CE90)** | Demonstrated <5 m CE90 without ground control |

Software used in the study are ERDAS Imagine for Georeferencing, image interpretation/analysis and ArcGIS for overlay of vector layers as well as analysis thereof.

## IMAGE PREPROCESSING AND PREPARATION

### Preprocessing

All the preprocessing steps commonly applied to all satellite data before the image processing options are now normally applied by the image providers. Preprocessing is required for certain sensor characteristics and systematic defects, which includes noise reduction, radiometric calibration, distortion correction. This was done by ordering higher level data products and these work flow is done by the data provider. This include: Correction and Calibration, Noise Reduction, Radiometric Calibration, Distortion Correction.

This processes for multiple temporal satellite data have an additional workflow which follows a processing flow sheet including georeferencing and co-registration, conversion to radiance, solar correction, atmospheric correction, topographic correction, and relative correction.

### Geometric correction and Orthorectification

The processes of georeferencing (alignment of imagery to its correct geographic location) and orthorectifying (correction for the effects of relief and view direction on pixel location) are components of geometric correction necessary to ensure the exact positioning of an image. In registration, the alignment of one image to another image of the same area is done and further rectification is done for alignment of an image to a map so that the image is planimetric, just like the map (like toposheet). Orthorectification was conducted with the high-resolution DEM and it involves the correction of the image, pixel-by-pixel, for topographic distortion.

### False Colour Composite

One of the most widely used data format for information extraction is the infrared False Color Composite (FCC) image. False color (or false colour) refers to a group of color rendering methods used to display images in color with NIR (red), green (blue) and red (green), which is a traditional band combination used to see changes in plant health. Because they reflect more NIR than green, plant-covered land appears deep red. The signal from plants is so strong that red dominates the image depicted for the project area in Figure 11.

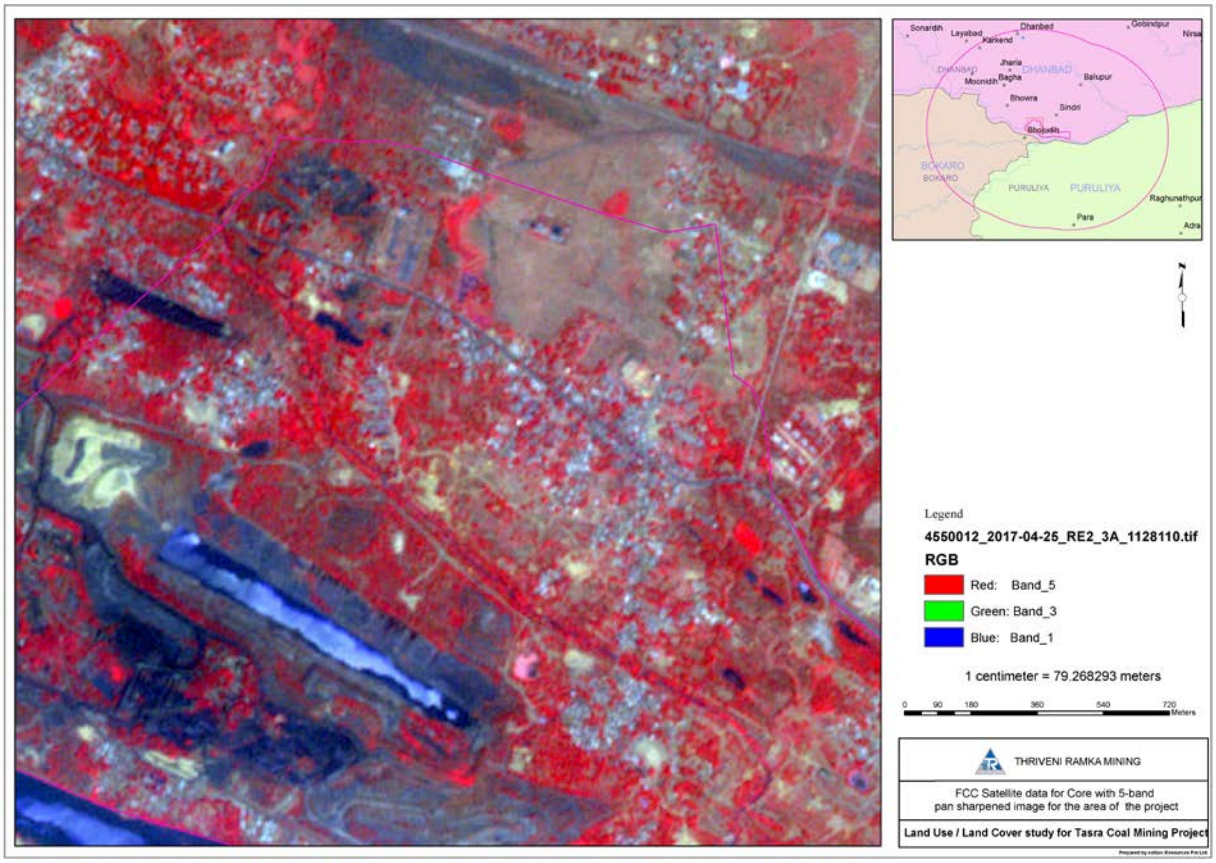
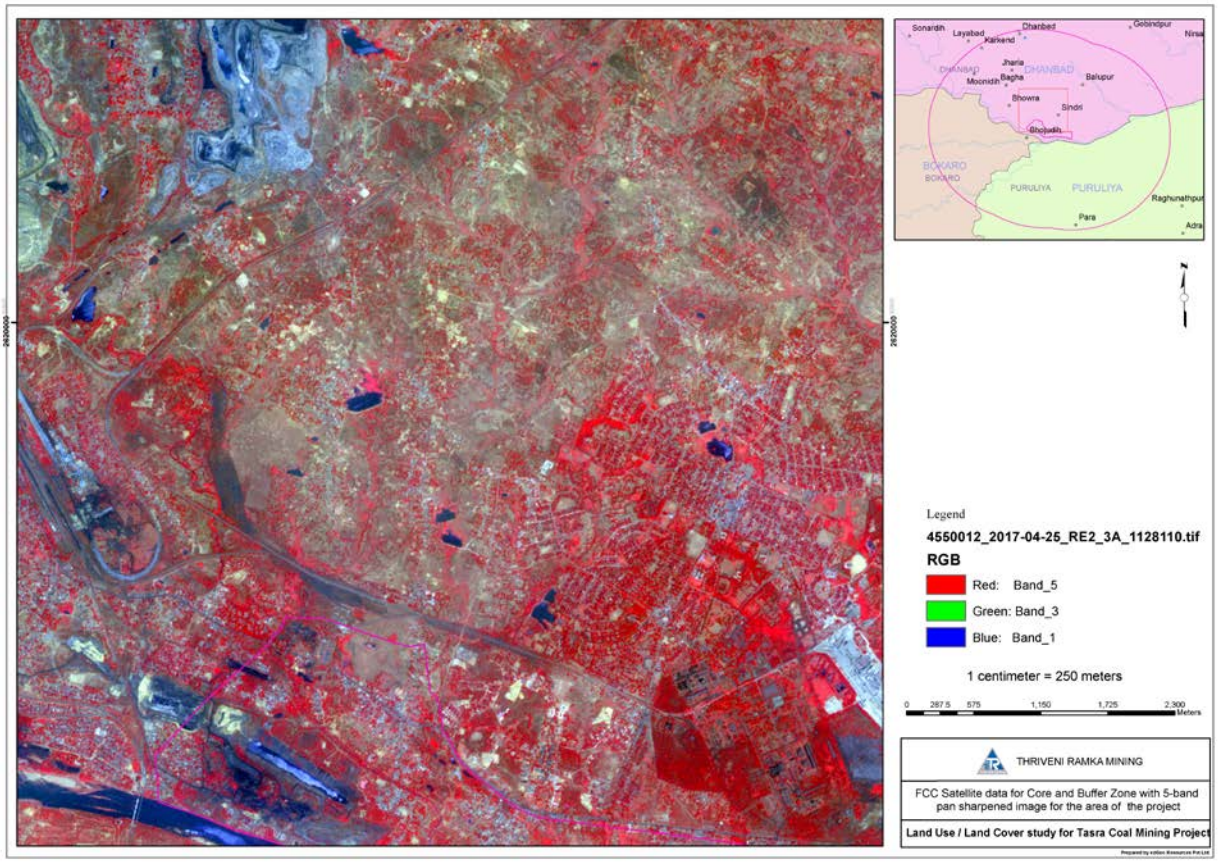



**Figure 11 a & b Two samples for False Color Composite of RapidEye 5m Data for April 2017 of project site**



# Land use/cover detection and analysis

With the more systematic development of remote sensing technology and GIS software, using remotely sensed data to monitor the status and dynamical change of land use/cover is become the one of the one of the most rapid, credible and effectual method. A very effective general workflow for classification can be followed and results can be automated with validation iterations.

## IMAGE PROCESSING

The array of information available on land use/cover requires to be arranged or grouped under a suitable framework to facilitate the creation of GIS database. Further, to accommodate the changing land use/vegetation cover pattern, it becomes essential to develop a standardized classification system that is not only flexible in nomenclature and definition, but also capable of incorporating information obtained from the satellite data and other different sources.

### Unsupervised Land Use Classification

In unsupervised classification, the software does most of the processing on its own generally resulting in more use categories than the user is interested in. This is the point where the user must make decisions on which categories can be grouped together into a single land use category.

Only the initial work flow of checking the image with different standard algorithms applied including False Color Composite (FCC) and Normalized Difference Vegetation Index (NDVI) images as discussed earlier. They only help in constraining the boundary for the classified and on-screen digitizing options and used extensively for data and LULC class validation.

### Supervised Land Use Classification

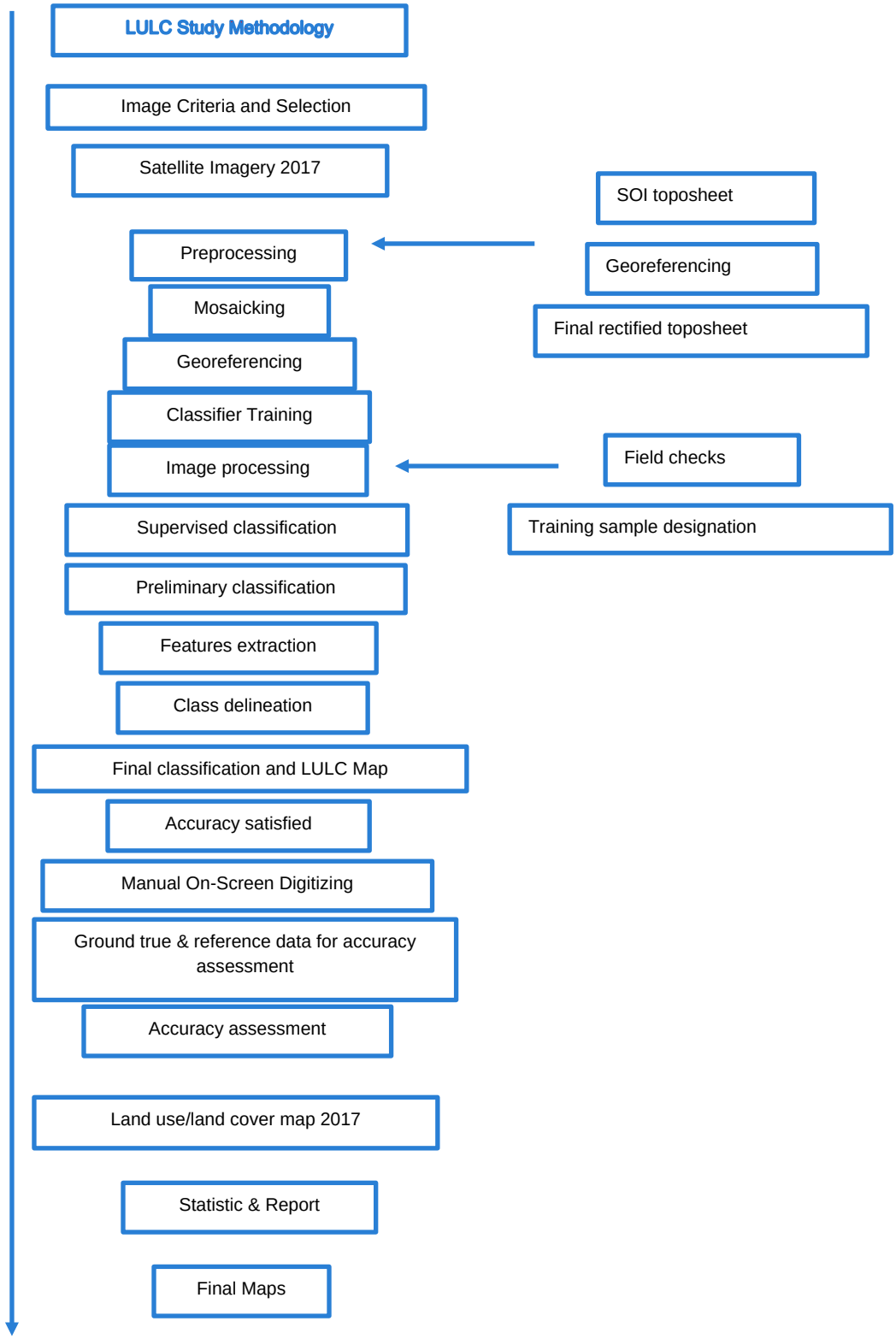
In supervised land classification, the individual processing the imagery guides the image processing software to help it decide how to classify certain features. This is done using a vector layer containing training polygons. These are mostly supported by ground truth data.

The image was classified using signatures from training sites that include all the land-cover types detailed in this document. A total of 20 distinct signatures were collected from all land-use and land-cover classes. The signatures were collected by digitizing polygons directly on the satellite image to collect the training samples supported by ground photo/data.

The Euclidean distance between their spectral signatures served as a measure of separability for the signatures collected for each land-use class; later, spectrally similar signatures of the same class were united. The maximum likelihood classification (MLC) was run and a feature-space non-parametric decision rule that was used for cases of overlap or unclassified pixels. Classes of the resulting image were recoded into the 17 land-use classes. The land use classes then were reduced to 12 classes with analysis of classes and clumping and sieving process.

The post-classification accuracy improvements by noise filtering and incorporation of ancillary land-use data from other sources and field verification using a Decision Support System workflow. Please see the Flow chart for methodology used for the current study used for land use/land cover and change detection (Table 6).

**Table 5 Flow chart and methodology for land use/land cover and change detection**



The data used in this project was extracted from two different datasets, one with two set of satellite data and rest with the Secondary /ancillary data from other sources (mostly digital) and ground truth data.

- Satellite Data
    1. For the core area: We have used the high-resolution satellite data with very high spatial resolution of 0.50m for Panchromatic bands. This has also 3 more spectral bands with 1.2 m spatial resolution and very high data integrity.
    2. Both the datasets are merged in a Pan-sharpening and image color matching technique which gets best for both the datasets and gives us a high-quality image for easier interpretation of different land use classes even with manual visual interpretation.
    3. For the Buffer area around the project: We have used the Rapid-eye satellite data with very high spectral (5 band spectral) and spatial data integrity with ground resolution of 5 meters.
- Secondary Data
    4. Secondary (ancillary) and ground data constitute important baseline information in remote sensing, as they improve the interpretation accuracy and reliability of remotely sensed data by enabling verification of the interpreted details and by supplementing it with the information that cannot be obtained directly from the remotely sensed data for Tasra Coal Project, Secondary Data used are:
        a. Survey of India toposheet
        b. Publicly available reports for the coalfields
        c. Digital Elevation Models
        d. Mining Plan Report and data provided by Tasra Project were also used in the study.

### Validation of classified image

Ground truth data collection for accuracy assessment Generally, there are three major ground truth data collection methods by different reference data sources:

1) Record the land use type and its location using GPS in the field through ground survey work.
2) Through image interpretation when the images are available and timely consistent with the remote sensing data used for classification.
3) Using GIS layer from other Secondary Data sources.

Ground truth survey was carried out for validation of the interpreted results from similar coal mining study area. Based on the validation, classification accuracy was assessed. Field photographs from the Ground truth survey is attached in the Annexure I.

### Image Interpretation

Visual and digital image classification techniques were conjunctively employed for delineation of LULC for different time periods using all remote sensing datasets. Visual interpretation method following the principles of tone, texture, context and association has been carried out to delineate different LULC classes. The spectral

reflectance properties of different LULC classes were also taken as support information during visual interpretation.

Image visualization and Interpretation has been carried out at scale of 1: 5,000 for better appreciation of contrast and image elements. Digital image classification of both supervised and unsupervised has been adopted to delineate different forest crown density classes. The land cover and land use layers for forest cover and non-forest cover areas were later integrated into a seamless layer. Field visits were made in similar area to relate and understand different features of satellite data for the support of image classification and accuracy assessment.

### Final Map from On-screen Digitization

On screen digitization was done in ArcMap 10.3 software. A polygon map was generated where each polygon represented a distinct class. The classes were then assigned their respective attributes. Ground truth verification was done by using a handheld GPS during field visit from similar coal mining study area. GPS readings which included river, road, rubber, water body and agricultural sites, mining area etc. and other important and identifiable landuse/landcover types were recorded and brought into GIS platform. It was found that points were very accurate in the satellite image. Finally, the area statistics of different categories of LULC and color coded classified map of the project was generated.

Visual image interpretation technique of classification was applied in the study. It is a process of identifying what we see on the images and communicates the information obtained from these images to others for evaluating their significance.

### Feature Extraction and Preliminary Classification

At this point one can expect to have training sets defined for each class, but they may be small. There would thus be value in eliminating features that are not effective for the set of classes at hand, to reduce the dimensionality without loss of information. A feature extraction algorithm was used for this purpose, followed by a preliminary classification.

From the preliminary classification, one can determine if the class list is suitably exhaustive, or if there have been classes of land cover of significant size that have been overlooked. One can also determine if the desired classes are adequately separable. If not, the classification can be used to increase the selection of training samples, so that a more precise and detailed set of quantitative class descriptions are determined.

### Final thematic map preparation

Final land use/Vegetation cover maps were designed in Arc GIS and prepared suitable to be printed on a A3 paper along with the report. However, all soft copy is provided in pdf format is also enclosed for printing on any desired scale. An example is given below for road network with all other datasets in the background in Figure 12.

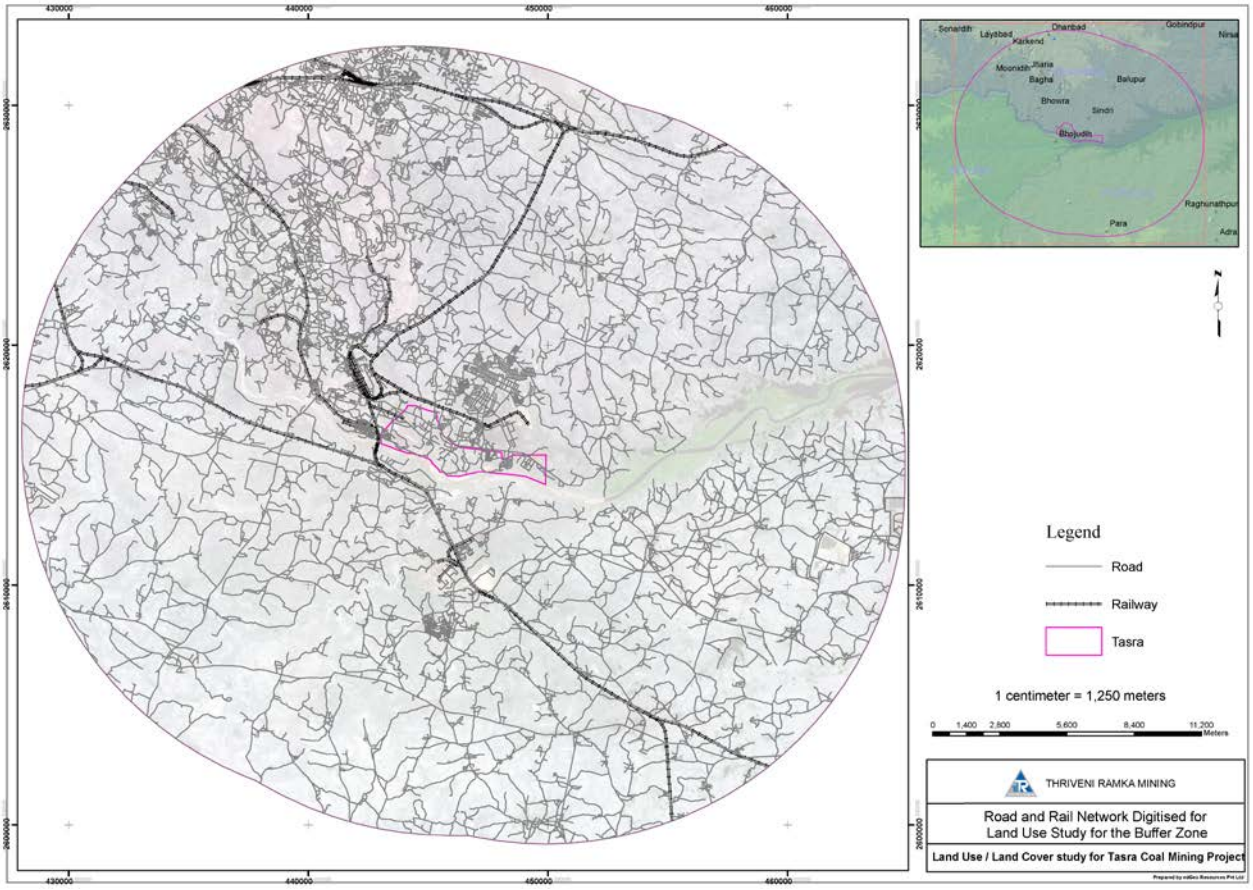



**Figure 12 Road Network Digitized for Land Use Study for the Buffer Zone**

# Land Use / Land Cover Classification

The present framework of land use/cover classification has been primarily based on the '***Manual of Nationwide Land Use/ Land Cover Mapping Using Satellite Imagery***' developed by National Remote Sensing Centre, Hyderabad, which has further been modified by CMPDI for coal mining areas. Land use/vegetation cover map was prepared based on image interpretation carried out based on the satellite data for the year 2017.

Following land use/cover classes are identified in the current project boundary region based on the LULC classification classes and description given in Table 8.

**Table 6 Land Use/Cover Categories Assessed in the Study**

| | LEVEL –I | | LEVEL-II | Description |
|---|---|---|---|---|
| 1 | Vegetation Cover | 1.1 | Forest | Forest having crown density between 40% to 70% |
| | | 1.2 | Open Forest | Forest having crown density between 10% to 40% |
| | | 1.3 | Scrubs | Vegetation characterized by sparse tree canopy cover, < 10 % in crown density. |
| | | 1.4 | Social Forestry/ Plantation | Part of the Social Forestry programs initiated by administration and with a systematics Plantation |
| 2 | Agricultural Land | 2.1 | Crop Land | Croplands |
| | | 2.2 | Fallow Land | Area associated current fallow lands |
| 3 | Settlements | 3.1 | Urban Settlement | Rural agglomerations interspersed with planted vegetation. |
| | | 3.2 | Rural Settlement | Denser urban agglomerations near to big cities |
| | | 3.3 | Industrial Settlement | Infrastructure related to the industrial / mining activities includes industrial campuses |
| 4 | Water Bodies | 4.1 | River/Streams /Nallah/Reservoir | Spread of water in various sizes and shapes including surface drainages of various sizes and stream orders |
| 5 | Mining Related | 5.1 | Mining Infrastructure | An area of excavation of the ground to extract ore leaving the mined surface exposed |
| | | 5.2 | Dumping Infrastructure | Area for dumping of surface material taken out to mine ore. |

## FINAL LULC MAPS FOR CORE AND BUFFER ZONE

Final LULC Maps for Core and Buffer zone as detailed in the previous section was calculated and analyzed for distribution of Final Land Use/Cover Categories for April-2017 image for pre- and post-mining scenario.

LULC Maps for Buffer zone with details has been presented in detail, which obviously include the data for core zone as well for brevity.

Please refer to the maps presented in Figure 13 and Figure 14 for buffer zone and Figure 15 for final maps for core zone.

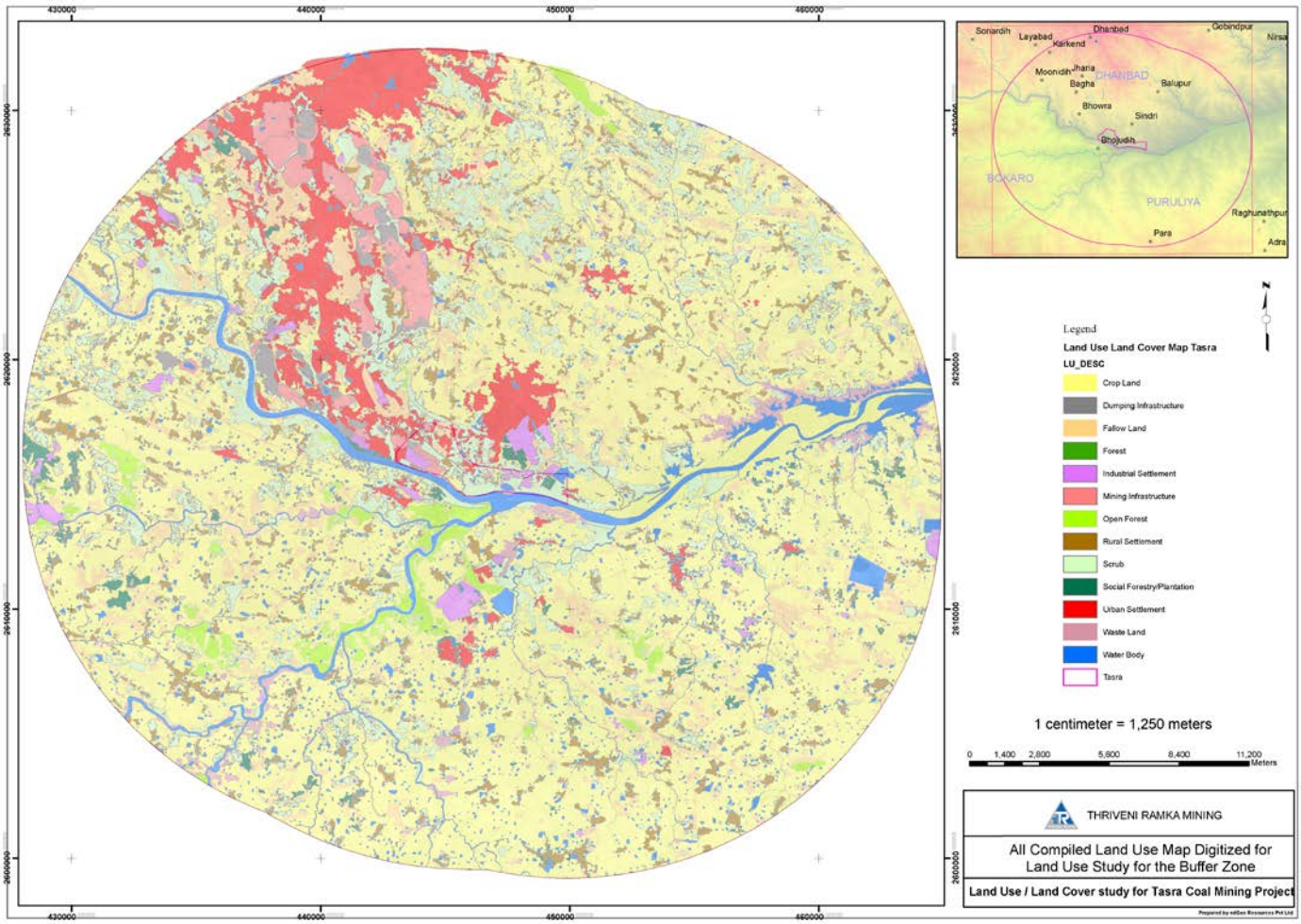



**Figure 13 Compiled Land Use Map Digitized for Land Use Study for the Buffer Zone of mining license for April 2017**

**Table 7 Final Land Use/Cover Categories extracted and summary from the Apr 2017 image for the Study Area**

| Apr 2017 | | | | |
|---|---|---|---|---|
| | **Count of Features** | **Area in sq m.** | **Area in Ha** | **% of Total** |
| **Crop Land** | 1,048 | 50,90,97,548 | 50,910 | **52.48%** |
| **Dumping Infrastructure** | 59 | 80,19,772 | 802 | **0.83%** |
| **Fallow Land** | 1,564 | 9,27,35,211 | 9,274 | **9.56%** |
| **Industrial Settlement** | 100 | 99,08,899 | 991 | **1.02%** |
| **Mining Infrastructure** | 36 | 1,59,59,250 | 1,596 | **1.65%** |
| **Open Forest** | 44 | 1,96,14,915 | 1,961 | **2.02%** |
| **Rural Settlement** | 2,325 | 5,35,49,077 | 5,355 | **5.52%** |
| **Scrub** | 1,514 | 11,91,63,900 | 11,916 | **12.28%** |
| **Social Forestry/Plantation** | 286 | 94,59,466 | 946 | **0.98%** |
| **Urban Settlement** | 362 | 6,20,75,797 | 6,208 | **6.40%** |
| **Waste Land** | 87 | 86,31,329 | 863 | **0.89%** |
| **Water Body** | 4,889 | 6,18,69,196 | 6,187 | **6.38%** |
| **Grand Total** | 12,314 | 97,00,84,361 | 97,008 | **100.00%** |

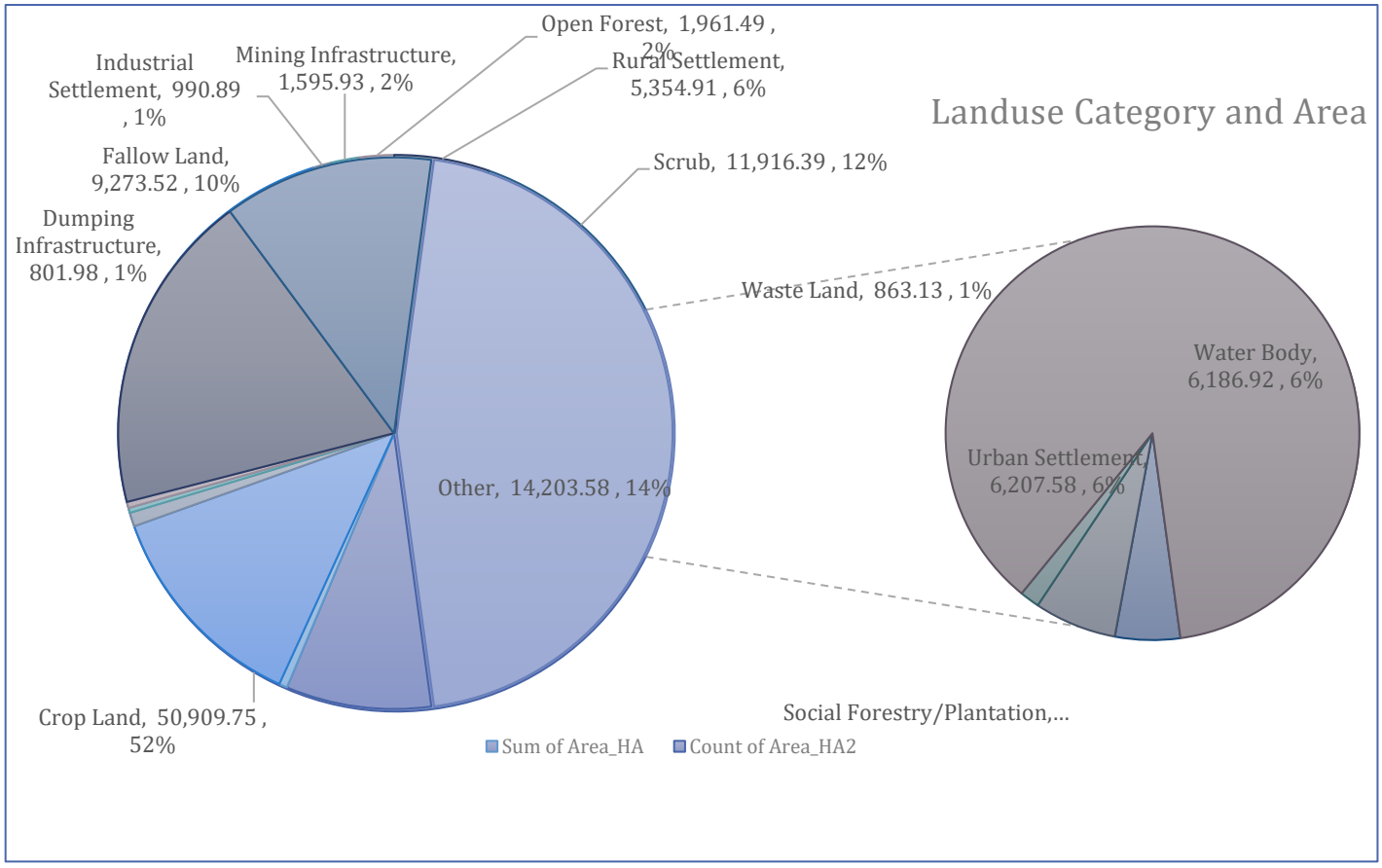



**Figure 14 Distribution of Final Land Use/Cover Categories of Apr 2017**

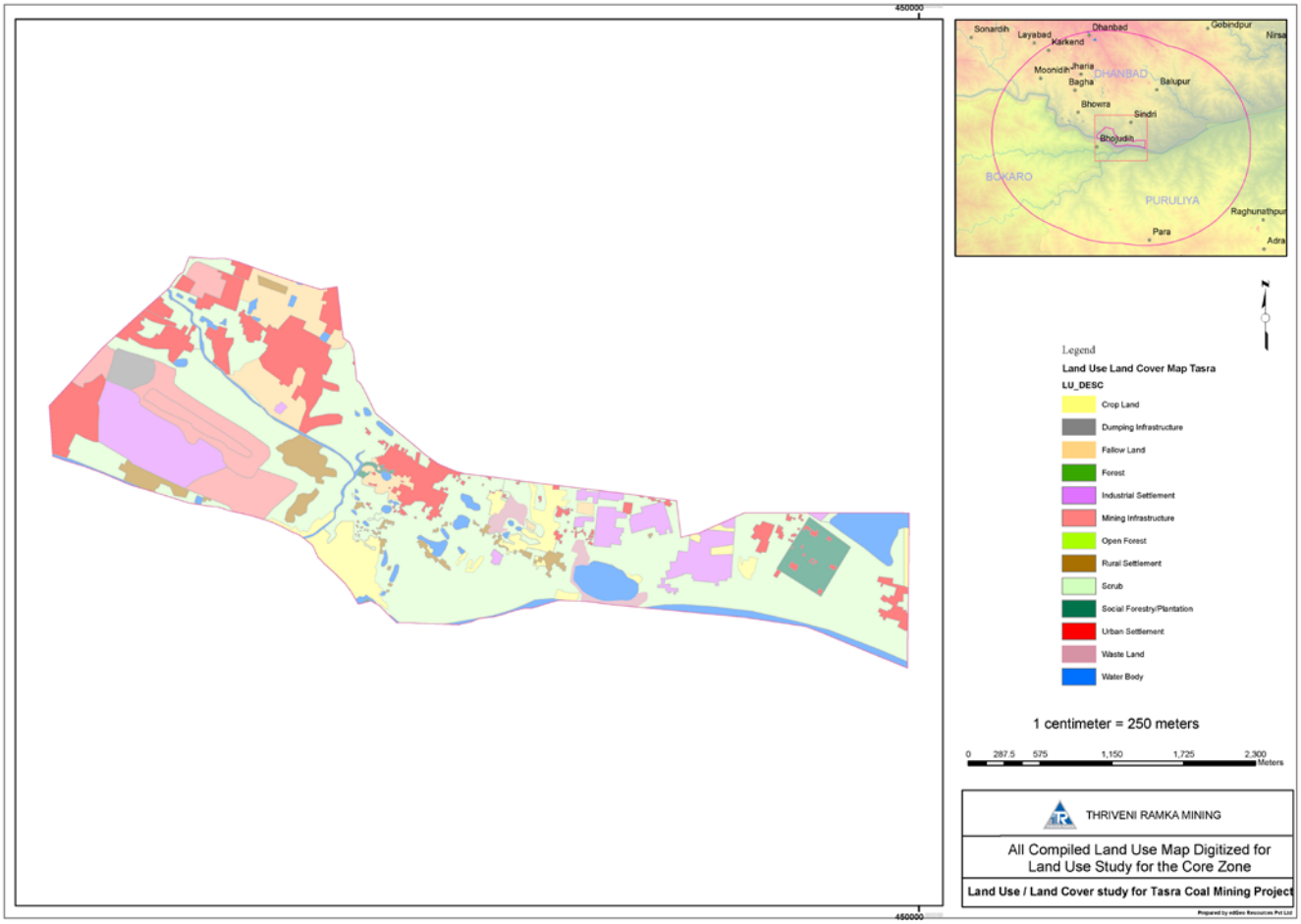



**Figure 15 Distribution of Final Land Use/Cover Categories for core zone of Apr 2017**

# Analysis of LULC classes

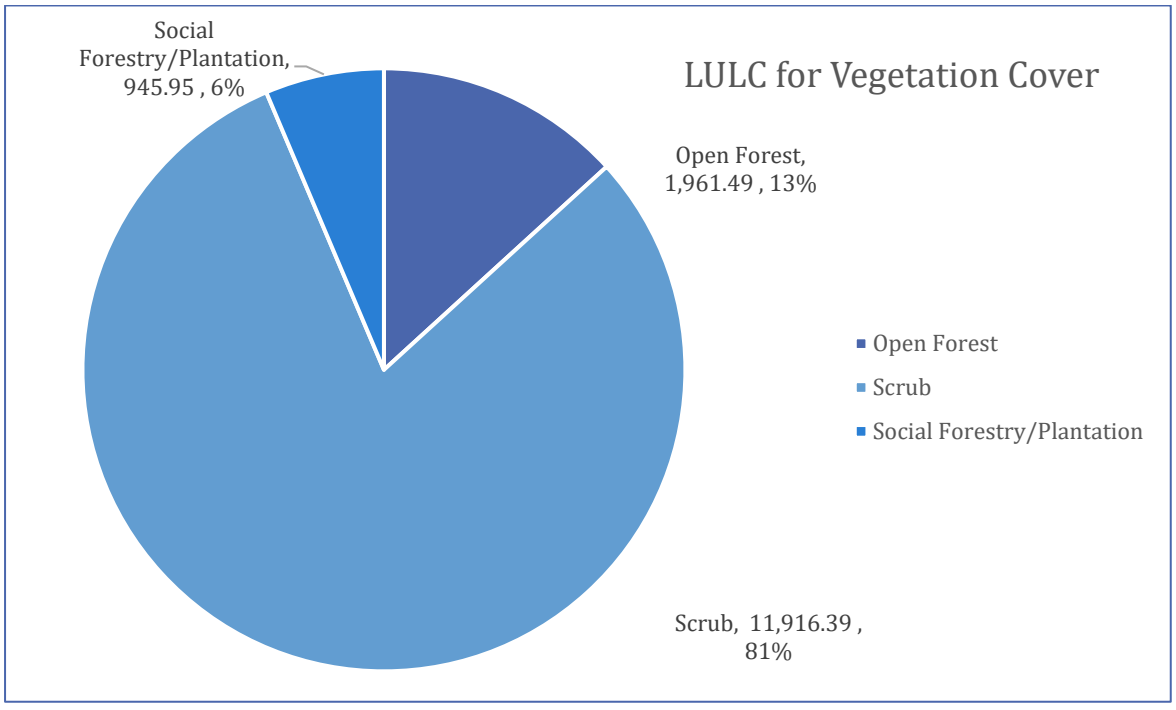
## VEGETATION COVER

Vegetation cover in the coalfield area has been found to be predominantly of two classes of Open Forest and Scrubs covering 13.2% and 80.4% of the total area respectively. Social Forestry/ Plantation have been put into a separate class in the study area with 945.95 Ha and 6.4% of area.

Distribution of the land use under the vegetation classes within the area as shown in in Table 9 and pie diagram associated with that.

**Table 8 Summary for all vegetation classes combined**

| Land Use Classes | Year 2014 | |
|---|---|---|
| | Area (Ha) | % of total |
| **VEGETATION COVER** | | |
| **Open Forest** | 1,961.49 | 13.2% |
| **Scrub** | 11,916.39 | 80.4% |
| **Social Forestry/Plantation** | 945.95 | 6.4% |
| **Grand Total** | 14,823.83 | 100.0% |



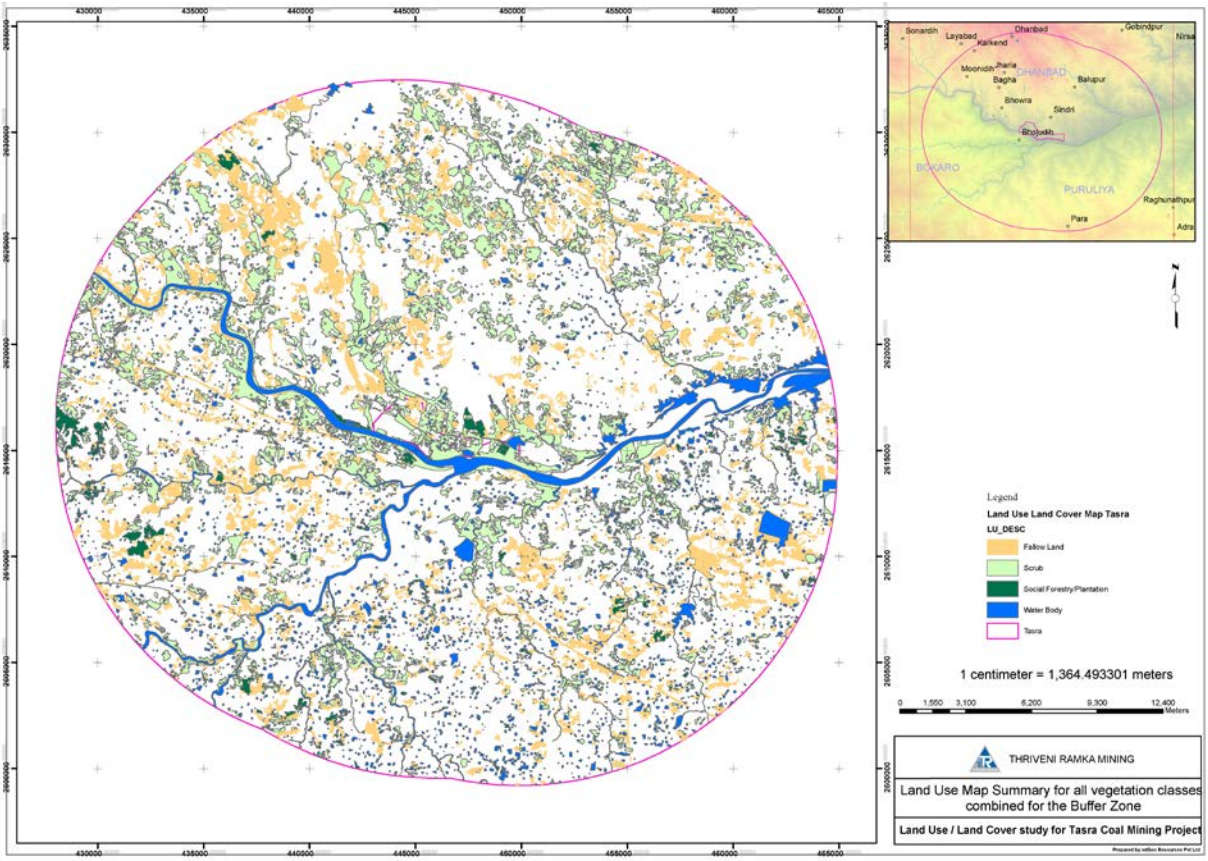



**Figure 16 Summary for all vegetation classes combined Apr 2017**

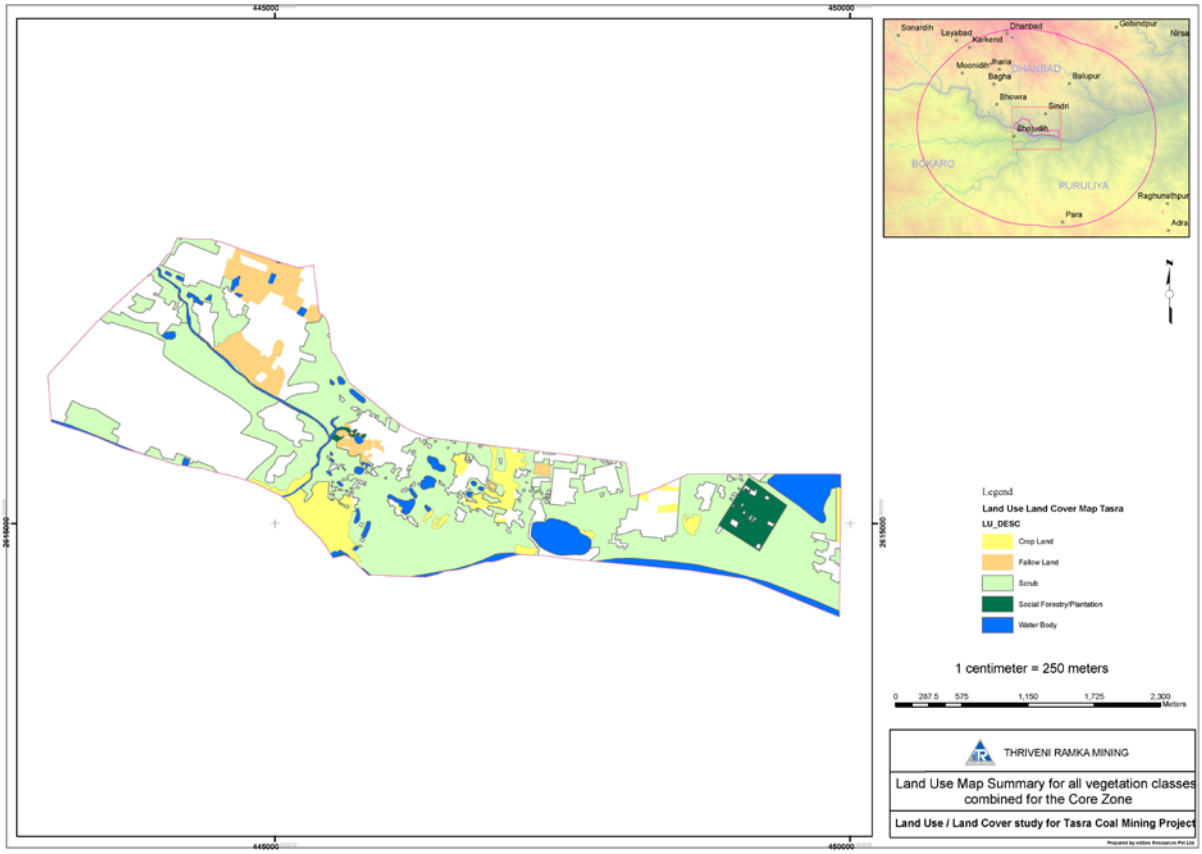



**Figure 17 Distribution of Agricultural Land Use/Cover Categories for core zone of Apr 2017**

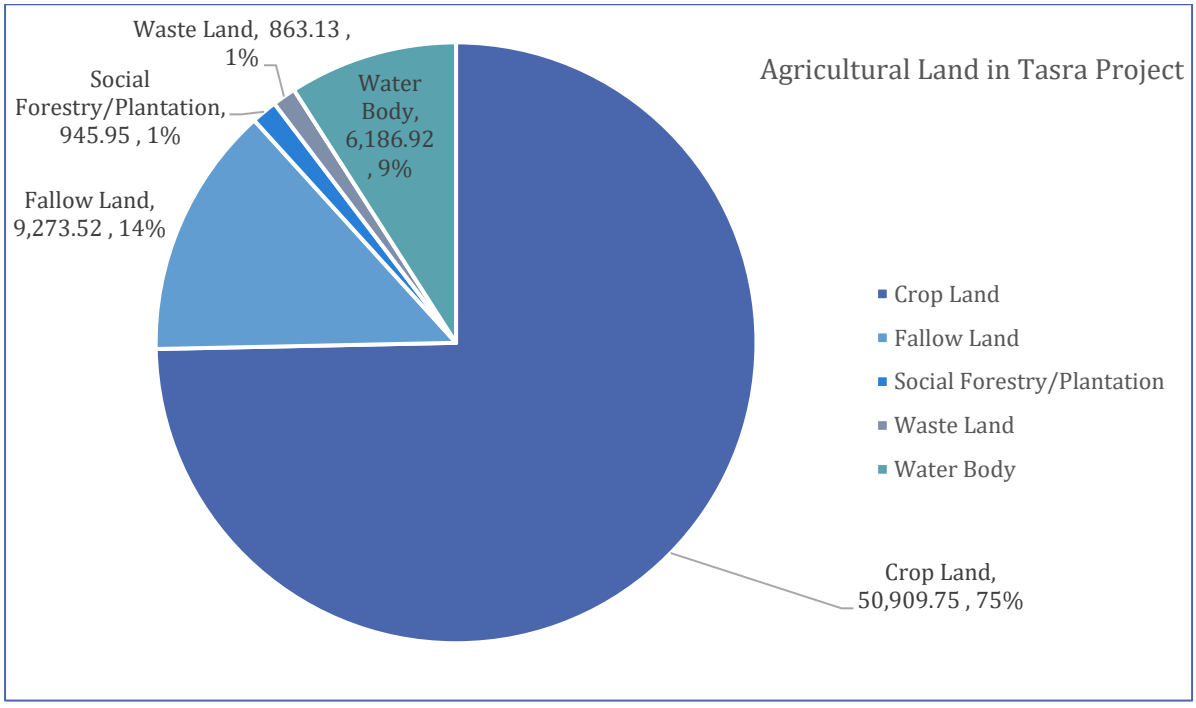
## AGRICULTURAL LAND

Land primarily used for farming and production of food, fibre and other commercial and horticultural crops falls under this category. It includes crop land (irrigated and unirrigated) and fallow land (land used for cultivation, but temporarily allowed to rest).

Total agricultural land which was 50,909 Ha in the year 2017. The details are shown below in Table 10.

**Table 9 Agricultural Land and other associated classes in Tasra Coal Project for the year 2017**

| Land Use Classes | Year 2017 | |
|---|---|---|
| | Area (Ha) | % of total |
| **Agriculture** | | |
| **Crop Land** | 50,909.75 | 74.7% |
| **Fallow Land** | 9,273.52 | 13.6% |
| **Social Forestry/Plantation** | 945.95 | 1.4% |
| **Waste Land** | 863.13 | 1.3% |
| **Water Body** | 6,186.92 | 9.1% |
| **Grand Total** | 68,179.28 | 100.0% |



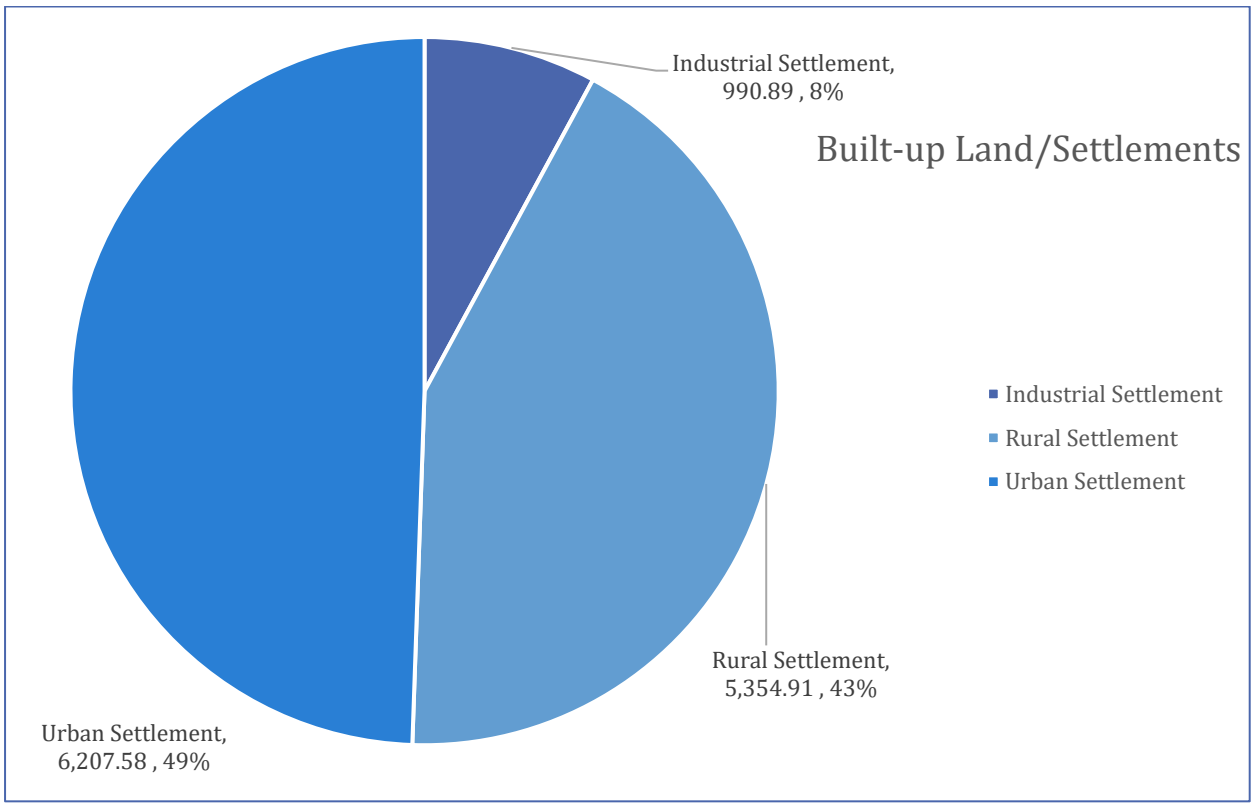
## SETTLEMENTS

All the man-made constructions covering the land surface are included under this category. Built-up land has been further divided in to rural and urban classes. The details of the land use under this category are shown in Table 11.

It is observed that the settlements within the coalfield buffer zone is 990.89 Ha, which is about 7.9% of the settlement area. It is observed that the rural settlements are of area 5,354.91 Ha which is 42.7% of the total settlement area. The Urban settlement within the coalfield area has grown to 6,207.58 Ha which is 49.4% of the settlement area. This increasing trend of urbanization and general improvement in economic condition and employment generation for the mining activity.

**Table 10 Built-up Land/Settlements in Tasra Coal Project for the year 2017**

| Land Use Classes | Year 2017 | |
|---|---|---|
| | Area (Ha) | % of total |
| **Settlements** | | |
| **Industrial Settlement** | 990.89 | 7.9% |
| **Rural Settlement** | 5,354.91 | 42.7% |
| **Urban Settlement** | 6,207.58 | 49.4% |
| **Grand Total** | 12,553.38 | 100.0% |



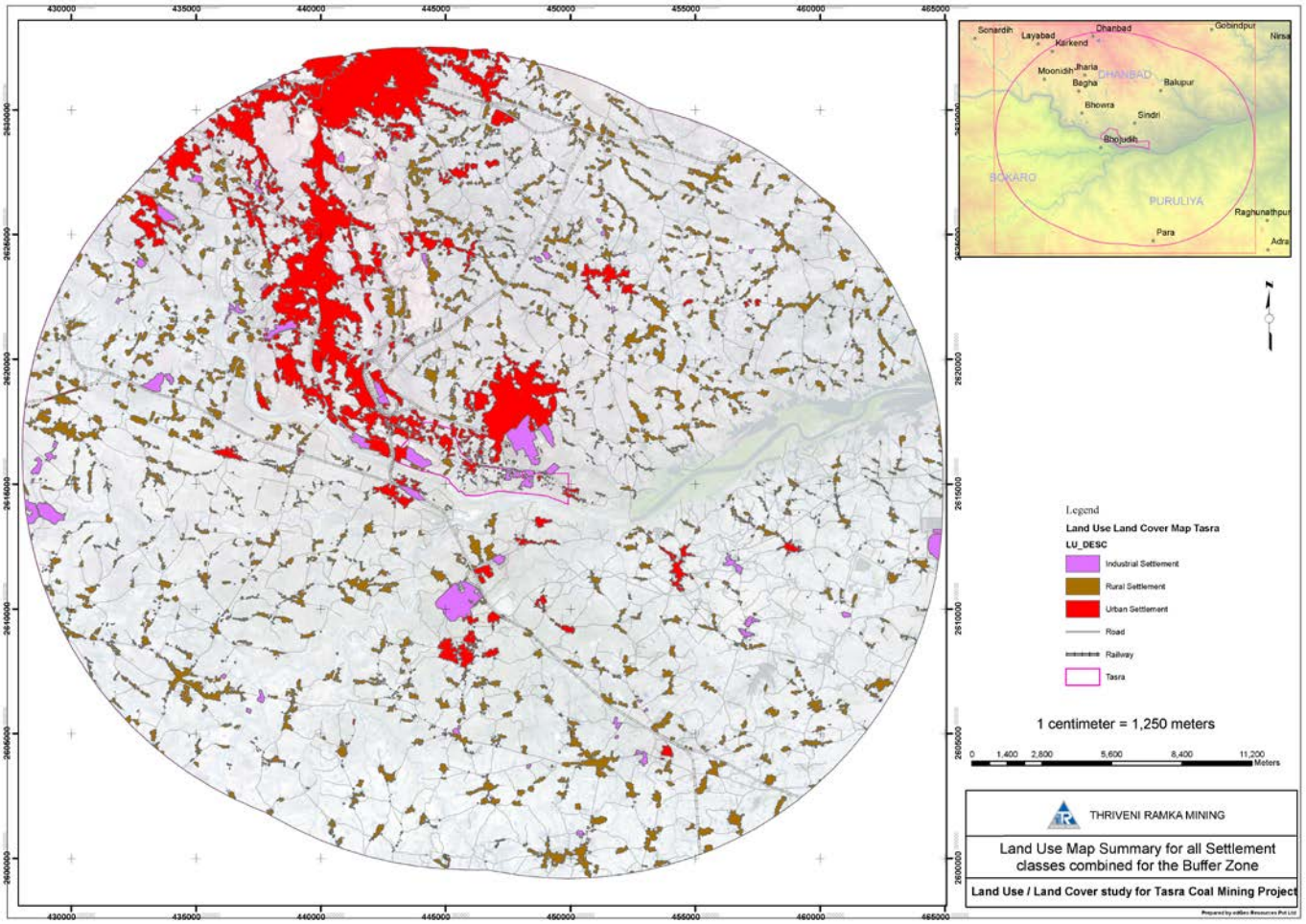



**Figure 18 Summarized Built-up Land/Settlements for project area in Tasra Coal Project for the year 2017**

## MINING AND DUMPING INFRASTRUCTURE

It is observed that the Mining Infrastructure within the coalfield have grown to 801.98 Ha, which is about 1.65 % of the buffer area. It is observed that the Dumping Infrastructure have grown to 1,595.93 Ha which is 0. 83% of the area. The corresponding rural and urban settlement within the coalfield area has also grown.

**Table 11 Land Cover for Mining/Overburden dump in Tasra Coal Project for the year 2017**

| Land Use Classes | Year 2014 | |
|---|---|---|
| | Area (Ha) | % of total |
| **Mining Infrastructure** | 801.98 | 23.7% |
| **Dumping Infrastructure** | 1,595.93 | 47.1% |
| **Total Mining Land use** | 2,397.90 | 70.8% |
| **Industrial Settlement** | 990.89 | 29.2% |
| **Grand Total Settlement and Mining Classes** | 3,388.79 | 100.0% |

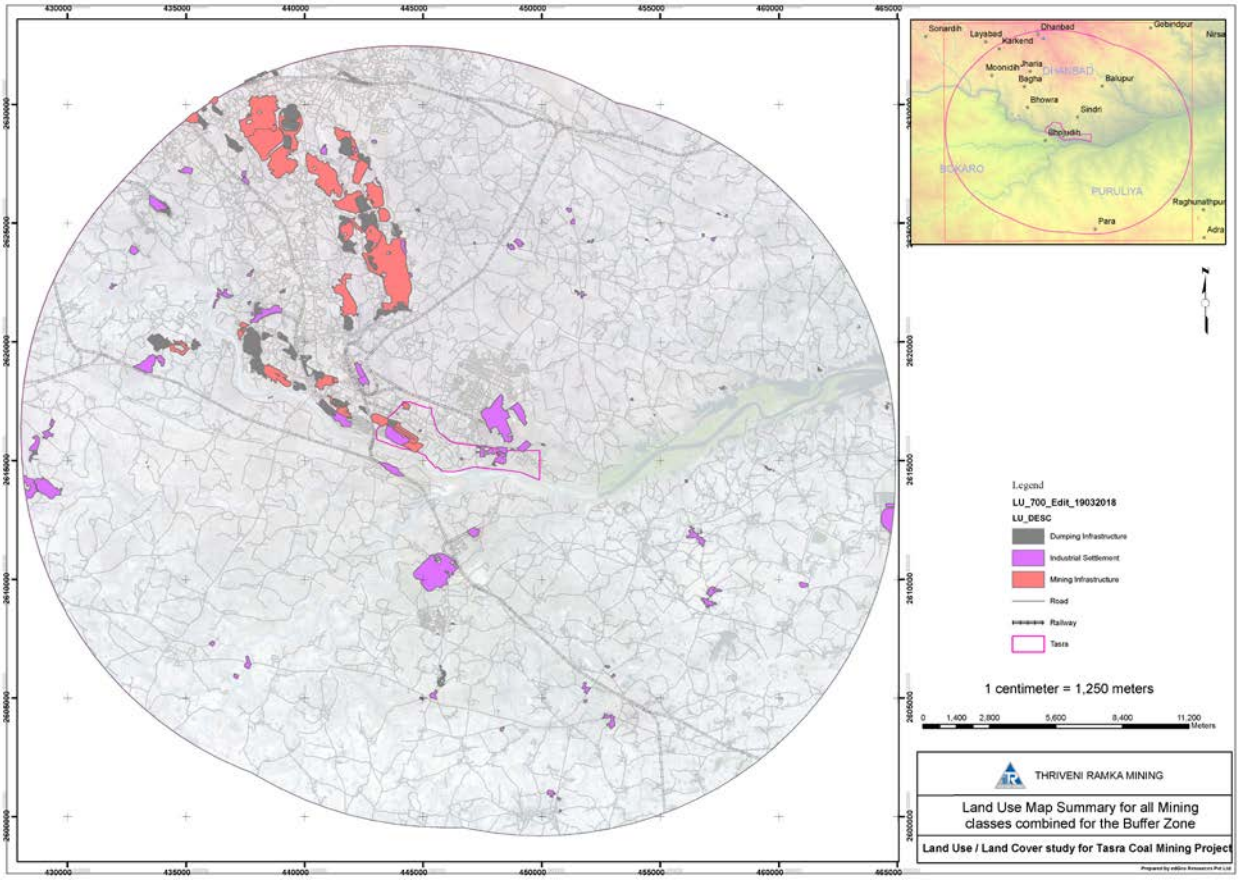
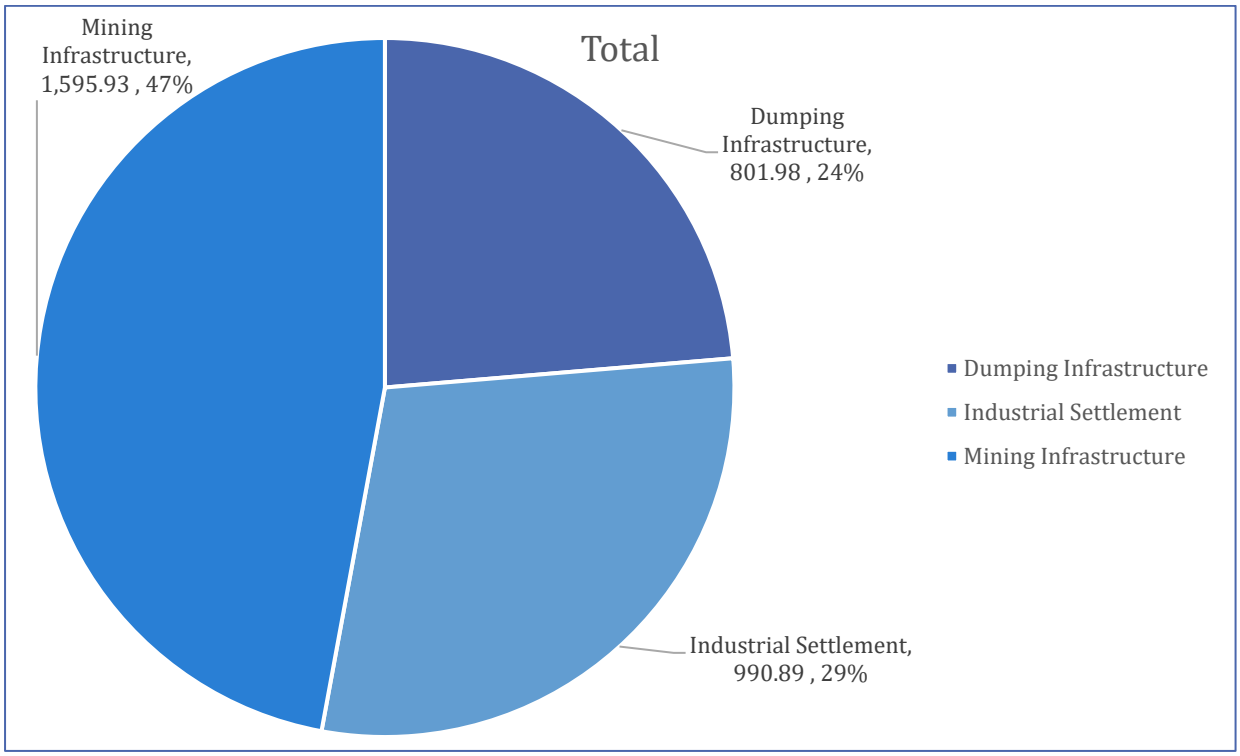



**Figure 19 Land Cover for Mining/Overburden dump and Industrial Settlement in Tasra Coal Project for 2017**



## WATER BODIES

It is the area of impounded water includes natural lakes, rivers/streams and manmade canal, reservoirs, tanks etc. The water bodies in the study area is 6,186.92 Ha or 6.4 % of the total buffer area. This is due to the extent of water bodies of surface water in many places and the increase in settlements.

**Table 12 Land Cover for Water Body in Tasra Coal Project for the year 2017**

| Land Use Classes | Year 2014 | |
|---|---|---|
| | Area (Ha) | % of total |
| **Water Body** | 6,186.92 | 6.4% |

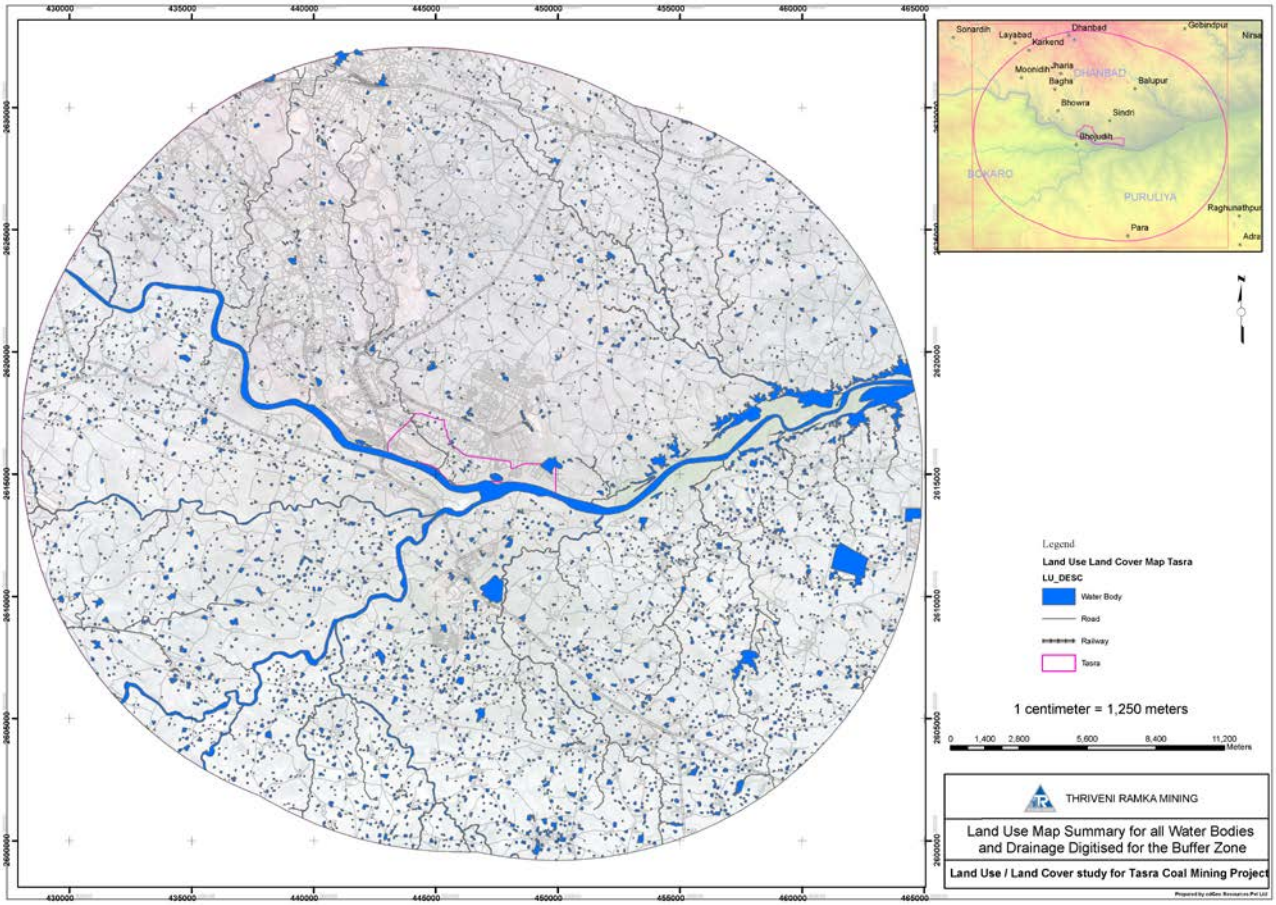



**Figure 20 Land Cover of water bodies in the study area**

## FINAL DISCUSSIONS

Final LULC Maps for Core and Buffer zones are presented in the previous section and shown in Figures/Maps. As detailed in the study the total area is calculated and analyzed for distribution of Land Use/Cover Categories in the core and buffer zone. This has been done for Apr 2017 images corresponding to mining scenario.

LULC Maps for Buffer zone with details has been presented in detail, which include the data for core zone as well. The data separately for core zone is analyzed separately and monitored.

Please refer to the maps presented in Figure 13 and Figure 15 and for final maps for buffer zone and core zone respectively for Apr 2017. Based on spatial database prepared, land use and land cover changes will be analyzed using similar approach for different classes subsequently.

The changes with respect to the mining scenario will be monitored in every three years. LULC Change assessment will be done with a focus to analyze how mining activity and development in economic activity affect influenced the settlements. And, in some cases, will be resulting in to conversions of open forest, scrub, agriculture and other land covers to mining related infrastructure.

## CONCLUSION & RECOMMENDATIONS

Natural resource management, environmental assessment, land monitoring and planning require frequently updated information on land cover status and condition over large areas. Support to an active monitoring effort at regional scale by manually extracting information through interpretation of satellite-based data.

In the present study, land use/vegetation cover map of Tasra Coal Project is prepared based on satellite data of Apr 2017 in order to generate the database on LULC for pre-mining conditions. This land use pattern is to detect and monitor the changes in future for effective natural resource management and its planning. The Land use/vegetation cover analysis will help to analyze and monitor the possible impact of mining and other industrial activities in the area.

ANNEXURE- VIII

## Environment Management Plan & Corporate Social Responsibility

**Expenditure of Environment Management Plan (EMP) for the FY 2023 - 2024**

| S.No | Environmental Measures/Activity | Expenditure financial year (2023-2024) (Rs) |
|---|---|---|
| 1 | Environmental Monitoring<br>i) Ambient Air Quality Monitoring<br>ii) Ground Water and Surface Water Monitoring<br>iii) Noise Monitoring | **4,47,120.00** |
| 2 | Pollution Control<br>i) Dust Suppression | **2,25,000.00** |
| 3 | Continuous Ambient Air Quality Monitoring Station (CAAQMS) | **54,00,000.00** |
| 4 | Monsoon Preparation (On Going)<br>i) Construction of Garland Drain<br>ii) Siltation pond | **3,00,000.00** |
| 5 | Piezometer | **66,200.00** |
| 6 | ETP | **156043.00** |
| **Total (Rs)** | | **65,28,163.00** |

## CSR ACTIVITY FOR THE FIANICIAL YEAR 2023 -2024

The Board of Directors of SAIL in its 503rd meeting held on July 21, 2023, based on the recommendation of the BSC on CSR in its 31st meeting held on 13/06/2023, have approved the following budgetary allocation to Collieries for carrying out CSR activities during the FY 2023-2024 is Rs. 392.5 Lakhs. The board approval copy is attached herewith.

The CSR activities done by MDO i.e M/s kalyaneswari Tasra Mining Pvt. Ltd (KTMPL) is given below in tabular form: -

| S.No | Date | Activity | Amount | Place where CSR activity taken up |
|---|---|---|---|---|
| 1 | 1.17.2024 | Road Safety Week | 5,860.00 | Rohrabandh School |
| 2 | 1.20.2024 | Football | 580.00 | Kalipur School |
| 3 | 1.20.2024 | Toffee/Others | 600.00 | Kalipur School |
| 4 | 1.20.2024 | Blankets | 94,500.00 | Rohrabandh Kalipur Asanbani |
| 5 | 1.22.2024 | Handpump Repair | 9,840.00 | Rohrabandh |
| 6 | 1.31.2024 | Republic day | 17,174.00 | Tasra Village |
| 7 | 2.07.2024 | Water Tanki | 29,326.00 | Rohrabadh |
| 8 | 2.08.2024 | LED Light | 29,500.00 | Rohrabandh & Tasra |
| 9 | 2.12.2024 | Cleaning of Khadia Pond | 53,572.00 | Tasra Village |
| 10 | 2.12.2024 | Saraswati Puja | 3,000.00 | Rohrabandh |
| 11 | 2.14.2024 | Adivasi Sarna Puja | 5,000.00 | Asanbani |
| 12 | 2.27.2024 | Health Camp | 1,910.00 | Asanbani |
| 13 | 2.24.2024 | Hanuman Mandir | 11,000.00 | Gaushla (Puja) |
| 14 | 3.02.2024 | Sports | 23,718.00 | Rohrabandh & Tasra |
| 15 | 3.02.2024 | Handpump Repair | 15,210.00 | Asanbani |
| 16 | 3.09.2024 | Toilet Inauguration Exp | 225.00 | |
| 17 | 3.07.2024 | Shivratri Puja Donation | 50,000.00 | |

| | | | | |
|---|---|---|---|---|
| 18 | 3.17.2024 | HP repair | 6,000.00 | Rajiv Kr. |
| 19 | 3.14.2024 | Marriage Gift | 2,200.00 | |
| 20 | 3.18.2024 | SIFI | 2,40,484.00 | February bill |
| 21 | 3.20.2024 | Medicine March | 77,194.00 | |
| 22 | 3.19.2024 | Cricket material | 5,320.00 | |
| 23 | 3.31.2024 | Toilet construction | 40,000.00 | Mahi Construction Suraj Dubey |
| 24 | 3.24.2024 | Well renovation | 33,000.00 | Kalipur |
| 25 | 3.29.2024 | Well renovation | 35,000.00 | Sarsakundi |
| 26 | 3.24.2024 | Platform construction | 70,000.00 | Kalipur |
| 27 | 3.31.2024 | SIFI | 2,51,340.00 | Dispensary March |
| 28 | 3.31.2024 | Water tanki | 17,129.00 | Rohrabandh |
| **Total Amount (Rs)** | | | **11,28,682.00** | |

ANNEXURE-IX

# स्टील अथॉरिटी ऑफ इंण्डिया लिमिटेड (सेल)

## *(कोयलारीज डिविजन)*

*एवं*

*(एम.डी.ओ.)*

## कल्यानेश्वरी टासरा माईनिंग प्राईवेट लिमिटेड

## सी.एस.आर. गतिविधि प्रतिवेदन

*(वित्तीय वर्ष 2023–24)*

# SAIL (MDO)-KTMPL - C A R E S

- **C** • Cheerful Health & Hygiene
- **A** • Alleviate Poverty & Hunger
- **R** • Respectful Rehabilitation
- **E** • Education & Employment
- **S** • Skill & Livelihood

## ध्यानाकर्षण क्षेत्र

- स्वास्थ्य एवं साफ–सफाई
- शिक्षा एवं खेलकूद
- महिला सशक्तिकरण
- कौशल विकास एवं आजीविका
- अधोसंरचना विकास
- सामुदायिक विकास

# प्राथमिक स्वास्थ्य केन्द्र का शुभारंभ एवं संचालन

खनन प्रभावित क्षेत्र के परिवारों हेतु प्राथमिक स्वास्थ्य केन्द्र का शुभारंभ कार्यकारी निदेशक श्री अनुप कुमार द्वारा किया गया।

# निःशुल्क स्वास्थ्य परीक्षण शिविर

परियोजना प्रभावित क्षेत्र के समस्त परिवारों की स्वास्थ्य देखभाल हेतु निशुल्क स्वास्थ्य परीक्षण किया गया।


# निःशुल्क चिकित्सा शिविर

## पुर्नवास क्षेत्र के प्रभावित परिवारों हेतु निःशुल्क स्वास्थ्य शिविर का आयोजन एवं दवाई वितरण कार्यक्रम


# निःशुल्क चिकित्सा उपचार

पुर्नवासित क्षेत्र के प्रभावित परिवार के सदस्यों का निःशुल्क चिकित्सा उपचार किया जा रहा है।


# निःशुल्क चलित चिकित्सा वाहन का शुभारंभ

पुर्नवासित क्षेत्र के प्रभावित परिवार के सदस्यों हेतु निःशुल्क चलित चिकित्सा वाहन का शुभारंभ किया गया।

# विकलांगों हेतु निःशुल्क ट्राई–साईकिल का वितरण

परियोजना प्रभावित क्षेत्र के विकलांगों को ट्राई–साईकिल का वितरण किया।


# निःशुल्क मोतियाबिन्द उपचार शिविर

## परियोजना प्रभावित क्षेत्र के शासकीय सामुदायिक स्वस्थ्य केन्द्र में निःशुल्क मोतियाबिन्द शिविर आयोजन

# स्वच्छ पेयजल की आपूर्ति

खनन प्रभावित क्षेत्र रोहड़ाबांध के प्रभावित परिवारों हेतु स्वच्छ पेयजल की पूर्ति निरंतर की जा रही है।



# कुँआ मरम्मतीकरण एवं चबूतरा निर्माण

पुर्नवासित क्षेत्र में पेयजल आपूर्ति हेतु कुँआ मरम्मत एवं चबूतरा निर्माण कार्य किया गया।

# चंपाकल मरम्मत काय

खनन प्रभावित क्षेत्र में पेयजल हेतु खराब पड़े चंपाकल का मरम्मत कार्य कराया जा रहा है।


# पेयजल हेतु पानी टंकी

## खनन प्रभावित क्षेत्र के विभिन्न मुहल्लों में 10 सार्वजनिक स्थानों पर पेयजल हेतु पानी टंकी स्थापना


# निःशुल्क कौशल विकास प्रशिक्षण

पुर्नवासित क्षेत्र के प्रभावित परिवारों को निःशुल्क कौशल विकास प्रशिक्षण का शुभारंभ कार्यकारी निदेशक श्री अनुप कुमार जी द्वारा किया गया।



# निःशुल्क कौशल विकास प्रशिक्षण

## पुर्नवासित क्षेत्र के प्रभावित परिवारों को स्व–रोजगार हेतु निःशुल्क कौशल विकास प्रशिक्षण प्रारंभ


# कौशल प्रशिक्षण हेतु उन्मुखीकरण कार्यक्रम

## खनन क्षेत्र के प्रभावित परिवारों को स्व–रोजगार हेतु कौशल उन्मुखीकरण कार्यक्रम का आयोजन


# कौशल प्रशिक्षण हेतु उन्मुखीकरण कार्यक्रम

## खनन क्षेत्र के प्रभावित परिवारों को स्व–रोजगार हेतु कौशल उन्मुखीकरण कार्यक्रम का आयोजन


# निःशुल्क कौशल विकास प्रशिक्षण के लिए बोकारो में एक्सपोजर

## पुर्नवासित क्षेत्र के प्रभावित परिवारों को स्व–रोजगार हेतु निःशुल्क कौशल विकास प्रशिक्षण प्रारंभ

# निःशुल्क कौशल विकास प्रशिक्षण कार्यक्रम

पुर्नवासित क्षेत्र के प्रभावित परिवारों को निःशुल्क कौशल विकास प्रशिक्षण प्रदान कराया जा रहा है।



# महिला स्नान घर निर्माण

खनन प्रभावित क्षेत्र रोहड़ाबांध दुर्गा मंदिर के पास महिलाओं के स्नान हेतु शेड निर्माण किया गया।


# तालाब साफ–सफाई काय

खनन प्रभावित क्षेत्र में जल संरक्षण हेतु खदिया तालाब की साफ सफाई कार्य कराया गया।

# खेल सामग्री एवं पोशाक वितरण

खनन प्रभावित क्षेत्र के बालिका खिलाडियों हेतु खेल सामग्री वितरण किया गया।

# खेल सामग्री एवं पोशाक वितरण

खनन प्रभावित क्षेत्र के बालिका फुटबॉल खिलाडियों हेतु खेल सामग्री वितरण किया गया।

# स्ट्रीट लाईट स्थापना

खनन प्रभावित क्षेत्र टासरा (मण्डल बस्ती) में स्ट्रीट लाईट स्थापित किया गया है।

# स्ट्रीट लाईट स्थापना

खनन प्रभावित क्षेत्र टासरा (हाण्डी कुली बस्ती) में स्ट्रीट लाईट स्थापित किया गया है।

# चबूतरा मरम्मतीकरण एवं निर्माण

पुर्नवास क्षेत्र में सामुदायिक चबूतरा का मरम्मत एवं निर्माण कार्य किया गया।

# शौचालय निर्माण

खनन प्रभावित क्षेत्र के विभिन्न मुहल्लों में आवश्यकता अनुसार सुलभ शौचालय का निर्माण किया गया है।


# कम्बल वितरण कार्यक्रम

खनन प्रभावित क्षेत्र के विधवा, गरीब एवं वृद्ध महिला पुरूषों को ठण्ड से बचाव हेतु कम्बल वितरण किया गया। जिसमें कुल 300 परिवारों को लाभान्वित किया गया।


# स्वेटर वितरण कार्यक्रम

खनन प्रभावित क्षेत्र के उत्क्रमित मध्य विद्यालय रोहड़ाबांध में कुल 160 बच्चों हेतु स्वेटर वितरण कर लाभान्वित किया गया।

# समुदाय की जरूरतों का आकलन की बैठक

## गांव में 91 सदस्यों के साथ बैठक हुई, 47 महिलाएं हैं

# विश्व पर्यावरण दिवस

- जल है तो जंगल है ,जंगल है तो वायु है वायु है, तो जीवन हैं

# CSR Activities which are initiated in April 2024

| Sl. | Name of activity |
|---|---|
| 1 | Establish a sewing center for women's in Tasra & Rohrabandh village. |
| 2 | Repairing ten handpumps in Rohrabandh village. |
| 3 | Repairing of middle school floor in Rohrabandh village. |
| 4 | Construction of two toilets in Rohrabandh village. |
| 5 | Installation of twenty 50W LED street lights in Handi Basti. |
| 6 | Construction of community platform in Handi Basti. |
| 7 | Installation of two handpumps in Asanbani village |
| 8 | Setting up of a healthcare camp in Kalipur |
| 9 | Renovation of temple, club and Anganwadi center in the Rohrabandh village |

# CSR Activities Planned for May 2024

| Sl. | Name of activity |
|---|---|
| 1 | Planned to provide the street lights and water supply facilities to the affected villages and also provide maintenance for the same. |
| 2 | Self-employment training center is going to be established in Sindri, KTMPL has hired an NGO to prepare a business model and way forward. |
| 3 | Development of nursery for development and training of farming including vertical etc to the villages. |
| 4 | A coaching center will be developed at a nearby location of the project site and also hire teachers for private as well as government schools. |
| 5 | Repairing and renovation work of schools and damages of houses affected due to blasting is also heading every month. |
| 6 | Twice in every month medical camps should be conducted for the project near villages. |

# मिडिया कवरेज

उत्क्रमित मध्य विद्यालय के 160 बच्चो हेतु स्वेटर वितरण कार्यक्रम का आयोजन किया गया

## कल्यानेश्वरी टासरा माइनिंग प्राइवेट लिमिटेड द्वारा किया गया स्वेटर वितरण

**स्कूली बच्चो को कठिन परिश्रम कर आगे बढ़ने हेतु मार्गदर्शन किया : किशोर बाबू सज्जा**

**संवाददाता सिन्दरी।** बुधवार को कल्यानेश्वरी टासरा माइनिंग प्राइवेट लिमिटेड के सौजन्य से सामाजिक उत्तरदायित्व का निर्वहन करते हुए, रोहराबांध स्थित उत्क्रमित मध्य विद्यालय के 160 बच्चो हेतु स्वेटर वितरण कार्यक्रम का आयोजन किया गया। यह कार्यक्रम केटीएमपीएल के सीएमडी किशोर बाबु सज्जा एवं सेल के मुख्य महाप्रबंधक शिवराम बनर्जी के मुख्य अतिथ्य में संपन्न हुआ। कार्यक्रम की शुरुआत मेहमानों को स्थानीय पुष्प गुच्छ प्रदान कर स्कूली बच्चो द्वारा स्वागत किया गया। किशोर बाबु द्वारा स्कुल की प्रभारी प्रधान अध्यापिका श्रीमति नूतन सिंह एवं अन्य शिक्षको को शाल एवं नारियल देकर सम्मानित किया गया। केटीएमपीएल के उप सभी प्रभावित ग्रामो में सी एस आर के तहत पेयजल, शिक्षा तथ स्वास्थ्य के क्षेत्र में कार्य कर ग्राम का विकास करना भी है। तत्पश्चात किशोर बाबु एवं शिवराम बनर्जी द्वारा अपने उद्बोधन में स्कूली बच्चो को कठिन परिश्रम कर आगे बढ़ने हेतु मार्गदर्शन किया एवं सभी स्कूली बच्चो को स्वेटर वितरण किया गया।

कार्यक्रम का समापन ग्राम रोहराबांध के अनिल सिंह द्वार धन्यवाद ज्ञापन करते हुए किय गया।कार्यक्रम का संचालन, सीएसआर प्रबंधक व गया। का डायरेक्टर, उमा महेश पंकज कु

## सड़क सुरक्षा जागरुकता कार्यक्रम का समापन

कार्यक्रम में शामिल लोग

**आवाज प्रतिनिधि। 17 जनवरी सिंदरी।** कल्याणेश्वरी टासरा माइनिंग प्राइवेट लिमिटेड एवं सेल के संयुक्त तत्वावधान में सात दिवसीय सड़क सुरक्षा जागरुकता कार्यक्रम का समापन समारोह बुधवार को उत्क्रमित मध्य विद्यालय रोहराबांध में आयोजित किया गया। कार्यक्रम केटीएमपीएल के निगमित सामाजिक उत्तरदायित्व के तहत आयोजित किया गया जिसमें मुख्य वक्ता केटीएमपीएल के सुरक्षा अधिकारी चन्दन बाबू ने स्कूली बच्चों को सड़क सुरक्षा से संबंधित जानकारी से अवगत कराते हुए विभिन्न उदाहरणों की प्रस्तुति देते हुए बारीकी से बताया कि नियमानुसार सड़क पर आवगमन करने पर राहगीर सड़क दुर्घटनाओं से बच सकते हैं। स्कूल के बच्चों को बताया गया कि कार में याला करते समय सीट बेल्ट बांधना जरुरी है एवं मोटर साइकिल में हेलमेट पहनना अति आवश्यक है ' कार्यक्रम में सेल के अधिकारी श्री के. के. राहुल एवं केटीएमपीएल से सीएसआर के एजीएम विजय तिवारी रोहराबांध के गणमान्य नागरिक, महिला स्व-सहायता समूह की सदस्यगण एवं रोहराबांध के अन्य गणमान्य नागरिक शामिल थे। कार्यक्रम में सड़कों पर लगे हुए सूचनात्मक बोर्ड एवं निर्देशों के पालन किये जाने हेतु स्कूली बच्चों को जागरूक किया गया। कार्यक्रम का संचालन सीएसआर के सहायक प्रबंधक बसंत किसपोट्टा तथा स्कूल की प्रभारी नूतन सिंह द्वारा धन्यवाद ज्ञापन किया गया।

## कल्यानेश्वरी टासरा माइनिंग क्षेत्र में 75 वें गणतंत्र दिवस समारोह का आयोजन

**सिंदरी।** गणतंत्र दिवस पुरे भारत देश में बाबा साहेब भीमराव अम्बेडकर द्वारा निर्मित संविधान पुस्तिका के अंगीकार होने के उपलक्ष्य में हर्षोउल्लास से मनाया जाता है। 26 जनवरी 1950 को अंगीकृत संविधान ने देश के हरएक नागरिकों को जीवन यापन हेतु समस्त अधिकार प्रदान करता है। केटीएमपीएल द्वारा टासरा माइनिंग क्षेत्र में इस पर्व को बड़े ही धूमधाम से मनाया गया। जिसमें एसएपी के जवानों द्वारा मार्च पास्ट किया गया तथा एसआईएस के जवानों के साथ मिलकर सेल, केटीएमपीएल के अधिकारियों एवं कर्मचारियों द्वारा तिरंगे झंडे को सलामी दी गयी। इस समारोह में मुख्य अतिथि के रूप में सेल के महाप्रबंधक शिवराम बनर्जी

एवं सह अतिथि पंकज मण्डल त अन्य अधिकारियों को आमंत्रित कि गया था। मुख्य अतिथि शिवर बनर्जी ने उपस्थित सभी जवान ग्रामीणों एवं केटीएमपीएम के समस्त अधिकारियों को प्रोत्साहित करते कहा कि कोयला खनन हीं केव हमारा उद्देश्य नहीं है, बल्कि ख क्षेत्र के आसपास के समस्त परिव का विकास हमारी पहली प्राथमिक है। उपमहाप्रबंधक पंकज मण्डल अपने उद्बोधन में कहा कि हम ख

क्त पर आधारित गीत व छात्र-छात्राए उपास्थित थी।

## वार्षिक खान सुरक्षा पखवाड़ा का आयोजन

सिंदरी/चासनाला, टासरा कोयला परियोजना खनन क्षेत्र में स्टील ऑथॉरिटी ऑफ़ इंडिया लिमिटेड (सेल) एवं एमडीओ कंपनी कल्यानेश्वरी टासरा माइनिंग प्राइवेट लिमिटेड के सयुंक्त तत्वाधान में वार्षिक खान सुरक्षा पखवाड़ा 2023 का आयोजन किया गया। इस वर्ष खान सुरक्षा पखवाड़ा सप्ताह 15 जनवरी से 27 जनवरी तक मनाया जाएगा। कार्यक्रम की शुरुआत सुरक्षा पखवाड़ा 2023 के झँड़ोत्तालन एवं सुरक्षा शपथ लेकर प्रारम्भ किया गया। उक्त खान सुरक्षा पखवाड़ा सप्ताह में श्रम एवं रोजगार मंत्रालय, भारत सरकार द्वारा गठित निरीक्षण दल द्वारा खान संचालन से सम्बंधित सुरक्षा तंत्र का जायजा लिया गया, जिसमें प्रमुख रूप से खानों में कार्यरत व्यक्तियों एवं कर्मचारियों की व्यावसायिक सुरक्षा, स्वास्थ्य और कल्याण से सम्बंधित मामलों पर गहन निरीक्षण किया गया, सेल एवं केटीएमपीएल के सयुंक्त सुरक्षा प्रबंधन को देखते हुए काफी प्रभावित हुए तथा अपने उद्बोधन में कहा कि इसी तरह वर्ष भर सुरक्षा के प्रति जागरूकता लाने और जागरूक रहकर

## सेल के अधिकारियों ने लालमणि वृद्धाश्रम में की बुजुर्गों की सेवा

दबंग हिन्द संवाददाता

**धनबाद।** लोहार बरवा टुंडी रोड स्थित लालमणि वृद्धा आश्रम में स्टील अथॉरिटी ऑफ इंडिया लिमिटेड सेल के पदाधिकारियों मो. अदनान जीएम आईसी सीएंडजे मोहम्मद अदनान, जीएम आदित्य सिंह, एजीएम पंकज कुमार, असिस्टेंट जनरल मैनेजर मनीष भाटिया आज लालमणि वृद्धाश्रम में स्माइल टेक यू माइल्स, हैप्पी बॉडी हैप्पी माइंड, टुवर्ड्स केयरिंग सोसाइटी एंड ग्रीनर एनवायरनमेंट का संदेश लेकर पहुंचे। आश्रम की जरूरतें, बुजुर्गों का हाल जानने और उनकी सेवा करने के पश्चात सबलपुर, सहयोगी नगर स्थित ओल्ड एज होम में जाकर बुजुर्गों से मिले और उनका हाल जाना तथा उनका मनोबल बढ़ाया। उन्होंने भविष्य में अधिक से अधिक मदद करने का आश्वासन दिया। अधिकारियों ने कहा कि सेल कोलियरी

एग्जीक्यूटिव डायरेक्टर अनूप कुमार के नेतृत्व में सेल जरूरतमंद बुजुर्गों को सीइसआर के तहत मदद करने के लिए प्रतिबद्ध है। वर्तमान में पांच ब्रांडेड मजबूत बेड और मैटरेस आश्रम को प्रदान किया गया है। इसमें सेल कोलियरी की महिला समिति की महत्वपूर्ण भागीदारी है। मोहम्मद अदनान ने बताया कि उनके माता-पिता का देहांत बहुत पहले हो चुका है। यहां आकर बहुत भावुक हो गया हूं और वृद्धों की सेवा कर खुशी मिली है। मौके पर आश्रम के सलाहकार डीएवी पब्लिक स्कूल पब्लिक, कुसुंडा के पूर्व प्रिंसिपल एसएस हाजरा ने आश्रम में सुविधा चढ़ाने की महत्वपूर्ण सलाह दी। अध्यक्ष नौशाद गद्दी ने बताया कि लोग आश्चर्यचकित होकर लोग पूछते हैं कि 35 बुजुर्गों वाले आश्रम की व्यवस्था कैसे चलती है? उनका जवाब होता है समाज के सहयोग से सारी कमी पूरी होती है। मौके पर अनवर इस्माइल खान, सदस्य ओंकार मिश्रा समेत अन्य उपस्थित थे।

सेल SAIL

# मिडिया कवरेज

## कल्यानेश्वरी टासरा माइनिंग क्षेत्र में 75वें गणतंत्र दिवस समारोह का आयोजन

**प्रतिनिधि,सिंदरी।** गणतंत्र दिवस पुरे भारत देश में बाबा साहेब भीमराव अम्बेडकर द्वारा निर्मित संविधान पुस्तिका के अंगीकार होने के उपलक्ष्य में हर्षोउल्लास से मनाया जाता है। 26 जनवरी 1950 को अंगीकृत संविधान ने देश के हरएक नागरिकों को जीवन यापन हेतु समस्त अधिकार प्रदान करता है। केटीएमपीएल द्वारा टासरा माइनिंग क्षेत्र में इस पर्व को बड़े ही धूमधाम से मनाया गया, जिसमें एसएपी के जवानों द्वारा मार्च पास्ट किया गया तथा एसआईएस के जवानों के साथ मिलकर सेल, केटीएमपीएल के अधिकारी एवं कर्मचारी तिरंगे झंडे को सलामी दी गयी। इस समारोह में मुख्य अतिथि के रूप में सेल के महाप्रबंधक शिवराम बनर्जी एवं सह अतिथि पंकज मण्डल तथा अन्य अधिकारियों को अभिनंदित किया गया था। मुख्य अतिथि शिवराम बनर्जी ने उपस्थित सभी जवानों, ग्रामीणों एवं केटीएमपीएम के समस्त अधिकारियों को प्रोत्साहित करते हुए कहा कि कोयला खनन ही केवल हमारा उद्देश्य नहीं है, बल्कि खान क्षेत्र के आसपास के समस्त परिवारों का विकास हमारी पहली प्राथमिकता है। उपमहाप्रबंधक पंकज मण्डल ने अपने उद्बोधन में कहा कि हम खान विकास के साथ साथ ग्राम विकास एवं देश के विकास हेतु प्रतिबद्ध है, हमारा उद्देश्य सर्वांगीण विकास करना है। गणतंत्र दिवस कार्यक्रम में केटीएमपीएल के प्रोजेक्ट डायरेक्टर डी. रमेशजी, एचआर प्रमुख विप्ती बाबुजी, माईन ऑपरेशन प्रमुख सुरजीत शर्मा, महेश बाबू एवं समस्त केटीएमपीएल के विभाग प्रमुख उपस्थित हुए। कार्यक्रम का संचालन एसएपी के जवान एवं सीएसआर विभाग द्वारा संचालित किया गया।

## सिंदरी : स्वास्थ्य जागरुकता को लेकर शुल्क चिकित्सा शिविर का आयोजन

02.2024 | U0

**प्रतिनिधि। 28 फरवरी**

सेल टासरा कोयला जना एवं कल्याणेश्वरी निंग प्राईवेट लिमिटेड एल) के संयुक्त में निःशुल्क चिकित्सा ायोजन वीरसिंहपुर ग्राम ाम आसनबनी में किया कार्यक्रम ग्रामीणों को प्रति जागरूक करने के जन-जन को स्वास्थ्य ना है। उक्त चिकित्सा

जांच कराने पहुंची महिलाएं

दर्द की शिकायत 20-25 वर्ष की सामाजिक उत्तरदायित्व

## सिटी बाइट्स

### आसनबनी में लगाया चिकित्सा शिविर

**सिंदरी.** सेल चासनाला व कल्याणेश्वरी टासरा माइनिंग प्राइवेट लिमिटेड (केटीएमपीएल) ने सीएसआर के तहत संयुक्त रूप से बुधवार को वीरसिंहपुर पंचायत के

## केटीएमपीएल द्वारा निःशुल्क चिकित्सा शिविर का आयोजन



री( धनबाद) सेल टासरा कोयला खनन परियोजना एवं कल्याणेश्वरी रा माइनिंग प्राईवेट लिमिटेड (केटीएमपीएल) के संयुक्त तत्वाधान में ल्क चिकित्सा शिविर का आयोजन वीरसिंहपुर ग्राम पंचायत के ग्राम

## कल्यानेश्वरी टासरा माइनिंग प्राइवेट लिमिटेड द्वारा किया गया स्वेटर वितरण

झारखण्ड उजाला, संवाददाता।

**सिंदरी /धनबाद।** बुधवार दिनांक 20 दिसंबर 2023 को कल्यानेश्वरी टासरा माइनिंग प्राइवेट लिमिटेड के सौजन्य से सामाजिक उत्तरदायित्व का निर्वहन करते हुए, रोहराबांध स्थित उत्क्रमित मध्य विद्यालय के 160 बच्चो हेतु स्वेटर वितरण कार्यक्रम का आयोजन किया गया ` यह कार्यक्रम केटीएमपीएल के सीएमडी झ श्री किशोर बाबु सज्जा एवं सेल के मुख्य महाप्रबंधक श्री शिवराम बनर्जी के मुख्य अतिथ्य में संपन्न हुआ, कार्यक्रम की शुरूआत मेहमानों को स्थानीय पुष्प गुच्छ प्रदान कर स्कूली बच्चो द्वारा स्वागत किया गयो श्री किशोर बाबु द्वारा स्कुल की प्रभारी प्रधान अध्यापिका श्रीमति नूतन सिंह एवं अन्य शिक्षको को शाल एवं नारियल देकर सम्मानित किया गया ` केटीएमपीएल के उप महाप्रंधक श्री विजय शर्मा द्वारा बताया गया है कि केटीएमपीएल को सेल द्वारा टासरा खदान के विकास हेतु एमडीओ के रूप नियुक्त किया गया है, परन्तु हमारा उद्देश न केवल खदान विकास करना है बल्कि सभी प्रभावित ग्रामो में सी एस आर के तहत पेयजल, शिक्षा तथा स्वास्थ्य के क्षेत्र में कार्य कर ग्राम का विकास करना भी है तत्पश्चात श्री किशोर बाबु एवं श्री शिवराम बनर्जी द्वारा अपने उद्बोधन में स्कूली बच्चो को कठिन परिश्रम कर आगे बढ़ने हेतु मार्गदर्शन किया एवं सभी स्कूली बच्चो को स्वेटर वितरण किया गया ` कार्यक्रम का समापन ग्राम रोहराबांध के श्री अनिल सिंह द्वारा धन्यवाद ज्ञापन करते हुए किया गया।कार्यक्रम का संचालन सीएसआर विभाग के सहायक प्रबंधक श्री बसंत किसपोट्टा द्वारा किया गया ` कार्यक्रम में केटीएमपीएल के डायरेक्टर श्री टी रमेश,सुरजीत शर्मा,उमा महेश एवं सेल के अधिकारी श्री पंकज कुमार एवं अन्य अधिकारी तथा ग्राम के गणमान्य सदस्य उपस्थित थें।

## सेल की तरफ से मुफ्त जांच शिविर का आयोजन किया गया

पोलिट लाइव रिपोर्टर

सिंदरी : स्टील अथॉरिटी ऑफ़ इंडिया लिमिटेड बोकारो स्टील प्लांट के अंतर्गत आनेवाले सेल कोलियरी डिवीई द्वारा सोमवार गौशाला स्थित आर्य समाज सिंदरी में निशुल्क मुक्त चिकित्सा शिविर का आयोजन किया गया।

इस चिकित्सा शिविर में क्षेत्र के गरीब लोग पहुंच कर आपना चिकित्सा जांच डाक्टरों से कराया एवं मुक्त में दवाईयां प्राप्त किया।

चिकित्सा शिविर में उपस्थित डा.अनन्या दे ने बताया कि सेल कोलियरी डीविजन एवं दुर्गापुर सुंदरम क्रिएटिव वेलफेयर सोसाइटी के संयुक्त सहयोग सें सेल बोकारो कोलियरी डिविजन के चासनाला, जीतपुर, रामनगर, टासरा आदि क्षेत्रों में समाजीक दाइत्व के तहत के लगया जाएगा। इसी क्रम में आज सेल टासरा क्षेत्र के अंतर्गत मुक्त चिकित्सा शिविर लगाया गया। उन्होंने कहा कि शिविर में शुगर जांच, अक्शिज लेवल जांच, रक्त चाप जांच, खाशी,बुखार, समेत अन्य बीमारियों की चिकित्सा व जांच किया गया तथा रोगियों को दवाई दी गई। चिकित्सा शिविर दल में डा. अनन्या दे,पारा मेडिकल स्टाफ पार्थो माजी, सुब्रत मजूमदार मौमिता मजूमदार आदि उपस्थित थे।

# मिडिया कवरेज

## केटीएमपीएल में विश्व पर्यावरण दिवस कार्यक्रम का आयोजन

संवाददाता

**सिन्दरी।** स्टील अथॉरिटी ऑफ इंडिया लिमिटेड (सेल) एवं कल्यानेश्वरी टासरा माइनिंग प्राइवेट लिमिटेड के संयुक्त तत्वाधान में टासरा परियोजना खनन क्षेत्र में सेल एवं केटीएमपीएल के अधिकारियों की उपस्थिति में विश्व पर्यावरण दिवस हर्षोल्लास के साथ मनाया गया। जिसमें पर्यावरण संरक्षण विषय पर उपस्थित जनों द्वारा मंतव्य व्यक्त किया गया।

उक्त कार्यक्रम में मुख्य अतिथि के रूप में उपस्थित सेल प्रबंधन के मुख्य महाप्रबंधक संजय तिवारी ने सेल चेयरमैन का संदेश पढ़ते हुए अपने उद्बोधन में बताया कि खनन परियोजना क्षेत्र में एक पेड़ के बदले 10 पेड़ लगाएंगे, जिससे पर्यावरण की रक्षा हो सके। पर्यावरण की रक्षा करना हम सभी का प्रथम कर्त्तव्य है। सेल प्रबंधन के महाप्रबंधक प्रभारी टासरा एवम चासनाला शिवराम बनर्जी ने पर्यावरण दिवस के उपलक्ष्य में सभी उपस्थित सदस्यों को वृक्षारोपण कर पर्यावरण की रक्षा हेतु प्रेरित किए तथा उन्होंने कहा कि प्रत्येक व्यक्ति का कर्तव्य है कि वह अपने घरों के आंगन में बाड़ी में खेतों के मेंढो पर अधिक से अधिक पेड़ लगाएं, जिसमें फलदार वृक्ष भी शामिल हों, इससे पर्यावरण में प्रतिकूल प्रभाव से बचा जा सकता है तथा साथ हीं साथ फलों से आय - अर्जन भी किया जा सकता है। उक्त कार्यक्रम में सेल प्रबंधन के महाप्रबंधक अदनान, महाप्रबंधक पी एंड ए कुलकर्णी , महाप्रबंधक वित्त सैकत मंडल,महाप्रबंधक टासरा परियोजना कुरील महाप्रबंधक पर्यावरण आदित्य सिंह, उप महाप्रबंधक पंकज मंडल एवं के एम तिवारी तथा अन्य अधिकारी शामिल हुए। विश्व पर्यावरण दिवस कार्यक्रम तसरा परियोजना कार्यालय में आयोजित किया गया। जिसमें केटीएमपीएल के अधिकारी चिट्ठी बाबू वाइस प्रेसिडेंट-एच आर एवं अन्य गणमान्य अधिकारी एवम कर्मचारी शामिल हुए। कार्यक्रम के अंत में समस्त उपस्थित अधिकारियों द्वारा केटीएमपीएल कार्यालय प्रांगण में वृक्षारोपण किया गया तथा धन्यवाद ज्ञापन के साथ कार्यक्रम का समापन किया गया।

# रांची एक्सप्रेस

06 जून 24

## केटीएमपीएल द्वारा विश्व पर्यावरण दिवस कार्यक्रम का आयोजन


सिन्दरी-बुधवार को स्टील अथॉरिटी ऑफ इंडिया लिमिटेड (सेल) एवं कल्यानेश्वरी टासरा माईनिंग प्राइवेट लिमिटेड के संयुक्त तत्वाधान में टासरा परियोजना खनन क्षेत्र में सेल एवं केटीएमपीएल के अधिकारियों की उपस्थिति में विश्व पर्यावरण दिवस हर्षोल्लास के साथ मनाया गया। जिसमें पर्यावरण संरक्षण विषय पर उपस्थित जनों द्वारा मंतव्य व्यक्त किया गया। उक्त कार्यक्रम में मुख्य अतिथि के रूप में उपस्थित सेल प्रबंधन के मुख्य महाप्रबंधक संजय तिवारी ने सेल चेयरमैन का संदेश पढ़ते हुये अपने उद्बोधन में बताया कि खनन परियोजना क्षेत्र में एक पेड़ के बदले 10 पेड़ लगाएंगे, जिससे पर्यावरण की रक्षा हो सके। पर्यावरण की रक्षा करना हम सभी का प्रथम कर्तव्य है।

सेल प्रबंधन के महाप्रबंधक प्रभारी टासरा एवम चासनाला शिवराम बनर्जी ने पर्यावरण दिवस के उपलक्ष्य में सभी उपस्थित सदस्यों को वृक्षारोपण कर पर्यावरण की रक्षा हेतु प्रेरित किए तथा उन्होंने कहा कि प्रत्येक व्यक्ति का कर्तव्य है कि वह अपने घरों के आंगन में बाड़ी में खेतों के मेंढो पर अधिक से अधिक पेड़ लगाएं, जिसमें फलदार वृक्ष भी शामिल हों, इससे पर्यावरण में प्रतिकूल प्रभाव से बचा जा सकता है तथा, साथ ही साथ फलों से आय - अर्जन भी किया जा सकता है।

उक्त कार्यक्रम में सेल प्रबंधन के महाप्रबंधक अदनान महाप्रबंधक (पी एंड ए) कुलकर्णी , महाप्रबंधक (वित्त) सैकत मंडल,, महाप्रबंधक (टासरा परियोजना) कुरील महाप्रबंधक (पर्यावरण) आदित्य सिंह, उप महाप्रबंधक पंकज मंडल एवं के एम तिवारी तथा अन्य अधिकारी शामिल हुए। विश्व पर्यावरण दिवस कार्यक्रम तसरा परियोजना कार्यालय में आयोजित किया गया जिसमें केटीएमपीएल के अधिकारी चिट्ठी बाबू (वाइस प्रेसिडेंट-एच आर) एवं अन्य गणमान्य अधिकारी एवम कर्मचारी शामिल हुए। कार्यक्रम के अंत में समस्त उपस्थित अधिकारियों द्वारा केटीएमपीएल कार्यालय प्रांगण में वृक्षारोपण किया गया तथा धन्यवाद ज्ञापन के साथ कार्यक्रम का समापन किया गया।

## केटीएमपीएल ने विश्व पर्यावरण दिवस पर कार्यक्रम किया आयोजन

सिंदरी : स्टील अथॉरिटी ऑफ इंडिया लिमिटेड (सेल) एवं कल्यानेश्वरी टासरा माइनिंग प्राइवेट लिमिटेड के संयुक्त तत्वाधान में टासरा परियोजना खनन क्षेत्र में सेल एवं केटीएमपीएल के अधिकारियों की उपस्थिति में विश्व पर्यावरण दिवस हर्षोल्लास के साथ मनाया गया। जिसमें पर्यावरण संरक्षण विषय पर उपस्थित जनों द्वारा मंतव्य व्यक्त किया गया। उक्त कार्यक्रम में मुख्य अतिथि के रूप में उपस्थित सेल प्रबंधन के मुख्य महाप्रबंधक श्री संजय तिवारी ने सेल चेयरमैन का संदेश पढ़ते हुये अपने उद्बोधन में बताया कि खनन परियोजना क्षेत्र में एक पेड़ के बदले 10 पेड़ लगाएंगे, जिससे पर्यावरण की रक्षा हो सके। पर्यावरण की रक्षा करना हम सभी का प्रथम कर्तव्य है। सेल प्रबंधन के महाप्रबंधक प्रभारी टासरा एवम चासनाला श्री शिवराम बनर्जी ने पर्यावरण दिवस के उपलक्ष्य में सभी उपस्थित सदस्यों को वृक्षारोपण कर पर्यावरण की रक्षा हेतु प्रेरित किए तथा उन्होंने कहा कि प्रत्येक व्यक्ति का कर्तव्य है कि वह अपने घरों के आंगन में बाड़ी में खेतों के मेंढो पर अधिक से अधिक पेड़ लगाएं, जिसमें फलदार वृक्ष भी शामिल हों, इससे पर्यावरण में प्रतिकूल प्रभाव से बचा जा सकता है तथा, साथ ही साथ फलों से आय - अर्जन भी किया जा सकता है।

उक्त कार्यक्रम में सेल प्रबंधन के महाप्रबंधक श्री अदनान जी, महाप्रबंधक (पी एंड ए) श्री कुलकर्णी जी, महाप्रबंधक (वित्त) सैकत मंडल,जी, महाप्रबंधक(टासरा परियोजना) श्री कुरील जी, महाप्रबंधक (पर्यावरण) श्री आदित्य सिंह, उप महाप्रबंधक श्री पंकज मंडल एवं के एम तिवारी तथा अन्य अधिकारी शामिल हुए। विश्व पर्यावरण दिवस कार्यक्रम तसरा परियोजना कार्यालय में आयोजित किया गया जिसमें केटीएमपीएल के अधिकारी श्री चिट्ठी बाबू (वाइस प्रेसिडेंट-एच आर) एवं अन्य गणमान्य अधिकारी एवम कर्मचारी शामिल हुए। कार्यक्रम के अंत में समस्त उपस्थित अधिकारियों द्वारा केटीएमपीएल कार्यालय प्रांगण में वृक्षारोपण किया गया तथा धन्यवाद ज्ञापन के साथ कार्यक्रम का समापन किया गया।

# मिडिया कवरेज

## सिंदरी सेल टासरा प्रोजेक्ट द्वारा सीएसआर के तहत सिलाई प्रशिक्षण केन्द्र का शुभारंभ

नई पत्रवार्ता प्रतिनिधि

सिंदरी : सिंदरी स्थित आवास संख्या एफडी 58 में महिलाओं के लिए सेल टासरा प्रोजेक्ट द्वारा सी एस आर के तहत सिलाई प्रशिक्षण केन्द्र का शुभारंभ बुधवार को किया गया। जिसका उद्घाटन सेल कोलियरीज के ईडी अनूप कुमार, सीजीएम पी एंड ए संजय तिवारी, जीएम टूटीएंडसी शिवराम बनर्जी, जीएम

## SAIL officers served the elderly at Lalmani Old Age Home

DN ■ Dhanbad

GM IC C&J Mohammad Adnan, GM Aditya Singh, AGM Pankaj Kumar, Assistant General Manager Manish Bhatia of Steel Authority of India Limited Cell at Lalmani Old Age Ashram located at Lohar Barwa Tundi Road Smile Miles, Happy Body Hap Towards Caring Society an

## सेल द्वारा सामाजिक दायित्व का निर्वाहन करते हुए निशुल्क मोतियाबिंद शिविर का आयोजन

झारखण्ड उजाला, संवाददाता।

**सिंदरी/ धनबाद।** शुक्रवार को गौशाला शहरी समुदायिक स्वस्थ्य केन्द्र में निः शुल्क मोतियाबिंद शिविर का विधिवत शुभारंभ किया गया।शिविर का उद्घाटन अनुप कुमार ईडी सेल कोलियरीज एंव सी सी एस ओ के द्वारा दीप प्रज्वलित कर किया गया। स्टील अथॉरिटी ऑफ इंडिया लिमिटेड द्वारा प्रायोजित इस कैंप का आयोजन रोटरी क्लब सिंदरी के तत्वावधान में किया गया। इससे पहले पूर्व सचिव रंजीत कुमार ने अतिथियों का परिचय कराया एवं रोटरी क्लब के आई कैंप का इतिहास तथा सेल के समाजिक दायित्व के बारे में बताया। अनुप कुमार ने सेल द्वारा सिलाई प्रशिक्षण, मेडिकल आन बहील एवं अन्य सी एस आर के

अंतर्गत चलाए जा रहे योजनाओं की जानकारी दी। उन्होंने रोटरी द्वारा कई वर्षों से आयोजित होने वाले आई कैंप के सेवाभावना एवं रोटरेक्टर के छात्र - छात्राओं की भूरि भूरि प्रशंसा की। उन्होंने छात्रों को समाजिक कार्यों में बढ़ योगदान देने की अपील भी की। कैंप के पहले दिन 146 मरीजों ने रजिस्ट्रेशन एवं आंखों की जांच कराई उनमें से102 मरीज मोतियाबिंद के पाए गए। इनमें से वी पी एवं शुगर जांच में समान्य पाए गए मरीजों का लेंस प्रत्यारोपण दस फरवरी को डॉ प्रवीण कुमार सिंह के द्वारा किया जाएगा। कार्यक्रम में सेल के संजय तिवारी, शिवराम बनर्जी,मो अदनान, एस एस सिंह, आदित्य सिंह, पंकज मंडल महिला समिति की छुमा बनर्जी , डॉ परवेज तथा रोटरेक्ट क्लब के सदस्य उपस्थित थे।


## सेल चासनाला ने किया दिव्यांगता जांच शिविर का आयोजन

दबंग हिंद संवाददाता

जोड़ापोखर। सेल ाला के तत्वावधान रया बीआरसी के में आज रिसोर्स सेंटर हयोग से दिव्यांगता शिविर का आयोजन गया। शिविर में बको कानपुर के ज्ञ चिकित्सक डॉ कुमार मंडल एवं रोहित यादव की टीम ने 35 दिव्यांगों की जांच की। इस 28 दिव्यांगों को व्हीलचेयर, सीपी चेयर, मोटराइज्ड ट्राइसाइकिल, बैशाखी के लिए चयनित किया गया। सेल इस्को के महाप्रबंधक ने कहा कि कंपनी ाजनों के कल्याण हेतु प्रतिबद्ध है।भविष्य में भी इस तरह की पहल की जायेगी। र्य में सहयोग के लिए जिला प्रशासन धन्यवाद का पात्र है। उन्होंने कहा कि का मुख्य उद्देश्य क्षेत्र में दिव्यांगों की जरूरतों की पहचान करना और उनका तन कर उनकी गतिशीलता और स्वतंत्रता को बढ़ाने के लिए उचित सहायक ण प्रदान करना था।

## झरिया रिसोर्स सेंटर के दिव्यांगता जांच शिविर में 28 दिव्यांगजन हुए सहायक सामग्री हेतु चयनित

नई पत्र वार्ता प्रतिनिधि

झरिया : सेल चासनाला के तत्वावधान में झरिया बीआरसी के प्रांगण में शुक्रवार को रिसोर्स सेंटर के सहयोग से दिव्यांगता जांच शिविर का आयोजन किया गया.शिविर में एलिम्बकों कानपुर के विशेषज्ञ चिकित्सक डॉ दीपक कुमार मंडल एवं रोहित यादव की टीम ने 35 दिव्यांग जनों का जांच किया. इस दौरान 28 दिव्यांगजनों को व्हीलचेयर, सीपी चेयर, मोटराइज्ड ट्राइसायकिल, बैशाखी, जैसी सहायक सामग्री, के लिए चयनित किया गया. सेल इस्को के महाप्रबंधक ने कहा कि हम दिव्यांगजनों के कल्याण हेतु प्रतिबद्ध हैं.

भविष्य में इसी तरह की पहल आय लिए तत्पर रहेंगें.धनबाद जिला प्रशासन को इस कार्य मे सहयोग के लिए धन्यवाद देते


हैं. उन्होंने कहा कि शिविर का मुख्य उद्देश्य क्षेत्र में दिव्यांगजनों की जरूरतों की पहचान करना और उनका आकलन कर उनकी गतिशीलता और स्वतंत्रता को बढ़ाने के लिए उचित सहायक उपकरण प्रदान करना था. शिविर दिव्यांग समुदाय के कल्याण और सशक्तिकरण के

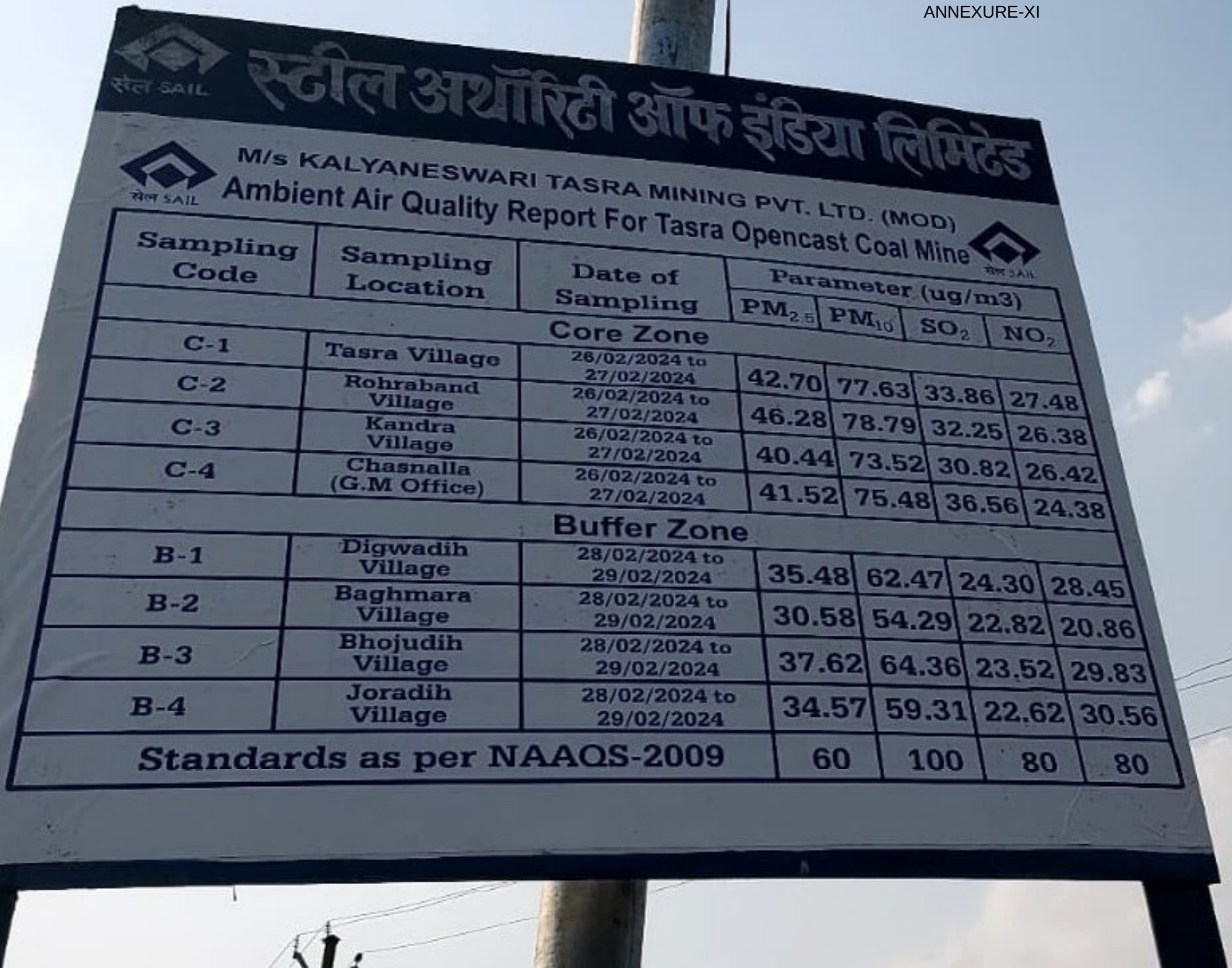

Piezometer Installed at Tasra Project Site

PIEZOMETER READING DATA

| Event Id | Device Id | Date | d1 |
|---|---|---|---|
| 370 | 1095 | 4/17/2024, 10:3 | 3.6 |
| 369 | 1095 | 4/17/2024, 9:2 | 3.51 |
| 368 | 1095 | 4/17/2024, 3:3 | 3.61 |
| 367 | 1095 | 4/17/2024, 1:3 | 3.63 |
| 366 | 1095 | 4/17/2024, 12:3 | 3.63 |
| 365 | 1095 | 4/17/2024, 11:3 | 3.61 |
| 364 | 1095 | 4/17/2024, 10:3 | 3.56 |
| 363 | 1095 | 4/17/2024, 8:3 | 3.53 |
| 362 | 1095 | 4/17/2024, 7:3 | 3.56 |
| 361 | 1095 | 4/17/2024, 6:3 | 3.56 |
| 360 | 1095 | 4/17/2024, 5:3 | 3.55 |
| 359 | 1095 | 4/17/2024, 4:3 | 3.57 |
| 358 | 1095 | 4/17/2024, 1:3 | 3.59 |
| 357 | 1095 | 4/17/2024, 12:3 | 3.57 |
| 356 | 1095 | 4/16/2024, 11:3 | 3.55 |
| 355 | 1095 | 4/16/2024, 10:3 | 3.54 |
| 354 | 1095 | 4/16/2024, 9:3 | 3.56 |
| 353 | 1095 | 4/16/2024, 8:3 | 3.58 |
| 352 | 1095 | 4/16/2024, 7:3 | 3.62 |
| 351 | 1095 | 4/16/2024, 6:3 | 3.61 |
| 350 | 1095 | 4/16/2024, 5:3 | 3.63 |
| 349 | 1095 | 4/16/2024, 4:3 | 3.64 |
| 348 | 1095 | 4/16/2024, 3:3 | 3.65 |
| 347 | 1095 | 4/16/2024, 2:3 | 3.62 |
| 346 | 1095 | 4/16/2024, 12:3 | 3.59 |
| 345 | 1095 | 4/16/2024, 11:3 | 3.56 |
| 344 | 1095 | 4/16/2024, 10:3 | 3.56 |
| 343 | 1095 | 4/16/2024, 9:3 | 3.51 |
| 342 | 1095 | 4/16/2024, 8:3 | 3.49 |
| 341 | 1095 | 4/16/2024, 6:3 | 3.5 |
| 340 | 1095 | 4/16/2024, 5:3 | 3.54 |
| 339 | 1095 | 4/16/2024, 4:3 | 3.5 |
| 338 | 1095 | 4/16/2024, 3:3 | 3.5 |
| 337 | 1095 | 4/16/2024, 2:3 | 3.51 |
| 336 | 1095 | 4/16/2024, 1:3 | 3.51 |
| 335 | 1095 | 4/16/2024, 12:3 | 3.52 |
| 334 | 1095 | 4/15/2024, 11:3 | 3.51 |
| 333 | 1095 | 4/15/2024, 10:3 | 3.52 |
| 332 | 1095 | 4/15/2024, 9:3 | 3.49 |
| 331 | 1095 | 4/15/2024, 8:3 | 3.54 |
| 330 | 1095 | 4/15/2024, 7:3 | 3.5 |
| 329 | 1095 | 4/15/2024, 11:3 | 3.41 |
| 328 | 1095 | 4/15/2024, 10:2 | 3.47 |
| 327 | 1095 | 4/15/2024, 9:2 | 3.46 |
| 326 | 1095 | 4/15/2024, 8:2 | 3.42 |

| | | | |
|---|---|---|---|
| 325 | 1095 | 4/15/2024, 7:2 | 3.42 |
| 324 | 1095 | 4/15/2024, 6:2 | 3.44 |
| 323 | 1095 | 4/15/2024, 5:2 | 3.47 |
| 322 | 1095 | 4/15/2024, 4:2 | 3.45 |
| 321 | 1095 | 4/15/2024, 3:2 | 3.44 |
| 320 | 1095 | 4/15/2024, 2:2 | 3.44 |
| 319 | 1095 | 4/15/2024, 1:2 | 3.5 |
| 318 | 1095 | 4/15/2024, 12: | 3.46 |
| 317 | 1095 | 4/14/2024, 11: | 3.44 |
| 316 | 1095 | 4/14/2024, 10: | 3.44 |
| 315 | 1095 | 4/14/2024, 9:2 | 3.42 |
| 314 | 1095 | 4/14/2024, 8:2 | 3.46 |
| 313 | 1095 | 4/14/2024, 7:2 | 3.49 |
| 312 | 1095 | 4/14/2024, 6:2 | 3.5 |
| 311 | 1095 | 4/14/2024, 5:2 | 3.46 |
| 310 | 1095 | 4/14/2024, 4:2 | 3.45 |
| 309 | 1095 | 4/14/2024, 3:2 | 3.47 |
| 308 | 1095 | 4/14/2024, 2:2 | 3.49 |
| 307 | 1095 | 4/14/2024, 1:2 | 3.44 |
| 306 | 1095 | 4/14/2024, 12: | 3.43 |
| 305 | 1095 | 4/14/2024, 12: | 3.47 |
| 304 | 1095 | 4/14/2024, 11: | 3.42 |
| 303 | 1095 | 4/14/2024, 10: | 3.39 |
| 302 | 1095 | 4/14/2024, 9:0 | 3.41 |
| 301 | 1095 | 4/14/2024, 8:0 | 3.38 |
| 300 | 1095 | 4/14/2024, 7:0 | 3.4 |
| 299 | 1095 | 4/14/2024, 6:0 | 3.42 |
| 298 | 1095 | 4/14/2024, 5:0 | 3.39 |
| 297 | 1095 | 4/14/2024, 4:0 | 3.41 |
| 296 | 1095 | 4/14/2024, 3:0 | 3.43 |
| 295 | 1095 | 4/14/2024, 2:0 | 3.38 |
| 294 | 1095 | 4/14/2024, 1:0 | 3.42 |
| 293 | 1095 | 4/14/2024, 12: | 3.36 |
| 292 | 1095 | 4/13/2024, 11: | 3.42 |
| 291 | 1095 | 4/13/2024, 10: | 3.41 |
| 290 | 1095 | 4/13/2024, 8:0 | 3.46 |
| 289 | 1095 | 4/13/2024, 7:0 | 3.42 |
| 288 | 1095 | 4/13/2024, 6:0 | 3.47 |
| 287 | 1095 | 4/13/2024, 4:0 | 3.46 |
| 286 | 1095 | 4/13/2024, 3:0 | 3.6 |
| 285 | 1095 | 4/13/2024, 1:0 | 3.43 |
| 284 | 1095 | 4/13/2024, 12: | 3.42 |
| 283 | 1095 | 4/13/2024, 11: | 3.36 |
| 282 | 1095 | 4/13/2024, 10: | 3.35 |
| 281 | 1095 | 4/13/2024, 9:0 | 3.36 |
| 280 | 1095 | 4/13/2024, 8:0 | 3.34 |
| 279 | 1095 | 4/13/2024, 7:0 | 3.33 |

ANNEXURE-XI




M/s KALYANESWARI TASRA MINING PVT. LTD. (MOD)

Ambient Air Quality Report For Tasra Opencast Coal Mine

| Sampling Code | Sampling Location | Date of Sampling | Parameter (ug/m3) | | | |
|---|---|---|---|---|---|---|
| | | | $PM_{2.5}$ | $PM_{10}$ | $SO_2$ | $NO_2$ |
| **Core Zone** | | | | | | |
| C-1 | Tasra Village | 26/02/2024 to 27/02/2024 | 42.70 | 77.63 | 33.86 | 27.48 |
| C-2 | Rohraband Village | 26/02/2024 to 27/02/2024 | 46.28 | 78.79 | 32.25 | 26.38 |
| C-3 | Kandra Village | 26/02/2024 to 27/02/2024 | 40.44 | 73.52 | 30.82 | 26.42 |
| C-4 | Chasnalla (G.M Office) | 26/02/2024 to 27/02/2024 | 41.52 | 75.48 | 36.56 | 24.38 |
| **Buffer Zone** | | | | | | |
| B-1 | Digwadih Village | 28/02/2024 to 29/02/2024 | 35.48 | 62.47 | 24.30 | 28.45 |
| B-2 | Baghmara Village | 28/02/2024 to 29/02/2024 | 30.58 | 54.29 | 22.82 | 20.86 |
| B-3 | Bhojudih Village | 28/02/2024 to 29/02/2024 | 37.62 | 64.36 | 23.52 | 29.83 |
| B-4 | Joradih Village | 28/02/2024 to 29/02/2024 | 34.57 | 59.31 | 22.62 | 30.56 |
| **Standards as per NAAQS-2009** | | | 60 | 100 | 80 | 80 |

**BIT – SINDRI, DHANBAD**
*(Department of Higher Technical Education & Skill Development)*
*Government of Jharkhand*

**DEPARTMENT OF MINING ENGINEERING**

# FINAL REPORT
# ON

## *Scientific study to find maximum charge per delay per round of blast, Tasra OCP, SAIL-Collieries Division, as per reg: 196(3), CMR – 2017*

***Sponsored by: M/s Steel Authority of India Limited***
***Project No. CNP/BIT/MIN/2020/SS&BD-01***

**Department of Mining Engineering • December 2020 • BIT-Sindri, Dhanbad.**

# BIT – SINDRI, DHANBAD

***(Department of Higher Technical Education & Skill Development)***

***Government of Jharkhand***

## DEPARTMENT OF MINING ENGINEERING

| | |
|---|---|
| Project title: | *Scientific study to find maximum charge per delay per round of blast, Tasra OCP, SAIL-Collieries Division, as per reg: 196(3), CMR – 2017* |
| Project number: | CNP/BIT/MIN/2020/SS&BD-01 |
| Sponsors of the project: | *M/s Steel Authority of India Limited* |
| Project Coordinator: | Manas Kumar Mallick & Rizwan Hasim |

The project commenced in January 2021




**Project Coordinator**
Manas Kumar Mallick
**Assistant Professor**
**Department of Mining Engineering**

**Project Coordinator**
Rizwan Hasim
**Assistant Professor**
**Department of Mining Engineering**

## EXCUTIVE SUMMARY

M/s Steel Authority of India Limited- Collieries Division awarded a consultancy project to suggest a blasting pattern and the optimum use of explosive for establishing maximum charge per delay and safe blasting practice at Tasra Open Cast Project. The mine falls near human dwellings area. The objective of the above study was to suggest the maximum charge per delay for limiting the Peak Particle Velocity (PPV) of ground vibration within permissible limits in the deep hole blasting with NONEL (shock tube) initiation system by considering the nearby residential area. During this period, the experimental blasts were conducted at various locations of the mine with varying hole depths, blast design and charge loading parameters. Blast induced ground vibrations and air overpressure/noise generated during the experimental blasts were monitored at various concerned locations i.e. near surface structures/houses.

Keeping in view of the above objectives, Department of Mining Engineering, BIT Sindri monitored all together 10 blasts using electronic initiation system. The ground vibrations and air overpressures were monitored with the help of 1 set of seismographs. The recorded data was statistically analyzed and based on the analysis the recommendations for limiting the Peak Particle Velocity (PPV) of ground vibration within different permissible limits are presented in this report. The report also depicts the measures to be adopted for controlling vibrations and fly rock within safe limits for the stability of the pillar and the structures. Blasting was carried out using bulk emulsion explosives of M/s IOCL Ltd. The blast hole diameter used in all the trial blasts was 100 mm. Large diameter cartridge explosives of 83 mm diameter and 2.78 kg weight each were used in all the experimental blasts.

The total number of holes in a blasting round varied from 12 to 16. Depth of blast holes, in various round of blasts, varied from 3.0 to 5.0 m. True burden varied from 2.0 to 2.5 m and true spacing varied from 2.5 to 3.0 m. The charge per round varied from 100 to 150 kg and the maximum charge per delay varied from 8.00 to 15.00 kg. The height of stemming column is varied from 2.5 to 3.0 m depending on the depth of the holes and blast face condition. The delays of 17 ms and 25 ms between the holes in a row and 42 ms, 67 ms and 84 ms between the rows were used. Exploder was used to initiate the circuit by giving the ignition and was placed at an appropriate safe distance from the blasting site. The blast results were acceptable in terms of ground vibration, fragmentation and control of fly rock and air overpressure.

During trial blasts the parameters were recorded which includes peak and resultant peak particle velocity (PPV) in the three orthogonal directions (mm/sec), frequencies, air overpressure, wave form, maximum charge per hole per delay, and per round, distance of vibration recording instruments from the blast site, sequence of initiation and tie-ins, delay periods, visual observations of the distance of flying fragments, charge distribution in holes and other relevant data for various test blasts.

The maximum allowable Peak Particle Velocity (PPV) is fixed at 10 mm/sec and 15 mm/sec (as suggested by DGMS, see Table 4) considering break houses and dwellings as the structures to be protected. The maximum charge per delay suggested has been computed for allowable PPVs of 10 and 15 mm/sec for different categories of structures, namely, not belonging to owner and belonging to owner respectively as per the Technical Circular 1997 in this regard. Details of drilling and firing patterns used in trial blasts are enclosed in Appendix I. The detail of suggested pattern for initiation system is presented in Appendix II. Mine Plan showing the Location of Trial Blasts and Ground Vibration Monitoring Stations presented in Appendix-III. The wave forms of the recorded ground vibrations for various blasts are enclosed in Appendix IV. A summary of trial blasts observations is detailed in Appendix V of this report. The site-specific empirical equation of the ground where blasts were conducted relating vibration (V), distance (R) and maximum quantity of explosive per delay (Q) is given by,

$$V_{95} = 1328.6 \times \left(\frac{R}{\sqrt{Q}}\right)^{-1.806}$$

Suggested maximum charge per delay for the safety of dwellings at various distances from the blast site and the developed workings can be estimated using the above equation or may be directly read from Table 7 of this report. The values for air over pressure recorded were well below the permissible limits. During trial blasts the maximum distance of flying fragments was less than 10 m. As the bench excavation progresses towards the developed pillar sections or dwellings as the case may be, suitable charge controls as suggested need to be exercised considering the safe vibration limits mentioned above. There is no such existence of fire in the working seam for the present working condition. History of fire in the coal seam is not found as well.

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# 1). Introduction

For increasing energy demands of the country, open cast coal mining method meet the same with a very favourable and economical way of mining. Around 96 % of the country's coal extracted through open cast method of extraction to retrieve the coal beneath the surface, a large portion of the earth material called the overburden/ overlying strata as well as the insitu coal is blasted and excavated by the help of open cast machineries. As a result of which the environmental aftermath and safety issues are prime concern, which causes numerous incidents and mishaps due to fly rock and ground vibration. This incurred huge losses to both men and material to the organization. The loss entailed is not only the cost encompassing unbudgeted expenditure and revenue reduction but can only cost surrounding unbudgeted expenses and revenue reduction. The importance of safe and adequately blast design for open-pits are well acknowledged such that the ground vibration which occurs during variable conditions can be avoided in any situation.

## *1.1) Brief History:*

Tasra Block is the eastern most coal bearing area of Jharia coalfield located in the district of Dhanbad, Jharkhand. Jharia coalfield is the most important extensively developed coalfield and is also the exclusive storehouse of the much needed and scarce coking coal in India. Mining right of Tasra Block & adjacent Chasnalla Block are entrusted with Steel Authority of India (SAIL). SAIL is doing mining in Chasnalla Block both by underground & opencast method but yet to start mining in Tasra Block. A Feasibility study was carried out in the year 1999 to assess techno-economic feasibility of coal mining from Tasra Block by opencast method. East & West portion of the Tasra Block was proposed for projectization leaving central part and was envisaged to exploit 26.73 Mt of coal out of 252.28 Mt geological reserves at an average stripping ratio of 2.52 $m^3$/t. The project was techno-economically feasible with a target capacity of 1.00 Mt per annum. The project did not start. A fresh study for Tasra Opencast Project was conceived by SAIL to exploit maximum possible quantity of much needed and scarce coking coal from entire Tasra Block by opencast method and the job of Detailed Project Report preparation for Tasra Opencast Project for a target capacity of 2.0 MTPA was entrusted to CMPDIL. During the course of project preparation, it was found prudent to projectized entire Tasra Block including part of the Chasnalla Block lying in the dip side of Tasra Block to enhance opencast potentiality of more reserves. It was decided in a meeting between representatives of CMPDIL & SAIL to formulate Tasra Opencast Project working out an optimum capacity with additional reserves base of identified part of Chasnalla Block. Accordingly, study was carried out in CMPDIL with an aim to

optimise the opencastable coal reserves & project capacity.

M/s SAIL endowed their trust on the Department of Mining Engineering, BIT-Sindri for blast vibration study of Tasra OCP through work order of vide reference no. CD/CC/WO/2020-21/103 dated 04/01/2021. The team of academician/ researchers has visited Tasra OCP, SAIL-Colliery Division to observe the present condition of Tasra OCP. During the visit at Tasra OCP, trial blasts were conducted by the Mine management. The trial blasts were conducted at the mine with varying hole depths, blast design and charge loading parameters. Blast-induced ground vibrations and air overpressure/noise generated during the experimental blasts were monitored at various concerned locations i.e. around surface structures/houses. All blasting events were also recorded using video camera to observe any occurrences of fly rock. Based on the results of the trial blasts, ground vibration and air overpressure data recorded at the site and their subsequent analyses, controlled blast design parameters have been recommended to carryout safe blasting operations near dwellings/structures not belonging to the owner.

## 2). Scope of the Work

Scientific study to find aggregate maximum charge per delay and per round of blast for Tasra OCP of SAIL-Colliery Division.

## 3). Geographical Location

Two jores will have to be shifted suitably in later years to maintain undisturbed mine progress with proper study so that the natural watercourse of the area is not disturbed. The power lines of DVC will have to be diverted suitably in consultation with DVC. The part of Dhanbad Sindri Road passing through the western part of the property will require diversion in later years.

Embankment along Damodar River has to be constructed to protect the mine from any water inrush as the mining area falls within the High Flood Level of 132.92 M (in 1978). The detailed study for design of the embankment has to be taken up by SAIL authorities as its construction needs lot of precautions to be taken to prevent any water in rush into the mining area. Tentative capital provisioning has been made in the report for the construction of embankment. The proposed project area is about 15 Km South of Dhanbad Railway Station and can be approached easily by Dhanbad-Jharia Town-Sindri road. National Highway No-18 (old NH-32) passes through north western corner of the project.

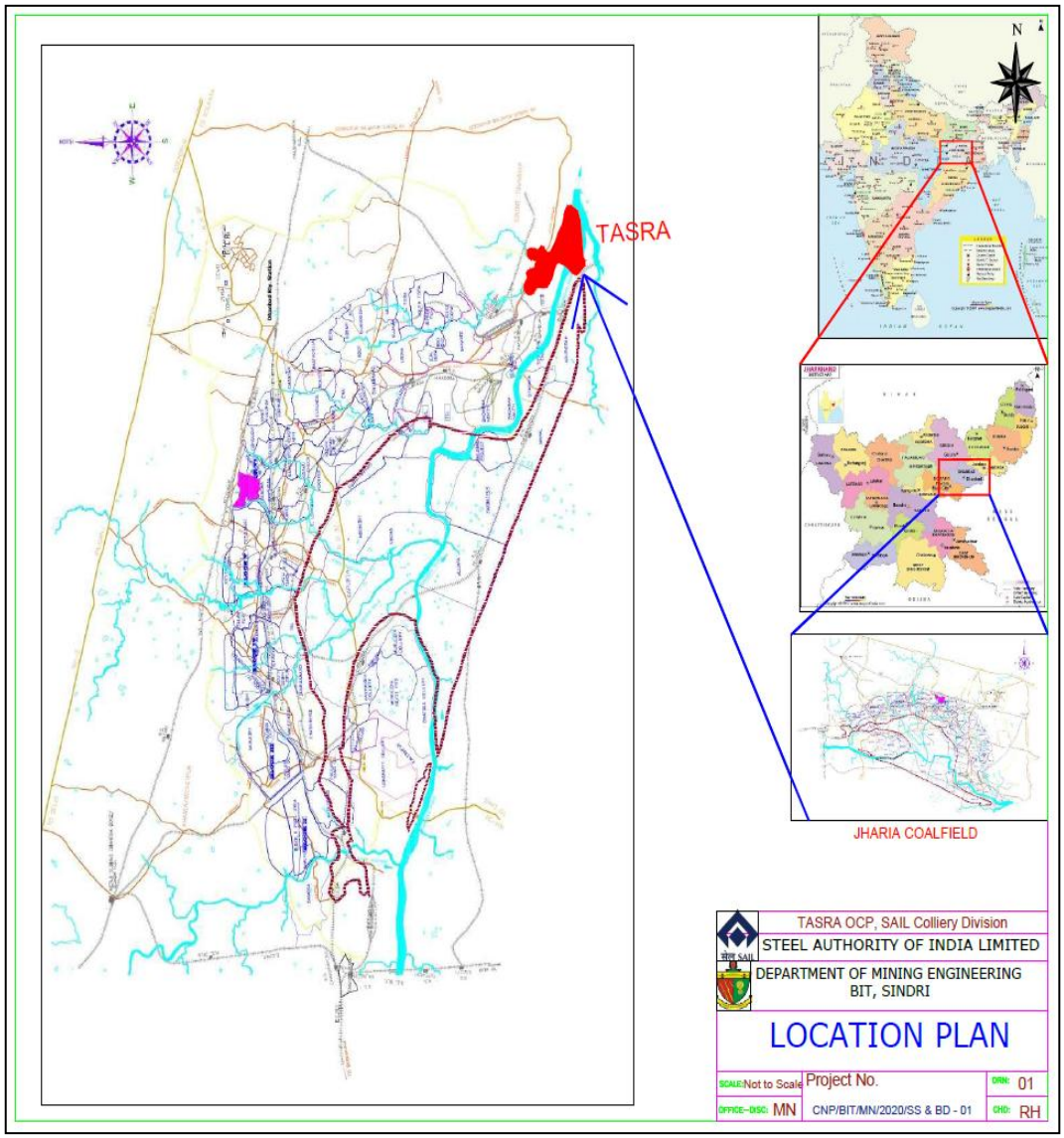


Figure 1. Surface Plan of Tasra OCP, SAIL-Colliery Division

# 4). Geology

## *4.1) Regional Geology of the Area*

The Jharia coalfield (453 $km^2$) is sickle shaped on plan and occurs in the form of syncline with its axis trending broadly in E-W direction and plunging towards west. The southern flank of this coalfield is truncated by boundary fault having maximum throw about 2.5 km at Mohuda Basin. The non-coal bearing Talchir formation is mainly exposed along the northern and western portion of the coalfield. The Barakar formation covering an area of 218 $km^2$ which is exposed in the northern, eastern and south-eastern part of the coalfield area contains over 40 coal horizons including local and persistent seams, some of which are exclusive store house of metallurgical coal in India. The Barakar formation is successively overlain by Barren Measure formation which is devoid of workable coal seams. This is mainly exposed in the central part of the coalfield. The Barren Measure is overlain by the coal bearing Raniganj formation (54 $km^2$).

**Stratigraphy:**

**Archeans:** The Archeans, consisting of gneisses and mica schists are exposed all along the periphery of Jharia Coalfield. The metamorphic are profusely intruded by quartz veins.

**Talchir:** In an Archean basement, the lower Gondwana sediments are deposited with a pronounced unconformity. The lowermost Gondwana sediments of Talchir formation are represented by variegated shale and greenish sandstones which at times show laths of unaltered feldspars. They are exposed all along the northern fringe of the coalfield. Near Lutipahar in the north-western part of the coalfield, Talchir formation is comparatively well developed in a large area and boulder bed shows exposures of spheroidal weathering.

**Barakar:** In the eastern, northern and north-eastern parts of the block, the Barakar are extensively developed. All along the southern boundary they are extending under the thick over of Barren Measures. The Barakar formation comprises pebbly sandstones, conglomerates, grits, coarse to fine grained sandstones, shales, carbonaceous shales and coal seams. Verma et. al. (1989) has observed a gradual decrease in thickness of Barakar from east to west. Its maximum thickness of more than 1250 m has been observed in the south- eastern part of the coalfield in Tasra region. Barakar is the most important geological formation as it contains more than 40 coal horizons having thickness more than 50 cm. In general seam X (Ten) and younger seams are better quality coal.

**Barren Measure:** The Barren Measure formation lying conformably over the Barakar formation consists of massive multistoried sandstone alternating with carbonaceous shale, grey shale and sandstone/ shale intercalations with occasionally very thin, impersistent and non-workable coal horizons in the lower part of the formation. The Barren Measures show a widespread development extending from the central part of the coalfield up to the southern margin. The maximum thickness of the Barren Measure has been estimated to be around 625m in the central part of the basin. It gradually decreases westward and eastward.

**Raniganj:** Raniganj formation is deposited in sub elliptical basin that is called Mohuda basin the south-western part of the coalfield. The formation is represented by sandstone, shale, carbonaceous shale and coal seams. There are 24 coal seams reported from this formation. These seams comprise high volatile, high moisture, medium coking coal. The maximum thickness around 725 m of Raniganj formation has been observed.

**Igneous Intrusive:**

Mica peridotite and dolerite are the two most common Post Gondwana intrusives. The mica peridotite occurs as dyke and silk throughout the coalfield and has caused widespread devolatisation of the coal seams. The dolerite dyke is mostly confined in the western part of the coalfield and has limited effect on coal seams. A number of dykes and

their offshoots have been established in the coalfield, but the most surprising phenomenon of a 250 m zone characterized by pyrolitization and devolatisation has been observed in the north-western part of the coalfield at Daumda Block, where presence of any igneous intrusive has not been noticed.

### *4.2) Geology of Tasra OCP*

The Tasra block located in the eastern extremity of the coalfield is occupied by rocks of the Talchir Formation, Barakar Formation of the Gondwana Super group and Post-Gondwana intrusive, apart from soil and alluvium of recent era. The area is mostly under soil cover and the rock exposures are mainly along the two-south flowing nalas.

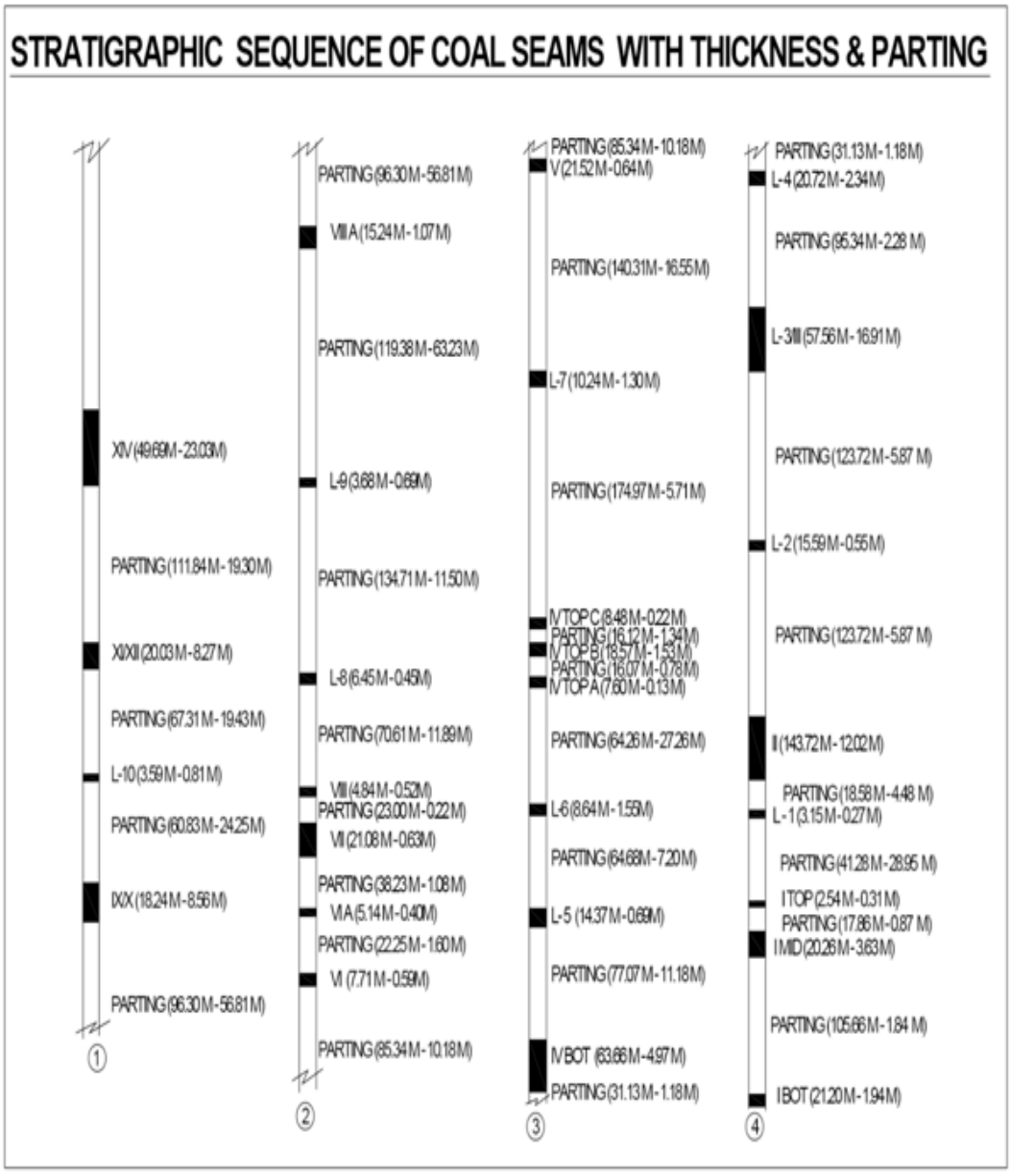


Figure 2: Bore hole section of Tasra OCP, SAIL-Colliery Division

There are number of quarry patches, they are of little help in projections & knowing the trends of beds. However, there dispositions have greatly facilitated in the bringing out the structure. The exposures along the northern bank of the Damodar River are very limited

and confined to the western end only. The exposures are generally of sandstones, intercalations, arenaceous shales and a few coal seams. Tasra block lies in the eastern extremity of Jharia Coalfield, District: Dhanbad, Jharkhand and covers an area of about 4.5 sq km. It falls within Latitudes 230 38'25" & 230 39'58" North and Longitudes 860 27'12" & 860 29'15" East. It is included in the survey of India Topo sheet No 73I/6. Adjacent portion of Chasnalla Block, which has been included in the Tasra OCP, lies in the south of the Tasra Block.

The study of data including borehole lithology, lay and disposition of coal seams, stripping ratio analysis, surface constraints etc. indicates that the entire net geological reserves of the block are not opencastable except up to certain depth. A net geological reserve of 78.45 Mt has been envisaged to extract by opencast from the Tasra block. Inclusion of part of Chasnalla block has added another 29.08 Mt of net geological reserves in the proposed pit. Net geological reserves within the delineated pit are 107.53 Mt. Mineable reserves from the proposed pit is 96.78 Mt. However, the proposed opencast mining will no way jeopardize of this coal seam by underground mining method in future, if feasible.

Table No 1: Bore hole Lithology of different Stratigraphic division

| **Stratigraphic division** | **Formation** | **Lithology** |
|---|---|---|
| Recent/ sub-recent | | Sandy/ clayey soil with detrital pebbles predominantly of quartz |
| ----------Erosional Unconformity---------- | | |
| Post Gondwana Intrusives | | Mica-peridotites, Sills & Dykes |
| ----------Time Lapse---------- | | |
| Lower Gondwana Group | Barakar | Fine to coarse grained sandstones, carbonaceous sandstones, shales, intercalations, carbonaceous shales, along with coal seams I to XVIII |

| | | |
|---|---|---|
| | Talchir | Fine grained buff & green-coloured sandstones, reddish & green colored shales and buff-coloured pebbly sandstones |
| ----------Unconformity---------- | | |
| Archeans | | Gneisses, Mica schists & granite gneisses |

## 5). Geo-hydrology

The area under consideration falls in the sub-humid region of the state of Jharkhand. The maximum temperature rises as high as 45°C during summer (April to middle of June) and falls down to minimum of 6°C during winter (December to January). The area receives fair to moderate rainfall, the average annual precipitation being 140 cm, most of which is received between June to September.

Groundwater occurrence and storage in study area are mainly controlled by the geological setup of the area. The ability of geological formation to store and transmit water is dependent on its formation parameters, such as porosity and hydraulic conductivity. Based on these two parameters, the rock formation of the area may be classified as hard and soft rocks. Hard rocks (mainly crystalline and consolidated sedimentary rocks) are characterized by very little porosity. Ground water in such rocks circulated to a limited extent through the secondary openings represented by joints, cracks, fissures and such other planes of discontinuity. Soft rocks represented by sandstone, pebbles and loose sand, possess higher degree of primary porosity and as such characterized by higher water storage capacity. As greater part of the study area is underlain by Precambrian crystalline rocks, the weathered residual of the hard rocks as well as the fractures, joints, fissures, faults and other zones of discontinuity are the principle repositories of ground water in the area. The weathered zone is usually of limited thickness, fractures and joints generally close up with depth. The thickness of weathered mantle in the hard rock zone of area is about 10-20 meter in the topographic lows. Ground water in the weathered and fracture zones of hard rocks occur under unconfined condition. Ground water circulating through fracture zone is sometimes held under pressure. Depth of the water table in the hard rock of the area generally ranges from 3.0 m to 15.0 m below ground level.

## 6). Drilling and Blasting

The mine is being worked by mechanized drilling and blasting method with 3 to 6 m high benches and with a bench angle close to $75^0$ to $80^0$ with horizontal. Drilling and blasting

operations were carried in Tasra OCP, SAIL-Colliery Division which is described below:

### *6.1) Drilling*

Crawler mounted DTH drills of 100 mm are being used to drill blast holes. General dip of the formations is steep dipping away from the face. The holes are made close to vertical.

### *6.2) Blasting*

During field investigations, altogether ten experimental blasts were conducted with varying design parameters and explosive charging patterns. The diameter of holes in the blasts was 100 mm. The depth of holes varied between 3.0 to 5.0 m. The total number of holes in a blasting round varied from 12 to 16. Burden and spacing values varied widely between 2.0 to 2.5 m and 2.5 to 3.0 m respectively in all the blasts. Top stemming columns varied between 2.5 m and 3.0 m depending on the depth of the holes and blast face condition. The delays of 17 ms and 25 ms between the holes in a row and 42 ms, 67 ms and 84 ms between the rows were used.

All the experimental blasts were conducted using large diameter cartridge explosives of 83 mm diameter, 2.78 kg weight. The explosive charge per hole varied widely from 5 to 10 kg depending upon the hole depth and effective burden in front of the hole. The total explosive charge in the blasting round ranged between 70 to 150 kg. The maximum explosive charge weight per delay also varied from 5.0 to 9.0 kg. Nonel (shock-tube) initiation system was used for all the blasts. Charging and firing patterns for all the blasts have been kept to ensure single hole firing at a time. Details of tie-ins and initiation arrangement are given in Appendix-I. Blasting was carried out using bulk emulsion explosives of M/s IOCL Ltd. It was found that powder factor varied between 0.9-1.0 $m^3$/kg of explosive depending on formation (compact /cracked), type of initiation sequence and other blast design variations. The number of blast holes per round varied from 12 to 16. The circuit was fired using exploder from a safe blasting location. The blast results were satisfactory in terms of ground vibration, fragmentation and control of fly rock and noise. Precautions against fly rock ejection were taken by muffling blast face with conveyor belt and sandbags.

## 7). Blast Monitoring during Trial Blast

The magnitude of blast-induced ground and air vibration in normal production blasts has been recorded using Micromate seismographs manufactured by M/s Instantel, Canada. The instruments recorded the level of vibration in terms of peak particle velocities in the three orthogonal directions, ground frequencies in the three directions, time of peak occurrence, and peak air over pressure in terms of decibels (linear). From the visual observation of blasts and inspection of site after blasting it was observed that the distance traveled by flying fragments less than 10 m. Fig. 3 shows the blasting during the trial

blast period with muffling at production bench in Tasra OCP, SAIL-Colliery Division

Figure 3: Blasting during the trial blast with muffling at Tasra OCP, SAIL Colliery Division

Fig. 4 represents blast hole charging at Tasra OCP, SAIL Colliery Division during the trial blast.


Figure 4: (A) (B) (C) (D) Charging the Blast hole at Tasra OCP, SAIL Colliery Division

## 8). Ground Vibrations

When an explosive charge detonates in the blast hole, intense strain waves are transmitted to the surrounding rock. The energy carried by these strain waves known as strain energy, fragments the rock medium due to different breakage mechanisms such as crushing, radial cracking and reflection breakage in the presence of a free face. Combined, the

crushed zone and radial fracture zone encompass a volume of permanently deformed rock. When the strain wave intensity diminishes to the level where no permanent deformation occurs in the rock mass (i.e. beyond the fragmentation zone), strain waves propagate through the medium in the form of elastic waves, oscillating the particles through which they travel. These waves in the elastic zone are known as ground vibrations, which closely conform to visco-elastic behaviour (Ricker, 1977).

Wiss and Linehan (1978) made studies to evaluate the influence of 14 blast variables considered to have an effect on the amplitude of ground vibrations. They found the charge weight per delay and length of delay to have the most significant influence on ground vibrations which is given in Table 2.

Charge weight per delay is a very important parameter which controls the intensity of ground vibrations. The intensity of vibrations increases as the quantity of charge detonated per delay increases. The selection of suitable delay interval is extremely important in multi-row blasts. Proper burden relief should be provided to each row for effective movement of the burden rock. If the delay between rows is not enough, the front row burden cannot move forward to sufficient distance to provide free face to the next subsequent row to move out. This adds to more confinement of charges in subsequent rows leading to increased ground vibrations and fly rock. It was found that the ground vibration levels could be reduced effectively by arranging delays between rows in such a manner so as to separate the wave fronts emanating from corresponding charges avoiding the superimposition of waves (Wei Wo, 1984).

The probability study made by Dowding (1985) revealed that no cosmetic or threshold cracking takes place below a particle velocity of 12 mm/s (0.5 in/s). The data considered by him for the study included the low frequencies below 4 Hz collected by Dvorak (1962). Residential structures typically resonate at frequencies in the range of 3 Hz to 8 Hz indicating a problem. However, the above study indicated no danger even up to 12 mm/s PPV with such low frequencies. To substantiate this Siskind et al. (1981) conducted studies and observed no blast induced cracking up to 19 mm/s PPV. The probabilistic data provided above may not be valid in specific cases as total time history of vibration event is more important for response spectrum of the structure.

Table No 2: Parameters influencing ground vibrations (Wiss and Linehan, 1978)

| **Parameters** | **Influence on PPV** | | |
|---|---|---|---|
| | **Significant** | **Moderately significant** | **Insignificant** |
| **Controllable variables** | | | |
| 1. Charge weight per delay | X | | |
| 2. Length of delay | X | | |
| 3. Burden and spacing | | X | |
| 4. Stemming quantity | | | X |
| 5. Type of stemming | | | X |

| | | | |
|---|---|---|---|
| 6. Charge length and diameter | | | X |
| 7. Angle of bore hole | | | X |
| 8. Direction of initiation | | X | |
| 9. Charge weight per blast | | | X |
| 10. Charge depth | | | X |
| 11. Bare Vs Covered detonating cord | | | X |
| **Uncontrollable variables** | | | |
| 1. General surface terrain | | X | |
| 2. Type and depth of overburden (Confinement) | | X | |
| 3. Wind | | | X |

The damage that results from vibration will depend on the nature of source, transmission characteristics of the intervening medium/strata, inherent strength of the subject structure, height and rigidity of the structure and foundation design etc. Damage caused by ground vibration is dependent on the amplitude of the ground velocity and on the frequency of the ground motion. All the vibration standards till date are based on the resultant peak particle velocity of ground vibration because this is accepted as the best criterion for assessing the levels of vibration damage. The recent trend is to refer to the frequency of the ground motion also. Low frequency waves cause more damage to structures particularly in case of multi-storied buildings.

Different countries adopt different standards of safe limits of vibration in terms of peak particle velocity (PPV) for various types of structures. A few standards widely accepted are given in Table 3 and 4.

Table No 3: USBM Standard for safe level of ground vibration (after Siskind et al 1980, USBM RI-8507)

| **Type of structure** | **Ground peak particle velocity (mm/see)** | |
|---|---|---|
| | High Frequency > 40 Hz | Low Frequency < 40 Hz |
| Modern homes, dry wall interior | 50 | 25 |
| Older homes, plaster on wood etc. | 50 | 12.5 |

Siskind et al (1980) in more recent studies suggests safe levels of PPV as mentioned in Table 3 for less than 40 Hz also, applicable for dominant frequencies of less than 10 Hz. He also advanced a safe level of displacement of 0.75 mm. The German standards are more stringent and are given in Table 4.

Table No 4: German Standard Din 4150 of 1938 (revised in 1984)

| **Type of structure** | **Peak Particle Velocity PPV (mm/sec)** | | | |
|---|---|---|---|---|
| | **At foundation level Frequency range (Hz)** | | | **At floor level of top most story (all frequencies)** |
| | < 10 | 10-50 | 50-100 | |
| Building used as offices & industrial structures | 20 | 20-40 | 40-50 | 40 |
| Domestic houses & associated constructions, structures with plasters | 5 | 5-15 | 15-20 | 15 |
| Buildings which do not fall under (i) &(ii) and objects of historic interest or other sensitive structures | 3 | 3 - 8 | 8-10 | 8 |

In India DGMS suggested standards of blast vibrations vide their circular No.7 of 1997 are being implemented. Accordingly, the permissible peak particle velocity (PPV) at the foundation level of structures in mining area is detailed in Table 5.

Table No 5: Permissible peak particle velocity as per DGMS in India (1997)

| **Type of structure** | **Dominant excitation frequency, Hz** | | |
|---|---|---|---|
| | < 8 Hz | **8 - 25 Hz** | > 25 Hz |
| **(A) Buildings/structures not belonging to the owner** | | | |
| i) Domestic houses/structures (Kuchha brick and cement) | 5 | **10** | 15 |
| ii) Industrial Buildings RCC and framed structures) | 10 | 20 | 25 |
| iii) Objects of historical importance and sensitive structures | 2 | 5 | 10 |
| **(B) Buildings belonging to owner with limited span of life** | | | |
| i) Domestic houses/structures (Kuchha brick and cement) | 10 | **15** | 25 |
| ii) Industrial buildings (RCC & framed structures) | 15 | 25 | 50 |

Table No 6: Analysis of blast monitoring data (25 observations)

| **Parameter** | **Range** | **Class Interval** | **No. of events** | **Remarks** |
|---|---|---|---|---|
| Max. charge per delay (kg), Q | 4.33-8.33 | 0-6 | 10 | Total 24 events were recorded |
| | | 6-8.33 | 14 | |
| | | >8.33 | 0 | |
| PPV, Peak Particle Velocity (mm/s) | 0.84-10.84 | 5 or below | 15 | Total 24 blast events were recorded. 92 % values were less than 10 mm/s. |
| | | 5-10 | 7 | |
| | | 10-15 | 2 | |
| | | Above 15 | 0 | |

| | | | | |
|---|---|---|---|---|
| Distance (m) | 70-200 | Blast site to monitoring station | | Varied to cover important structures and adjacent workings. |
| Frequency (Hz) | Transverse, Vertical, and Longitudinal | | | Almost 82 % events recorded above 8 Hz. This has a bearing on fixing allowable PPV. |
| | < 8 | 8-25 | >25 | |
| | 13 | 56 | 03 | |
| AOP (Air over pressure), dBL | 88-123 | | | Most of the events are below the safe limits of 140 dBL |

The analysis of ground vibration records from the Table 6 reveals that the dominant frequencies of the ground vibration at Tasra OCP, SAIL-Colliery Division varied from 5 to 80 Hz. It may be noted that frequencies less than 8 Hz were recorded in 13 observations, 50 observations were between 8 – 25 Hz and 10 observations were having a frequency more than 25 Hz. Considering the dwellings nearby as the main structures to be protected, the maximum allowable Peak Particle Velocity (PPV) is fixed at 10 mm/s and 15 mm/s respectively (refer to Table 5).

## *8.1) Empirical Relationship between Ground Vibration, Distance and Explosive Charge.*

Applying the method of least square regression analysis, an empirical equation is established relating resultant peak particle velocity, V (mm/sec) of the ground, the distance of blasting site from the point of monitoring R (m) and the maximum charge per delay Q (kg). The derived empirical ground vibration predictor equation for the Tasra OCP, SAIL-Colliery Division with Non-electric detonator is given below at 95% confidence level in equation (1).

$$V = 1328.6 \times \frac{R}{\sqrt{Q}}^{-1.806} \quad \ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots (1)$$

At 50 % of confidence interval

$$V = 712.3 \times \frac{R}{\sqrt{Q}}^{-1.806} \quad \ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots (2)$$

Coefficient of determination $R^2 = 0.72$

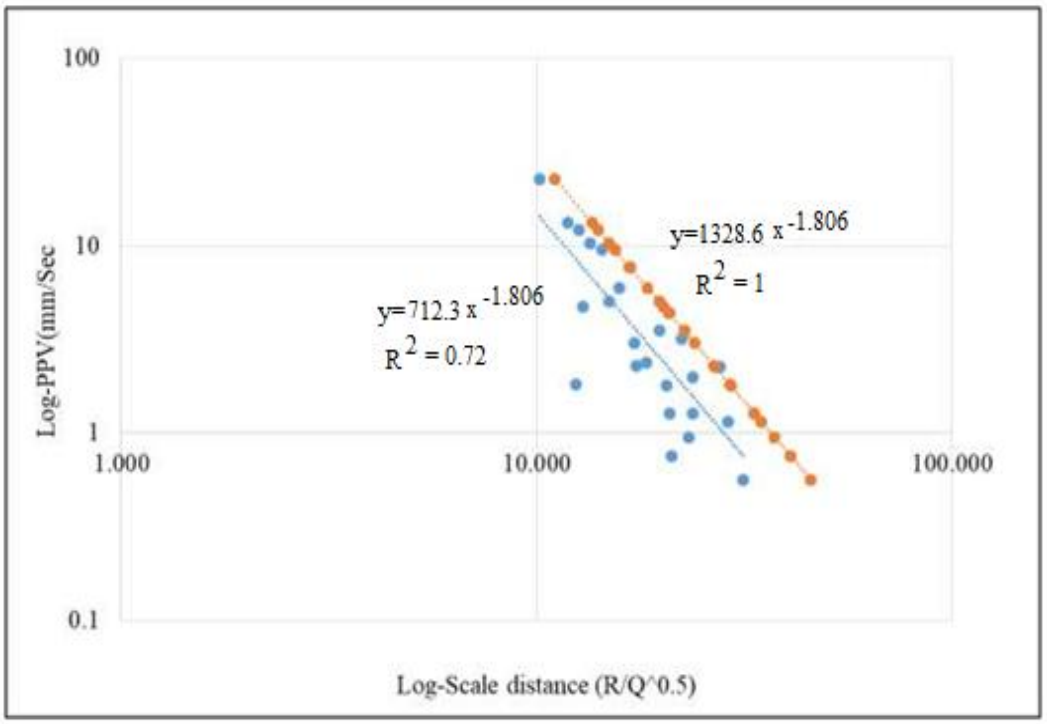


Figure 5: Ground vibration predictor equation for Tasra OCP, SAIL-Colliery Division

Equation (3) depicts the relation among resultant peak particle velocity, V (mm/sec) of the ground, the distance of blasting site from the point of monitoring, R (m) and the total charge quantity per round TQ (kg). The derived empirical ground vibration predictor equation for the Tasra OCP, SAIL-Colliery Division at 95% confidence level is given below in equation (3).

$$V = 118 \times \frac{R}{\sqrt{TQ}}^{-1.258} \quad \ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots (3)$$

At 50 % confidence level

$$V = 58.4 \times \frac{R}{\sqrt{TQ}}^{-1.258} \quad \ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots (4)$$

Coefficient of determination $R^2 = 0.74$

The scaled distance and peak particle velocity values are plotted on a log-log scale. Statistically, the above equation has reasonable index of determination with 95 % of confidence level and therefore, can be accepted for prediction of ground vibration and estimation of safe maximum charge per delay for various distances of structures from the blasting sites.

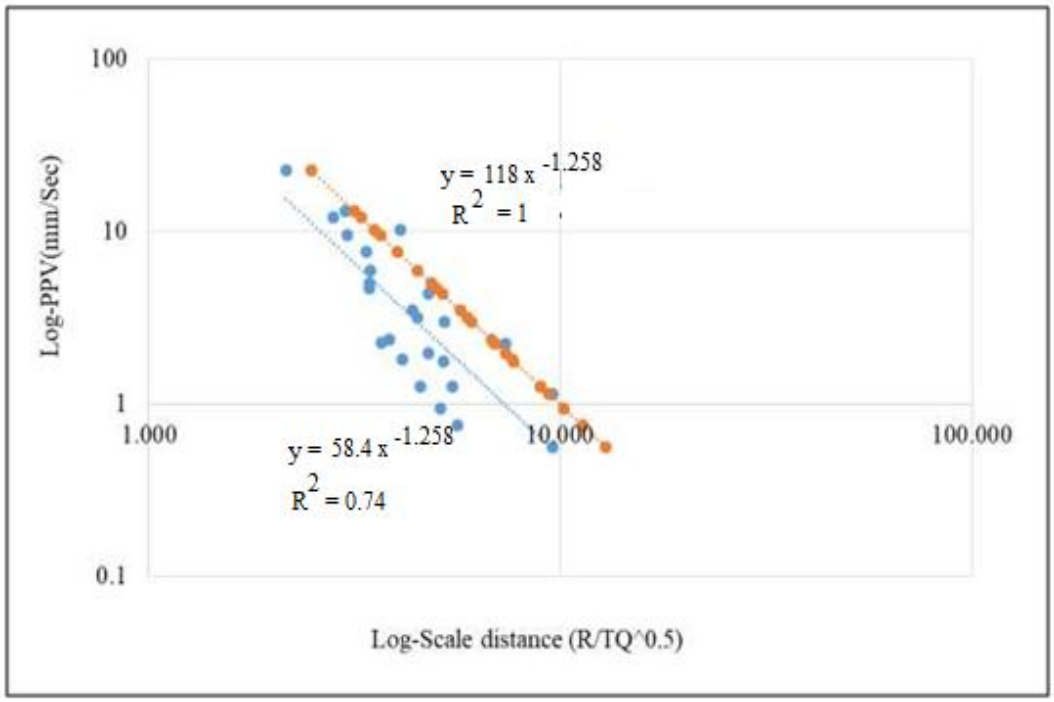


Figure 6: Ground vibration predictor equation for total charge for Tasra OCP, SAIL-Colliery Division

The suggested maximum charge per delay at 95% confidence level of prediction using non-electric initiating systems for the safety of surface structures nearby Tasra OCP, SAIL-Colliery Division, has been given in the Table 7.

Table 7: Suggested maximum charge per delay and per round, Tasra OCP, SAIL-Colliery Division

| **Distance (m)** | **Maximum charge per delay-Q (kg)** | | **Total charge per round TQ (kg)** | |
|---|---|---|---|---|
| | **Allowable PPV (10 mm/s)** | **Allowable PPV (15 mm/s)** | **Allowable PPV (10 mm/s)** | **Allowable PPV (15 mm/s)** |
| 25 | 2.78 | 4.36 | 12.36 | 23.54 |
| 50 | 11.13 | 17.44 | 49.42 | 94.15 |
| 75 | 25.04 | 39.23 | 111.20 | 211.83 |
| 100 | 44.52 | 69.75 | 197.68 | 376.59 |
| 125 | 69.56 | 108.98 | 308.88 | 588.43 |
| 150 | 100.16 | 156.93 | 444.79 | 847.33 |
| 200 | 178.06 | 278.98 | 790.73 | 1506.37 |
| 250 | 278.22 | 435.91 | 1235.52 | 2353.71 |
| 300 | 400.64 | 627.71 | 1779.15 | 3389.34 |
| 400 | 712.25 | 1115.93 | 3162.94 | 6025.49 |
| 500 | 1112.89 | 1743.65 | 4942.09 | 9414.82 |

## *8.2) Air Overpressure Monitoring*

During trial blasts air overpressure (air blast) was also monitored and the details of

measurements are given in Appendix V. The values obtained were analyzed for a propagation equation and the same has been shown in Figure 7.

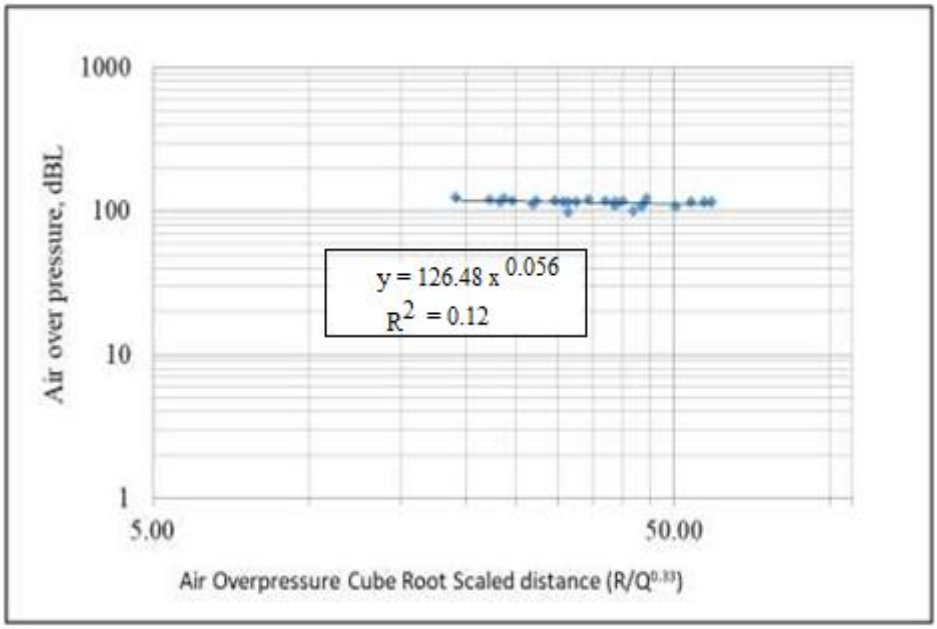


Figure 7: Air overpressure predictor equation for Tasra OCP, SAIL-Colliery Division

The air over pressure can be given by

$$Air\ over\ pressure = 126.48 \times \left(\frac{R}{Q^{0.33}}\right)^{0.056} \ldots\ldots\ldots\ldots\ldots\ldots (5)$$

## *8.3) Additional Precautions during drilling and blasting*

1. The position/location of holes where drilling is to be done should be clearly marked on the bench surface indicating the depth to which drilling should be done. Uneven depth of holes on a bench must be avoided as it will result in a very bad and inefficient blast and will give rise to excessive fly rock, vibrations, boulders and toe problems. The tie-ins and initiation system should be such that the direction of throw is always towards free face side. Whenever two free faces are available the diagonal tie-ins should be preferred unless there is some basic advantage with other designs.
2. Drill cuttings or stone chips of 3-7 mm will suit as the best stemming material.
3. Muffling of holes including the area to be blasted must be done if it is within the danger zone which is defined by the DGMS.
4. Each blast should be carefully planned, checked, executed and observed by responsible officials.
5. Post-blast observations should also be recorded for each blast round in a bound register which should include degree of fragmentation, flying of rock fragments,

magnitude of vibration in quantitative, complaint from neighbourers if any, boulders in the previous blast if any and any other remark which is useful for describing the blast results.

It is not exaggerations but true that constant supervision and involvement of responsible officials right from the drilling stage is the key for an efficient blast and to achieve desired results. This practice must be introduced in all blasting operations in order to make the operation smooth and efficient.

## 9). Suggestions for Fly Rock Control

In addition to the blast induced vibrations, fly rock is another important hazard of blasting operations, particularly if it is conducted in the vicinity of mines/ structures/ machines/ equipment. The factors which influence the distance of flying of fragments include:

- Height of stemming column and the type/quality of stemming material
- Irregular shape of free face, particularly, for an old mine being reorganized
- Excessive toe burden or blasting without a free face.
- Scattering and overlapping of delay timings of delay detonators/relays
- Presence of water in blast holes.

The first four parameters can be controlled by properly designing the blasting pattern whereas the last parameter is not easily controllable. Muffling or covering of holes including entire area to be blasted is one of the most common methods to contain the distance of travel of flying fragments particularly when blasting is done within the danger zone as specified by DGMS. However, the most common practice in mines is to cover only the blast hole mouths with a 1-1.5 m wide expandable wire mesh nets of 30 x 30 mm to 50 x 50 mm openings. Gunny bags and the cartridge empty boxes of 4 to 5 numbers are filled with sand or drill cuttings are placed around each blast hole.

Another effective and reliable method of controlling the flying of rock fragments from the mouth of hole (vertical fly rock) is the height of stemming column in blast holes. It has been observed that the fly rock, particularly, towards high wall side, was effectively controlled by maintaining the height of stemming column in all holes greater than the effective burden. The height of stemming column should be 1.2 to 1.5 times the true burden in all holes.

Combination of muffling and maintaining the stemming column length greater than the burden in all holes should be adopted for effective control of fly rock. Use of electronic system should be preferred because of less scattering in delay timing in relays and reduced chances of misfires. The length of blast should be more than three times the width. Above practices in blasting will considerably reduce the quantum and distance of flying fragments, ground vibration and will improve the fragmentation.

# 10). Suggestions and Recommendations

This report presents the scientific investigations on the assessment of ground vibration while blasting in the Tasra OCP, SAIL-Colliery Division. During investigation period 10 rounds of blasts comprising of 24 events were analyzed. On the basis of the analysis of data following conclusions may be drawn:

The site-specific empirical equation relating vibration, distance and maximum explosive quantity per delay for the overburden rock has been found to be as given below at 95% confidence level

$$V = 1328.6 \times \left(\frac{R}{\sqrt{Q}}\right)^{-1.806}$$

The dominant frequencies of ground vibration in the 10 rounds of blasts recorded varied from 3 to 100 Hz However, all events (82 %) recorded dominant frequency is above 8 Hz.

Siskind et al (1989) of USBM in more recent studies suggest safe levels of PPV as mentioned in Table 3 for less than 40 Hz also applicable for dominant frequencies of less than 10 Hz. For RCC buildings a safe ground vibration of 19.5 mm/sec is suggested for the safety of structures. The maximum charge per delay suggested has been computed for allowable PPVs of 10 and 15 mm/s for different categories of structures, namely, not belonging to owner and belonging to owner respectively as per the Technical Circular 1997 in this regard.

Assuming a safe level of ground vibration as 10 mm/sec for safety of surface structures (Kuchha brick and cement) near OC patch and 15 mm/sec for concrete structure the maximum permissible charge per delay is calculated using site specific empirical equation for various distances of surface structures from the blast site and the results are tabulated in Table-7 which must be adhered to. For the longer holes the maximum permissible charge per delay to be adhered by providing the solid decking in between the charge column.

For effective control of vertical and back fly rock fragments the height of stemming column at the top must be 1.2 to 1.5 times the burden in all holes. This is in addition to the muffling of the entire surface area to be blasted.

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## Appendix-I

Details of trial blast at Tasra OCP, SAIL-Colliery Division

| Blast No. | Date | Burden (m) | Spacing (m) | No. of Holes | Total Charge (kg) | Charge per hole (kg) | Max. Charge per delay (kg) | Hole Depth (m) |
|---|---|---|---|---|---|---|---|---|
| 1 | 10.07.2021 | 2.5 | 3.0 | 16 | 121 | 6.0 - 8.33 | 8.33 | 3.0-4.0 |
| 2 | 10.07.2021 | 2.5 | 3.0 | 12 | 88 | 6.0 - 8.33 | 8.33 | 3.0-4.0 |
| 3 | 13.07.2021 | 2.4 | 3.0 | 12 | 91 | 6.0 - 8.33 | 8.33 | 3.0-4.0 |
| 4 | 14.07.2021 | 2.5 | 3.0 | 15 | 112 | 6.0 - 8.33 | 8.33 | 3.0-4.0 |
| 5 | 14.07.2021 | 2.4 | 3.0 | 12 | 86 | 6.0 - 8.33 | 8.33 | 3.0-4.0 |
| 6 | 14.07.2021 | 2.5 | 3.0 | 14 | 70 | 3.0 – 5.55 | 5.55 | 3.0-3.5 |
| 7 | 15.07.2021 | 2.4 | 3.0 | 12 | 58 | 3.0 – 5.55 | 5.55 | 3.0-3.5 |
| 8 | 15.07.2021 | 2.4 | 3.0 | 16 | 122 | 6.0 -8.33 | 8.33 | 3.0-4.0 |
| 9 | 28.07.2021 | 2.5 | 3.0 | 15 | 114 | 6.0 -8.33 | 8.33 | 3.0-4.0 |
| 10 | 28.07.2021 | 2.5 | 3.0 | 16 | 120 | 6.0 -8.33 | 8.33 | 3.0-4.0 |

**Other Blast Design information**

Drill hole diameter: 100 mm

Drilling Pattern: Rectangular and Staggered

Stemming Length: 2.5 - 3.0 m

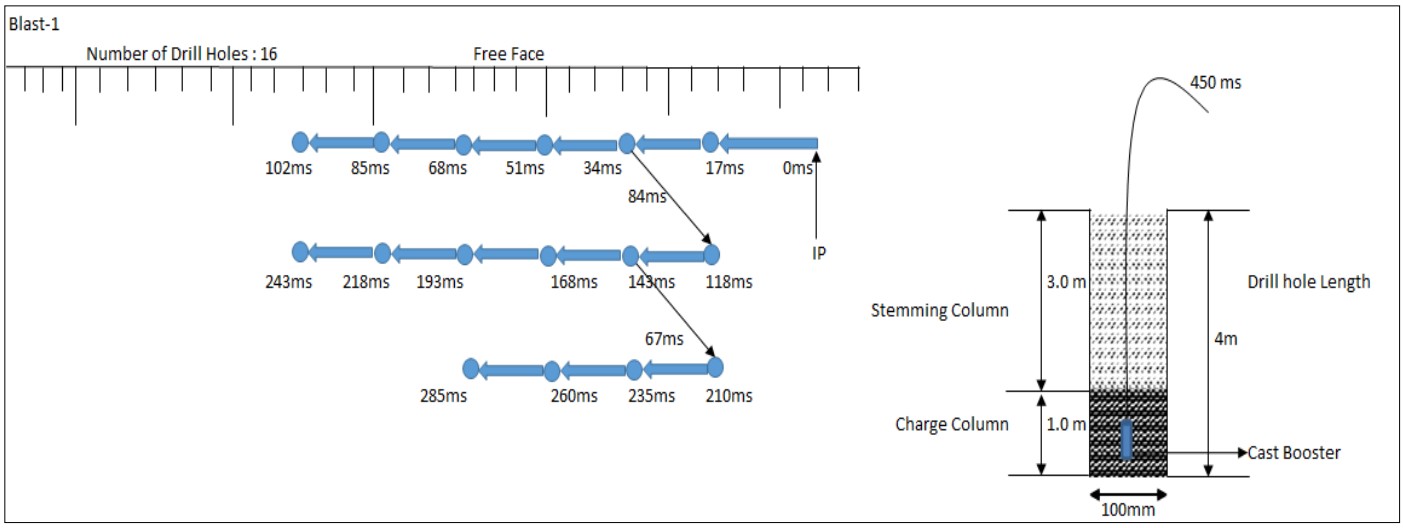
Explosive: SME (Make: IOCL)

Primer: 2.78 kg (Make Solar/IDEAL)

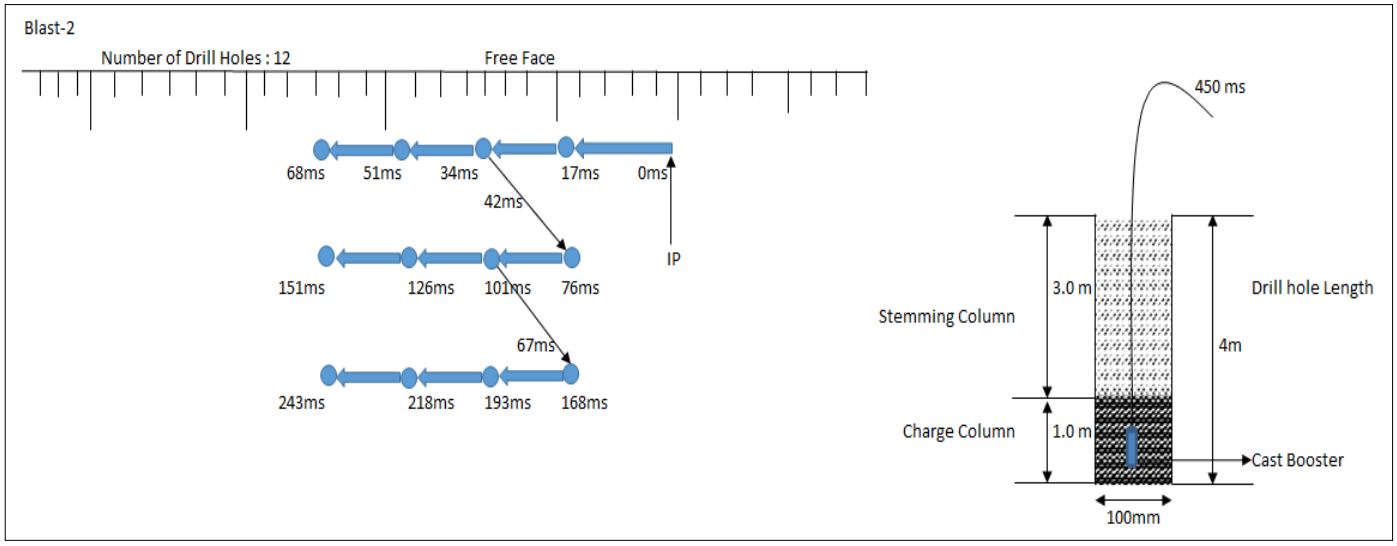
Delay: 17ms/ 25ms/ 42ms /67ms /84ms, Non-electric detonator, Microdet (Make-Solar/ IDEAL)

## Drilling and Firing Patterns during Trial Blasts

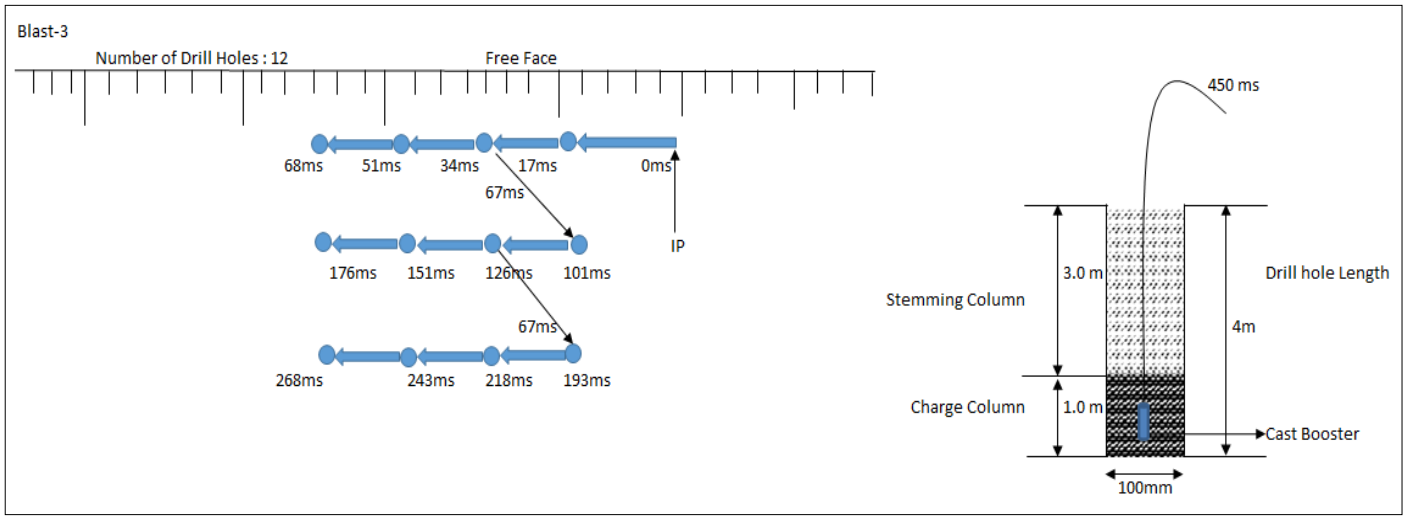
### Blast-1



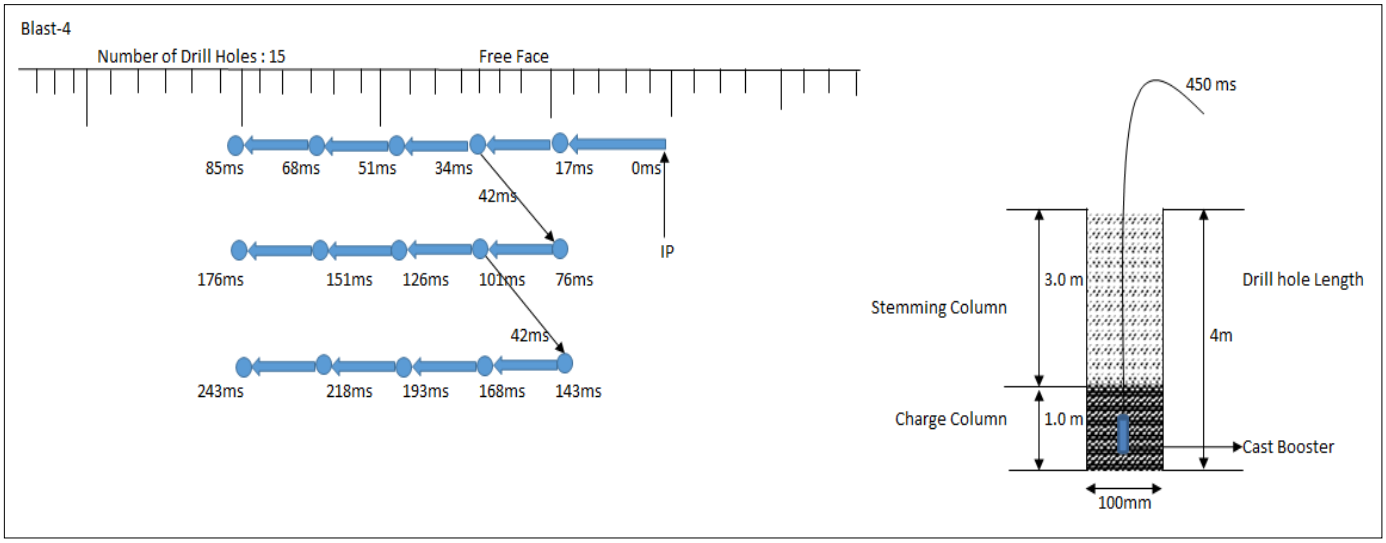

### Blast-2



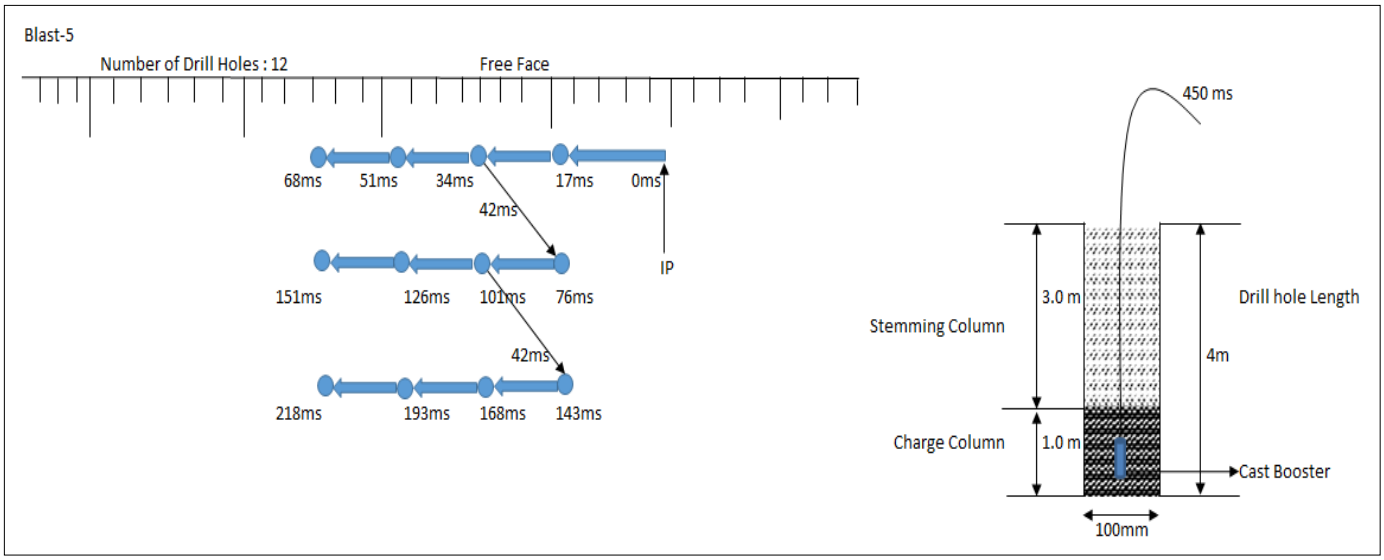

### Blast-3



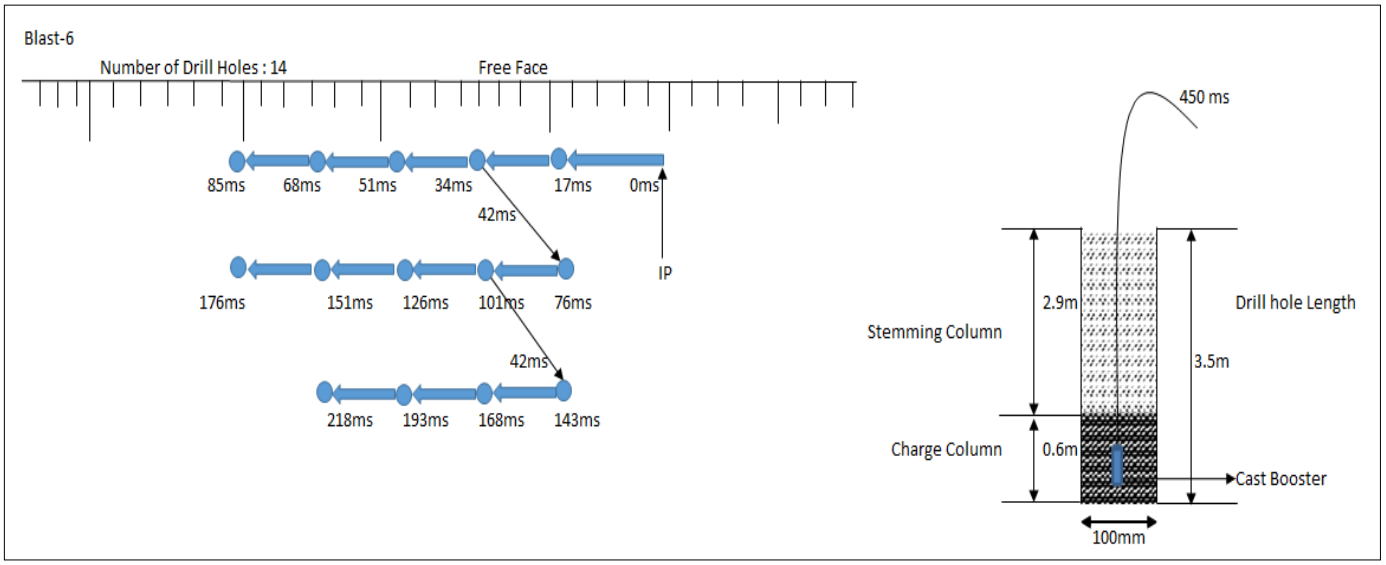
## Blast-4



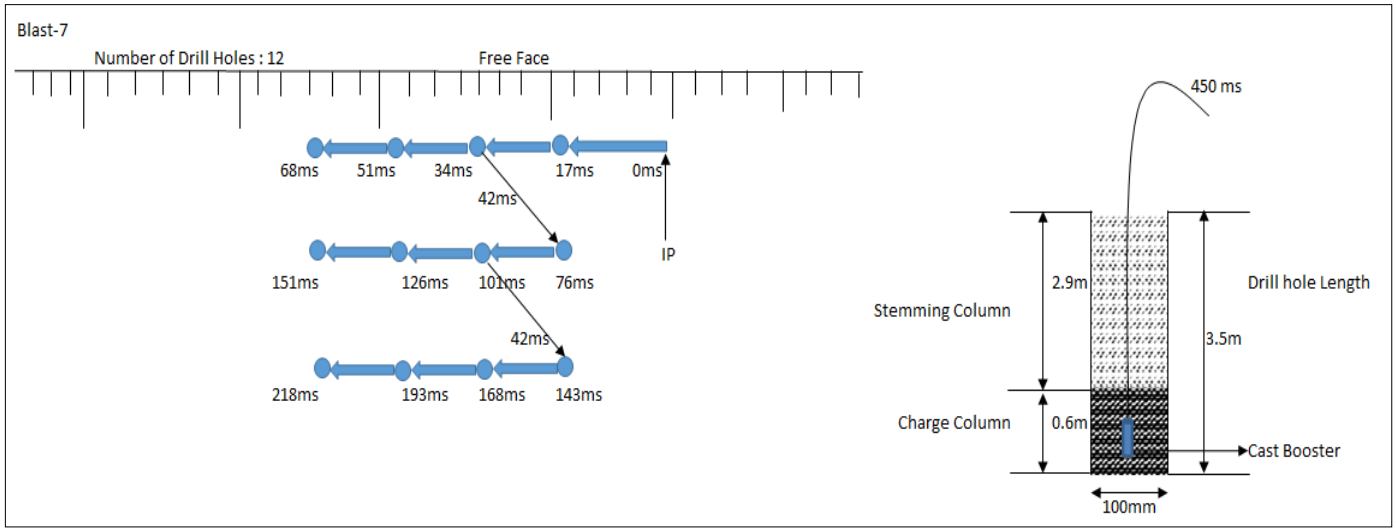

## Blast-5



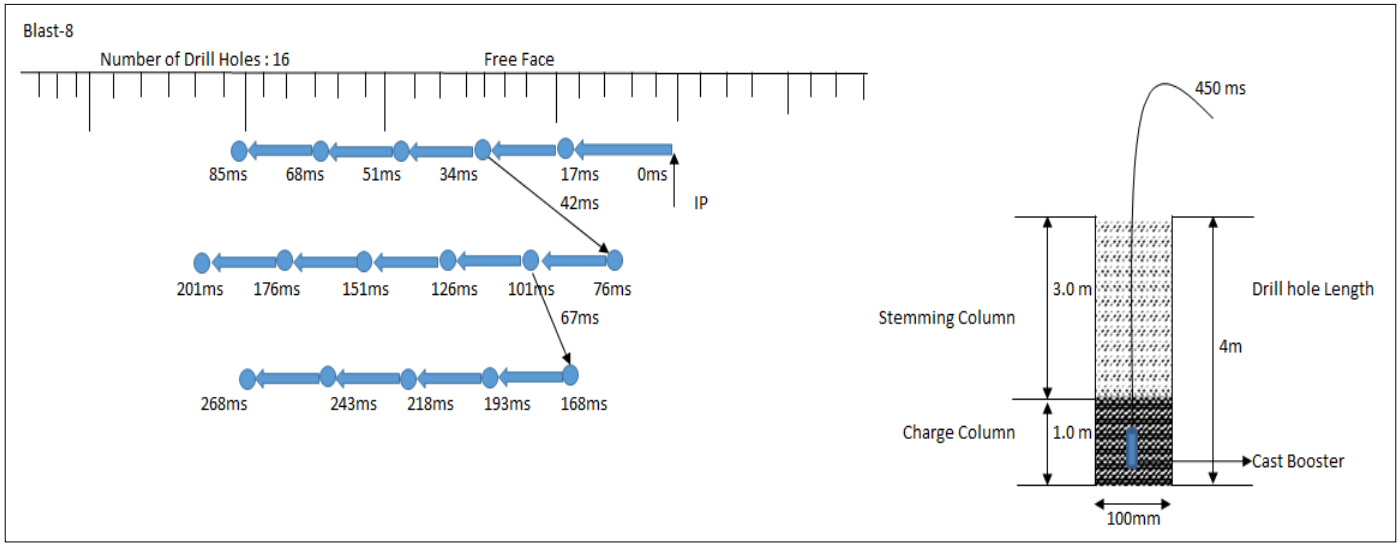

## Blast-6



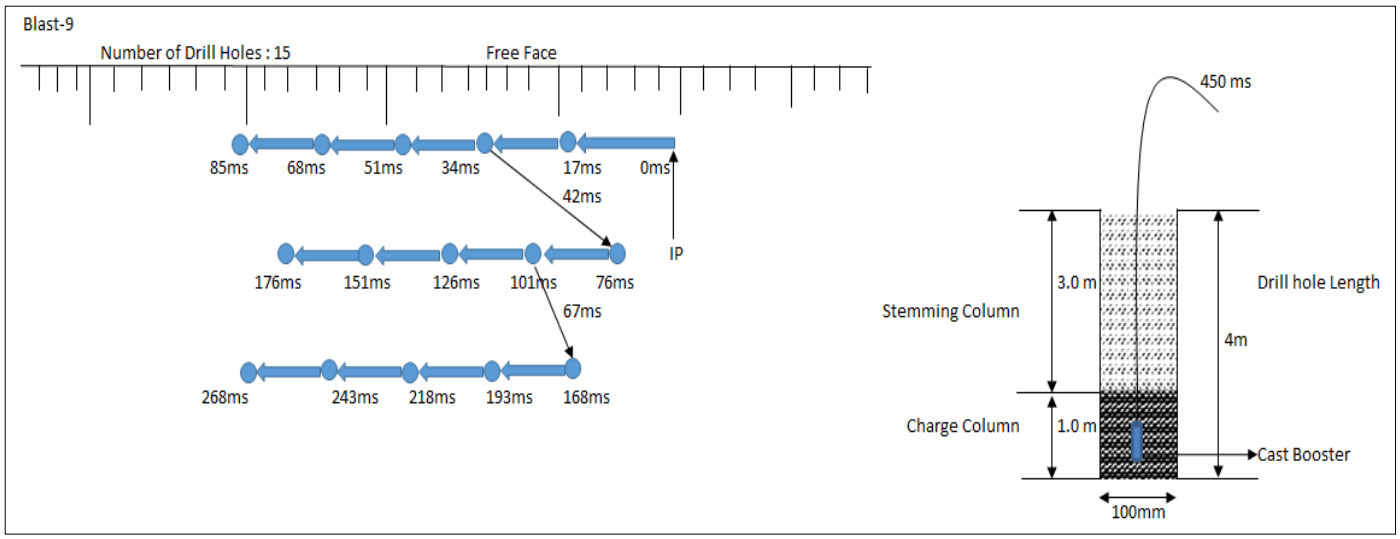
## Blast-7



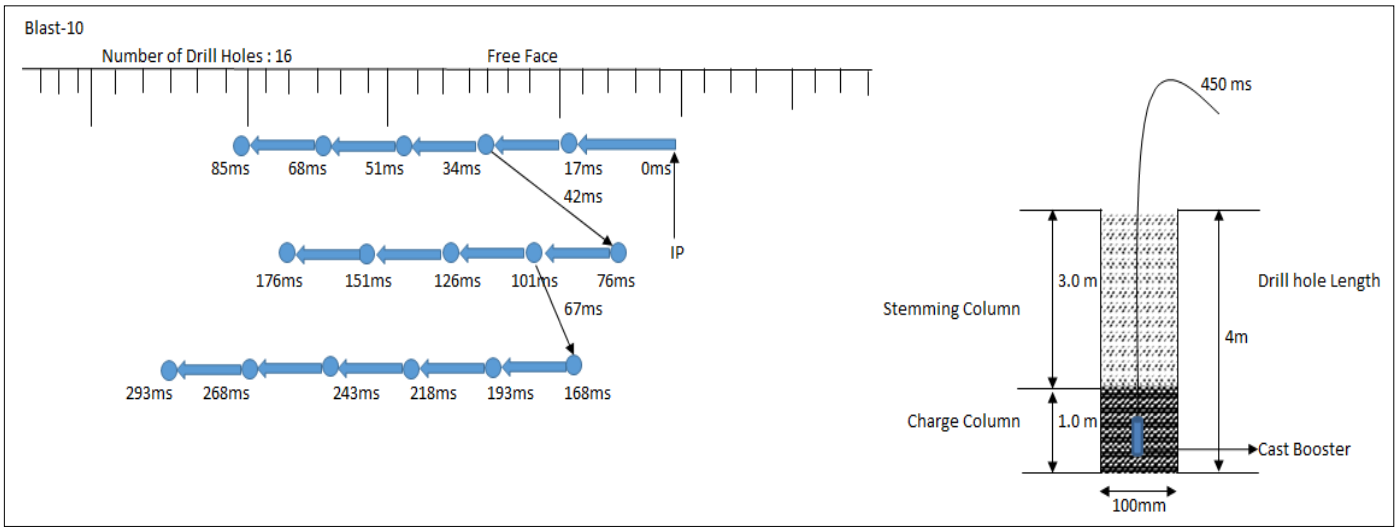

## Blast-8




## Blast-9



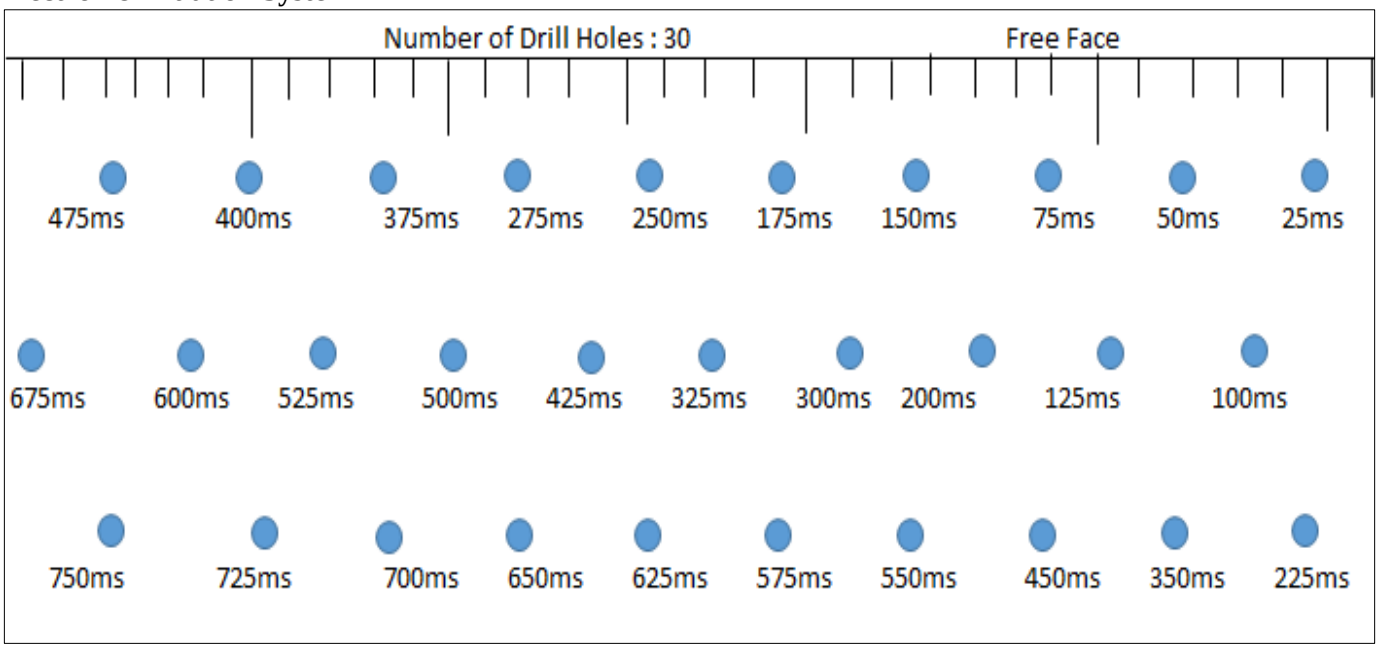
## Blast-10


Blast-10
Number of Drill Holes : 16
Free Face
85ms
68ms
51ms
34ms
17ms
0ms
42ms
IP
176ms
151ms
126ms
101ms
76ms
67ms
293ms
268ms
243ms
218ms
193ms
168ms
450 ms
3.0 m
Stemming Column
Drill hole Length
4m
Charge Column
1.0 m
Cast Booster
100mm

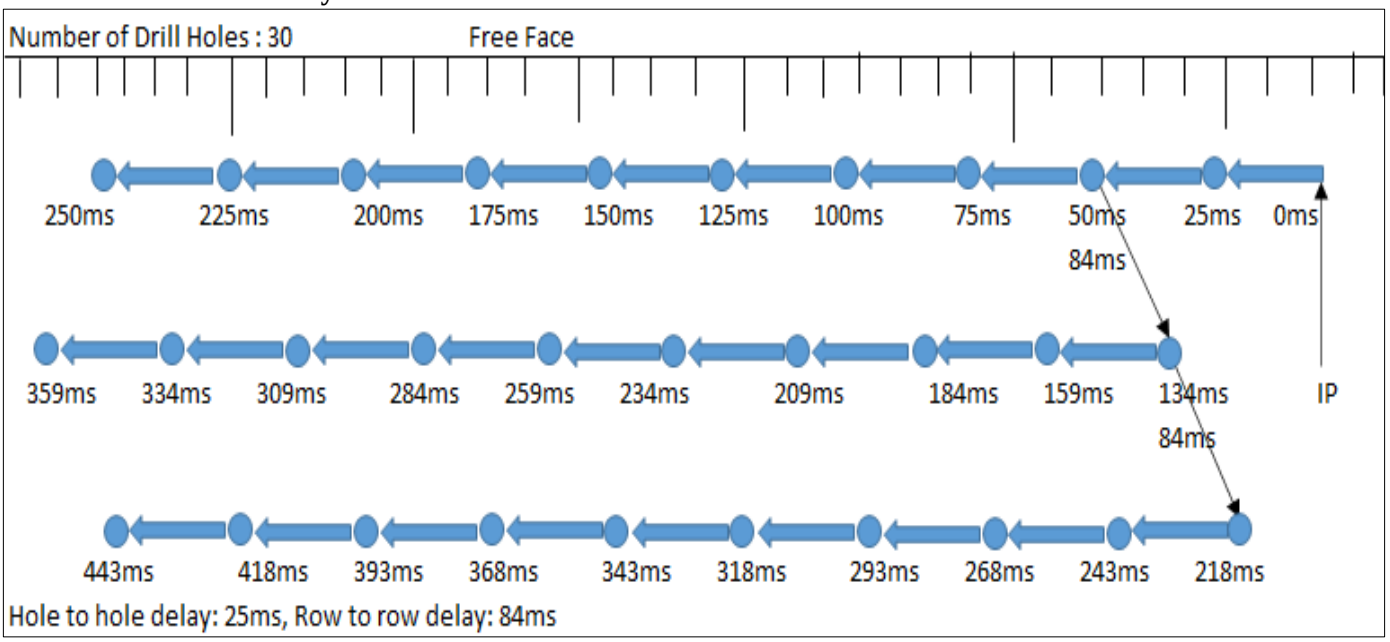
# Appendix-II

**Recommended Blasting Pattern for Tasra OCP, SAIL-Colliery Division**

**Electronic Initiation System**

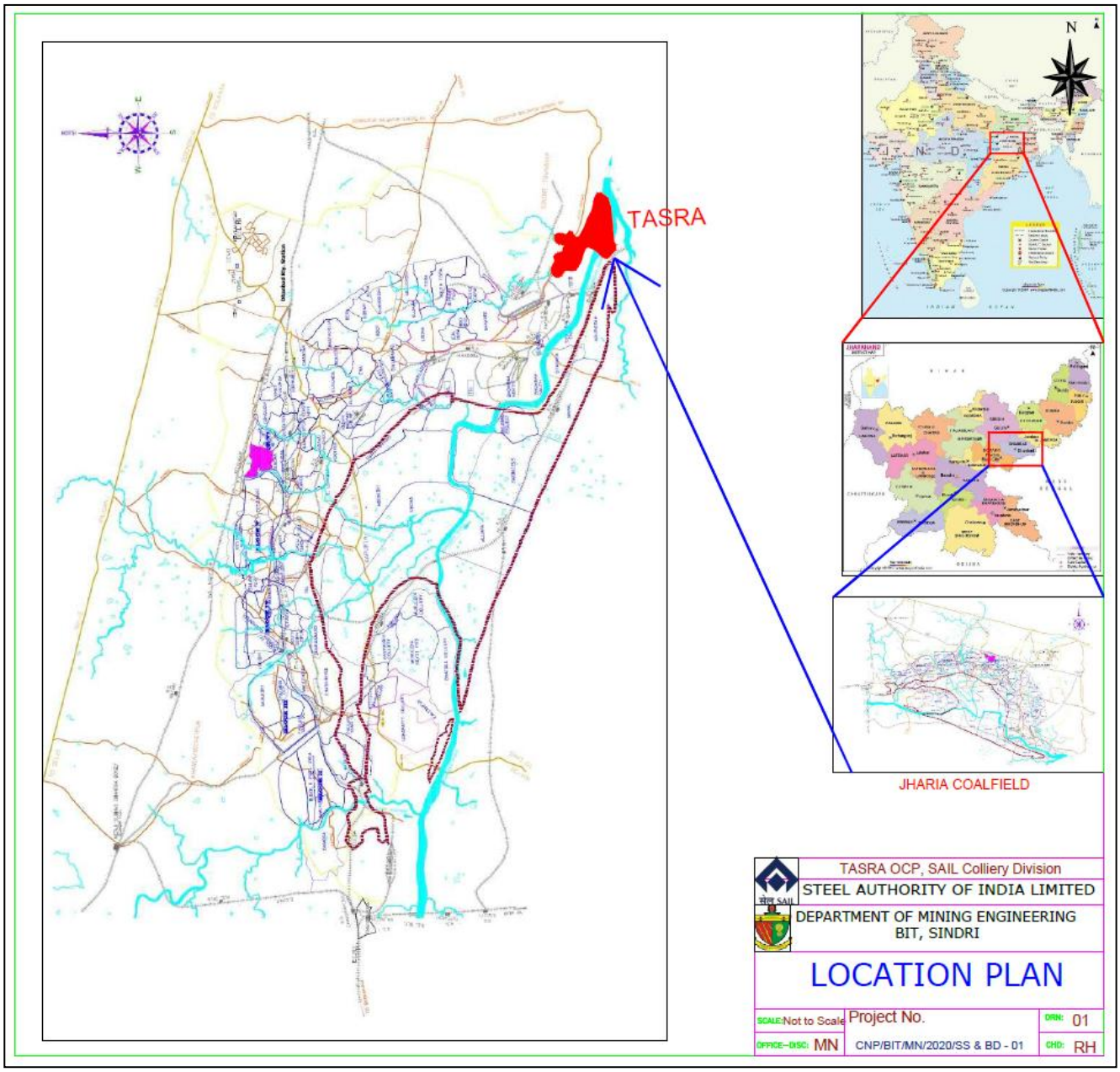



**Non- electric Initiation System**



## Appendix-III

Surface Layout Plan for Tasra OCP, SAIL-Colliery Division



# Appendix-IV

Details of waveforms, frequency and OSMRE of Tasra OCP, SAIL-Colliery Division

Instantel

| | | | |
|---|---|---|---|
| **Waveform Trigger Source** | Long at July 10, 2021 16:05:04 | **Serial Number** | UM12384 |
| **Trigger Level(s)** | Geo 0.128 mm/s | **Model Number** | Micromate ISEE 10.89 |
| **Trigger Level (Mic)** | Mic 68.95 pa, 131 dB(L) | **Battery Level** | 3.8 volts |
| **Pre-Trigger/Record Time** | 0.01 sec/3.0 sec (Fixed) | **Unit Calibration** | January 13, 2018 by UES New Delhi |
| **Sample Rate** | 2048 sps | **Event File Name** | UM12384_20210710160504.IDFW |
| **Setup File Name** | factory_AA.MMB | **USB Sensor Support** | Disabled |
| **Operator** | Operator | | |
| **Job Number** | 1 | | |

**Notes**

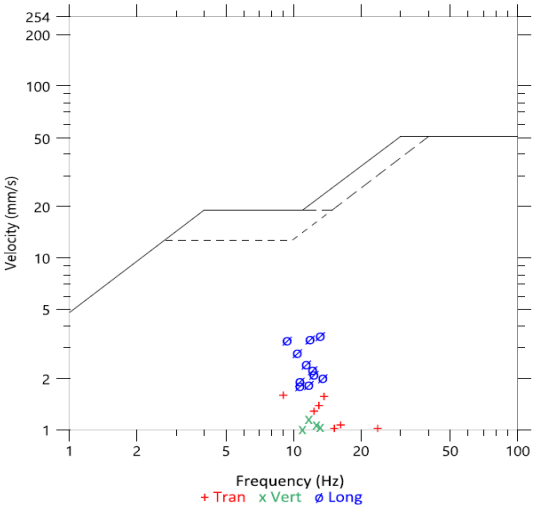
Location: Tasra, OCP
Client: Steel Authority of India Limited
User Name: Department of Mining Engineering, BIT Sindri
General:

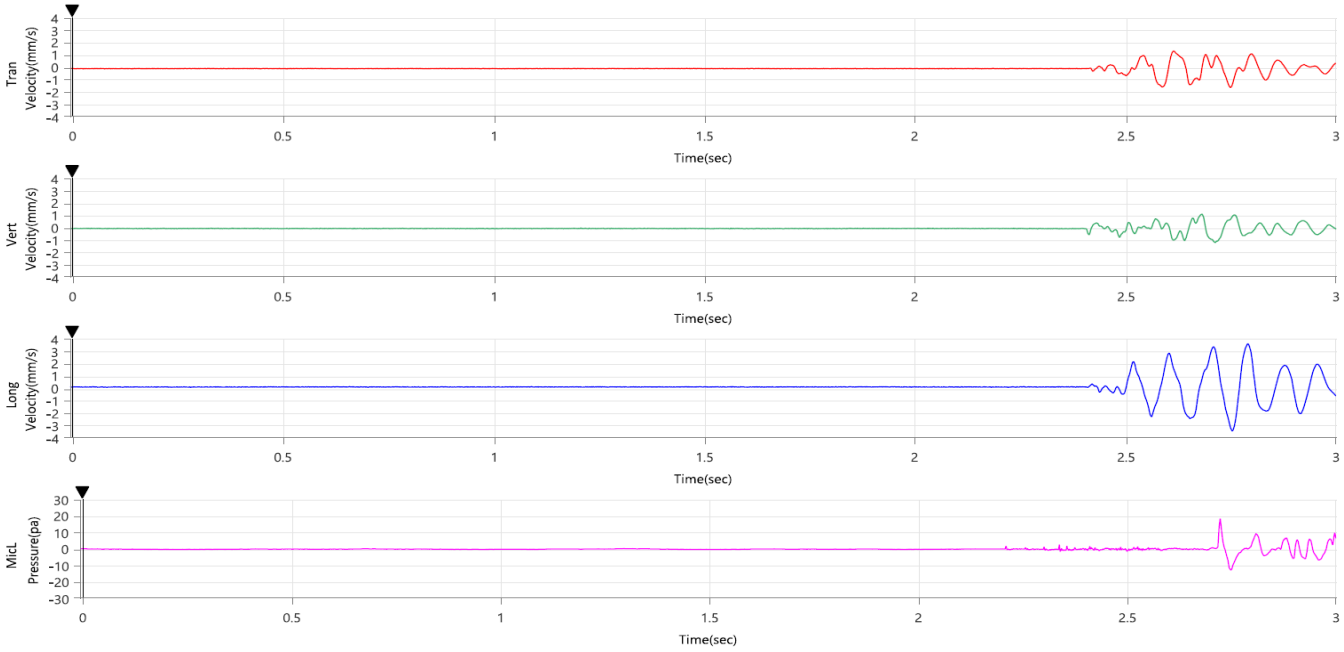
**Post Event Notes** No text to be displayed.

| **Geophone** | **Tran** | **Vert** | **Long** |
|---|---|---|---|
| Peak Particle Velocity | 1.639 mm/s | 1.190 mm/s | 3.586 mm/s |
| Zero Crossing Frequency | 9.1 Hz | 11.6 Hz | 13.1 Hz |
| Time (Relative to Trigger) | 2.749 sec | 2.712 sec | 2.790 sec |
| Peak Acceleration | 0.026 g | 0.025 g | 0.061 g |
| Peak Displacement | 0.132 mm | 0.075 mm | 0.138 mm |
| Sensor Check | ✓ Passed | ✓ Passed | ✓ Passed |
| Frequency | 7.3 Hz | 7.5 Hz | 7.3 Hz |
| Overswing Ratio | 3.7 | 3.3 | 3.3 |
| Peak Vector Sum | 3.827 mm/s at 2.753 sec | | |

| **ISEE Linear Microphone** | |
|---|---|
| Peak Sound Pressure Level | 18.37 pa |
| Time (Relative to Trigger) | 2.722 sec |
| Zero Crossing Frequency | 13.5 Hz |
| Sensor Check | ✓ Passed |
| Frequency | 19.7 Hz |
| Test Amplitude | 1135 mv |

**USBM RI8507 And OSMRE**
Velocity versus Frequency (Zero Crossing)

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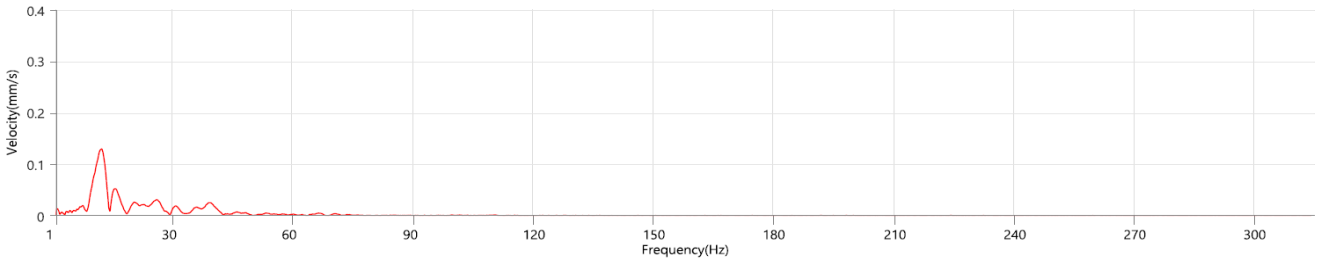
| | | | |
|---|---|---|---|
| **Waveform Trigger Source** | Long at July 10, 2021 16:05:04 | **Serial Number** | UM12384 |
| **Trigger Level(s)** | Geo 0.128 mm/s | **Model Number** | Micromate ISEE 10.89 |
| **Trigger Level (Mic)** | Mic 68.95 pa, 131 dB(L) | **Battery Level** | 3.8 volts |
| **Pre-Trigger/Record Time** | 0.01 sec/3.0 sec (Fixed) | **Unit Calibration** | January 13, 2018 by UES New Delhi |
| **Sample Rate** | 2048 sps | **Event File Name** | UM12384_20210710160504.IDFW |
| **Setup File Name** | factory_AA.MMB | **USB Sensor Support** | Disabled |
| **Operator** | Operator | | |
| **Job Number** | 1 | | |

**Notes**

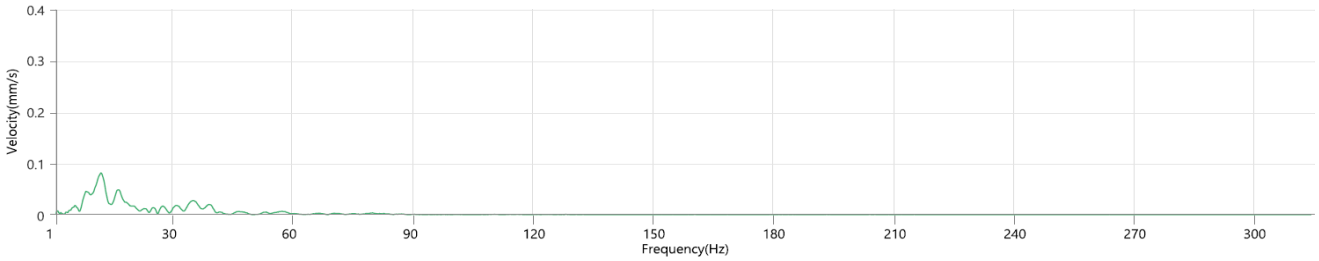
| | |
|---|---|
| Location: | Tasra, OCP |
| Client: | Steel Authority of India Limited |
| User Name: | Department of Mining Engineering, BIT Sindri |
| General: | |

**Post Event Notes** No text to be displayed.

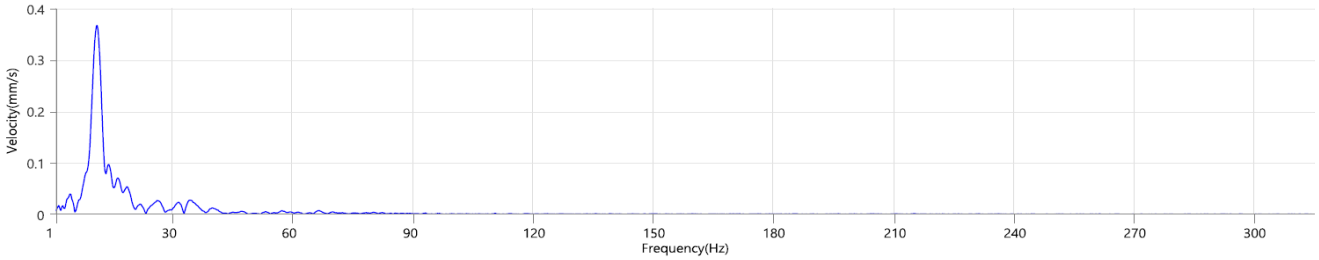
**Tran - Dominant Frequency 12.5 Hz, Amplitude 0.130 mm/s (Peak Particle Velocity: 1.639 mm/s)**



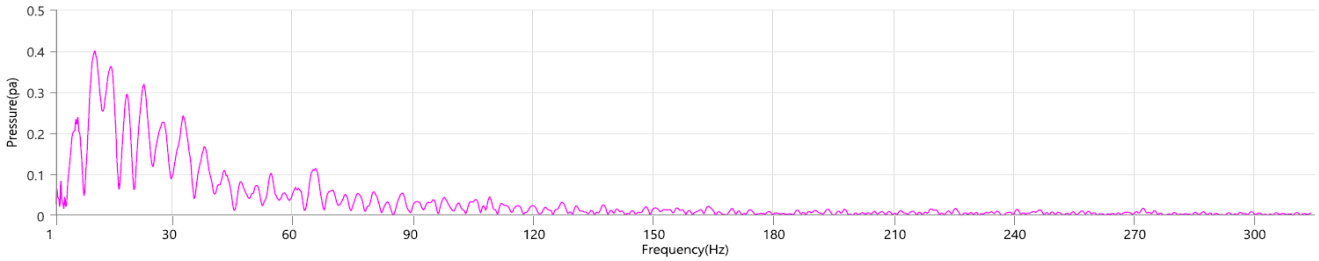

**Vert - Dominant Frequency 12.2 Hz, Amplitude 0.082 mm/s (Peak Particle Velocity: 1.190 mm/s)**




**Long - Dominant Frequency 11.2 Hz, Amplitude 0.368 mm/s (Peak Particle Velocity: 3.586 mm/s)**




**MicL - Dominant Frequency 10.8 Hz, Amplitude 0.40 pa (Peak Sound Pressure Level: 18.37 pa)**

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Instantel

| | | | |
|---|---|---|---|
| **Waveform Trigger Source** | Tran at July 10, 2021 16:12:28 | **Serial Number** | UM12384 |
| **Trigger Level(s)** | Geo 0.128 mm/s | **Model Number** | Micromate ISEE 10.89 |
| **Trigger Level (Mic)** | Mic 68.95 pa, 131 dB(L) | **Battery Level** | 3.8 volts |
| **Pre-Trigger/Record Time** | 0.00 sec/3.0 sec (Fixed) | **Unit Calibration** | January 13, 2018 by UES New Delhi |
| **Sample Rate** | 2048 sps | **Event File Name** | UM12384_20210710161228.IDFW |
| **Setup File Name** | factory_AA.MMB | **USB Sensor Support** | Disabled |
| **Operator** | Operator | | |
| **Job Number** | 1 | | |

**Notes**

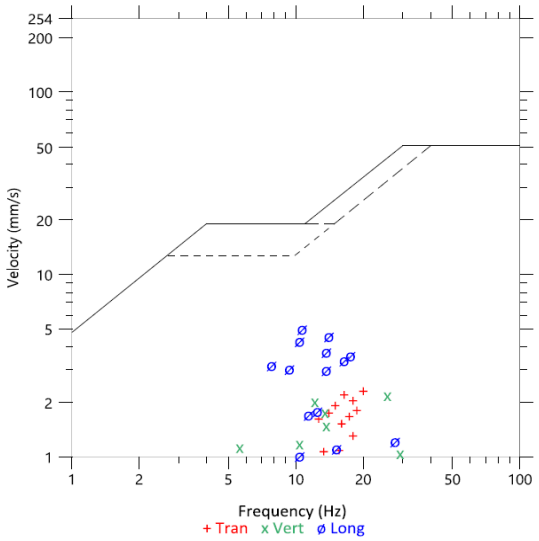
Location: Tasra, OCP
Client: Steel Authority of India Limited
User Name: Department of Mining Engineering, BIT Sindri
General:

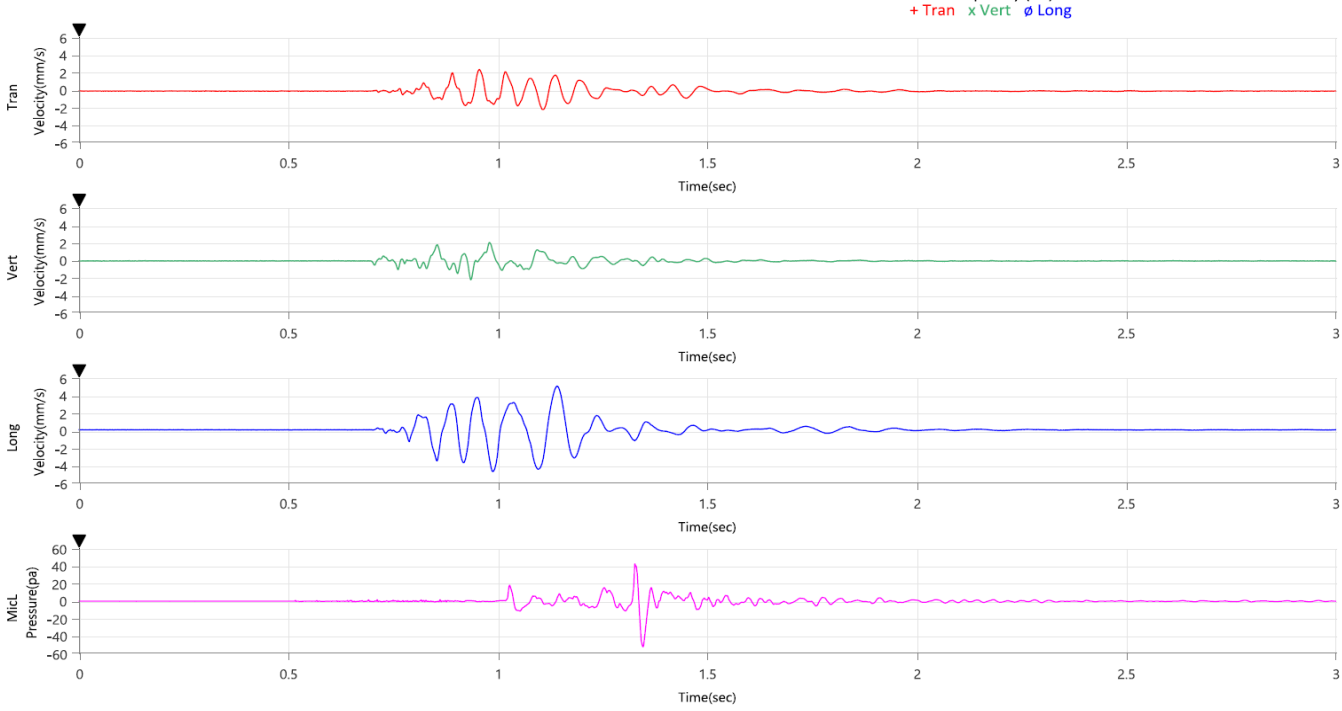
**Post Event Notes** No text to be displayed.

| **Geophone** | **Tran** | **Vert** | **Long** |
|---|---|---|---|
| Peak Particle Velocity | 2.333 mm/s | 2.223 mm/s | 5.092 mm/s |
| Zero Crossing Frequency | 20.1 Hz | 25.6 Hz | 10.7 Hz |
| Time (Relative to Trigger) | 0.954 sec | 0.935 sec | 1.140 sec |
| Peak Acceleration | 0.038 g | 0.039 g | 0.054 g |
| Peak Displacement | 0.045 mm | 0.026 mm | 0.075 mm |
| Sensor Check | ✓ Passed | ✓ Passed | ✓ Passed |
| Frequency | 7.3 Hz | 7.5 Hz | 7.3 Hz |
| Overswing Ratio | 3.7 | 3.3 | 3.3 |
| Peak Vector Sum | 5.325 mm/s at 1.140 sec | | |

| **ISEE Linear Microphone** | |
|---|---|
| Peak Sound Pressure Level | 52.41 pa |
| Time (Relative to Trigger) | 1.346 sec |
| Zero Crossing Frequency | 21.3 Hz |
| Sensor Check | ✓ Passed |
| Frequency | 19.7 Hz |
| Test Amplitude | 1150 mv |

**USBM RI8507 And OSMRE**
Velocity versus Frequency (Zero Crossing)



Instantel

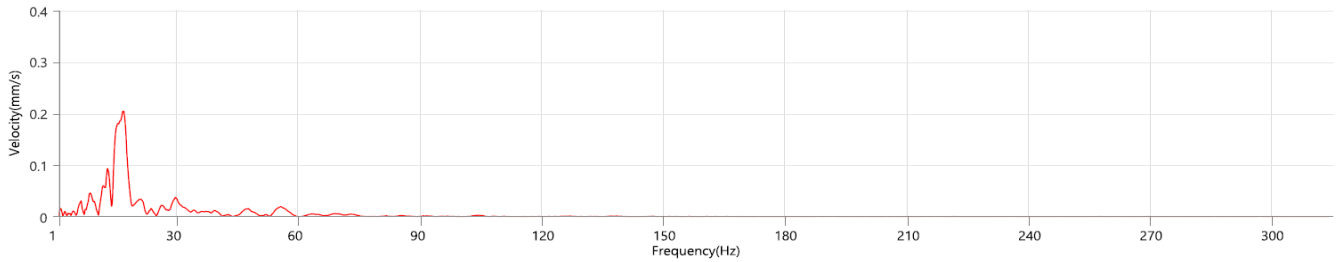
| | | | |
|---|---|---|---|
| **Waveform Trigger Source** | Tran at July 10, 2021 16:12:28 | **Serial Number** | UM12384 |
| **Trigger Level(s)** | Geo 0.128 mm/s | **Model Number** | Micromate ISEE 10.89 |
| **Trigger Level (Mic)** | Mic 68.95 pa, 131 dB(L) | **Battery Level** | 3.8 volts |
| **Pre-Trigger/Record Time** | 0.00 sec/3.0 sec (Fixed) | **Unit Calibration** | January 13, 2018 by UES New Delhi |
| **Sample Rate** | 2048 sps | **Event File Name** | UM12384_20210710161228.IDFW |
| **Setup File Name** | factory_AA.MMB | **USB Sensor Support** | Disabled |
| **Operator** | Operator | | |
| **Job Number** | 1 | | |

**Notes**

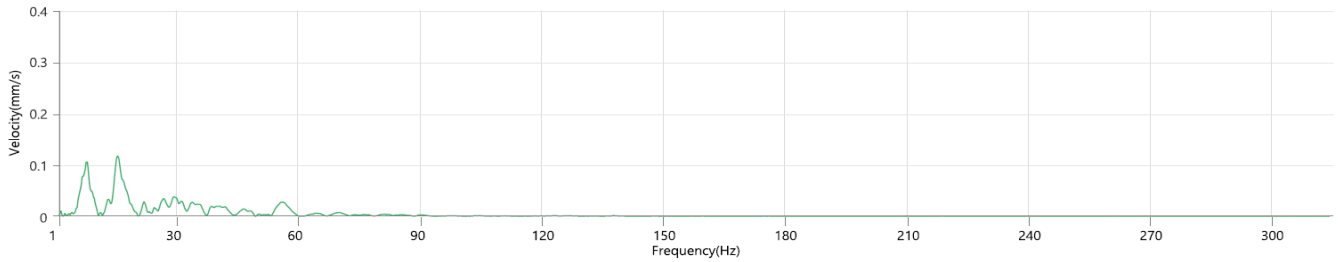
| | |
|---|---|
| Location: | Tasra, OCP |
| Client: | Steel Authority of India Limited |
| User Name: | Department of Mining Engineering, BIT Sindri |
| General: | |

**Post Event Notes** No text to be displayed.

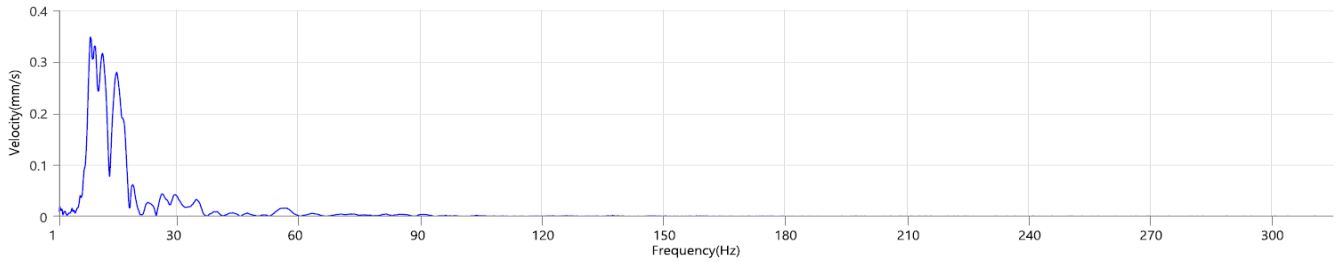
**Tran - Dominant Frequency 17.0 Hz, Amplitude 0.205 mm/s (Peak Particle Velocity: 2.333 mm/s)**



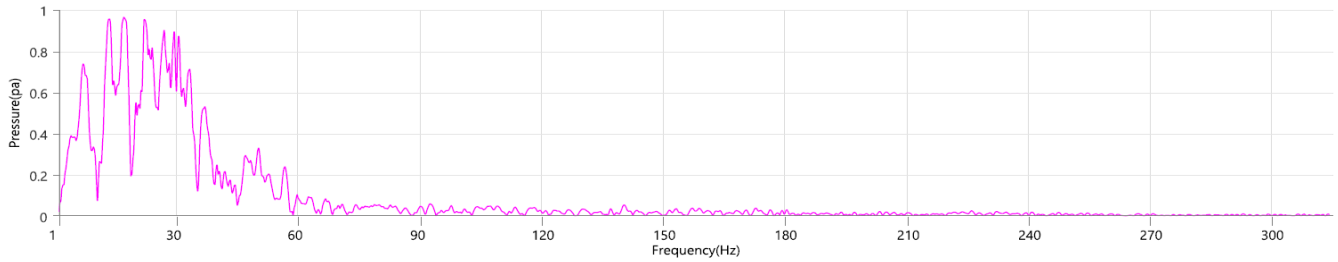

**Vert - Dominant Frequency 15.5 Hz, Amplitude 0.118 mm/s (Peak Particle Velocity: 2.223 mm/s)**




**Long - Dominant Frequency 8.8 Hz, Amplitude 0.349 mm/s (Peak Particle Velocity: 5.092 mm/s)**




**MicL - Dominant Frequency 17.0 Hz, Amplitude 0.97 pa (Peak Sound Pressure Level: 52.41 pa)**

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Instantel

| | |
|---|---|
| **Waveform Trigger Source** | Tran at July 13, 2021 14:33:05 |
| **Trigger Level(s)** | Geo 0.128 mm/s |
| **Trigger Level (Mic)** | Mic 68.95 pa, 131 dB(L) |
| **Pre-Trigger/Record Time** | 0.00 sec/3.0 sec (Fixed) |
| **Sample Rate** | 2048 sps |
| **Setup File Name** | factory_AA.MMB |
| **Operator** | Operator |
| **Job Number** | 1 |

| | |
|---|---|
| **Serial Number** | UM12384 |
| **Model Number** | Micromate ISEE 10.89 |
| **Battery Level** | 3.8 volts |
| **Unit Calibration** | January 13, 2018 by UES New Delhi |
| **Event File Name** | UM12384_20210713143305.IDFW |
| **USB Sensor Support** | Disabled |

**Notes**

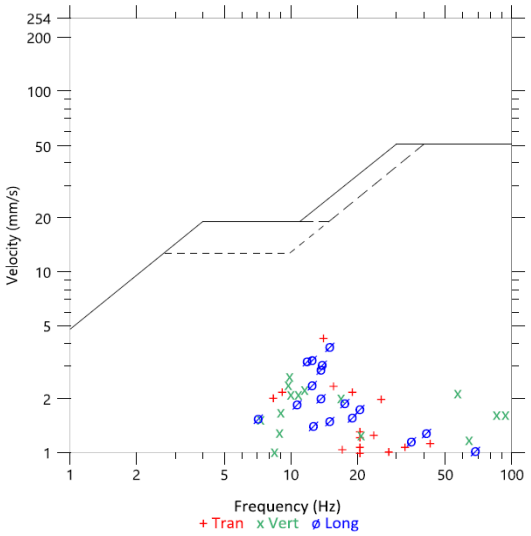
| | |
|---|---|
| Location: | Tasra, OCP |
| Client: | Steel Authority of India Limited |
| User Name: | Department of Mining Engineering, BIT Sindri |
| General: | |

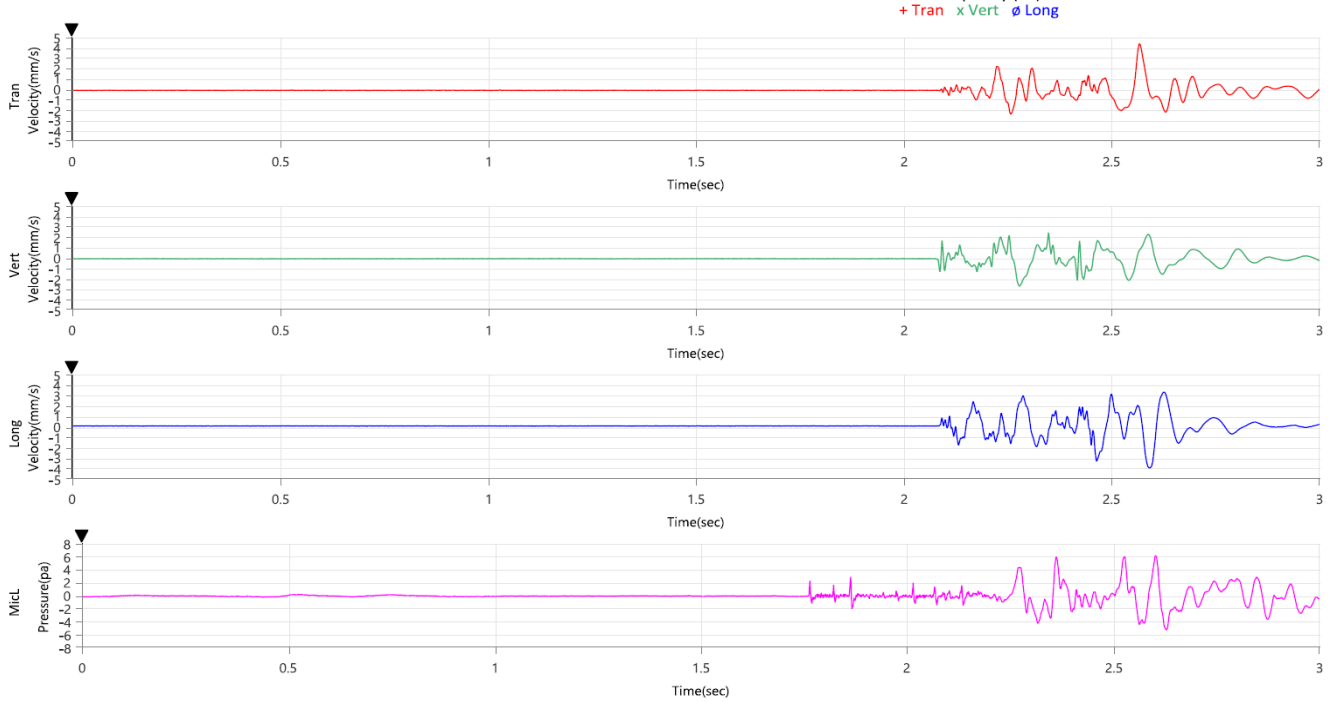
**Post Event Notes** No text to be displayed.

| **Geophone** | **Tran** | **Vert** | **Long** |
|---|---|---|---|
| Peak Particle Velocity | 4.390 mm/s | 2.703 mm/s | 3.965 mm/s |
| Zero Crossing Frequency | 14.0 Hz | 9.8 Hz | 15.1 Hz |
| Time (Relative to Trigger) | 2.567 sec | 2.278 sec | 2.591 sec |
| Peak Acceleration | 0.054 g | 0.117 g | 0.089 g |
| Peak Displacement | 0.111 mm | 0.073 mm | 0.081 mm |
| Sensor Check | ✓ Passed | ✓ Passed | ✓ Passed |
| Frequency | 7.3 Hz | 7.5 Hz | 7.3 Hz |
| Overswing Ratio | 3.7 | 3.3 | 3.4 |
| Peak Vector Sum | 4.772 mm/s at 2.567 sec | | |

| **ISEE Linear Microphone** | |
|---|---|
| Peak Sound Pressure Level | 6.14 pa |
| Time (Relative to Trigger) | 2.602 sec |
| Zero Crossing Frequency | 18.0 Hz |
| Sensor Check | ✓ Passed |
| Frequency | 19.7 Hz |
| Test Amplitude | 1167 mv |

**USBM RI8507 And OSMRE**
Velocity versus Frequency (Zero Crossing)




Created by version 1.3.0.12.

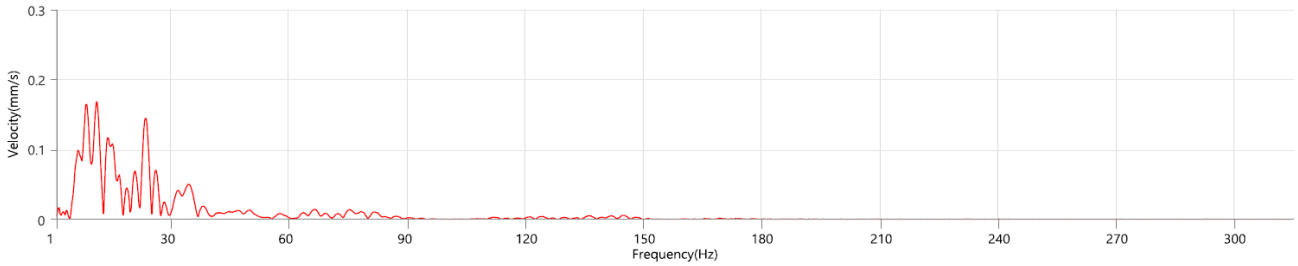
| | | | |
|---|---|---|---|
| **Waveform Trigger Source** | Tran at July 13, 2021 14:33:05 | **Serial Number** | UM12384 |
| **Trigger Level(s)** | Geo 0.128 mm/s | **Model Number** | Micromate ISEE 10.89 |
| **Trigger Level (Mic)** | Mic 68.95 pa, 131 dB(L) | **Battery Level** | 3.8 volts |
| **Pre-Trigger/Record Time** | 0.00 sec/3.0 sec (Fixed) | **Unit Calibration** | January 13, 2018 by UES New Delhi |
| **Sample Rate** | 2048 sps | **Event File Name** | UM12384_20210713143305.IDFW |
| **Setup File Name** | factory_AA.MMB | **USB Sensor Support** | Disabled |
| **Operator** | Operator | | |
| **Job Number** | 1 | | |

**Notes**

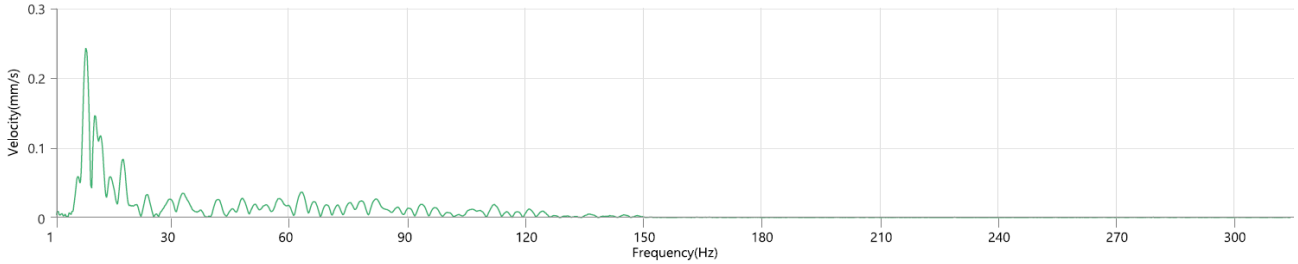
| | |
|---|---|
| Location: | Tasra, OCP |
| Client: | Steel Authority of India Limited |
| User Name: | Department of Mining Engineering, BIT Sindri |
| General: | |

**Post Event Notes** No text to be displayed.

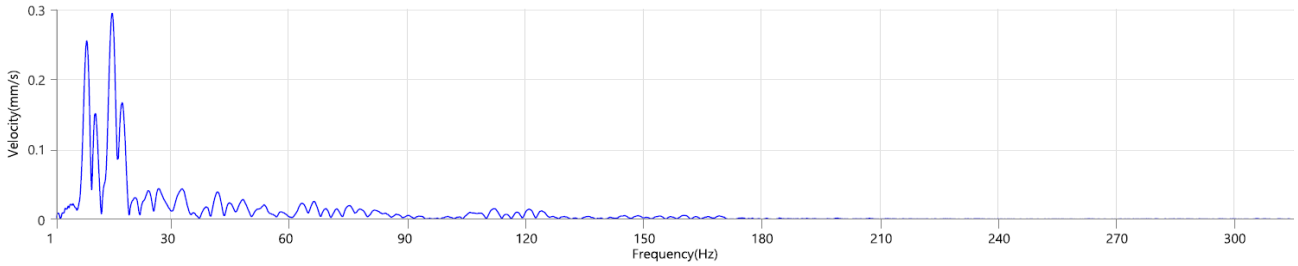
**Tran - Dominant Frequency 11.2 Hz, Amplitude 0.169 mm/s (Peak Particle Velocity: 4.390 mm/s)**



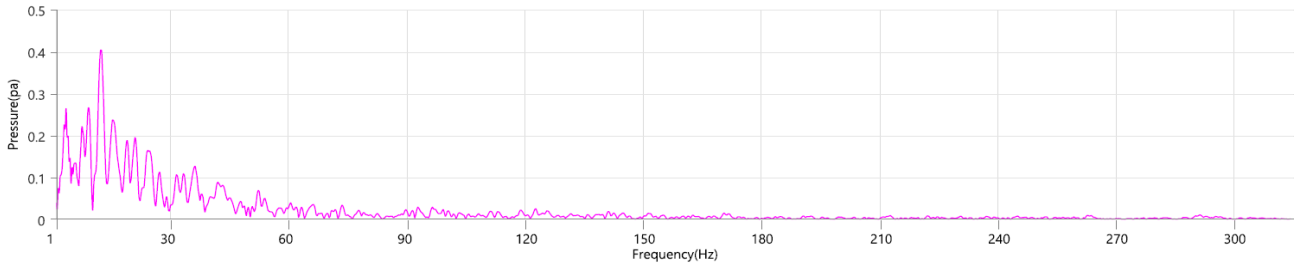

**Vert - Dominant Frequency 8.5 Hz, Amplitude 0.243 mm/s (Peak Particle Velocity: 2.703 mm/s)**




**Long - Dominant Frequency 15.2 Hz, Amplitude 0.294 mm/s (Peak Particle Velocity: 3.965 mm/s)**




**MicL - Dominant Frequency 12.2 Hz, Amplitude 0.40 pa (Peak Sound Pressure Level: 6.14 pa)**

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Instantel

| | | | |
|---|---|---|---|
| **Waveform Trigger Source** | Tran at July 14, 2021 13:29:59 | **Serial Number** | UM12384 |
| **Trigger Level(s)** | Geo 0.128 mm/s | **Model Number** | Micromate ISEE 10.89 |
| **Trigger Level (Mic)** | Mic 68.95 pa, 131 dB(L) | **Battery Level** | 3.8 volts |
| **Pre-Trigger/Record Time** | 0.00 sec/3.0 sec (Fixed) | **Unit Calibration** | January 13, 2018 by UES New Delhi |
| **Sample Rate** | 2048 sps | **Event File Name** | UM12384_20210714132959.IDFW |
| **Setup File Name** | factory_AA.MMB | **USB Sensor Support** | Disabled |
| **Operator** | Operator | | |
| **Job Number** | 1 | | |

**Notes**

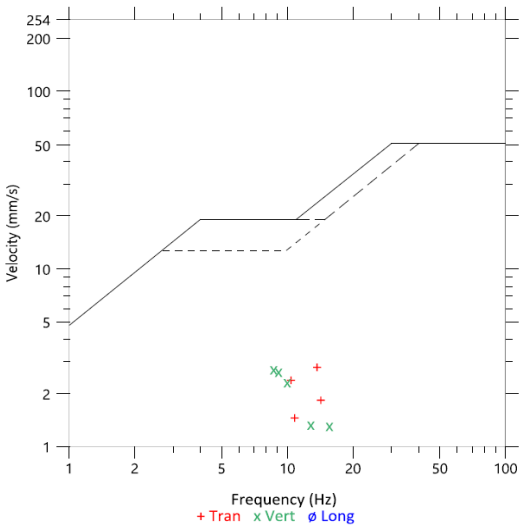
Location: Tasra, OCP
Client: Steel Authority of India Limited
User Name: Department of Mining Engineering, BIT Sindri
General:

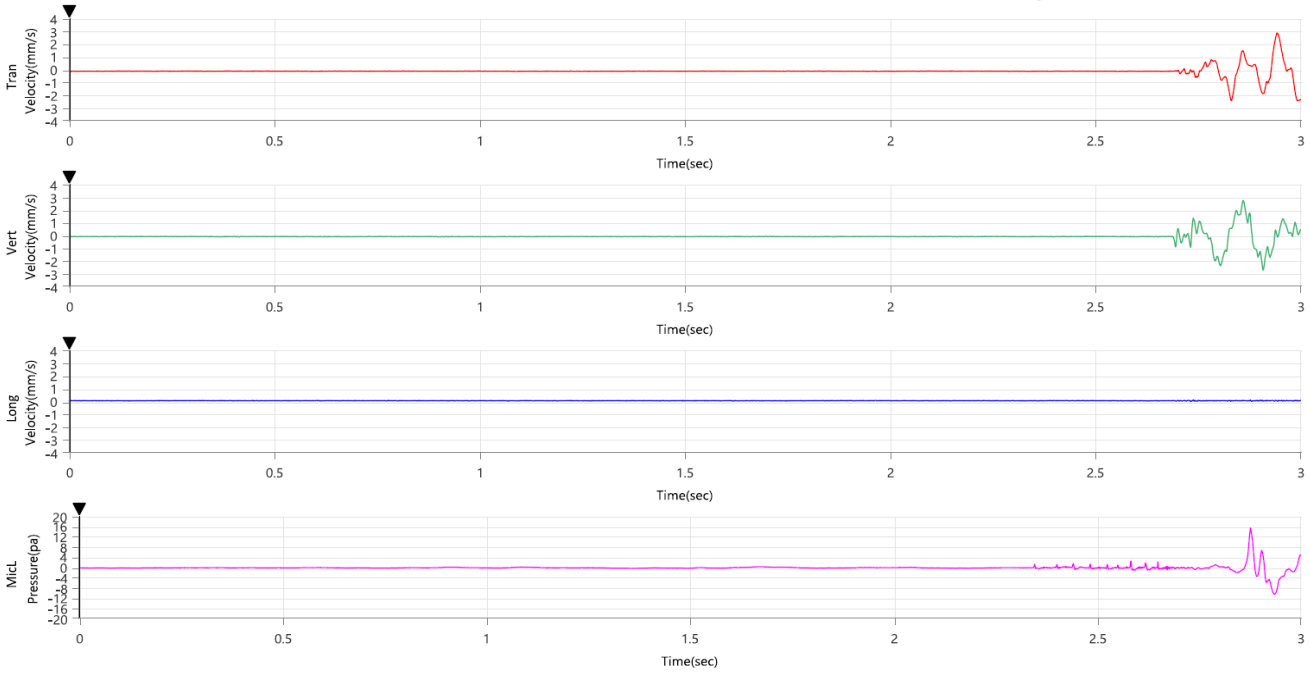
**Post Event Notes** No text to be displayed.

| **Geophone** | **Tran** | **Vert** | **Long** |
|---|---|---|---|
| Peak Particle Velocity | 2.885 mm/s | 2.767 mm/s | 0.134 mm/s |
| Zero Crossing Frequency | 13.8 Hz | 8.6 Hz | N/A |
| Time (Relative to Trigger) | 2.941 sec | 2.858 sec | 2.738 sec |
| Peak Acceleration | 0.039 g | 0.061 g | 0.010 g |
| Peak Displacement | 0.153 mm | 0.093 mm | 0.098 mm |
| Sensor Check | ✓ Passed | ✓ Passed | ✗ Check |
| Frequency | 7.3 Hz | 7.5 Hz | 14.8 Hz |
| Overswing Ratio | 3.7 | 3.3 | 3.2 |
| Peak Vector Sum | 3.286 mm/s at 2.908 sec | | |

| **ISEE Linear Microphone** | |
|---|---|
| Peak Sound Pressure Level | 15.56 pa |
| Time (Relative to Trigger) | 2.875 sec |
| Zero Crossing Frequency | 20.1 Hz |
| Sensor Check | ✓ Passed |
| Frequency | 19.7 Hz |
| Test Amplitude | 1201 mv |

**USBM RI8507 And OSMRE**
Velocity versus Frequency (Zero Crossing)



Instantel

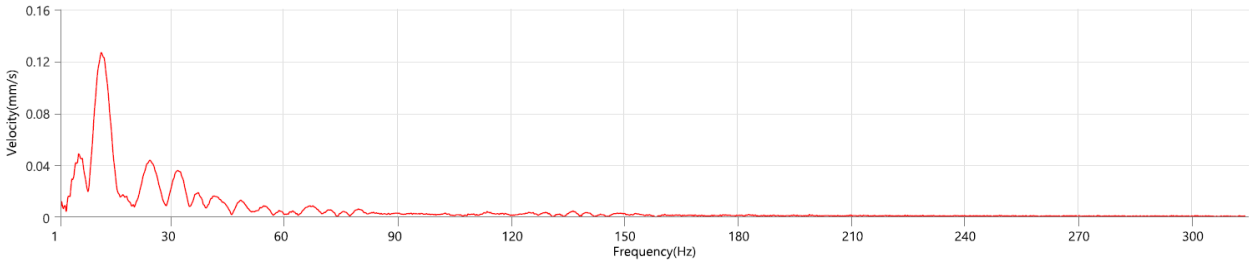
| | | | |
|---|---|---|---|
| **Waveform Trigger Source** | Tran at July 14, 2021 13:29:59 | **Serial Number** | UM12384 |
| **Trigger Level(s)** | Geo 0.128 mm/s | **Model Number** | Micromate ISEE 10.89 |
| **Trigger Level (Mic)** | Mic 68.95 pa, 131 dB(L) | **Battery Level** | 3.8 volts |
| **Pre-Trigger/Record Time** | 0.00 sec/3.0 sec (Fixed) | **Unit Calibration** | January 13, 2018 by UES New Delhi |
| **Sample Rate** | 2048 sps | **Event File Name** | UM12384_20210714132959.IDFW |
| **Setup File Name** | factory_AA.MMB | **USB Sensor Support** | Disabled |
| **Operator** | Operator | | |
| **Job Number** | 1 | | |

**Notes**

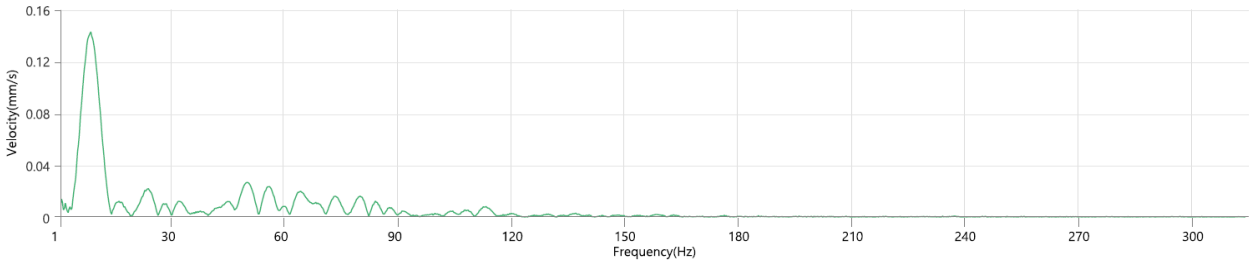
Location: Tasra, OCP
Client: Steel Authority of India Limited
User Name: Department of Mining Engineering, BIT Sindri
General:

**Post Event Notes** No text to be displayed.

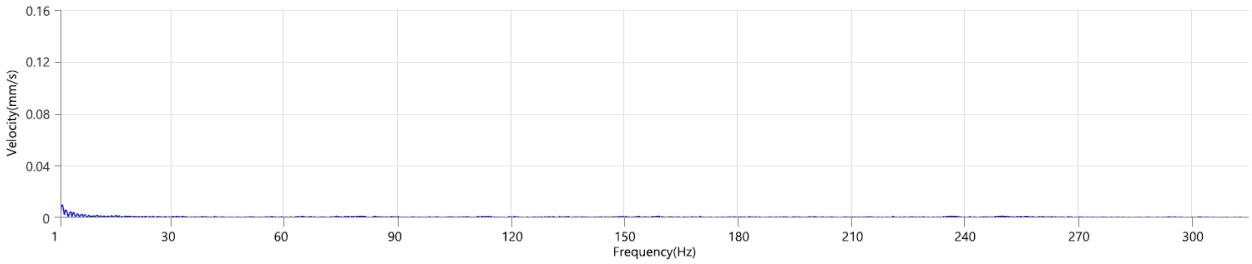
**Tran - Dominant Frequency 11.8 Hz, Amplitude 0.127 mm/s (Peak Particle Velocity: 2.885 mm/s)**



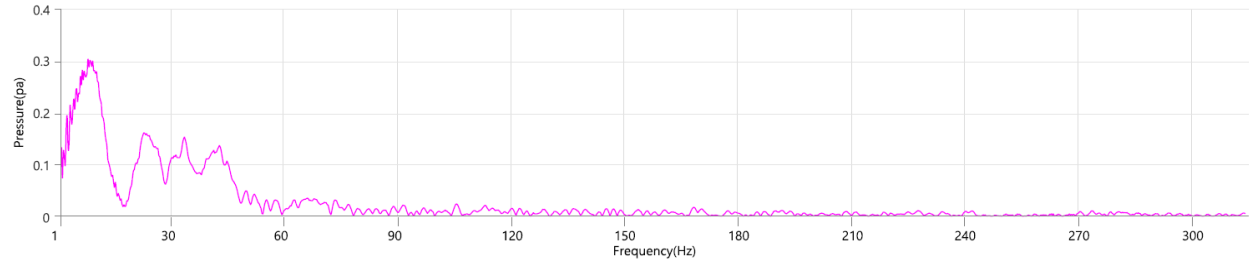

**Vert - Dominant Frequency 9.0 Hz, Amplitude 0.143 mm/s (Peak Particle Velocity: 2.767 mm/s)**




**Long - Dominant Frequency 1.5 Hz, Amplitude 0.010 mm/s (Peak Particle Velocity: 0.134 mm/s)**




**MicL - Dominant Frequency 8.2 Hz, Amplitude 0.30 pa (Peak Sound Pressure Level: 15.56 pa)**

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Instantel

| | | | |
|---|---|---|---|
| **Waveform Trigger Source** | Tran at July 14, 2021 13:22:10 | **Serial Number** | UM12384 |
| **Trigger Level(s)** | Geo 0.128 mm/s | **Model Number** | Micromate ISEE 10.89 |
| **Trigger Level (Mic)** | Mic 68.95 pa, 131 dB(L) | **Battery Level** | 3.8 volts |
| **Pre-Trigger/Record Time** | 0.00 sec/3.0 sec (Fixed) | **Unit Calibration** | January 13, 2018 by UES New Delhi |
| **Sample Rate** | 2048 sps | **Event File Name** | UM12384_20210714132210.IDFW |
| **Setup File Name** | factory_AA.MMB | **USB Sensor Support** | Disabled |
| **Operator** | Operator | | |
| **Job Number** | 1 | | |

**Notes**

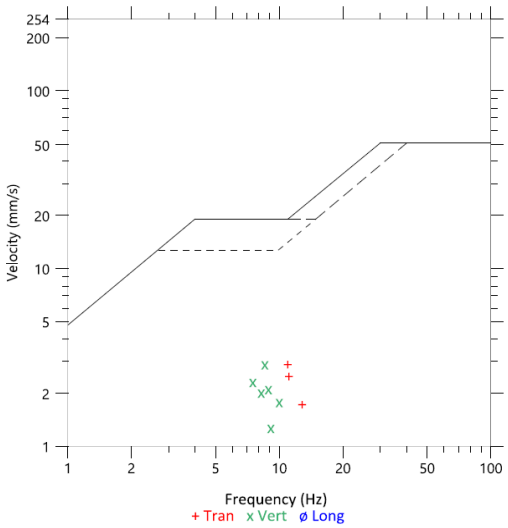
| | |
|---|---|
| Location: | Tasra, OCP |
| Client: | Steel Authority of India Limited |
| User Name: | Department of Mining Engineering, BIT Sindri |
| General: | |

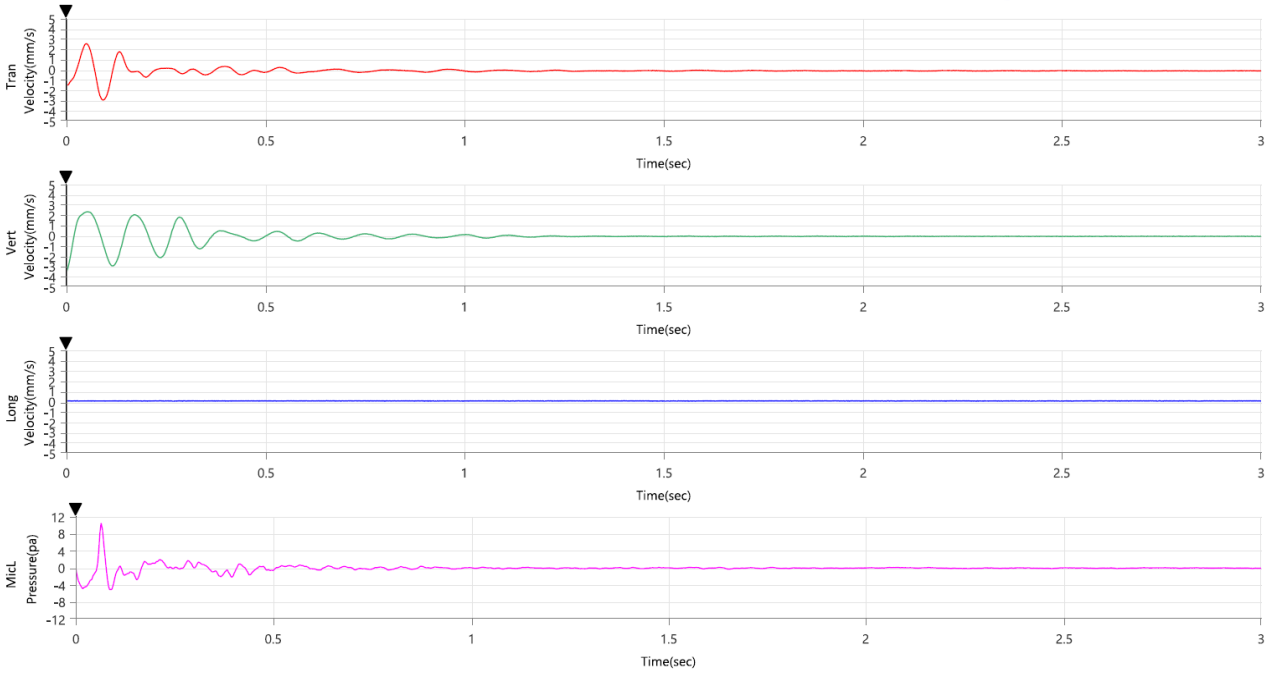
**Post Event Notes** No text to be displayed.

| **Geophone** | **Tran** | **Vert** | **Long** |
|---|---|---|---|
| Peak Particle Velocity | 2.971 mm/s | 3.641 mm/s | <0.127 mm/s |
| Zero Crossing Frequency | 10.9 Hz | N/A | N/A |
| Time (Relative to Trigger) | 0.092 sec | 0.000 sec | 2.235 sec |
| Peak Acceleration | 0.025 g | 0.030 g | 0.010 g |
| Peak Displacement | 0.044 mm | 0.055 mm | 0.000 mm |
| Sensor Check | ✓ Passed | ✓ Passed | X Check |
| Frequency | 7.3 Hz | 7.5 Hz | 14.8 Hz |
| Overswing Ratio | 3.7 | 3.3 | 3.2 |
| Peak Vector Sum | 3.884 mm/s at 0.000 sec | | |

| **ISEE Linear Microphone** | |
|---|---|
| Peak Sound Pressure Level | 10.36 pa |
| Time (Relative to Trigger) | 0.063 sec |
| Zero Crossing Frequency | 21.3 Hz |
| Sensor Check | ✓ Passed |
| Frequency | 19.7 Hz |
| Test Amplitude | 1201 mv |

**USBM RI8507 And OSMRE**
Velocity versus Frequency (Zero Crossing)

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Instantel

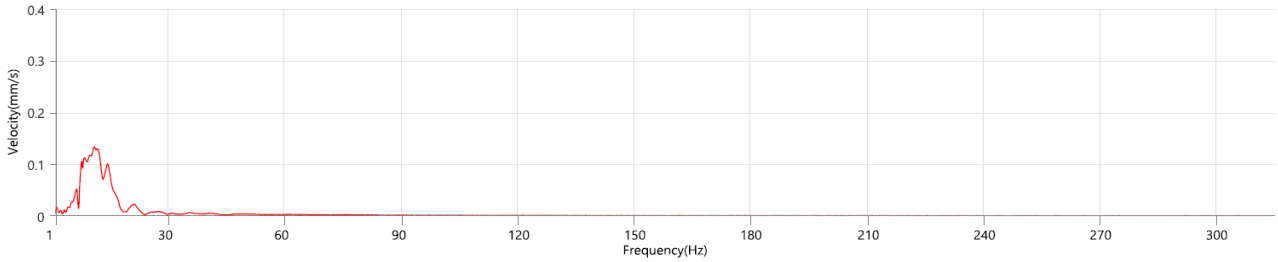
| | | | |
|---|---|---|---|
| **Waveform Trigger Source** | Tran at July 14, 2021 13:22:10 | **Serial Number** | UM12384 |
| **Trigger Level(s)** | Geo 0.128 mm/s | **Model Number** | Micromate ISEE 10.89 |
| **Trigger Level (Mic)** | Mic 68.95 pa, 131 dB(L) | **Battery Level** | 3.8 volts |
| **Pre-Trigger/Record Time** | 0.00 sec/3.0 sec (Fixed) | **Unit Calibration** | January 13, 2018 by UES New Delhi |
| **Sample Rate** | 2048 sps | **Event File Name** | UM12384_20210714132210.IDFW |
| **Setup File Name** | factory_AA.MMB | **USB Sensor Support** | Disabled |
| **Operator** | Operator | | |
| **Job Number** | 1 | | |

**Notes**

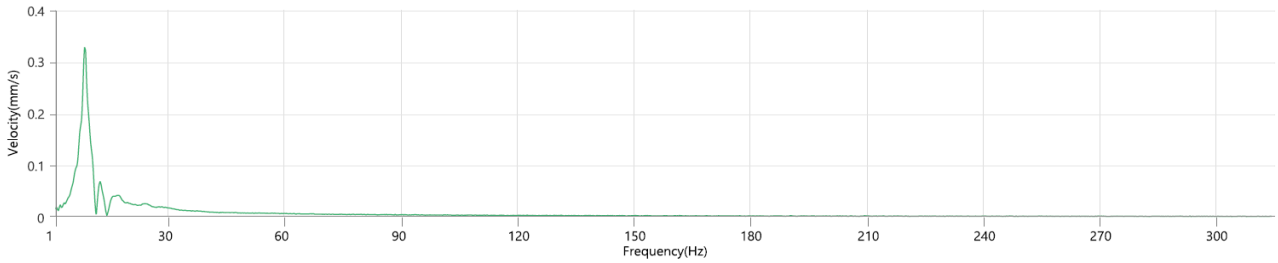
| | |
|---|---|
| Location: | Tasra, OCP |
| Client: | Steel Authority of India Limited |
| User Name: | Department of Mining Engineering, BIT Sindri |
| General: | |

**Post Event Notes** No text to be displayed.

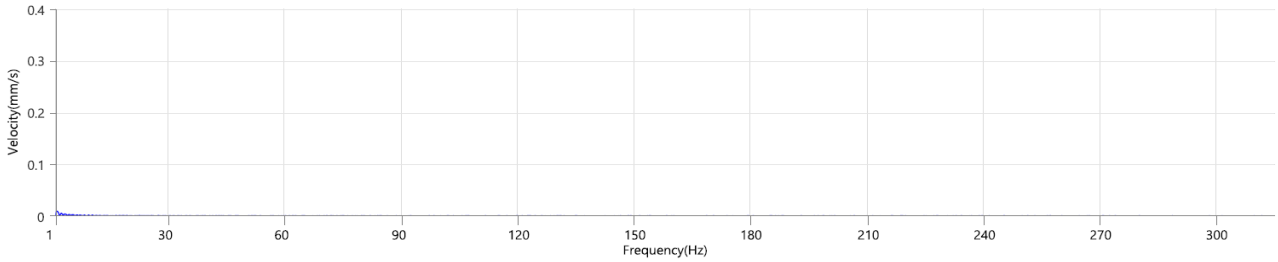
**Tran - Dominant Frequency 11.0 Hz, Amplitude 0.134 mm/s (Peak Particle Velocity: 2.971 mm/s)**



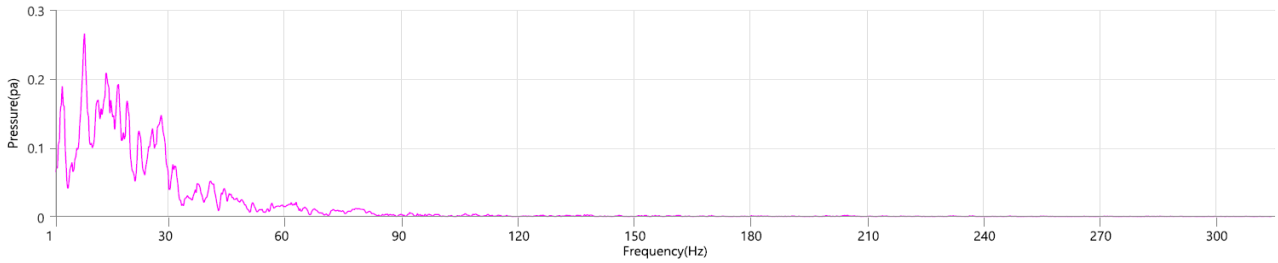

**Vert - Dominant Frequency 8.5 Hz, Amplitude 0.328 mm/s (Peak Particle Velocity: 3.641 mm/s)**




**Long - Dominant Frequency 1.5 Hz, Amplitude 0.009 mm/s (Peak Particle Velocity: 0.110 mm/s)**




**MicL - Dominant Frequency 8.5 Hz, Amplitude 0.26 pa (Peak Sound Pressure Level: 10.36 pa)**

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| | | | |
|---|---|---|---|
| **Waveform Trigger Source** | Tran at July 14, 2021 13:29:59 | **Serial Number** | UM12384 |
| **Trigger Level(s)** | Geo 0.128 mm/s | **Model Number** | Micromate ISEE 10.89 |
| **Trigger Level (Mic)** | Mic 68.95 pa, 131 dB(L) | **Battery Level** | 3.8 volts |
| **Pre-Trigger/Record Time** | 0.00 sec/3.0 sec (Fixed) | **Unit Calibration** | January 13, 2018 by UES New Delhi |
| **Sample Rate** | 2048 sps | **Event File Name** | UM12384_20210714132959.IDFW |
| **Setup File Name** | factory_AA.MMB | **USB Sensor Support** | Disabled |
| **Operator** | Operator | | |
| **Job Number** | 1 | | |

**Notes**

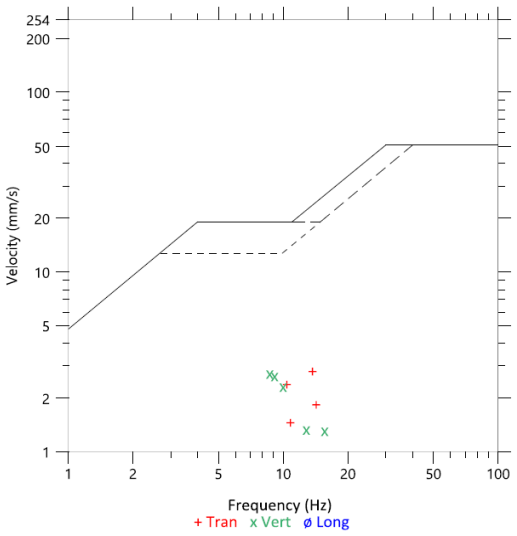
Location: Tasra, OCP
Client: Steel Authority of India Limited
User Name: Department of Mining Engineering, BIT Sindri
General:

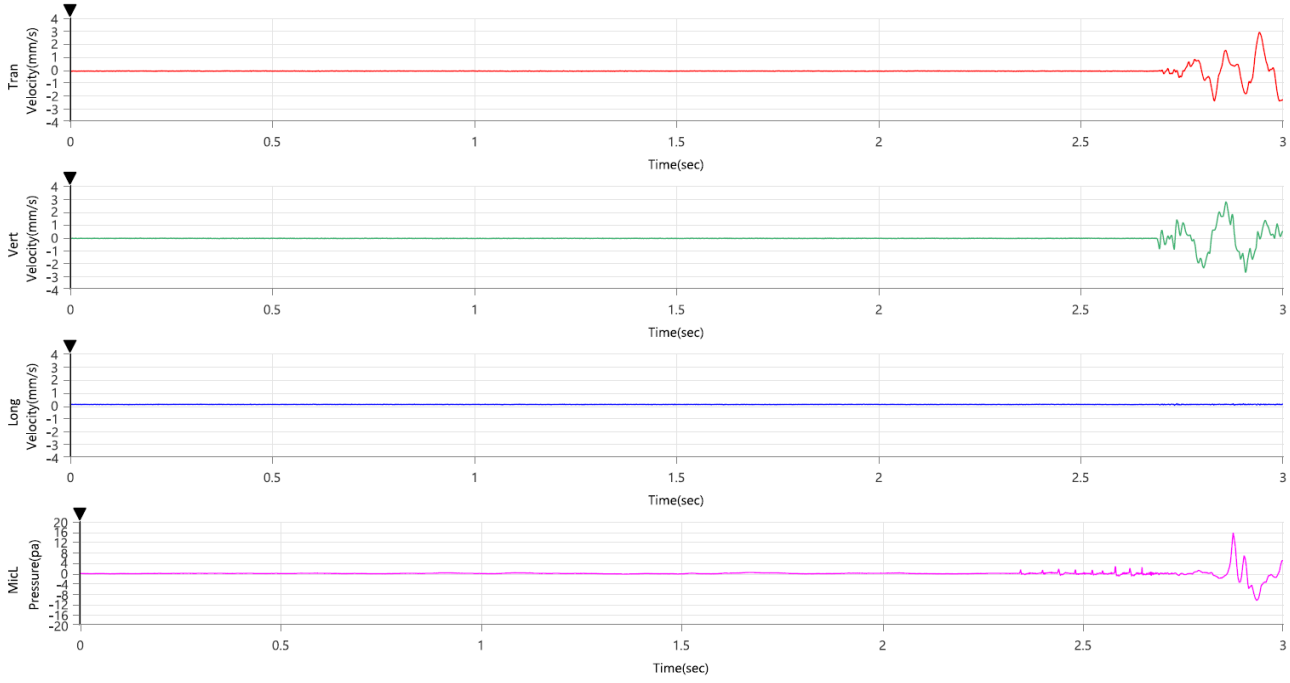
**Post Event Notes** No text to be displayed.

| **Geophone** | **Tran** | **Vert** | **Long** |
|---|---|---|---|
| Peak Particle Velocity | 2.885 mm/s | 2.767 mm/s | 0.134 mm/s |
| Zero Crossing Frequency | 13.8 Hz | 8.6 Hz | N/A |
| Time (Relative to Trigger) | 2.941 sec | 2.858 sec | 2.738 sec |
| Peak Acceleration | 0.039 g | 0.061 g | 0.010 g |
| Peak Displacement | 0.153 mm | 0.093 mm | 0.098 mm |
| Sensor Check | ✓ Passed | ✓ Passed | ✗ Check |
| Frequency | 7.3 Hz | 7.5 Hz | 14.8 Hz |
| Overswing Ratio | 3.7 | 3.3 | 3.2 |
| Peak Vector Sum | 3.286 mm/s at 2.908 sec | | |

| **ISEE Linear Microphone** | |
|---|---|
| Peak Sound Pressure Level | 15.56 pa |
| Time (Relative to Trigger) | 2.875 sec |
| Zero Crossing Frequency | 20.1 Hz |
| Sensor Check | ✓ Passed |
| Frequency | 19.7 Hz |
| Test Amplitude | 1201 mv |

**USBM RI8507 And OSMRE**
Velocity versus Frequency (Zero Crossing)

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| | | | |
|---|---|---|---|
| **Waveform Trigger Source** | Tran at July 14, 2021 13:29:59 | **Serial Number** | UM12384 |
| **Trigger Level(s)** | Geo 0.128 mm/s | **Model Number** | Micromate ISEE 10.89 |
| **Trigger Level (Mic)** | Mic 68.95 pa, 131 dB(L) | **Battery Level** | 3.8 volts |
| **Pre-Trigger/Record Time** | 0.00 sec/3.0 sec (Fixed) | **Unit Calibration** | January 13, 2018 by UES New Delhi |
| **Sample Rate** | 2048 sps | **Event File Name** | UM12384_20210714132959.IDFW |
| **Setup File Name** | factory_AA.MMB | **USB Sensor Support** | Disabled |
| **Operator** | Operator | | |
| **Job Number** | 1 | | |

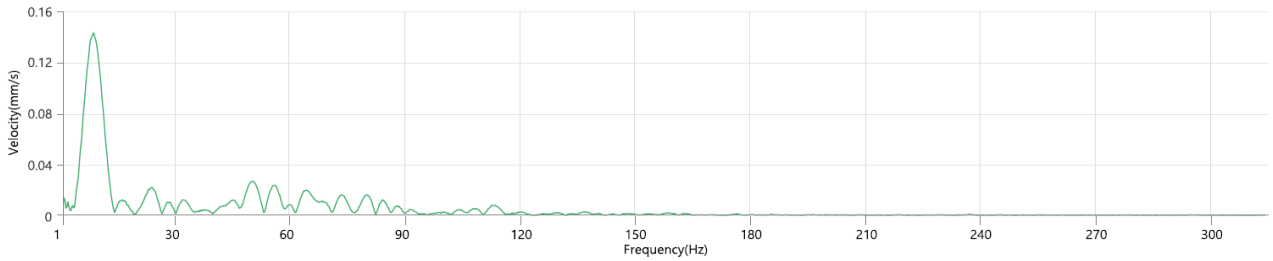
**Notes**

Location: Tasra, OCP
Client: Steel Authority of India Limited
User Name: Department of Mining Engineering, BIT Sindri
General:

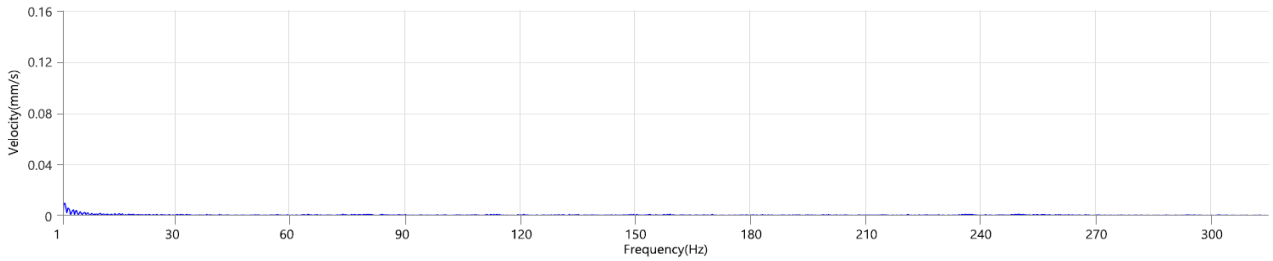
**Post Event Notes** No text to be displayed.

**Tran - Dominant Frequency 11.8 Hz, Amplitude 0.127 mm/s (Peak Particle Velocity: 2.885 mm/s)**

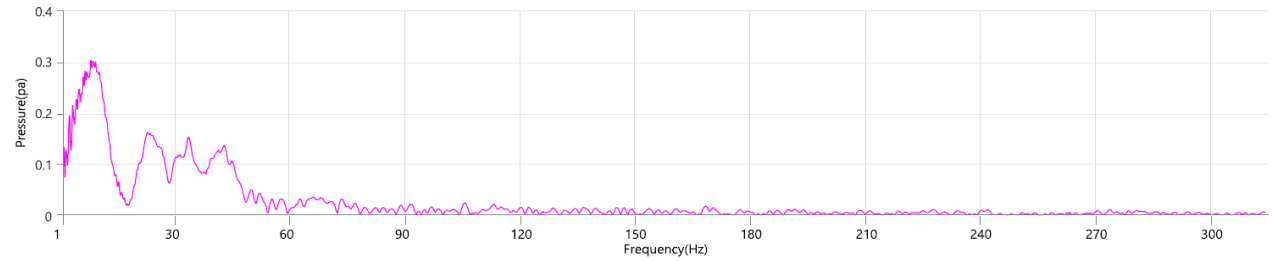

**Vert - Dominant Frequency 9.0 Hz, Amplitude 0.143 mm/s (Peak Particle Velocity: 2.767 mm/s)**




**Long - Dominant Frequency 1.5 Hz, Amplitude 0.010 mm/s (Peak Particle Velocity: 0.134 mm/s)**




**MicL - Dominant Frequency 8.2 Hz, Amplitude 0.30 pa (Peak Sound Pressure Level: 15.56 pa)**

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| | | | |
|---|---|---|---|
| **Waveform Trigger Source** | Tran at July 15, 2021 13:48:38 | **Serial Number** | UM12384 |
| **Trigger Level(s)** | Geo 0.128 mm/s | **Model Number** | Micromate ISEE 10.89 |
| **Trigger Level (Mic)** | Mic 68.95 pa, 131 dB(L) | **Battery Level** | 3.8 volts |
| **Pre-Trigger/Record Time** | 0.00 sec/3.0 sec (Fixed) | **Unit Calibration** | January 13, 2018 by UES New Delhi |
| **Sample Rate** | 2048 sps | **Event File Name** | UM12384_20210715134838.IDFW |
| **Setup File Name** | factory_AA.MMB | **USB Sensor Support** | Disabled |
| **Operator** | Operator | | |
| **Job Number** | 1 | | |

**Notes**

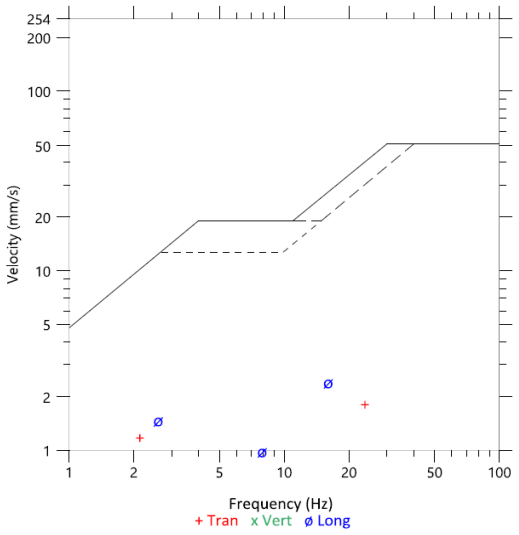
Location: Tasra,OCP
Client: Steel Authority of India Limited
User Name: Department of Mining Engineering, BIT Sindri
General:

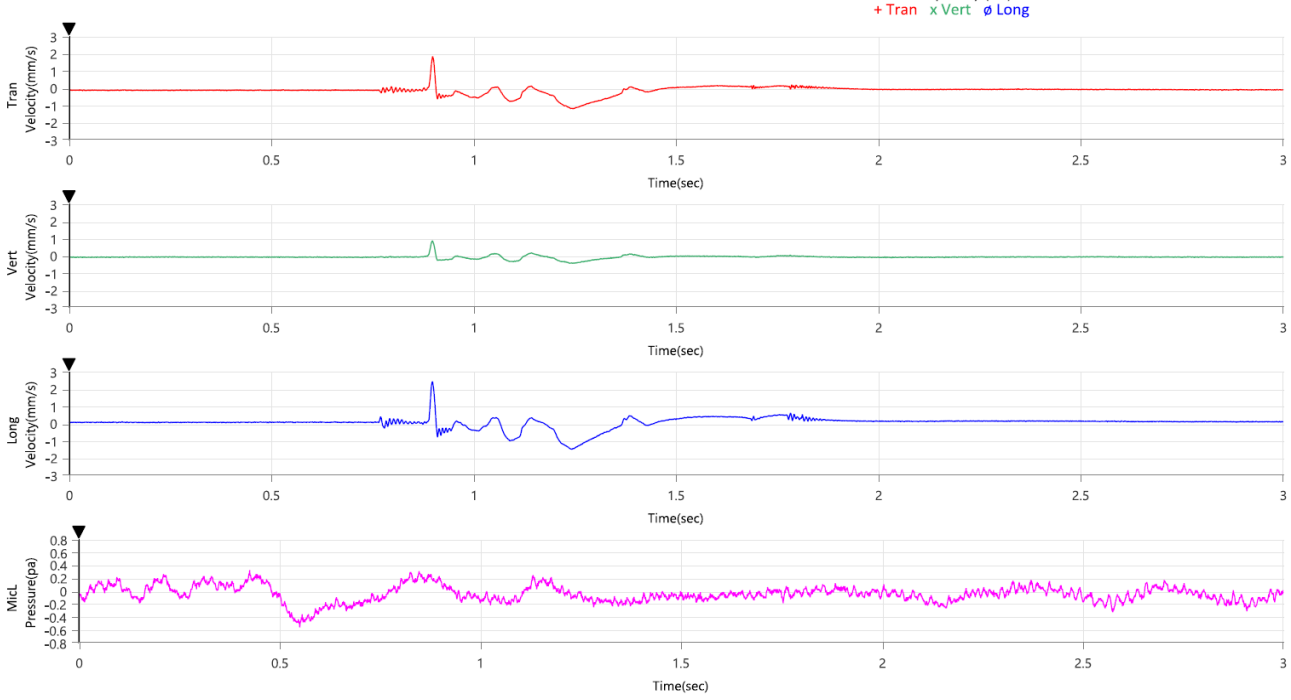
**Post Event Notes** No text to be displayed.

| **Geophone** | **Tran** | **Vert** | **Long** |
|---|---|---|---|
| Peak Particle Velocity | 1.844 mm/s | 0.867 mm/s | 2.428 mm/s |
| Zero Crossing Frequency | 23.3 Hz | 25.0 Hz | 16.0 Hz |
| Time (Relative to Trigger) | 0.897 sec | 0.896 sec | 0.896 sec |
| Peak Acceleration | 0.035 g | 0.020 g | 0.043 g |
| Peak Displacement | 0.074 mm | 0.033 mm | 0.074 mm |
| Sensor Check | ✓ Passed | ✓ Passed | ✓ Passed |
| Frequency | 7.3 Hz | 7.5 Hz | 7.5 Hz |
| Overswing Ratio | 3.6 | 3.3 | 3.3 |
| Peak Vector Sum | 3.147 mm/s at 0.897 sec | | |

| **ISEE Linear Microphone** | |
|---|---|
| Peak Sound Pressure Level | 0.56 pa |
| Time (Relative to Trigger) | 0.549 sec |
| Zero Crossing Frequency | 1.8 Hz |
| Sensor Check | ✓ Passed |
| Frequency | 19.7 Hz |
| Test Amplitude | 1130 mv |

**USBM RI8507 And OSMRE**
Velocity versus Frequency (Zero Crossing)

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Instantel

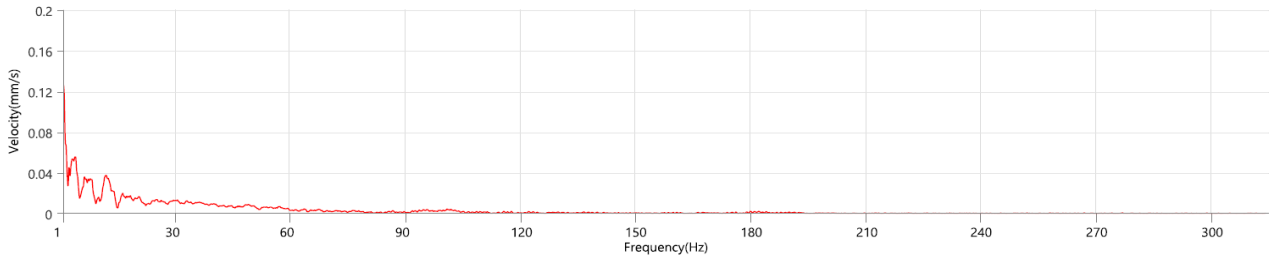
| | | | |
|---|---|---|---|
| **Waveform Trigger Source** | Tran at July 15, 2021 13:48:38 | **Serial Number** | UM12384 |
| **Trigger Level(s)** | Geo 0.128 mm/s | **Model Number** | Micromate ISEE 10.89 |
| **Trigger Level (Mic)** | Mic 68.95 pa, 131 dB(L) | **Battery Level** | 3.8 volts |
| **Pre-Trigger/Record Time** | 0.00 sec/3.0 sec (Fixed) | **Unit Calibration** | January 13, 2018 by UES New Delhi |
| **Sample Rate** | 2048 sps | **Event File Name** | UM12384_20210715134838.IDFW |
| **Setup File Name** | factory_AA.MMB | **USB Sensor Support** | Disabled |
| **Operator** | Operator | | |
| **Job Number** | 1 | | |

**Notes**

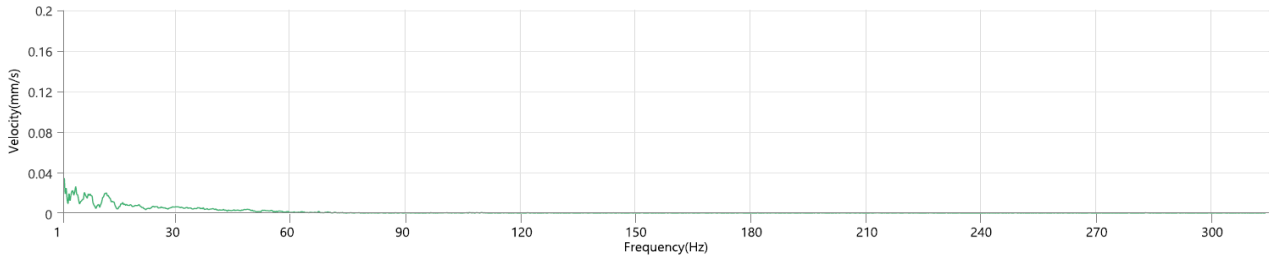
| | |
|---|---|
| Location: | Tasra,OCP |
| Client: | Steel Authority of India Limited |
| User Name: | Department of Mining Engineering, BIT Sindri |
| General: | |

**Post Event Notes** No text to be displayed.

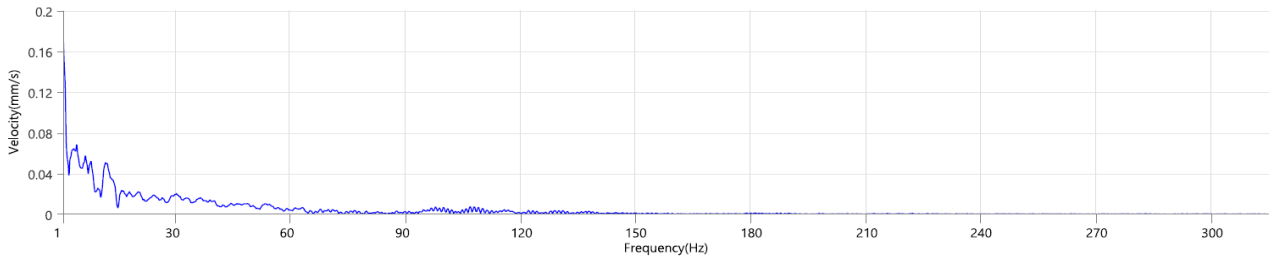
**Tran - Dominant Frequency 1.0 Hz, Amplitude 0.128 mm/s (Peak Particle Velocity: 1.844 mm/s)**



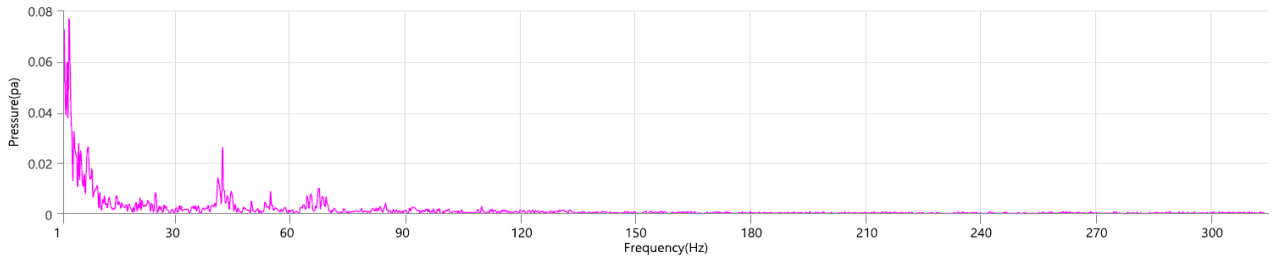

**Vert - Dominant Frequency 1.2 Hz, Amplitude 0.035 mm/s (Peak Particle Velocity: 0.867 mm/s)**




**Long - Dominant Frequency 1.0 Hz, Amplitude 0.176 mm/s (Peak Particle Velocity: 2.428 mm/s)**




**MicL - Dominant Frequency 2.5 Hz, Amplitude 0.08 pa (Peak Sound Pressure Level: 0.56 pa)**

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| | | | |
|---|---|---|---|
| **Waveform Trigger Source** | Tran at July 15, 2021 14:13:03 | **Serial Number** | UM12384 |
| **Trigger Level(s)** | Geo 0.128 mm/s | **Model Number** | Micromate ISEE 10.89 |
| **Trigger Level (Mic)** | Mic 68.95 pa, 131 dB(L) | **Battery Level** | 3.8 volts |
| **Pre-Trigger/Record Time** | 0.00 sec/3.0 sec (Fixed) | **Unit Calibration** | January 13, 2018 by UES New Delhi |
| **Sample Rate** | 2048 sps | **Event File Name** | UM12384_20210715141303.IDFW |
| **Setup File Name** | factory_AA.MMB | **USB Sensor Support** | Disabled |
| **Operator** | Operator | | |
| **Job Number** | 1 | | |

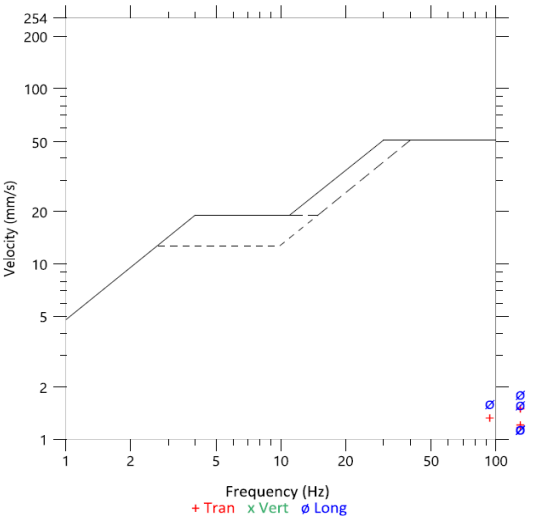
**Notes**
Location: Tasra OCP
Client: Steel Authority of India Limited
User Name: Department of Mining Engineering, BIT Sindri
General:

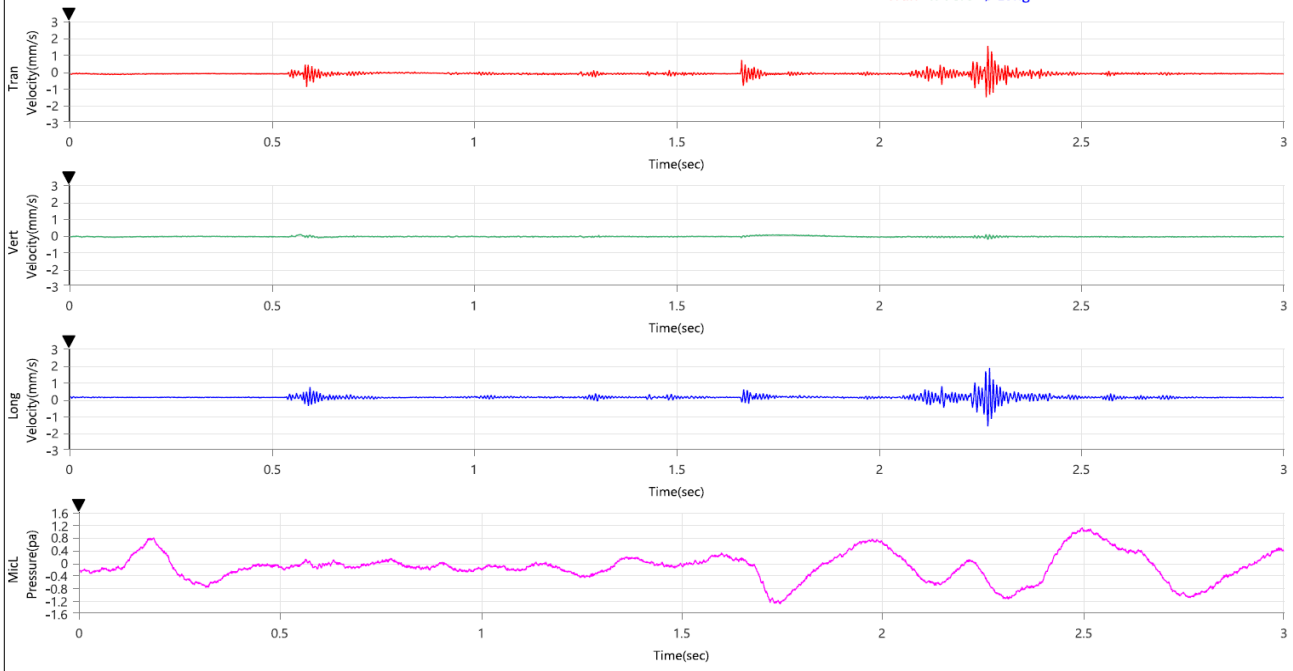
**Post Event Notes** No text to be displayed.

| **Geophone** | **Tran** | **Vert** | **Long** |
|---|---|---|---|
| Peak Particle Velocity | 1.529 mm/s | 0.236 mm/s | 1.852 mm/s |
| Zero Crossing Frequency | >100 Hz | 78.8 Hz | >100 Hz |
| Time (Relative to Trigger) | 2.265 sec | 2.269 sec | 2.273 sec |
| Peak Acceleration | 0.127 g | 0.013 g | 0.133 g |
| Peak Displacement | 0.036 mm | 0.022 mm | 0.029 mm |
| Sensor Check | ✓ Passed | ✓ Passed | ✓ Passed |
| Frequency | 7.3 Hz | 7.5 Hz | 7.3 Hz |
| Overswing Ratio | 3.6 | 3.3 | 3.3 |
| Peak Vector Sum | 2.259 mm/s at 2.273 sec | | |

| **ISEE Linear Microphone** | |
|---|---|
| Peak Sound Pressure Level | 1.30 pa |
| Time (Relative to Trigger) | 1.745 sec |
| Zero Crossing Frequency | 2.7 Hz |
| Sensor Check | ✓ Passed |
| Frequency | 19.7 Hz |
| Test Amplitude | 1124 mv |

**USBM RI8507 And OSMRE**
Velocity versus Frequency (Zero Crossing)




Created by version 1.3.0.12.

Instantel

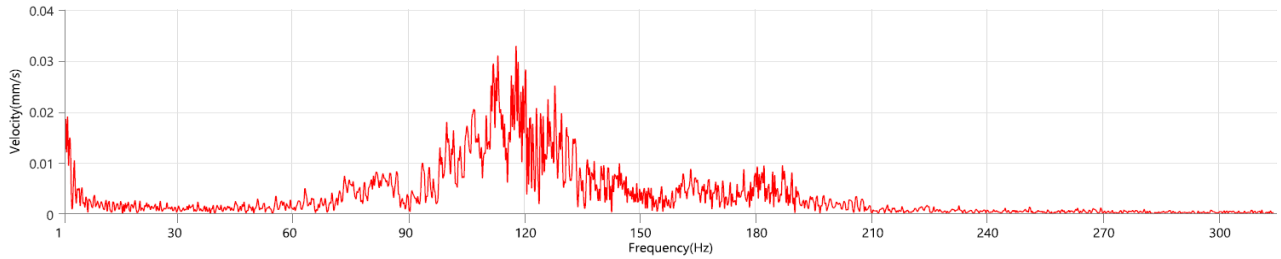
| | | | |
|---|---|---|---|
| **Waveform Trigger Source** | Tran at July 15, 2021 14:13:03 | **Serial Number** | UM12384 |
| **Trigger Level(s)** | Geo 0.128 mm/s | **Model Number** | Micromate ISEE 10.89 |
| **Trigger Level (Mic)** | Mic 68.95 pa, 131 dB(L) | **Battery Level** | 3.8 volts |
| **Pre-Trigger/Record Time** | 0.00 sec/3.0 sec (Fixed) | **Unit Calibration** | January 13, 2018 by UES New Delhi |
| **Sample Rate** | 2048 sps | **Event File Name** | UM12384_20210715141303.IDFW |
| **Setup File Name** | factory_AA.MMB | **USB Sensor Support** | Disabled |
| **Operator** | Operator | | |
| **Job Number** | 1 | | |

**Notes**

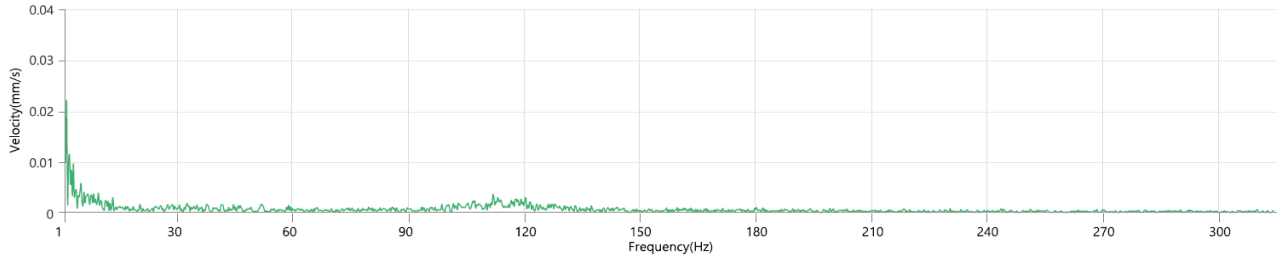
| | |
|---|---|
| Location: | Tasra OCP |
| Client: | Steel Authority of India Limited |
| User Name: | Department of Mining Engineering, BIT Sindri |
| General: | |

**Post Event Notes** No text to be displayed.

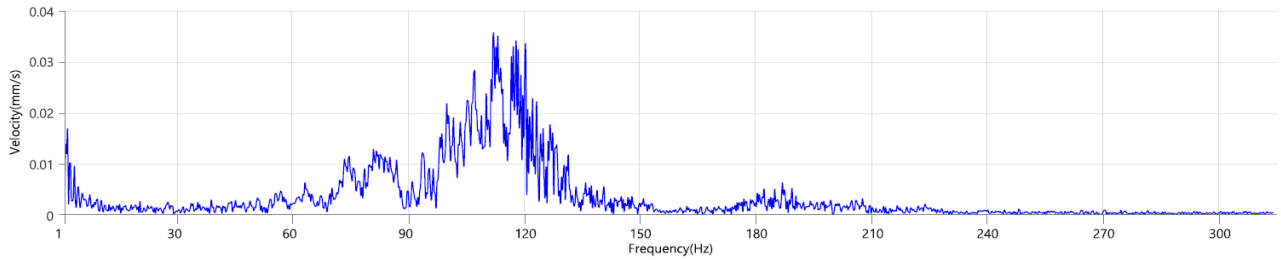
**Tran - Dominant Frequency 118.0 Hz, Amplitude 0.033 mm/s (Peak Particle Velocity: 1.529 mm/s)**



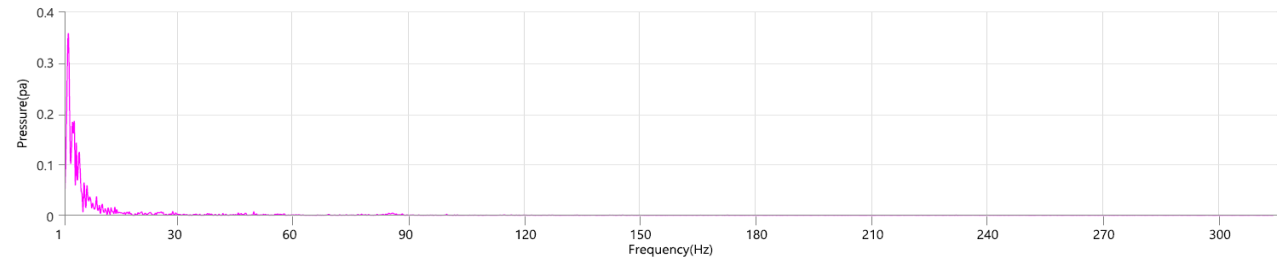

**Vert - Dominant Frequency 1.5 Hz, Amplitude 0.022 mm/s (Peak Particle Velocity: 0.236 mm/s)**




**Long - Dominant Frequency 113.2 Hz, Amplitude 0.035 mm/s (Peak Particle Velocity: 1.852 mm/s)**




**MicL - Dominant Frequency 2.0 Hz, Amplitude 0.35 pa (Peak Sound Pressure Level: 1.30 pa)**




Created by version 1.3.0.12.

Instantel

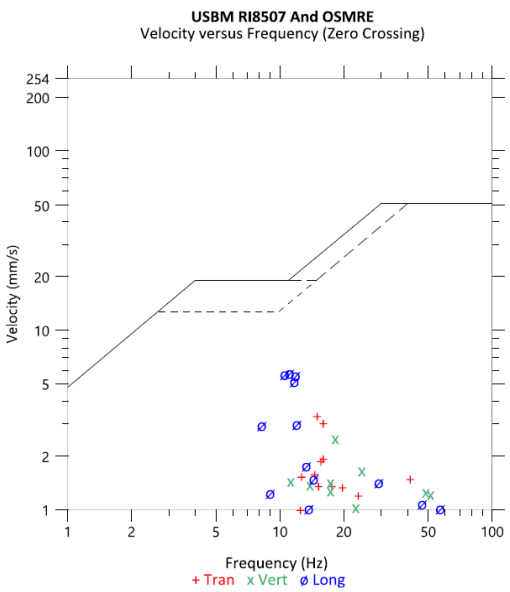
| | | | |
|---|---|---|---|
| **Waveform Trigger Source** | Tran at July 28, 2021 14:32:10 | **Serial Number** | UM12384 |
| **Trigger Level(s)** | Geo 0.128 mm/s | **Model Number** | Micromate ISEE 10.90 |
| **Trigger Level (Mic)** | Mic 68.95 pa, 131 dB(L) | **Battery Level** | 3.8 volts |
| **Pre-Trigger/Record Time** | 0.00 sec/3.0 sec (Fixed) | **Unit Calibration** | January 13, 2018 by UES New Delhi |
| **Sample Rate** | 2048 sps | **Event File Name** | UM12384_20210728143210.IDFW |
| **Setup File Name** | factory_AA.MMB | **USB Sensor Support** | Disabled |
| **Operator** | Operator | | |
| **Job Number** | 1 | | |

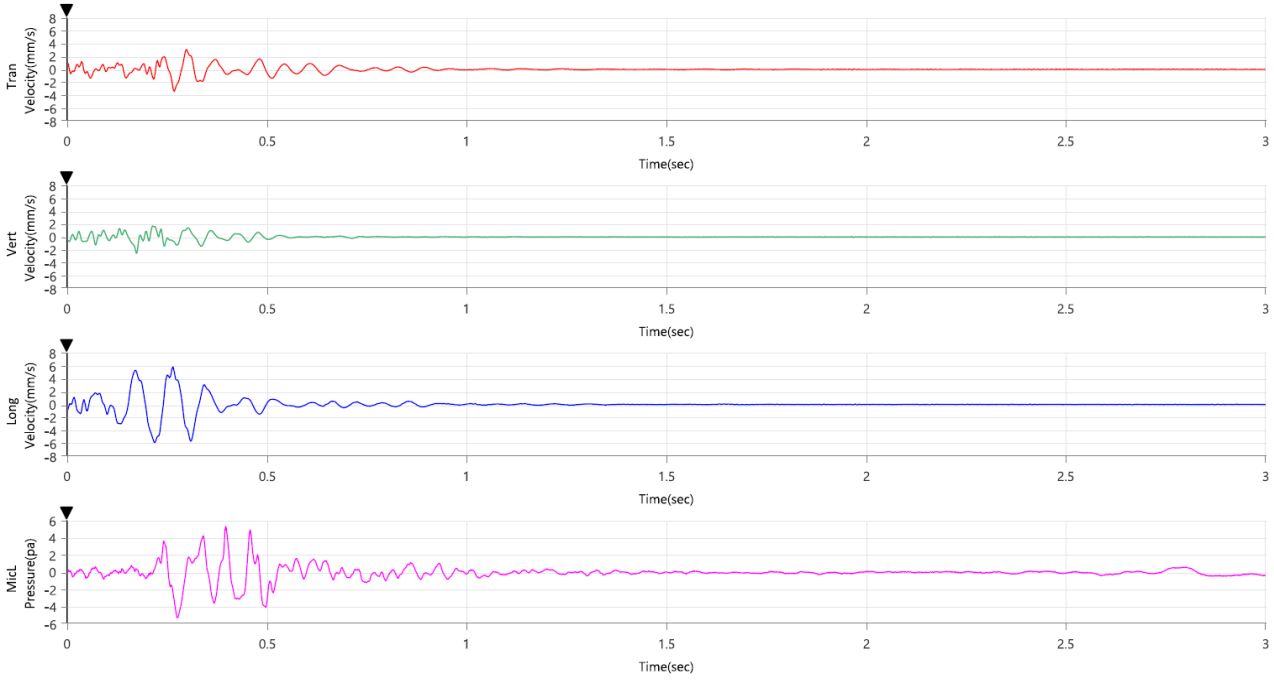
**Notes**
Location: Tasra OCP
Client: Steel Authority of India Limited
User Name: Department of Mining Engineering, BIT Sindri
General:

**Post Event Notes** No text to be displayed.

| **Geophone** | **Tran** | **Vert** | **Long** |
|---|---|---|---|
| Peak Particle Velocity | 3.397 mm/s | 2.554 mm/s | 5.896 mm/s |
| Zero Crossing Frequency | 15.1 Hz | 18.3 Hz | 11.1 Hz |
| Time (Relative to Trigger) | 0.268 sec | 0.174 sec | 0.219 sec |
| Peak Acceleration | 0.054 g | 0.054 g | 0.072 g |
| Peak Displacement | 0.029 mm | 0.017 mm | 0.087 mm |
| Sensor Check | ✓ Passed | ✓ Passed | ✓ Passed |
| Frequency | 7.3 Hz | 7.5 Hz | 7.3 Hz |
| Overswing Ratio | 3.7 | 3.3 | 3.4 |
| Peak Vector Sum | 6.566 mm/s at 0.266 sec | | |

| **ISEE Linear Microphone** | |
|---|---|
| Peak Sound Pressure Level | 5.34 pa |
| Time (Relative to Trigger) | 0.275 sec |
| Zero Crossing Frequency | 11.4 Hz |
| Sensor Check | ✓ Passed |
| Frequency | 19.7 Hz |
| Test Amplitude | 1211 mv |




Created by version 1.3.0.12.

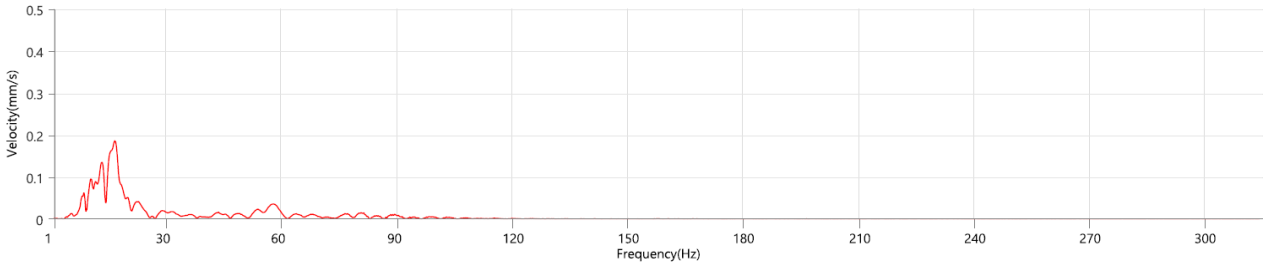
| | | | |
|---|---|---|---|
| **Waveform Trigger Source** | Tran at July 28, 2021 14:32:10 | **Serial Number** | UM12384 |
| **Trigger Level(s)** | Geo 0.128 mm/s | **Model Number** | Micromate ISEE 10.90 |
| **Trigger Level (Mic)** | Mic 68.95 pa, 131 dB(L) | **Battery Level** | 3.8 volts |
| **Pre-Trigger/Record Time** | 0.00 sec/3.0 sec (Fixed) | **Unit Calibration** | January 13, 2018 by UES New Delhi |
| **Sample Rate** | 2048 sps | **Event File Name** | UM12384_20210728143210.IDFW |
| **Setup File Name** | factory_AA.MMB | **USB Sensor Support** | Disabled |
| **Operator** | Operator | | |
| **Job Number** | 1 | | |

**Notes**

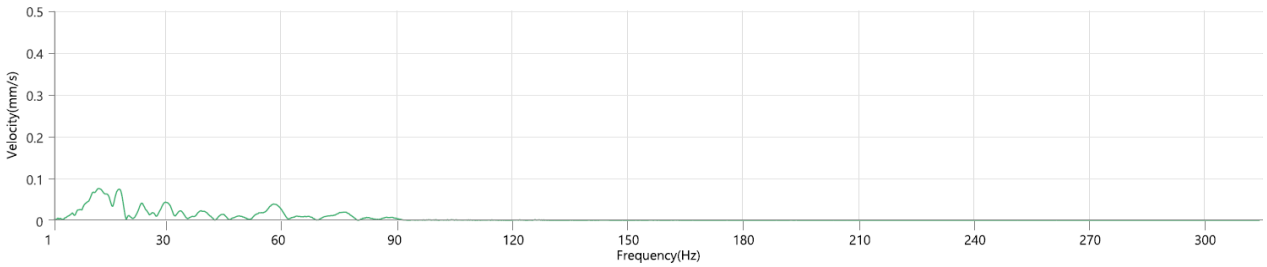
Location: Tasra OCP
Client: Steel Authority of India Limited
User Name: Department of Mining Engineering, BIT Sindri
General:

**Post Event Notes** No text to be displayed.

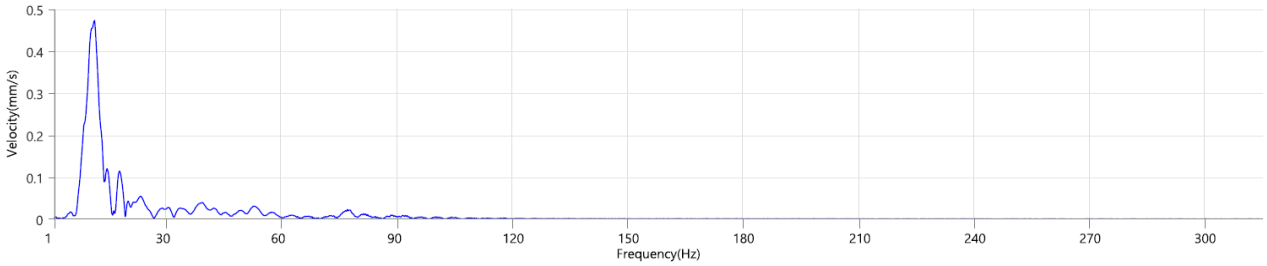
**Tran - Dominant Frequency 16.8 Hz, Amplitude 0.187 mm/s (Peak Particle Velocity: 3.397 mm/s)**



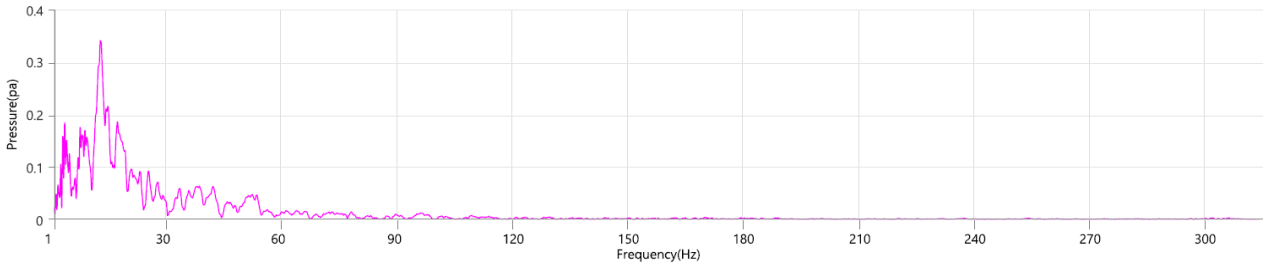

**Vert - Dominant Frequency 12.5 Hz, Amplitude 0.077 mm/s (Peak Particle Velocity: 2.554 mm/s)**




**Long - Dominant Frequency 11.5 Hz, Amplitude 0.474 mm/s (Peak Particle Velocity: 5.896 mm/s)**




**MicL - Dominant Frequency 13.0 Hz, Amplitude 0.34 pa (Peak Sound Pressure Level: 5.34 pa)**




Created by version 1.3.0.12.

Instantel

| | | | |
|---|---|---|---|
| **Waveform Trigger Source** | Vert at July 28, 2021 14:45:08 | **Serial Number** | UM12384 |
| **Trigger Level(s)** | Geo 0.128 mm/s | **Model Number** | Micromate ISEE 10.90 |
| **Trigger Level (Mic)** | Mic 68.95 pa, 131 dB(L) | **Battery Level** | 3.8 volts |
| **Pre-Trigger/Record Time** | 0.25 sec/3.0 sec (Fixed) | **Unit Calibration** | January 13, 2018 by UES New Delhi |
| **Sample Rate** | 2048 sps | **Event File Name** | UM12384_20210728144508.IDFW |
| **Setup File Name** | factory_AA.MMB | **USB Sensor Support** | Disabled |
| **Operator** | Operator | | |
| **Job Number** | 1 | | |

**Notes**

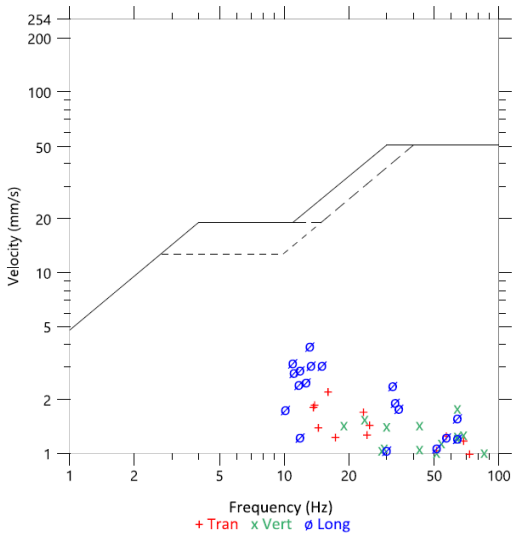
Location: Tasra OCP
Client: Steel Authority of India Limited
User Name: Department of Mining Engineering, BIT Sindri
General:

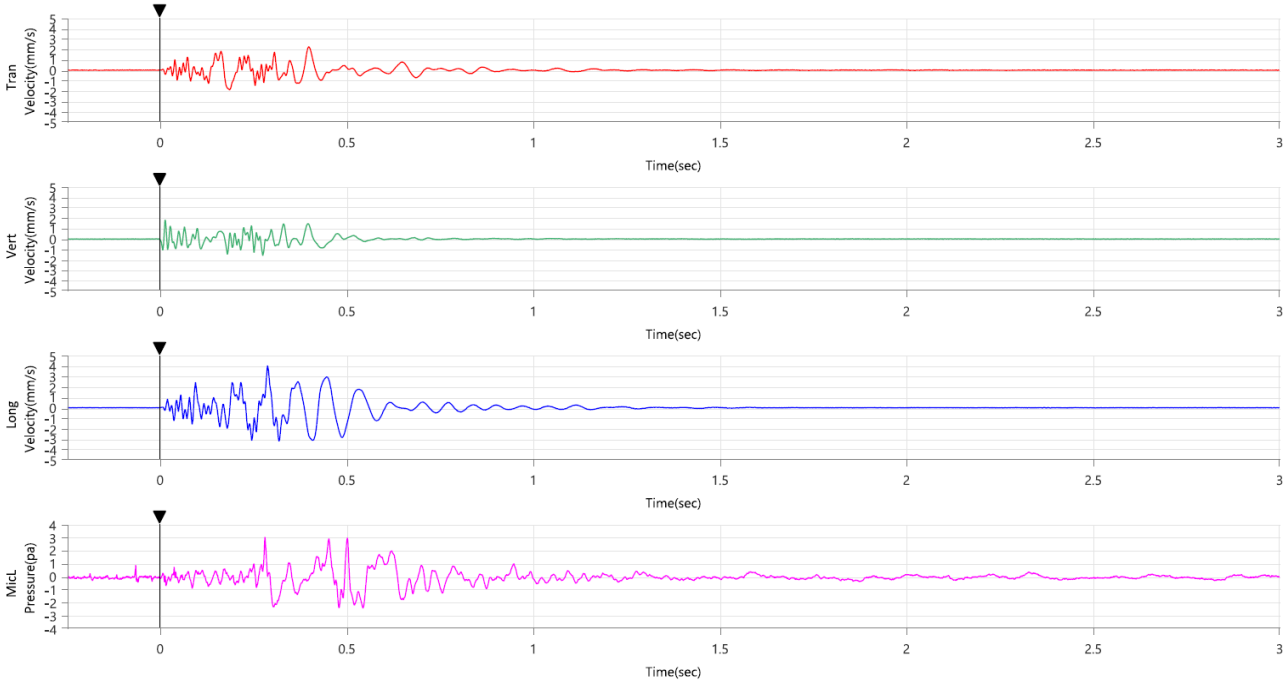
**Post Event Notes** No text to be displayed.

| **Geophone** | **Tran** | **Vert** | **Long** |
|---|---|---|---|
| Peak Particle Velocity | 2.254 mm/s | 1.821 mm/s | 4.035 mm/s |
| Zero Crossing Frequency | 16.0 Hz | 64.0 Hz | 13.1 Hz |
| Time (Relative to Trigger) | 0.397 sec | 0.013 sec | 0.287 sec |
| Peak Acceleration | 0.064 g | 0.076 g | 0.095 g |
| Peak Displacement | 0.020 mm | 0.013 mm | 0.042 mm |
| Sensor Check | ✓ Passed | ✓ Passed | ✓ Passed |
| Frequency | 7.3 Hz | 7.5 Hz | 7.3 Hz |
| Overswing Ratio | 3.7 | 3.3 | 3.4 |
| Peak Vector Sum | 4.038 mm/s at 0.287 sec | | |

| **ISEE Linear Microphone** | |
|---|---|
| Peak Sound Pressure Level | 3.01 pa |
| Time (Relative to Trigger) | 0.279 sec |
| Zero Crossing Frequency | 20.9 Hz |
| Sensor Check | ✓ Passed |
| Frequency | 19.7 Hz |
| Test Amplitude | 1211 mv |

**USBM RI8507 And OSMRE**
Velocity versus Frequency (Zero Crossing)




Created by version 1.3.0.12.

Instantel

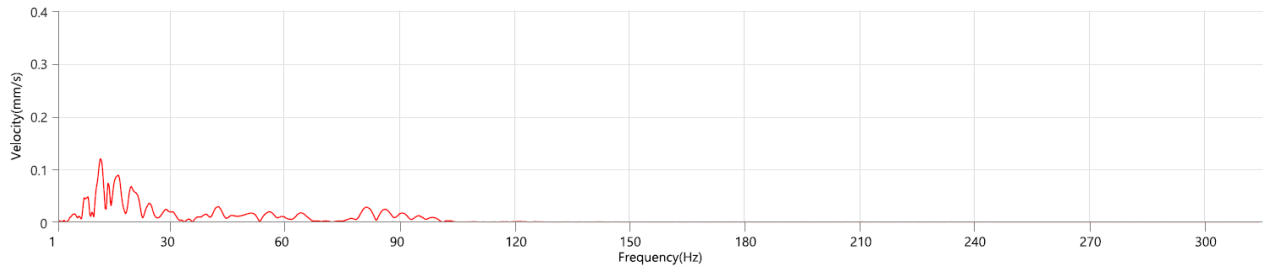
| | | | |
|---|---|---|---|
| **Waveform Trigger Source** | Vert at July 28, 2021 14:45:08 | **Serial Number** | UM12384 |
| **Trigger Level(s)** | Geo 0.128 mm/s | **Model Number** | Micromate ISEE 10.90 |
| **Trigger Level (Mic)** | Mic 68.95 pa, 131 dB(L) | **Battery Level** | 3.8 volts |
| **Pre-Trigger/Record Time** | 0.25 sec/3.0 sec (Fixed) | **Unit Calibration** | January 13, 2018 by UES New Delhi |
| **Sample Rate** | 2048 sps | **Event File Name** | UM12384_20210728144508.IDFW |
| **Setup File Name** | factory_AA.MMB | **USB Sensor Support** | Disabled |
| **Operator** | Operator | | |
| **Job Number** | 1 | | |

**Notes**

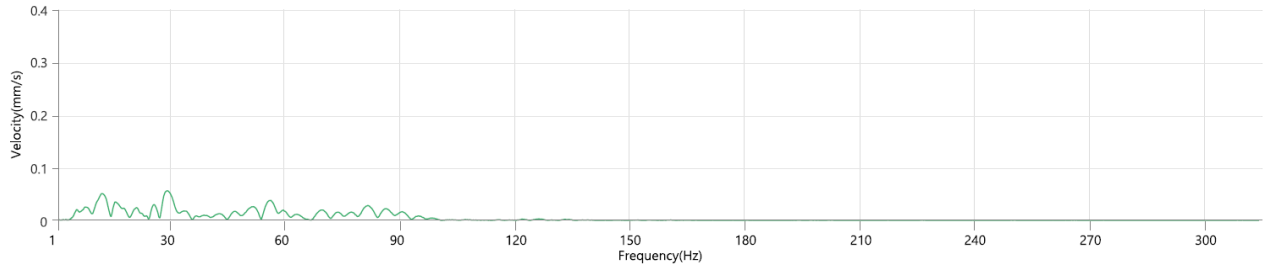
Location: Tasra OCP
Client: Steel Authority of India Limited
User Name: Department of Mining Engineering, BIT Sindri
General:

**Post Event Notes** No text to be displayed.

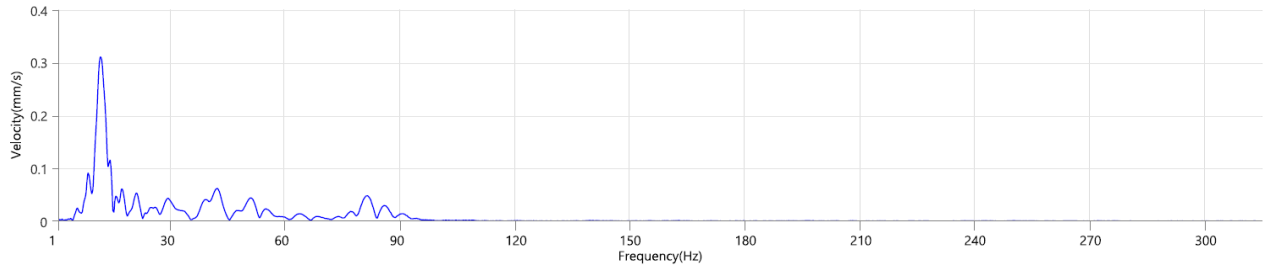
**Tran - Dominant Frequency 12.0 Hz, Amplitude 0.121 mm/s (Peak Particle Velocity: 2.254 mm/s)**



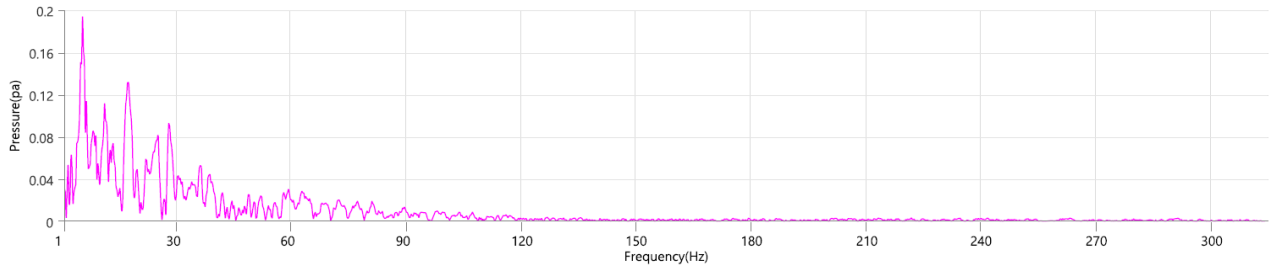

**Vert - Dominant Frequency 29.5 Hz, Amplitude 0.057 mm/s (Peak Particle Velocity: 1.821 mm/s)**




**Long - Dominant Frequency 12.0 Hz, Amplitude 0.311 mm/s (Peak Particle Velocity: 4.035 mm/s)**




**MicL - Dominant Frequency 5.8 Hz, Amplitude 0.19 pa (Peak Sound Pressure Level: 3.01 pa)**

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## Appendix-V

Summary of trial blasts at Tasra OCP, SAIL-Colliery Division

| Sl. No. | Blast No. | DATE | Distance (m) | MCPD (kg) | TCPR (kg) | PPV (mm/sec) | Dominant frequency (Hz) (T, V, L) | AOP (dB) |
|---|---|---|---|---|---|---|---|---|
| 1 | 1 | 10.07.2021 | 100 | 8.33 | 121 | 3.827 | 12.5, 12.2,11.2 | 119.3 |
| 2 | 1 | 10.07.2021 | 75 | 8.33 | 118 | 10.52 | 11.4, 12.1,10.6 | 115.4 |
| 3 | 2 | 10.07.2021 | 130 | 8.33 | 88 | 2.325 | 17, 15.5, 8.8 | 128.67 |
| 4 | 2 | 10.07.2021 | 125 | 8.33 | 94 | 2.465 | 16,14.6,7.9 | 117.4 |
| 5 | 3 | 13.07.2021 | 125 | 8.33 | 91 | 2.772 | 8.5, 15.2, 12.2 | 109.74 |
| 6 | 3 | 13.07.2021 | 80 | 8.33 | 102 | 5.628 | 9.4, 14.6, 13.8 | 98.26 |
| 7 | 4 | 13.07.2021 | 85 | 8.33 | 98 | 5.584 | 10.6, 13.4, 11.2 | 102.35 |
| 8 | 4 | 13.07.2021 | 135 | 8.33 | 104 | 2.628 | 12.6, 11.4, 13.6 | 116.48 |
| 9 | 4 | 13.07.2021 | 145 | 8.33 | 106 | 2.286 | 13.4, 12.8, 25.6 | 118.24 |
| 10 | 5 | 14.07.2021 | 130 | 5.55 | 112 | 2.242 | 11.8, 1.5, 7.8 | 117.82 |
| 11 | 5 | 14.07.2021 | 125 | 5.55 | 114 | 2.884 | 12.6, 8.6, 11.4 | 115.60 |
| 12 | 6 | 14.07.2021 | 76 | 5.55 | 86 | 9.286 | 11.0, 8.5, 1.5 | 114.27 |
| 13 | 6 | 14.07.2021 | 163 | 5.55 | 84 | 2.047 | 12.6, 11.4, 14.6 | 115.36 |
| 14 | 6 | 14.07.2021 | 70 | 5.55 | 70 | 10.84 | 11.8, 9.0, 1.5 | 117.82 |
| 15 | 7 | 15.07.2021 | 110 | 5.55 | 58 | 3.648 | 1.0, 1.2, 1.0 | 88.94 |
| 16 | 7 | 15.07.2021 | 92 | 5.55 | 68 | 6.256 | 5.6, 4.8, 5.2 | 92.64 |
| 17 | 8 | 15.07.2021 | 185 | 5.55 | 116 | 0.842 | 7.8, 9.6, 11.4 | 96.26 |
| 18 | 8 | 15.07.2021 | 82 | 5.55 | 122 | 8.256 | 9.6, 8.4, 10.8 | 98.26 |
| 19 | 8 | 15.07.2021 | 110 | 5.55 | 118 | 6.566 | 10.8, 12.4, 14.8 | 105.82 |
| 20 | 9 | 28.07.2021 | 84 | 8.33 | 114 | 8.424 | 16.8,12.5,11.5 | 108.53 |
| 21 | 9 | 28.07.2021 | 182 | 8.33 | 116 | 0.098 | 15.3, 12.1, 25.8 | 98.46 |
| 22 | 9 | 28.07.2021 | 106 | 8.33 | 121 | 3.218 | 14.2, 11.6, 10.6 | 102.6 |
| 23 | 10 | 28.07.2021 | 145 | 8.33 | 120 | 2.524 | 12, 29.5,12 | 103.55 |
| 24 | 10 | 28.07.2021 | 150 | 8.33 | 122 | 1.826 | 12.4, 14.6, 11.8 | 101.48 |

MCPD: Maximum Charge per Delay, TCPR: Total Charge per Round, AOP: Air Over Pressure

# ADITI R&D SERVICES

**Testing Laboratory**

**NABL ACCREDITED**

**(A Constituent Board of Quality Council of India)**

**ISO/IEC 17025:2017, ISO 9001:2015,ISO (OHSAS) 45001:2018 Certified**

Plot No. - I-B-17 (P)
Sindri, Industrial Area,
P.O.- Domgarh, Dist.- Dhanbad
Jharkhand - 828107
Email ID: sindriaditi@gmail.com
Website: aditirndservices.com
Phone: 0326-2952377 (O)
Mobile: 09471358492, 09431512608


## TEST REPORT OF NOISE (AMBIENT) LEVEL MONITORING

| Ref. No. & Date | NAME AND ADDRESS OF THE CLIENT | | | |
|---|---|---|---|---|
| ARDS/23-24/2034 Date: 01/03/2024 | TASRA COAL MINING PROJECT, COLLIERIES DIVISION, STEEL AUTHORITY OF INDIA LTD. CHASNALLA – 828135, DIST. - DHANBAD | | | |
| Date of Monitoring | | | | |
| 26/02/2024 to 27/02/2024<br>28/02/2024 to 29/02/2024 | Avg. Ambient Temperature (°C) | Average Humidity (%) | Weather Condition | Status of the plant |
| P.O : 6000036592 & Date : 29.01.2024 | 26 | 50 | CLEAR | RUNNING |

### MONITORING RESULTS

| Sl. No | Place of Monitoring | Day Time (6 AM to 10 PM) Avg. dB(A) | | | Night Time (10 PM to 6 AM) Avg. dB(A) | | | Noise level (Ambient standard) for Industrial Area as per CPCB Noise Pollution (Regulation and Control) (Amendment) Rules , 2000 notified vide S.O. 1046(E) Dt. 22.11.2020 Limit in dB(A) Leq | |
|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | | Day Time | Night Time |
| | LOCATION | MAX | MIN | AVG. dB(A) Leq | MAX | MIN | AVERAGE dB(A) Leq | Residential Area | Residential Area |
| | BUFFER ZONE 28/02/2024 TO 29/02/2024 | | | | | | | | |
| 1. | BJOJUDIH | 47.8 | 42.6 | 45.94 | 38.4 | 34.2 | 36.79 | | |
| 2. | BAGHMARA | 46.6 | 41.8 | 44.83 | 39.6 | 33.8 | 37.60 | 55 | 45 |
| | CORE ZONE 26/02/2024 TO 27/02/2024 | | | | | | | Industrial Area | Industrial Area |
| 1. | TASRA | 71.61 | 69.36 | 70.63 | 65.8 | 55.2 | 63.15 | 75 | 70 |
| 2. | KANDRA | 70.8 | 68.4 | 69.76 | 64.2 | 53.8 | 61.57 | | |
| 3. | GOUSALLA | 69.4 | 66.8 | 68.29 | 63.8 | 54.2 | 61.24 | | |
| 4. | ROHRABANDH | 68.6 | 63.4 | 66.74 | 60.4 | 59.9 | 60.16 | | |

Sr. Chemist
Aditi R&D Services

ADITI R&D SERVICES P.O.- DOMGARH DHANBAD SINDRI INDUSTRIAL AREA

Technical Manager
Aditi R&D Services, Sindri

**Statements :**

1. The test report refers only to the particular item(s) submitted for testing.
2. The test results reported in this report are valid at the time of and under the stated condition of measurment.
3. This particular test report cannot be reproduced except in full without prior permission of Quality Manager of the laboratory.

**KRS ERECTORS PVT LTD**
**Medical Record**

| S No. | Date | REF NO | NAME | AGE |
|---|---|---|---|---|
| 1 | 01-03-2024 | DC/24/01 | MD RAHIS | 30 |
| 2 | 01-03-2024 | DC/24/02 | AMARDEEP KR PASWAN | 37 |
| 3 | 01-03-2024 | DC/24/03 | RAJU KUMAR DAS | 37 |
| 4 | 01-03-2024 | DC/24/04 | ANAND CHANDRA MALIK | 25 |
| 5 | 01-03-2024 | DC/24/05 | SURAJ SHARMA | 32 |
| 6 | 01-03-2024 | DC/24/06 | SUBODH KUMAR SINGH | 49 |
| 7 | 01-03-2024 | DC/24/07 | JAGDISH SINGH | 33 |
| 8 | 01-03-2024 | DC/24/08 | DIPU SINGH | 39 |
| 9 | 01-03-2024 | DC/24/09 | AMIT SINGH | 22 |
| 10 | 01-03-2024 | DC/24/10 | PULLE AJAY | 27 |
| 11 | 01-03-2024 | DC/24/11 | JAGARNATH DHIWER | 44 |
| 12 | 01-03-2024 | DC/24/12 | RAJU BAURI | 41 |
| 13 | 01-03-2024 | DC/24/13 | SANDIP KUMAR | 33 |
| 14 | 01-03-2024 | DC/24/14 | MANIK MANDAL | 46 |
| 15 | 01-03-2024 | DC/24/15 | I KIRAN KUMAR | |
| 16 | 01-03-2024 | DC/24/16 | MAHENDER PRASAD | 34 |
| 17 | 01-03-2024 | DC/24/17 | JITENDER KUMAR MISHRA | 48 |
| 18 | 01-03-2024 | DC/24/18 | VERMA PRASAD | 50 |
| 19 | 01-03-2024 | DC/24/19 | RAJU KUMAR | 30 |
| 20 | 01-03-2024 | DC/24/20 | ARJUN KUMAR SINGH | 30 |
| 21 | 01-03-2024 | DC/24/21 | KARAMCHAND | 39 |
| 22 | 01-03-2024 | DC/24/22 | BANDE NAGABABU | 32 |
| 23 | 01-03-2024 | DC/24/23 | SUMIT KUMAR SINGH | 35 |
| 24 | 01-03-2024 | DC/24/24 | PUGAZHANDHI | |
| 25 | 01-03-2024 | DC/24/25 | BHARAT MAHATO | 56 |
| 26 | 01-03-2024 | DC/24/26 | ANIL KUMAR RAVIDAS | 37 |
| 27 | 01-03-2024 | DC/24/27 | P SANTOSH REDDY | 27 |
| 28 | 01-03-2024 | DC/24/28 | MITHILESH KUMAR SINGH | 55 |
| 29 | 01-03-2024 | DC/24/29 | YERRA RAMU | 32 |
| 30 | 01-03-2024 | DC/24/30 | M M NAIDU | 40 |
| 31 | 01-04-2024 | DC/24/31 | UTTAM KUMAR MANDAL | 46 |
| 32 | 01-04-2024 | DC/24/32 | SUDAN KUMAR SINGH | |
| 33 | 01-04-2024 | DC/24/33 | PANCHANAND SINGH | 54 |
| 34 | 01-04-2024 | DC/24/34 | ASHOK MANDAL | 51 |
| 35 | 01-04-2024 | DC/24/35 | RAMU KUMAR | 24 |
| 36 | 01-04-2024 | DC/24/36 | BAIPALLI BALRAM | 34 |
| 37 | 01-04-2024 | DC/24/37 | SANJIV KUMAR MANDAL | 29 |
| 38 | 01-04-2024 | DC/24/38 | DEWASHISH | 24 |
| 39 | 01-04-2024 | DC/24/39 | CHITRASEN MALIK | 26 |
| 40 | 01-04-2024 | DC/24/40 | DEEPAK KUMAR SINGH | 35 |
| 41 | 01-08-2024 | DC/24/41 | LAKHAN MANDAL | 47 |
| 42 | 01-08-2024 | DC/24/42 | BISWAJIT MANDAL | 45 |
| 43 | 01-08-2024 | DC/24/43 | BIMAL MANDAL | 37 |
| 44 | 01-08-2024 | DC/24/44 | ASHOK KUMAR SINGH | 30 |
| 45 | 01-08-2024 | DC/24/45 | VICKY SINGH | 31 |
| 46 | 01-08-2024 | DC/24/46 | BIKRAM SINGH | 26 |
| 47 | 01-08-2024 | DC/24/47 | DEEPU KUMAR SINGH | 22 |
| 48 | 01-08-2024 | DC/24/48 | AJEET SINGH | 27 |
| 49 | 01-08-2024 | DC/24/49 | AMRIT KUMAR SINGH | 27 |
| 50 | 01-08-2024 | DC/24/50 | MOJEEN ANSARI | 30 |

| S No. | Date | REF NO | NAME | AGE |
|---|---|---|---|---|
| 51 | 01-08-2024 | DC/24/51 | MIHIR MANDAL | 44 |
| 52 | 01-08-2024 | DC/24/52 | DIGAMBER SINGH | 33 |
| 53 | 01-08-2024 | DC/24/53 | MANTU KUMAR MAHATO | 40 |
| 54 | 01-08-2024 | DC/24/54 | RAJENDER KUMAR MAHATO | 43 |
| 55 | 20/1/2024 | DC/24/55 | BIRJU SINGH | 44 |
| 56 | 20/1/2024 | DC/24/56 | BABLU MAHATO | 36 |
| 57 | 20/1/2024 | DC/24/57 | CHANDAN BABU | 34 |
| 58 | 20/1/2024 | DC/24/58 | RATHRAM KEVANT | 35 |
| 59 | 20/1/2024 | DC/24/59 | GUJJU SHANKAR REDDY | 54 |
| 60 | 20/1/2024 | DC/24/60 | RAJDEO SINGH | 31 |
| 61 | 20/1/2024 | DC/24/61 | DEEPAK KUMAR MANADL | 36 |
| 62 | 20/1/2024 | DC/24/62 | RAJESH GORAI | 42 |
| 63 | 20/1/2024 | DC/24/63 | BIRENDER SINGH | 42 |
| 64 | 20/1/2024 | DC/24/64 | CHHOTU BAURI | 26 |
| 65 | 20/1/2024 | DC/24/65 | GOVIND SINGH RAJAWAT | 19 |
| 66 | 20/1/2024 | DC/24/66 | ROHIT SINGH | 25 |
| 67 | 20/1/2024 | DC/24/67 | RUDAL KUMAR | 21 |
| 68 | 20/1/2024 | DC/24/68 | ANGAD MAHATO | 53 |
| 69 | 20/1/2024 | DC/24/69 | KONDRU GOPI | 23 |
| 70 | 20/1/2024 | DC/24/70 | SHANKAR SINGH | 35 |
| 71 | 20/1/2024 | DC/24/71 | RAJVEER SINGH | 32 |
| 72 | 20/1/2024 | DC/24/72 | SHAIKH MOHAMOOD | 48 |
| 73 | 20/1/2024 | DC/24/73 | SHAILENDER NAGURI | 40 |
| 74 | 20/1/2024 | DC/24/74 | MOHAN KUMAR SINGH | 37 |
| 75 | 20/1/2024 | DC/24/75 | JAGDISH GOSWAMI | 40 |
| 76 | 20/1/2024 | DC/24/76 | AJAY KUMAR SINGH | 38 |
| 77 | 20/1/2024 | DC/24/77 | PRADEEP KUMAR SINGH | 34 |
| 78 | 20/1/2024 | DC/24/78 | GOPAL SINGH | 22 |
| 79 | 20/1/2024 | DC/24/79 | SUKHDEV SINGH | 46 |
| 80 | 20/1/2024 | DC/24/80 | KAILASH SINGH | 34 |

ANNEXURE-XV

09/01/24

झारखण्ड सरकार

# उपायुक्त–सह–जिला दण्डाधिकारी का कार्यालय धनबाद।

## (जिला भू–अर्जन शाखा)

Email-dlao.dhanbad@gmail.com, Mob. 9934790514

## आम सूचना

एतद् द्वारा सूचित किया जाता है कि भूमि अर्जन पुनर्वासन और पुनर्व्यवस्थापन में उचित प्रतिकर और पारदर्शिता का अधिकार अधिनियम, 2013 की धारा–4 के प्रावधानों के तहत स्टील अथॉरिटी ऑफ इंडिया लिमिटेड के टासरा ओपन कॉस्ट परियोजना हेतु धनबाद जिला अन्तर्गत झरिया अंचल के मौजा रोहड़ाबांध–169 एवं मौजा टासरा–168 (वार्ड संख्या–53) में अर्जन हेतु प्रस्तावित भूमि के लिए सामाजिक समाघात निर्धारण अध्ययन हेतु अधिसूचना संख्या 1537/भू0अ0, धनबाद दिनॉक 23/11/2023 के द्वारा मेसर्स Social Action for Rural Development (SARDA) को एस0आई0ए0 दल नियुक्त किया गया है। एस0आई0ए0 दल द्वारा उपरोक्त अधिसूचना के आलोक में सर्वे उपरांत ड्राफ्ट एस0आई0ए0 रिपोर्ट समर्पित किया गया है।

अतः ड्राफ्ट एस0आई0ए0 रिपोर्ट के प्रमुख निष्कर्षों पर विमर्श करने हेतु अधिनियम की धारा–5 एवं नियमावली के नियम–11 के तहत दिनांक 14/02/24 को 11 बजे पूर्वाह्न में आर्य समाज मैदान रोहड़ाबांध (वार्ड संख्या–53) में लोक सुनवाई निर्धारित की जाती है।

प्रभावित होने वाले परिवारों से अनुरोध है कि उक्त लोक सुनवाई में उपस्थित होकर सामाजिक समाघात निर्धारण के संबंध में अपने विचार रखने का कष्ट करेंगें।

उपायुक्त, धनबाद

ज्ञापांक– 53 /भू–अर्जन, धनबाद /दिनांक. 09/01/2024

प्रतिलिपि–

1. अनुमण्डल पदाधिकारी, धनबाद / अंचल अधिकारी, झरिया को सूचनार्थ एवं आवश्यक कार्यवाही हेतु प्रेषित। अनुरोध है कि उपरोक्त आम सूचना सर्वसाधारण की जानकारी हेतु कार्यालय के नोटिस बोर्ड पर चस्पा किया जाय।
2. अपर समाहर्त्ता (विधि–व्यवस्था) सह–नोडल अधिकारी, एन0आई0सी0, धनबाद को सूचनार्थ प्रेषित। अनुरोध है कि उपरोक्त आम सूचना सर्वसाधारण की जानकारी हेतु nic धनबाद की website पर upload किया जाय।
3. जिला जन सम्पर्क पदाधिकारी धनबाद, को सूचनार्थ प्रेषित। अनुरोध है कि उपरोक्त आमसूचना का प्रकाशन दो स्थानीय दैनिक समाचार पत्रों में प्रकाशित किया जाय।
4. मेसर्स Social Action for Rural Development (SARDA) Chhotaki Murram Ramgarh Cantt. Ramgarh-82922 को निदेश दिया जाता है उपरोक्त निर्धारित तिथि एवं स्थान पर उपसथित होना सुनिश्चत करें।

उपायुक्त, धनबाद

# सामाजिक प्रभाव आंकलन

## ड्राफ्ट रिपोर्ट

जिला भू-अर्जन अधिकारी, धनबाद ,झारखण्ड

टासरा ओपन कास्ट परियोजना हेतु मौजा रोहड़ाबांध एवं मौजा टासरा में भू-अर्जन परियोजना

झरिया, धनबाद

**प्रस्तुत**

उपायुक्त

धनबाद , झारखण्ड

**दिसम्बर, 2023**

**सोशल एक्शन फॉर रूरल डेवलपमेंट (सारदा)**

**सारदा भवन , छोटकी मुर्रम, रामगढ कैंट,रामगढ – 829122 (झारखण्ड)**

# Summary of Draft SIA Report

# टासरा ओपन कास्ट परियोजना हेतु मौजा रोह्डाबाँध एवं मौजा टासरा में भू-अर्जन ड्राफ्ट एस० आइ० ए० रिपोर्ट का कार्यकारी सारांश

Approved by **Dr. N.P. Singh**

Signed by

Position Held **Managing Director**

Date

This SIA report has been undertaken in compliance with the **Rule 10 & 11 of Chapter III** of approved GUIDELINES of **Jharkhand Right to Fair Compensation and Transparency in Land Acquisition, Rehabilitation & Resettlement Rules, 2015** issued by Department of Revenue and Land Reforms (Government of Jharkhand), vide letter No-10A/Bhu.A.Ni. /Niyamawali-21/2015/131/Ni.Ra. dated 30.03.2015. Information and content provided in the report is factually correct for the purpose and objective for such study undertaken.

## 1. कार्यकारी सारांश

धनबाद झारखंड राज्य में स्थित 24 जिलों में से एक है। धनबाद जिले के अंतर्गत आने वाले कुल 8 ब्लॉक हैं और इस क्षेत्र में कुल 1159 गांव और 44 शहर हैं। हमारा अध्यन क्षेत्र धनबाद जिले के झरिया ब्लाक के 2 मौजा रोहडाबाँध और टासरा है | झरिया एक सामुदायिक विकास खंड था जिसने भारत के झारखंड राज्य के धनबाद जिले में एक प्रशासनिक प्रभाग का गठन किया था। झरिया (सामुदायिक विकास खंड) को धनबाद नगर निगम में मिला दिया गया है। झरिया 23°44′45″N 86°24′44″E पर स्थित है। झरिया सीडी ब्लॉक उत्तर में धनबाद सीडी ब्लॉक, पूर्व में बलियापुर सीडी ब्लॉक, दक्षिण में पश्चिम बंगाल के पुरुलिया जिले में रघुनाथपुर II सीडी ब्लॉक और पश्चिम में बोकारो जिले में चंदनकियारी सीडी ब्लॉक से घिरा है। झरिया सीडी ब्लॉक का क्षेत्रफल 9,077.15 हेक्टेयर है। इसमें 63 ग्राम पंचायतें और 58 गाँव हैं।

हमारा मुख्य अध्यन क्षेत्र टासरा ओपन कास्ट परियोजना हेतु धनबाद जिले के झरिया ब्लॉक के मौजा – रोह्डाबाँध एवं मौजा टासरा में प्रथम चरण में प्रस्तावित भूमि भू अर्जन परियोजना का सामाजिक मूल्यांकन है।

प्राथमिक हितधारक रैयत होंगे जिनके भूमि का अधिग्रहण करना है। प्रस्तावित अधिग्रहण में कुछ आवासीय या वाणिज्यक गतिविधि पाई गयीं । परियोजना में अनुमानतः 1130 आवासीय घरों को नुक्सान होगा जिससे 3208 PAF परिवार विस्थापित होंगे , जिससे झारखंड-आरएफसीटीएलआरआर नियम, 2015 के प्रावधानों के तहत पुनर्वास एवं पुनार्वास्थापन किया जाना आवश्यक है।

प्रभावित रैयतों एवं स्थानीय लोगों से सामाजिक मूल्यांकन के दौरान किये गए बात चित के आधार पर यह निष्कर्ष निकलता है कि भूमि अधिग्रहण से भूमि एवं उस पर अवस्थित परिसम्पत्तियों का भू-अर्जन कानून के तहत सही मुआवजा दिये जाने पर इस परियोजना से होने वाले नुकशान की तुलना में मिलने वाले लाभ ज्यादा होंगे। यहाँ यह भी उल्लेखनीय है कि अर्जन हेतु प्रस्तावित भूमि कोयला धारक क्षेत्र की भूमि है जिस पर कोई खेती बाड़ी इत्यादि कार्य नहीं करता है और अधिकांश भूमि बंजर पड़ा हुआ है जिसपर कोई भी परिवार आजीविका के लिए निर्भर नहीं है बल्कि इसके विपरीत परियोजना के विस्तार से व्यपक पैमाने पर रोजगार का सृजन होगा और स्थानीय लोगों के जीवन स्तर में सुधार होगा।

SIA रिपोर्ट की प्रक्रिया में रैयत के अलावा ग्रामीणों ने भागीदारी निभाई एवं जैसा कि रैयत (भूमि स्वामी) सहित ग्रामीणों के साथ चर्चा की गई है, वे परियोजना के समर्थन में हैं और परियोजना के प्रस्तावित परिणाम से खुश हैं।

झारखंड-आरएफसीटीएलआरआर नियम, 2015 के अनुसार मुआवजा एवं पुनर्वास की उचित व्यवस्था किये जाने पर प्रभावित रैयत के द्वारा इस परियोजना का समर्थन किया गया। सामाजिक मूल्यांकन के लिए विशेष समूह बैठक में उठाए गए मुख्य मुद्दों में रोजगार की समस्या का समाधान, R&R कॉलोनी में समुचित घर एवं जन सुविधाओ का दिया जाना, विगत कई वर्षों से भूमि अधिग्रहण की अनिश्चितता को दुर करते हुए जल्द से जल्द सम्पूर्ण मौजा के भूमि का अधिग्रहण कर समुचित मुआवजा दिया जाये, हरेक परिवार के सभी बेरोजगार युवकों को नौकरी दिया जाये, जब

तक विस्थापन नहीं होता है तब तक प्रभावित क्षेत्र में पेय-जल, चिकित्सा, स्वस्थ एवं रोजगार इत्यादि की समुचित व्यवस्था की जाये शामिल है जिनपर प्रशासन के द्वारा जन सुनवाई में विचार किये जाने एवं भू-अर्जन कानून के तहत सही मुआवजा की मांग पूर्ति होने पर रैय्यत इस परियोजना हेतु अपनी भूमि देने को तैयार हैं। ग्रामीणों के ऊपर इस परियोजना का न्यूनतम नकारात्मक प्रभाव को देखते हुए तथा प्रत्याशित दीर्घकालीन सामाजिक एवं आर्थिक लाभ तथा रैय्यत के साथ बातचीत के आधार पर इस प्रस्तावित परियोजना हेतु भूअर्जन की सिफारिश की जाती है।

## 2. विस्तृत परियोजना विवरण

### 2.1 परियोजना पृष्ठभूमि

टासरा परियोजना स्टील अथॉरिटी ऑफ़ इंडिया लिमिटेड (SAIL) की महत्वकांछी परियोजना है जिसकी कोयला उत्पादन क्षमता 4 मिलियन टन प्रति वर्ष है तथा परियोजना की कुल अवधि 28 वर्ष है। इस परियोजना में कोयला उत्खनन का कार्य खुली खदान विधि से किया जायेगा जिसमे कुल 7 मौजा की भूमि प्रभावित होगी तथा प्रथम चरण में दो मौजा रोहड़ाबांध एवं टासरा की रैयती भूमि का अर्जन किया जाना प्रस्तावित है। यह परियोजना पूर्व में भारत कोकिंग कोल् लिमिटेड के स्वामित्व में थी जिसका हस्तांतरण कोयला मंत्रालय भारत सर्कार के आदेशानुसार SAIL को किया गया है जिससे उत्पादित कोयले का उपयोग उसके स्टील प्लांट में किया जायेगा जिससे कोकिंग कोल के विदेशों से आयात पर निर्भरता को कम करने में मदद मिलेगी और देश के विदेशी मुद्रा भंडार में वृद्धि होगी। कोयला उत्पादन से राज्य सरकार को प्रति वर्ष लगभग 240 करोड़ रूपये के राजस्व की प्राप्ति होगी और व्यापक पैमाने पर स्थनीय लोगों को रोजगार मिलेगा एवं भू-अर्जन से लगभग 500 करोड़ रूपये मुआवजा राशि के रूप में भू-स्वमियों को प्राप्त होगी जिससे स्थानीय आर्थिक गतिविधियों में काफी विकास होगा। प्रस्तावित भू अर्जन क्षेत्र में पूर्व में भी विभिन्न लोक उपक्रमों जैसे BCCL, FCIL, DVC, SAIL इत्यादि के द्वारा पूर्व में भूमि अर्जन किया गया है जिसका उपयोग परियोजना के विकास में किया जायेगा। परियोजना का संचालन MDO के माध्यम से किया जायेगा।

### 2.2 परियोजना और सार्वजनिक उद्देश्य के लिए तर्क

टासरा परियोजना स्टील अथॉरिटी ऑफ़ इंडिया लिमिटेड (SAIL) जो की भारत सरकार का एक लोक उपक्रम है की महत्वाकांक्षी परियोजना है जिसके विस्तारीकरण के लिए भू-अर्जन किया जाना नितांत आवश्यक है। प्रस्तावित भू-अर्जन कोयला धारक क्षेत्र की भूमि पर किया जा रहा है जहाँ से प्राकृतिक संसाधन कोकिंग कोल् को निकाला जाना है जो कि राष्ट्र हित में आवश्यक है।

### 2.3 परियोजना विवरण और वैकल्पिक विश्लेषण

प्रस्तावित परियोजना वर्तमान में दो मौजा की भूमि अर्जन से संबंधित है जो की धनबाद नगर निगम के वार्ड संख्या 53 में स्थित है मौजा रोहड़ाबांध में कैडेस्ट्रल सर्वे (C.S.) के अनुसार बने खतियान प्रचलन में है जबकि मौजा टासरा में रिविजनल सर्वे (R.S.) के अनुसार तैयार खतियान प्रचलन में है। मौजा रोहड़ाबांध के पार्ट एरिया जो की खनन पट्टा

क्षेत्र में स्थित है में 509 प्लॉट की कुल रकबा 113.963 एकड़ रैयती भूमि का अर्जन किया जाना प्रस्तावित है जबकि टासरा मौजा के सम्पूर्ण भूमि का अर्जन किया जाना प्रस्तावित है जिसमे C.S. खतियान के अनुसार 493 प्लाट जिसका कुल रकबा 88.764 एकड़ है जबकि R.S. खतियान के अनुसार कुल 525 प्लाट की कुल रकबा 118.52 एकड़ भूमि रैयती है जिसका अर्जन किया जाना है (रैयतों से बात-चित एवं उनके द्वारा प्रस्तुत राजस्व अभिलेखों के विश्लेषण में पाया गया की R.S. खतियान एवं C.S. खतियान में भू स्वामित्व संबंधी बहुत सारे विवाद है जिसमे से कुछ मामले न्यायालय में विचाराधीन है)

प्रस्तावित भू-अर्जन के लिए "सोशल इंपैक्ट आकलन (एस.आई.ए)" को मंजूरी दे दी थी, जिसमें प्रमुख रूप से इस क्षेत्र में पीएफ़ का पहचान और गिनती कर सामाजिक समाघात निर्धारण करना है । झारखण्ड भू अर्जन नियम , 2015 के दिशानिर्देश के तहत एस.आई.ए. की पूरी गतिविधि की गयी है।

## 2.4 लागू कानूनों और नीतियां

इस देश के मौजूदा कानूनों और विनियमों के बारे में बताया गया है, जो होने वाले प्रस्तावित अधिग्रहण के लिए लागू होते हैं । यह उल्लेख करना अनावश्यक है कि परियोजनाओं को कार्यान्वित करने में कानूनी और प्रक्रियाओं को समझने के लिए अधिनियमों और नीतियों का विश्लेषण करना और उसमें मौजूद अंतराल की पहचान करना अति महत्वपूर्ण है। प्रस्तावित अधिग्रहण के लिए भूमि अधिग्रहण, पुनर्वास और पुनर्वास पर लागू कानून, जैसा ऊपर भी उल्लिखित है, ये हैं:

• भूमि अर्जन, पुनर्वासन और पुनर्व्यवस्थापन में उचित प्रतिकर और पारदर्शिता का अधिकार अधिनियम- 2013

• झारखण्ड भूमि अर्जन, पुनर्वासन और पुनर्व्यवस्थापन में उचित प्रतिकर और पारदर्शिता का अधिकार नियम, 2015

## 2.5 अध्ययन क्षेत्र :

धनबाद झारखंड राज्य में स्थित 24 जिलों में से एक है। धनबाद जिले के अंतर्गत आने वाले कुल 8 ब्लॉक हैं और इस क्षेत्र में कुल 1159 गांव और 44 शहर हैं। हमारा अध्यन क्षेत्र धनबाद जिले के झरिया ब्लाक के 2 मौजा रोहडाबाँध और टासरा है | झरिया एक सामुदायिक विकास खंड था जिसने भारत के झारखंड राज्य के धनबाद जिले में एक प्रशासनिक प्रभाग का गठन किया था। झरिया (सामुदायिक विकास खंड) को धनबाद नगर निगम में मिला दिया गया है। झरिया 23°44′45″N 86°24′44″E पर स्थित है। झरिया सीडी ब्लॉक उत्तर में धनबाद सीडी ब्लॉक, पूर्व में बलियापुर सीडी ब्लॉक, दक्षिण में पश्चिम बंगाल के पुरुलिया जिले में रघुनाथपुर II सीडी ब्लॉक और पश्चिम में बोकारो जिले में चंदनकियारी सीडी ब्लॉक से घिरा है। झरिया सीडी ब्लॉक का क्षेत्रफल 9,077.15 हेक्टेयर है। इसमें 63 ग्राम पंचायतें और 58 गाँव हैं।

हमारा मुख्य अध्यन क्षेत्र टासरा ओपन कास्ट परियोजना हेतु धनबाद जिले के झरिया ब्लॉक के प्रस्तावित भू अर्जन मौजा रोहड़ाबांध के पार्ट एरिया जो की खनन पट्टा क्षेत्र में स्थित है में 509 प्लॉट की कुल रकबा 113.963 एकड़ रैयती भूमि जबकि टासरा मौजा के सम्पूर्ण भूमि का अर्जन किया जाना प्रस्तावित है जिसमे C.S. खतियान के अनुसार 493 प्लाट जिसका कुल रकबा 88.764 एकड़ है जबकि R.S. खतियान के अनुसार कुल 525 प्लाट की कुल रकबा 118.52 एकड़ भूमि रैयती है जिसका अर्जन किया जाना है का सामाजिक मूल्यांकन है|

| क्रमांक | ब्लाक का नाम | गांवों का नाम | वार्ड संख्या | रैयत एवं ग्रामीण के साथ परामर्श की तिथि |
|---|---|---|---|---|
| 1 | झरिया | रोहडाबाँध | 53 | दिनांक 25/11/2023 से 15/12/2023 तक |
| 2 | झरिया | टासरा | | |

**नोट: चूंकि यह पहली मसौदा रिपोर्ट है जिसके विस्तृत विवरण, प्रतिक्रिया और परिणाम पर सार्वजनिक सुनवाई अभी तक आयोजित नहीं की गई है। परिणामस्वरूप जन सुनवाई के पश्चात जन सुनवाई में पाए गए जांच परिणाम को सम्मिलित करते हुए फाइनल रिपोर्ट पुनः प्रस्तुत की जाएगी।**

## 3. सामाजिक प्रभाव प्रबंधन योजना

### 3.1 मुकाबला करने और क्षतिपूर्ति करने के उपाय

झारखण्ड भूमि अर्जन, पुर्नवासन और पुनर्व्यवस्थापन में उचित प्रतिकर और पारदर्शिता का अधिकार नियमावली 2015 के अनुसार, प्रस्तावित परियोजना वर्तमान में दो मौजा की भूमि अर्जन से संबंधित है जो की धनबाद नगर निगम के वार्ड संख्या 53 में स्थित है। मौजा रोहड़ाबांध के पार्ट एरिया जो की खनन पट्टा क्षेत्र में स्थित है में 509 प्लॉट की कुल रकबा 113.963 एकड़ रैयती भूमि जबकि टासरा मौजा के सम्पूर्ण भूमि का अर्जन किया जाना प्रस्तावित है जिसमे C.S. खतियान के अनुसार 493 प्लाट जिसका कुल रकबा 88.764 एकड़ है जबकि R.S. खतियान के अनुसार कुल 525 प्लाट की कुल रकबा 118.52 एकड़ भूमि रैयती है जिसका अर्जन किया जाना है भू अर्जन परियोजना का सामाजिक मूल्यांकन है।

भूमि के अधिग्रहण के नकारात्मक सामाजिक प्रभावों को कम करने के लिए यह सामाजिक प्रभाव प्रबंधन योजना (एसआईएमपी) तैयार की गई है। सामाजिक प्रभाव प्रबंधन योजना (एस.आई.पी.) में प्रतिकूल सामाजिक प्रभावों को खत्म करने या स्वीकार्य स्तरों को कम करने के लिए परियोजना के डिजाइन, निर्माण और संचालन के चरणों के दौरान शमन, निगरानी और संस्थागत उपायों का एक समूह शामिल है। सामाजिक प्रभाव प्रबंधन का मुख्य उद्देश्य यह सुनिश्चित करना है कि विभिन्न प्रतिकूल प्रभावों को कम किया गया है और सकारात्मक प्रभाव बढ़े हैं। सामाजिक

प्रभाव प्रबंधन परियोजना के विभिन्न चरणों के दौरान कार्यान्वित किया जाएगा, अर्थात पूर्व निर्माण मंच, निर्माण मंच और परिचालन चरण।

## 3.2 प्रभाव से बचने, मुकाबला करने और क्षतिपूर्ति करने के उपाय:

1. परियोजना प्रभावित परिवारों को स्पष्ट रूप से उन लोगों से लिए जा रहे भूमि के बारे में स्पष्ट रूप से सूचित किया जाना चाहिए, और तदनुसार कुल मुआवजा राशि की गणना कर भुगतान किया जाना चाहिए आदि। बीच में किसी भी प्रकार के बिचौलिया से पूरी तरह से बचा जाना चाहिए।
2. जन सुनवाई एक महत्वपूर्ण गतिविधि है और हमें यह सुनिश्चित करना होगा कि रैयतों के सभी संदेहों को हल किया जाए और उनके संतुष्टि के स्तर को मंजूरी दी जाए।
3. भूमि के अधिग्रहण के बाद, रैयत को अधिग्रहित भूमि के लिए कर का भुगतान करने के बोझ से राहत दिया जाए।
4. यदि हितधारकों में कोई विवाद है, तो इस विवाद को पहले हल कर लिया जाना चाहिए और यह सुनिश्चित किया जाना चाहिए कि मुआवजे कानूनी मालिकों को दी जाये।
5. R & R योजना के तहत दिये जाने वाले लाभ एवं भूमि मुआवजा के बारे में विस्तार से प्रभावित परिवारों को बताया जाये।

## 3.3 विभिन्न संभावित सामाजिक प्रभावों का विश्लेषण, और उनके प्रस्तावित उपाय:

| क्रमांक | प्रभाव का प्रकार | स्थिति | प्रस्तावित शमन योजना |
|---|---|---|---|
| 1 | भूमि का नुकसान | हाँ, भूमि का नुकसान होगा | झारखंड-आरएफसीटीएलएआरआर नियम, 2015 के अनुसार मुआवजा |
| 2 | बिल्ट-अप प्रॉपर्टी का नुकसान | हाँ, | झारखंड-आरएफसीटीएलएआरआर नियम, 2015 के अनुसार मुआवजा |
| 3 | उत्पादक संपत्ति का नुकसान | नहीं | - |
| 4 | आजीविका का नुकसान | कोई महत्वपूर्ण प्रभाव नहीं, रैयत प्रमुख मजदूर हैं | |
| 5 | सार्वजनिक उपयोगिता लाइनों की हानि | हाँ, | झारखंड-आरएफसीटीएलएआरआर नियम, 2015 के R & R के अधिकारों के अनुसार भुगतान |
| 6 | सामान्य संपत्ति संसाधनों की हानि | हाँ, | |
| 7 | नागरिक सेवाओं और आम संपत्ति संसाधनों तक पहुंच का नुकसान | नहीं | |
| 8 | सांस्कृतिक गुणों में कमी | नहीं | |
| 9 | कमजोर समूहों के विस्थापन | हाँ, कुछ भूमिहीन परिवार घर बना कर रह रहे हैं | झारखंड-आरएफसीटीएलएआरआर नियम, 2015 के अनुसार मुआवजा |

## 3.4 सामाजिक प्रभाव प्रबंधन योजना

इस परियोजना में निम्नलिखित उत्पन्न होने वाले प्रभाव को कम करने की आवश्यकता है। प्रबंधन योजना ग्रामीणों के सुझाव के अनुसार लिए गए हैं ।

| क्र.सं. | प्रभाव | न्यूनीकरण योजना |
|---|---|---|
| 1 | इस परियोजना के लिए प्रथम चरण में दो मौजा के निजि भूमि का अधिग्रहण किया जा रहा है जिससे हितबद्ध व्यक्तियों की पहचान कर भूमि एवं उसपर अवस्थित परिसम्पत्तियों का उचित मुआवजा दिया जाना चाहिए तथा विस्थापित एवं प्रभावित परिवारों को उनके हक़दारी के पुनर्वास के लाभ दिया जाना चाहिये । | 1. परियोजना प्रभावित परिवारों को सर्वेक्षण के समय, कुल मुआवजा राशि की गणना, भुगतान विधि आदि के बारे में स्पष्ट रूप से संप्रेषित करने की आवश्यकता है। बीच में किसी भी बिचौलिये से पूरी तरह से बचा जाना चाहिए।<br>2. वास्तविक रैयत की पहचान गहन सर्वे एवं राजस्व अभिलेखों की जाँच कर की जाये।<br>3. ग्रामीणों को किये जा रहे भू अर्जन की भूमि के माप की स्पष्ट जानकारी होनी चाहिए। इसलिए लिए जा रहे भूमि का चिन्हीकरण कर रैयत को स्पष्ट जानकारी देते हुए उचित मुआवजा का आंकलन कर रैयतों को भुगतान किया जाए।<br>4. R & R योजना के तहत दिये जाने वाले लाभ एवं भूमि मुआवजा के बारे में विस्तार से प्रभावित परिवारों को बताया जाये।<br>5. भूमि के अधिग्रहण के बाद, रैयत को अधिग्रहित भूमि के लिए कर का भुगतान करने के बोझ से राहत मिले।<br>6. मुआवजा भुगतान के लिये परियोजना क्षेत्र में कैंप लगाकर कार्य किया जाये।<br>7. जिन भू-स्वामी का राजस्व अभिलेख दुरुस्त नहीं हो उनकी सर्वे से पहचान कर रिकॉर्ड दुरुस्ती किया जाये।<br>8. प्रभावित परिवारों को परियोजना के विकास में सहभागी बनाते हुए रोजगार के अधिकतम अवसर उपलब्ध कराया जाये। |